Head movement and linear edges

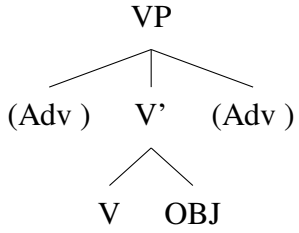
December 11, 2024

1 Introduction: Head Movement

1.1 Motivating Head movement

It is a well-known fact that verbal heads do not appear in the position where they are introduced in the tree. Given that verbs selects objects in their complements, and that adverbs like *often* are located at the VP/vP-edge (1), verbs would be expected to appear in a position strictly adjacent to the objects. That is indeed the case for English lexical verbs, as shown in (2).

(1)



(2) a. Mary often reads books
b. *Mary reads often books
c. Mary reads books often

However, in many other languages, comparable adverbs appear between verbs and objects. This is the case in French, for instance, where the adverb may appear between the verb and object (Emonds 1970; Pollock 1989). In fact, the adverb cannot appear to he immediate left of the verb:

(3) a. Jean embrasse souvent Marie
J. kisses often M.
b. *Jean souvent embrasse Marie
J. often kisses M.
c. Jean embrasse Marie souvent
J. kisses M. often
"John often kisses Mary"

Hence, the linear position of the verb doesn't reflect constituency.

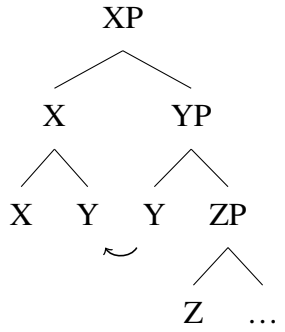
The general solution to such apparent linear order - constituency mismatches is movement (Internal Merge), where in our cases, the head adjoins to the next higher head (Koopman 1984; Travis 1984; Baker 1985). This type of account is known as *head movement*. In the French examples, V adjoins to a higher head (say T) and, as a result the verb appears to the left of a VP-level adjunct.

1.2 Challenges for Head Movement accounts

Traditionally, head movement has been perceived as a movement operation applying in narrow syntax, much akin A- or Ā-movement. At the same time, there are at least four dimensions, in which head movement deviates from other types of movement.

The first one is that head movement violates common conceptions of cyclicity — we dub this the *Cyclicity Problem*. As can be seen in the tree below, head adjunction does not target the root of the tree and in that sense, head movement is not cyclic: it violates the extension condition.

(4)



The second dimension is that unlike cases of A- or Ā movement, head movement does not appear to feed LF. Head movement is semantically vacuous — we term this the *Vacuity Problem*. This can be seen by examples like (5)-(6):

(5) a. Mary doesn't like any student
b. *[Any student]$_1$ isn't liked t_1 by Mary

(6) Mary need$_i$n't t_1 books

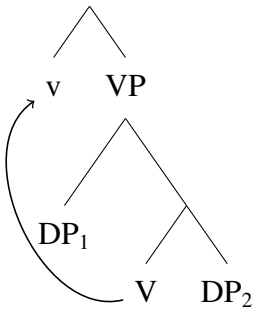
In (5), the NPI *any students* must appear in a surface position below negation; if it A-moves to a position above negation, it will end up being unlicensed. However, head movement of *need* in (6) does not exhibit this effect, suggesting that head movement does not feed semantics.[1]

Another challenge for head movement, our third dimension, is noted by Kalivoda (2018). He notes that, given a Match Theoretic view of the mapping from syntax to prosody (Selkirk 2011),

1. It has been argued in the literature that head movement can sometimes feed semantics. Lechner (2004) and Iatridou and Zeijlstra (2013) for instance arge that scopal relations between negation and modals are best captured under the assumption that head movement feeds semantics. At the same time, arguments have been provided against the reliance on head movement of such analyses (e.g. Jeretič and Thoms (2023)). In fact, Iatridou and Zeijlstra (2013, fn. 22) point out that their analysis is also compatible with the view that head movement effects are PF-based and do not feed semantics.

standard approaches to ditransitive constructions, which are commonly assumed to involve head movement low in the clause, are predicted to have a particular prosodic structure, where both internal arguments should form a joint prosodic phrase — this we name the *Phrasing Problem*.

(7) vP ($_{\varphi}$ v+V ($_{\varphi}$ DP_1 DP_2))



Kalivoda conducts a survey of attested patterns of prosodic phrasing of ditransitives across a number of languages. Notably, he finds that the above pattern of phrasing is unattested. By and large the most common phrasings are those shown below.

(8) ($_{\varphi}$ v+V DP_1 DP_2)

(9) ($_{\varphi}$ v+V DP_1) ($_{\varphi}$ DP_2)

Kalivoda takes these facts to motivate a different approach to the mapping of syntax to prosody, which we take no particular stance on here. What we wish to note is that the two mappings above — in particular, that in (8) — are exactly what we might expect were head movement not to take place at all. This, foreshadowing the proposal to be introduced later in this paper, would be possible only if heads could be linearized to the left of their specifiers.

The fourth dimension in which head movement is different from A- or $\bar{A}$ movement concerns locality. Head movement is strictly local. It is impossible to adjoin a head X to a head Y if some head Z intervenes. This is known as the Head Movement Constraint (HMC), which goes back to Travis (1984). A- or $\bar{A}$ movement, by contrast, does not have to target the closest specifier (albeit that A-movement does target the closest A position). We call this the *Locality Problem*.

This difference between head movement on the one hand and A- and A'-movement on the other have led to the development of three schools of thought. One places head movement squarely in the syntax, with the differences between head movement and phrasal movement being attributed to other factors; the other is to delegate parts of head movement to a distinct module of the grammar. A third approach takes head movement — at least of the classical sort – out of narrow syntax in its entirety. Below we discuss these briefly, and relate them to the proposal we wish to make.

1.3 Approaches to head movement and their problems

Here, we'll briefly review several schools of thought on head movement and how they relate to the problems mentioned beforehand. For a more detailed overview, we refer the reader to Dékány (2018).

One sort of approach locates head movement chiefly in the syntax. This can either be by adopting an approach where Merge is allowed to apply freely (see Safir (2019) for an instance where this

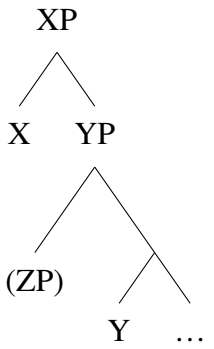
logic is made explicit). Another approach would be to assimilate head movement to phrasal movement (see Massam (2000) for such an analysis of a verb-initial language). While we do not dismiss the latter approach for languages like Niuean and comparable verb-initial languages, we suspect that a full-blown extension of such an account for all instances of head movement ultimately be unsatisfactory. As for the former sort of approach, while it is possible to define a cyclic principle regulating Merge that will allow for both head movement and phrasal movement, it is not clear that such an approach escapes the other problems for syntactic head movement mentioned beforehand, namely the *Vacuity Problem* and the *Phrasing Problem*.

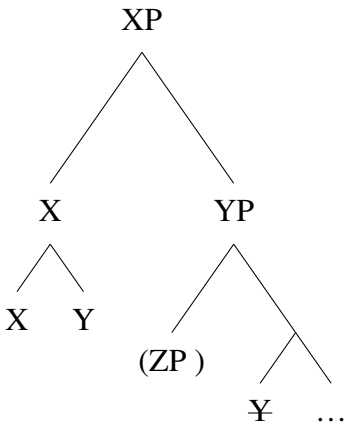
A second sort of approach places portions of head movement in the syntax and other portions in the morphology. The most famous example of this sort of approach comes from Matushansky (2006). Matushansky suggests that head movement takes place in two steps. Heads may undergo movement to specifier positions, with a subsequent morphonological operation — M-merger — being responsible for assimilating the head in specifier position together with another nearby head. While this approach solves the *Cyclicity Problem*, it runs afoul of the three other problems mentioned before. It does not lead us to expect head movement to be semantically vacuous, so it is still subject to the *Vacuity Problem*, it predicts the unattested prosodic phrasings that characterize the *Phrasing Problem*, and the *Locality Problem* is not addressed under this proposal either.

A third sort of approach locates head movement in the postsyntax. Thereby, the differences between head movement and non-head movement is captured by attributing the properties of one to a distinct module from the other. Outsourcing head movement to PF trivially explains why it no longer feeds LF, resolving the *Vacuity Problem*. It may also avoid the *Cyclicity Problem* as there is no reason to a priori expect operations at PF to be subject to the same cyclic principles as the narrow syntax, although it is not clear why cyclicity should work differently in the PF component of grammar. The *Phrasing Problem* might also be worked around if the prosodic structure is derived from a PF representation, rather than the syntactic tree proper (although we do not know of any claims made in the literature which directly address this juncture between PF-level rebracketing and prosodic phrasing).

The third sort of approach thus seems more promising, as it furnishes a straightforward solution to the three problems discussed beforehand. Indeed, we will develop just such an approach. However, we wish here to raise issue with many approaches to post-syntactic head movement, namely that the structures which they operate on are similar in nature. Taking Harizanov and Gribanova (2019) as an example, consider the operation they propose for instances of head movement at PF: given two heads, where the first is the head of the phrase which serves as the complement to the second, one of the two might be adjoined to the other.

(10)





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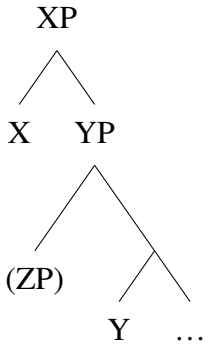
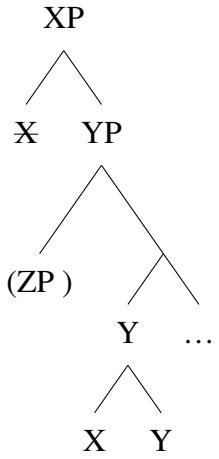




We are right to be suspicious of approaches such as these, however. It is not clear that much is to be won by taking a set of putatively syntactic operations and declaring them part of a distinct module by wit of explanation. We are right to be suspicious of putatively modular approaches to grammar where two supposed modules of grammar truck in the same vocabulary — here, minimal and maximal projections, and adjunction to them — and produce very similar outputs — here, novel constituents where the properties of one of the two daughters of the novel constituent are inherited.

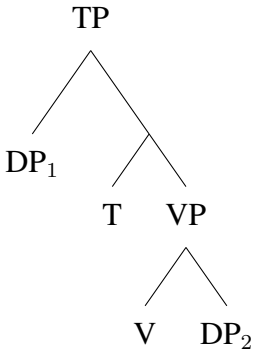
Our aim, then, is to sketch what a post-syntactic approach to head movement might look like without making a direct appeal to operations of the sort discussed above. We will take an altogether different approach, and place much of the responsibility for ensuring that two heads are in a local relationship in the hands of a different PF mechanism without alluding to any kind of movement, neither in narrow syntax, nor at PF. Instead, we suggest that head movement effects might be treated as the consequence of a particular linearization algorithm that allows a wider range of possible linear orders for a given maximal projection than is commonly assumed.

2 Linearization and head movement

Following Kayne (1994) and much subsequent work, it is often assumed that there is a strict one-to-one mapping of syntactic structure to linear order. For instance, if one has a tree like the following,

only one order of terminal nodes will be admitted, namely: DP_1 T V DP_2. Under such strict views of linearization, *any* deviation from this linear order must reflect a difference in syntactic structure — head-finality, for instance, must involve movement of constituents within the clause.

(12)



Even if a less strict approach is taken — for instance, by assuming something like a head parameter — the result is the same: any one tree must map to exactly one linear order. But if we admit a head parameter into the system that is not uniform across all heads in a language, in essence allowing the features of certain lexical items to determine linear order, we might wonder whether a fully feature-driven view of linearization is possible. We will pursue this line of analysis here. More specifically, we will suggest that the relative order of heads and phrases dominated by the projection of that head are, at least in principle, freely linearizable. Restrictions on the ordering of elements arises from lexically specified features analogous to the aforementioned features encoding the head parameter, and a highly cyclic approach to the linearization of elements in the clause. Our core focus, naturally, will be the capturing of certain word order patterns generally attributed to head movement.

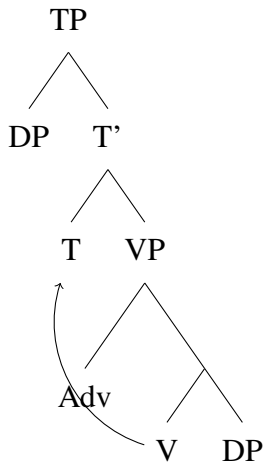
2.1 Linearization

Ad discussed before, a well known set of facts commonly attributed to head movement involves differences between languages with respect to possible orderings of head, complement, and adjunct. For expository purposes, we restrict ourselves to fairly simple syntactic representations free of intermediate projections, but we note that the analysis presented here is, of course, compatible with enriched representations of this sort. As shown in Section 1, and repeated here, certain adverbs may appear between the verb and object in French, but not in English (at least when it concerns lexical verbs".

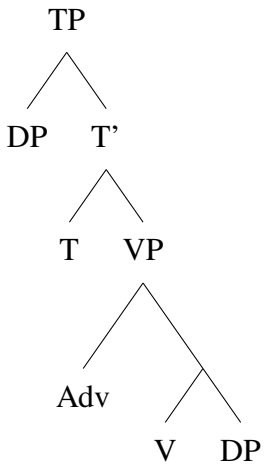
(13) a. Jean embrasse souvent Marie
J. kisses often M.
"John often kisses Mary." FRENCH
b. *John kisses often Mary.

A common analysis of facts like these, following Emonds (1970) and Pollock (1989), involves a parametric difference between English and French cashed out in terms of head movement: in French, V moves to T (14), while in English V does not (15).

(14)



(15)



The strategy here, then, is similar to that commonly assumed for A and Ā-movement. The expected linear order where the adverb precedes the verb is not present in French as a result of the verb undergoing displacement to a head which takes the VP, including the adverb, as its complement. The relevant linear order reflects derived constituency.

But as said before, the question is indeed whether linearization always needs to reflect (derived) constituency. Going back to the head parameter, the idea is that linear order is not fully predictable on the basis of the hierarchical order of the syntactic objects, but only partially so, and additional linearization constructions come from features on particular heads. If V has some head-initial feature, it must be linearized to the left of its complement; if V instead has a head-final feature, it must be linearized to the right of it.

Head-initial and head-final features are, however, not sufficient to determine the linear order between a head and its specifier(s) and/or adjuncts. Unless additional mechanisms are assumed (like anti-symmetry or other linearization features) the order of a head with respect to these non-complements (both specifiers and adjuncts) is underdetermined. The question is whether that is a good or a bad thing.

But before addressing that question, it should be noted that specifiers and adjuncts behave differently when it comes to (rigid) linearization. Specifiers generally have a specific position in the linear order (often to the left of their heads); here underspecification would be problematic:

(16) a. She likes her
b. *Likes her she

But adjuncts are relatively free and can often appear both to the left and to the right of the verb and its complement, as shown below:

(17) a. She often eats spinach
b. She eats spinach often

From the perspective of adjuncts, underspecified linearization constraints would actually result in the observed word order freedom.

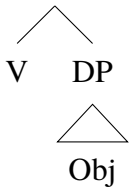
There are good reasons to assume, though, that the fixed order of specifiers is due to other factors. For one, specifiers could tend to be leftward for reasons like the EPP. Alternatively, certain

affixes need something metrically strong supporting them or a prosodic alignment requirement (Richards 2016). Another reason for the leftness of specifiers in head-initial phrases could be that certain heads are barred from appearing phrase initially (see Sabbagh 2014, who discusses 2nd person clitics of various sorts). And finally, as argued for in Zeijlstra 2022, if specifier positions are landings sides for movement, and movement is leftward, such specifiers positions should be to the left of their complements as well. Irrespective of the exact reason, we take the general leftness of specifiers to be something that follows on independent grounds and argue that a general theory of linearization can leave the position of non-complements in principle relatively free.

The question, then, arises how the linear order of heads, complements and non-complements (i.e. specifiers and adjuncts) is determined. To answer that question, we will discuss our assumptions step by step and look first at cases English lexical verbs, where no head movement effects can be observed. After that, we will look at cases where head movement effects do play a role.

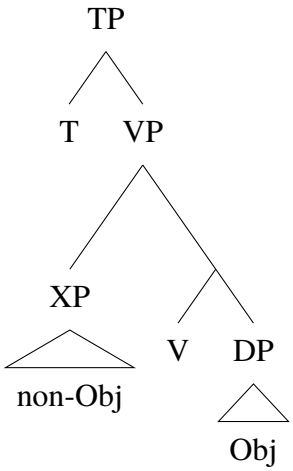
Our first assumption is that linearization takes place whenever a head and complement are merged. The reason is that when a head and its complement merge, it is only then that the head parameter can be properly implemented. As we will see, the fact that linearization is this highly cyclic also makes that what makes like head movement look highly local. Hence, when a VP consisting of a head V and a complement DP is linearized, V is either linearized to the left of (all the material inside) DP or to the right of it. In English, V, being head-initial, ends up at the left of its complement.

(18)



The next step of linearization applies when the next head is merged, which we take to be T:

(19)



It is already clear from the above that V must appear to either the left or the right of its complement. Since English is overall head-initial, V appears to the left. The same applies to T. This way, the following linearization statements established:

(20) a. T < VP
b. V < DP

As VP contains XP, V and DP, the list or established linearization conditions can be extended as follows:

(21) a. T < XP
b. T < V
c. T < DP
d. V < DP

Hence, the order T < V < DP is already established; the only question is where XP needs to be pronounced. In this light, it is important that the relative position of XP does not have to be restricted to one position. As we saw, in the case of adjuncts, it can be either in between T and V, or after the DP. In other words, the adjunct needs to be linearized at the edge of the VP. The choice of the word *edge* is deliberately chosen.

But what is the proper definition of "edge"? It may be intuitive to think of the edge of a phrase as the outer layer (either linear or structural) of some phrase. But outer is configurationally defined; a position is an outer position of a phrase if the next element up no longer belongs to that phrase. Let's therefore define a linear edge as follows.

(22) An element X that is part of a phrase BP in a configuration [A [BP]] is linearized at the edge of BP if it is
a. linearized as closely to A as possible with respect to other linearization conditions,
b. or as far away as possible from A with respect to other linearization conditions.

This way, XP is either linearized to the immediate right of T, or to the immediate right of the DP. This gives us two sets of possible linearization conditions:

(23) a. T < XP
b. T < V
c. XP < V
d. T < DP
e. V < DP
f. XP < DP

or

(24) a. T < XP
b. T < V
c. T < DP
d. V < DP
e. DP < XP
f. V < XP

This is indeed in full accordance with the examples shown before. If XP is an adjunct, both orders are fine; if XP is a specifier, the second order must be ruled out independently, for reasons we have mentioned earlier in this section. This allows us to formulate the following linearization algorithm:

(25) **Within a cycle of linearization**
a. A head is linearized to the left or right of its complement.
b. A non-complement inside its complement is linearized at an edge of that complement

This derives the English cases with lexical verbs that do not display head movement effects. Of course, more needs to be said about English. For one, lexical verbs are marked for tense and agreement, which we do not attribute to linear adjacency between V and T. Rather, we assume is that tense morphology is not hosted on T but rather on V itself, which then Agrees with T (see also Bjorkman (2012) for proposals that Agree between T and V may be responsible for determining the way V is inflected). Evidence for that may also come from examples like:

(26) Wolfgang played tennis on every Sunday. Armin Von Stechow 2006

The intended interpretation of (26) is one where past tense outscopes the distributive quantifier *every Sunday*, which in turn outscopes the lexical verb *play*, yielding the paraphrase in (27a). The scopal order where past tense would take scope at its surface position, i.e., under *every Sunday*, amounts to the reading in (27b), which is absent Arnim Von Stechow 2003, 2005; Zeijlstra 2012.

(27) a. There exists a past interval t such that for every Sunday in t, Wolfgang plays tennis.
b. *For every Sunday, there exists a time before it such that Wolfgang plays tennis at that time.

This suggests that the semantic locus of tense does not coincide with the surface position of the tense marker.

Another thing that needs to be addressed concerns auxiliaries. As is well known, auxiliaries (*be*, *have*, modals) display certain head movement effects. Take, for instance, the following examples, where the auxiliary verb appears to the left of negation.

(28) a. Mary hasn't left
b. Mary can't leave

Have is clearly verbal and therefore must head a VP. Also, a modal like *can* taks scope below negation and must thus head a projection that is c-commanded by negation. Despite this, they appear to the left of the marker of negation. Their surface position, therefore, does not reflect their

base position, which would commonly be attributed to head movement. We might then wonder how such head movement effects can result from our linearization algorithm. To answer this question, we will first focus on a language that manifests head movement effects for all verb, namely French. After that, we will return to the question raised by English auxiliaries.

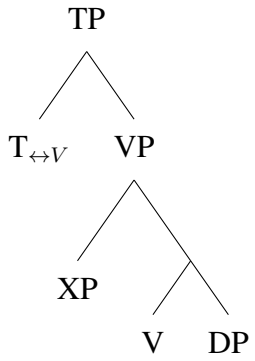
2.2 Adjacency diacritics

Now, let's look at French. As shown before, in French, the finite verb needs to precede adverbs that are located at the VP-boundary, unlike is the case with English lexical verbs. An adjunct thus follows the verb but may still precede or follow the object.

(29) a. Jean embrasse souvent Marie
J. kisses often M.
b. Jean embrasse Marie souvent
J. kisses M often.
"John often kisses Mary."

Following classical analyses of head movement, we assume that in French T is subject to a condition that it is linearly adjacent to V. However, unlike classical analyses of head movement, we do not assume that this triggers head adjunction to T. We assume that in French T is equipped with a feature, which we notate as $[\leftrightarrow V]$, which merely informs the linearization mechanism to linearize V and T in a strictly adjacent fashion (see Ryan 2010). With this in mind, let us no look how linearization will take place exactly. Take the tree in (30).

(30)



First, after merger of V and DP, the following linearization construction is derived following the algorithm introduced earlier in this section, based on the fact that French is head-initial.

(31) a. V < DP

Then, upon merger with T, an additional instruction is generated. Next to the instruction that says that T should precede VP, there is an additional instruction, T«V, which states that T should be strictly adjacent to V. We thus derive the following rules:[2]

2. Note that this may suggests that T should be prefixal on V instead of suffixal, contrary to fact. However, the internal order of V and T is something that is determined by the morphology/vocabulary insertion that applies after linearization

(32) a. T < XP
b. T « V
c. T < DP
d. V < DP

The final question is then how XP must be linearized. What we know is that such elements have to be spelled out in the edge of T's complement, i.e. XP must be linearized as closely to T as possible with respect to other linearization conditions, or as far away as possible from A with respect to other linearization conditions. Since, V must be strictly adjacent to T, the closest possible linear position for XP to T is then to the immediate right of V. The position furthest away is immediately after DP. Thus, the following statements hold:

(33) a. T < XP
b. T « V
c. T < DP
d. V < DP
e. V < XP
f. XP < DP

or

(34) a. T < XP
b. T « V
c. T < DP
d. V < DP
e. V < XP
f. DP < XP

Note that by the sole innovation of a diacritic like $_{\leftrightarrow}V$ the linearization component can linearize the verb in a position that does not *appear* to reflect its base position. But crucially, no head movement has taken place, neither in syntax nor at PF. In French, T is uniformly equipped with $_{\leftrightarrow}V$. One could even say that $_{\leftrightarrow}V$ is connected to the feature [T]. But this does not always have to be the case. It may very well be that only T with some particular feature has a property like $_{\leftrightarrow}V$. This is what we assume is the case for English auxiliaries. We assume that T[Aux] has a diacritic $_{\leftrightarrow}V$, so that whenever T merges with a VP (or any other phrase) with a head containing feature [Aux], this head ends up strictly adjacent to T. The presence or absence of auxiliaries is then controlled by the presence or absence of [Aux] on T. If [Aux] is present, there must be an auxiliary in the clause, which then ends up adjacent to T. If no auxiliary is present, $_{\leftrightarrow}V$ on T remains unsatisfied. Hence, only if [Aux] is absent on T, can verbs not raise to T. This is trivially the case when there is only a lexical verb inside VP. But what happens if there is an auxiliary inside VP without T[Aux]? Here, we argue that this must be ruled out syntactically: auxiliaries are required to Agree with a feature $T_{[Aux]}$. Note that given multiple agreement, in case there are multiple auxiliaries inside the complement of T (as in *Mary must have seen Bill*), only one of them, the highest one, will end up adjacent on T. This captures the facts that relate to head 'movement' effects of auxiliaries.

2.3 So far

So far, we have established an account of head displacement effects that crucially involve no such thing as head movement. Heads do not undergo movement and stay at their base position when they are linearized. This mechanism naturally resolves the four problems that traditional accounts of head movement were facing: the *Cyclicity Problem*, the *Vacuity Problem*, the *Phrasing Problem*, and *Locality Problem*. As for the *Cyclicity Problem*, since there is no head movement going on whatsoever, this problem is trivially resolved. As for the *Vacuity Problem*, since linearization is a PF phenomenon, no semantic feeding is expected in the first place. As for the *Phrasing Problem*, since heads do not undergo movement, the syntactic structures should give rise to the relevant prosdic structures attested. And, fnally, the *Locality Problem* also no longer applies, as the linearization mechanism is highly local itself; it applies at any instance of merger of a head with its complement.

At the same time, there are also many questions left open. One of them concerns so-called "mixed headedness" patterns. These, we will discuss in the next section.

3 Mixed headedness

So far we have looked at harmonious languages where every head is either head-inital or head-final. In this section we discuss a potential challenge for the theory developed here — that of "mixed headedness". Those are languages where one head that is head-initial dominates another head that is head final. Take, for instance, German (35). German is a language with head-final VP and TP but with head-inital CP. In addition, in main clauses, the finite verb/auxiliary 'raises' to C. This way, the highest verb (either lexical or an auxiliary) shows up in a clause-initial position, preceding the object, but the rest of the verbs cluster in the hierarchically determined order in clause-final position (see Besten and Rutten 1989 and many others).

(35) a. Ich sehe Marie.
I see Marie
"I see Mary."

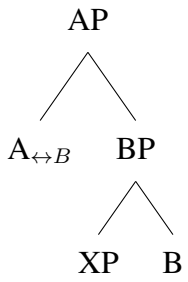
b. Ich habe Marie gesehen.
I have Marie seen
"I have seen Marie."

c. Ich werde Marie gesehen haben.
I will Marue seen have
"I will have seen Marie."

d. dass Ich Marie gesehen haben werde.
that I seen Marie have will
"that I will have seen Marie."

Apart from cases like (35d), the theory of linearization developed so far does not straightforwardly account for such cases where a head-final verb appears to 'raise' to C. The reason is that in such cases, the linearisation mechanism yields conflicting statements. To illustrate this, let's look at the tree below, including only a higher head-initial AP dominating a lower head-final BP, where B should be string-adjacent to A:

(36)



Here, B, being head-final, should be linearised to the right of its complement XP. At the same time, it should be strictly adjacent to A, and A should be linearised to the left of XP:

(37) a. A < B
b. A < XP
c. XP < B
d. A « B

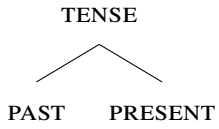
This is a contradictory set of linearization statements: (37d) precludes the possibility of the statements (37b) and (37c) in conjunction. In general, the system we have developed does not account for straightforwardly cases where one head may appear to the left or right of its complement in one context and on the other side in another. Below, we present two possible solutions to this challenge. One involves enriching the inventory of linearization diacritics; the other involves making less-standard assumptions about the phrase structure of "mixed headed" languages.

3.1 Approach 1

The first approach involves a non-Kaynean version of an asymmetry between head-initiality and head-finality, inspired by markedness theory. In many cases, markedness effects are not taken to be the result of one of two features that stand in a geometrical sisterhood relation (see Harley 1994), one being more prominent than the other, but rather the result of the result of two features standing in a geometrical mother-daughterhood relation.

To see this, take present vs, past tense. Once could argue that a geometry of tense features would involve a superfeature [Tense] with two daughters, [Past] and [Present]. Here, [Past] and [Present] would stand in a symmetric sisterhood relation and the alleged markedness of [Past] should follow from something else. Alternatively, one may assume that the geometry actually involves a mother feature [Tense] and a daughter [Past]. [Tense] is unspecified with respect to anteriority, [Past] is not. The fact that [Tense] generally denotes a present tense would then be a pragmatic blocking effect: anteriority must be expressed by using the more specific [Past] feature, hence only of the speaker does not intend to make an anteriority claim will she usee underspecified [Tense]. Such an asymmetry between past and present has been proposed independently by many (including Sauerland 2002; Altshuler and Schwarzschild 2013 and many others). If [Past] and [Present] indeed stand in asymmetric feature-geometric relation, it follows naturally that the more specific feature is also the more marked one.

(38) **"Differentiated present" approach**

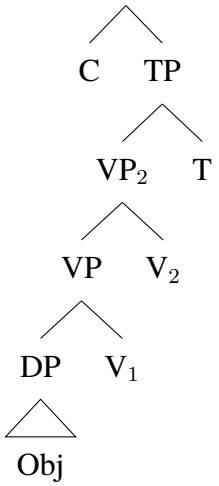


(39) **"Underspecified present" approach**

The same reasoning could apply to opposite featural diacritics like < and >. They could be real duals of each other, with opposite head-directionality 'values', but they could also be taken to stand in an asymmetric relation. We could assume instead that there are two diacritics. One is < (giving rise to head-initiality) and one is •. • is underspecified. Since < is more specific than •, • should have a default interpretation of > unless this violates other linearization statements. Hence, H < ComP means H should precedes its complement, H • Comp means that H follows Comp unless this violates other linearization statements.

Now take German C-Obj-V-Aux, where Aux is to be treated as the morphological realization of an adjacent V and T.

(40) CP C-Obj-V_1-V_2-T



Now assume C is head-initial and that V and T are head final. This gives rise to the following linearisation statements:

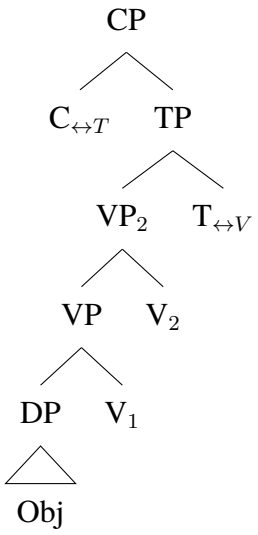
(41) a. C < TP
b. T • VP_2
c. V_2 • VP_1
d. V_1 • Obj

This means that T and V may strictly speaking appear either to the left or right of their complement, but unless anything contradicts this, TP and VP will be linearised in a head-final way.

Now, let's also assume the following linearisation conditions $T_{\leftrightarrow V}$ and $C_{\leftrightarrow T}$.

In that case, linearization of the following tree, where T should be adjacent to V ($T_{\leftrightarrow V}$) and C to T ($C_{\leftrightarrow T}$) would block interpretation of • as being a head-final diacritic.

(42)



To see this, let's go through all the relevant steps.

First step: V_1 • Obj, will result in V ending up to the right of Obj, unless overruled later on:

(43) a. V_1 • Obj

Next, V_2 • VP_1 will result in V_2 ending up the right of VP_1, unless overruled later on.

(44) a. V_1 • Obj
b. V_2 • V_1
c. V_2 • Obj

In the third step, $T_{\leftrightarrow V}$ • VP_2, should in principle still result in T appearing to the right of VP_1 (unless overruled later on). The diacritic, will result in a statement that V_2 and T be adjacent. Hence, we have, where •• indicates (unspecified) strict adjacency:

(45) a. V_1 • Obj
b. V_2 • V_1
c. V_2 • Obj
d. T •• V_2
e. T • V_1
f. T • Obj

Here, nothing would block an interpretation of x as •, and the following order would appear: Obj < V_1 < V_2 < T. Note that this is indeed the attested order in German embedded (non-V2) clauses (35d).

But now, let's see what happens when matrix head-initial C with the adjacency diacritic for T, $\leftrightarrow$T gets merged:

(46) a. V_1 • Obj
b. V_2 • V_1
c. V_2 • Obj
d. T •• V_2
e. T • V_1
f. T • Obj
g. C « T
h. C < V_2
i. C < V_1
j. C < Obj

As the reader can see, at this stage, in order not to trigger any contradictions, C must be linearized to the left of TP (and everything in it), while C, T and V_2 must be strictly adjacent. This will now force • to be interpreted as < in the set of statements:

(47) a. V_1 • Obj
b. V_2 < V_1
c. V_2 < Obj
d. T « V_2
e. T < V_1
f. T < Obj
g. C « T
h. C < V_2
i. C < V_1
j. C < Obj

The only unspecified order is that between Obj and V_1, and. Hence, only V_1 will be linearized to the right of the object. Hence, we get the following linearization: C « T « V_2 < Obj < V_1 , which is the attested order. Thus, this way German V2 orders can be derived as well.

Note further more that the mirror image of these V2 (V-penultimate) cannot be derived given the asymmetry between head-finality and head-initality. As long is it is hard-wired that head-initial features are more marked than head-final ones and markedness implies specificity relations, only leftward head 'movement' is possible.

3.2 Approach 2

As mentioned before, systems like German — or any system where headedness is not uniform — are difficult for the theory developed here to account for. Consider again the German case below.

(48) a. Ich schlief.
I slept
"I sleep."
b. Ich habe geschlafen.
I have slept
"I have slept."

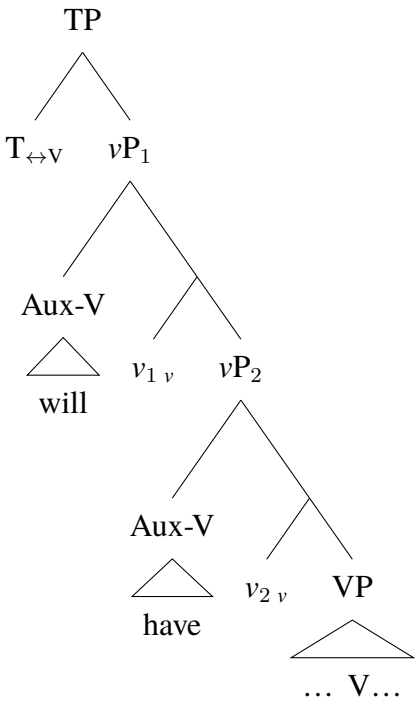
c. Ich werde geschlafen haben.
I will slept have
"I will have slept."

Here, the highest verb — be it lexical or auxiliary — appears to the left of all elements aside from that which has undergone Topicalization. The rest of the verbs appear to the right of any direct objects in a hierarchically determined order. As mentioned before, the problem for the approach sketched in the previous chapters involves the highly cyclic approach we have proposed for linearizing heads: If a head is linearized off to the right at one stage of the derivation, as a result of the parameter for the linearization of heads being rightward, there will be no way for the system to subseqently alter the linear order of the heads in question.

This subsection notes that this sort of effect can be also derived using just the machinery developed so far. The consequence is that we will have to think of verbs in these languages differently from the way that we thought of verbs in the languages discussed so far, where headedness was not mixed in the way suggested here. More specifically, we will have to treat verbs, for languages that display mixed-headedness of the sort found in German, as being structurally analogous to non-complements in languages like French and German. This involves adopting an approach like that proposed in Pietraszko (2023), where in at least some languages auxiliaries are merged as specifiers of heads that select them, and bears some similarity to the approach to adverb ordering developed in Cinque (1999), where adverbials appear either as as overt heads which must be merged in a rigidly defined order with respect to each other, or as phrasal elements which are selected as specifiers by the heads in question.

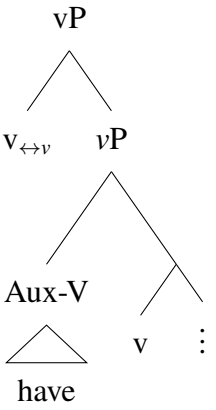
To show how this proposal works, we begin with cases involving auxiliaries. We are aiming for a system where only the highest verb is linearized to the left, while all others are linearized to the right. Consider now the structure below. Here, we use v to denote the aforementioned functional heads which select certain auxiliary phrases as their specifiers, and Aux-V to denote these overt auxiliaries themselves. Recall also that we have at present a strategy for ensuring that certain heads appear adjacent to each other: the $\leftrightarrow$ diacritic, which appears on each of the vs in the structure below.

(49)

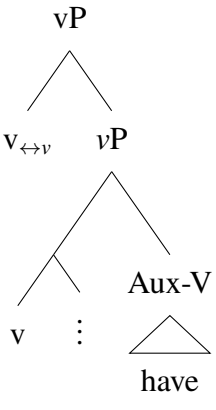


Accounting for the attested word order requires an additional set of assumptions in line with what we have proposed for other languages in prior sections of the paper. First, contra common assumption, we may assume that heads in German are linearized to the left of their complements. The consequence of these first two assumptions taken in tandem is that any Aux-V in a specifier position which is not the highest in a given clause must be linearized to the right of the head it is a specifier of and of that head's complement. Were the Aux-V instead linearized to the left of these elements, the strict adjacency requirement imposed by $\leftrightarrow v$ on the higher of the two *v*s could not be satisfied, as the Aux-V would be linearized between them.

(50) **Linearizing Aux-V to the left prevents adjacency between two *v*s**



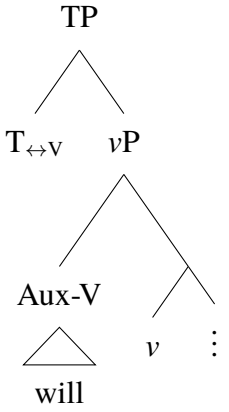
(51) **Linearizing Aux-V to the right satisfies adjacency between two *v*s**



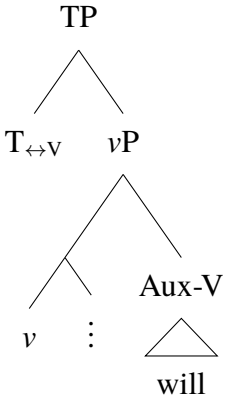
This correctly predicts that for "stacked" instances of auxiliaries, the auxiliaries will appear to the right of the VP in the attested order. How, then, are we to ensure that the highest verb or auxiliary is linearized to the left? The crucial assumption to adopt here is that some higher head — which we

notate for expository convenience as T (well aware of proposals that the V2 position in German is likely in the verbal extended projection) — bears an $\leftrightarrow$V diacritic. Consequently, the highest verb in the structure in question — here the Aux-V *will* — must be linearized in a position immediately adjecent to this functional head, forcing it to appear to the left of the head which selects it as well as that heads complement.

(52) **Adjacency between T and Aux-V satisfied**

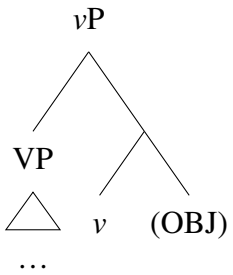


(53) **Adjacency between T and Aux-V blocked**



Put together, this strategy allows us to understand the attested pattern for auxiliaries: the highest appears to the left, while all other lower auxiliaries appear to the right. Now: how are we to treat lexical verbs in languages such as these? The straightforward answer is to treat them as we would auxiliaries, namely, as elements hosted in non-complement position of some functional head, notated here for consistency as *v*, as schematized below. We refer the interested reader to Ahn (2022) and references therein for argumentation that there may be functional material low in the clause which glues together the lexical verb and its direct object, and Newman (2021) for argumentation that phrase structure of the sort shown below, where verbs appear in specifier position, should be admitted.

(54)



Given this assumption, lexical verbs should behave in more or less the same way that auxiliaries do, and for the same reason. If no higher *v* head selects the phrase that contains them they will be linearized to the left to satisfy the $\leftrightarrow$V diacritic on T. If a higher *v* head does select the phrase containing that verb, they must be linearized to the right, to allow the $\leftrightarrow v$ diacritic to be satisfied.

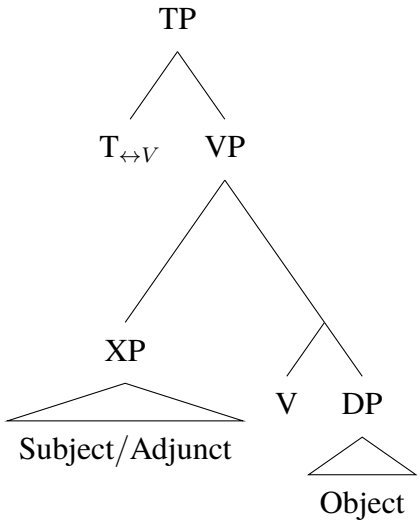
4 Whether or not a language has scrambling

4.1 Predicting scrambling

In this part of the paper we introduce another feature of heads, which requires them to be non-initial, in that they must host a (leftward) specifier of some sort. We suggest that this sort of feature underlies at least some classical EPP effects. That is to say: the need for an element to be non-initial might consistently be satisfied by syntactic movement of a phrase to a specifier position. In doing so, we highlight a potentially interesting property of the system developed here: elements that undergo head movement may not themselves be allowed to have an EPP property. Building on work by Branan (2021), we show that this derives a difference between Japanese and Tagalog with respect to the semantic effect of scrambling. In both languages — analogous to the cases discussed involving adjuncts in the prior section — complements of the verb and specifiers may be linearized freely with respect to each other, giving rise to semantically vacuous scrambling.[3]

In the previous section, we assumed a simplified clause structure like that given below for French-like languages. There, we saw that complement and adjunct or specifier could be freely linearized with respect to each other, while V was required to precede both of them.

(55)



It turns out this model for French works very well for languages like Tagalog.[4] More specifically, a structure like that above is one where we should expect the verb to appear first, followed by the arguments it selects. Much like adverbs and objects in French, an agent in spec,VP and internal argument as comp,V will be freely ordered with respect to each other. As shown below, this is indeed the case.[5]

3. This is analogous, in some respects, to proposals made by Sauerland and Elbourne (2002) for scrambling in Japanese. There, they suggest that scrambling in Japanese may take place either in the narrow syntax or at PF. In the former case, reconstruction does not take place, while in the latter case the constituent is obligatorily interpreted in its base position. Considered in this light, the theory developed here builds a model of what PF scrambling might look like.

4. We set aside the question of voice alternations in Tagalog for now, and return to them at the end of this section.

5. We gloss *ang* here as a nominative marker, but note that everything said here is compatible with an analysis of ergative-absolutive analysis of Tagalog like that put forth in Aldridge (2004). We gloss *ng* as a genitive marker,

(56) a. Lumunon ang ina ng mani.
av.swallowed ANG mother GEN peanut
'The mother swallowed a peanut'.
b. Lumunon ng mani ang ina.
av.swallowed GEN peanut ANG mother
'The mother swallowed a peanut'.

We should further expect that the relative order of arguments in to have no effect on scope or variable binding. As demonstrated below, this is indeed the case.[6] Regardless of the order of a pivot agent and non-pivot theme, for instance, the theme may never take scope over the agent, and thus may not bind a variable in it.

(57) a. *Nagmamahal ng bawat anak ang kanyang ama
AV-love GEN every child ANG poss. father
"Her$_i$ father loves every$_i$ child."
b. *Nagmamahal ang kanyang ama ng bawat anak
AV-love ANG poss. father GEN every child
"Her$_i$ father loves every$_i$ child." Rackowski (2002)

This absence of semantic effect is just what we should expect if the free order of arguments in Tagalog is a result of the linearization algorithm developed here, rather than a result of syntactic movement (see, e.g. (Richards 1993) for an analysis of Tagalog scrambling as involving Ā-movement which undergoes obligatory reconstruction). However, given the fact that there are languages — such as Japanese, which we will discuss in further detail below — which do allow scrambling that has a semantic effect, we might now wonder why it would be the case that no learner of Tagalog takes the free order of constituents as a sort of syntactic scrambling. It turns out that the system we have developed has a ready answer for this question when amended to allow us to understand movement dependencies.

To illustrate how this works, we turn to Japanese, and will subsequently return to Tagalog. First, consider the two simple sentences like the following. We assume that Japanese is a head-final language — for the structures below T and V are linearized to the right of their complements. Note, given the logic we applied to the case of adjuncts in French, that the relative order of arguments is free. The subject may be linearized either to the left of V, placing it as close as possible to the higher T, modulo the requirement that T and V be strictly adjacent, or to the left of the complement of V. In the latter case, an SOV order arises, while in the former case an OSV order arises.

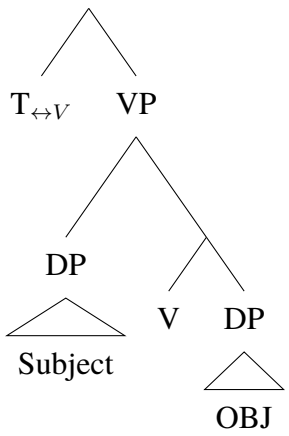
(58) a. John-ga ringo-o tabe-ta
J.-NOM apple-ACC eat-PST
"John ate an apple."

following standard convention where the *ng* marker which appears on many non-pivot arguments is analyzed as being identical to a comparable *ng* which appears on arguments of nominals.

6. See also Branan (2021) for discussion of nuclear stress in Tagalog that is in accord with what has been discussed here.

b. Ringo-o John-ga tabe-ta
apple-ACC J.-NOM eat-PST
"John ate an apple."

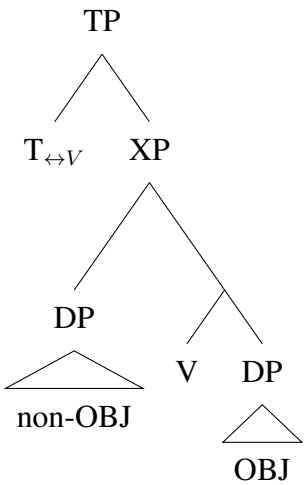
(59) OBJ < V



V < T
OBJ < T
SUBJ < V
SUBJ < T
SUBJ < OBJ **or** OBJ < SUBJ

Note that the underlying structure for the two sentences is the same, even in the case where the object precedes the subject. Given that Japanese has scrambling, this is somewhat desirable. For Tagalog, the facts are very much the same, modulo the setting of the headedness parameter. As sketched below, V will be linearized before the object, and the subject may be linearized between the verb and object — placing it as close to T as possible, modulo the requirement that nothing appear between V and T — or after both the verb and object — placing it as far away from T as possible. The effect here is much the same as in Japanese: the presence of an adjacency requirement between T and V results in an in-situ subject being linearized freely with respect to the object.

(60)

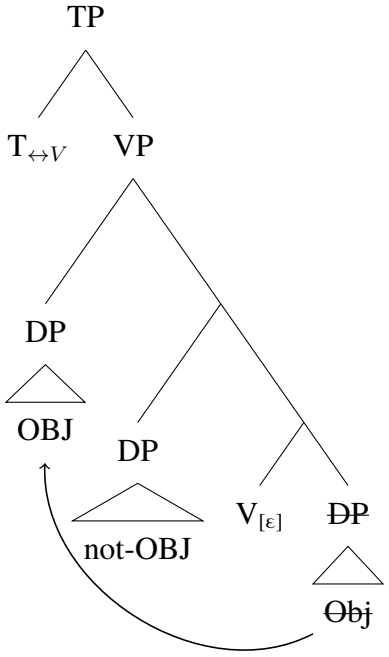


V < OBJ
T < V
T < OBJ
T < non-OBJ
V < non-OBJ
not-OBJ < OBJ **or** OBJ < Not-OBJ

What of the cases where scrambling *does* have a semantic effect in Japanese? At present, our system is unable to account for these case, and thus require an amendment. As we have stressed throughout, our approach to linearization is *feature driven* — the basic insight is that the individual properties of lexical items are by and large the factors which determine the relative order of specifiers, heads, and their complements within a given maximal projection. Here, we would like to introduce another feature of lexical items, which we call [ε] (where [ε] is reminiscent of EPP). For the system developed here, the order of specifiers with respect to other elements in their phrase is in principle free. We suggest that the [ε] feature demands that a particular specifier of a phrase appear in the highest position. Features of this sort, we suggest, can also be triggers for movement of elements c-commanded by the head bearing the relevant feature: whichever element undergoes movement driven by [ε] must be leftmost in the relevant phrase.[7]

For the cases of scrambling in Japanese which do have a semantic effect, we assume a structure like the following. Here the object has undergone movement to a specifier position, driven by the needs of [ε]. Consequently, the object must be linearized at the left edge of VP, allowing only the OSV word order. Here, the object precedes the subject, feeding an interpretation where the object takes scope over the subject for the purposes of evaluating scope and variable binding.

(61)



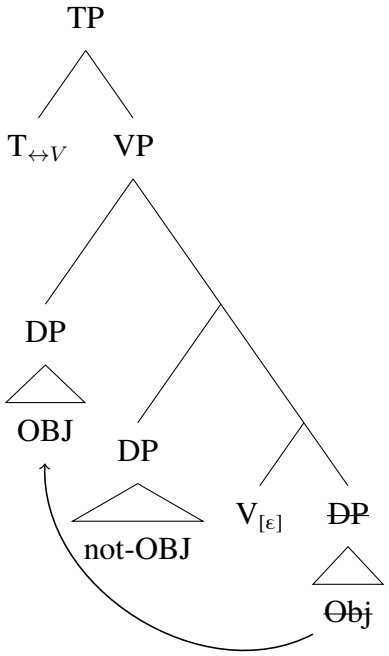
V < T

7. Alternatively, one culd asume that there is a higher head present that triggers movement of the relevant phrase into its specifier. This assumption is orthogonal to our proposal.

not-OBJ < V
not-OBJ < T
OBJ < T
OBJ < V
OBJ < not-OBJ

We return now to Tagalog, and highlight an interesting outcome of the analysis proposed for Japanese scrambling which effects the semantics: Tagalog cannot have scrambling which leads to an interpretive difference. Consider the following, where heads are linearized before their complements, T and V have an adjacency requirement, and V has an [ε] feature. The result is a conflict at PF: the [ε] feature on V requires the object to be linearized in an initial position, before all other elements in the phrase. However, if this takes place, the requirement that T and V be strictly adjacent cannot be satisfied, as the scrambled object precedes V, as a consequence of being moved by [ε].

(62)



T < V
T < OBJ
T < not-OBJ
V < not-OBJ
OBJ < not-OBJ
OBJ < V

The system presented here should allow Japanese-like scrambling only in languages that are head-final, or head-initial without adjacency requirements between V and T like those found in French. In languages that do have such a requirement, scrambling will be impossible, as the particular linear order imposed by [ε] is incompatible with the linear order imposed by [↔V] on T.

4.2 Voice alternations in Tagalog

Tagalog is famous for having a robust *voice system*, where one argument recieves a particular marker which corresponds with systematic changes in the morphology of its selecting predicate. Much work on Tagalog voice alternations suggests that this privileged element — which we will call the *pivot* — occupies a structurally privileged position above all other arguments in the clause. For instance, for the *patient voice* clause below, there is good evidence that the pivot has undergone movement to a position above the agent: the theme pivot may bind a variable in the non-pivot agent.

(63) Minamahal ng kanyang ama ang bawat anak
PV-love GEN POSS father ANG every child
"Her father$_i$ loves every child$_i$." Rackowski (2002)

Evidence for movement of this sort comes from facts involving scope and binding, where theme arguments may outscope and bind into agents only when they are the pivot of the clause (Rackowski 2002), as well as a process of quantifier float which may take place only from the pivot of the clause (Kroeger 1993).

This potentially seems at odds with the proposal put forth in this section, depending on the position one assumes non-agent pivots land in. If we adopt a more elaborated clause structure, we might expect movement of this sort to target a position "in the middle of the clause" — which should be ruled out given the proposal put forth here, which leads us to expect movement of this sort to uniformly be banned. Here, we present two possible ways out of this conundrum.

The first would be to deny that the landing site of the pivot is clause-medial in Tagalog. More specifically, we would hope that the pivot lands in a position at or above the highest head in the extended inflectional projection which bears a $\leftrightarrow$ feature. Such proposals have antecedents in the literature — McGinn (1988), Richards (1996), and Sabbagh (2005) all propose that the landing site of the pivot in Tagalog is somewhere high in the left periphery, but differ in their details as to how the pivot appears freely in the post-verbal position. McGinn and Sabbagh both suggest that pivots move to this position, and are then positioned freely after verb through a post-syntactic operation. Richards suggests that movement to the pivot position in Tagalog is covert movement. Of the three, Richards' proposal is the most straightforwardly compatible with the analysis that we have developed so far. We leave serious conderation of reconciling McGinn's and Sabbagh's proposals with our own a task for future work.

The second would be to deny that the pivot undergoes movement. Such an approach has been posited by Chen (2017). Chen suggests that Agree underlies the relationship between the lexical elements that are realized as voice morphology and the pivot, but that this does not involve displacement of pivots. This approach would be straightforwardly compatible with the theory developed here, with the choice of pivot having no effect at all on the syntactic configuration of arguments with respect to each other. To our mind, the main challenge such an approach faces is not in reconciliation with the theory developed here, but rather in explaining the aforementioned scope and binding facts in a parsimonious way. We leave this too a task for future work.

5 Conclusion

In this paper, we have set out to model classical head movement effects as the consequence of a particular linearization mechanism, rather than a structure-altering transformation. On this approach, classical head movement effects involve linearizing a head at the edge of the phrase it heads, with other orders being blocked as a consequence of the PF needs of the next head up. We have demonstrated how this approach works to derive the difference between French-like and English-like languages. We discussed two potential extensions of the model to account for mixed-headed languages like German. Finally, we saw that the theory leads us to expect scrambling to be possible in some languages but impossible in others.

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