Weight Sensitivity and Linearization*

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Abstract

Some word orders obey the end-weight principle, which requires heavier (or longer) constituents to follow lighter ones, and others do not. What determines the weight (in-)sensitivity of word orders? This paper argues that there are two kinds of linearization rules, one being weight-related and the other weight-insensitive, and that the weight (in-)sensitivity is derived by these linearization rules. The proposed linearization rules are formulated based on the prosodic representation, and therefore the current analysis supports the view that linearization is a process of externalization, not the core syntax.

Keywords: linearization, externalization, the end-weight principle

1. Introduction

Although English has an S(ubject)-V(erb)-O(bject) word order as a canonical order, various grammatical processes can alter this word order. For instance, in heavy NP shift (HNPS), a direct object moves to the sentence-final position, as shown in (1).

(1) a. John has all the facilities that are needed for his experiments available.
b. John has available *all the facilities that are needed for his experiments*.
(Kuno (1979: 283))

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31-70

It has widely been acknowledged that HNPS is sensitive to prosody. Specifically, it obeys the *end-weight* principle. According to this principle, lighter (or shorter) constituents are more likely to precede heavier (or longer) constituents (see Kuno (1979), Quirk et al. (1985: 1361-1362), and Huddleston and Pullum (2002: 1371)).[1] This tendency to put a heavier phrase in the sentence-final position conditions the application of HNPS. Thus, the application of HNPS to shorter object DPs will result in unacceptability.

(2) ?? John has available to him whenever he wants to conduct experiments in biochemistry *all these facilities*. (Kuno (1979: 283))

However, unlike HNPS, there are constructions with noncanonical word orders that do not necessarily obey the end-weight principle. For instance, the locative inversion construction with unaccusative verbs is free from the heaviness requirement; it is well-formed regardless of the length of the post-verbal subject.

(3) a. On the stage appeared a student.
b. On the stage appeared a student who everyone thought was the most talented actress.

Such data suggest that it remains necessary to examine each noncanonical word order pattern in terms of weight sensitivity.

This paper will examine which word order patterns are weight-sensitive and which are not, and then explain why they are weight (in-)sensitive. We will consider word order patterns including canonical word order, heavy NP shift, presentational *there* construction, two kinds of locative inversion, and comparative inversion.

Turning to the theoretical concern, constructing a link between word order and prosody has been becoming a more important issue, given that the current minimalist

syntax attributes linearization to the syntax-phonology interface, or externalization, instead of the core syntax (Chomsky (2013, 2014) among others). This shift is motivated by the fact that syntactic computation solely depends on hierarchical structures, not on word order. To capture this, the current minimalist approach advocates that syntax representations do not contain any information about linear order. Hence, no syntactic operations and conditions cannot be sensitive to word order. Then, word orders should be determined outside syntax; externalization will be responsible for this. Given this approach, we need to ask what kind of rules externalization employs to determine word orders. Moreover, it also matters how such a rule interacts with the prosodic weight of constituents. In other words, it is an urgent matter to explore the interaction between the linearization mechanisms and the end-weight principle outlined above.

Now, we have both empirical and theoretical questions. As an empirical issue, we will address the question of which word order pattern is sensitive to weight. The theoretical concern will ask what procedure in externalization accounts for the interaction between linearization and the end-weight principle illustrated by the examples of HNPS in (1) and (2). For these questions, I will propose that there are two different linearization rules, one being weight-related and the other weight-insensitive. Based on the proposal, it will be demonstrated that the application of weight-related linearization rules plays a crucial role in determining the weight (in-)sensitivity of each word order pattern.

This paper is organized as follows. In section 2, I will present a set of data regarding constructions exhibiting (non)canonical word orders, paying particular attention to the weight (in-)sensitivity they exhibit. These data show that weight sensitivity varies across the constructions with noncanonical word orders. Section 3 formulates a prosody-based linearization theory. In section 4, I will demonstrate that the proposed linearization theory can correctly derive the presence/absence of weight-sensitivity for each construction. Section 5 is the conclusion.

2. Weight (In-)Sensitivity of Word Order

In this section, I will demonstrate that some word order patterns are subject to the heaviness condition (i.e. wight-sensitive word orders) while others do not (i.e. wight-insensitive word orders). The data to be considered include canonical SVO orders, heavy NP shift (HNPS) construction, presentational *there* construction (PTC), two types of locative inversion construction, and comparative inversion construction (CI).

As I have pointed out in the opening section, English has S(ubject)-V(erb)-O(bject) word order as the unmarked, canonical, word order. Nonetheless, it also shows several word order alternations. For instance, the direct object may move across the post-verbal adjunct. Such marked placement of object DPs is called *heavy NP shift* (HNPS). (4a) is an example of the canonical SVO word order, and (4b) instantiates the one produced by HNPS, where the direct object *all the facilities that are needed for his experiments* is postposed to the sentence-final position.

(4) a. John has *all the facilities that are needed for his experiments* available.
b. John has available *all the facilities that are needed for his experiments*.
(Kuno (1979: 283))

Importantly, HNPS is acceptable only when the shifted object is heavy, that is relatively long. If a lighter/shorter DP undergoes HNPS, the output is ungrammatical.

(5) a. John has *all these facilities* available to him whenever he wants to conduct experiments in biochemistry.
b. ??John has available to him whenever he wants to conduct experiments in biochemistry *all these facilities*. (Kuno (1979: 283))

The contrast in acceptability between (4b) and (5b) shows that the weight of the

constituent affects the well-formedness of the HNPS construction. On the other hand, there is no difference in acceptability between (4a) and (5a). This indicates that the canonical SVO word order has nothing to do with the weight of a particular constituent. In other words, HNPS is an instance of weight-sensitive word orders while the canonical order is weight-insensitive.

Weight-sensitivity can also be seen in presentational *there* construction (PTC). (6a) is an example of canonical word order patterns and its PTC counterpart is given in (6b), where the subject DP is displaced to the sentence-final position and the expletive *there* is inserted to the surface subject position.

(6) a. A man with long blond hair walked into the room.
b. There walked into the room a man with long blond hair.
(Rochemont and Culicover (1990: 116))

PTC is similar to HNPS in that its postposed DP in PTC also obeys the heaviness condition. If the subject of PTC is not heavy, it will be degraded as shown in (7a).

(7) a. ??There slept soundly in the room Robin.
b. There slept soundly in the room the student who was always at the top of the class.

This contrast observed in (7) suggests that PTC is another instance of weight-sensitive word orders.

Next, let us examine the wight-sensitivity of the locative inversion construction. Relevant examples are given in (9), where the locational PPs are preposed and the subject DPs appear in the sentence-final position. Sentences in (8) are canonical counterparts of (9).

(8) a. John walked into the room.
b. Her mother sat in front of her. (Rochemont and Culicover (1990: 70))

(9) a. Into the room walked John.
b. In front of her sat her mother. (Rochemont and Culicover (1990: 70))

Culicover and Levine (2001) distinguish two different kinds of locative inversion: inversion with unergative verbs (heavy inversion: HI) and inversion with unaccusative verbs (light inversion: LI). HI and LI have their post-verbal subject in different positions. While LI is widely assumed to keep the subject DPs in situ, HI has the subject moved to some higher position like VP-adjoined positions. So, the subject of HI appears after VP adjuncts *carefully* in (10), which suggests that the subject of HI moves out of VP.

(10) Into the room walked carefully the students in the class who had heard about the social psych experiment that we were about to perpetrate.
(Culicover and Levine (2001: 292))

Interestingly, HI and LI display the difference in weight sensitivity. On the one hand, HI is subject to the heaviness constraint. So, HI is degraded when the subject is prosodically light. The contrast in (11) shows that the HI construction is classified into weight-sensitive word orders.

(11) a. ?In the room slept soundly the student who was always at the top of the class.
b. ??In the room slept soundly Robin.

On the other hand, LI exhibits no difference in acceptability between the shorter and longer subject DPs. So, both (12a) and (12b) are equally acceptable.

(12) a. On the stage appeared a student.
b. On the stage appeared a student who everyone thought was the most talented actress.

This observation indicates that LI is wight-insensitive, unlike HI.

LI is not the only construction involving weight-insensitive subject postposing. Comparative inversion (CI) is also free from the heaviness restriction. CI is an inversion found in the comparative clauses (Merchant (2003) and Culicover and Winkler (2008) among others).

(13) Sandy is much smarter than {is the professor / the professor is}.
(Culicover and Winkler (2008: 626))

CI is compatible both with light subject DPs and with heavy ones; the difference in the length of the subject does not change the acceptability of this construction.

(14) a. ?(Mary had never been to France at that time but) she spoke French more fluently than did the other students.
b. ?(Mary had never been to France at that time but) she spoke French more fluently than did the other students who had ever been to France.

So far, we have examined the weight sensitivity of various word order patterns. Constructions with a weight-sensitive word order include HNPS, PTC, and HI. On the other hand, the canonical SVO order, LI, and CI do not exhibit weigh sensitivity. In other words, they are weight-insensitive word order.[2]

The question that will immediately arise is why only some, not all, word order

patterns show weight sensitivity and how weight (in-)sensitivity emerges. In what follows, I will propose a mechanism of linearization that provides a unified explanation for the descriptive facts observed above.

3. Assumptions and Proposal

In this section, I will propose a novel theory of linearization. Following the current minimalist view that linearization is operative at externalization, I will argue that linearization applies to prosodic representations mapped from syntactic representations at the syntax-phonology interface. After introducing some theoretical assumptions on the syntax-phonology interface in section 3.1, section 3.2 will present the proposed linearization mechanism.

3.1. Prosodic Structures

In the current minimalist linguistics, word order is no longer a property of syntactic structures. Syntax only generates hierarchically structured expressions without any order specification (Chomsky (2013, 2014), etc.). It immediately follows from this that human language syntax exhibits structure dependency, ignoring linear information. Then, some additional process at the syntax-phonology interface is required to assign word order to unordered syntactic structures. This process is called linearization. Chomsky (2013) makes this point explicit.

(15) Order and other arrangements are a peripheral part of language, related solely to externalization at the SM interface, where of course they are necessary. (Chomsky (2013: 36))

If linearization is one of the externalization processes, then it can be hypothesized that linearization procedure refers to the representations of phonology, not ones of narrow syntax. This paper pursues this possibility. So, before formulating the

linearization mechanism, I would like to introduce some theoretical background about the syntax-phonology interface in which prosodic structures are composed.

Phonology has an independent hierarchical structure. This is called *prosodic hierarchy* (Selkirk (1984), Nespor and Vogel (1986), and more recently Ito and Mester (2012, 2013) among others). Following Ito and Mester (2012, 2013), I will assume that there are three distinct prosodic categories above words: prosodic words (ω), phonological phrases (φ), and intonation phrases (ι). These three categories are hierarchically organized and sometimes appear recursively. (Prosodic words consist of one or more syllables (σ) as their parts.)

(16) Prosodic Hierarchy:

Intonation Phrase	(		)
Phonological Phrase	( )	( )	( )
Prosodic Word	ω ω ω ω	ω ω ω	ω ω ω

In the syntax-phonology interface theory, a question to be answered is how prosodic domains are constructed in relation to syntactic structures. For syntax-prosody mapping, I will assume that terminal nodes and phasal nodes in syntax are prosodically associated with prosodic domains. First, every terminal node with phonetic content should be visible for the phonological process, and they are mapped onto the lower prosodic categories (ωs or σs). As for larger prosodic units, syntactic constituents of special computational status are mapped onto phonological phrases. Ever since Chomsky (2000, 2001, 2008), syntactic derivations proceed by a unit called *phases*, and much literature has associated phasehood with phonological phrasing (e.g. Dobashi (2003), Kratzer and Selkirk (2007), and Ishihara (2007) among others). In line with these previous works, I assume that the boundaries of the designated phrasal nodes align with the edges of the phonological constituents, based on which I will propose a linearization theory in the next subsection.[3]

(17) Assumption (Syntax-Prosody Mapping)

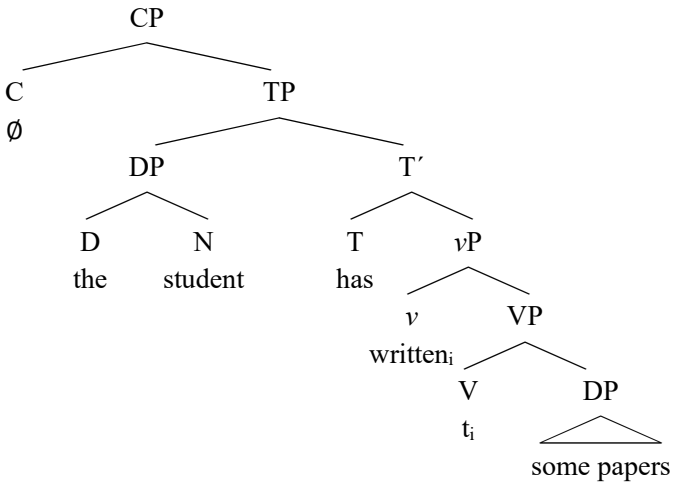
a. Every terminal node is ω or σ depending on its lexical status (i.e. whether it is a content word or a function word).

b. Phases (*v*Ps, CPs, and DPs) are φs.[4]

Let me illustrate briefly how this mapping process works. Consider the prosodic phrasing of a sentence structure with a transitive predicate in (18b). (Irrelevant details are omitted.)

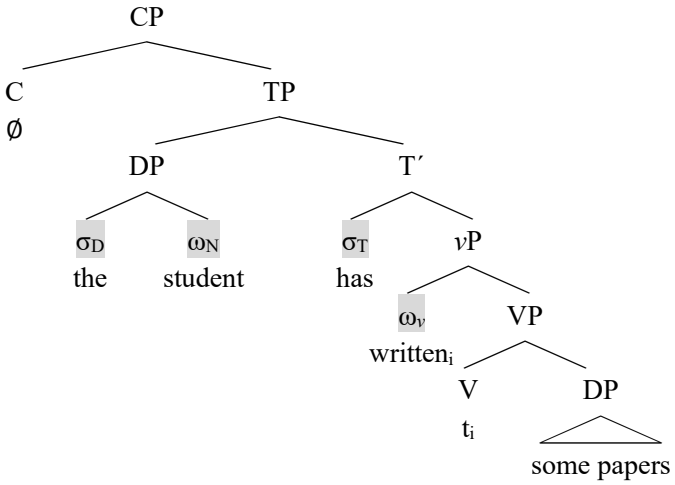
(18) a. The student has written some papers.

b.



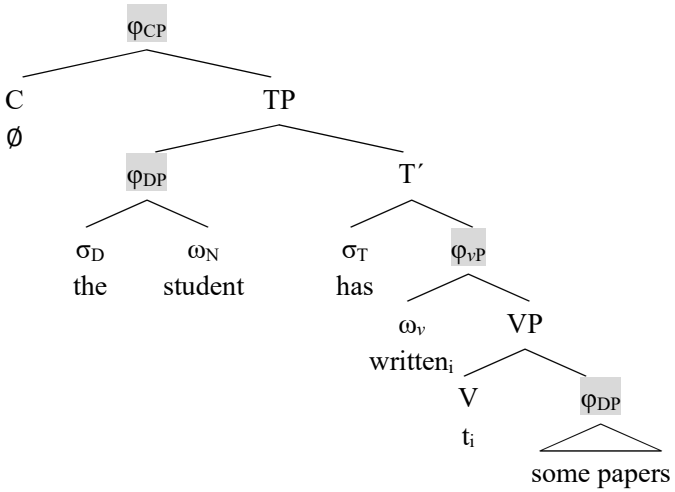
First, every X^0 category is translated into ω or σ. The choice of the prosodic category depends on its lexical property (a content word or a function word). Phonetically empty nodes including traces are ignored for the mapping process. This rule turns X^0 categories (D, N, T, and *v*-V) into prosodic constituents (ω or σ), as shown in (19). Here, D and T are function words that are mapped to σ.

(19)



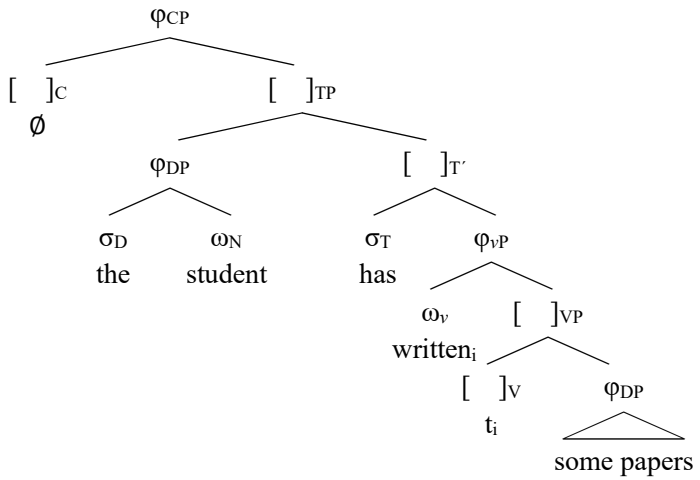
In addition to this word level mapping, phases (CPs, *v*Ps, and DPs) are mapped onto phonological phrases (φ), resulting in the representation in (20).

(20)



The other nodes will not be associated with any phonologically overt exponent. I will represent such nodes as empty brackets ([ ]) for notational convenience. Then, we obtain the following prosodic representation in (21).

(21)



It is this representation that will be an input to the linearization mechanism.[5]

3.2. Proposal

Let us move on to the specific proposal of linearization, which is based on the prosodic representation introduced in the previous subsection. One may think of linearization as a function that maps some asymmetric relation in input to a precedence relation, which is also asymmetric. In this sense, linearization necessarily includes a search process that detects an asymmetry in the input representation. So, the question to be asked is what kind of prosodic information is detectable for linearization.

I propose that linearization refers to two different kinds of asymmetries. First, it matters whether two nodes in a sister relation are both prosodic constituents or not. Second, when both nodes in a sister relation are prosodic constituents, then linearization will further detect which one is more prosodically prominent. The more prominent node, which I will call *prosodic head*, precedes or follows the less prominent node. So, I formulate the prosody-based linearization rules as follows.

(22) Proposal (Prosody-based Linearization)

a. For {X, Y} where only X is a prosodic category, then X precedes Y.

b. For {X, Y} where both X and Y are prosodic categories, then the one chosen as a prosodic head precedes or follows the other.

The choice of directionality in (22b) is parameterized. English puts the prosodic head *after* its sister node.[6,7]

The intuition of the proposal is as follows. The search for linearization applies to a prosodic representation from top to bottom, detecting nodes to be pronounced. If only one of the two sister nodes has a phonological exponent, then the search algorithm specifies that detected node will be pronounced first (=((22a)). If the search algorithm detects two nodes in a sister relation at the same time (i.e., both nodes are associated with prosodic constituents), other prosodic feature, prosodic headedness, are detected to determine word order.

Following Kratzer and Selkirk (2020: 25), I will assume that a prosodic head is determined for each pair of prosodic categories in a sister relation according to the prosodic hierarchy as follows:[8]

(23) When sisters are both prosodic constituents, then the one of them is realized as a prosodic head, which must realize as being heavier (i.e. longer) than its sister on the surface.
If the sisters are of unequal prosodic constituents, then the one higher in the prosodic hierarchy (16) is chosen as a prosodic head.

According to this rule, we can think of three cases. (Here, π stands for prosodic constituents σ, ω and φ.)

(24) a. For $\{\pi_n, \pi_{n+1}\}$, where π_{n+1} is higher in the prosodic hierarchy, π_{n+1} will be chosen as a prosodic head, which must realize as a heavier constituent.

b. For $\{\pi_n, [\ ]\}$, where [ ] is not a prosodic constituent, no prosodic head is chosen, because not one of the sisters is not prosodic constituent.

c. For $\{\pi_n, \pi'_n\}$, where π and π' are of equal prosodic constituent, the choice of the prosodic head is optional. Either one is realized as a prosodic head (i.e. being longer than the other).

According to (24a), φ will be chosen as a prosodic head for {ω, φ}. (24b) says that there is no prosodic head in a pair of prosodic nodes in a sister relation when one of them is a prosodically inert node [ ]. When sister nodes in a prosodic representation belong to the same prosodic category like {ω, ω} or {φ, φ}, one of the two becomes a prosodic head (=(24c)). The node chosen as a prosodic head must be heavier than its sister in the later phonetic representation, and will be linearized so that the heavier node (i.e. a prosodic head) will follow its lighter sister. In other words, the heaviness condition is imposed on it. If the node designated as a prosodic head does not count as heavy enough, it will result in an ill-formed phonetic/phonological representation.

4. Analysis

In the previous section, I formulated a novel prosody-based linearization algorithm, which applies to prosodic representation produced by the syntax-prosody mapping. The aim of this section is to demonstrate that the proposed linearization mechanism derives the weight (in-)sensitivity of word order patterns observed in section 2.

Before analyzing each case, let me illustrate the general prediction. Among the two linearization rules I proposed, the rule (22a) does not make reference to the

prosodic headedness while (22b) does. This means that the application of (22b) leads to weight sensitivity. Thus, we obtain the following predictions.

(25) Predictions (Weight Sensitivity and Linearization Types)

a. Word orders that are determined by (22a) will be weigh-insensitive.

b. Word orders that are produced by (22b) will be weight-sensitive.

In what follows, I will demonstrate that these predictions are born out.

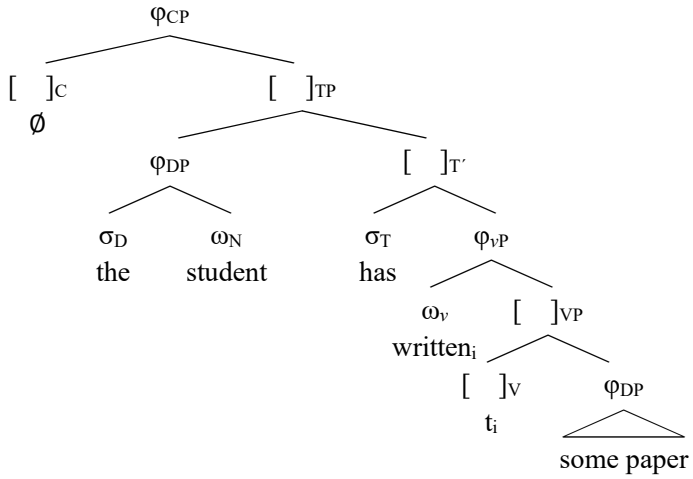
4.1. Weight-Insensitive Word Orders

Let us begin with weight-insensitive word order patterns. They include the canonical SVO order, LI, and CI.

Take (18) as an example of the canonical SVO order. I repeat it in (26) with its prosodic structure (27).

(26) The student has written some papers.

(27)



Let us examine how linearization procedure proceeds in detail. We consider

the linearization process from top to bottom. First, the linearization of TP will yield an order where the subject DP precedes T′ according to (22a).[9] This is because only the DP is a prosodic constituent φ. Next, the node T′ has two nodes which belong to different prosodic categories. This leads to the application of (22b). Since $\varphi_{v\mathrm{P}}$ is bigger than σ_{T} in the prosodic hierarchy, $\varphi_{v\mathrm{P}}$ is a prosodic head. So, T precedes *v*P. A heaviness effect here arises on *v*P, but this requirement is trivially satisfied because σ_{T} is a prosodically weak syllable. The next lower phrase *v*P places ω_{v} before [ ]$_{\mathrm{VP}}$ via (22a). Finally, in linearizing {[ ]$_{\mathrm{V}}$, φ_{DP}}, (22a) applies to yield an order where DP precedes V. However, its application is quite vacuous because one node, V, is a prosodically null trace. Hence, the linearization of this node will be quite trivial.[10]

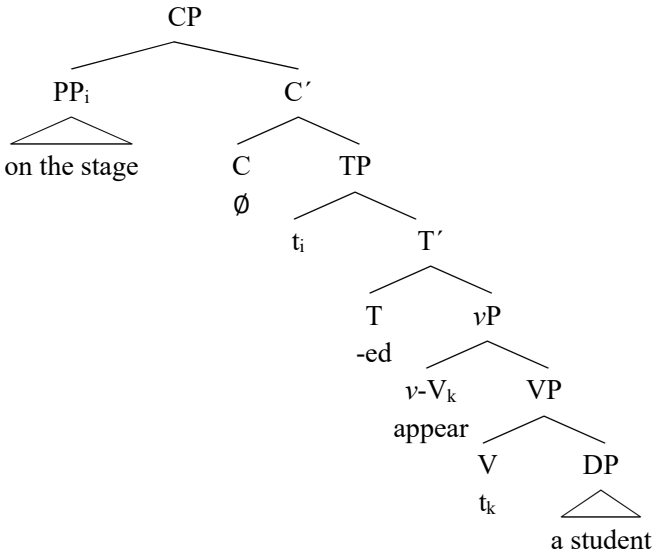
Notice that most part of the linearization process that derives the canonical SVO order utilizes (22a), which makes this word order weight-insensitive according to (25). This result is compatible with the observation in section 2 that in the canonical word order, no heaviness constraint is imposed on any particular constituent.

Let us move on to the linearization of LI. I repeat (12a) below.

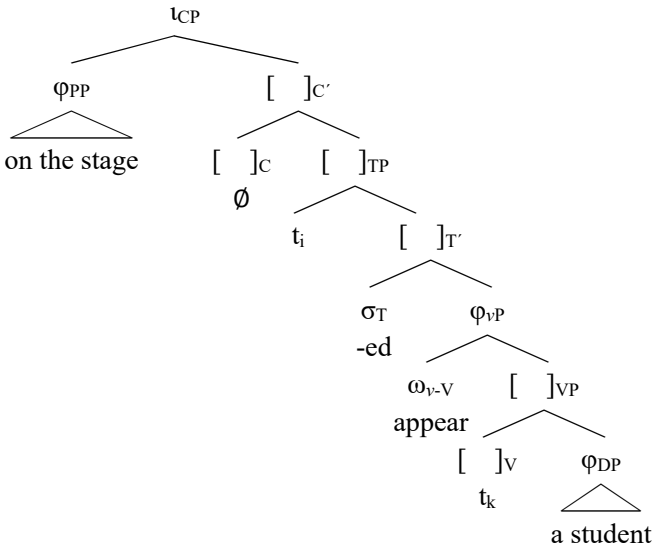
(28) On the stage appeared a student.

Since the predicate used in LI is an unaccusative verb, the subject DP is base-generated in the complement of VP. I tentatively assume that the locative PP moves through Spec, TP to Spec, CP. The syntax-prosody mapping procedure (17) will translate (29) into (30).

(29)



(30)



(30) is subject to the linearization procedures. The order between *v*-V and VP, which contains the object DP, is determined by (22a) since only the former is a prosodic constituent. Then, *v*-V precedes VP and hence the object DP. Since we do not resort to the weight-sensitive rule (22b) here, the post-verbal subject DP of LI will show

no weight sensitivity, as we observed in section 2. Again, the absence of weight sensitivity is reduced to the application of (22a).

Finally, let us examine the linearization of CI, which is also weight-insensitive. As for the syntax of CI, I adopt Culicover and Winkler's (2008) analysis. They assume that the subject of CI stays in Spec, *v*P. They provide two pieces of evidence for this structure. First, the subject of CI can follow a sequence of auxiliaries, as shown in (31). This indicates that the derivation of CI does not involve subject-auxiliary inversion, which only moves a single T^0 to C^0. Rather, the auxiliary-subject order is the result of leaving the subject in the base (i.e. VP-internal) position.

(31) a. But Mokótow was much further from the City Center [than had been the OLD town] and the evacuation under the German lines all the more perilous.

b. Some ranchers still permitted the military to use their property, though the vehicles were far more destructive to the land [than had been the soldiers on HORSEBACK].

(Culicover and Winkler (2008: 629-630))

Second, the subject of CI precedes the VP-internal materials. Consider the examples given in (32) and (33).

(32) a. Sandy made more money in 2001 than did {Leslie/any of the other students} in 2002.

b. *Sandy made more money in 2001 than did in 2002 {Leslie/any of the other students}.

c. *In 2001 Sandy made more money than did in 2002 {Leslie/any of the other students}. (Culicover and Winkler (2008: 634))

(33) a. Sandy ate more cookies at the party than did {Leslie/any of the other students}, slices of cake.

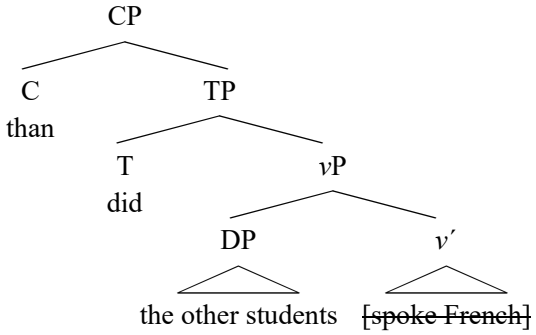
b. *Sandy ate more cookies at the party than did slices of cake, {Leslie/any of the other students}. (*ibid*.)

In the data above, the subjects must precede other VP-internal materials in the examples of VP ellipsis in (32) and pseudogapping in (33). So, the subject of CI never undergoes rightward displacement like HNPS. Rather, it stays in its base-generated position.

We then assume with Culicover and Winkler (2008) that in CI, the post-verbal subject is left within its base-generated position, namely Spec, *v*P. Given this derivation, the comparative clause of (34) has a structure like (35) with VP deleted.

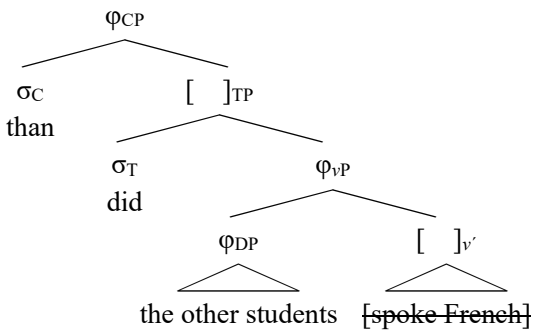
(34) ?(Mary had never been to France at that time but) she spoke French more fluently than did the other students.

(35)



Then, it will be mapped onto the following prosodic representation.

(36)



Like the constructions with a weight-insensitive word order we have seen so far, *v*P containing the subject DP is linearizable without resorting to the weight-sensitive rule (22b). This is because *v*′ is not a prosodic category and therefore (22a) is employed. This linearization does not impose any heaviness requirement on the subject DP in CI, as is desired.[11]

So far, we have examined the linearization of three weight-insensitive word orders: canonical SVO, LI, and CI. All of them employ only (22a) at the relevant step of linearization. Thus, we can correctly predict the absence of heaviness requirement. Therefore, our linearization mechanism correctly characterizes these word order patterns as weight-insensitive.

4.2. Weight-Sensitive Word Orders

We have demonstrated that the weight-insensitivity of the canonical SVO order, LI and CI is reduced to the use of (22a). In this subsection, then, we aim to show that the weight sensitivity of noncanonical word order pattens stems from the application of (22b), according to our prediction (25b). The following discussion is concerned with the linearization of HNPS, HI, and PTC, all of which are weight-sensitive word order pattens as discussed in section 2.

First, I would like to examine the linearization of HNPS, in which the postposed object must be heavy. I repeat the example of this construction (4b) below.

(37) John has available all the facilities that are needed for his experiments.

We assume that the shifted DP adjoins to *v*P. This structure is empirically supported by the fact that the shifted DP may be deleted under VP ellipsis, and it can be either inside or outside the target of *do so* replacement in (38) and VP preposing in (39).

(38) a. John threw into a wastebasket a letter which he received from the professor, and Tom did so, too. (= threw into a wastebasket a letter which he received from the professor.)

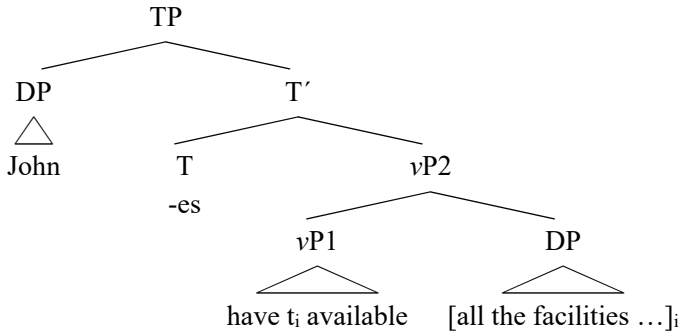
b. John threw into a wastebasket a letter which he received from the professor, and Tom did so a bill which he picked up on the road. (= threw into a wastebasket.) (Nakajima (1982: 58-59))

(39) a. Everyone said that John would give to Mary all of the money that he won at the track, and give to Mary all of the money that he won at the track he did.

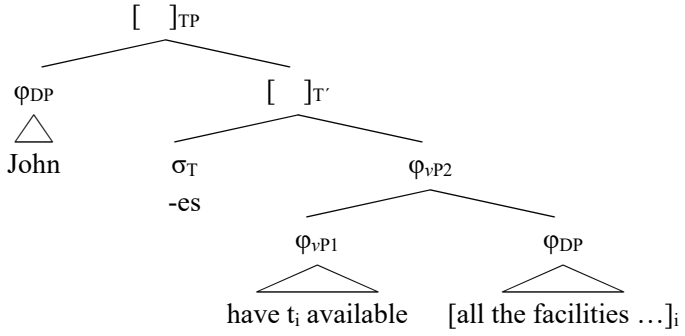
b. ?Everyone said that John would give to Mary something very valuable to him, and give to Mary he did [$_{VP}$ e] all of the money that he won at the TRACK. (Rochemont and Culicover (1990: 120))

Given these observations, I assume that (37) has the structure (40a), which is later mapped onto the prosodic representation (40b).

(40) a.



b.



What is crucial here is the linearization of *v*P2. Since its daughters are mapped to the same prosodic category, the linearization rule (22b) applies to this structure. For this linearization rule to work, one of the two nodes must be a prosodic head (i.e. being heavier than the other node). Given that the two nodes are φs, either of them can be a prosodic head, according to (23).

Assume that φ_{DP} is a prosodic head. Then, (22b) will yield an order in which *v*P1 precedes DP, a configuration of HNPS. In this case, the postposed DP is a prosodic head. So, this DP needs to be a heavier constituent in a phonetic realization. Thus, we can correctly derive the heaviness requirement imposed on the object in the HNPS construction.

If *v*P1 were a prosodic head, we would obtain S-O-V word order, which is not permitted in English. This word order is ruled out for some independent reason. Here, I stipulate that T^0 and V (or *v*-V) have to be adjacent for a morpho-phonological

reason because T^0 is a bound morpheme to be adjoined to V. If the direct object is arranged before *v*P in (40b), the DP comes to intervene between T^0 and *v*P, violating the morpho-phonological requirement. As a result, the choice of the DP as a prosodic head (i.e. choosing the configuration of HNPS) is the only possibility for linearization of (40b).[12]

Let us move on to the linearization of PTC. The relevant example is repeated in (41). As the contrast in (41) shows, PTC also shows the weight sensitivity.

(41) a. ??There slept soundly in the room Robin.
b. There slept soundly in the room the student who was always at the top of the class.

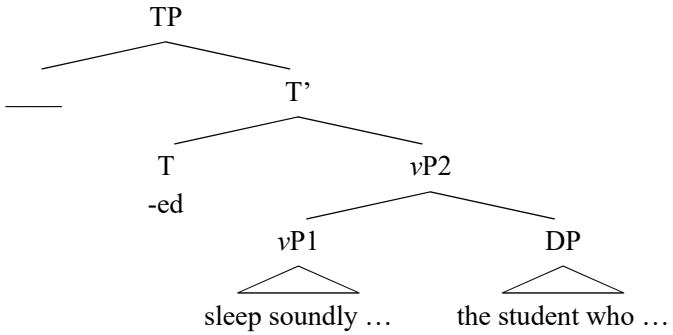
Following Nishihara (1999), I assume that the postverbal DP in PTC undergoes HNPS. To support this derivation, Nishihara points out the similarity between HNPS and PTC; extraction is prohibited out of the shifted DP in both constructions.

(42) a. *Who did you buy yesterday a beautiful picture of?
b *Of whom did you buy yesterday a beautiful portrait of?
(Rochemont and Culicover (1990: 134))

(43) a. *Which artist did there hang on the wall a portrait of?
b. *Of which artist did there hang on the wall a portrait?
c. *Which community did there walk into the room a member of?
d. *Of which community did there walk into the room a member?
(Nishihara (1999: 394))

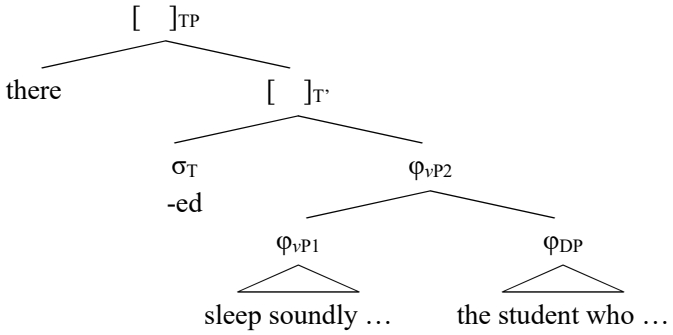
Then, (41b) has the structure in (44).

(44)



This structure is later mapped on to the prosodic representation of (45).[13]

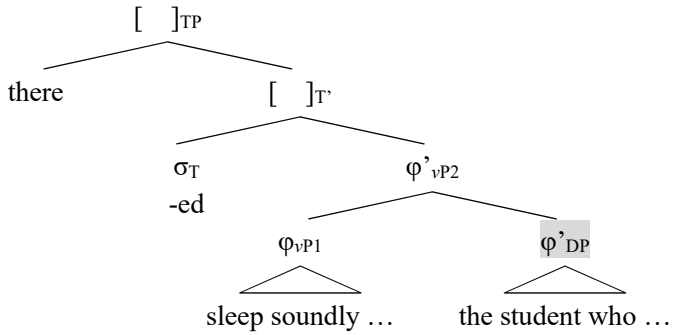
(45)



Upon the linearization of *v*P2, the linearization rule (22b) will be employed, since its sisters, *v*P1 and DP, are both mapped onto the prosodic categories (φ). Then, the choice of the prosodic head (either *v*P1 or DP) is crucial to determine the weight sensitivity pattern of PTC.

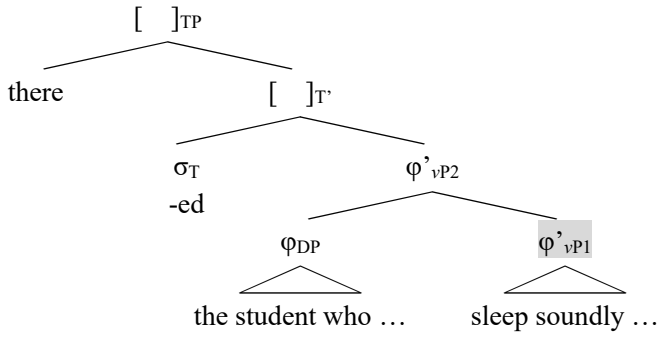
When the DP is chosen as a prosodic head, this DP will be linearized after *v*P1, and be realized as a heavier constituent, just like the shifted object of HNPS.

(46)



The other logically possible option is to linearize DP before *v*P (illustrated in (47)). This option is prohibited by the requirement that T and V are adjacent.

(47)



As a result, only the word order pattern of PTC is a well-formed option for the structure in (45), which results in the postverbal subject being obligatorily heavier.

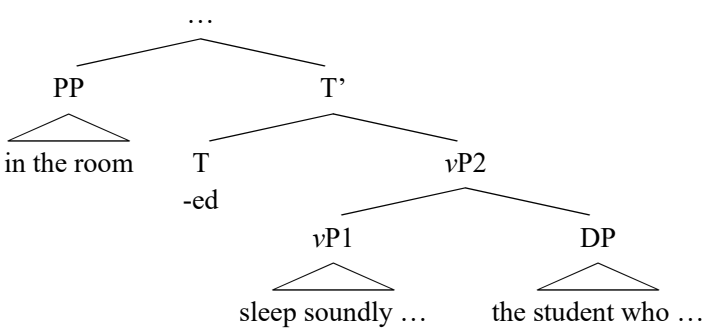
In the derivation of PTC, we assumed that expletive *there* is inserted to Spec, TP so that EPP requirement is met. Culicover and Levine (2001: 296) suggests that instead of expletive insertion, the leftward movement of PP can also satisfy EPP. This derivation results in HI, which is another construction with the weight-sensitive word order as illustrated by the contrast in (48).

By preposing PP, HI in (48a) will have the structure (49).[14]

(48) a. ?In the room slept soundly the student who was always at the top of the class.

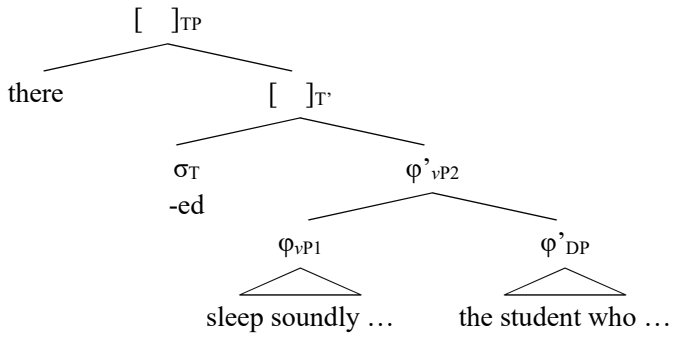
b. ??In the room slept soundly Robin.

(49)



The syntax-prosody mapping in (17) translates the structure (49) to the prosodic representation (50).

(50)



Again, according to (22b), choosing DP as a prosodic head yields a word order in which DP follows *v*P. Due to the use of (22b), the postverbal DP must be heavier than its sister constituent. Thus, we can derive the weight-sensitivity of HI.

In this subsection, I have demonstrated that the three weight-sensitive word order patterns, HNPS, PTC, and HI, are derived through the linearization rule (22b). Because of this linearization step, the prosodic head, which is heavy, is placed after

its sister constituent.

5. Conclusion

In this paper, we have examined the weight (in-)sensitivity of different word order patterns. The canonical SVO order, LI, and CI are weight-insensitive while HNPS, HI, and PTC are subject to the heaviness requirement on a postposed constituent. This variability of weight sensitivity receives a uniform explanation from the proposed linearization mechanism. The presence/absence of the weight sensitivity is reduced to the difference in the linearization rules to be applied.

Note that both of the two linearization rules I proposed only refer to prosodic structures, instead of syntactic ones. Therefore, as far as the proposed analysis is on the right track, we have support for the idea that linearization is a part of externalization.

One of the issues that is not addressed in this paper is how the two rules are parameterized. I leave for future work what implication the current proposal makes for the cross-linguistic investigations of word orders.

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Notes

1) Kuno (1979) is one of the most comprehensive theories of the end-weight. He proposes that unmarked word orders are permitted to violate discourse principles including the end-weight principle, whereas marked ones derived via transformation obligatorily obey these principles. His analysis can account for the fact that HNPS always obeys the end-weight while unmarked orders do not necessarily follow it.

Although Kuno's work provides a clear picture of the phenomenon, it is not without problems. Empirically, as I will demonstrate in section 2, not every marked order has to obey the end-weight principle. Since markedness is defined in terms of the application of transformation (i.e. movement), once put in the current syntactic framework, Kuno's analysis bears a wrong prediction; the canonical SVO word order will be regarded as being marked because it involves A-movement of the subject DP from Spec, *v*P to Spec, TP. Theoretically, current minimalism has abandoned the distinction of D-/S-Structures and the notion of transformation, which Kuno crucially relies on to define markedness of word orders. Therefore, we need to construct an alternative analysis. This is what this paper tries to do.

2) One may wonder whether the length is the only phonetic reflex of prosodic heaviness. Specifically, the emphatic stress required by contrastive focus has often been argued to be related to prosodic heaviness. However, unlike lengthening, adding such contrastive stress does not necessarily improve the grammaticality of HNPS.

(i) ??(Robin found Mary in the room. —) No. He found in the room Julia (, not Mary).
(ii) Robin found in the room the student who was always at the top of the class.

Similarly, heavy inversion (HI) also improves with longer subjects but not with focal

DPs. The following set of data shows that the lengthening of a subject DP improves the acceptability ((a)-(b)), but adding contrastive focus on it does not have any influence (=(c)).

(iii) a. ??In the room slept soundly Robin.
b. ?In the room slept soundly the student who was always at the top of the class.
c. ??(Look! Robin slept soundly in the room. —) No. In the room slept soundly Julia (, not Robin).

Based on these observations, I will limit our discussion to the effect of length on the word order putting focal stress aside, though it might be relevant to current concern in some indirect way.

Note in this respect that among the three weight-sensitive word order patterns to be discussed in this paper, only PTC behaves differently with respect to contrastive focus. Unlike HNPS and HI, PTC can improve its acceptability not only by heaviness counted in terms of length but also contrastive focus. So, examples of PTC involving both types of heaviness below are equally acceptable.

(iv) a. ?There slept soundly in the room the student who was always at the top of the class.
b. ?(Look! Robin slept soundly in the room. —) No. There slept soundly in the room Mary (, not Robin).

PTC is similar to HNPS and HI in that it is also weight-sensitive, while PTC behaves in the same way as weight-insensitive comparative inversion (CI) in that they are influenced by focus. (See note 11 for the focus-sensitivity of CI.)

As for the peculiar behavior of PTC with respect to heaviness, I would like to

suggest that weight in terms of length is referred to by linearization as proposed in this paper whereas focus sensitivity is attributed to the suspension of EPP (as argued by Culicover and Winkler (2008) in analyzing CI). It is not until *there*-insertion at PF that PTC has EPP unsatisfied, and CI never fills Spec, TP overtly. On the other hand, HI meets EPP by preposing locative PP in narrow syntax (and HNPS trivially satisfies EPP by usual subject A-movement). Then, the possible analysis is that focus sensitivity will arise when EPP is suspended until PF. See also Fujinawa (2020) for the suggestion that EPP is a semantic phenomenon in nature and the presence or absence of elements in Spec, TP interacts with the types of judgment in the sense of Anton Marty, which Kuroda (1972) introduced to linguistic analysis. I leave this issue for further study.

3) The formation of intonation phrases (ι) is not relevant to the current analysis, but I would like to mention this briefly.

I tentatively assume with Selkirk (2005) that there is some operation in phonology that promotes φs to ιs. Such an ι-promotion may be sensitive to the prosodic length, speech rate, or pragmatic factors like illocutionary force (cf. Selkirk (2009, 2011), Truckenbrodt (2015), Ishihara (2022) among others). So, ι-phrasing is not a matter of syntax-phonology interface. Rather, ι-formation is done at the purely phonological component or the prosody-pragmatics interface.

4) See Citko (2014: Chapter 4) for the phasehood of CPs, *v*Ps, and DPs and their diagnostics.

5) One may wonder what the prosodically null node, notated by [ ], will eventually be. Adopting Kratzer and Selkirk (2020), I tentatively assume that it is pruned through the two-step mechanism of the syntax-phonology interface. This is illustrated below.

(i) Morpho-Syntactic Output Representation (MSO)

↓ Spellout (gives phonological expression to MSO)

Phonological Input Representation (PI)

↓ Phonology (determines optimal PO)

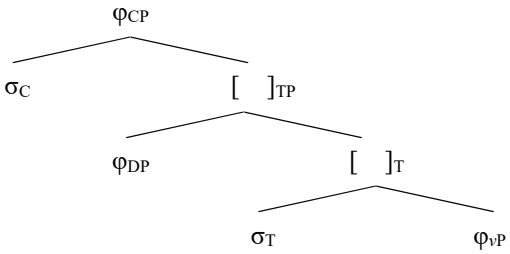
Phonological Output Representation (PO)

↓

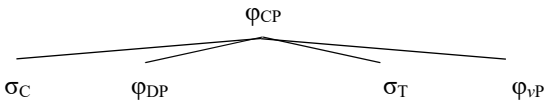
Phonetic Interpretation (Kratzer and Selkirk (2020: 17))

The mapping rule in (17) is operative in the MSO-PI mapping. This yields the PI representation, which is not a pure phonological representation but an interface level to be interpreted by phonology. I assume that the PI-PO mapping (phonology in Kratzer and Selkirk's model) then removes these empty nodes, flattening the PI representation (ii) into the PO representation (iii).

(ii)



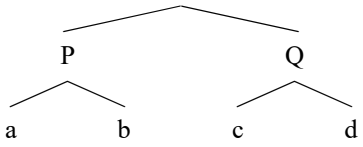
(iii)



This is the overview of the externalization mechanism that I tentatively assume throughout the paper. Of course, it also begs further empirical and theoretical justifications, which I leave for future work.

6) Strictly speaking, I assume a finer-grained version of linearization mechanism, in line with Kayne (1994). Linearization consists of two processes: ordering of non-terminals and ordering of terminals. To illustrate this, consider the linearization of (i), where P and Q are non-terminals and a, b, c, and d are terminals.

(i)



Linearization first specifies the order between P and Q, say P before Q. Then, the relative ordering between non-terminals is passed to their terminals. Thus, a and b precede c and d. The current paper mainly concerns the former procedure, assuming that the latter step may be implemented later.

7) The proposed linearization mechanism is largely based on Tokizaki (2018). Tokizaki (2018) has recently reformulated the head parameter phonologically, and its spirit is inherited to my proposal (22a). The difference between our analysis and Tokizaki's paper is that our analysis assumes additional, more structural linearization mechanisms (22b).

The current paper is also similar to Kitada (2012) in that both claim that linearization should have two different components. Our attempt, however, is different from Kitada's with respect to the locus of linearization. We formulate linearization in prosodic terms, which enables our analysis to deal with the weight effect.

The current analysis has something to do with Lambrecht's (1994) typological analysis. Lambrecht proposes to divide languages into two groups. The first type has a word order pattern that is determined by grammatical principles, while the other group determines the word order by pragmatic principles. Since Lambrecht relates the pragmatic interpretations like focus with prosodic pitch accent, Lambrecht's

pragmatically controlled word order can be equated to a prosodically controlled word order. Then, our analysis has shown that these two different types of word order can be found even within a single language. Our finding suggests that Lambrecht's typological work should be reinterpreted as a tendency; some languages tend to show syntactically controlled word order more often, whereas other languages tend to exhibit pragmatically/prosodically controlled word order patterns. Putting it in our terms, some languages are more likely to use (22a), while other languages employ (22b) more often. Such a difference may be attributed to the variation of the phonological representation, which is an input for linearization. Reexamination of Lambrecht's work in this respect is left for future work.

8) The original definition of this constraint is as follows.

(i) HEAVYSISTERPROMINENCE [HVSISPROM]
When sisters within a prosodic constituent are of unequal prosodic category, the heavy sister is the head.
The heavy sister is the constituent whose category is higher in the prosodic hierarchy. (Kratzer and Selkirk (2020: 25))

We should be careful with the terminology used in (i). The notion of heaviness of assumed in Kratzer and Selkirk (2020) is different from ours. While heaviness in (i) is concerned with the levels of prosodic constituents in prosodic hierarchy, our heaviness is measured by the length of the constituents. So, our analysis regards prosodic headedness as heaviness, whereas Krazer and Selkirk's headedness only concerns the size of the prosodic constituents.

9) In this paper, we skip the linearization process within a DP because that step is not important for the current discussion.

Here, I illustrate how {D, NP} is linearized briefly. First, {D, NP} is mapped to $\{\sigma_D, [\ \ ]_{NP}\}$ at the syntax-phonology interface. Then, linearization rule (22a) applies to this representation, resulting the order with no weight sensitivity in which σ_D precedes $[\ \ ]_{NP}$.

10) Alternatively, one may think that the linearization of VP does not need to specify any ordering between them because one of its daughters, V, is a phonetically null trace (see Takita (2020) for relevant discussions).

11) One should distinguish the notion of heaviness in terms of length from the one in terms of contrastive focus. (See note 2.) I showed that CI is not sensitive to length, but it is influenced by contrastive focus; contrastive focus has to be on the subject DP in CI. The following data show that subjects may not be focused in comparatives without inversion, whereas CI imposes contrastive focus requirements on subject DPs. To establish contrastive interpretation appropriately, the subjects of the matrix and subordinate clauses refer to different entities indicated by indexes.

(i) a. Bill Clinton$_i$ said more than the president$_i$ COULD have.
b. Bill Clinton$_i$ said more than the PRESIDENT$_j$ could have.
c. Bill Clinton$_i$ said more than could have the PRESIDENT$_j$.
d. *Bill Clinton$_i$ said more than COULD have the president$_i$.

(Culicover and Winkler (2008: 644))

Contrastive focus might be required to be placed on the inverted subject DPs for some independent reason: for instance, feeding the application of ellipsis or the suspension of EPP satisfaction (for the latter idea, see Culicover and Winkler (2008)).

12) Though I tentatively assume that there is no possibility to linearize the object

before *v*P in (40b), some authors have recently pointed out that English even permits SOV word order in some restricted circumstances (Otaki (2017) and Kanno et al. (2023)). I cite some examples from Otaki (2017: 153).

(i) a. A chemical does not a product make.
b. Four walls do not a prison make, …
c. Twin peaks don't a mountain range make.

The investigation of these constructions especially in terms of their prosody, is left for future work.

13) The expletive *there* is assumed to be inserted into the surface position at some later process of derivation, either narrow syntax or externalization (e.g. Bobaljik and Wurmbrand (2012)). The precise timing of expletive insertion is irrelevant for the current analysis, but it might be relevant for the contrastive focus interpretation (see note 2 and 10).

14) Analyzing the precise structure of HI (especially, identifying where postverbal DPs are) is a quite tough work because it resists the application of syntactic diagnostics. Applying VP ellipsis causes ill-formedness whether the subject DP is elided or stranded.

(i) a. ? At the door slept soundly three armed police officers who kept the night watch and for some reason I had thought that <u>at the door might sleep soundly three armed officers</u>.
b. ?? At the door slept soundly three armed police officers who kept the night watch and for some reason I had thought that <u>at the door might (so)</u>.

c. ??At the door slept soundly three armed police officers who kept the night watch and for some reason I had thought that <u>at the door might much more armed police officers.</u>

Moreover, the pseudo-cleft targeting VP is fully ungrammatical regardless of whether the postverbal DP is left within the *wh* clause or not. So, HI behaves as if its postverbal subject was *frozen* for further syntactic operations.

(ii) a. *What at the door did was sleep soundly three armed police officers who kept the night watch.

b. *What at the door did three armed police officers who kept the night watch was sleep soundly.

As reported by Rochemont and Culicover (1990), such a frozen character is also found in PTC. These behaviors might reflect the stylistic or pragmatic functions of HI and PTC. Diagnosing their syntax requires further understanding of how the stylistic component and grammar interacts, and I have to leave it for further study.

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