A prosodic restriction affecting stress patterns and word order

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1 Introduction

In this paper, I propose and defend a general restriction on prosodic structure, shown in (1). (1) rules out certain constituents whose members are mismatched in prominence from appearing at the left edge of larger constituents.

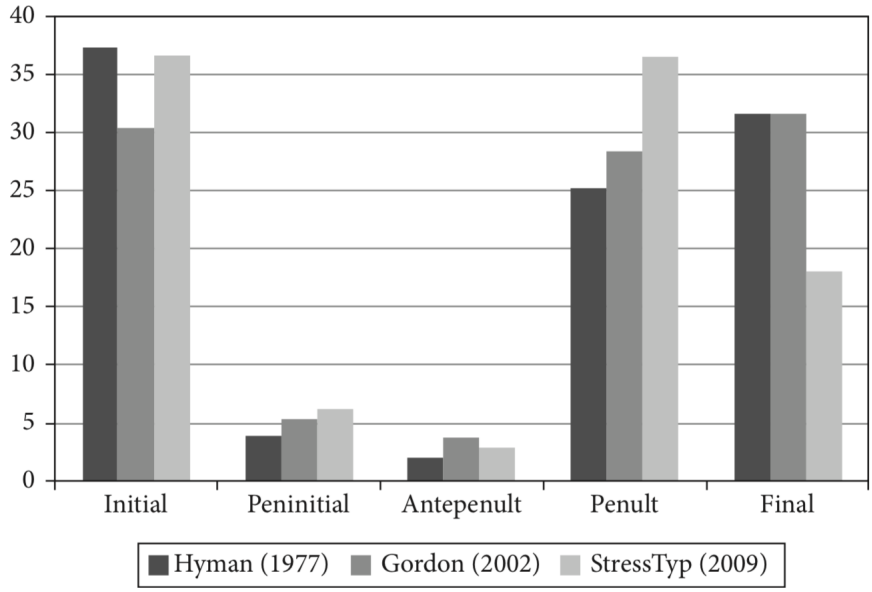
(1) **The Left Edge Ban:**
* ((w **S** …
where w means "weak"
and **S** means "strong"

We will see that the ban in (1) — the LEB — has effects on prosodic constituents of various sizes. At the word level, the LEB will account for a crosslinguistic skew in the distribution of main stress in weight-insensitive stress systems. At the phrase level, the ban in (1) will account for certain restrictions on disharmonic word order that have previously received a purely syntactic explanation. The driving idea behind the analyses presented in this paper is that languages manipulate the prosodic structure, either directly or indirectly, so that the LEB might be respected.

2 The LEB at the word level

In this section we will see the effects of the LEB at the word level, where the ban governs the distribution of main stress. We will restrict our attention primarily to languages with weight-insensitive stress systems. There are five attested systems crosslinguistically, but with a skewed distribution, as shown in a variety of surveys of stress systems: peninitial and antepenultimate stress systems are much rarer than the other three, as shown in the chart reproduced from Gordon (2016) below.

(2) **Relative frequency of stress** *Gordon (2016)* [1]



Setting aside the antepenultimate pattern for now — which we will return to shortly — a simple mechanism can be defined which captures the other four stress systems. Such a mechanism is given in (3). The mechanism lies on the

[1] The Y-axis is the percentage of languages displaying the pattern in a survey. N = 306 (Hyman, 1977); 186 (Gordon, 2002); 211 (Goedemans & van der Hulst, 2009).

assumption that stressable elements are grouped into larger constituents — *feet* — which are then grouped together to form a *word*. The stress assignment mechanism either assigns stress to the left or rightmost stress-bearing unit in a foot, or chooses the left or rightmost foot in a word as a locus for stress assignment.

(3) **Stress assignment mechanism**

a. If a constituent immediately dominates a stress-bearing unit, assign stress to the {left, right}most stress-bearing unit and terminate.

b. If a constituent does not immediately domainate a stress-bearing unit, apply the stress assignment mechanism to the {left, right}most element dominated by that constituent.

Each of the two options in (3) is independently parameterized, leading to four possible stress systems. If both (3a-b) favor the leftmost element, an initial stress pattern is generated, (4). If both (3a-b) favor the rightmost elment, a final stress pattern is generated, (5). If (3a) favors the leftmost element but (3b) favors the rightmost element, a penultimate stress pattern is generated, (6). Finally, if (3a) favors the rightmost element but (3b) favors the leftmost element, a peninital stress pattern is generated (7).

(4) **Initial:**
$(_{\omega}(_{ft}$ **S** w) …

(5) **Final:**
…(w **S**$)_{ft})_{\omega}$

(6) **Penultimate:**
…(**S** w$)_{ft})_{\omega}$

(7) **Peninitial:**
$(_{\omega}(_{ft}$ w **S**) …

Recall now the LEB, repeated in (8). The LEB rules out constituents mismatched in prominence from appearing at the left edge of some larger prosodic constituent. (7) is in violation of (8), if stressed syllables are considered more prominent than unstressed syllables: it contains a foot containing a w **S** sequence, and that foot appears at the left edge of a larger prosodic constituent, namely the word.

(8) **The Left Edge Ban:**
***** ((w **S** …
where w means "weak"
and **S** means "strong"

The set of parametric choices which would lead to the penintial stress system will consistently lead to a violation of the LEB. The peninitial system is ruled out as a result.

2.1 Accounting for exceptions

Penintial systems and antepenultimate systems are attested, but rare. Neither is straightforwardly generated by the system discussed previously in this section: it cannot generate the antepenultimate system, and the peninitial system runs afoul of the LEB. In this subsection I will suggest that these systems underlyingly involve one of the parametric choices in (8), plus some sort of additional process that obscures this underlying choice. I will limit my discussion to two processes of this sort — extrametricality of a peripheral syllable and edge targeting phonological processes. The hope will be that the the relative rarity of peninitial systems and antepenultimate systems reflects the fact that they require some additional process to be generated, outside of the core system of stress assignment discussed before.

If we admit extrametricality of no more than one stress bearing unit into our system, it becomes possible to generate an antepenultimate stress system. Antepenultimate stress could arise from the parametric choices that lead penultimate stress with the addition of final syllable extrametricality, as schematized in (9).

(9) **Antepenultimate stress as penultimate stress + extrametricality:**
…(**S** w$)_{ft})_{\omega}$ w

It also becomes possible to generate a penintial stress stress system which respects the LEB: at least some peninitial stress systems could arise from the set of parametric choices leading to initial stress, with the addition of initial syllable extrametricality, as schematized in (10).

(10) **Peninitial stress is initial stress + extrametricality:**
w ($_{\omega}$($_{ft}$ **S** w) …

Such a proposal has been made for certain dialects of Basque with penitial stress in Hualde (1991)by Melinger (2002) for Seneca.[2] Recall now that the frequency of penintial and antepenultimate stress systems is roughly equivalent — we have seen here that edge syllable extrametricality allows both to be generated. We can understand the relative rarity and parity of occurence of these systems as a result: both are reliant on the same mechanism. There are a number of imaginable reasons why stress systems involving extrametricality are less preferred than those that lack extrametricality. One possibility is that systems with extrametricality are not diachronically stable; systems with extrametricality tend over time to become systems lacking extrametricality.

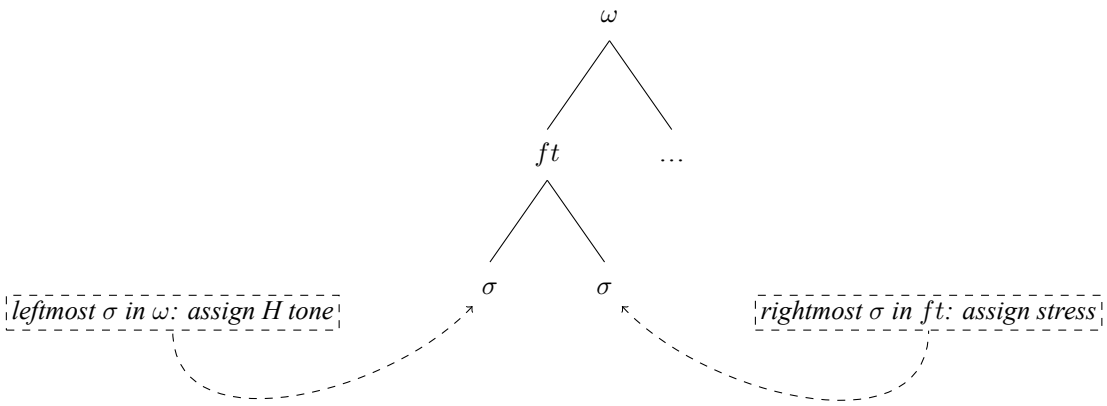
Another way a language with peninitial stress might skirt the LEB is by increasing the prominence of the initial syllable, along with the second. Osage, as discussed in Altshuler (2009), is an example of such a language. Altshuler notes that the default stress pattern in Osage is on even syllables counting from left to right, as in (11).

(11) a. pa:ˈxo ‘mountain’
b. nã:ˈloxa ‘undercover’
c. xõ:ˈt͡soði:ˌbrã ‘smoke cedar’

This pattern, on its face, appears to be problematic for the LEB. However, Altshuler goes on to provide an analysis of the phonetics of Osage stress, under which one of the primary correlates of stress is increased F0. Here he makes an interesting discovery. Unstressed syllables always have a lower F0 than the stressed syllables which precede and follow them. However, putatively unstressed initial syllables in words which follow the default stress pattern have an F0 which is roughly equivalent to the syllable which follows them.

Altshuler concludes from this analysis that Osage is a language which has both stress and tone at the word level. In addition to the peninitial stress pattern, Osage has word-initial high tone. Given this analysis of Osage, we are in a position to understand how it is able to circumvent the LEB. As schematized in (12), both syllables in the initial foot in the Osage word are targeted by a prominence-boosting process.

(12)

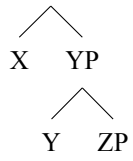


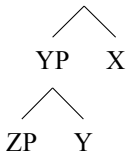
At the word level, the LEB generally rules out peninitial stress because the second syllable is strong in comparison to the first — i.e. they are mismatched in prominence. In the case of Osage, placing stress on the peninitial syllable does not have this effect, because the initial syllable is at least as prominent as the second, as a result of high tone assignment. Since the peninitial syllable in Osage is not stronger than the initial as a result of initial high tone assignment, the LEB does not rule out initial stress.

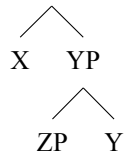
[2] It is here worth noting that the possibility of initial extrametricality has been argued against, notably by Kager (1995); Hyde (2002), among others. If extrametricality ends up being asymmetric, then some other explanation will be needed for penintial stress systems more generally.

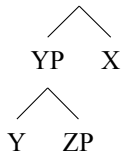
3 The LEB at the phrase level

Much work on comparative syntax (Greenberg, 1963; Dryer, 1992; Sheehan et al., 2017, a.m.o.) has revealed a particular preference: languages prefer harmonic syntactic structures (13-14) over disharmonic syntactic structures (15-16).

(13) 

(14) 

(15) 

(16) ! 

In particular, (16) has been shown to be particularly dispreferred. Holmberg (2000); Biberauer, Holmberg & Roberts (2014); Sheehan, Biberauer, Roberts & Holmberg (2017) propose and refine a general ban — the FOFC, (17) — that rules out this structure entirely.

(17) **The FOFC:**
*[$_{XP}$ [$_{YP}$ Y ZP] X]

The FOFC is meant to account for a number of restrictions on word order. For instance: Finnish is known to display remarkably free word order in question contexts. However, as shown below, one particular word order is ruled out.

(18) **Object order in Finnish**

a. *milloin Jussi [olisi [kirjoittanut romaanin]]*
when Jussi would-have written novel-def

b. *milloin Jussi [olisi [romaanin kirjoittanut]]*
when Jussi would-have novel-def written

c. *milloin Jussi [[romaanin kirjoittanut] olisi]*
when Jussi novel-def written would-have

'When would have Jussi written a novel?'

d. * *milloin Jussi [[kirjoittanut romaanin] olisi]* → **FOFC violated**
when Jussi written novel-def would-have

Holmberg (2000)

The FOFC is responsible for the unacceptability of (18d): the VP is head-initial, but the phrase headed by the auxiliary *olisi*, which takes the VP as its complement, is head-final. As shown in Holmberg (2000), if common assumptions about triggers of syntactic movement are held, a system which can generate the word orders in (18a-c) should also be able to generate (18d), so something else is necessary to rule out this particular word order.

Recall the LEB—it bears a similarity to the FOFC in (17). Both rule out certain types of constituent at the left edge of some larger constituent.

(19) **The Left Edge Ban:**
* ((w **S** …
where w means "weak"
and **S** means "strong"

Given certain assumptions about the mapping of syntactic structure to prosodic structure, we can understand the FOFC as being a result of the LEB. First, we will need a mechanism for translating syntactic structure to prosodic structure. Here I assume something like Match Theory (Selkirk, 2009, et seq, a.o.), given below in (20).

(20) **Match Theory**

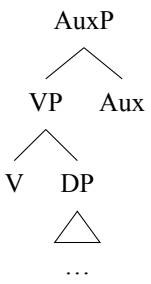
a. For each XP, there is a phonological phrase ϕ dominating the exponents of the terminals XP dominates.

b. For each X^0 there is a phonological word ω dominating the exponent of X^0.

c. If X^0 is null, X/XP are ignored by Match.

Consider for instance the problematic syntactic structure for (18d). (20) will translate it into the prosodic representation in (21).

(21)



$\rightarrow\rightarrow\rightarrow$ $\phi(\ \phi(\ \text{kirjoittanut}_{\omega}\ (\phi\ \text{romaanin}_{\omega}\ )\ )\ \text{olisi}_{\omega}\ )$

We are in a position to understand why the LEB would rule out the prosodic representation in (21) if ϕ are stronger than ω. Provided there is a prominence-related process which generally applies to ϕ but not to ω, a ϕ will always be stronger than its ω sister as the two will always be mismatched in prominence. For expository purposes, I give the following definition for determining the relative strength and weakness of constituents at the phrasal level.

(22) **Informal heuristic for determining strength and weakness:**

a. For a structure like (ω ϕ) or (ϕ ω), ϕ is strong and ω is weak.

b. If an element that would otherwise be weak has been targeted by a prominence boosting process, it will not be weak.

Given this, we can understand the unacceptability of (21): the prosodic representation in (21) is in violation of the LEB. The ϕ corresponding to VP consists of an ω followed by a ϕ—here ω is weak and ϕ is strong. That ϕ is at the left edge of a larger prosodic constituent, which is the configuration the LEB rules out.

The theory of disharmonic word order developed here appears to cover more or less the same empirical ground as the FOFC. I will show now that the two theories can be teased apart, and that the approach suggested here has a number of empirical advantages. On the LEB theory, we should expect manipulation of the prosody of the clause to allow disharmonic word orders to exceptionally surface. We should furthermore expect the LEB to govern the distribution of constituents that the FOFC would not.

3.1 Manipulation of the prosodic representation

As reported in Sheehan (2017), the FOFC in Finnish may be violated when the object or adverb between a verb and auxiliary is phonologically light, as shown in (23). The sentences in (23) should have the same syntactic structure as the problematic Finnish sentence discussed earlier in this section. The difference here is the object or adjunct in the putatively problematic configuration in (23) are both phonologically light pronominals.

(23) **Phonologically light elements violate the FOFC**

a. *Milloin minä* ($_{\phi}$($_{\phi}$ *laulanut täällä*) *olisin*)
when I sung here aux

'When would I have sung here?'

b. *Kyllä minä* ($_{\phi}$($_{\phi}$ *lukenut sen*) *olen*)
prtcl I read it aux

'I have indeed read it.' *Sheehan (2017)*

This is unexpected for the classical FOFC. The syntactic structures for (23) should be ruled out, independent of the phonological weight of the elements involved. For the LEB, in contrast, we should expect this sort of sensitivity. Provided the smaller ϕ in (23)—corresponding to VP—does not itself contain a ϕ, the structure will not run afoul of the LEB. There are at least two non-mutually-exclusive possibile explanations for the LEB-based theory of disharmonic word order for the acceptability of (23).

One possibility is that pronominal elements—like *sen, 'it'* and *täällä, 'there'*—don't map to ϕ, but to ω (or perhaps something smaller). As has been long noted that functional words — in particular pronominal objects — do not behave in the same way as lexical words in terms of their prosodic structure [see Selkirk (1996); Tyler (2019), a.o.]. This could be accounted for straightforwardly if we follow a version of Match Theory proposed in Selkirk (2017) for Xitsonga. On this view, Match is sensitive to whether a syntactic phrase is headed by a 'lexical' or 'functional' element: only lexically headed phrases need to map to ϕ. Pronominal elements like *sen, 'it'* and *täällä, 'there'* need not map to ϕ, since they are not lexically headed. The upshot of this is that the the verb in (23) will be an ω, and therefore at least as strong as its sister, which will also be an ω (or perhaps smaller). No violation of the LEB will arise.

Another possible manipulation of the ϕ corresponding to the VP would be to target the verb with some sort of prominence-boosting process. It is noted in Sheehan, Biberauer, Roberts & Holmberg (2017) that the sentences in (23) are most acceptable when the verb additionally bears contrastive stress.

We could account for this if — as suggested in the heuristic earlier — narrow focus on the verb causes it to no longer count as a weak element in comparison to its object complement. This would be analogous to the case of Osage discussed in §2. On this view, prominence-related manipulation of sisters in the prosodic tree can alter their relative strength. An ω bearing contrastive stress, for instance, would be neither strong or weak in comparison to its ϕ sister, since there would be a prominence-related process — the application of focal stress — which applied to the ω but not its ϕ sister. The upshot: the verb in (23) will be at least as strong as its sister. No violation of the LEB should arise.

3.2 VPs at the left edge

Another difference between the LEB and the FOFC: the LEB bars a constituent with a mismatch in prominence of its subconstituents from appearing at the left edge of larger prosodic constituents, independent of the status of elements which follow the constituent at the left edge. The FOFC, in contrast, holds only over certain types of head-complement structures. We should expect, on the LEB approach, to be able to identify cases where the LEB has an effect that do not involve the head-complement structure relevant for the FOFC.

Van Urk (2019) discusses a consistent pattern in languages that display a particular sort of word order alternation in predicate-initial languages, given in (24).

(24) **Van Urk's generalization**
In a language that allows [VO]X or [V]XO word order, [VO]X word order requires the object to be prosodically reduced.

In the discussion which follows, we will use Fijian as an example, but similar facts are reported by Van Urk to hold in many other languages, including Imere, Niuean (Massam, 2001), Samoan (Collins, 2017), Hawaiian (Medeiros, 2013) [all Oceanic], Gitksan [Tsimshanic] (Forbes, 2018), Tenetéhara [Tupí-Guaraní] (Duarte, 2012), Ch'ol [Mayan] (Coon, 2010), and Santiago Laxopa Zapotec [Zapotecan] (Adler et al., 2018). For simplicity's sake, I will assume that languages exhibiting this alternation in word order are all languages in which verb-initial word order is derived through VP fronting. It is of course conceivable that that this is not the case; the analysis proposed here should be compatible with a number of imaginable alternatives, provided there is some other motivation for the object to form a prosodic constituent with the verb.

Certain particles mark the right edge of the Fijian VP. Internal arguments, either with determiners, (25a), or PPs, (25b), must appear to the right of these particles.

(25) **Heavy elements appear outside of VP in Fijian**

a. *e* *a* [$_{VP}$ *kau-ta* _____ *mai*] [$_{DP}$ *na* *ilokoloko*] *ko* *Eroni.*
3sg pst bring-tr.n dir det.n pillow det.pr Eroni

'Eroni brought the pillows.'

b. *e* *a* [$_{VP}$ *vosa* ____ *tiko*] [$_{PP}$ *vei* *Jone*] *ko* *Eroni*
3sg pst talk prog to.pr Jone det.pr Eroni

'Eroni talked to Jone.' *Van Urk (to appear)*

In contrast, prosodically light arguments may appear to the left of these particles, inside the VP. pronominal arguments, (26a), or DPs lacking determiners, (26b), may appear in this position.

(26) **Light elements appear inside VP in Fijian**

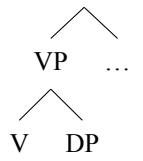
a. *e* *a* [$_{VP}$ *kau-ta* *au* *mai*] *ko* *Eroni.*
3sg pst bring-tr.n 1sg dir det.n Eroni

'Eroni brought me.'

b. *e* *dau* [$_{VP}$ *kau* *ilokoloko* *tuga* *mai*] *ko* *Eroni.*
3sg hab bring pillow always dir det.pr Eroni

'Eroni always brings pillows.' *Van Urk (to appear)*

Given what we have said so far, we can see this as a consequence of the LEB. The LEB does will out a heavy object appearing in this left-edge ϕ. If the DP in the fronted VP is pronounced in the expected position — as in (27) — then a LEB-violating prosodic structure will be generated, as in (28). If the DP is not pronounced in this position — as in (29), either as a result of it evacuating the VP (Massam, 2001, for Niuean) , or as a result of scattered deletion (Van Urk, 2019) — the phrase corresponding to the VP will respect the LEB, as in (30).

(27)


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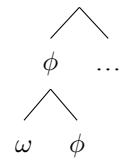

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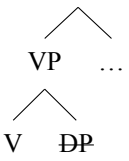

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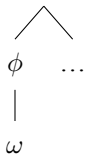
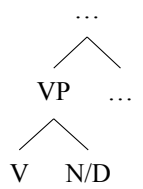


When the object is light, this does not occur: neither of the elements in the ϕ corresponding to VP is stronger than the other, so no violation of the LEB could occur. In the structure in (31), the complement to V is either a bare determiner or a bare noun. Match Theory will not require such an element to map to a ϕ; these elements are heads/X^0, and may therefore map to ω, as in (32). The structure in (32) respects the LEB, since it consists of constituents which are balanced in prominence.

(31)


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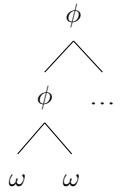


The pattern we see here is analogous to what we saw earlier in this section for Finnish. There and here we see that the LEB allows a certain type of structure only when the initial element in the structure is at least as prominent as the peninitial element in the structure. Under the LEB, classical FOFC effects appear when a ϕ corresponding to VP appears at the left edge of some larger domain, when the second element — an internal argument — in that ϕ is stronger than the first. However, when the second element is not stronger than the first, the effect vanishes — which is not expected under the classic FOFC. Prosodically light elements are thus consistently exempt from the ban. In the cases investigated in this subsection, it is furthermore unclear why the FOFC should govern these configurations: the disharmonic head configuration which gives rise to FOFC effects is not clearly present in the cases examined.

3.3 Incorporation of weak initial material

The LEB has another potential advantage over the classical FOFC. A problem for the classical FOFC arises when we consider constituents like the German VP in (33): the DP is head initial, but the VP is head final. The FOFC should rule such structures out, Given the widely assumed DP hypothesis (Abney, 1987).

(33) **German VP looks like a FOFC violating structure**

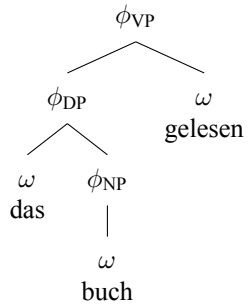
… *daß Johann* [$_{VP}$ [$_{DP}$ *das Buch*] *gelesen*] *hat*
that John the book read has

"…that John has read the book"

The move made by Biberauer, Holmberg & Roberts (2014); Sheehan, Biberauer, Roberts & Holmberg (2017, a.o.) to account for (33) is to relativize the evaluation of the FOFC to certain domains. Rather than evaluating the FOFC over the entire structure, the FOFC is evaluated only within the extended projection of a lexical head. On this view, (33) is acceptable since the higher head in the problematic structure, V, is not in the extended projection of N.

The structure in (33) is potentially similarly problematic for the LEB. It should have a prosodic structure like (34) — given the strict definition of Match Theory assumed in §3 — which is not LEB compliant.

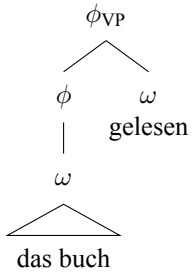
(34) **German VP maps to a LEB violating structure**



→ *((w **S** …

Of course, if (34) is not the correct representation, then there is hope that the correct representation is LEB compliant. Recall our previous discussion of the peculiar prosodic status of functional words — in particular, determiners. We saw there that such elements consistently fail to map to independent phonological words, but instead appear to be prosodic clitics, which tend to procliticize onto a lexical word following them. Following Hall (1999); Kabak & Schiering (2006); Ito & Mester (2009), I suggest that German determiners do not map to independent phonological words, but rather to some smaller element which adjoins in some way to the lexical noun, schematized below.

(35)

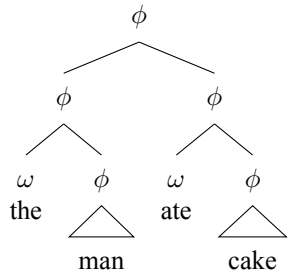


→ ✓((**S** …

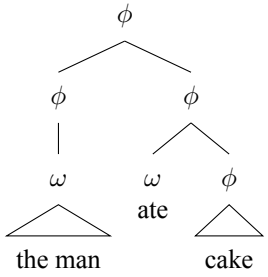
This is suggestive of the analysis of peninitial stress in Basque noted in §2: there, rendering a weak element in the initial position of a left edge constituent extrametrical in some way allows what looks like an LEB violation. It is also suggestive of part of the analysis of Finnish in §3.1: there, we saw that 'weak', functional, determiner like elements behaved differently from lexical nominals with respect to the ban. If the proposed amendment to Match Theory is adopted there, then it could extend here as well—DP need not map to ϕ, since it is not headed by a lexical element.

This potential problem for the LEB — and hopefully, the suggested solution — is more general. Subjects in English, for instance, look on the surface to pose a similar sort of problem: if the determiner in a subject were to map to an ω, as in (36), then we should expect the LEB to rule the sentence out. However, it has been argued—see Selkirk (1996); Ito & Mester (2009) for more details—that determiners in English behave similarly [but not identically] to determiners in German, in that they seem to be prosodically dependent on the lexical word that follows them.

(36) **Subject violates the LEB**



(37) **Subject respects the LEB**



If the LEB is on the right track, we should generally expect phrase-initial functional words to be prosodically dependent, in order to avoid creating a violation of the LEB, particularly in languages where these words generally appear at the left edge of some larger prosodic constituent. However, we should not necessarily expect this to be true of functional words which fail to appear in an initial position. The tendency of functional words — in particular, phrase-initial functional words — to prosodically dependent in some way could potentially be seen as a consequence of the LEB: prosodically dependent elements will never create the embedding of prosodic structure which could give rise to an LEB violation.

3.4 Conclusion

In this paper, I proposed and defended a general ban on certain types of prosodic constituent whose elements are mismatched in prominence, given below. This ban was argued to hold at a variety of levels of representation, and accounted for a number of broad cross-linguistic trends.

(38) **The Left Edge Ban:**
* ((w **S** …
where w means "weak"
and **S** means "strong"

We first saw that the LEB accounted for the fact that peninitial stress is crosslinguistically rare, and, when it appears, seems to require something 'extra' to happen to the first syllable. We then saw that this accounted for a number of word order requirements, including harmonic word order effects that the FOFC was posited to capture. In a number of the cases investigated, something 'extra' happening to an element in the configuration seems to rescue a structure that might otherwise be LEB violating.

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