The Typology of the Distribution of Edge : the propensity for bipositionality

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The typology of the distribution of Edge: the propensity for bipositionality

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Abstract

We discuss the grammatical conditions that can be imposed between segmental content (features) and syllable structure (positions) and how a representational preference can influence diachronic development. The discussion centers on the co-distribution of two properties: occlusivity and bipositionality. The first is the phonological feature that induces occlusivity and reduces amplitude (that is: |ʔ|, which we will refer to as *Edge(*)*), the second is the autosegmental structural property of belonging to multiple positions (which we refer to as 'C.C'). *Edge(*)* and bipositionality have a universal affinity but they are not reducible to each other. Instead, the inherent diachronic tendency to preserve *Edge(*)* in bipositional structures can become grammaticalised through licensing conditions that dictate the alignment of the two properties. This can be expressed bidirectionally, forming two major language types. Type A has the condition stated from the featural perspective (*Edge(*)* must be found in C.C). While, Type B comes from the other direction (C.C must contain *Edge(*)*). Crucially, the same structure is diachronically stable: (*Edge(*)*-C.C). What varies is the distribution of those properties elsewhere (given the direction of licensing condition). Type A excludes *Edge(*)* from {#__,V_V}, while Type B excludes C.Cs without *Edge(*)*. Although there is variation on this point, there is a UG component, because there are no anti-Type A/B languages where *Edge(*)* repels bipositionality.

1 Introduction

This paper is broadly about the grammatical relationship that can be imposed between segmental content (features) and syllable structure (positions). In its broadest terms, we present a representational model where well-formedness is defined in terms of licensing. The discussion centers on the co-distribution of two properties: occlusivity and

bipositionality. By occlusivity we mean a phonological feature that induces occlusivity and reduces amplitude. In Element Theory (Backley 2011) the occlusivity feature is: |ʔ| and it may be headed or headless. For expository purposes we will be referring to this as *Edge(*)* — in section (3) we will introduce the feature in a little more detail. By 'bipositionality' (C.C) we mean the autosegmental property of belonging to multiple positions in syllable structure (as in geminates, heterosyllabic consonant clusters *etc*). We will show that there is a universal affinity between *Edge(*)* and bipositionality, but that neither property can be reduced to the other. The distribution of *Edge(*)* shows in a particularly clear way the Honeyboneian principle of 'sharing makes us stronger'.

The structure of the paper is as follows. We begin the discussion with a description of Ontena Gadsup, the only known language to violate a universal against underlying oral stops. This fact is a product of an analysis and it is itself reducible to another highly unusual state of affairs: the unified lenition environment of {#__, V__V}. We will show that comparison of a closely related dialect suggests that diachronically there was no such unified environment and that initial weakening was a secondary and separate process from intervocalic spirantisation. The actual distribution of stopness in Ontena Gadsup is shown to be regulated by the licensing of *Edge** in relation to bipositionality. We show that it forms a linguistic type (Type A) that also finds expression in the spirantising Berber languages. The analysis simultaneously predicts another major linguistic type (Type B), one which is attested in the so called 'Prince languages' such as the Kingi dialect of Soninké. In Type A languages *Edge** is licensed by being contained in a bipositional syllable structure, while in Type B languages it is the bipositional structure that is licensed by containing *Edge*. Although there is variation on this point, there is a UG component because there are no anti-Type A/B languages where *Edge(*)* repels bipositionality. Such different language types must be able to arise diachronically, and we consider this below, suggesting that with a diachronic reanalysis one could make a Type B into a Type A language.

2 Ontena Gadsup lenition and violation of universals

Gadsup refers to a cluster of Trans-New Guinea languages spoken in the Eastern Highlands Province of Papua New Guinea. Of these, the Ontena variety of Gadsup is a 'rarissima' language. It appears unique in defying the absolute phonological universal that the inventories of all languages must contain oral stop consonants.

This statement is, however, a matter of analysis. In Ontena Gadsup stops have an extremely limited distribution. They are not found word-initially or intervocalically. They occur only after a homorganic nasal or a glottal stop: {[N._], [ʔ._]}.

Due to the extremely limited distribution of oral stop consonants, formal economy suggests that they should be derived from underlying fricatives by a fortition rule.

(1) [–son , +cont] → [–cont] / [–cont] __

According to this analysis, the underlying set of consonants in Ontena Gadsup reduces to the inventory shown in (2).

(2) Ontena Gadsup inventory (Frantz 1994)

Group 1	ɸ	β	s	ɾ	x
Group 2	m	n	j	(ʔ)	

From the application of the rule in (1) to the inventory of consonants in (2), the consonants of Group 1 are obliged to surface as stops: [p, b, t, d, k] in post-consonantal contexts. This post-consonantal hardening is shown in (3).

(3) Ontena Gadsup

(a) Fricative forms

xamani	*__k__amani	‘sweet potato’
a**ɾ**aʔi	*a**t**aʔi	‘bowels’
sa**x**omi	*sa**k**omi	‘frog’

(b) Stops found post-consonantally

fon**t**i	‘pig meat’

2.1 Problem

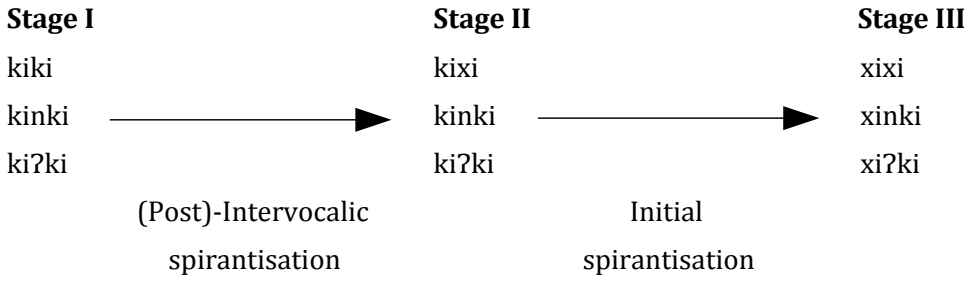
The part of this analysis that is clear is the reason why [–cont] consonants retain their non-continuancy when following non-continuant consonants. The problem with this analysis is that it suggests a story where the word-initial and intervocalic environments were unified as one weak environment. The implied weakening hypothesis is shown in (4).

(4) Lenition environment: Weak {#__ , V__V}
Strong {N.__, C.__}

In fact, because there are no reported alternations in the language, another diachronic pathway suggests itself, one which does not take {#__ , V__V} as a unified weak environment. The origin of the Gadsup pattern could be explained as a two-step process where the first step is *post-vocal spirantisation* which is then followed by *initial weakening*.

(5) Two step weakening hypothesis

(Post)-Intervocalic spirantisation followed by Initial spirantisation



As shown in (5), a Stage I language (with stops in all positions) could introduce a phonological process of intervocalic spirantisation.[1] This would eliminate stops from all positions, except word-initially and post-consonantally (Stage II). Then there would be a second process of initial spirantisation that would remove the stops from initial position also, leaving them exclusively in post-consonantal environment, this pattern (Stage III) is what is attested in Ontena Gadsup.

If this were the proper diachronic account for the synchronic distribution of stops in Gadsup it would not require unification of initial and intervocalic environments into one weak environment. Therefore, fricatives would share these two environments but initial weakening and the intervocalic weakening would not have the same *cause*. The intervocalic pattern would be true lenition, while the initial weakening would be caused by another factor, perhaps not even technically lenition.

Beyond wanting to know 'what actually happened' there is a theoretically significant reason for wanting to distinguish between these two hypotheses. The normal expectation is that the initial

[1] We do not discuss stops in 'coda' position because they are irrelevant for the discussion of Ontena.

position is phonologically strong — there is evidence for this from experimental work, diachronic change and synchronic alternations. Experimental work suggests the universality of initial strength (Becker et al. 2012; Becker et al. in press). Diachronically, initial weakening is rarely attested (cf. Coda Mirror, Ségéral and Scheer 2001). In fact, true initial weakening is very rare cf. Greek pt > ft, *collis* > hill 'Grimms law'. And synchronically, apparent cases of initial weakening are almost always (if not always) associated to strong-weak morphological patterns, the consonant mutations of Celtic (Breit 2015), Bantu (Kula 2002), West-Atlantic (McLaughlin 2000), and Nivkh (Shiraishi 2006), or the quasi-morphological patterns of Neapolitan (Russo and Ulfsbjorninn 2015). These do not indicate the weakness of a position because, in fact, only a phonologically strong position could even host such a contrast, which is why these strong-weak alternations usually affect the initial consonant.

Luckily there is an argument in favour of the non-lenition, two step analysis of initial weakening.

2.2 Proof of the two step process

The confirmation of the two-step diachronic analysis, sketched in (5) in the previous section, comes from a related dialect. In a charming analysis-driven punchline, while Ontena Gadsup has no underlying stops, Akuna Gadsup has plenty of stops but no underlying fricatives.[2] The fricatives of Akuna are allophonic and are generated by a rule of intervocalic spirantisation.

(6) Akuna Gadsup inventory (Frantz and Frantz 1966)

Group 1	p	t	d	k	
Group 2	β	m	n	j	(ʔ)

In fact, the Akuna dialect appears to have what is presumably also the Proto-Ontena Gadsup phonological system. In Akuna, intervocalic stops have all lenited to fricatives, but they have been preserved post-consonantally, that is in precisely the context where they are still found in Ontena Gadsup: {[N._], [ʔ._]}. Crucially, unlike modern Ontena Gadsup, the stops have also (categorically) remained in initial position. We show the difference between these two varieties in (7) beneath.

[2] Apart from [β] which is significant as we will show soon.

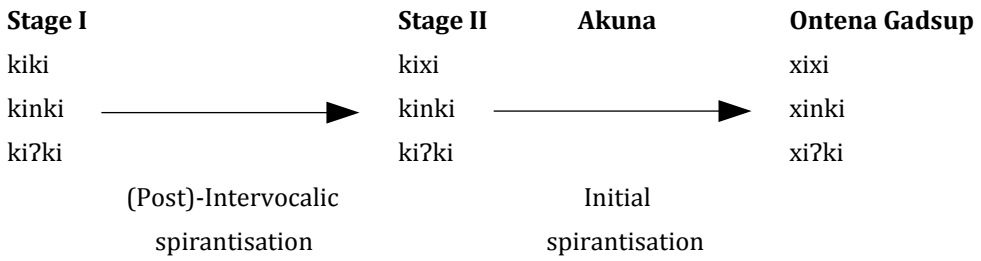
(7) Distribution of Stops

	Initial	Intervocalic	Post-consonantal
Akuna	yes	no	yes
Ontena	no	no	yes

Interestingly, Akuna is reported to have the beginnings of 'initial weakening'. At the time that it was described, it had already reduced all instances of word-initial historic *b to [β], but it had also begun an optional and variable process of word-initial weakening: the oral stop consonants /p, t, d, k/ are also beginning to surface as: [ɸ, s, ɾ, x]. Crucially, the intervocalic spirantisation was fully completed in the Akuna variety before the initial weakening began toward the path of becoming fixed. Based on this, we are comfortable in claiming that the diachronic path behind the loss of stops in Gadsup was *not* achieved through a phonological unification of initial and intervocalic environments as one weak environment. The synchronic pattern is a product of a two-step diachronic model (shown in (5) and repeated in (8) below), where spirantisation in intervocalic and initial environments do not share one cause. We label Stage III as Ontena Gadsup and place Akuna above the arrow because it is clearly categorically in Stage II, but apparently moving toward Stage III.

(8) Weakening in Gadsup

(Post)-Intervocalic spirantisation followed by initial spirantisation



3 Distribution of stopness in Gadsup

The structural description of Ontena Gadsup's unusual distribution of stopness leads to an interesting discussion with regard to the grammar of segment and syllable structure interaction. Before we describe the pattern in phonological terms, we will present a lightning introduction to Element Theory (ET), the framework the analysis is set in (the analysis could be translated into other featural systems).

ET is a system of representation based on equipollent, non-articulatory features (neutral between speaker and hearer) (Harris and Lindsey 1995). For a recent comprehensive introduction see Backley (2011). The elements broadly split into a 'place' vs. 'manner/voicing' split. |A|, |I|, |U| are the 'place', 'colours' or resonance elements, while |H| stands for aperiodic noise, voicelessness and high tone, |L| for murmur, voicing and low tone, and |ʔ| for creakiness and a sustained drop in overall amplitude. These last three elements can be referred to by name: *Noise*, *Murmur* and *Edge* respectively. Each element can be headed or unheaded — this is marked by underlining the element in its brackets (|H| vs. |H̲|), or when referred to by 'name' the headed variant of the feature is shown with a superscript asterisk (*Noise* vs. *Noise**). We will assume that the elemental make up of sounds is roughly as shown in (9).[3]

(9) Element composition by class of sound
Headed elements are shown with an asterisk, and in curly brackets in the example column (as underlining is not clearly seen in tables). Also, for simplicity, features for voicing contrasts have not been shown.

	Edge	Noise	Murmur	Place	Example
Oral stop	|ʔ|*	|H|		A, I, U	/q/ ({ʔ}, H, U, A)
Oral Affricate	|ʔ|*	|H|*		A, I, U	/q͡χ/ ({ʔ, H}, U, A)
Oral Fricative		|H|*		A, I, U	/f/ ({H}, U)
Nasal	|ʔ|		|L|	A, I, U	/m/ (ʔ, L, U)
Lateral	|ʔ|			A, I, U	/ɬ/ (ʔ, A, U)
Rhotic				A, I, U	/ɹʷ/ (A, U)
Glide				A, I, U	/w/ (U)
Glottal fricative		|H|			/h/ (H)
Glottal stop	|ʔ|				/ʔ/ (ʔ)

Because Gadsup requires a discussion of the distribution of stopness, it is the element *Edge(*)* that needs explaining. With respect to *Edge(*)*, the sound classes line up as follows: stops are distinguished by this abrupt and sustained drop in amplitude, though they also contain some noise in their burst and some spectral modulation corresponding to place of articulation. Affricates are similar but they also emphasise their *Noise* component. In both Stops and Affricates *Edge(*)* is headed (*Edge**) (9a). Oral fricatives on the other hand do not contain *Edge(*)* at all — they are made up of *Noise* to correspond to

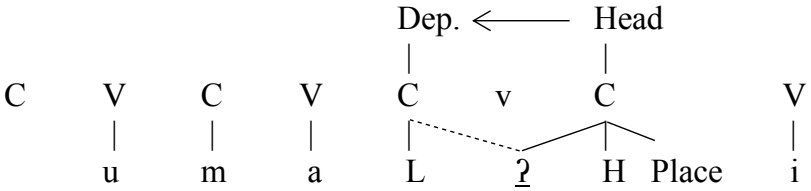
[3] In fact, all varieties of GP/Strict CV assume that phonological specification of features is broadly language specific. In some languages stops may or may not contain laryngeal features. Laterals may or may not contain *Edge*. *Etc*…

their aperiodic energy in addition to some spectral modulation (9b). Nasals, on the other hand (9c), do contain *Edge* reflecting their sustained drop in amplitude, however, this is not their headed property. Laterals (9d) also may or may not have an *Edge* element. Rhotics, (9e) have never been shown to have one, and that's also the case for the rest of the semi-consonantal noises (glides *etc*) (9f).

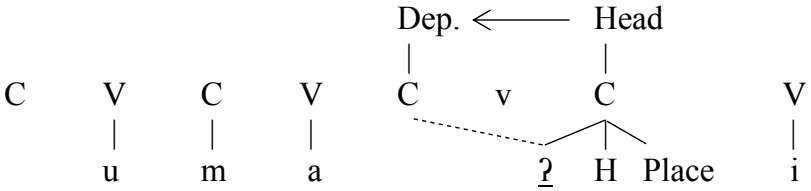
The peculiarity of Gadsup Ontena revolves around the distribution of |ʔ|, that is, *Edge**. Recall that in Ontena Gadsup, stops cannot be found word-initially or intervocalically, instead they must be preceded by either a nasal or a glottal stop. This is equivalent to saying that *Edge** is only licensed in structures where it branches across two positions: once as a head (on the right). The headedness of the branching edge is expressed on the headedness of the heterosyllabic cluster, it is on the right (cf. Kaye et al. 1990; Charette 1990).

(10) Ontena Gadsup[4]

(a) Headed edge found after homorganic nasal [uma**nt**i] 'example'



(b) Headed edge found after glottal stop [uma**ʔk**i]

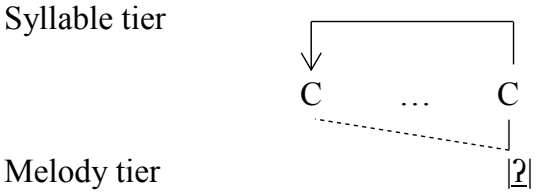


To describe the well-formedness of words in Ontena Gadsup one could write a condition on licensing such as is expressed in (11).

[4] While *Edge** must branch to a dependent position, the headed part of Edge* is manifested only on the headed part of the C.C cluster, the rightmost part. We show the following with the hypothetical minimal pair: 'umanti' and 'umacti'.

(11) Licensing condition on *Edge** in Ontena Gadsup

- *Edge** (|ʔ|) must branch to a dependent position.
- A feature *Edge** is licensed iff it is contained by two C positions (Or: *Edge** must branch)



The licensing condition in (11) is reminiscient of Charette and Göksel's (1998) licensing constraints except that it checks well-formedness across two tiers of representation, the syllable structure tier and the melodic tier (features).

The licensing condition in (11) is stated as a restriction on melody. Therefore, as it is relevant to Ontena Gadsup, *Edge** is only found in structures where it can also branch to a dependent position. As a consequence of this condition, stops are restricted to post-consonantal positions, the relationship between the two properties *Edge** and bipositionality are presented in the table in (12).

(12) *Edge** distribution and bipositionality in Ontena

Initial	**Intervocalic**	**Post-consonantal**
no	no	yes
Monopositional		Bipositional

The connection between the properties of *Edge* and bipositionality already has an expression in the Government Phonology literature. Jensen (1994), Pöchtrager (2006), Pöchtrager & Kaye (2013) and other work in what is called 'GP 2.0' actually reduce these two properties as if they were expressions of each other: Bipositionality = *Edge*. In this framework, the feature *Edge* is expressed solely as a structural configuration of essentially two positions.

It is formally important to note that in our work the two properties are *not* being reduced to each other. In fact, our observation that in Ontena Gadsup *Edge** and Bipositionality are related through licensing goes only one way. It is an expression limiting the distribution of the feature *Edge**. According to the formulation of the licensing condition in

(11), and in line with the facts, bipositional structures are free to host any other consonantal sequences: e.g. [o**ns**ena].[5]

This argument relies on a licensing condition that regulates the co-occurrence restrictions of features and syllable structures. The way it works is laid out in (13) beneath.

(13) Logical structure of licensing condition

- In a given language there will be certain syllable structures, *x*, *y*, *z*….
- In this language there are also certain features: α, β, γ…
- The grammar includes a set of licensing conditions: 1, 2, 3…
- 1 says that feature α ***must*** be found in *x*
- Therefore feature α cannot be found in *y* (because *y* is not *x*).
- However, anything else may be contained by *y* (as far as 1 is concerned).

The way this works for Ontena Gadsup is schematized in (14).

(14) Ontena Gadsup

Conditions:

Feature: *Edge**

Bipositional structure: C.C

Licensing condition: *Edge** can only be found in C.C

Outcome:

Can you have Edge* outside of C.C? NO

Can you have C.C without Edge*? YES

So while Jensen (1994) and Pöchtrager (2006) are not correct that *Edge** is reducible to a consonantal structure with multiple positions, there is nonetheless a positive (and we will see, universal) relationship between these two properties, one of which is a feature and the other a syllable structure, and we were able to capture this relationship through a licensing condition.

4 The typology of the distribution of *Edge*

In fact, the licensing condition stated in (11) — applied to either headed or headless edge (*Edge** or *Edge*) — and the logic laid out in (13) unravel into a typology.

[5] Unless any other conditions are stated.

When it comes to the distribution of *Edge(*)* there are in fact many types of languages. Some have no restriction, or few if any restrictions on *Edge(*)*; some have very specific conditions, where the distribution of *Edge(*)* is tied to other linguistic objects/licensing forces (such as *Edge** and *Government* in Tuscan Italian (cf. Bafile 1997; Marotta 2008)). However, the hypotheses proposed to account for Ontena Gadsup in the previous section extend into a very broad typology of two grand classes. These two major types of *Edge(*)*-distribution are interesting when put next to each other, as they shed light on the nature of phonology, and may even be diachronically connected, as we show in the final section, so it is these two grand classes that will be discussed in this paper. They are shown in (15).

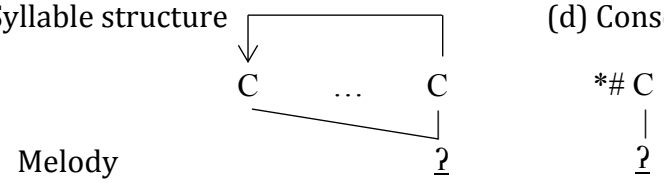
(15) Type A *Edge** is licensed by being bi-positional (C.C)
(Ontena Gadsup, Berber)
Type B C.C is licensed by containing *Edge*
('Prince languages', Soninké)

4.1 Type A

Type A is the kind of language that includes Ontena Gadsup and where we kicked off the discussion. Ontena Gadsup is indeed very rare in its patterning but it is not, typologically speaking, an isolate. Some Berber languages manifest the same distribution of stopness and can easily be analysed as further instances of Type A.

Type A is the kind of language you get when the distribution of *Edge** is positively connected with bipositionality and, crucially, the grammar is focused on the distribution of the feature, almost as if it were tracking the co-indexation of these two properties on these two different tiers from the perspective of the feature. It is a feature-centric expression of the licensing condition that marries *Edge** and bipositionality.

(16) Type A
(a) Licensing status: *Edge** is licensed by being bi-positional (C.C)
(b) Example: Ontena Gadsup, Berber.
(c) Syllable structure (d) Consequences:



In this language type, there are no *Edge**-based restrictions on the consonants that populate bipositional structures. Rime-onset sequences and geminates can (in principle, and all things being equal) contain any consonantal types, but singleton onsets cannot contain *Edge**.

In certain varieties of Berber like Tamazight, Tarifit and Kabyle, oral stops spirantise in many contexts except when they are geminated (17a-b). Word-initial stops also spirantise in these varieties. Elsewhere, 't, d' resist spirantisation but only when they are preceded by '*m, n, l*' (18) — see El Kirat (1987), and Kossmann & Stroomer (1997).

(17) (a) Tashlhiyt Berber — Tamazight (Saïb 1976, Kossmann 1995)

a**k**uz	a**ç**uz	'weevil'
azu**k**nni	azu**ç**ənni	'thyme'
a**g**ur**d**i	a**ç**ur**ð**i	'kind of bug'
a**k**a**b**ar	a**ç**a**β**ar	'caravan'
tir**g**in	**θ**ir**ʒ**in	'embers'
txdm	**θ**əx**ð**əm	'she worked'
tumzˁt	**θ**umz**ð**	'you held'

(b) Singleton / geminate (Tamazight, Saïb 1976)

Aorist	Imperfective	
n**ç**ər	nə**kk**ər	'stand up'
r**ç**əl	rə**kk**əl	'kick'
m**ʒ**ər	mə**gg**ər	'harvest'
f**θ**əl	fə**tt**əl	'roll'
r**β**əl	rə**bb**əl	'ramble'

(18) Beni Iznassen Berber (El Kirat 1987) — Tashlhiyt

θam**d**imt	lm**d**int	'town'
θammem**t**	tammn**t**	'honey'
θaqbil**t**	taqbil**t**	'tribe'
ul**t**ma	ul**t**ma	'my sister'
θaħnin**t**	taħnin**t**	'tender woman'

In (17a), we see Tamazight Berber spirantizing singleton stops in various positions, including intervocalic and word-initial. These can be

contrasted with their cognates in Tashlhiyt where these stops remain unchanged. (17b) contrasts singleton stops that have become spirantized in the aorist and their geminated counterparts in the imperfective which remain non-spirantised. Data in (18) further show cases where 't, d' resist spirantization when preceded by '*m, n, l*'.

In the spirantising Berber languages, whatever other conditions hold, *Edge** as a feature (stopness) is only found in bipositional structures, either as a geminate or as part of N.C and L.C sequences: [**t**irgin] > [**θ**irʒin] 'embers' vs. [fə**tt**əl] 'roll', [**θ**aħni**nt**] 'tender woman', [u**lt**ma] 'my sister'. The fact that Edge* is shared across two positions is crucial. Merely being *post-consonantal* is not sufficient to block spirantisation: [agu**rd**i] vs. [açu**rð**i] 'kind of bug'. In our model, this is an expected outcome because, as we show in (9), rhotics do not contain occlusivity. Therefore, in R.C (and unlike N.C and L.C) sequences Edge* cannot branch across the two positions. Consequently, R.C structures do not meet the licensing condition discussed in this section, and the stops in these configurations must spirantise.

4.2 Type B

Meanwhile, Type B languages share the positive relationship between *Edge* and bipositionality, but they express the condition from the other direction, from the syllable structure. Indeed, the licensing condition in Type B languages is phrased as in (19). It is checking the positive relationship of bipositional syllable structure and the feature *Edge* in terms of what the syllable structure contains.

(19) Type B (cf. 15): C.C is licensed by containing *Edge* in both positions.

As we see in (19), the condition forces bipositional syllable structure to contain a certain feature. Notice here that the condition is a little less strict as it allows *Edge* in both its incarnations (headed and headless).[6]

Many of what are sometimes called the 'Prince' languages would be of this type (Prince 1984; Piggott 2003). These languages have consonant clusters but they are restricted to two-member, heterosyllabic (rime-onset) clusters which contain either geminates or N.C clusters.[7] A good example of a Type B language is the Kingi variety

[6] Whatever applies to *Edge* applies to *Edge**, but not everything that applies to *Edge** applies also to *Edge*.
[7] Not prenasalised consonants, but actual N+C sequences.

of Soninké (Creissels 2015). The basic segmental inventory of this language is given in (20).

(20) Kingi Soninké inventory (Creissels 2015)

Stops	p	t	c	k	q
	b	d	j	g	
Fricatives	s	h			
Nasal	m	n	ɲ	ŋ	
Lateral	l				
Rhotic	r				
Glides	w	y			

In this language, the consonants that are allowed to be in bipositional structures are highly restricted. Taking geminates as one example of C.C bipositionality, we show in (21) that only the consonants containing *Edge* are licensed.

(21) *Edge* condition on gemination in Kingi Soninké

Geminates: p, c, ŋ, t, k, q, m, ɲ, l[8]	Have *Edge*
Banned: s, h, r, w, y	No *Edge*

The other instances of consonantal bipositional structure must also contain *Edge*. We can see this in Kingi Soninké's sandhi alternations triggered by nasal + stop concatenation, as shown in the post-nasal hardening in (22).

(22) Consonants licensed after nasals

N + Ø	→	ŋ
r	→	l
w	→	ŋ
y	→	ɲ
s	→	c
h	→	p[9]

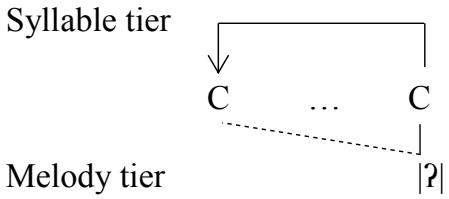
[8] Voiced stops are very marginally attested in geminates, b, d, j. Because, they are in fact possible, albeit low frequency, we take them to be categorically permitted and their rarity is due to substantive factors. g is not attested, we take this to be an accidental gap.

[9] The h was diachronically f (Creissels p.c.).

A preceding nasal consonant triggers these hardening alternations. Their structural description in Element Theory is one where singleton onsets, which can contain any consonant (with or without *Edge*), are 'suddenly' forced into the head of a bipositional structure. The head of the bipositional structure in Kingi must always contain *Edge*, and so the consonants harden to meet this licensing condition. *Edge* becomes part of their description. We express this in (23), as a licensing condition, just as we did for Ontena Gadsup.

(23) Licensing condition on bipositionality in Kingi Soninké

- C.C must contain *Edge* across both positions (C.C must contain branching *Edge*)



The licensing condition in (23) shows exactly the same positive relationship between *Edge(*)* and bipositionality as the licensing condition formulated for Berber and Ontena Gadsup (shown as Type A languages in (15)). But here it is expressed from the perspective of the syllable structure. The condition is on what this bipositional structure must contain. This means that the distribution of *Edge* in Type B languages is very different to that of Type A languages. Specifically, singleton onsets can contain *Edge* both initially and intervocalically. The licensing condition in (23) only restricts the bipositional structure, forcing it to contain *Edge*.

(24) Kingi Soninké

Conditions:

Feature: *Edge*

Bipositional structure: C.C

Licensing condition: C.C **must** contain *Edge*

Outcome:

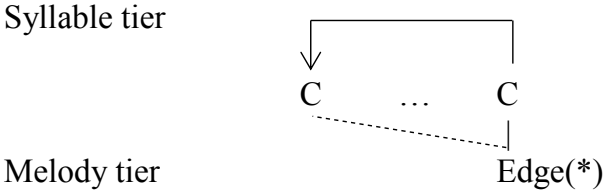
Can you have *Edge* outside of C.C? YES

Can you have C.C without *Edge*? NO

4.3 Bipositionality and *Edge*

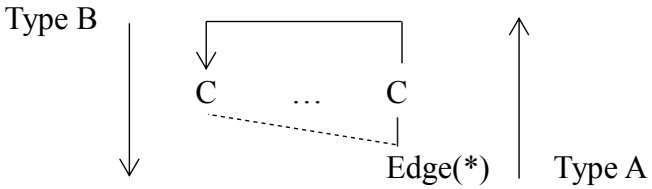
As we have seen a few times now, there is pressure from the grammar in both Type A and Type B languages to positively combine the feature *Edge(*)* (either in only its headed form or in its headed and unheaded form) with a bipositional syllable structure (C.C). The description that both these types of grammar are aiming to produce is identical, and is repeated in (25).

(25) Alignment of C.C and *Edge(*)*



The languages diverge, however, in terms of the direction from which the licensing condition is stated. In Type A languages the condition is on the feature, while in Type B languages the condition is on the syllable structure. From a UG perspective, licensing conditions across tiers are *bidirectional*, as shown in (26).

(26) Condition for Type A and Type B



Type A 'is my feature in the right place'

Type B 'does the structure contain the right feature'

The way that this creates variation, hence typology, is from what conditions are generated elsewhere. Type A languages enforce a ban on *Edge** occurring in singleton stops (initially and intervocalically). Type B languages allow no set of features to be present in C.C unless they include Edge.

In all instances the structure that is being positively associated through licensing is one where material is shared. In the next section we will show some potential diachronic interactions of C.C and *Edge(*)* and how they relate to Honeybone's (2005) notion that 'sharing makes us stronger'.

5 Diachronic and theoretical consequences

5.1 Diachronic consequences

We have presented Ontena Gadsup as a Type A language and Kingi Soninké as a Type B language with regard *Edge(*)* and C.C. In what way can these two systems interact in diachrony?

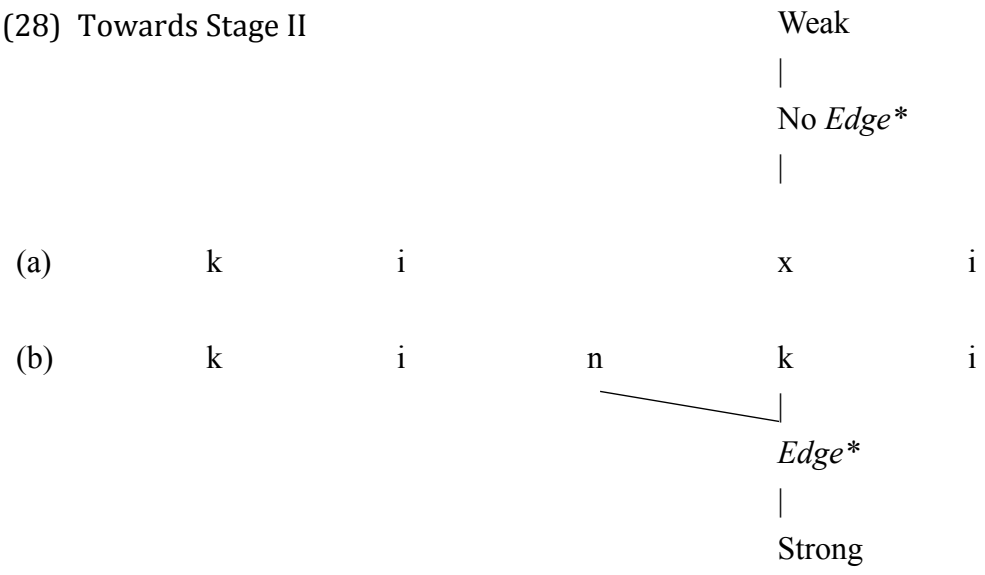
A language like Kingi Soninké forces the bipositional structures to contain *Edge*. Some of this condition is mimicked by Akuna Gadsup where (at the very least) intervocalic spirantisation creates paradigmatic syllable structure contrasts where singletons never have *Edge*, while bipositional structures do. Consider stage II in (27).

(27) Diachrony in *Edge* and C.C licensing (repeated from (8))
(Post)-Intervocalic spirantisation followed by initial spirantisation

Stage I		**Stage II**	**Akuna**	**Ontena Gadsup**
kiki		kixi		xixi
kinki	→	kinki	→	xinki
ki?ki		ki?ki		xi?ki

At Stage I there is nothing remarkable because in the middle of the word the child language learner sees stops everywhere. But if the language begins to be spirantise stops, so that it moves towards Stage II, the child learner will begin to receive (admittedly very partial) paradigmatic contrasts between fricatives and stops.

(28) Towards Stage II



Specifically, the child sees a very partial pattern where stopness cannot be found in intervocalic context *except where it is hosted by a bipositional structure*.

In keeping with Honeybone's (2005) 'sharing makes us stronger', if *Edge** is never removed when it is shared across two positions, then the child could posit the licensing condition that stopness is positively related to bipositionality, such as what is formulated in (11).

This positive correlation of *Edge** and bipositionality can become progressively stronger (as more and more stops are lenited). In so doing, there will be more and more examples of this contrast. Somewhere (presumably on an s-curve of change) the child will set a categorical licensing constraint banning *Edge** from singleton consonants. If that is phonologised as a licensing condition like: *Edge* can only be found in C.C*, then the change will be categorical and one will obtain the Ontena Gadsup system. It is therefore conceivably possible to go from a system *like* Kingi Soninké to something *like* Ontena Gadsup, the first ingredient is intervocalic spirantisation.

In fact, many paths of change are probably possible — and that is only considering the phonological properties of *Edge(*)* and bipositionality. The precise diachrony, showing how this relates to the life cycle of phonological processes (Bermudez-Otero 2014), would need to be carefully worked out. But it seems from our licensing conditions that such segment / syllable structure mappings would be a fruitful area for future study.

5.2 Theoretical consequences

We have seen a positive relationship between *Edge(*)* and bipositionality. These two properties can be found without each other, meaning that their distribution is not universally and bidirectionally co-extensive. They are in a very important sense independent (they are on different tiers and cannot be reduced to each other). There is variation therefore in how these two properties are related to each other in grammars. But crucially, we argue that there is a UG component to the distribution of *Edge* in relation to bipositionality. The structure shown in (26) which is created bottom up in Type A languages and top down in Type B languages reflects a deep affinity between these two separate properties. We state this observation in (29).[10]

(29) *Edge(*)* and bipositionality go together

[10] It's not a principle, definition or condition. It's merely an observation.

Indeed, in no language with both monopositional and bipositional structures could one restrict the distribution of *Edge** to singleton stops, while simultaneously banning its presence in its bipositional structures. In no language does spirantisation target only geminates and not singletons. Or perhaps better (less likely to be reduced to substantive phonetic factors), there will not be languages with systematic gaps in rime-onset sequences (where *Edge* in N.C sequences and geminates are systematically banned). Discovering what underlies the affinity behind the observation in (29) would itself make a valuable research project.

6 Conclusion

This paper has considered the distribution of two linguistic properties: *Edge(*)* and bipositionality (C.C). The former is a featural property, the latter is a syllable-structure property. In this paper, we have demonstrated that there is a positive relationship between them. In extreme cases this creates the phonological patterns of Kingi Soninké and Ontena Gadsup, where both languages have phonologised licensing conditions which juxtapose *Edge(*)* and bipositionality. We showed that this was achieved in two basic ways which formed two basic classes of languages: Type A, which restricts the presence of the feature *Edge** to the bipositional syllable structures, and Type B, which obliges a bipositional syllable structure to contain *Edge* across its two positions. The effects of these licensing conditions on the *Edge(*)* feature and on bipositionality when they are not coextensive produces cross-linguistic variation. Type A languages end up banning stops from singleton onset position, both initially and intervocalically. While Type B languages end up banning anything but stops, nasals and laterals from consonant clusters and geminates. While it is true that *Edge(*)* and bi-positionality are not universally coextensive (the two properties cannot be reduced to each other), the variation in *Edge*-licensing is neither random nor logically exhaustive, therefore it does have value in terms of phonological universal grammar. Indeed, in no language is *Edge(*)* explicitly *restricted* to mono-positional structures. The inherent strength of initial positions is also preserved (even in a language like Ontena Gadsup where stops are banned word-initially) because the apparent initial weakening can be reanalysed as a condition on bipositionality for a certain element — it is not the product of a generalised weak environment that unifies the word-initial and intervocalic environments. We have speculated on the origin of this

condition, which seems related to the principle that 'sharing makes us stronger': *Edge(*)* in particular wants to be shared.

Comments invited

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