Polgárdi, Krisztina. 2022. The representation of sC-clusters: A Strict CV analysis. *Glossa: a journal of general linguistics* 7(1). pp. 1–29. DOI: https://doi.org/10.16995/glossa.5702

Open Library of Humanities

The representation of sC-clusters: A Strict CV analysis

Krisztina Polgárdi, Hungarian Research Centre for Linguistics, 1068 Budapest, Benczúr u. 33, HU, polgardi.krisztina@nytud.hu

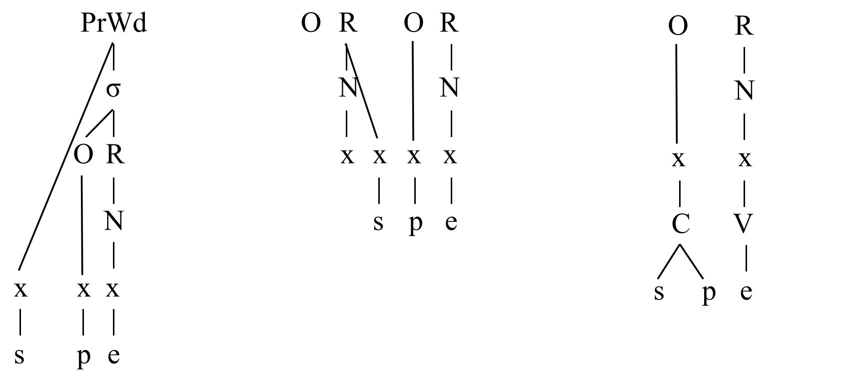
sC-clusters have always posed a challenge for theories of phonological representation because they behave like coda-onset clusters, but they can also occur word-initially (where their behaviour typically differs from that of branching onsets comprising an obstruent followed by a sonorant). [s] in such initial clusters has been analysed as an appendix, as a coda, or as part of a complex segment. Out of these possibilities, the coda analysis (where initial [s] is assumed to be preceded by an empty nucleus) is shown to account for the data in the most satisfactory way. However, it faces the problem of how to ensure that this empty nucleus remains silent (called Magic Licensing). Instead, I propose a Strict CV representation of initial **s**C-clusters, where the melody of [s] is shared by a neighbouring V position, by a language specific choice: in Italian and Portuguese [s] occupies the preceding V position, while in English the following one. As the initial nucleus does not remain empty in this analysis, no special licensing is necessary. I also show that not only is the branching representation of [s] identical to that of syllabic sonorants in this model, their distribution is also parallel. In English, syllabic sonorants branch on the left, while syllabic [s] branches on the right, and the differences in their behaviour follow directly from the difference in the direction of branching. Finally, the marked structure of syllabic consonants is only permitted if without their branching the representation is ill-formed. This means that they must always be flanked by a consonant at least on one side.

1 Introduction

The representation of *s*C-clusters has long been a challenge because they exhibit ambiguous behaviour. Word-internally they pattern like coda-onset clusters, but in many languages they can also occur word-initially, which is generally used as evidence for onsethood in non-linear phonology. However, even in this position, *s*C-clusters behave differently from regular branching onsets comprising an obstruent followed by a sonorant. For example, *s*C-clusters can exhibit a falling sonority profile, as in [sp st sk]. Therefore, [s] in this position has been analysed variously as an appendix, linked directly to some higher order prosodic unit, such as the prosodic word (e.g. Rialland 1994), as a coda of an empty headed rhyme (e.g. Kaye 1992), or as part of a complex segment (e.g. Van de Weijer 1994), shown in (1a–c), respectively.[1] See also Goad (2011) and Vaux & Wolfe (2009) for further discussion and references.

(1) *representation of [s] in initial sC-clusters*

a. appendix b. coda c. complex segment



Out of these possibilities, it is the Government Phonological (GP) analysis in terms of a coda[2] in (1b) which can be argued to account for the data in the most satisfactory way (Kaye et al. 1990; Kaye 1992; Harris 1994; Goad 2012). However, it faces the problem of how to license the empty nucleus preceding the initial coda [s] to remain silent (which is normally not possible across a consonant cluster), dubbed Magic Licensing by Kaye (1992) for exactly that reason.

In this paper, I analyse *s*C-clusters in a Strict CV framework (Lowenstamm 1996), a more recent version of GP, where branching syllabic constituents are dispensed with, and syllable

[1] The sibilant fricative in *s*C-clusters is most often alveolar, but in some languages it can also be palato-alveolar or retroflex, and voiced as well as voiceless. Therefore, when I refer to [s], I mean any of [s ʃ ʂ z ʒ ʐ], when they pattern in the same way.

[2] The coda is not recognised as a syllabic constituent in GP, the term is simply used as a shorthand for post-nuclear rhymal dependent position (Kaye et al. 1990; Harris 1994).

structure consist of strings of CV units only. I propose a representation where the melody of [s] is shared by a neighbouring V position (either the preceding or the following one, chosen parametrically), as in (2a–b).

(2) *Strict CV representation of [s] in initial* sC*-clusters*

a. left-branching

C V C V_2 C V
s p e

b. right-branching

C V C V
s p e

Here, the first V position is filled by [s] itself in each case, and the empty V_2 position in (2a) can be silenced by a neighbouring filled V position, and therefore no Magic Licensing is necessary. As the branching representation is identical to that proposed for syllabic sonorants in this model (Harris 1994), I compare the distribution of syllabic sonorants and syllabic [s], and I show that indeed they behave in the same way, providing further support for this analysis. There is a phonetic difference, though, between these two types of syllabic consonants, as the syllabicity of [s] is only phonological in (2), and phonetically it cannot be distinguished from a non-syllabic [s] (unlike its sonorant peers). A syllabic [s] can, therefore, also be referred to as a virtual syllabic consonant (similarly to virtual geminates, mentioned in Section 4).

The paper is built up as follows. In Section 2, I present the coda analysis of *s*C-clusters, discussing supporting data from English, Italian and Portuguese, and also some of the problems such an account faces. Section 3 contains the Strict CV analysis of the same data, which does not encounter the problems of the coda account. In Section 4, I extend the analysis to further data from English, also comparing it to Italian, justifying the parametric nature of direction of branching of the [s] in different languages. In Section 5, I turn to a comparison of syllabic sonorants and syllabic [s] in English, which contains both types of consonants. Section 6 summarises the results.

2 The coda analysis: Magic Licensing

The first type of evidence showing that *s*C-clusters differ from branching onsets is provided by the phonotactic restrictions applying to them (e.g. Harris 1994: 57–58). This is illustrated in (3), by word-initial two-member clusters in English. The first consonant is placed on the vertical axis and the second consonant on the horizontal axis. [j] is omitted from the discussion because it hardly shows phonotactic restrictions with the preceding consonant, however, it can only be followed by [uː] or its broken counterpart [ʊə], which suggests that it forms some sort of a unit with the following vowel (as proposed by Davis & Hammond 1995; Nádasdy 2006; and Polgárdi 2015a). Combinations for which very few examples exist appear in parentheses.

(3) *English word-initial two-member clusters (excluding [j])*

	w	ɹ	l	m	n	f	p	t	k
p	*	pɹeɪ	plɔɪ	*	*	*	*	*	*
b	*	bɹaʊ	bluː	*	*	*	*	*	*
t	twɪn	tɹuː	*	*	*	*	*	*	*
d	dwɛɫ	dɹɔː	*	*	*	*	*	*	*
k	ˈkwaɪət	kɹəʊ	klɪə	*	*	*	*	*	*
g	ˈgwɑːnəʊ	gɹɑːs	glɛə	*	*	*	*	*	*
f	*	fɹɒg	flʌʃ	*	*	*	*	*	*
θ	(θwɔːt)	θɹiː	*	*	*	*	*	*	*
s	swɪŋ	*	slæk	smɪə	snəʊ	sfɪə	spɔɪɫ	staʊt	skuːɫ
ʃ	(ʃwɑː)	ʃɹɪŋk	(ʃlɒk)	(ʃmʌk)	(ʃnæps)	*	(ʃpiːɫ)	(ʃtʊp)	*

glosses: *pray, ploy, brow, blue, twin, true, dwell, draw, quiet, crow, clear, guano, grass, glare, frog, flush, thwart, three, swing, slack, smear, snow, sphere, spoil, stout, school, schwa, shrink, schlock, schmuck, schnapps, spiel, schtup*

As shown in (3), stops and non-sibilant fricatives behave differently from sibilant fricatives: the former can only be followed by a glide or a liquid, while the latter can also precede nasals and even obstruents. In addition, the clusters [pw bw fw tl dl θl] are ruled out, whereas [sl] is well-formed. As [ɹ] is postalveolar in English, this is generally formulated as a non-homorganicity restriction on complex onsets – again, contradicted by the sibilant fricatives.[3]

Word-internally, *s*C-clusters do not exclusively belong to the onset either, as evidenced for example by Italian Tonic Lengthening (Kaye et al. 1990; Kaye 1992). In Italian, consonant length is contrastive, while vowel length is not. A distinction in vowel length exists, but the distribution of short and long vowels is predictable, as illustrated in (4).

(4) *Italian Tonic Lengthening*

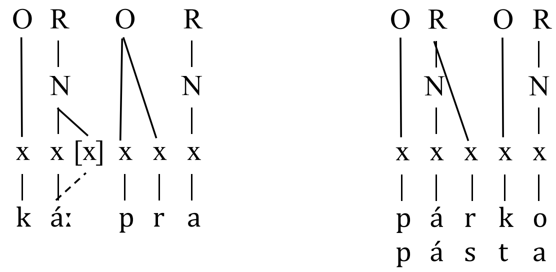
a. [fáːto] ‘fate’
b. [káːpra] ‘goat’
c. [párko] ‘park’
d. [fátto] ‘fact’
e. [pásta] ‘pasta’

[3] It is interesting to note that while [ʃɹ] is licit, all other *ʃ*C-clusters are at best marginal in English, whereas we find the opposite situation with *s*C-clusters, where [sɹ] is illicit, while everything else is well-formed. This suggests that [ʃɹ] is derived from [sɹ] via place assimilation.

As shown in (4a–b), a stressed vowel is long if it precedes a single intervocalic consonant or a branching onset. That is, a stressed vowel is lengthened if it stands in an open rhyme.[4] If the stressed vowel is followed by a cluster of the coda-onset type or by a geminate, as in (4c–d), then the vowel remains short. That is, in a closed syllable, tonic lengthening does not apply because a coda already provides the required weight. In other words, a stressed rhyme must be heavy in Italian, either by virtue of being closed, or by containing a long vowel (Stress-to-Weight). As (4e) demonstrates, no lengthening is found before an *s*C-cluster either, providing evidence for its heterosyllabic status.

In the classical GP approach of Kaye et al. (1990) and Kaye (1992), this pattern is analysed as in (5).

(5) a. open rhyme b. closed rhyme



In (5a), a lexically short vowel precedes a branching onset, that is, it occurs in an open rhyme. As a stressed rhyme must be heavy, an extra slot is provided (indicated by square brackets) which is filled by spreading, and the stressed vowel surfaces as long. In the closed rhyme of (5b), there is no need for tonic lengthening, as the rhyme already branches. The behaviour of the *s*C-cluster is completely parallel to that of other coda-onset clusters in the language. Examples including *s*CC-clusters, like [móstro] ‘monster’, where the stop is followed by a sonorant, behave in the same way, showing that they have the same representation in terms of a coda-onset cluster, with the only difference that in this case the onset is branching, dominating both [t] and [r].

Turning to the word-initial position in Italian, we find that – similarly to English – *s*C-clusters are permitted here (unlike other coda-onset clusters), but again they do not pattern with onsets. This is shown by the phenomenon of *raddoppiamento sintattico* (Kaye et al. 1990; Kaye 1992), in (6).

(6) *raddoppiamento sintattico*

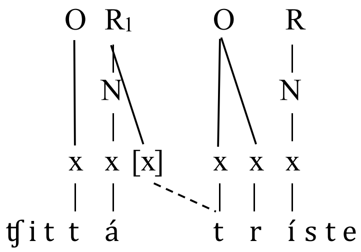
a.	*paltò pulito*	[paltóppulí:to]	‘clean coat’
b.	*città santa*	[ʧittássánta]	‘holy city’
c.	*città triste*	[ʧittáttríste]	‘sad city’
d.	*caffè spesso*	[kaffésspésso]	‘thick coffee’

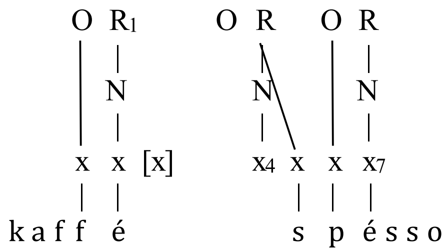
[4] Word-final stressed vowels contradict this generalisation, as they cannot lengthen in Italian. I will come back to this issue in Section 3.

As illustrated in (6a–c), the first consonant in a word-initial onset geminates if preceded by a word ending in a stressed vowel (regardless of the quality of the onset consonant). The initial [s] in an *s*C-cluster in (6d), in contrast, remains short.

Gemination in (6) can be understood as another means of satisfying the weight requirement on stressed rhymes in Italian, by providing a coda, as shown in (7a), with an example of an initial branching onset.

(7) a. word-initial branching onset b. word-initial *s*C-cluster





The word-final stressed rhyme, R_1, needs to be heavy, so an extra slot is provided. However, vowel lengthening is not available in this position in Italian. Therefore, it is the melody of the following consonant that fills the additional timing unit, resulting in a geminate.[5]

(7b) shows the representation of a word-initial *s*C-cluster. Kaye et al. (1990) and Kaye (1992) assume that *s*C-clusters always form coda-onset sequences, which word-initially are preceded by an empty nucleus. Empty nuclei in this approach may remain silent if they are properly governed, as stated by the Empty Category Principle, given in (8).

(8) *Empty Category Principle (ECP)* (Kaye et al. 1990: 219)
A position may be uninterpreted phonetically if it is properly governed.

Government is a binary, asymmetric relation between skeletal positions. Proper government is a special form of government, and the version employed by Kaye et al. (1990) and Kaye (1992) is defined in (9). I have added the attribute iambic to distinguish it from the trochaic version I will use, introduced in the next section.

(9) *Iambic (right-to-left) Proper Government* (Kaye et al. 1990)
A nuclear position *A* properly governs a nuclear position *B* iff
a. *A* governs *B* (adjacent on its projection) from right to left
b. *A* is not properly governed
c. no governing domain intervenes between *A* and *B*

[5] In addition to stress induced lengthening illustrated here, gemination can also be triggered by a small group of lexical items without final stress, as in *quálche tacchíno* [kwálkettakkí:no] 'some turkey', not discussed by the sources cited above. In these cases, the extra skeletal unit must be part of the lexical representation of the items. Diachronic motivation for this comes from the fact that historically these words ended in a consonant, subsequently subject to the general loss of final consonants during the evolution from Latin to Romance (Chierchia 1986; Passino 2013).

In (7b), however, the empty nuclear position x_4 cannot be properly governed by x_7 because they are separated by a coda-onset cluster [sp], constituting an intervening governing domain. Nevertheless, x_4 remains silent, and Kaye (1992) calls the force licensing this *Magic Licensing*, to indicate that it is a stipulation not yet understood.

[s] in (7b) cannot spread to the extra slot provided by stress because it itself occupies a coda position, and geminates form coda-onset clusters (as shown in (7a)). Kaye et al. (1990) suggest that [s] can form the coda of R_1 in this structure. However, it is not clear to me how this could be achieved, or indeed, if it should be. In examples where the second word starts with a pronounced vowel, as in the phrase *caffè amaro* [kafféamá:ro] 'bitter coffee', nothing happens either, the hiatus remains unresolved, and the final stressed rhyme of the first word remains light. The behaviour of words starting with an *s*C-cluster is thus entirely parallel to that of words starting with a vowel, and the weight requirement cannot be satisfied in these cases.

This approach is further supported by the phenomenon of nasalisation in European Portuguese (Kaye 1992). In this language, nasals cannot appear in a coda, instead nasalisation of the preceding vowel occurs. When the negative prefix *in-* is added to a vowel-initial stem, as in (10a), the nasal surfaces intact.

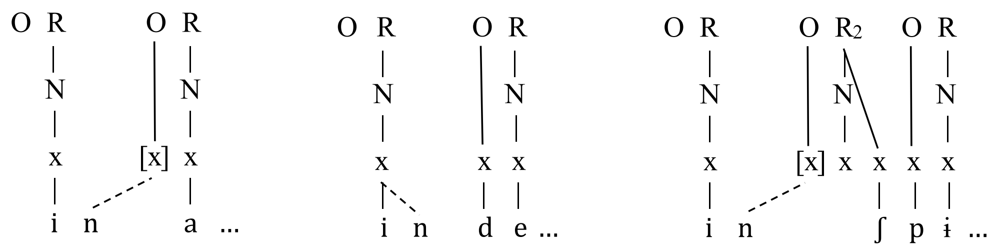
(10) *European Portuguese nasalisation*

a.	[in]aplicável	'inapplicable'
b.	[ĩ]decente	'indecent'
c.	[ĩ]sonhável	'inconceivable'
d.	[ĩ]frangível	'unbreakable'
e.	[inʃp]erado	'unexpected'

When it is followed by a simple or branching onset, a nasal vowel arises, as in (10b–d). (10c) demonstrates that *s*V-initial stems behave in the same way as stems starting with other consonants. Stems beginning with an *s*C-cluster, in contrast, behave like vowel-initial stems do and the nasal consonant is preserved, given in (10e). In fact, such examples may also be pronounced with a stem-initial epenthetic vowel [ɨ], that is, as [iniʃpɨˈradu] 'unexpected' (Freitas & Rodrigues 2003).

These data can be analysed as shown in (11) (representations slightly modified from Goad 2012).

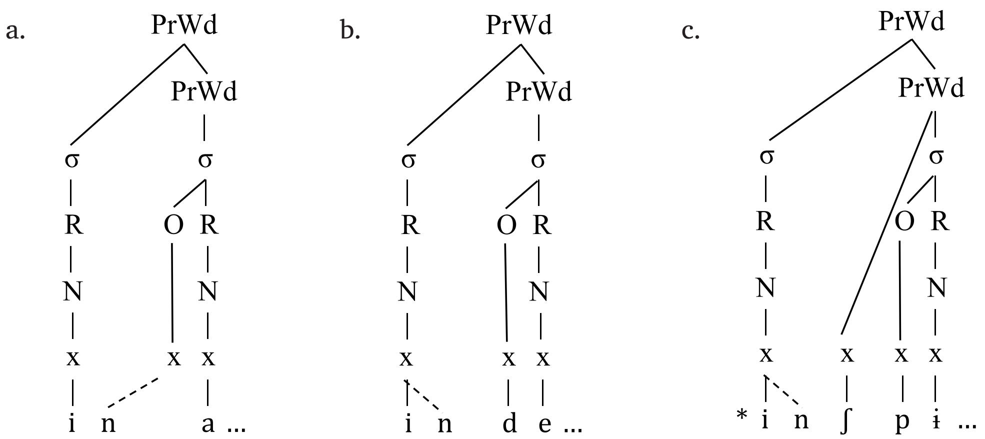
(11) a. vowel-initial b. consonant-initial c. *s*C-initial



Goad (2012) suggests that the variable behaviour of the final nasal of the prefix can be expressed by assigning it no skeletal slot of its own. Therefore, the nasal can only surface as a consonant when it can occupy the empty onset at the beginning of a vowel-initial stem, as in (11a).[6] Before a filled onset, it surfaces as vowel nasalisation, as in (11b). An *s*C-initial stem patterns like vowel-initial stems do, as the empty onset can host the melody of the nasal, given in (11c). This analysis is supported by the optional appearance of the epenthetic vowel [ɨ], which can occupy the empty nucleus posited in R_2, making Magic Licensing unnecessary.

As Goad (2012) demonstrates, an analysis in terms of an appendix cannot capture the pattern in (10) because there is no extra slot for the nasal to fill in (12c).

(12) *Appendix analysis*



Here, [ʃ] occupies an appendix licensed by the prosodic word, and the prefix *in-* is assumed to be adjoined to the prosodic word of its host. Note that the same problem is faced by an analysis in terms of a complex segment (illustrated in (1c)), which occupies the initial onset of the prosodic word comprising the stem.

As the Portuguese data cannot be accounted for by either the appendix or the complex segment analysis, whereas the coda analysis can handle all the data discussed so far, it seems that only the coda analysis can provide a unified explanation for the behaviour of *s*C-clusters across different languages. Therefore, I will not consider the appendix and complex segment analyses any further in this paper. However, the coda analysis also faces some problems. Firstly, as mentioned above, it is not clear what licenses the empty nucleus in cases like (7b) and (11c) to remain silent (Magic Licensing). Secondly, *s*C-clusters in this analysis form coda-onset sequences, bound by interconstituent government (as discussed in relation to (7b)). For the second consonant in such clusters to be able to govern [s], it cannot be less complex than [s] (i.e.

[6] In this approach, empty onsets (as opposed to empty nuclei) lack a skeletal point, which can be generated if the need arises, as in (11a) and (11c).

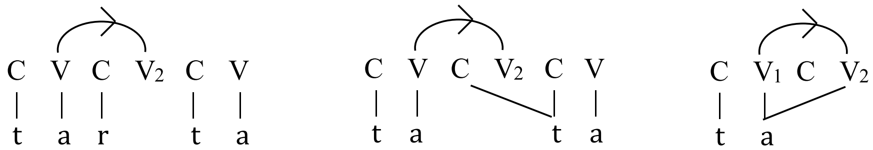
it cannot contain fewer elements) (Harris 1990). However, word-initially, [s] can be followed virtually by anything, including a glide, as in *swing* [swɪŋ] in English, shown in (3). Glides in this approach only comprise a single resonance element, whereas fricatives like [s] also include the noise element (standing for frication) and will, therefore, be more complex than the glide. Kaye (1992) regards this as another magical property of [s] in *s*C-clusters. To solve these problems, I propose a Strict CV analysis where no magic will be required.

3 A Strict CV analysis

In my analysis, I follow Lowenstamm's (1996) Strict CV approach in the idea that syllable structure consists of strictly alternating C and V positions. As a consequence, the representation of closed syllables, geminate consonants and long vowels involves an empty position, as shown by the hypothetical forms in (13).[7]

(13) *Strict CV* (Lowenstamm 1996)

a. *closed syllable* b. *geminate consonant* c. *long vowel*



Geminates and long vowels are built up of two CV units. In a geminate the consonantal melody straddles an empty V position, while in a long vowel the vocalic melody straddles an empty C.

Following Rowicka (1999a; b), I employ trochaic (left-to-right) proper government instead of the more usual right-to-left type given in (9) (indicated by a curved arrow in (13)), as defined in (14).[8]

(14) *Trochaic (left-to-right) Proper Government* (Rowicka 1999a; b)
A nuclear position *A* properly governs a nuclear position *B* iff
a. *A* governs *B* (adjacent on its projection) from left to right
b. *A* is not properly governed

As stated by the Empty Category Principle in (8), an empty V position may remain silent if it is properly governed, illustrated by V_2 in (13a–b). According to Rowicka (1999a; b), the relationship between the two halves of a long vowel is also one of proper government, as shown in (13c).

[7] In this approach, there is no syllabic structure above the skeleton, all we have are the CV units, with some positions potentially remaining empty. For ease of exposition, I will keep using expressions like rhyme, closed syllable, branching onset etc., but only as descriptive terms, referring to specific configurations in the data, which then will receive a CV-analysis.

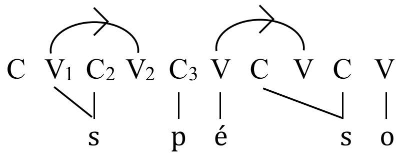
[8] Additional advocates of trochaic proper government include Gibb (1992), Yoshida (1999), and Polgárdi (2012; 2015a; b).

Since the C position between V_1 and V_2 is unfilled, this governing relationship is manifested by spreading the melodic content of V_1 into V_2. The ECP permits properly governed positions to remain uninterpreted, but it does not demand that they do so. Therefore, the realisation of V_2 in (13c) does not contradict the ECP.

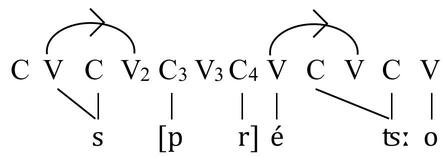
For word-initial *s*C-clusters, I propose the representation in (15a), where [s] branches on the preceding V position.

(15) word-initial *s*C(C)-clusters

a. *s*C-cluster



b. *s*CC-cluster: [sprétsːo] 'scorn'



V_1 properly governs the empty V_2 inside the cluster, thereby silencing it, so there is no need for Magic Licensing. In addition, no governing relationship is contracted by C_2 and C_3 in this approach, therefore the C_3 position can contain any consonant, including a glide. Note that branching of the [s] in (15) is purely phonological, and the phonetic interpretation of this configuration cannot be distinguished from that of a non-branching [s] in the language.

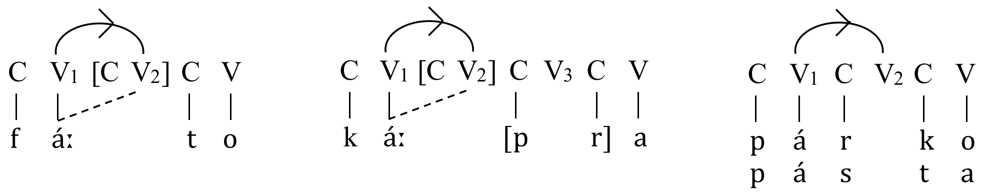
As far as I know, Rowicka (1999b: 116) was the first who tentatively suggested to interpret Magic Licensing in terms of spreading, in her analysis of Mohawk, but she did not consistently pursue the idea all through her book. In her account, [s] spreads to the following V position, an option I will come back to in the next section. After presenting the analysis proposed here, it was brought to my attention that Barillot & Rizollo (2012), followed by Prince (2017), in unpublished work also adopt the right-branching representation for *s*C-clusters in French. However, they employ iambic proper government, which faces some problems that I will return to below.

As seen in the discussion of (5), three-member *s*CC-clusters where CC contain a stop followed by a sonorant behave in the same way as two-member *s*C-clusters. Therefore, both are represented as coda-onset clusters in classical GP, with the only difference in the (non-)branching status of the onset. In Strict CV, branching constituents have been eliminated, and all clusters are separated by an empty nucleus. To be able to express the fact that stop + sonorant clusters behave like single consonants in the sense that the empty nucleus enclosed by them does not require proper government to be able to remain silent, Scheer (1999) proposed that these consonants form a closed domain for proper government by contracting what he calls an infrasegmental government relation. As the name suggests, this interaction is based on the melodic composition and complexity of the consonants involved (established independently). Infrasegmental government is illustrated in (15b), where the closed domain of consonantal interaction between C_3 and C_4 is indicated by square brackets in the example of [sprétsːo] 'scorn'. The structure in (15b) is entirely parallel to that in (15a), with the exception of the presence of the "branching onset" [pr] instead of the non-branching [p]. V_3 in (15b) cannot be properly governed by V_2 (itself properly governed), but it does not need to be because it is already taken care of by infrasegmental government, and the representation is well-formed. In contrast, clusters not capable of such consonantal interaction, like coda-onset clusters or geminates (as in (13a–b)), as well as the *s*C-clusters in (15), require proper government to silence the empty nucleus they enclose.

Adopting Polgárdi's (2012) proposal, Italian Tonic Lengthening can be analysed in Strict CV with trochaic proper government as given in (16). The heavy stressed rhyme requirement corresponds in this approach to the demand on stressed positions to head a proper governing domain (NB not every proper governing domain is interpreted as stress). In an open "rhyme" like (16a) this is achieved by lengthening the vowel.

(16) *Italian Tonic Lengthening*

a. open "rhyme" b. "branching onset" c. closed "rhyme"



As V_1 needs to properly govern an empty nucleus to its right, an extra CV unit is created (indicated by square brackets). This CV unit cannot remain completely empty, at least one of its positions must be filled (Larsen 1998).[9] Therefore, the melody of the stressed vowel spreads to V_2, to license it segmentally. In (16b), we see the same thing happening before a "branching onset", where the empty V_3 is silenced by infrasegmental government. In contrast, in the closed "rhyme" of (16c) the proper governing domain is already present, thus no lengthening occurs.

I propose to represent *raddoppiamento sintattico* as in (17): vowel lengthening and gemination are thus again two ways of satisfying the weight requirement. V_1 in (17a) needs to properly govern, therefore an extra CV unit is created. However, in this position the vocalic melody cannot spread, hence it is the melody of the next C position that fills the empty CV unit.

(17) *raddoppiamento sintattico*

a. word-initial branching onset b. word-initial *s*C-cluster

[9] This restriction does not apply to the initial empty CV unit proposed by Lowenstamm (1999), which replaces the boundary symbol #, traditionally used to identify the beginning of the word. This site normally remains silent. In this paper, employing trochaic proper government, however, I cannot adhere to the idea of the initial site.

I adopt Larsen's (1998) proposal that the failure of vowel lengthening in word-final position follows from the fact that domain-final empty nuclei cannot be licensed in Italian. Another manifestation of this restriction is that words cannot normally end in a consonant in this language. The two words in the phrase in (17a) constitute separate analytic domains, evidenced for example by the fact that both bear word stress. It seems that gemination across the boundary between the two domains eliminates this boundary, or makes it invisible, and proper goverment of V_2 becomes possible, satisfying this way the weight requirement.[10] In fact, Italian is not unique in this respect: a similar state of affairs can be found in Hungarian, where geminates also seem to erase analytic domain boundaries inside and around themselves (Polgárdi 2008a).

In the word-initial *s*C-cluster of (17b), [s] branches on the preceding V position, and V_3 properly governs V_4 enabling it to remain silent (just like V_1 properly governs V_2 in the word-internal *s*C-cluster of (16c)). V_1 in (17b) would want to properly govern, and an extra CV unit is created, but neither the melody of V_1, nor that of C_4 can spread. Therefore, the domain boundary remains intact and V_2 cannot be properly governed. As a result, nothing happens, and the weight requirement cannot be satisfied, similarly to the classical GP analysis presented in (7b). According to Larsen (1998), ungoverned empty CV units cannot be maintained in the skeleton, and Lowenstamm (1999) also claims that unutilised empty CV units wither away. This is indicated by angle brackets in (17b).

Note that exactly the same situation arises in the case of examples where the second word starts with a pronounced vowel, as in the phrase *caffè amaro* [kafféamá:ro] 'bitter coffee', shown in (18) (not discussed in the literature on *raddoppiamento sintattico* that I am familiar with).

(18) word-initial vowel

```
      C  V <C  V>    C  V  C  V
      |  |              |  |  |
  kaff   é              a  m  á: ro
```

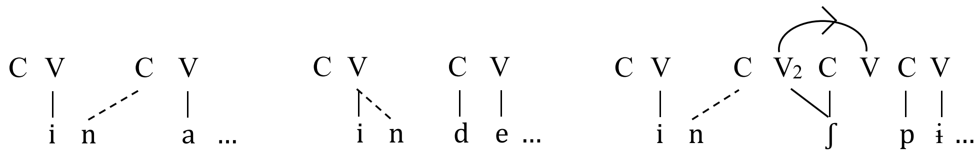
Here, the empty CV unit cannot be filled either, nor can it be properly governed, therefore, the weight requirement remains unsatisfied in the same way as in (17b). It seems, thus, that the weight requirement is a violable constraint that has an effect whenever it can, but which may also remain violated if satisfying it would violate some higher ranked constraints, as in the cases

[10] Larsen (1998) utilises iambic proper government, thus for him V_2 is governed by the first pronounced vowel of the second word. As proper government normally cannot apply across separate analytic domains, the boundary enclosed by gemination must also become invisible in his analysis, although he does not discuss this issue. Passino (2013) analyses *raddoppiamento sintattico* in a more recent version of Strict CV as a case of fortition in a strong position. As it is not clear why this strengthening does not also occur word-internally and utterance-initially, but only in the sandhi context, I think, her analysis can be considered as a variant of Larsen's account. In any event, she does not mention analytic domain boundaries either, but uses the rather vague formulation that gemination occurs when the empty CV is "internal to the phonological string".

of (17b) and (18). This could be captured in terms of Optimality Theory (Prince and Smolensky 1993), but the details will not be worked out here for reasons of space.

In European Portuguese, the nasal can take up the initial empty onset in both vowel-initial stems and *s*C-initial stems, similarly to Goad's analysis (in (11) above). The epenthetic vowel [ɨ] may optionally occupy the position of the [ʃ] in V_2 in (19c), avoiding a marked structure.

(19) *European Portuguese nasalisation*
a. vowel-initial b. consonant-initial c. *s*C-initial



This account resembles the classical GP analysis in that [s] here too occupies a coda position both medially and initially, in the sense that it precedes an empty nucleus.

4 Can [s] branch on the following V position?

The next question is whether it is possible for [s] to branch on the following V position (as proposed for Mohawk by Rowicka 1999b and for French by Barillot & Rizollo 2012). This would clearly not work for Italian and Portuguese, but I will argue that it is exactly what happens in English. The direction of branching, thus, seems to be a parametric choice.

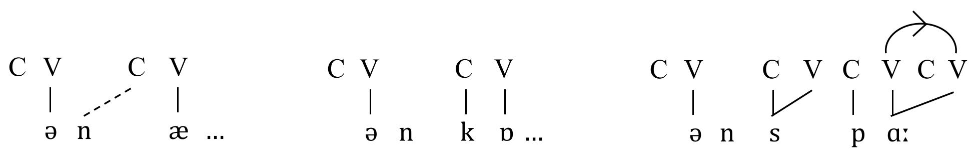
As we have seen in (3), in English, phonotactic restrictions applying to initial *s*C-clusters differ from those on branching onsets. Still, the two groups can also pattern together, for example, in triggering indefinite article allomorphy, as shown in (20).

(20) *English indefinite article allomorphy*
a. *an apple*
b. *a coffee*
c. *a trick*
d. *a spa*

Here, the final nasal of the article is only realised when it precedes a vowel-initial stem, as in (20a), and it remains silent whenever it is followed by a consonant (cluster) of any type, as in (20b–d) – in contrast to the behaviour of the nasal in European Portuguese.

This pattern can be analysed as in (21).

(21) a. vowel-initial b. consonant-initial c. *s*C-initial



Again, the nasal can be assumed to lack a skeletal slot of its own and, therefore, it can only be realised if it finds an empty C position that it can occupy (for a similar analysis in Strict CV of liaison in the French plural definite article *les*, see Lowenstamm 1999, originally proposed by Clements & Keyser 1983: 102). If the [s] in an initial *s*C-cluster branches on the following V position, as in (21c), then surfacing of the nasal is only possible in vowel-initial stems, as in (21a).

The existence of “superheavy rhymes” provides an additional argument for this analysis, illustrated in (22).

(22) *“superheavy rhymes”*

a. VVsonC: coronal		b. VVfricC: coronal, except after [ɑː]	
launder	[ˈlɔːndə]	easter	[ˈiːstə]
ancient	[ˈeɪnʃənt]	oyster	[ˈɔɪstə]
council	[ˈkaʊnsəɫ]	basket	[ˈbɑːskɪt]
paltry	[ˈpɔːɫtɹi]	after	[ˈɑːftə]
c. VCCC: nas + (stop(*t)) + obs		d. VCsC: nas/stop(*t)/l + s + stop	
empty	[ˈem*p*ti]	monster	[ˈmɒnstə]
tincture	[ˈtɪŋ*k*tʃə]	substitute	[ˈsʌbstɪtjuːt]
sphincter	[ˈsfɪŋ*k*tə]	explicate	[ˈeksplɪkeɪt]
function	[ˈfʌŋ*k*ʃən]	solstice	[ˈsɒɫstɪs]

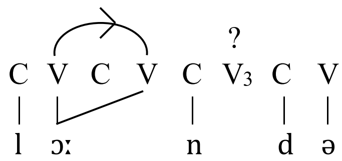
A superheavy rhyme either contains a long vowel plus a single consonant, as in (22a–b) or a short vowel followed by two consonants, as in (22c–d). When the vowel is long, the “coda” can only be filled by a sonorant or by a fricative (Harris 1994: 69). When it is filled by a sonorant, the cluster must be homorganic, more specifically coronal (with very few exceptions, like *chamber* [ˈtʃeɪmbə] and *sample* [ˈsɑːmpəɫ]), as in the examples of (22a). When the coda is filled by a fricative, the cluster is still usually coronal (i.e. [st]). However, [s] can also be followed by [p] or [k], and [t] can be preceded by [f], if the long vowel is a lengthened reflex of a historically short vowel, as the [ɑː] of *basket* and *after* in accents like Standard British English, given in (22b).

Superheavy rhymes containing a short vowel followed by two consonants are not considered by Harris (1994). Goad (2012) discusses some examples like those given in (22d), however, the phonotactic restrictions are not identified and examples like (22c) are not mentioned. I have used the electronic database of Lindsey and Szigetvári (2013) to collect data for this type of sequences. I have checked all examples cited in Wells’ (2008) *Longman Pronunciation Dictionary*.

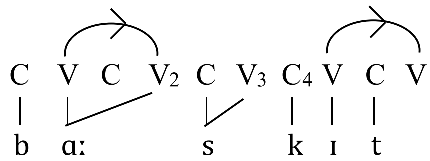
There are two subtypes of superheavy rhymes containing two consonants. When the second consonant in the sequence is not [s], it must be a stop (except for [t]), preceded by a homorganic nasal, and followed by an obstruent which is mostly coronal, shown in (22c). The medial stop in these forms can optionally be deleted, indicated by italics in the transcription.[11] When the second consonant is [s], as in (22d), it can be preceded by a nasal or a stop (except for [t]), and in a few examples by an *l*, and it must be followed by a stop, whose place is unrestricted. As a coronal stop cannot occur in a word-internal coda in English (words like *chapter* [pt] and *doctor* [kt] exist, but the reverse clusters, [tp] and [tk], are ruled out), it can be stated that the first C position in the clusters of (22d) is occupied by consonants which are expectable codas. This is supported by the fact that the lateral in examples like *solstice* [ˈsɒɫstɪs] is dark.

The different types of superheavy rhymes can be analysed as presented in (23).

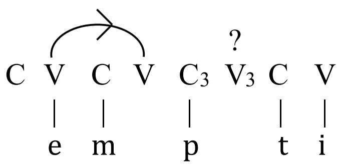
(23) a. VVsonC: *launder* [ˈlɔːndə]



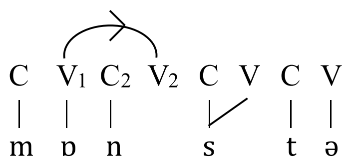
b. VVfricC: *basket* [ˈbɑːskɪt]



c. VCCC: *empty* [ˈem*p*ti]



d. VCsC: *monster* [ˈmɒnstə]



When the rhyme contains a long vowel followed by a sonorant, as in (23a), the question arises what permits V_3 to remain silent. As the coda-onset cluster in these cases is restricted to homorganic clusters of coronal place, this must play a role in the solution. Homorganic clusters share their place melodies, forming a branching structure, and coronal consonants in English all have at least the element **A** in their representation according to the feature theory of GP (e.g. Backley 2011: 97). This element **A** is therefore shared between them, forming a so-called **A**-bridge in the terminology of Charette & Göksel (1998). **A** is in a sense the most vocalic element

[11] Note that there is also a process of stop insertion, operating optionally between a nasal and a voiceless fricative, as in *comfort* [ˈkɒm^{p}fət] and *concert* [ˈkɒn^{t}sət]. Polgárdi (to appear), however, argues that the two processes are distinct. If we employed a unified analysis, we would not be able to account for the following differences. Insertion only occurs before a fricative, while deletion also occurs before a stop or an affricate. When the last consonant in the cluster is a fricative, the alternation only occurs if the following vowel is unstressed (e.g. *concert* *[kən^{t}ˈsɜːt]), whereas in case of a stop the alternation is also found pretonically (e.g. *punctilious* [pʌŋ*k*ˈtɪliəs]). An optional [t] can be found before a fricative, but never before a stop (e.g. *melancholy* *[ˈmelən^{t}kəli]), which is understandable if a nasal + stop + stop cluster must be underlying (as a [t] is generally ruled out from a coda position in English) but the [t] in forms like *concert* [ˈkɒn^{t}sət] is excrescent. Finally, voiceless stops are also optionally deleted in the parallel forms containing the word-level suffixes *-s*, and *-ed*: e.g. *jumped* [ʤʌm*p*t], *prints* [prɪn*t*s], and *thanks* [θæŋ*k*s], where an insertion analysis is not feasible.

in GP, standing for resonance. But precisely how this shared **A**-element licenses the structure in (23a) is left for future research.[12]

In (23b) the representation of cases containing a long vowel followed by a fricative is shown. As can be seen, [s] here can only branch on the right, spreading to the V_3 position, because the V_2 position is occupied by the preceding vowel. The restriction that a non-coronal consonant is only allowed in C_4 by a long [ɑː] is surprising. However, as [s] itself also contains the element **A**, the solution again might be connected to the presence of this element.[13]

In (23c), a non-coronal homorganic nasal cluster is followed by a (usually) coronal obstruent. Again, V_3 is not licensed, but now there is no **A**-bridge to protect it (in contrast to (23a)). Therefore, it is no surprise that the cluster is optionally simplified, by deleting the C_3V_3 sequence.[14]

The representation of a triconsonantal cluster containing a medial [s] is shown in (23d). Here, too, [s] can only branch on the right, to leave the V_2 position empty. This is necessary to be able to account for the absence of [t] in C_2 and for darkening of the lateral in this position: that is, if [s] branched on the left, C_2 would be followed by a filled V position and, therefore, would be a word-internal onset and not a coda, where a [t] should freely occur and the lateral should surface as light. In addition, English is a Tonic Lengthening language (Hammond 1997), similarly to Italian, which means that the stressed V_1 position needs to head a proper governing domain (Polgárdi 2012).[15] This provides independent motivation for V_2 to remain empty in this structure.

Another consequence of Tonic Lengthening can be observed when a word-medial *s*C-cluster follows a short vowel, as in *whisper* [ˈwɪs̱p̱ə]. In this case, [s] does not branch, but it forms the coda in the internal cluster, as shown in (24a).

---

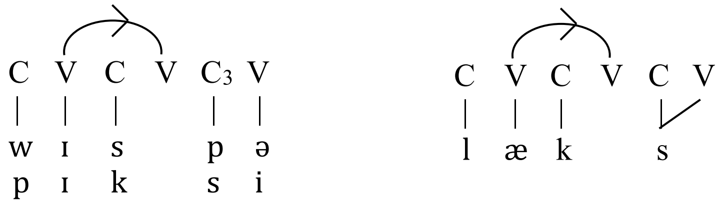
[12] Pöchtrager (2021) proposes a special governing relation, specifically formulated for coronal obstruents, to account for their clustering properties (which in addition is blocked between consonants that are "too similar" to each other). I find this relationship controversial because it is not subject to the Complexity Condition (Harris 1990), unlike other types of government applying between consonants. Pöchtrager's proposal is made in the context of dispensing with the distinction between analytic vs non-analytic affixation. I consider this move problematic because many generalisations will be lost (e.g. those pertaining exclusively to the stem-level, or those concerning the life cycle of phonological processes), and it will not be feasible for languages with a richer morphological system, such as Hungarian, for which the analytic vs non-analitic distinction has already been shown not to be refined enough (Rebrus et al. 1996; Rebrus 2000).

[13] For a proposal in a different version of GP to account for the special status of the element **A** by reinterpreting it as structure, see Pöchtrager (2017).

[14] Note that with iambic proper government, V_3 would be governed by the following filled V position. In that situation, we would not expect that CV unit to delete, but rather the previous one, contrary to what actually happens.

[15] When a stressed short vowel seems to occur in an open rhyme (in words like *city* [ˈsɪ̱ti]), Hammond (1997) assumes that the stressed rhyme is in fact closed by a latent consonant, a virtual geminate. This solution is also adopted by Polgárdi (2012).

(24) a. VsC: *whisper* [ˈwɪspə] b. VCs#: *lax* [læks]



This is also supported by the fact that [s] can be followed by a non-coronal stop in C_3, regardless of the quality of the preceding vowel (in contrast to the examples in (22b)). A word-medial C*s*-cluster, as in *pixie* [ˈpɪksi], behaves in the same way and, therefore, has the same representation.

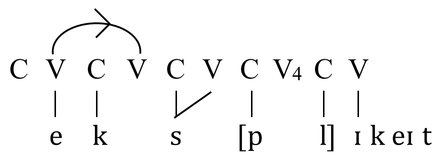
Word-finally, however, as shown by *lax* [læks] in (24b), the [s] in the C*s*-cluster needs to branch on the following V position. Although word-final consonant clusters abound in English, they are only well-formed as long as they form permissible coda-onset sequences, as in *gulp* [gʌɫp],[16] whereas bogus clusters like [tl] and branching onsets like [fl] are ruled out in this position. That is, the generalisation is that rising sonority at the end of the word is interpreted as a syllabic peak in English, i.e. as a pronounced V position – as all such words can either be pronounced with a schwa followed by a non-syllabic sonorant (as in *settle* [ˈsɛtəɫ], *muffle* [ˈmʌfəɫ]), or with a syllabic sonorant without a preceding schwa ([ˈsɛtɫ̩], [ˈmʌfɫ̩]). The only apparent exceptions monomorphemically involve stop + [s] clusters, as in *lax* [læks]. These have been analysed by assigning [s] to an appendix, even in GP (see the discussion in Harris 1994: 81–82, for example). Now we can see in (24b) that these forms are, in fact, not exceptions because if [s] branches to the right, then the rising sonority cluster involves a filled V position, similarly to the examples mentioned above containing sonorants.

We have seen ample evidence showing that in English [s] branches on the following V position. We have also seen in (22d) that such a right-branching [s] may be followed by a branching onset, as in the example of *explicate* [ˈeksplɪkeɪt]. The representation of this form is given in (25a), where the empty V_4 is silenced by infrasegmental government (just like in its Italian counterpart in (15b)). The question then arises if such an [s] can also be followed by a cluster other than a branching onset (i.e. where no closed domain of consonantal interaction can be formed and, therefore, the empty nucleus inside the cluster needs to be properly

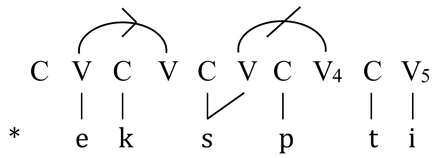
[16] To take care of the second empty nucleus in the sequence, domain-final licensing of empty nuclei needs to be permitted parametrically (e.g. Yoshida 1999), or a Loose CV approach needs to be adopted which dispenses with inaudible domain-final empty nuclei altogether (e.g. Polgárdi 2015b).

governed). Hypothetical forms involving a coda-onset cluster [pt] following [s] are provided in (25b–c).

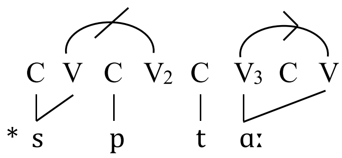
(25) a. VCs[CC]: *explicate* [ˈeksplɪkeɪt]



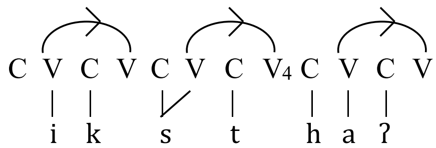
b. VCsCC: *[ˈekspti]



c. #sCCV: *[sptɑː]



d. Mohawk VCsCC: [ˈiksthaʔ]

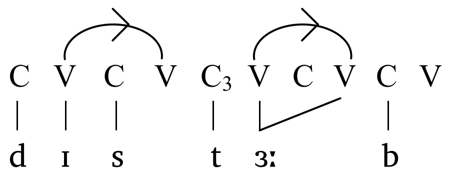


As the examples show, such sequences are ungrammatical in English, both word-internally and word-initially. This means that even though [s] can occupy a V position in English, it lacks the ability to properly govern a following empty V position. We have seen above that in Italian, in (15) and (17), and in Portuguese, in (19), this was not the case. In Mohawk, too, where [s] branches to the right, it can properly govern, as shown by examples like [ˈiksthaʔ] 'I am good at' (Rowicka 1999b: 118), in (25d), exactly paralleling (25b), with the only difference that here V_4 is properly governed. However, English [s] is not unique in its inability to properly govern: in Blackfoot (Goad & Shimada 2014), for example, where [s] can occupy a V position without also being linked to a C position, we find the same restriction, that is, nuclear [s] cannot be followed by a coda-onset cluster (Polgárdi 2018). This thus seems to be a parametric option that languages can choose. Support for this position can also be found in languages like Dutch where not even all vocalic nuclei can properly govern: in Dutch, only lax vowels can do so (in fact, they must properly govern), while tense vowels and schwa cannot (Polgárdi 2008b). This accounts for their distribution, in closed vs open syllables, respectively, as well as for their behaviour in stress assignment, which treats tense vowels as light, while lax vowels in closed syllables as heavy (making an analysis in terms of length problematic).

Notice that an analysis utilising iambic proper government together with a right-branching representation of [s], such as that of Barillot & Rizollo (2012) and Prince (2017), cannot provide an explanation for this gap. In that account, V_4 in (25b) would be governed by V_5, while V_2 in (25c) would be governed by V_3. As this government is independent of the preceding [s], I do not see a way for preventing it from applying. Yet, the forms in (25b–c) are ungrammatical. Such an analysis is, therefore, inferior to the one proposed here.

Before continuing the comparison between English and Italian, one further issue raised by this analysis of *s*C-clusters needs to be considered: namely, how the lack of aspiration in examples like (26) is accounted for.[17]

(26) *disturb* [dɪˈstɜːb]



Irrespective of whether [s] branches in this type of cases (i.e. whether it follows a short or long vowel or a consonant), the stop [t] in C_3 occupies foot-initial position. It is therefore expected to be aspirated (Kiparsky 1979). The coda analysis of *s*C-clusters, of course, makes the same, false, prediction. To solve this problem, I follow Iverson & Salmons' (1995) proposal, as does Goad (2012) in her classical GP analysis. In this approach, voiceless obstruents in languages like English are represented by a specification of [spread glottis], corresponding to the element **H** in GP (Harris 1994, Backley 2011). Aspiration then is the phonetic implementation of this specification of plosives in foot-initial position. However, in an *s*C-cluster, there is only a single specification of **H**, shared by the fricative and the stop (following from the OCP). The duration of glottal opening associated with a single gesture is found to be constant, but association of the peak of glottal opening depends on the consonant(s) involved: in a singleton stop it occurs at the point of release, in a singleton fricative it is associated to the beginning of oral constriction, whereas in a fricative + stop cluster it is coordinated with the boundary between the two articulations. As a consequence, narrowing of the glottis will be achieved during the closure phase of the plosive within the cluster, whereas in a singleton stop the same narrowing will only occur during the release phase, causing aspiration in the latter case but not in the former. Of course, when a word-level morphological boundary separates the cluster, as in *distaste* [dɪsˈtʰeɪst] or *peacetime* [ˈpiːstʰaɪm], then both consonants have their own specification of **H**, and the stop surfaces aspirated. This analysis is valid regardless of the syllabic affiliation of the cluster, thus it can also be employed in a Strict CV account.

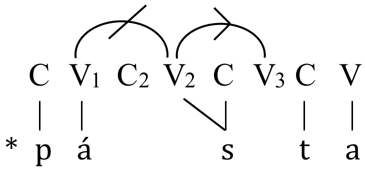
Returning to Italian now, we can observe that in this language superheavy rhymes like those given in (22) are illicit (Chierchia 1986). Restricting our attention to clusters containing [s], the lack of forms like (22b) is as expected: long vowels in Italian arise only as a result of Tonic Lengthening, which does not operate in closed rhymes (see (16c)). The question, however, arises

[17] When a word-final consonant follows a long vowel, the final empty nucleus is left without a proper governor (similarly to the case of final consonant clusters, as in *gulp* [gʌɫp], discussed above). Here again, either domain-final licensing of empty nuclei needs to be permitted parametrically (e.g. Yoshida 1999), or a Loose CV approach needs to be adopted (e.g. Polgárdi 2015b).

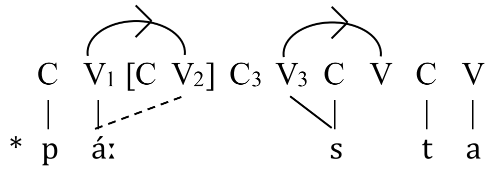
whether postvocalic [s] could branch in Italian, similarly to English. Potential representations are presented in (27).

(27) Italian: *postvocalic branching [s]*

a. VsC



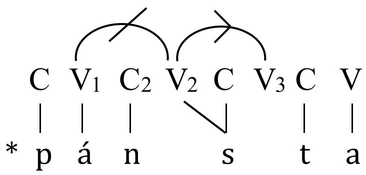
b. VVsC



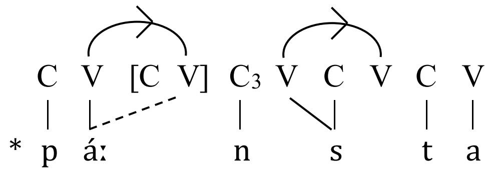
As established in Section 3, [s] in Italian branches on a preceding V position. It thus cannot directly follow a vowel, they must be separated by an empty C position. The structure in (27a), however, is ill-formed because the stressed vowel in V_1 cannot properly govern an empty V position to its right, V_2 being filled by the [s] and properly governing the following empty V_3. Put in another way, if V_1 did properly govern V_2, then V_2 would be unable to govern V_3, and the structure would still be illicit. (27b) resolves this problem by the addition of an extra CV unit (after all, V_1 is in an open rhyme here, similarly to V_1 in (16a)), inducing lengthening of the stressed vowel. However, such forms are unattested in Italian. We might suppose that the reason for this ill-formedness is the hiatus formed by V_2 and V_3, which is often only permitted between certain types of nuclei in different languages. But this turns out not to be the case, when we examine the parallel situation found in a postconsonantal context. The relevant structures are illustrated in (28).

(28) Italian: *postconsonantal branching [s]*

a. VCsC



b. VVCsC



(28a), analogously to (27a), is ill-formed because V_1 does not head a proper governing domain (to allow V_2 to govern V_3), but (28b) is also illicit. The only difference between (27) and (28) concerns the empty vs filled status of the C_2 position in (a) and of the C_3 position in (b). Avoidance of hiatus could perhaps explain the gap in (27b), but why is the structure in (28b) also ruled out?

In the literature, *s*C-clusters in English and in Italian usually have been distinguished by positing an appendix licensed at different levels of the prosodic hierarchy: by the syllable for English (e.g. Levin 1985: 162–163; Giegerich 1992: 149–150; Kenstowicz 1994: 258) but by the prosodic word or higher for Italian (e.g. Chierchia 1986; Davis 1990).[18] In Goad's (2012)

[18] To be precise, a late rule of stray adjunction incorporates [s] in Italian at the phrase level according to Chierchia (1986) and at the word level according to Davis (1990).

classical GP analysis this corresponds to a parameter permitting magically licensed empty nuclei only word-initially (i.e. at the left edge of a morphological domain) in Italian, while in an unrestricted manner in English. We must conclude that the appearance of a branching [s] needs to be parametrised in the same way in the Strict CV analysis, and it has to be restricted to the left edge of a word in Italian (accounting for the gaps in (27) and (28)), while it is allowed to occur freely in this respect in English.

Finally, let us examine whether a branching [s] can occur at word-edges next to a vowel in both languages. The word-initial prevocalic situation is illustrated in (29).

(29) *word-initial prevocalic branching [s]*

a. Italian b. English

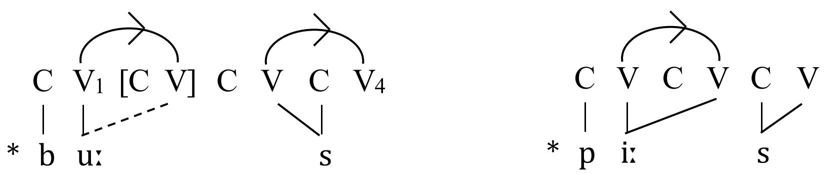
In English, illustrated in (29b), I cannot think of any empirical test that would support this analysis of the word *sea* [siː] instead of the simpler representation lacking the V_1C_2-sequence. Economy therefore requires usage of the less marked structure. In addition, this representation contains a hiatus, which is also avoided by lax vowels, including schwa, in English (e.g. Polgárdi 2012, and references therein). Branching [s] then falls in the same category.

In Italian, shown in (29a), this structure is also ill-formed. We have seen in (6) that *s*V-initial words like *santa* 'holy' behave like other consonant-initial words do, and only *s*C-initial words are special. It is not immediately obvious, however, what is wrong with this representation.

Examining the word-final postvocalic context might shed more light on this issue. This is shown in (30).

(30) *word-final postvocalic branching [s]*

a. Italian b. English



Here, it is Italian that exhibits hiatus (similarly to (27b)). But there are other reasons, too, for the ill-formedness of this structure: branching [s] is not word-initial, and words ending in a consonant are extremely infrequent in Italian to begin with (Krämer 2009: 137–138). A few recent loanwords like [bus] 'bus' exist, but the correct representation of this word would be much simpler: V_1 would properly govern V_4, and the two medial CV units would be missing. However, as we have seen above, domain-final empty nuclei cannot be licensed in Italian, and therefore such forms occur only marginally.

The English example *peace* [piːs] in (30b) is similar to the one in (29b) in the sense that it is not clear what evidence could support this representation instead of one without branching of the [s]. And it is also similar to (29a) in the sense that there is nothing noticeably wrong with the representation itself. It seems thus that the marked structure of a branching [s] can only be utilised if without this branching the representation would be ill-formed. If this is not the case, as in the examples of (29) and (30), then a non-branching [s] must appear. In fact, this also distinguishes *whisper* [ˈwɪs̲p̲ə] in (24a) from the examples in (23), where the superheavy rhymes require the presence of a branching [s]. Finally, as branching [s] of either type cannot occur next to a vowel unless it is flanked by a consonant on the other side, it is also ruled out intervocalically.

In summary, we have seen that branching [s] shows maximally different behaviour in the two languages. In Italian, it branches on the preceding V position, it can properly govern, and it is restricted to the left edge of a morphological domain. In English, in contrast, it branches on the following V position, it cannot properly govern, and its occurrence is not positionally restricted. Discovery of languages exemplifying the full typology defined by these parameters is left for future research.

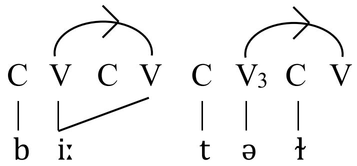
5 Syllabic consonants

Finally, the proposed representation of *s*C-clusters in (15) and (21), i.e. consonants branching on neighbouring nuclei, is identical to that of syllabic consonants, although in the case of [s] this branching is purely phonological and it has no phonetic manifestation, thus it is somewhat abstract. The direction of branching has also been shown to be language specific in the case of syllabic sonorants. Italian and Portuguese do not exhibit this configuration, but English is interesting in this respect because here syllabic sonorants have been claimed to branch on the preceding V position (Szigetvári 1999; Scheer 2004; Polgárdi 2015b) – as opposed to what I have argued for [s] in the previous section. English thus presents ideal laboratory conditions for a comparison of the behaviour of syllabic [s] and syllabic sonorants since all else is really equal in this case, and the only phonological difference between the two lies in the direction of branching. If they turn out to show parallel behaviour, that provides further confirmation of a branching analysis of [s].

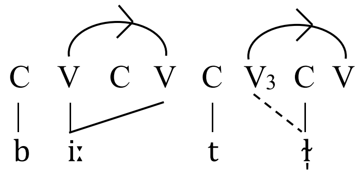
Syllabic sonorants in English alternate with a schwa plus non-syllabic sonorant sequence, as shown in (31a–b).

(31) *English syllabic sonorants*: branching on the preceding V position

a. *beetle* [ˈbiːtəɫ]



b. *beetle* [ˈbiːtɫ̩]



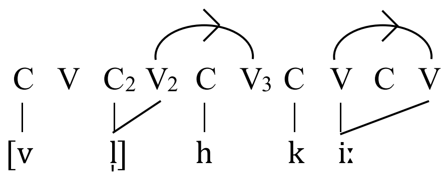
The syllabic sonorant thus occupies the place of the deleted schwa in V_3 and, in fact, it behaves like an unstressed vowel in that position. For example, it can be preceded by a long vowel, as in the example in (31), which is not true of word-internal bogus clusters like [tl] (where the V position inside the cluster is silent). Also, a syllabic sonorant can occur after complex onsets, as in *patronage* [ˈpætrn̩ɪʤ], which must be licensed by a following pronounced V position according to Scheer (1999).

However, syllabic sonorants do not behave in the same way in all languages. Blaho (2004) and Scheer (2009) argue that in Slovak and Czech syllabic sonorants branch on the following V position. For example, they can be followed by consonant clusters other than branching onsets in both Slovak ([ˈkr̩tʃma] 'inn') and Czech ([ˈvl̩hkiː] 'humid'), producing a sequence of silent empty nuclei, unless the syllabic consonant branches to the right. This is illustrated in (32a), adapted to trochaic proper government, where the syllabic [l̩] in C_2 branches to the V_2 position, from where it can properly govern the following empty V_3.

(32) *syllabic sonorants*: direction of branching is parametric

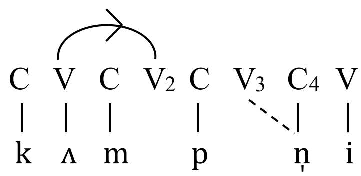
a. Czech: *right-branching*

[ˈvl̩hkiː] 'humid'



b. English: *left-branching*

[ˈkʌmpn̩i] 'company'



In contrast, syllabic sonorants in English can be freely preceded by consonant clusters, as in *company* [ˈkʌmpn̩i], shown in (32b). Here, V_3 cannot be properly governed by V_2 to remain silent, instead, it is taken care of by spreading from the following C_4 position. Polgárdi (2015b) argues that the direction of branching in a syllabic consonant is, therefore, a parametric choice. This has proven to be so for [s], too. And in English the direction of spreading has been shown to be different in the case of syllabic sonorants and syllabic [s].

Finally, let us compare the distribution of syllabic sonorants and syllabic [s] in English, as summarised in (33).

(33) *distribution* of syllabic sonorants and syllabic [s]

		syllabic [ɹ̩ ɫ̩ n̩ m̩]		*syllabic [s]*	
a.	C _ C	faculty	[ˈfækɫ̩ti]	monster	[ˈmɒnstə]
b.	C _ #	rhythm#	[ˈɹɪðm̩]	lax#	[læks]
c.	# _ C	—		#spa	[spɑː]
d.	C _ (unstressed) V	gallery	[ˈgælɹ̩i]	*	
e.	CC _	company	[ˈkʌmpn̩i]	*	
f.	_ CC	*		—	
g.	VV _ C	*		basket	[ˈbɑːskɪt]
h.	# _ V	*		*	
i.	V _ #	*		*	
j.	V _ V	*		*	

As shown in (33a–b) and (33d–e), a syllabic sonorant must be preceded by a consonant (and can be followed by either another consonant, or the end of the word, or an unstressed vowel[19]). As we have just seen, it can be preceded by a consonant cluster other than a branching onset, as in (33e), but it cannot be followed by one, as in (33f), regardless of what occurs on its other side. The gap in (33c) is marked by a dash instead of an asterisk because such forms are ruled out independently in English. As also indicated in (33d), syllabic consonant formation is only permitted preceding an unstressed vowel, and it is blocked pre-tonically within monomorphemic forms. Since one of the first two syllables must always bear stress in English, this restriction will also exclude forms like (33c).

Syllabic [s] must also be flanked by a consonant on one side, as in (33a–c) and (33g), but not by a consonant cluster, as in (33e–f) (see (25) above for the independent restriction ruling out (33f), indicated again by a dash instead of an asterisk). Syllabic [s] cannot be followed by a vowel, as in (33d), and it can only be preceded by a long vowel (provided it is itself followed by a consonant), as in (33g). Neither type of syllabic consonant can occur beside a vowel at either edge of the word or intervocalically, shown in (33h–j).

As can be seen, the distribution of syllabic sonorants and syllabic [s] is partly complementary and partly overlapping in English. The interesting cases are those where the behaviour of the two types differs (or could differ if independent restrictions did not interfere), that is (33d–g). The difference in behaviour in these contexts directly follows from the difference in the direction

[19] When the following sound is a vowel, as in *gallery* [ˈgælɹ̩i], branching of the sonorant is not strictly speaking necessary for well-formedness of the structure, as bogus clusters exist in English. However, they are marked at the stem level where syllabic consonant formation applies, and they only arise in larger numbers via the lexically variable process of syncope at the word level (Polgárdi 2015b). Appearance of a syllabic consonant is thus called for to avoid a marked configuration.

of branching. Syllabic sonorants branch on the left, therefore, they can be followed by a vowel but cannot be preceded by one ((33d) vs (33g)); whereas they can follow a consonant cluster but cannot precede one ((33e) vs (33f)). In contrast, syllabic [s] branches on the right, therefore it cannot be followed by a vowel but it can be preceded by one ((33d) vs (33g)); and it cannot follow a consonant cluster but it should be able to precede one if not excluded by an independent constraint ((33e) vs (33f)). (33a–c) show contexts where in principle branching in either direction is possible, and indeed we find both, unless ruled out independently. Finally, in (33h–j), there is nothing that could force the appearance of a syllabic consonant instead of a non-syllabic one and, therefore, both types are illicit next to a vowel at word-edges or intervocalically.[20]

In short, branching [s] behaves in the same way as other syllabic consonants do, confirming its representation in terms of branching, although phonetically it cannot be distinguished from a non-branching [s] and, therefore, its syllabicity is purely phonological, or virtual.

6 Summary

I have shown that the mystery of licensing of *s*C-clusters can be resolved in a Strict CV approach employing trochaic proper government, where the [s] can branch on a neighbouring V position. Depending on the behaviour of [s], the direction of branching is parametric: in Italian and Portuguese it branches on the preceding V position, while in English it branches on the following one. In addition, it might be restricted to occur only at the left edge of the word (as in Italian), and it might be unable to properly govern a following empty V position (as in English).

I have also shown that not only is the representation of branching [s] identical to that of syllabic consonants (including the parametric nature of the direction of branching), their distribution is also parallel. English is very interesting in this respect because in this language syllabic sonorants branch on the left, while syllabic [s] branches on the right. I have demonstrated that the differences in their behaviour follow directly from the difference in the direction of branching. Finally, syllabic consonants share the characteristic that their marked structure is only allowed if their branching ensures the well-formedness of the representation. This means that they must always be flanked by a consonant at least on one side.

[20] This is perhaps less surprising if we know that cross-linguistically the source of a syllabic consonant is always a vowel: either via syncope (i.e. loss of the vowel) or via consonantisation (i.e. change of the vowel itself into a consonant) (Bell 1978).

Acknowledgements
I would like to thank Katalin Balogné Bérces, Péter Siptár, four anonymous *Glossa* referees, and audiences of presentations at the Government Phonology Round Table 2017, and at the 15th Old World Conference in Phonology (OCP15), for valued comments on previous versions of this paper.

Competing interests
The author has no competing interests to declare.

References
Backley, Phillip. 2011. *An introduction to Element Theory*. Edinburgh: Edinburgh University Press.

Barillot, Xavier & Rizollo, Olivier. 2012. Où s'accroche le [s] dans les groupes sC en français? Paper presented at the French Phonology Network Meeting, Paris.

Bell, Alan. 1978. Syllabic consonants. In Greenberg, Joseph H. (ed.), *Universals of human language, Vol. 2: Phonology*, 153–201. Stanford, CA: Stanford University Press.

Blaho, Sylvia. 2004. *Syllabic consonants in Strict CV*. Budapest: Péter Pázmány Catholic University MA thesis.

Charette, Monik & Göksel, Asli. 1998. Licensing constraints and vowel harmony in Turkic languages. In Cyran, Eugeniusz (ed.), *Structure and interpretation: Studies in phonology*, 65–88. Lublin: Folium.

Chierchia, Gennaro. 1986. Length, syllabification and the phonological cycle in Italian. *Journal of Italian Linguistics* 8. 5–34.

Clements, George N. & Keyser, Samuel Jay. 1983. *CV phonology: A generative theory of the syllable*. Cambridge & London: The MIT Press.

Davis, Stuart. 1990. Italian onset structure and the distribution of *il* and *lo*. *Linguistics* 28. 43–55. DOI: https://doi.org/10.1515/ling.1990.28.1.43

Davis, Stuart & Hammond, Michael. 1995. On the status of onglides in American English. *Phonology* 12. 159–182. DOI: https://doi.org/10.1017/S0952675700002463

Freitas, Maria João & Rodrigues, Maria Celeste. 2003. On the nature of sC-clusters in European Portuguese. *Journal of Portuguese Linguistics* 2. 55–86. DOI: https://doi.org/10.5334/jpl.28

Gibb, Lorna. 1992. *Domains in phonology: With evidence from Icelandic, Finnish and Kikuyu*. Edinburgh: University of Edinburgh dissertation.

Giegerich, Heinz J. 1992. *English phonology: An introduction.* Cambridge: Cambridge University Press. DOI: https://doi.org/10.1017/CBO9781139166126

Goad, Heather. 2011. The representation of sC clusters. In van Oostendorp, Marc & Ewen, Colin J. & Hume, Elizabeth & Rice, Keren (eds.), *The Blackwell companion to phonology, Vol. 2*, 898–923. Oxford: Wiley-Blackwell. DOI: https://doi.org/10.1002/9781444335262.wbctp0038

Goad, Heather. 2012. *s*C Clusters are (almost always) coda-initial. *The Linguistic Review* 29(3). 335–373. DOI: https://doi.org/10.1515/tlr-2012-0013

Goad, Heather & Shimada, Akiko. 2014. /s/ can be a vocoid. In Iyer, Jyoti & Kusmer, Leland (eds.), *NELS 44: Proceedings of the Forty-Fourth Annual Meeting of the North East Linguistic Society*, 135–148. Amherst, MA: GLSA.

Hammond, Michael. 1997. Vowel quantity and syllabification in English. *Language* 73(1). 1–17. DOI: https://doi.org/10.2307/416591

Harris, John. 1990. Segmental complexity and phonological government. *Phonology* 7. 255–300. DOI: https://doi.org/10.1017/S0952675700001202

Harris, John. 1994. *English sound structure*. Oxford: Blackwell.

Iverson, Gregory K. & Salmons, Joseph C. 1995. Aspiration and laryngeal representation in Germanic. *Phonology* 12. 369–396. DOI: https://doi.org/10.1017/S0952675700002566

Kaye, Jonathan. 1992. Do you believe in magic? The story of *s*+C sequences. *SOAS Working Papers* 2. 293–313.

Kaye, Jonathan & Lowenstamm, Jean & Vergnaud, Jean-Roger. 1990. Constituent structure and government in phonology. *Phonology* 7. 193–231. DOI: https://doi.org/10.1017/S0952675700001184

Kenstowicz, Michael. 1994. *Phonology in generative grammar.* Oxford: Blackwell.

Kiparsky, Paul. 1979. Metrical structure assignment is cyclic. *Linguistic Inquiry* 10(3). 421–441.

Krämer, Martin. 2009. *The phonology of Italian*. Oxford: Oxford University Press.

Larsen, Uffe Bergeton. 1998. Vowel length, Raddoppiamento Sintattico and the selection of the definite article in Modern Italian. In Sauzet, Patrick (ed.), *Langues et grammaire II–III: Phonologie*, 87–102. Paris: Université Paris 8.

Levin, Juliette. 1985. *A metrical theory of syllabicity*. Massachusetts Institute of Technology dissertation.

Lindsey, Geoff & Szigetvári, Péter. 2013. *Current British English searchable transcriptions*. http://seas3.elte.hu/cube.

Lowenstamm, Jean. 1996. CV as the only syllable type. In Durand, Jacques & Laks, Bernard (eds.), *Current trends in phonology: Models and methods*, 419–441. Paris: CNRS.

Lowenstamm, Jean. 1999. The beginning of the word. In Rennison, John & Kühnhammer, Klaus (eds.), *Phonologica 1996: Syllables!?* 153–166. The Hague: Holland Academic Graphics.

Nádasdy, Ádám. 2006. *Background to English pronunciation*. Budapest: Nemzeti Tankönyvkiadó.

Passino, Diana. 2013. A unified account of consonant gemination in external *sandhi* in Italian: *Raddoppiamento Sintattico* and related phenomena. *The Linguistic Review* 30(2). 313–346. DOI: https://doi.org/10.1515/tlr-2013-0010

Pöchtrager, Markus A. 2017. It's all about size. In Szigetvári, Péter (ed.), *70 snippets to mark Ádám Nádasdy's 70th birthday*. http://seas3.elte.hu/nadasdy70/pochtrager.html.

Pöchtrager, Markus A. 2021. Morphology made (too) simple? Phonological problems with and a solution to the analytic/non-analytic distinction. *Acta Linguistica Academica* 68(1–2). 2–30. DOI: https://doi.org/10.1556/2062.2021.00480

Polgárdi, Krisztina. 2008a. Geminates and degemination in Hungarian: A Loose CV analysis. In Pinon, Chris & Szentgyörgyi, Szilárd (eds.), *Approaches to Hungarian, Vol. 10: Papers from the Veszprém Conference*, 127–146. Budapest: Akadémiai Kiadó.

Polgárdi, Krisztina. 2008b. The representation of lax vowels in Dutch: A Loose CV approach. *Lingua* 118-9. 1375–1392. DOI: https://doi.org/10.1016/j.lingua.2007.09.008

Polgárdi, Krisztina. 2012. The distribution of vowels in English and trochaic proper government. In Botma, Bert & Noske, Roland (eds.), *Phonological explorations: Empirical, theoretical and diachronic issues* (Linguistische Arbeiten 548), 111–134. Berlin & New York: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110295177.111

Polgárdi, Krisztina. 2015a. Vowels, glides, off-glides and on-glides in English: A Loose CV analysis. *Lingua* 158. 9–34. DOI: https://doi.org/10.1016/j.lingua.2015.02.003

Polgárdi, Krisztina. 2015b. Syncope, syllabic consonant formation, and the distribution of stressed vowels in English. *Journal of Linguistics* 51. 383–423. DOI: https://doi.org/10.1017/S0022226714000486

Polgárdi, Krisztina. 2018. What does it mean that Blackfoot [s] can be a vowel? Paper presented at the conference on Elements, University of Nantes.

Polgárdi, Krisztina. to appear. The representation of nas + stop + obs clusters in English: Stop insertion or stop deletion? In van de Weijer, Jeroen (ed.), *Representing phonological detail, Vol. 1: Segmental structure and representations* (Phonology and Phonetics). Berlin and New York: Mouton de Gruyter.

Prince, Alan & Smolensky, Paul. 1993. *Optimality Theory: Constraint interaction in generative grammar*. Ms., Rutgers University & University of Colorado, Boulder. [Published 2004, Malden, MA & Oxford: Blackwell.]. DOI: https://doi.org/10.1002/9780470759400

Prince, Typhanie. 2017. The representation of French TR, RT and *s*T sequences: Data from aphasic speech (Licensing and government conditions in aphasia). Paper presented at the workshop on Constituent-based approaches to phonology and morphophonology, University College London.

Rebrus, Péter. 2000. Morfofonológiai jelenségek [Morphophonological phenomena]. In Kiefer, Ferenc (ed.), *Strukturális magyar nyelvtan, 3. kötet: Morfológia*, 763–947. Budapest: Akadémiai Kiadó.

Rebrus, Péter & Siptár, Péter & Szigetvári, Péter & Törkenczy, Miklós. 1996. *Hungarian Morphology Doesn't Meet GP*. Paper presented at the Government Phonology Workshop, at the 8th International Phonology Meeting, Vienna.

Rialland, Annie. 1994. The phonology and phonetics of extrasyllabicity in French. In Keating, Patricia A. (ed.), *Phonological structure and phonetic form: Papers in laboratory phonology III*, 136–159. Cambridge: Cambridge University Press. DOI: https://doi.org/10.1017/CBO9780511659461.009

Rowicka, Grażyna. 1999a. On trochaic Proper Government. In Rennison, John & Kühnhammer, Klaus (eds.), *Phonologica 1996: Syllables!?* 273–288. The Hague: Holland Academic Graphics.

Rowicka, Grażyna. 1999b. *On ghost vowels: A Strict CV approach*. The Hague: Holland Academic Graphics.

Scheer, Tobias. 1999. A theory of consonantal interaction. *Folia Linguistica* 32(3–4). 201–237. DOI: https://doi.org/10.1515/flin.1998.32.3-4.201

Scheer, Tobias. 2004. *A lateral theory of phonology: What is CVCV, and why should it be?* Berlin & New York: Mouton de Gruyter. DOI: https://doi.org/10.1515/9783110908336

Scheer, Tobias. 2009. Syllabic and trapped consonants in the light of branching onsets and licensing scales. In Zybatow, Gerhild, & Junghanns, Uwe & Lenertová, Denisa & Biskup, Petr (eds.), *Studies in formal Slavic phonology, morphology, syntax, semantics and information structure: Proceedings of FDSL 7, Leipzig 2007 (Linguistik International 21)*, 411–426. Frankfurt am Main: Peter Lang.

Szigetvári, Péter. 1999. *VC Phonology: A theory of consonant lenition and phonotactics*. Budapest: Eötvös Loránd University & Hungarian Academy of Sciences dissertation.

van de Weijer, Jeroen. 1994. *Segmental structure and complex segments*. Leiden: Leiden University dissertation.

Vaux, Bert & Wolfe, Andrew. 2009. The appendix. In Raimy, Eric & Cairns, Charles E. (eds.), *Contemporary views on architecture and representations in phonology*, 101–143. Cambridge, MA: MIT Press. DOI: https://doi.org/10.7551/mitpress/9780262182706.003.0005

Wells, J. C. 2008. *Longman pronunciation dictionary*, 3rd edn. Harlow: Longman.

Yoshida, Shohei. 1999. Inter-nuclear relations in Arabic. In Rennison, John & Kühnhammer, Klaus (eds.), *Phonologica 1996: Syllables!?* 335–354. The Hague: Holland Academic Graphics.