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Governing domains are head-final*

Tobias Scheer

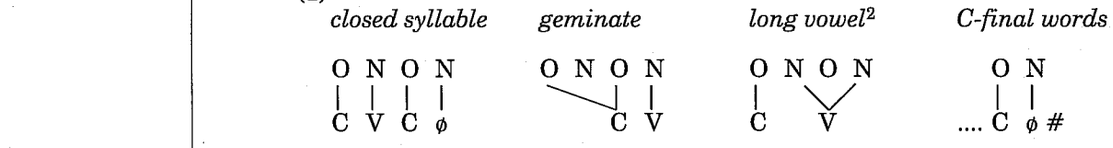
In recent work, analyses have been put forward which assume a "CVCV"-constituent structure allowing only for a strict sequence of non-branching onsets and non-branching nuclei (Lowenstamm 1996).[1] These analyses rely crucially on the assumption of a CVCV-structure and are not sustainable within a more traditional model recognising branching constituents and codas.

In this paper, I explore some of the consequences that a strict CVCV structure entails for phonological and government theory. The logical implications discussed will allow for an evaluation of the CVCV model in comparison with traditional views of constituent structure. It will be shown that the assumption of a strict CVCV structure leads to a unified model where all governing domains are head-final. After a short introduction to CVCV (section 1), the particular questions I address are Proper Government (section 2), interconsonantal relations (section 3), vowel length (section 4), and the governing and licensing abilities of various phonological actors (section 5).

1. CVCV syllable structure

The CVCV-model (Lowenstamm 1996) views syllabic structure as a strict alternating sequence of non-branching onsets and non-branching nuclei (i.e. no branching constituents, no codas). For the sake of clarity, consider how closed syllables, geminates, long vowels and the right edge of consonant-final words are represented within this framework

(1)



* This paper has profited from comments by Jean Lowenstamm, Bergeton Larsen and the participants of Workshops on Government Phonology in Vienna (November 1996) and Leiden (June 1997). I'm especially indebted to Eugeniusz Cyran for his remarks.

[1] See e.g. Lowenstamm (1988), Guerssel and Lowenstamm (in prep.), Bendjaballah (1995), Creissels (1989), Bonvino (1995), Ségéral (1995), Hérault (1989), Nikiema (1989), Ségéral and Scheer (1994, in press), Larsen (1994, 1995), Heo (1994), Scheer (1996, 1997b, in press b).

[2] A discussion of the headedness of long vowels is provided in section 4.

All the structural information contained in traditional syllabic analyses is preserved. For instance, the site of "closed-syllable" phenomena such as devoicing, lenition, shortening etc. that occur word-finally and before consonants usually receive the uniform description: "coda". In a CVCV approach, these phenomena are said to occur *before an empty nucleus*. The difference between these two descriptively equivalent statements is the causal relation between the relevant environment and the observed phenomena: considering, for example, that the coda position admits only a subset of possible consonants, it is commonly referred to as a "weak" constituent. The cross-linguistic *observation* that it is weak is doubtlessly correct, but the use of the term coda to capture this generalisation does not explain why things are the way they are. There is no particular reason why segments should devoice, deaspirate, lenite, in short decomplexify in this special position. In contrast in a framework like Government Phonology (Kaye *et al.* 1990, henceforth KLV) where the onset is viewed as a dependent of the nucleus, the fact that objects decomplexify before an empty nucleus stands in a direct causal relation to the emptiness of the latter. That is, the licensing potential of an empty category is smaller than that of a filled category.

A CVCV structure multiplies the number of empty categories by allowing for empty nuclei. This situation raises the more general question of the status of empty categories in linguistic theory. The broad consensus is that "you cannot get an empty category for free". One implementation of this idea is the *Empty Category Principle* which states that an empty category may remain unexpressed if and only if precise conditions are met. These conditions are defined in terms of a local relation between the empty category and a filled category. It has been proposed that syntactic movement can only take place if the empty base-position of the moved item is properly governed by the item in its new position. *Proper Government* has been defined as a structural relation between the filled and the empty position, subject to certain locality conditions (c-command, barriers). This example from syntax provides the typical kind of motivation for the existence of empty categories. If there were no structure preservation, i.e. if the category the object was moved from were deleted or not even present lexically, no explanation along the above lines would be available. Nor would such an explanation be available if there were no empty categories.

Empty categories burden the grammar because they need special treatment (e.g. Proper Government). Nevertheless, their existence is a necessary condition for an explanatory account. Hence, burdening the grammar with more empty categories should not be viewed as an undesirable overload, but on the contrary as a welcome source of explanation. If movement is restricted by the need to create or maintain the conditions necessary for the existence of empty categories, it looks as though it is possible to arrive at a more constrained model of grammar. The challenge, as for any other scientific theory, is to propose a model that is as constrained as possible while covering all the relevant data.

The same reasoning holds for phonology. KLV (1990:219) propose a theory of phonological Proper Government based on the same kind of lateral long-distance

phenomena involving empty and filled categories that gave rise to syntactic Proper Government. In their view, empty categories are subject to the ECP in phonology as well as in syntax. A slightly altered version of their phonological ECP is given in (2).

(2) EMPTY CATEGORY PRINCIPLE

An empty nucleus may remain unexpressed iff it is properly governed.

The long-distance phenomena which are to be found in phonology are vowel – zero alternations. The next section shows how they can be accounted for in a CVCV framework, and discusses some issues arising from such treatment.

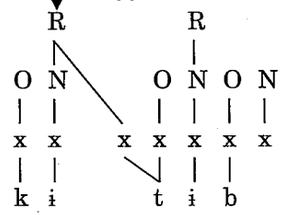
2. Proper Government

2.1. Proper Government in a CVCV framework

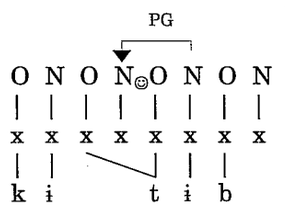
Typically, vowel – zero alternations are sensitive to what stands between zero (empty nucleus: ∅) and the vowel to its righthand side (filled nucleus).[3] Consider for example Czech /hudøb-a/ 'music, nom. sg' vs. /hudeb-ní/ *(hudøb-ní) 'musical', Moroccan Arabic /køtib/ 'he writes, pf.' vs. /kittib/ *(køttib) 'he causes to write' or Somali /gaʃøn-o/ 'leg, pl.' vs. /gaʃan/ 'leg, sg. indefinite', /gaʃan-ta/, *(gaʃøn-ta) 'leg, sg. definite'. If the alternation site and the following vowel are separated by more than one consonant, the expected zero surfaces as a vowel. Under the standard analysis (e.g. Kaye 1990a), the intervening CC-cluster is viewed as a barrier that does not allow the filled nucleus to properly govern the empty nucleus, which therefore must surface.

However, the blocking effect of the "barrier" CC is a purely observational fact that does not follow from anything. By contrast, the multiplication of empty nuclei which a CVCV structure entails offers an immediate answer to the question why do intervening CCs block Proper Government (PG)?

(3) a.



b.



(3a) provides no answer to this question. (3b) by contrast contains a straightforward explanation: there is no alternation at the expected site because the

[3] See e.g. Kaye (1990a,b), Charette (1990) for data and analyses concerning vowel – zero alternations, and Scheer (1996, 1997b) for a CVCV account.

intervening [CC] encloses an empty nucleus $N_\odot$, /$CN_\odot C$/, that requires PG. PG is not blocked, it simply cannot reach the first [i] since it has to control $N_\odot$.

Under a CVCV analysis, the grammar is radically simplified since there is no need for a special definition of PG anymore: vowels are marked lexically as possible targets for PG. They undergo PG any time there is a proper governor available. They do not undergo PG if they must act as a proper governor themselves.[4] Even this last statement does not need any special definition: it follows entirely from the above Empty Category Principle which states that empty Nuclei can exist only if they are subject to PG.[5]

The CVCV-account (cf. Scheer 1997b, in press b) offers the following advantages over the standard way of viewing PG (e.g. KLV 1990, Charette 1990): i. it provides a unified theory of government. While the standard analysis needs Constituent Government, Interconstituent Government, Government-Licensing and Proper Government in order to handle vowel-zero alternations, PG alone can account for the same set of data when CVCV is assumed. ii. PG functions in a unified manner. In the standard analysis PG may or may not apply depending on intervening consonant clusters; within the CVCV-model PG is always active - only its target is variable. In the next section we see how it works.

2.2. Lexical presence of properly governable vowels

In the standard model, PG applies exclusively to lexically empty nuclei.[6] The observable vowels that surface when these nuclei escape PG are the result of a language-specific process of epenthesis. This amounts to saying that they are absent from lexical representations. The derivation of Czech *pes* 'dog, nom. sg.' (vs. /pøs-a/ 'dog, gen. sg.') for instance implies a lexical structure /pøs/ that is not involved in a governing relation. In the nominative, no vowel is suffixed. Consequently, /ø/ escapes PG and epenthesis occurs. The genitive marker *-a* by contrast establishes a domain of PG whose target is /ø/. The governing domain in question is lexically non-existent. No epenthesis occurs. This way of viewing PG supposes an undesirable sequence within the derivation that is reminiscent of ordered rules: *first*, phonology comes into play (PG does, or does not, apply), and *then* epenthesis fills empty nuclei that are not subject to PG.

Assuming CVCV, this implementation of PG is ruled out. Consider vowel-zero alternations in languages where PG applies over more than one consonant. As shown in (4a), the Czech prefix *bezø / beze* 'without' exhibits an [ɛ] – [ø] alternation even though a consonant cluster occurs to its righthand side.[7] In (4b), the

[4] See the cases of Government Licensing environments described by Charette (1990) such as French [fɔrN$_\odot$ʒərɔ̃] (*[fɔrN$_\odot$ʒøRɔ̃]) *forgeron* 'smith' where schwa must properly govern the empty nucleus $N_\odot$ and therefore cannot undergo PG.

[5] The lexical difference between nuclei hosting vowel – zero alternations and unexpressed nuclei where no alternation occurs is discussed in the next section.

[6] See, e.g. KLV (1987:219), Kaye (1990b:313), Charette (1990:235).

[7] The behaviour of consonant-final prefixes is absolutely regular in Czech. See Scheer (1996) for illustration.

Metropolitan French schwa – zero alternations illustrate the same behaviour.[8]

(4) a. *Czech*

bɛzɛ-snii	*beze-sný*	'sleepless'
bɛzø-bradii	*bezø-bradý*	'beardless'
bɛzɛ-ʃvii	*beze-švý*	'seamless'
bɛzø-vlasii	*bezø-vlasý*	'hairless'

b. *Metropolitan French*

səkrɛ	*secret*	'secret'
søkrɛ	*secret*	'secret' (both realisations are attested)

If PG applied exclusively to empty nuclei, a word like [bɛzø-bradii] would receive the lexical representation /bɛzN$_2$-bN$_\odot$radii/ in a CVCV account. $N_\odot$ would have to properly govern N_2 and therefore could not undergo PG itself. Escaping PG, $N_\odot$ would undergo epenthesis, yielding the unattested *[bɛzø-bɛradý].

Things are different when we assume representations where vowels that alternate with zero are lexically present. In such a scenario, PG does not apply to empty nuclei but to vowels that are lexically specified as possible PG-targets. In the ensuing representation /bɛzɛ$_1$-bN$_\odot$radý/ where ε_1 is a possible target for PG but $N_\odot$ is not, [a] properly governs the prefixal -ε_1. $N_\odot$ having no reason to undergo epenthesis, the surface form [bɛzbradii] is correctly derived. The question of the inaudibility of $N_\odot$ will be addressed in the next section.

Rubach (1993:135), Yoshida (1993:138) and Larsen (1995) also come to the conclusion that alternating vowels are lexically present in languages as different as Slovak, Palestinian Arabic and Italian, respectively. In any event, the model based on epenthesis breaks down when faced with languages of the Eastern Slavic kind where different vowels alternate with zero in identical contexts. In Russian for example, both [ɛ] and [ɔ] alternate with zero. There is no way to predict which one will appear in the alternation site. Their distribution is a lexical property of each word. Consider two words like *deň* 'day' and *son* 'dream'. Both vowels alternate with zero in inflected forms, *dňa* and *sna* (gen. sg.). If they were not lexically present, i.e. if they were inserted into a lexically empty nucleus via epenthesis, there would be no way for a speaker to know that 'day' always receives an [ɛ] and 'dream' always receives an [ɔ].[9]

Hence, running PG in a CVCV framework enforces the recognition of two different kinds of empty nuclei: i. those alternating with zero that are viewed as

[8] The alternations shown are optional. They are produced by a subset of speakers only. See Dell (1973), Encrevé (1988), Charette (1990) and the references therein for a more detailed presentation of the facts.

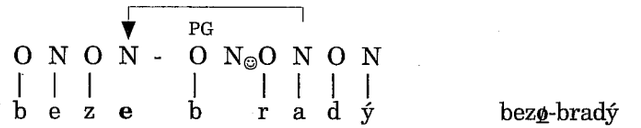
[9] See Rubach (1993:135) for an extensive discussion of this point, as well as for other arguments against an insertion account.

lexically empty in the standard model, e.g. *bez-/ beze-:* assuming CVCV, these nuclei are underlyingly filled with the vowel that appears on the surface. Nuclei hosting vowel – zero alternations are lexically marked as potential PG-targets. No epenthesis occurs. ii. Nuclei that are never observable on the surface, i.e. $N_{\odot}$. In the CVCV account, these nuclei are lexically empty. PG is always responsible for the inaudibility of the former kind of nucleus in case it remains unexpressed. The phonetic absence of the latter may also be a consequence of another phonological operation which will be discussed in the next section.

2.3. Inaudibility of empty nuclei

Assuming CVCV, an explanation must be provided for the inaudibility of $N_{\odot}$ in the cases of Czech /bezø-b$N_{\odot}$radý/ and French /sø k$N_{\odot}$ret/ mentioned above (non-associated segments are inaudible).

(5)



bezø-bradý

Since the prefix-final nucleus is subject to PG, the inaudibility of $N_{\odot}$ must be due to another factor. In the standard model (KLV 1990), there are only two reasons for nuclei not to surface: PG and parametric licensing of final empty nuclei.[10] As $N_{\odot}$ is not final, the tools provided by the theory are insufficient to account for its phonetic absence. However, inaudible nuclei such as $N_{\odot}$ do not occur at random. A close examination of the relevant cases in French and Czech reveals that these nuclei always occur between consonants of increasing sonority, i.e. what is classically regarded as a branching onset. Hence, the question why $N_{\odot}$ is inaudible and the phenomenon of branching Onsets are two sides of the same coin.

It has long been recognised that the distribution of consonants in word-initial clusters is not free. There are languages which only have initial clusters of increasing sonority (e.g. Indo-European languages), and others with no restrictions on initial clusters (e.g. some Semitic languages), but there is no language which only has initial clusters of decreasing sonority. The classical approach views initial clusters of the Indo-European type as branching onsets because of the constraint saying that "sonority must increase within branching onsets". However, the only reason why this constraint is proposed rather than its reverse is the *observation* that sonority always increases in Indo-European initial clusters. This kind of reasoning is circular.[11]

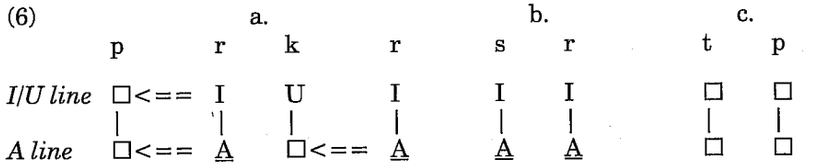
In response to these problems, I have proposed a theory of consonantal interaction (Scheer 1996, in press a). A domain of *Infrasegmental Government* (IG)

[10] The more recent theory of Interonset Government will be discussed in detail in section 3. A proposal made in Kaye (1992) is of no relevance here.

[11] See Scheer (in press a), Carvalho (1997) for more discussion of the circularity related to this kind of constraint.

may hold between two consonants iff the conditions regarding i. their segmental identity and ii. the licensing of the head of the domain are satisfied. As to the former, IG may apply iff a phonological primitive faces an empty position (□) on a given phonological line (<== indicates IG).[12]

(6)



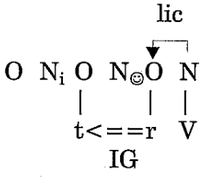
For the internal structures shown, it can be seen that a domain of IG may be established for [pr] and [kr] (6a) where at least one element faces an empty position on a given line. By contrast, IG may not hold within the clusters of (6b,c) because either all places are filled [sr] or no governor is available [tp]. As can be seen, IG is a function of the internal structure of consonants. In the model of consonantal representation used here, "sonority" is not an autonomous phonological category but a mere consequence of the idiosyncratic identity of each consonant. In this sense, IG is a development of Harris' (1990) complexity condition on government. This condition states that C_1 may govern C_2 iff C_2 is not more complex than C_1 (complexity is proportional to the number of primes defining a segment). The desirability of assessing governing-abilities on the basis of segmental criteria, among other factors, has led to a model where segmental complexity has taken over the function of Charm (cf. Harris 1990, 1994). However, the internal structures assumed by Harris (1990, 1994) and Harris and Lindsey (1995) just as in the former Charm-driven framework, reproduce the situation where obstruents normally govern, while sonorants are typically governed. A discussion of what kind of evidence could be used to derive the internal structure of consonants would lead us too far afield here (see Scheer 1996, in press a for arguments concerning the model of consonantal representation used here). What I would like to show below (section 3) is that the assumption of CVCV calls for an analysis where sonorants are governors, and obstruents governees.

The other condition on IG concerns the licensing of its head. According to Charette (1990), a non-nuclear governor may govern only if it is licensed to do so by a following Nucleus. In a CVCV-framework, Charette's Government-Licensing makes the following correct predictions when considering word-initial clusters of increasing (7a) and falling (7b) sonority. The former represents a right-headed IG, while the latter, unattested word-initially, illustrates a left-headed domain of consonantal interaction.

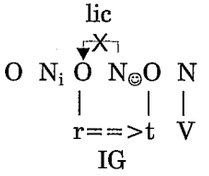
[12] Note that the segmental condition on IG does not make any prediction as to the directionality of the interconsonantal relation. (6) shows right-headed structures, but the opposite kind of structure is allowed as well at the present stage of the discussion.

(7) *word-initial clusters in languages of the IE type*

a. *well-formed structure*



b. *ill-formed structure*



In both cases (7a) and (7b), the segmental requirements are met in order for an IG-domain to be possible. But only the head [r] of the [tr]-cluster is licensed: in (7b), the head [r] fails to be government-licensed because the nucleus on its right-hand side is empty. Assuming CVCV, the special status of initial clusters is due to the fact that the first vowel of the word is not available as a proper governor of $N_\odot$ since it must govern the initial empty nucleus N_i. See Lowenstamm (in press) for arguments regarding the existence of a word-initial empty CV (replacing the non-phonological SPE-notation "#").

Note that unlike the branching onset approach, IG is not circular because it draws on a general principle, Government-Licensing, and the internal structure of consonants, both of which are entirely independent from word-initial contexts.

Given the above characterisation of possible domains of IG, $N_\odot$ occurs between consonants that may interact. I therefore propose that we extend the cases where nuclei may remain unexpressed to IG: *empty nuclei enclosed within a domain of IG are licensed.* (8) sums up the situations where nuclei may remain unexpressed.

(8) *Nuclei are licensed and may remain phonetically unexpressed iff they are*
- a. *subject to Proper Government or*
- b. *subject to parametric licensing of final empty nuclei or*
- c. *enclosed within a domain of Infrasegmental Government*

2.4. Branching onsets and domains of Infrasegmental Government are different

Within a CVCV framework, a coda-onset sequence hosts an empty nucleus within the cluster: /C_{+son} N C_{-son}/. In any event, this empty nucleus requires PG since it is neither word-final, nor are its surrounding consonants able to interact. The contrast between the coda- and the CVCV approach is overt. In contrast, a domain of IG such as (7a) and a branching onset in the standard model may look much the same. Indeed, the empty nucleus enclosed within the domain of IG not only does not normally surface, but also does not burden the grammar. Provided that there is a vowel following the cluster, the domain is autonomous. It does not need PG in order to be well-formed. How, then, can the existence of this empty

nucleus be motivated? In what follows, I show that a domain of IG and a branching onset are neither equivalent in nature nor in function.

Firstly, the presence of an empty nucleus is crucial for the demonstration illustrated in (7). Initial [rt] clusters are ill-formed because the embedded empty nucleus is unable to license [r]. Under a branching onset analysis, this kind of argument is not available.

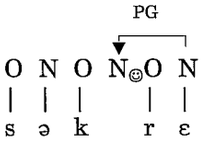
Secondly, there are cases where empty nuclei enclosed within a cluster of increasing sonority do require PG.

(9)

Quebec French		*Metropolitan French*			
səkrɛ	*søkrɛ	səkrɛ	sø**k**rɛ	*secret*	'secret'
rətrɛt	*røtrɛt	rətrɛt	røtrɛt	*retraite*	'pension'

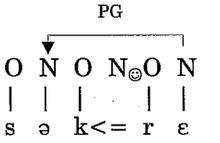
In Quebec French, schwa must be realised before consonant clusters, whereas in certain varieties of Metropolitan French, it can optionally be dropped (see note (8) for references). In a CVCV account, this contrast is expressed by the existence vs. the non-existence of a domain of IG.

(10) a.



Quebec French səkrɛ

b.



Metropolitan French søkrɛ

In (10a), [k] and [r] do not interact. Accordingly, the empty nucleus they enclose is not inaudible by virtue of IG but requires PG from the rightmost vowel. As a consequence, PG from [ɛ] cannot reach schwa. By contrast, in (10b), [k] and [r] do interact. $N_\odot$ is licensed by IG. PG coming from [ɛ] can therefore reach schwa. Note that even though all the conditions are met in order for a domain of IG to hold in a case like (10a), nothing in the theory predicts that such a domain *must* be established. Rather, it may exist.

The presence of an empty nucleus within [kr] is crucial for the analysis presented. If [kr] were regarded as a branching onset, there would be no possibility of expressing the contrast observed between the two varieties of French by means of giving the clusters a different status.

Recall that the goal of this section is not to argue in favour of CVCV. Rather, it is intended to show that viewing a CC as a branching onset is not equivalent to viewing it as a domain of IG. A domain of IG enclosing an empty nucleus is not just a consecution of two consonants hosting a nucleus that is neutralised by IG. This nucleus plays an active role in the grammar.

3. Interonset Government

Both the standard and the CVCV-model have to link the inaudibility of certain nuclei to the relationship holding between the consonants surrounding them. For instance, Gussmann and Kaye (1993:448) propose that a governing relation may hold between two adjacent onsets. This consonantal relation, termed Interonset Government, is invoked to account for cases such as those in (11).

(11) *Polish*

nom.sg.		*gen.pl.*	
mgł-a		mgieł	'mist'
pchł-a	ch=[x]	pcheł	'flea'

The initial two consonants do not fulfil the sonority (complexity-, Charm-) requirements so that they cannot be argued to form a branching onset. Hence, they must be separated by an empty nucleus. The genitive plural forms show the existence of a vowel between the last two consonants. As a consequence, in cases like the nominative where this vowel is absent, the second and the third consonant of the stems are also to be viewed as pertaining to two distinct onsets separated by an empty nucleus. These words thus instantiate a sequence of two empty nuclei /$C_1\phi C_2\phi C_3$-/ under any syllabic analysis. Consider the representations of such clusters using Interonset Government and Infrasegmental Government.

(12) a. *Interonset Government (IO)* b. *Infrasegmental Government (IG)*

Both proposals are descriptively equivalent: an empty nucleus, $N_{\odot}$, is licensed to remain phonetically unexpressed by virtue of the relation contracted by the consonants surrounding it. However, they have very different implications as far as theoretical issues are concerned.

Firstly, the standard syllabic analysis in Government Phonology crucially relies on two conventions, that is, Strict Locality and Strict Directionality (KLV 1990). The former states that a non-nuclear governing domain can hold only between two positions that are adjacent on the skeletal tier. The latter is defined below.

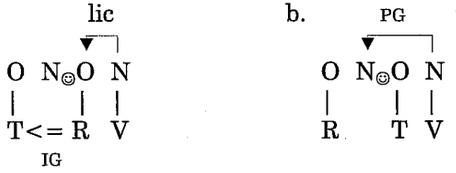
(13) STRICT DIRECTIONALITY

a. *for a given type of government (within a constituent or involving two constituents), the directionality is always the same.*
b. *that is, government within constituents (e.g. branching onsets) goes from left to right. Government involving two different constituents (i.e. coda-onset) goes from right to left.*

The Interonset-analysis in (12a) assumes a governing relation between two different constituents that are not adjacent, thereby violating both Strict Directionality and Strict Locality. Hence, it is inconsistent for branching onsets, coda-onset sequences *and* Interonset Government to coexist within the same analysis. In Gussmann and Kaye's (1993) analysis of Polish, these devices coexist since the authors recur to a CVCV structure only if a TR-cluster (TR standing for any sequence of rising sonority, RT for any cluster of falling sonority) cannot form a branching onset or if it hosts a vowel – zero alternation. Ordinary word-initial TR clusters, for example, are still analysed as branching onsets.

By way of contrast, in a CVCV framework Strict Directionality and Strict Locality can be dispensed with completely. This is a desirable move in itself because both devices have the status of stipulations that do not follow from any more general principle. The asymmetry of TR- and RT clusters is then viewed as a consequence of the possible existence of an IG in the former case, but not in the latter.

(14) a. b.



The empty nucleus enclosed between both TR and RT-clusters can be taken care of by IG in the former, but not in the latter case. Accordingly, $N_{\odot}$ must be subject to PG in RT-clusters. Hence, the proper governor following RT exhausts its governing ability and therefore cannot reach beyond the cluster. It will be shown below how the different status of $N_{\odot}$ in (14a,b) accounts for what is commonly referred to as closed syllable shortening.

Given these provisions, the TR- RT contrast is no longer expressed by means of different syllabification. Rather, it is viewed as a consequence of contrasting governing-relations holding within clusters. In any event, in a CVCV model, all governing relations are of the interconstituent type since there are no branching constituents. Syllable structure is invariable, so that neither Strict Locality nor Strict Directionality must be assumed in order to capture the TR- RT contrast. The question as to whether two adjacent consonants belong to a branching onset or a coda-onset sequence simply does not arise.

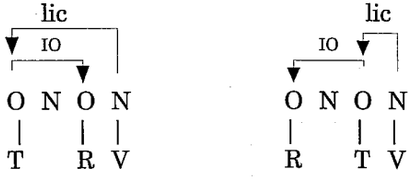
The second difference concerns the blocking effect of governing domains. Under the Interonset analysis (12a), PG applies over the domain of Interonset Government. This is inconsistent with the generalisation "PG is blocked by an intervening governing domain". The empirical content that this generalisation is intended to cover has been established in e.g. Charette (1990), Kaye (1990a), Scheer (1997b). Within the standard model of PG, the blocking effect of an intervening governing domain causes [ə] to be stable in a [əCCV] context (where [ə] is properly governable (see the discussion of (3)). In the standard model which recognises codas and branching constituents, it is the governing relation between the coda-onset and between the two members forming branching onsets respectively that blocks PG. Hence, the whole analysis of vowel – zero alternations crucially relies on the blocking effect of governing domains. Accounting for the facts in (11) by means of Interonset Government, while still allowing PG to cross this governing domain, is therefore incompatible with the standard account of vowel – zero alternations, and vice-versa. Unless a non-CVCV analysis relying on a statement different from "PG is blocked by intervening governing domains" is proposed, it is inconsistent to allow both PG applying over an IO domain and codas/ branching onsets to co-exist. Analyses that do so, such as Kaye and Gussmann (1993) and Cyran and Gussmann (in press), have to come up with an alternative account for the blocking effect of CC-clusters.

In a CVCV framework, the observation "intervening clusters block PG" is replaced by the explanation "PG cannot reach the properly governable vowel because it is called to apply to the empty nucleus enclosed within the cluster" (see section 2.1). Moreover, there is no conflict between a relation holding between two adjacent consonants and PG applying over them. Hence, the data in (11) indirectly call for a CVCV-analysis of syllable structure not only for the Polish facts exemplified there, but also for languages exhibiting the vowel – zero alternations mentioned.

The assumption of CVCV, then, would allow for an Interonset account of the Polish data that is consistent with the analysis of vowel – zero alternations. However, consider the situation Interonset Government encounters word-initially.

(15) INTERONSET GOVERNMENT

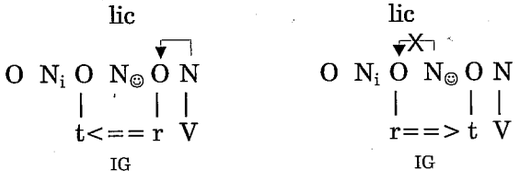
a. *left-to-right* b. *right-to-left*



In principle, nothing indicates the directionality of Interonset Government. The only well-formedness condition for an IO domain is that its head must be licensed by a following nuclear position (cf. e.g. Harris 1992:380, Charette 1990). How, then, can word-initial restrictions, that is #TR, but *#RT, be accounted for? As shown in (15a), the existence of #TR clusters supposes that the initial #T be licensed by the first vowel of the word. Accordingly, there is no reason why the T in the opposite #RT case (15b) should not be licensed by the immediately adjacent vowel on its right-hand side. An analysis along the lines of (7), repeated below for convenience, is not available under the assumptions of Interonset Government.

(16) *word-initial clusters in languages of the IE type*

a. *well-formed structure* b. *ill-formed structure*



That is, there is no principled way to exclude that the empty nucleus enclosed within the Interonset domain licenses its onset #R, thereby excluding #RT-clusters. Assuming Interonset Government, the licensing path goes from the first vowel of the word over the empty nucleus to its target #T in #TR-clusters. Apart from the problem of ruling out #RT-clusters, the empty nucleus enclosed within the cluster does not play any specific role in the grammar under an IO analysis (cf. section 2.4).

Infrasegmental and Interonset Government are based on the same idea, namely, empty nuclei are inaudible if they are enclosed within a domain of consonantal interaction. Both approaches rely on segmental complexity. They contrast in two respects. Firstly, they differ as to the governing status they assign to the different consonants. Secondly, they disagree as to the origin of the licensing that legitimises the head of the consonantal domain. Since a CVCV model with Interonset Government does not encode the RT-TR contrast, the one with Infrasegmental Government seems to provide a more adequate analysis of consonantal relations.

4. Vowel length

In this section we shall see how a CVCV framework which includes a device of consonantal interaction can handle phenomena relating to vowel length. Long vowels can behave in five different ways.

(17)

a. *they never alternate with short vowels, as illustrated by German (18) and Somali (19).*

if they do alternate, the selection of the short or long version of a vowel may be related to:

b. *the overall constant weight of a given morphological structure (cf. Slovak and Czech in (20)).*

c. *a specific grammatical category, as for Classical Arabic and Czech in (22).*

d. *lateral relations between segments may cause an alternation commonly referred to as closed syllable shortening, examples of which are given in (23) and (24).*

e. *a short vowel may become long when an adjacent segment fails to be realised. This phenomenon called Compensatory Lengthening, is illustrated in (26) by Latin, Tiberian Hebrew and Chilungu.*

First let us consider the German case.[13]

(18) *German*[14]

zuuχ-ən	zuuχ-tə	zuuχ!	*suchen, suchte, such!*	'search,/pret./imp.'
zææ-ən	zææ-tə	zææ!	*säen, säte, säe!*	'sow,/pret./imp.'
buuχ	byyç-ɐ		*Buch, Bücher*	'book,/pl.'

As can be seen, the long vowels remain stable throughout various morphological and phonological contexts, that is __C# ([zuuχ!]), __C-V ([zuuχ-ən]), __C-CV ([zuuχ-tə]), __# ([zææ!]). Their length is not affected either when they are subject to phonological processes: the long [uu] of the singular [buuχ] undergoes a palatalisation called Umlaut in plural formation. The quality of the vowel is altered (sg. = [uu], pl. = [yy]), while its quantity remains unaffected.

However, the following objection to the German data might be raised: as long vowels are subject to no contextual influence, they might be expected to have an unrestricted distribution. This expectation is not borne out: long vowels occur in the hostile environment of closed syllables only if more than one morpheme is involved (__C-CV [zuuχ-tə], or word-final, __C# [zuuχ]), but they do not appear

[13] Phenomena involving diphthongs are left aside here. Consonantal influences on adjacent vowels, such as vowel-lengthening triggered by a following voiced consonant, will not be considered either. The latter occurs e.g. in a subset of German strong verbs: *reiten – ritt* [aj]–[ɪ] 'ride, inf./3sg. pret.' vs. *scheiden – schied* [aj]–[ii] 'separate, inf./3sg. pret.'. It was also active in the history of Polish, as can be seen in present-day *Łódź* [u] 'cityname' vs. *prosić* [ɔ] 'ask', [u] and [ɔ] being the reflexes of former long [ɔɔ] and [ɔ], respectively.

[14] Vowel-length is stable in German except for the closed class of strong verbs where short vowels in the present tense sometimes have long corresponding forms in the preterite: *fallen – fiel* [a]–[ii] 'fall', *schaffen – schuf* [a]–[uu] 'create', *erschrecken – erschrak* [ɛ]–[ɑɑ] 'scare'.

in *monomorphemic* closed syllables where the closure is achieved by two consonants (*...VVCC-). This distributional gap is not synchronic in nature since it does not correspond to any generalisation that could be synchronically described. Whatever the status of this gap, we are not interested in finding a language where there are no distributional restrictions on the occurrence of long vowels. Rather, German is merely supposed to illustrate the non-alterability of long vowels.

The case of Somali is unambiguous. In Somali long vowels are contrastive (*barbar* 'side, edge' vs. *barbaar* 'young adult man', *bar-ka* 'half' vs. *baar-ka* 'eyelashes, hair on the hump of a camel's back'), they are not subject to any distributional restrictions, and they never alternate, as can be seen in (19).[15]

(19) *Somali*

__C	*__CC*	
maalin	maalm-o	'day, sg./pl.'
keen, keen-aa	keen-taa	'bring, inf./1sg. hab./2sg. hab.'
	ʃaanɖ-o	'sieve, strainer, indef.'
	eeddo, aabbe	'paternal aunt/father'

Somali long vowels remain stable when followed by a single word-final consonant [keen] or a single consonant and a homomorphemic [maal**in**] or heteromorphemic [keen-**aa**] vowel. They remain unaffected when they stand on the lefthand side of consonant clusters, be they homomorphemic geminates [ee**d**-**d**o], non-geminates [ʃaa**n**ɖ-o, maa**lm**-o) or polymorphemic [kee**n**-**t**a]. Somali can thus be taken as an example where long vowels are free of any distributional or contextual restrictions.

Let us now turn to the case mentioned in (17b). In the Slovak and Czech examples in (20) below, long vowels are prohibited in dependent morphemes of morphologically complex forms when the head of the morphological structure hosts a long vowel. In Slovak (e.g. Rubach 1993:172), suffixes may not be long if the root is. In Czech (Scheer 1997a), prefixes are always short when the root-vowel is long.[16]

(20) a. *Slovak:* $*[..VV.]_{root}$-$[VV.]_{suffix}$ → $[..VV.]_{root}$-$[V.]_{suffix}$

√..V.-VV.	√..VV.-V.	
mal-ii	t͡ʃiir-i	'small/clear, nom.sg.masc.'
mal-aa	t͡ʃiir-a	'id., nom.sg.fem.'
mal-eemu	t͡ʃiir-emu	'id., dat.sg.masc.'
par-aam	luuk-am	'steam/meadow, daat.pl.'
par-aax	luuk-ax	'id., loc.pl.'
pros-iim	xvaal-im	'ask/praise, 1sg. present'

[15] Saeed (1993) and Zorc *et al.* (1991), among others, provide a more ample illustration of the facts.

[16] Note that only affixes alternate in length in both languages. Root-vowels never do in the relevant examples.

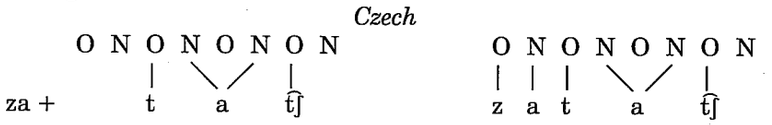
b. *Czech:*	*[..VV]$_{prefix}$-[..VV..]$_{root}$	
..VV-√..V.	..V-√..VV..	
zaa-tɔʧ-ka	za-taaʧ-ka	'turn (dance)/bend'
zaa-nɔʃ-ka	za-naaʃ-ka	'change (gym)/registration'
zaa-suf-ka	za-firaat-ka	'socket/little garden'

In both cases, the length of the morphologically dependent affix is a function of the length of the root. If the head of the structure is long, the dependant is short, and vice-versa. This generalisation concerns the overall vowel weight of the object [[Head]-[Affix]], which is always constant. Using the notion of mora (Hayes 1989), the head and the affix can be said to respond to the weight-constraint "three and only three moras". Alternatively, a parallel can be drawn with Afro-Asiatic languages where this kind of weight restriction is commonly interpreted as stemming from an autosegmentally independent syllabic template (e.g. McCarthy 1979). In this view, head and affix are realised on a unique template that supports three vocalic positions, e.g. **CVC(C)VCV**. The association of the head, whether long or short, is lexical. When the affixed form is derived, the segmental material of the affix associates to the remaining positions. If the head occupies two Vs, there is only one V left for the affix, which will be short. In case of a short head, two Vs are available for the affix, a long version of which will appear on the surface.[17]

(21) *lexical entries* *affixation*

a. *long head*

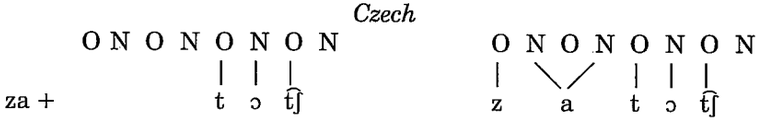
Czech



Slovak

b. *short head*

Czech



[17] These phenomena do not involve issues related to vocalic headedness. The figures below therefore do not specify whether the long vowels shown are right- or left-headed.

Slovak

Another kind of non-arbitrary vowel-length, (17c), is commonly found in Afro-Asiatic languages, but not only there, as witnessed by the Czech example in (22b). The data in (22) below illustrate cases where vowel length is associated with a particular grammatical category.

(22)

a. *Classical Arabic: the first vowel of a verb is long in its reciprocal from*

Form[18]	'wear'	'write'	
I	labis	katab	semantically unmarked
II	labbas	kattab	causative / intensive
III	laabas	kaatab	reciprocal
VII	nlabas	nkatab	inchoative

b. *Czech: infinitives have at least two moras*[19]

infinitive	*1st sg. pres.*	*past active partic.*	
kraas-t	krad-u	kradl	'steal'
ruus-t	rɔst-u	rɔstl	'grow'
krii-t	kri-j-u	kril	'cover'
staa-t sɛ	stanɛ- sɛ	stal sɛ	'become'
znaa-t		znal	'know'
po-znat			'recognise'
dlii-t		dlɛl	'stay'
praa-t	pɛr-u	pral	'wash'

In Classical Arabic as well as in Czech, a specific verbal form displays long vowels only (reciprocals in the former, infinitives in the latter language), while other forms exhibit short vowels.[20] Classically, the presence of long vowels in a given grammatical category is viewed as a consequence of a specific syllabic template being associated with this category (McCarthy 1979).

The cases of non-arbitrary contrasts in vowel-length considered so far are related to space restrictions at the syllabic level rather than to lateral relations between segments. The latter kind of alternation is represented by two different cases, namely, closed syllable shortening (17d) and Compensatory Lengthening (17e). Some examples of the former are given in (23) and (24).

[18] The forms given illustrate the active perfective paradigm of sound triliteral roots.

[19] Only a handful of verbs such as *chvět se* 'tremble', *pět* 'sing' or *jet* 'ride' disregard this generalisation.

[20] Note, however, that vowel-length in the Arabic examples is the only marker indicating that the item has to be considered as a Form III. By contrast, Czech has an independent infinitive morpheme, that is *-t*.

(23)	VVC-V	VC-ϕ	VC-CV		
	ʔa-quul-u	–	ta-qul-na	Cl. Arabic	'say,1sg./2pl.fem.'
	meraak-i	merak	merak-tah	Turkish	'law, nom.sg./poss./pl.'
	kraav-a	kraf	kraf-ka	Czech	'cow, nom.sg./gen.pl./dim.'
(24)	*Italian*[21]				
	VVCV	CV-ϕ	VVTRV	VRTV	
	faato	ʃi	piigro	parko	'destiny/ski/lazy/park'

The above data illustrate entirely regular phenomena in the respective languages. Italian contrasts with the other languages because its sequences [VCC] are always monomorphemic, as opposed to the [VC-C] structures in (23). The Italian alternation is more illuminating than those in (23) since it allows us to observe both [VTR] and [VRT] sequences. I will therefore refer to Italian below, but one should bear in mind that the languages in (23), all of which behave identically, represent a subset of the Italian pattern.

The generalisation that is classically drawn upon the kind of evidence we are using here is of a syllabic nature: underlyingly long vowels shorten iff their syllable is closed by a coda. This view is descriptively correct, but fails to explain the facts: why should long vowels be prohibited in closed syllables? Using the closed-syllable analysis mentioned, Kaye and Lowenstamm (1985) take an explanatory approach, assuming that the head of a constituent must c-command any other item of the same constituent. In a rhyme without coda that hosts a long vowel [R[N[x x]]], the skeletal slot that assumes the function of the head of the domain c-commands the other slot of the long vowel. By contrast, in a structure like [R[[N [x x]]C[x]]] where a long vowel and a coda co-exist within the rhyme, the head slot fails to c-command the coda slot. Therefore, this kind of structure is ill-formed.

Kaye (1990b) advocates an analysis lacking codas where [VRT] sequences are analysed as /VRV$_{\text{empty}}$T/. By this means he is able to formulate a different generalisation that is descriptively equivalent to the former: long vowels are prohibited before an empty nucleus. In Kaye's framework, which lacks codas in the environment discussed but admits branching onsets, a "closed syllable" [[VR][T]] is any syllable "before an empty nucleus" [VRV$_{\text{empty}}$T]. Kaye thus moves from a syllable-based generalisation to one that capitalises on the existence of empty nuclei. However, this step is made at the cost of losing explanatory power: why should a long vowel be prohibited before an empty nucleus?

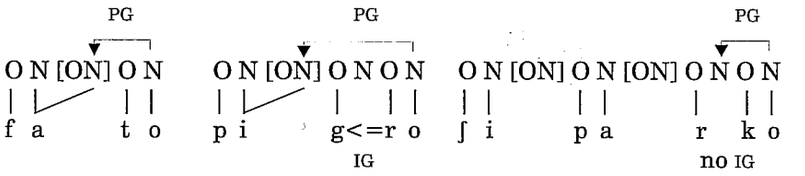
Larsen (1995), developing an idea contained in Yoshida (1993), proposes that the long vowels displayed in (23), (24) are left-headed objects. Being lexically short, they spread to the vocalic position on their right-hand side[22] iff this position is licensed by Proper Government.

[21] Long vowels in the paradigm shown occur only under stress. The phenomenon therefore is called Tonic Lengthening. As stress is irrelevant for the demonstration, it will not be considered. See Larsen (1995) for discussion.

[22] That is either lexically present or, as in the Italian case, provided by stress. In the figures below, [ON] indicates the syllabic material provided by stress.

(25)

a. *spreading onto a PGed position*



b. *failure to spread onto a position that is not subject to PG*

In (25a), the vowel can spread because the target is licensed by PG. The result is a long vowel. In contrast, in (25b), the potential target of the spreading is not properly governed. In fact, an [ON] sequence can only exist if it is segmentally interpreted or subject to PG. In (25b), neither of these is the case.[23] The virgin [CV] drops, and the resulting vowel is short. Note that this analysis crucially relies on three things: i. the existence of an empty nucleus within RT-clusters, ii. the existence of an IG within TR-clusters and iii. the impossibility for IG to hold within RT-clusters.[24]

Finally, let us examine the second case of laterally conditioned vowel length, that is, Compensatory Lengthening (17e). For various reasons such as diachronic loss in Latin (26a), the inability of a consonant to geminate in Tiberian Hebrew (26b) or the elision of a vowel in Chilungu (Bantu language, Zambia) (26c), the space occupied by an unrealised segment is recovered by an adjacent short vowel which is thereby lengthened.[25]

(26) a. *Latin*

*kasnus	→	kaanus	'gray'
*kosmis	→	koomis	'courteous'
*fideslia	→	fideelia	'pot'

[23] The absence of consonant-final native words in Italian indicates that final empty nuclei are not licensed in this language (Larsen 1995:111 on this point). Hence, the last nucleus of the representation assigned to [ʃi] 'ski' fails to be licensed. As a consequence, no spreading occurs, and the vowel remains short.

[24] In (25), nuclei are entitled to receive phonetic interpretation only if they are subject to PG. In the analysis of vowel – zero alternations previously discussed, lexically present segmental material is prohibited from associating when the nucleus at hand falls under PG. This contrastive behaviour of PG, sometimes allowing for, sometimes preventing the expression of the melody must be viewed as being due to the licensing it provides operating in two different ways. Although this point needs further examination, the contrast may stem from the fact that PG applies to empty nuclei in (25), whereas it targets lexically filled nuclei in vowel – zero alternations.

[25] See Wetzels and Sezer (1985) for a collection of phenomena corresponding to this description.

b. *Tiberian Hebrew*

ha	definite article
kəlaßim, rəqaħim	'dogs, spices'
ha kkəlaßim	'the dogs'
haa rəqaħim	'the spices'

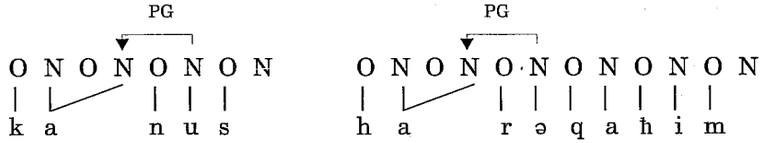
c. *Chilungu*[26]

/ma-tama/	→	matama	'cheeks'
/ka-koma/	→	kakoma	'one who kills'
/ma-ino/	→	miino	'eyes'
/ka-eleka/	→	keeleka	'one who cooks'

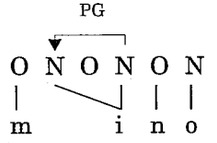
In (26a), the diachronic loss of preconsonantal [s] is followed by the lengthening of the preceding short vowel. In Tiberian Hebrew (26b), the first consonant of a root normally geminates when the definite article is added. However, gutturals and [r] may not geminate in this language. In cases of r-initial roots like √rqħ 'spice', the [a] of the definite article lengthens. In Chilungu (26c), the prefix-final vowel is elided before a root-initial vowel, which is then lengthened.

If Compensatory Lengthening is triggered by the non-realisation of a consonant, the preceding vowel may lengthen, whereas the following vowel never does. In all cases, the position the short vowel spreads on is properly governed.

(27) a. *left-to-right spreading: absence of a consonant*



b. *right-to-left spreading: absence of a vowel*

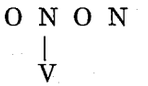


When discussing closed syllable shortening, an analysis was proposed whereby spreading could occur only if its target is licensed by PG. As can be seen, this condition on spreading is also respected in Compensatory Lengthening processes. Head-initial long vowels such as in (27a) need external support from a licensor to their right in order to spread. Head-final long vowels like in (27b) act as the licensor of the nucleus to their left themselves.

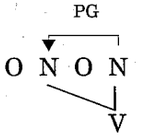
[26] Data from Bickmore (1995).

The following representations obtain for lexically long vowels vs. lexically short vowels that are lengthened by a phonological process.

(28) *lexical representation of alternating long vowels e.g. Italian*



non-alternating long vowels e.g. Somali



I propose that the spreading of alternating long vowels onto their complement is a phonological process conditioned by PG. In the case of head-final long vowels, this condition on spreading is always satisfied, while it depends on the context as far as head-initial structures are concerned. Note that alternating long vowels may be right- or left-headed, whereas the governing domain they depend on is always head-final. In contrast, non-alternating vowels are right-headed only. Their spreading onto the complement is lexically achieved and therefore not subject to any condition of a phonotactic nature. Vowel length related to space restrictions of a templatic nature, as illustrated in (20) and (22) is not phonotactically conditioned. It is dealt with by another device of the grammar.

5. Governing and licensing abilities

All through the preceding sections, objects of different phonological status were assumed to contract lateral relations with various kinds of constituents. For instance, it follows from the discussion that final unexpressed nuclei (FUN) are able to properly govern empty nuclei as in English /parøkN/, where the only possible reason for ø to remain inaudible is the PG coming from N. By contrast, FUN cannot properly govern lexically filled nuclei that are specified as possible targets for PG: in [CeCN] sequences where *e* is a possible PG-target such as Czech nom.sg. /pesN/ (gen.sg. [psa]), the properly governable vowel always surfaces.

The table below makes these tacitly assumed relations explicit. It summarises the different cases that can be distinguished in terms of different objects and lateral relations.

(29) *Illustration of the table:*

i. ability to govern lexically empty nuclei
   a. non-final unexpressed nuclei: NO. e.g. Moroccan Arabic /kø$_1$tø$_2$b-u/ 'they have written' surfaces as [kitøb-u]. The suffixal *-u* properly governs ø$_2$ which therefore remains inaudible. ø$_2$, in turn, is unable to govern ø$_1$ which surfaces.

b. FUN: YES. e.g. English *par*ϕ_1*k*ϕ_2 where the only possible reason for ϕ_1 to remain inaudible is the PG from the final unexpressed nucleus ϕ_2.
c. expressed nuclei: YES. e.g. Italian /parøko/ *parco* 'park' where *-o* properly governs ϕ.

ii. ability to license consonant clusters
a. non-final unexpressed nuclei: NO. The impossibility of #RTV clusters is accounted for by the fact that R in #RøTV fails to be licensed by ϕ, whereas it receives licensing from V in #TøRV.
b. FUN: YES(?). Possibly French /katøχN/ [katχ] *quatre* 'four' where N licenses [χ] so that a domain of IG is established that precludes ϕ from surfacing. However, ϕ could also remain unexpressed by virtue of the PG coming from N. I am not aware of any evidence that could decide between these two options.
c. expressed nuclei: YES. e.g. Italian /piNgøro/ [piigro] where the inaudibility of ϕ must be due to its enclosure within an IG domain. It cannot be a consequence of PG since *-o* already properly governs N. Hence, *-o* simultaneously properly governs N and licenses the consonantal domain /gør/.

iii. ability to properly govern lexically filled nuclei that are marked as possible targets for PG
a. non-final unexpressed nuclei: NO. e.g. Czech [ʃɛf] vs. [ʃøv-ɛt͡s] vs. [ʃɛf-øt͡s-ɛ] *šev* 'seam, nom. sg.', *šøv-ec* 'shoemaker', *šev-øc-e* 'shoemaker, gen. sg.'. In /šev-øc-e/, the inflectional ending *-e* properly governs ϕ, whose underlying identity is /e/, as witnessed by /šøv-**ec**/. Being subject to PG, ϕ cannot properly govern the first /-e-/, which therefore appears as such on the surface.
b. FUN: NO. e.g. Czech /pesN/ [pɛs] *pes* 'dog, nom. sg.'. N cannot properly govern the lexically present /e/ which remains stable. The alternating character of /e/ is evidenced by the gen. sg. form /pøs-a/.
c. expressed nuclei: YES. See the formerly discussed /pøs-a/ 'dog, gen. sg.'.

	can properly govern lexically empty nuclei	can license consonant clusters	can properly govern lexically filled nuclei specified as PG targets
non-final unexpressed nuclei (reason for phonetic absence: PG or IG)	NO	NO	**NO**
FUN (reason: parametric licensing)	YES	YES(?)	**NO**
expressed nuclei	YES	YES	YES

6. Conclusion

In this article, a number of consequences ensuing from the assumption of a strict CVCV syllable structure have been explored. Firstly, the interplay of Proper Government and domains of consonantal interaction has been considered. If CVCV is adopted because of its advantages when accounting for vowel – zero alternations, domains of consonantal interaction are to be viewed as head-final only. That is, for any C_1C_2-cluster, either C_2 governs C_1 (TR clusters that were classically viewed as branching onsets), or both consonants do not interact (RT clusters).

Secondly, a number of questions regarding the representation of long vowels in a CVCV framework have been addressed. It has been shown how the phenomenon that is classically referred to as closed syllable shortening can be accounted for when assuming CVCV. A proposal was made to the effect that long vowels that alternate in length are lexically short, their length being the result of a phonotactically conditioned process that depends on PG. On the other hand, non-alternating long vowels are head-final. Their length is lexical.

Finally, the governing and licensing abilities of the different phonological categories present in the CVCV framework were made explicit.

The overall result of this paper may be summed up as follows: within a CVCV framework with Infrasegmental Government, governing domains of any kind can be viewed as head-final only. Stipulations regarding directionality and locality of government can be dispensed with.

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