Vowel-zero Alternations in Czech Double Diminutives: From the *Havlík* Pattern to the *Lower* Pattern

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1. Introduction

V(owel)-zero alternations have become the most studied phenomenon in Slavic generative phonology; see Scheer (2004a) for an overview. The reason why I return to this topic is the fact that the generative literature has studied only one pattern of V-zero alternations, known as *Lower*. In languages that follow the *Lower* pattern, when several alternation sites occur in a row, strong alternants (i.e. vowels) are always preceded by strong alternants. However, there is yet another pattern, called *Havlík* below, where strong alternants are always preceded by weak alternants (zeros).[1] Hence the Lower-Havlík variation presents a challenge for any phonological theory.

In this paper I develop an analysis of the Lower-Havlík variation based on the following assumptions. 1. Alternation sites, where vowels alternate with zero, are unique phonological objects: they are *lexically floating segments* whose phonetic realization is controlled by so-called *government***.** 2. Government is a lateral, regressive relation between two neighbouring syllabic nuclei: those nuclei with floating segments that are governed have no phonetic realization. 3. The Lower-Havlík variation is a consequence of *derivation by phase*: in the *Havlík* pattern floating segments in a row are derived in one single phase while in the *Lower* pattern they are derived in different phases.

I focus on double diminutives derived by the suffix *-ek*, which in Old Czech (OCz) followed the *Havlík* pattern, but in Modern Czech (MoCz) follow the *Lower* pattern. However, the analysis of the Lower-Havlík variation presented ambitions to have more general validity. First, it predicts that *Havlík* and *Lower* are the only patterns of V-zero alternations that can appear in natural language. Second, it predicts that the *Havlík* pattern can occur in both mono- and poly-morphemic words, while the *Lower* pattern is restricted to polymorphemic structures. And last but not least, the proposed model is consistent with the current minimalist model that assumes phase-based spell-out of morphosyntatic structure.

2. Double diminutives in Modern and Old Czech

2.1 The Lower vs. the Havlík pattern

Simple (masculine) diminutives are derived by two suffixes in MoCz: *-ek* and *-ík*. Table (1) illustrates that the initial vowel of the former suffix alternates with zero (*ø*), while the initial vowel of the latter does not. Examples also show that strong alternants (vowels) appear before zero suffixes (here, the NomSg marker), while weak alternants (zeros) are found before vowel-initial suffixes (here, the adjective suffix *-ov*).

(1)

	-ek	-ík	gloss
_C-Ø	dom-**e**k-Ø	kol-**í**k-Ø	√house/pole-dim.-NomSg
_C-V	dom-**ø**k-ov-ý	kol-**í**k-ov-ý	√house/pole-dim.-adj.-NomSgMasc

[1] I call this second pattern the *Havlík* pattern after the Czech linguist Antonín Havlík who described it a century ago; cf. Havlík (1889).

These simple diminutives serve as bases for the derivation of double diminutives, which are formed by adding another copy of the suffix *-ek*. Table (2) shows that when the suffix *-ek* is attached to simple diminutives in *-ík*, nothing interesting happens. But if it is attached to simple diminutives in *-ek*, two alternation sites occur in a row. In this case the strong alternant in the first diminutive suffix emerges despite the fact that it is followed by a vowel-initial suffix (i.e. the second diminutive suffix which also shows the strong alternant).[2]

(2)

-ek-ek	-ík-ek	gloss
dom-**e**č-**e**k-Ø	kol-**í**č-**e**k-Ø	√house/pole-dim.-dim.-NomSg
dom-**e**č-**ø**k-ov-ý	kol-**í**č-**ø**k-ov-ý	√house/pole-dim.-dim.-adj.- NomSgMasc

To sum up, the behaviour of the diminutive suffix *-ek* illustrated in tables (1) and (2) indicates that the distribution of V-zero alternants before vowel-initial suffixes is sensitive to whether or not suffix-initial vowels alternate with zero. The initial *o* of the adjective suffix *-ov* does not alternate with zero and does not cause vocalization of the preceding alternation site (the same holds true for the diminutive *-ík*), while the initial vowel of the diminutive suffix *-ek* alternates with zero and causes vocalization of the preceding alternation site.

As a matter of fact, the behaviour of the suffix *-ek* has evolved since Old Czech. As table (3) illustrates, in OCz strong and weak alternants in double diminutives were in complementary distribution: the first diminutive suffix displayed either the strong or the weak alternant depending on which alternant occurred in the second suffix; see e.g. Gebauer (1963:163) or Lamprecht et al. (1986:47).

(3)

Modern Czech	dom-**e**č-**e**k	dom-**e**č-**ø**k-ov-ý
Old Czech	dom-**ø**č-**e**k	dom-**e**č-**ø**k-ov-ý

MoCz and OCz double diminutives which are the result of the recursive concatenation of the suffix *-ek* hence illustrate two different patterns of V-zero alternations: the *Lower* pattern (*dom**e**č**e**k*) and the *Havlík* pattern (*dom**ø**č**e**k*). The aim of my paper is to show that this diachronic evolution, i.e. the Havlík-to-Lower change, is a consequence of the fact that the diminutive suffix *-ek* has become a phase-triggering morpheme, a status that it did not have in Old Czech.

2.2 The Havlík-to-Lower *change is fully productive*

Czech diachronic grammars approach the Havlík-to-Lower change in double diminutives in terms of paradigm analogy. For example Gebauer (1963:163), Komárek (1982:26) and Lamprecht et al. (1986:47) claim that the first suffix in the NomSg of double diminutives vocalizes diachronically due to the other paradigm forms. However, in what follows I show that the explanation of the Havlík-to-Lower change via analogy fails.[3]

First, provided that the change of the NomSg form is really motivated by the alignment of the paradigm forms, the NomSg should end in the string *ečk* instead of *eček* because the

[2] The diminutive suffixes also trigger velar palatalization (e.g. *k* → *č* ([t͡ʃ])), a process that does not bear on the argument and is left uncommented below.

[3] Moreover, these grammars say nothing about the timeline of the alleged analogy-driven evolution. Space limitations preclude detailed discussion of this problem, but my research based on the corpus of various texts indicates that the Havlík-to-Lower change was completed in the 2nd half of the 17th century; see the appendix.

Gen/Dat/LocSg form is *domečku*, the InsSg form is *domečkem* etc. Hence the given phonological string in the NomSg is still different from the rest of paradigm forms.[4]

The second argument against analogy concerns the direction of the change in question. Table (4) illustrates that diachronic grammars not only consider the Havlík-to-Lower change (C*ø*C-*e*C > C*e*C-*e*C) to be a consequence of analogy, but also other changes in the distribution of V-zero alternants.[5]

(4)

paradigm majority wins	paradigm minority (i.e. the default form) wins
dom-**ø**č-ek > dom-**e**č-ek	m**ø**ch-u > m**e**ch-u (NomSg m**e**ch)
	b**ø**z-u > b**e**z-u (NomSg b**e**z)
ji**l**em > ji**l**øm (GenSg ji**l**øm-u)	d**ø**ch-u > d**e**ch-u (NomSg d**e**ch)

In the left column, the NomSg form adapts to the most common form in other paradigm cells. This adaptation proceeds in two ways: the vowel replaces the original weak alternant (e.g. NomSg *dom**e**ček* < *dom**ø**ček* because GenSg is *dom**e**čk-u,* NomPl is *dom**e**čk-y* and so on), but also *vice versa*, i.e. the weak alternant appears instead of the original vowel (e.g. NomSg *ji**l**øm* < *ji**l**em* because GenSg is *ji**l**øm-u,* NomPl is *ji**l**øm-y* and so on). However, examples in the right column illustrate a different situation: the NomSg, as the default paradigm form, causes the rest of the case forms to vocalize (e.g. GenSg *m**e**ch-u* < *m**ø**ch-u,* NomPl *m**e**ch-y* < *m**ø**ch-y* and so on because NomSg is *m**e**ch*). In sum, diachronic grammars uniformly treat as analogy two antagonistic types of the change in the distribution of V-zero alternants: 1. the influence of the majority, 2. the influence of the minority, i.e. the default paradigm form.

The third argument against analogy concerns the productivity of the Havlík-to-Lower change. Table (5) illustrates the contrast between the regularity of the change in the distribution of V-zero alternants in double diminutives and changes in the behaviour of single alternation sites, which are irregular. That is, in the same phonological context an alternating vowel has sometimes become non-alternating (examples in the left column), but at other times has remained alternating (examples in the right column), and this cannot be predicted.[6]

(5)

	loss of an alternation site	no change
T_T	b**ø**z-u > b**e**z-u	p**ø**s-a, p**e**s
T_R	hem**ø**z-a > hm**e**z-a (nč. hmyz)	koz**ø**l-a, koz**e**l
R_T	m**ø**ch-u > m**e**ch-u	r**ø**t-u, r**e**t
R_R	ji**l**em > ji**l**øm	l**e**n, l**ø**n-u

To sum up, the fact that the change in the distribution of V-zero alternants in double diminutives proceeded in one direction only (C*ø*C-*e*C > C*e*C-*e*C) and was fully productive is strong evidence against an analogical scenario.

[4] The point could be made that the NomSg cannot be fully analogous because a heavy consonant cluster *čk* [t͡ʃk], i.e. **domečk*, would emerge. But this argument fails: in Czech, there is no phonotactic constraint against affricate-stop clusters; see e.g. *zmáčk* [t͡ʃk] ('push', truncated *l*-participle), *zácp* [t͡sp], *poct* [t͡st] ('congestion', 'honour', both GenPl), *jedenáct* [t͡st] ('eleven').

[5] Glosses: house, double dim.; moss; lilac; elm; breath.

[6] In table (5), T and R stand for any obstruent and any sonorant, respectively. Glosses: lilac, GenSg; dog, GenSg, NomSg; insect, GenSg; goat, GenSg, NomSg; moss, GenSg; lip, GenSg, NomSg; elm, NomSg; flax, NomSg, GenSg.

2.3 Morphology of simple and double diminutives

In this section I argue that the Havlík-to-Lower change in double diminutives is related to the fact that the two alternation sites that they contain are always heteromorphemic.

Generally, two alternation sites in a row in diminutives may be produced by two means: 1. by recursive application of the diminutive suffix *-ek* to a stem whose last vowel does not alternate (e.g. *dům* > *dom-**e**k* > *dom-**e**č-**e**k*); 2. by concatenating one single suffix *-ek* to a stem whose last vowel, which belongs either to the root or to the non-diminutive suffix, alternates with zero (e.g. *moz**e**k* > *moz**e**č-**e**k* 'brain', *pitom-**e**c* > *pitom-**e**č-**e**k* 'idiot').[7]

Synchronic grammars of Czech, e.g. *Mluvnice češtiny* (1986:302) or Karlík et al. (1995:127), however, analyze the structure of true double diminutives of the *domeček* type in a different way. While diminutives *mozeček* and *pitomeček* are produced as before, i.e. by the concatenation of the suffix *-ek* (these are called *simple* diminutives, SD), true *double* diminutives (DD) of the *domeček* type are derived by the suffix *-eček*, i.e. a single and morphologically non-complex lexical item. From this it follows that in the latter case, the *eček* string is not a result of recursive concatenation of the suffix *-ek*, so there is no reason to suppose that its first *e* occurs in any alternation site. In what follows I argue that the analysis assuming two independent diminutive suffixes, *-ek* and *-eček*, which both merge with non-diminutive bases (i.e. SD: *dům* > *dom-ek*, DD: *dům* > *dom-eček*), misses at least three independent generalizations about how diminutives are derived.

First, the form of DD is predictable from the form of SD. As was mentioned, SDs may be derived by two distinct diminutive suffixes: *-ek* and *-ík*. Table (6) illustrates that SDs in *ek* have DD pendants in *eček* and similarly SDs in *ík* have DD pendants in *íček*.

(6)

	simple diminutive	double diminutive	gloss
ek : eček	rukáv-ek, zvon-ek	rukáv-eč-ek, zvon-eč-ek	sleeve, bell
ík : íček	dort-ík, sokl-ík	dort-íč-ek, sokl-íč-ek	cake, socle

If *-eček* and *-íček* were independent morphemes, then alongside with pairs such as *ek* : *eček* and *ík* : *íček*, pairs of the kind *ek* : *íček* and *ík* : *eček* should exist. Such mixed diminutive pairs really occur (e.g. SD: *kous-ek*, DD: *kous-íček* 'piece'), but they are entirely unproductive.

Second, the bi-suffixal analysis disregards the fact that DDs in *eček* behave phonologically the same way as their simple pendants in *ek*. As examples in table (7) show, root vowels lengthen both in SDs and DDs.

(7)

non-dim. base: V	simple dim.: VV	double dim.: VV	gloss
d**a**r, kl**i**d	d**á**r-ek, kl**í**d-ek	d**á**r-eč-ek, kl**í**d-eč-ek	gift, rest
z**u**b, č**e**p	z**ou**b-ek, č**í**p-ek	z**ou**b-eč-ek, č**í**p-eč-ek	tooth, pin

Vowel lengthening in diminutives is discussed in Scheer (2004b), who shows that simple masculine diminutives represent a templatic category. According to this analysis the masculine diminutive template is made of three morae (short vowels and syllabic consonants weigh one mora, long vowels or diphthongs weigh two morae). The three-moraic template is the reason why root vowels lengthen before the suffix *-ek*: this suffix weighs one mora hence the root must weigh two morae to meet the three-moraic constraint. The fact that root vowels in DDs in *eček* lengthen just like root vowels in their simple pendants in *ek* indicates that only

[7] It should be noted that not all *e*'s of diminutives in *eček* always alternate. For example, in SDs like *bifteč-ek* 'beefsteak', *obleč-ek* 'clothes' or *šneč-ek* 'snail' the first *e*, which belongs to the root, is a stable vowel that does not alternate with zero (as evidenced, for example, by the GenSg forms *biftek-u*, *oblek-u* and *šnek-a*).

the first *e* in *ečk* counts into the three-moraic template. From this it follows that the template is restricted only to SDs which serve as bases for the derivation of DDs; see the derivation in (8) bellow.

(8)	e*k* concatenation	templatic lengthening (3m)	e*k* concatenation	double dim.
	dar + ek →	d**á**rek →	dárek + ek →	dáreček
		2 1		

The third argument against treating *ečk* as a mono-morphemic string concerns the vocalization of alternation sites. We have already observed that vocalization takes place only before those vowel-initial suffixes whose vowels alternate with zero. In roots like √neh*e*t 'nail' or √lok*e*t 'elbow', the last vowel alternates with zero, as evidenced by the NomSg and NomPl forms: *neh**e**t, neh**ø**t-y* and *lok**e**t, lok**ø**t-y*. The fact the root alternation site is vocalized in both SDs in *ek* and DDs in *ečk* (the root alternating *e* further undergoes the templatic lengthening *e* > *ý* [i:]), i.e. *neh**ý**t-ek*, *neh**ý**t-ečk* and *lok**ý**t-ek*, *lok**ý**t-ečk*, indicates that both initial *e*'s in *ek* and *ečk* as well must represent alternating vowels.

To sum up, both *e*'s in the double diminutive string *ečk* are alternating vowels which belong to two separate morphemes. In what follows I focus on why this double diminutive string in OCz followed the *Havlík* pattern (*dom**ø**č**e**k*), while in MoCz it follows the *Lower* pattern (*dom**e**č**e**k*).

3. Analyses of Slavic V-zero alternations: abstract vowels or empty nuclei

In this section I briefly discuss two approaches to the representation of Slavic V-zero alternations that are found in the generative literature, both assuming that alternating and stable vowels differ lexically, but are phonetically identical.[8]

3.1 Abstract vowels

In the first model, alternation sites are represented as *abstract vowels* whose phonetic realization is conditioned by a modification of their underlying structure. Two groups of analyses may be identified: linear and autosegmental.

In the linear analyses, since Lightner (1965), alternating and stable vowels differ segmentally. These analyses follow the Slavic philological tradition and label vowels which alternate with zero in modern Slavic languages the *yers*. They assume that these modern yers have the same segmental features as their Proto-Slavic ancestors: they are defined as [+high,-tense] vowels. In the autosegmental analyses, since Rubach (1986), alternating vowels differ from their stable counterparts in the way they communicate with the skeleton: alternating and stable vowels have the same segmental makeup, but the former are lexically floating segments, i.e. segments which are not associated with the skeleton in the lexicon. Stable vowels, on the other hand, are lexically associated. Both types of analyses in question agree that these abstract vowels (yers/floating segments) are realized phonetically iff another yer/floating segment follows them.

In the linear analyses, yers followed by yers change their segmental features: (9) shows that this change (called *Lower*) consists in lowering of high lax vowels.

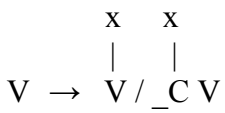
[8] All analyses of Slavic V-zero alternations mentioned in this section are discussed at greater length in Ziková (2008).

(9) Linear Lower rule (Lightner 1965)

[+high,-tense] → [-high] /_C_0 [+high,-tense]

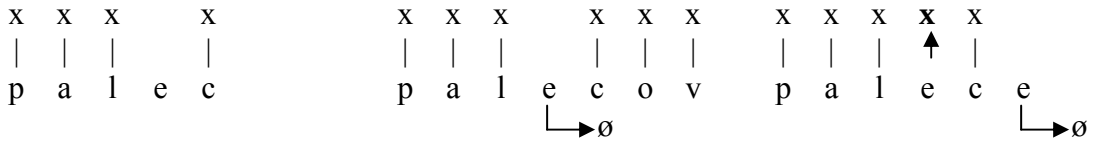
In the autosegmental analyses, floating segments followed by floating segments attach to the skeleton and therefore are phonetically realized:

(10) Autosegmental Lower rule (Kenstowicz & Rubach 1987)



Under (11) I show how rule (10), which vocalizes floating segments, works. Figure (11) represents the root √pal*e*c 'thumb' whose last vowel alternates with zero and thus possesses a floating *e*. Figure (11) illustrates its merge with the adjective suffix *-ov*: rule (10) does not apply because the suffix-initial *o* is not a floating vowel; remaining unassociated to the skeleton, the root-internal floating *e* is deleted and the form *palcov(ý)* is derived. Figure (11) represents the NomSg form *palec* which is derived by the zero case marker. Provided that floating vowels vocalize iff another floating vowel follows, the phonological identity of all zero case markers must be a floating vowel itself because in the context of zero case markers alternation sites always vocalize.

(11) a. √pal*e*c b. paløc-ov(ý) (adj.) c. palec (NomSg)



3.2 Empty nuclei

Not all autosegmental analyses of V-zero alternations work with abstract vowels. In *Government Phonology* (henceforth standard GP) the lexical identity of alternation sites are empty nuclei where particular vowels are inserted; see e.g. Gussmann & Kaye (1993) or Kaye (1995), where Polish examples are analyzed.

As the analyses presented in the preceding section, the standard GP analysis assumes that alternation sites are vocalized iff phonological objects of the same type follow them: empty nuclei are filled with epenthetic vowels iff they are followed by another empty nucleus. In standard GP, vocalization of alternation sites depends on *government*, a lateral, regressive relation between two nuclei: empty nuclei which are governed by a following full nucleus are not realized phonetically; they receive an epenthetic vowel in case the following nucleus is empty and therefore cannot govern them.

Figures in (12) illustrate how government works. In (12), the alternation site within the final consonant cluster of the root √pal*e*c is represented as an empty nucleus.[9] In (12), I show the structure of the adjective derived by the suffix *-ov*. The root-internal empty nucleus is not

[9] Another empty nucleus occurs after the root-final consonant. Assuming that all morpheme-final consonants are in fact onsets of empty nuclei makes standard GP distinct from other autosegmental theories; see Kaye (1990) for relevant arguments.

realized phonetically because it is governed by the following nucleus, which hosts the adjective vowel *o*. In (12), the root is merged with the zero NomSg marker: the alternation site, i.e. the root-internal empty nucleus, is now followed by an empty nucleus; it is ungoverned and therefore subject to epenthesis.

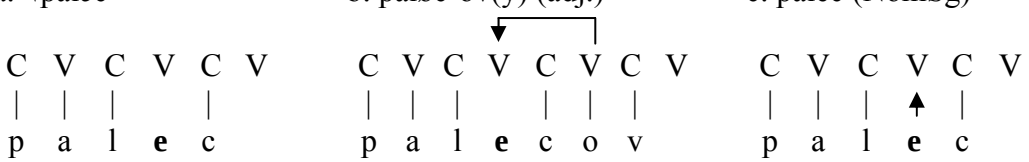
(12) a. √pal*e*c b. paløc-ov(ý) (adj.) c. palec (NomSg)

4. Two types of floating segments

A problem of autosegmental analyses of V-zero alternations presented in the previous section is the fact that although alternation sites display a unique phonological behaviour they do not have a unique phonological representation: all V-zero alternation sites are lexically represented as floating segments/empty nuclei, but not every floating segment/empty nucleus represents an alternation site; for example, neither the word-final floating segment in (11) nor the word-final empty nucleus in (12) display any alternation.[10]

An alternative analysis of V-zero alternations, which is a combination of these two autosegmental models, is proposed by Scheer (2004a): alternation sites are lexically floating segments whose phonetic realization depends on government. Scheer's model is illustrated in (13). In (13), the floating *e* within the root √pal*e*c is governed by the following nucleus that hosts the adjective vowel *o*, hence it does not realize phonetically; in (13), it is not governed by the final empty nucleus and therefore vocalizes.

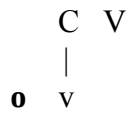
(13) a. √pal*e*c b. paløc-ov(ý) (adj.) c. palec (NomSg)



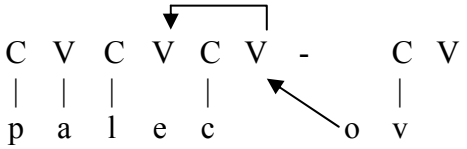
If figure (13) is the correct representation of the adjective *paløc-ov(ý)*, then the vowel *o* situated on the left periphery of the adjective suffix *-ov* must be lexically floating as under (14). As figure (14) shows, this suffix-initial floating vowel associates to the root-final empty nucleus and thereby creates a good governor of the preceding root nucleus whose melody floats.

[10] Also final affricate-stop clusters present a problem for the epenthesis-based scenario. In standard GP, these clusters uniformly represent two independent onsets separated by an empty nucleus. However, in Czech, this nucleus does not behave uniformly: sometimes it hosts epenthetic vowels (e.g. the empty nucleus in the double diminutive *domeček*), sometimes it does not (e.g. the empty nucleus in the GenPl *poct*); see also footnote 2. Therefore in the model where alternation sites are represented as empty nuclei, there is no possibility to predict which affricate-stop cluster will behave which way. Another argument against the epenthesis-based analysis are Slavic languages with several alternating vowels; see Scheer (2004a:515). The fact that their quality is not predictable indicates that the alternating vowels must be present in the lexicon; cf. Slovak *tuc**e**t* ('dozen', GenSg *tuc**ø**t-a*) and *oc**o**t* ('vinegar', GenSg *oc**ø**t-u*) where the same affricate-stop cluster *ct* hosts either *e* or *o*.

(14) a. -ov



b. paløc-ov

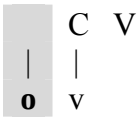


From what has been said it follows that stable vowels have different lexical representations depending on their position in morphological structure: suffix-initial stable vowels are lexically floating segments (e.g. the *o* in the adjective suffix *-ov*), while stable vowels in all other positions are lexically associated to their nuclei (e.g. the *a* in the root √pal*e*c).

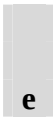
The assumption that floating vowels represent either stable vowels or vowels that alternate with zero seems to be conflicting with the claim that alternation sites should have a unique lexical representation. A solution of this problem is proposed in Ziková (2008).

In Ziková (2008), I distinguish between alternating and stable floating vowels: the former are controlled by government, the latter are not. That is, stable, but not alternating floating vowels associate automatically to the final empty nucleus of the preceding morpheme no matter whether this nucleus is governed or not (see the behaviour of the adjective *o* in (14)). By contrast, alternating floating vowels associate only to ungoverned nuclei. This contrast must be encoded in the lexical representation of the suffixes, and I propose the following way to do that: stable floating vowels do not look at whether or not their target nucleus is governed because they are lexically supplied with their own association line that makes sure that they can connect to any empty nucleus (see (15)); by contrast, alternating floating vowels lack this association line (see (15)).

(15) a. -ov: stable *o*



b. -ek: alternating *e*



The following section returns to double diminutives and the diachronic perspective that they provide on the Lower-Havlík variation.

5. Phase-based derivation of chains of alternation sites

It has been already mentioned that the generative literature on Slavic (Rubach (1984) is an exception; see section 6 below) only considers the *Lower* pattern (when strong alternants are preceded by strong alternants). Moreover, to derive it either by the *Lower* rule or by government, autosegmental analyses make an additional assumption that chains of alternation sites are derived in different phonological phases.[11]

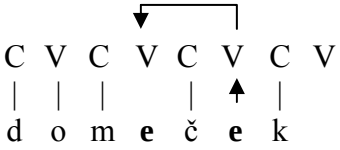
In what follows I argue that the change in the distribution of V-zero alternations in double diminutives consists in a change of the properties of the lexicon: in MoCz, but not in OCz the suffix *-ek* is lexically specified as a phase-triggering lexical item.

[11] Cyclic derivation (today derivation by phase) plays a key role in generative phonology since its inception in the 1960s; see Ziková (2008) or Scheer (2009) for a historical overview of this issue.

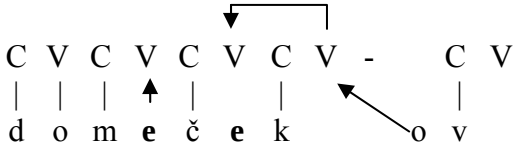
5.1 The Lower pattern: alternation sites are separated by empty nuclei

Figures in (16) illustrate that government automatically derives the *Havlík* pattern (*domøček*): if there are two alternating floating vowels in a row either the first or the second vocalizes depending on government. In (16), the structure of the OCz NomSg form *domøček* is shown: the floating *e* of the second diminutive suffix associates to the skeleton because it is not governed by the following word-final empty nucleus; this newly created full nucleus then governs the floating *e* of the first diminutive suffix and thus inhibits it from pronouncing. In (16), the second diminutive suffix is followed by the adjective suffix *-ov* whose initial floating vowel *o* is lexically provided with an association line which automatically associates it to the empty nucleus in the end of the second diminutive suffix; this newly created full nucleus governs the floating *e* of the second diminutive suffix. Because governed nuclei cannot govern, the floating *e* of the first diminutive suffix is not goverened and associates to the root-final empty nucleus.

(16) a. dom-øč-ek (NomSg)



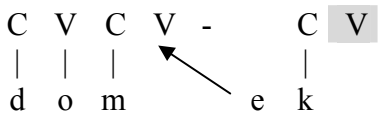
b. dom-eč-øk-ov(ý) (adj.)



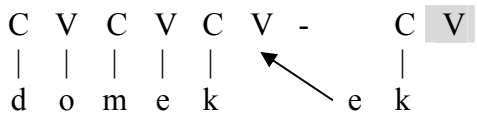
Now let us look at the *Lower* pattern (*domeček*) where the alternating vowel of the first diminutive suffix is insensitive to the behaviour of the alternating vowel of the second diminutive suffix: it *always* vocalizes. If it is true that alternating floating vowels vocalize iff they are not governed, then the alternating floating vowel of the first diminutive suffix, or more precisely, the final nucleus of the preceding morpheme which hosts it, must be *always* ungoverned. The fact that the floating *e* of the first diminutive suffix in *domeček* is not governed even if it is followed by the full nucleus, associated to the initial *e* of the second diminutive suffix, indicates that both diminutive suffixes must be derived in different phonological phases: at the phase when the first diminutive suffix is computed, the second suffix is not present; that is, the first floating *e* is followed by the empty nucleus.

The phase-based derivation of the NomSg *domeček* is illustrated in (17). In phase 1, the structure of the first diminutive suffix *-ek* is derived: the suffix-initial floating *e* is followed by the suffix-final empty nucleus, it is not governed and therefore associates to the root-final empty nucleus. The second diminutive suffix is derived along the same procedure in phase 2. Note that the concatenation of the second *-ek* has no influence on the vocalization of the *e* of the first *-ek* since this *e* is a stable associated vowel by the time the string is computed in phase 2.

(17) phase 1: √dom + ek



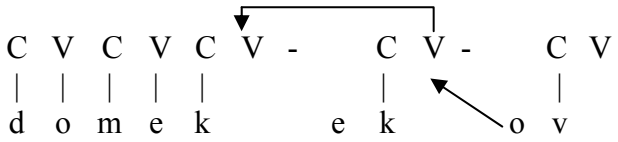
phase 2: domek + ek



Finally, figure (18) illustrates the phase-based derivation of the adjective *domečøkov(ý)*. The fact that the floating *e* of the second diminutive suffix is not realized phonetically indicates that the root-final nucleus is governed by the initial vowel of the adjective suffix *-ov*. From this it follows that the suffix *-ov* must be derived in the same phase as the second diminutive suffix: being a stable floating vowel, the initial vowel of the suffix *-ov* automatically

associates to the empty nucleus at the end of the second diminutive suffix and therefore is a good governor for the root-final empty nucleus, to which the initial vowel of the diminutive suffix *-ek* therefore can not associate (recall that it is sensitive to whether its target is governed or not).

(18) phase 2: domek + ek + ov



To sum up, the crucial difference between OCz double diminutives, which follow the *Havlík* pattern, and their MoCz counterparts, which follow the *Lower* pattern, is the fact that in MoCz the morphosyntactic boundary of the diminutive suffixes is visible to phonology: in the former, alternating floating vowels really occur in a row, i.e. they occupy neighbouring nuclei which are derived in one single phase, but in the *Lower* pattern alternating floating vowels are separated by phase boundaries.

5.2 The diminutive -ek *as a phase-trigger*

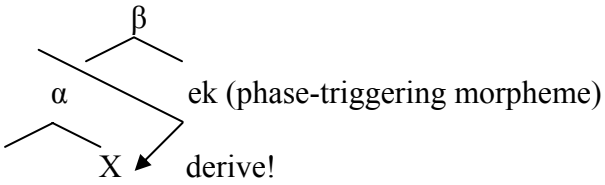
A question logically arises: how does phonology know that a given morphosyntactic boundary is simultaneously a phase boundary?

There are two logical posibilities where phonological phases may come from: 1. from the morphosyntactic tree, 2. from the lexical representation of given morphemes. Both options are found in literature. The former option is advocated e.g. in Marvin (2002), which assumes that every little *v, n, a* phrase triggers phonological (and semantic) interpretation. The latter option is maintained e.g. by Halle & Vergnaud (1987), which distiguish two types of affixes: phase-triggering and phase-neutral (in their terms *cyclic* and *non-cyclic*). Which of them is more suitable for our double diminutives?

Let us first examine the posibility that phonological phases are encoded directly in the morphosyntactic tree. If the *Lower*, but not the *Havlík* pattern has internal phase boundaries, MoCz and OCz double diminutives must be represented by different morphosyntactic trees. The problem is that this argumentation is circular: other than the Havlík-Lower variation, there is no evidence that OCz and MoCz double diminutives differ morphosyntactically (both MoCz and OCz diminutives are formed by the same suffix combinations, both inherit the gender from their bases and so on).

From this it follows that the phase-trigger is the diminutive suffix *-ek* as such: in MoCz as well as in OCz it is lexically specified for identical morphosyntactic features, but only in MoCz it is also defined as a phase-trigger, in OCz the same suffix *-ek* was phase-neutral. What it exactly means to be a "phase-trigger" is illustrated in (19): the insertion of such a lexical item into the appropriate morphosyntactic node triggers the phonological interpretation of its sister node and crucially not of its mother as Halle & Vergnaud's (1987) analysis assumes.

(19)



Furthermore, the "spell-out your sister mechanism" illustrated in (19) also corresponds to Chomsky's (2001) derivation by phase: in case that XP contains a phase head, then only its complement is spelt out in the XP phase, its edge, i.e. the head itself and the specifier, will be interpreted in the next phase; cf. Scheer (2008).

6. A note on directionality in phonology: *Rubach (1984)*

As has been said, the Slavic generative literature typically considers only the *Lower* pattern of V-zero alternations which is found in modern Slavic languages; an exception is Rubach (1984).

Also Rubach's analysis assumes that the *Lower* pattern has internal phases, but the *Havlík* pattern has not. However, there is a crucial difference between Rubach's phase-based analysis of the Havlík-Lower variation and the analysis proposed in this paper concerning the source of the phasehood.

In Rubach's analysis, which is done within the *Lexical Phonology* framework, the phasehood is not enconded in the lexicon, but in the phonology: he does not distinguish phase-triggering and phase-neutral morphemes, but phase-based and non-phase-based phonological rules (he calls them *cyclic* and *non-cyclic* rules). From this point of view the diachronic change from the *Havlík* to the *Lower* pattern (which is attested in the evolution of Polish as well) is a change in the phonology: the *Lower* rule, which controls vocalization of yers, was non-cyclic (i.e. in the non-cyclic phonological component) and has become cyclic (i.e. moved into the cyclic component).

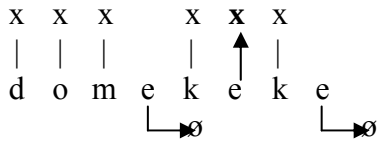
Cyclic and non-cyclic application of the autosegmental version of *Lower* rule (10) is demonstrated in tables (20) and (21). Figure (20) illustrates cyclic application of the *Lower* rule to the NomSg of the double diminutive which results in the *Lower* pattern (*domeček*). Provided that the phonological identity of zero case markers is the floating vowel (*v*), the structure of the NomSg of the double diminutive *domeček* will be derived in four phases: [[[[dom$_1$]*v*k$_2$]*v*k$_3$]*v*$_4$]. In phases 1 and 2, the root phase [dom] and the simple diminutive phase [dom*v*k], the structural description of the *Lowe*r rule is not met (there is no floating vowel after the first diminutive suffix in phase 2), therefore I do not display them. In phases 3 (the double diminutive phase [dom*e*k*v*k]) and 4 (the case marker phase [dom*e*k*e*k*v*]), the *Lower* rule is successively applied to both floating diminutive vowels. Finally, at the end of the derivation, the floating vowel of the NomSg marker is deleted.

(20) a. phase 3: [dom*e*k*v*k] b. phase 4: [dom*e*k*e*k*v*]

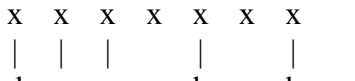
Figures in (21) show that non-cyclic application of the *Lower* to the same morphological string will result in the *Havlík* pattern iff the derivation proceeds from its right margin, i.e. from the case marking floating vowel via the floating vowel of the second diminutive suffix to the floating vowel of the first diminutive suffix. In (21), the case marking floating vowel is computed first; the *Lower* rule is not applied to it because its structural description is not met. Derivation moves on to the floating vowel of the second diminutive suffix; it occurs in the context of the case marking floating vowel therefore it vocalizes. Finally, the third floating vowel in a row, the floating vowel of the first diminutive suffix, is computed; the *Lower* rule is not applied on it because the floating vowel of the second suffix has been already vocalized.

Figure (21) illustrates that if the *Lower* rule was applied non-cyclically, i.e. to one single domain, but from its left margin, the *Lower* pattern would be derived. First, the floating vowel of the first diminutive suffix is computed; being followed by the floating vowel of the second diminutive suffix, the *Lower* rule is applied to it. And the rule is applied to the floating vowel of the second diminutive suffix as well because it is also followed by another floating vowel, the floating vowel which marks the NomSg.

(21) a. right-to-left application of *Lower* to [dom*v*k*v*k*v*]: the *Havlík* pattern



b. left-to-right application of *Lower* to [dom*v*k*v*k*v*]: the *Lower* pattern



From what has been said it follows that in Rubach's model, the term *cyclicity* refers to two distinct aspects of how phonology processes morphological structure. First, *to be non-cyclic* means *to be unable to track morphology*: non-cyclic rules are applied to a domain that is not morphologically constrained. Second, *to be non-cyclic* also means *to be applied in a specific direction*: non-cyclic rules are supposed to be applied right-to-left; compare Rubach (1984:190): "Havlík's Law states that Lower used to apply from right to left vocalizing even numbered yers and not from left to right as shown by derivations such as that for *pieseczek* 'dog' (double dimin.). The change of directionality comes as a surprise in a noncyclic framework. In our theory this change follows automatically from the fact that Lower became a cyclic rule."

The problem is that this relation between the inability of a particular phonological rule to read morphological structure and the direction of its application is simply a stipulation: in fact there is nothing in Rubach's theory, i.e. Lexical Phonology, that prevents non-cyclic rules to start to process the morphological piece that is send to the non-cyclic phonological component from its left periphery, instead from its right.

On the other hand, in the govenrment-based model presented in this paper, regressive parsing of the morphological string that is submitted the phonology automatically follows from the fact that *government*, which is responsible for vocalization of floating vowels, is a head-final relation between syllable positions.

7. Conclusion

In this paper, I have analyzed the phonological and the morphological structure of Czech double diminutives in *ečeк*. I have argued that these diminutives are created by recursive application of the suffix *-ek* whose initial vowel *e* alternates with zero. Diachronically speaking, the *ečeк* diminutives display both patterns of V-zero alternations that are found in languages: in OCz they followed the *Havlík* pattern, where alternants are in complementary distribution (*domøček*), while in MoCz they follow the *Lower* pattern, where strong alternants (i.e. vowels) are always preceded by strong alternants (*domeček*).

Although V-zero alternations have been widely discussed in the Slavic generative literature, no comprehensive analysis of the *Havlík-Lower* variation is found. Typically, the literature only mentions the *Lower* pattern which is found in modern Slavic languages (besides in Czech, e.g. in Polish or Russian).

The analysis of the Havlík-to-Lower change presented follows Rubach's (1984) classical analysis where the *Lower* pattern is derived from the cyclic application of the *Lower*

rule; in modern terminology, this means that the *Lower* pattern has internal phase structure (while the *Havlík* pattern has not). I argue that in the *Lower* pattern all floating vowels in a row (except the last one) vocalize because each of them is immediately followed by an empty nucleus, an empty nucleus at the phase boundary. Furthermore, the comparison of OCz and MoCz double diminutives, which both display the same morphosyntactic features, indicates that phasehood is a lexical property, i.e. a property of the particular lexical item, namely the diminutive suffix *-ek*. From this perspective, the Havlík-to-Lower change consists in a change of the properties of the lexicon: in MoCz, the suffix *-ek* is lexically specified as a phase-trigger whose insertion into the appropriate morphosyntactic node initiates derivation of its sister node. By contrast in OCz the diminutive *-ek* did not trigger any phase.

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Appendix

This appendix contains a corpus of simple and double diminutives collected from texts dated from the beginning of the 15th century to the beginning of the 18th century. It shows that the Havlík-to-Lower change has three phases: in the first phase only the Havlík pattern is active (till the end of the 16th century), in the second both patterns, the Havlík and the Lower, co-occur, even in the same texts (during the 1st half of the 17th century), and in the third phase the Lower pattern wins (since the 2nd half of the 17th century).*

	Havlík pattern	Lower pattern
Diakorp (1380–1450)	dnek, dólček, hrnček, libček, mladček mládenček pacholček, přiebytček, samček, skopček starček, statček, svazček, vdolček, zvonček	
Stč. banka	měšček, zvonček, stolček, věnček, skopček, starček, hrnček, dólček, samček, konček, vdolček, drobtek	
Hájek (1562)	zvonček, statček, starček	
Hýzrle (1614)	dvorček, zámček, domček	stoleček, domeček
Dačický	starček, Němček	stařeček, Tureček, Němeček, Mysliveček, mládeneček
Komenský	domček (Lab)	lísteček (Hl), stateček (List)
Černínová	starček	hrneček, svazeček, stařeček
Rosa (1672)		Mareček, Vavřineček, srneček, krkaveček, holoubeček, krteček, jelíneček, doubeček, důleček, strůmeček
Fišer (1705)		zvoneček, sameček, vrabeček, koneček

* All texts quoted (except Hájek 1562, Rosa 1672) are available electronically. The abbreviations correspond to the following sources: Diakorp: Diachronic corpus (http://ucnk.ff.cuni.cz); Stč. banka: Corpus of Old Czech texts till the beginning of the 16th century (http://vokabular.ujc.cas.cz); Hájek: Hájek's translation (1562) of Mattioli's Compendium; Hýzrle: biography of Jindřich Hýzrle z Chodů (1614) (available at http://citanka.cz); Dačický: Memoirs of Mikuláš Dačický z Heslova (from the last quater of 16th century till the fist quater of 17th century) (available at http://citanka.cz); Komenský: Listové (1619), Labyrint světa a ráj srdce (1623), Hlubina bezpečnosti (1633) (available at http://citanka.cz); Černínová: correspondence of Zuzana Černínová (1638–48) (available at http://citanka.cz); Rosa: Václav Jan Rosa: Čechořečnost (1672) (English translation by G. Betts, J. Marvan, 1991); Fišer**:** Kryštof Fišer: Knihy hospodářské hospodářství polního (1705) (from Diakorp).