

Ghost vowels and syllabification

Evidence from Bulgarian and French

by

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Introduction

This dissertation provides description and phonological accounts for the patterns of ghost vowel alternations in two languages where these alternations are largely conditioned by constraints on syllabification: modern standard Bulgarian and a variety of standard French spoken in Paris.

Much more space (the whole chapter 1) is devoted to description of the Bulgarian data. This is necessary, because apart from Scatton's books, there are very few publications on Bulgarian phonetics and phonology written in languages other than Bulgarian. The description argues for distinguishing between ghost schwas that are underlyingly present and schwas that are triggered by epenthesis.

As for French schwa/zero alternations, there is a great deal of literature on the subject. Moreover, the French data I refer to are given very detailed description in a series of well-known publications. However, chapter 4 discusses the data from French and claims that different phonological status should be attributed to two distinct classes of French ghost vowels. Sensitivity of [ɛ]/zero alternations to the rhythmic structure of the utterance is another point of emphasis. Needless to say, I am perfectly aware that schwa/zero alternations in French are a widely variable phenomenon. I do not presume that the data on which my analysis is based reflect the behavior of all French speakers. However, to the extent that they represent one particular dialect of the language, as attested by the authority of the scholars who collected them, they constitute a valid test for the phonological model here exploited. Further research is needed to enlarge the coverage, taking into account other dialects of French.

Chapter 2 begins with comments on previous treatments of Bulgarian ghost vowels and of liquid/schwa metathesis in Bulgarian. The proposal for an alternative linear analysis (§2.3) aims to demonstrate that doing without word-final jers is possible in every framework. Then I give two accounts for the Bulgarian data in two different frameworks: Harmonic Phonology (the 3-level M/W/P model) and Optimality Theory (the 2-level Correspondence Theory version). Both accounts use the same underlying representations for words with ghost vowels: all ghost [e]'s and the ghost schwas that are viewed as underlyingly present are represented as floating vowels at M-level. In both accounts, some of the ghost schwas are assumed not to be present underlyingly and to be the product of default vowel insertions.

Chapter 3 offers a diachronic view on the Bulgarian ghost vowel alternations. My hypothesis is that both representations and rules associated with the Old Church Slavonic jer vowels (that gave rise to the modern ghost vowel alternations) have been subjected to reanalysis during the Middle Bulgarian period.

The variety of French discussed in chapter 4 is treated only in the framework of Harmonic Phonology. However, since this model is also applied to the analysis of Bulgarian, this makes it possible to conduct a contrastive description of the mechanism of ghost vowel alternations in Bulgarian and French (§4.4).

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1. The data

1.1. Data on ghost [ə] and [e] vowels.

Ghost vowels (GV's) are vowels that alternate with zero in surface forms. Two of the six vowels in the Bulgarian vowel system [i, e, a, ə, o, u] systematically behave as ghost vowels: [ə] and [e]. Exceptionally, [i] and [o] can be ghosts : [i] in four lexical items, [o] optionally in one (cf. Tilkov 1982:232, Aronson 1968:121). The examples in (1) parallel those in (2). Each pair demonstrates that in similar phonological and morphological contexts, a vowel [ə] or [e] may be syncopating (1) or stable (2).

(1)	xr̀ab̄ar 'brave' masc.sg.	(1a)	xr̀abr+i, pl.
	z̀al̄āk 'morsel' masc.sg.		z̀alc+i, pl.
	f̀akel 'torch' masc.sg.		f̀akl+i, pl.
	t̄āž+en 'sad' ¹ masc.sg.		t̄āž+n+a, fem.
(2)	g̀ab̄ar 'hornbeam' masc.sg.		g̀ab̄ar+i, pl.
	z̀am̄āk 'castle' masc.sg.		z̀am̄ac+i, pl.
	št̄ar̄kel 'stork' masc.sg.		št̄ar̄kel+i, pl.
	k̀ož+en 'leather' adj. ² masc.sg.		k̀ož+en+a, fem.

First of all, it is important to distinguish between two different problems:

- (3) The distribution of roots and suffixes whose last vowel is [ə] or [e] in two different paradigms: the non-syncopating paradigm vs. the syncopating paradigm, see (2) vs. (1). Morphemes that fall into the syncopating paradigm will be considered to contain a ghost vowel (a ghost [ə] or a ghost [e]).
- (4) The distribution of syncopated vs. non-syncopated allomorphs within the syncopating paradigm, see (1) vs. (1a).

Our claims are:

¹ This adjective is derived from *tāg+a`* 'sadness' with a change [g] → [ž] by 1st Velar Palatalization before the front vowel [e] of the suffix; cf. 1.4.2.

² cf. *kōž+a* 'leather', noun fem.sg.

- (5) the distribution described as (3) is lexically conditioned. To have a ghost vowel is an idiosyncratic property of a given root/suffix and must be encoded in its lexical representation.
- (6) The distribution stated in (4) is phonologically conditioned, unless a morphophono-logical effect suspends the GV alternation (see 1.1.6.1).

1.1.1. Domain of ghost vowel alternations

GV alternations like those in (1) occur only within the phonological word. The conditioning context for syncope of [e] or [ə] never spans word boundaries. We can test this by adding the clitic form *e*, 3p.sg.pres., of the copula 'be', to the alternating forms listed in (1):

- (7) Xràbār e 'He is brave', *Xràbr e
 Sàmo edìn zàlāk e 'It is just a morsel', *Sàmo edìn zàlk e
 Fàkel e, kakvò da e? 'It's a torch, what could it be?' *Fàkl e, ...
 Tàžen e 'He is sad', *Tàžn e

As can be seen from (7), the vowel that is lost in (1a) before a vocalic inflection (-*i* or -*a*), does not syncope before the vocalic clitic form *e*.

1.1.2. Ghost vowels in roots

1.1.2.1. Ghost vowel alternations with inflection

With inflection only Ø-inflected roots (i.e. roots whose base form is consonant-final) may exhibit ghost vowels. Most of the Ø-inflected roots are masculine (e.g. *mǎž* 'man' masc. sg.) and a limited set are feminine nominal roots (e.g. *kost* 'bone' fem.sg.). All neuter roots, most feminine and a limited set of masculine roots are vocalic, i.e. the base form is vowel-inflected (V-inflected). In V-inflected forms, stress can fall on the root (e.g. *mljàk+o* 'milk' neut.sg., *màs+a* 'table' fem.sg.) or on the inflection (*mor+è* 'sea' neut.sg., *žen+a`* 'woman' fem.sg., *bašt+a`* 'father' masc.sg.).

1.1.2.1.1. Inventory of ghost vowel Ø-inflected roots

1.1.2.1.1.1. Masculine noun Ø-inflected roots with ghost vowels

A number of masculine noun roots exhibit a ghost vowel *ǎ* [ə], see (8). The change of the stem-final *-k* to *-c* before the plural inflection *-i* is due to 2nd Velar Palatalization, see 1.4.2.

- (8) vòpāl 'wail' — vòpl+i, pl.
žèzāl 'scepter' — žèzl+i, pl.
còkāl 'wainscot, plinth' — còkl+i, pl.
àgāl 'corner' — àgl+i, pl.
čèxāl 'slipper' — čèxl+i, pl.
bòbār 'beaver' — bòbr+i, pl.
minìstār 'minister' — minìstr+i, pl.
fìltār 'filter' — fìltr+i, pl.
lìtār 'litre' — lìtr+i, pl.
cilìndār 'cylinder' — cilìndr+i, pl.
nègār 'Black' — nègr+i, pl.
tìgār 'tiger' — tìgr+i, pl.
vìxār 'whirlwind' — vixr+i, pl.
ògān 'fire' — ogn'+òve, pl.
rìtām 'rhythm' — rìtm+i, pl.
kòsām 'strand of hair' — kòsm+i, pl.
zàlāk 'mouthful, bite' — zàlc+i, pl.
lākāt 'elbow' — lakt+i, pl.
nòkāt 'nail' — nòkt+i, pl.

Other masculine roots contain a ghost vowel [e]:

- (9) vâzel 'knot' — vâzl+i, pl.
fâkel 'torch' — fâkl+i, pl.
kotèl 'cauldron' — kotl+ì, pl.
orèl 'eagle' — orl+ì, pl.
petèl 'cock' — petl+ì, pl.
koz+èl 'male goat' — koz+l+i, pl.
dèn 'day' — dn+ì, pl.
ov+èn 'ram' — ov+n+ì, pl.

zàek 'rabbit' — zàjc+i, pl.
 venèc 'wreath' — venc+i, pl.
 šturèc 'cricket' (the insect) — šturc+i, pl.

Many foreign borrowings exhibit a GV alternation. The suffix *-(i)zǎm*, productive in borrowings, exhibits a ghost schwa, cf. (18).

entusià+zǎm 'enthusiasm' — entusià+zm+ǎt, def.

In some of the examples a non-productive suffix is recognizable: *-el³* in *koz+èl*, cf. *koz+à*, 'female goat'; *-en* in *ov+èn*, cf. *ov+c+à* 'sheep'

It can be seen that most masculine GV roots are stressed on one of their stable vowels. However, a limited number of them —where the ghost is [e], cf. (9)— are stressed on their final vowel in the singular. When the latter, a ghost vowel, is syncopated in the plural, the stress is shifted to the inflection.

1.1.2.1.1.2. Feminine noun Ø-inflected roots with ghost vowels

A few feminine nouns that are Ø-inflected like masculine nouns exhibit a ghost *ǎ* or *e*.

- (10) m̀isǎl 'thought' — m̀isl+i, pl.
 sǎblǎzǎn 'temptation' — sǎblǎz+n+i, pl.
 p̀esen 'song' — p̀esn+i, pl.

1.1.2.1.1.3. Adjectival Ø-inflected roots with ghost vowels

In Bulgarian the masc. sg. indefinite form is used as lexical entry for adjectives.⁴ The adjectives listed in (11) contain a ghost schwa.

- (11) zǎl 'evil' masc.sg. — zl+à, fem., zl+ò, neut., zl+i, pl., zl+iǰ+[ǎ] masc.sg.def.
 nǎgǎl 'arrogant' — nǎg+l+i, pl.
 pòdǎl 'base' — pòd+l+i, pl.
 svèt+ǎl 'light' (cf. svèt+[ǰ+ǎ]⁵ 'shine')— svèt+l+i, pl.

³ from Proto-Slavic *-ilŭ* (< Indo-European *-ilo*) according to Georgiev 1971-1995, vol.2:525.

⁴ Unlike other Slavic languages that confine this form (coinciding with the bare adjectival stem) to predicative use, Bulgarian has also extended it to attributive use and has lost the former longer attributive form.

tòpāl 'warm' — tòpl+i, pl.
kràg+āl 'round' (< krāg 'circle') — krāg+l+i, pl.
bèg+āl 'cursory' (< bjag 'running') — bèg+l+i, pl.
bìstār 'clear' masc.sg. — bìstr+a, fem., bìstr+o, neut., bìstr+i, pl., bìstr+ij+[ə],
masc.sg.def.
bòdār 'alert' — bòdr+i, pl.
dobār 'good' — dobr+ì, pl.
mādār 'wise' — mād+r+i, pl.
pāstār 'variegated' — pāstr+i, pl.
xìtār 'clever' — xìtr+i, pl.
xràbār 'brave' — xràbr+i, pl.
štèdār 'generous' — štèdr+i, pl.
mārt+āv 'dead' (cf. s+mārt 'death') — mārt+v+a, fem., mārt+v+o, neut.,
mārt+v+i, pl., mārt+v+ij+[ə], masc.sg.def.
edn+àk+āv 'identical' — edn+àk+v+i, pl.
k+ak+āv 'what sort of' — k+ak+v+ì, pl.
vsjà+k+ak+āv 'every sort of' — vsjà+k+ak+v+i, pl.
njà+k+ak+āv 'some' — njà+k+ak+v+i, pl.
nì+k+ak+āv 'no' — nì+k+ak+v+i, pl.
dālāg 'long' — dāl+g+i, pl.

In some of the adjectives in (11), the non-productive adjectivizing suffixes -l-, -r-, -v-⁶ are recognizable.

1.1.2.1.2. Ø-inflected ghost vowel root + Vocalic suffix:

1.1.2.1.2.1. In noun declension

Some vocalic nominal inflections (all plurals, some vocatives) cause the syncope of the ghost vowel in a GV root, cf. (8), (9), (10), or in a GV suffix, see (12). Others

⁵ As usually do Bulgarian linguists, I use the 1p.sg.pres. as citation form for verbs. The old infinitive has been lost in Bulgarian. A newly-created truncated infinitival form can be used after a small set of modal auxiliaries like *stīga* 'stop', *nedēj* 'do not', etc. [j+ə] stands for orthographic *ja*, the ending of the 1p.sg.pres. for so-called soft stem verbs, which corresponds to the vowel [ə] with palatalization of the preceding consonant. Thus, the stem-final consonant in *svētja* 'shine' is realized as palatalized [tʲ].

⁶ Coming from historical suffixes -lŭ, -rŭ, -vŭ.

exert a suspending effect on the GV alternation in the root (definite articles, count plurals, some vocatives), cf. 1.1.6.1.

The following vocalic inflections in noun declension trigger GV syncope :

i. The plural inflection *-i*

The plural inflection *-i* is usually found with masculine polysyllabic and with feminine nouns and exceptionally, with some monosyllabic masculine nouns. (8), (9), (10) for roots, and (12), further repeated in 1.1.4.1, for suffixes, demonstrate that the ghost vowel syncope is systematic before the plural *-i*.

- (12) lov+èc 'hunter' — lov+c+i, pl.
xubav+èc 'handsome man' — xubav+c+i, pl.

ii. The plural inflection *-ove*

The plural *-ove* is found exclusively in the declension of masculine monosyllabic nouns. Two GV masculine roots⁷ take this inflection and in both plurals the ghost vowel is syncope.

- (13) ògǎn 'fire' — ognj+òve, pl.
vjătâr 'wind' — vetr+ovè⁸, pl.

i.i.i. Vocative affixes for masc. sg. nouns

The vocative is productive with animate masc. sg. and fem. sg. nouns only. None of the feminine GV roots is animate. For masc. sg. nouns with Ø-inflected roots there are two basic suffixes: *-o* (with the variant *-ó* [ʝo]) and *-e*. Some nouns have two vocatives with different affixes, e.g., *čovèk+o* and *čovèč+e* 'you man' (with 1st Velar Palatalization changing [k] into [č] before *-e*, a front vowel, and not before *-o*, a back vowel), cf. *čovèk* 'man'.

The vocative suffix *-e* systematically triggers GV syncope in the root:

⁷ The surface forms of these two nouns are bisyllabic, but their underlying forms can be viewed as monosyllabic, see (124), (125).

⁸ This is an instance of the *ä*-alternation, cf. 1.5. Here *vja-* [vʝa] changes to *ve-* [ve], i.e. [a] changes to [e] because of the stress-shift on the final syllable in the plural, and the preceding consonant depalatalizes before a front vowel.

minìstār 'minister' — minìstr+e 'you minister'
 tìgār 'tiger' — tìgr+e 'you tiger'
 vjàtār 'wind' — vètr+e 'you wind'⁹ (with personification)
 vixār 'whirlwind' — vixr+e 'you whirlwind' (with personification)

Suffixed nouns in *-ec-*, see (12), also syncopate the suffixal ghost [e] when they take the *-e* vocative, e.g. *stār+ec* 'old man' — *stār+č+e* 'you old man', where the change [c] → [č] is an instance of Affricate Palatalization, see 1.4.2.

The vocative suffix *-’o*, [Jo], i.e. *-o* with palatalization of the preceding consonant, combines only with sonorant-final roots. Syncopation in GV roots is systematic, see (14). Here palatalization of the root-final consonant is not part of the root's lexical form, as can be seen from the respective def. sg. forms: *orèla* (*orèlja), *petèla* (*petèlja), *ovèna* (*ovènja), but belongs to the suffix. Note also the stress-shift to the first syllable in the vocative.

- (14) orèl 'eagle' — òrl+[Jo] 'you eagle'
 petèl 'cock' — pètł+[Jo] 'you cock'
 ovèn 'ram' — òvn+[Jo] 'you ram'
 šturèc 'cricket' (the insect) — šturèč+o (< šturc+[Jo] with Affricate Pal., cf. 1.4.2, and [J]-deletion¹⁰)

The vocative *-o* (without palatalization) suspends the GV alternation, i.e. the ghost vowel of the stem is retained, see (15). An exception is *mòmăk* 'lad' which regularly syncopates its ghost *ă* before the vocalic vocative *-o*, see (16). Note that the *-ec* suffix, that normally shifts its stress to the inflection, cf. (12), remains stressed in vocatives.

- (15) zàek 'rabbit' — zàek+o 'you rabbit'
 lov+èc 'hunter' — lov+èc+o 'you hunter'
 begł+èc 'fugitive' — begł+èc+o 'you fugitive'

- (16) mòmăk 'lad', momc+ì, pl. — mòmċ+o 'you lad', *mòmăċ+o

⁹ See footnote 8. The difference is that in the **vocative** the change [v^la] → [ve] occurs before a front vowel in the next syllable (the vocative *-e*), cf. 1.5.

¹⁰ cf. ex.7a, Table 3, p.74, and the analysis in chapter 2, (13).

iv. The masc. sg. definite article

A systematic suspension of the GV alternation in the root is observed before the postpositive definite article for the masc.sg, see (17). The Bulgarian definite article -*ăt*, -*a*, phonetically $[-\text{ə}]$, masc.sg., -*ta*, fem.sg., -*to*, neut. sg., -*te* and -*ta*, pl. (where the vowel varies in accordance with the plural inflection¹¹), is postposed to the first nominal constituent of definite noun phrases. If the first nominal constituent is an adjective, the latter takes the definite article, which in adjectival declension is -*ija(t)*, phonetically $[-ij+\text{ə}(t)]$ where [ij] is a thematic vowel added to the article that we find also with nouns, masc.sg., -*ta*, fem., -*to*, neut., -*te*, pl. The masc. sg. definite article contrasts non-objective and objective forms. The distinction is strictly observed only in careful written Bulgarian, where the so-called *pălen člen* ('full article') is restricted to non-objective s (subject and predicative attribute), while the *kratāk člen* ('short article') is used elsewhere (direct object or prepositional complement). The standard colloquial variant of Bulgarian, at least the variant spoken in Sofia, does not distinguish two forms of the article and makes use of $[-\text{ə}]$ for nouns and $[-ij+\text{ə}]$ for adjectives, i.e. without the final [t], in all cases.

Some authors (Scatton 1975, Zec 1988) posit an underlying jer (i.e. a high lax vowel, which in their interpretation corresponds to our underlying ghost vowels) for the $[\text{ə}]$ of the definite article. According to the definition of ghost vowels we adopt here, i.e. a vowel that alternates with zero, the $[\text{ə}]$ of the definite masc.sg. article cannot be a ghost vowel. It never happens to find itself before another vocalic suffix and thus never syncopates.

- (17) vòpāl 'wail' — vòpāl+ $[\text{ə}]$ def., objective form, vòpāl+ăt, def., non-objective form
minìstār 'minister' — minìstār+ $[\text{ə}]$, def.
vjàtār 'wind' — vjàtār+ $[\text{ə}]$, def.
kòsām 'strand of hair' — kòsām+ $[\text{ə}]$, def.
ògǎn 'fire' — ògǎn^[j]+ $[\text{ə}]$, def.

¹¹ The choice of the plural definite article (-*te* or -*ta*) is made on phonetic grounds and regardless of the noun's gender: -*te* is selected by nouns whose plural inflection is *i*-final (e.g. lèbed 'swan' masc.sg. — lèbed+i, pl., lèbed+i+te, pl.def.; vod+à 'water' fem.sg. — vod+ì, pl., vod+ì+te, pl.def.) or *e*-final (e.g. grād 'town' masc.sg. — grad+ovè, pl., grad+ovè+te, pl.def.; ràm+o 'shoulder' neuter sg. — ram+enè, pl., ram+enè+te, pl.def.), whereas plurals with *a*-final inflections select the -*ta* definite article (e.g. krāk 'leg' — krak+à, pl., krak+à+ta, pl.def.; pol+è 'field' neuter sg. — pol^[j]+à, pl., pol^[j]+à+ta, pl.def.; ràm+o 'shoulder' neuter sg. — ram+enà, pl., ram+enà+ta, pl.def.)

zàlǎk 'mouthful' — zàlǎk+[ə], def.
 nòkǎt 'nail' — nòkǎt[J]+[ə], def.
 vâzel 'knot' — vâzel+[ə], def.
 orèl 'eagle' — orèl+[ə], def.
 dèn 'day' — den[J]+[ə̃], def.
 zàek 'rabbit' — zàek+[ə], def.

In (17) it can be seen that some of the roots (namely *den*, *ogǎn*, *nokǎt*) contain a final consonant that is underlyingly palatalized. The root-final consonant depalatalizes in the uninflected form, because in Bulgarian, the word-end neutralizes the opposition palatalized vs. plain consonants, see 1.4.1.

The ghost [ə] of the suffix *-(i)zǎm* resists the suspending effect of the definite article, see (18).¹²

- (18) entusià+zǎm 'enthusiasm' (cf. entusiàst 'enthusiast') — entusià+zm+[ə], def.
 cin+ìzǎm 'cynicism' (cf. cin+ìk 'cynic', cin+ìč+en 'cynical') — cin+ìzm+[ə],
 def.
 skeptíc+ìzǎm 'scepticism' (< skeptìk 'sceptic' with *k* → *c* by 2nd Velar Pal., cf.
 skeptìč+en 'sceptical' with 1st Velar Pal.) — skeptíc+ìzm+[ə], def.

spàzǎm 'spasm', *spàzm+i*, pl., where *-zǎm* is not a suffix, retains its ghost [ə] before the definite article: *spàzǎm+[ə]*, *spàzǎm+ăt*.

v. The count plural inflection *-a*

The count plural, used with cardinal numerals, is productive with countable and non-personal masculine nouns.

With personal masculine nouns, special "virile" forms of the numerals with the suffix *-(i)ma* are used (*dvà+ma* 'two', *tri+ma* 'three', *četiri+ma* 'four', *pet+ìma* 'five', *šest+ìma* 'six', etc.) and the latter do not select the count plural, but the normal plural, e.g. *tri+ma nègr+i* 'three Blacks', *pet+ìma ministri+i* 'five ministers'. Neither feminine nor neuter nouns have count plurals.

- (19) žèzǎl 'scepter', žèzl+i, pl. — dvà žèzǎl+a 'two scepters'

¹² This peculiarity of Standard Bulgarian was systematically infringed by Todor Zhivkov, leader of the Bulgarian Communist Party for 30 years (1958-1989), even in his political talks. He thus demonstrated his indifference to orthoepic norms.

àgāl 'corner', àgl+i, pl. — četiri àgāl+a 'four corners'
 bòbār 'beaver', bòbr+i, pl. — pèt bòbār+a 'five beavers'
 tìgār 'tiger', tìgr+i, pl. — šèst tìgār+a 'six tigers'
 fìltār 'filter', fìltr+i, pl. — dvàjset fìltār+a 'twenty filters'
 ògān 'fire', ogn'+òve, pl. — dvà ògān[J+a] 'two fires'
 fàkel 'torch', fàkl+i, pl. — stò fàkel+a 'hundred torches'
 kozèl 'male goat', kozl+i, pl. — dvà kozèl+a 'two male goats'
 làkāt 'elbow', làkt+i, pl. — pèt làkāt[J+a] 'five elbows, five cubits'

mètār 'metre', *mètr+i*, pl. and *lìtār* 'litre', *lìtr+i*, pl., as well as their derivatives exceptionally drop the ghost [ə] in the count plural:

- (20) *dèset mètr+a* (**mètār+a*) 'ten meters'
dvà mililìtr+a (**mililìtār+a*) 'two milliliters'

1.1.2.1.2.2. In adjectival declension

In adjectival declension, all vocalic inflectional suffixes without exception trigger GV syncope: the definite article for the masc.sg. *-ija*, *-[ij+ə]*, objective form, and *-ijat*, *-[ij+ət]*, non-objective form, cf. (iv) above, the fem.sg. ending *-a*, the neut. sg. ending *-o*, the plural inflection *-i*.

(21)	<i>masc.sg.indef.</i>	<i>masc.sg.def.</i>	<i>fem.sg.</i>	<i>neut. sg.</i>	<i>pl.</i>
	bìstār 'clear'	bìstr+ij+[ə]	bìstr+a	bìstr+o	bìstr+i
	dobār 'good'	dobr+ìj+[ə]	dobr+à	dobr+ò	dobr+ì
	bèg+āl 'cursory'	bèg+l+ij+[ə]	bèg+l+a	bèg+l+o	bèg+l+i
	zāl 'evil'	zl+ìj+[ə]	zl+à	zl+ò	zl+ì
	mărtāv 'dead'	mărtv+ij+[ə]	mărtv+a	mărtv+o	mărtv+i
	kakāv 'what sort of'		kakv+à	kakv+ò	kakv+ì
	tăž+en 'sad'	tăž+n+ij+[ə]	tăž+n+a	tăž+n+o	tăž+n+i
	rjād+āk 'rare'	rèdk+ij+[ə]	rjād+k+a	rjād+k+o	rèd+k+i

1.1.2.1.3. Ø-inflected GV root + Consonantal inflectional suffix

1.1.2.1.3.1. In noun declension

The singular definite article for feminine nouns (*-ta*, *-[tâ]*) is the only consonantal inflection in declension. It does not trigger syncope when added to GV Ø-inflected roots:

- (22) *mìsāl* 'thought', *mìsl+i*, pl. — *misāl+tâ*, sg. def.
neprijàžān 'enmity', *nerpijāzn+en*, 'hostile' adj.masc.sg. — *neprijazān+tâ*
'enmity' sg. def.
pèsen 'song', *pèsn+i*, pl. — *pesen+tâ*, sg. def.

1.1.2.1.3.2. In verb conjugation

GV alternations in conjugation are very limited. This is due to the fact that the vast majority of Bulgarian verbs contain a verbalizing suffix between the root and conjugational desinences. Thus, the verbal stem consists of the root and a verbalizing suffix. A number of Bulgarian verbs exhibit different verbalizing suffixes in the present tense and aorist. Below we describe both the present tense stem and the aorist stem for the main subclasses of verbs. All verb forms are derived from one of these two stems.

The typically Bulgarian third conjugation, which is productive for the derivation of secondary imperfectives and assimilation of borrowed verbs (cf. Scatton 1993), is characterized by a number of verbalizing suffixes all ending in *-a* (*-a-*, *-ja-*, *-ava-*, *-java-*, *-va-*, *-uva-*, *-ira-*, *-stva-*). Third-conjugation verb forms have no thematic vowel, but retain their verbalizing suffix in both the present and aorist stems. Thus, consonantal desinences attach exclusively to the final [a] of the suffix, see (23).

(23) bjàg+a+m 'run' (< bjag 'running' noun)	
bjàg+a+m, pres. 1p.sg.	bjàg+a+x, aor. & ipft. 1p.sg.
bjàg+a+š, 2p.sg.	bjàg+a ¹³ , aor. 2&3p.sg.
bjàg+a, 3p.sg.	bjàg+a+še, ipft. 2&3p.sg.
bjàg+a+me, 1p.pl.	bjàg+a+xme, aor. & ipft. 1p.pl.
bjàg+a+te, 2p.pl.	bjàg+a+xte, aor. & ipft. 2p.pl.
bjàg+a+t, 3p.pl.	bjàg+a+xa, aor. & ipft. 3p.pl.
bjàg+a+j, imper.sg.	bjàg+a+j+te, imper. pl.
bjàg+a+l, aor. & ipft. part. masc.sg.	bjàg+a+n, passive part. ¹⁴
bjàg+a+št, pres.part. masc.sg.	bjàg+a+jki, gerund
noun	bjàg+a+ne, verbal noun

Most first- and second-conjugation verbs exhibit a thematic vowel in the present tense stem (-*e-* for first conjugation and -*i-* for second conjugation) and a verbalizing suffix (-*a-* for first conjugation and -*i-* or -*ja-* for second conjugation) in the aorist stem. The thematic vowel is retained before consonantal desinences and is replaced by the vocalic inflections of the 1p.sg., -*a* [ə], and 3 p.pl., -*at* [ət], see the conjugation pattern in (24) illustrated by the second-conjugation verb *čìst*+*[j+ə]* 'clean'. Before the vocalic inflections the second-conjugation thematic vowel -*i-* deletes, but causes palatalization of the preceding root-final consonant.

The verbalizing suffixes -*ej-* and -*aj-* attach the thematic vowel -*e-* in the present tense stem (like first-conjugation verbs) and exhibit vowel-final forms (that result from *j*-deletion) in the aorist stem: *živ*+*èj*+*[ə]* 'live' (< *živ* 'alive' adj.masc.sg.), pres. 1p.sg., *živ*+*è*+*e*+*š*, 2p.sg. — *živ*+*[j]*+*x*, aor. 1p.sg.; *igr*+*àj*+*[ə]* 'play'. (< *igr*+*à* 'play' noun fem.sg.), pres. 1p.sg., *igr*+*à*+*e*+*š*, 2p.sg.— *igr*+*à*+*x*, aor. 1p.sg.

¹³ This form being homophonous with the 3p.sg. of the present tense, there exists an alternative aorist form with stress-shift to the inflection. The latter involves the *ä*-alternation in the root: *beg*+*à*.

¹⁴ The passive participle of an intransitive verb like *bjagam* is used, in its neuter form, with the so-called "impersonal passive", e.g. *Po tazi pàteka mnogo e bjagano*. 'This is a well-run path.'

(24) čìst+[j+ə] 'clean' 1p.sg. pres. (< čìst 'clean' adj.masc.sg.)

	<i>present tense</i>	<i>aorist</i>	<i>imperfect</i>	<i>imperative</i>
1p.sg.	čìst+[j+ə]	čìst+i+x	čìst+e+x	
2p.sg.	čìst+i+š	čìst+i	čìst+e+še	čìst+i
3p.sg.	čìst+i	čìst+i	čìst+e+še	
1p.pl.	čìst+i+m	čìst+i+xme	čìst+e+xme	
2p.pl.	čìst+i+te	čìst+i+xte	čìst+e+xte	čìst+è+te
3p.pl.	čìst+[j+ə]t	čìst+i+xa	čìst+e+xa	
	čìst+i+l, aor.part. masc.sg.		čìst+e+l, ipft.part. masc.sg.	
	čìst+en, passive part. masc.sg.		čìst+e+št, pres.part. masc.sg.	
	čìst+e+jki, gerund		čìst+e+ne, verbal noun	

Finally, the unsuffixed roots of some first-conjugation verbs, are augmented with an intervening vowel *-o-* (cf. čèt+o+x, čèt+o+xme, etc. in (25) below) before the consonantal aorist desinences *-x*, *-xme*, *-xte*, *-xa*, and take a thematic vowel *-e* in the Ø-inflected 2p.sg. and 3p.sg. of the aorist (cf. čèt+e). Verbs belonging to this conjugational type take the thematic vowel *-e-* before consonantal inflections in the present tense. The conjugation of unsuffixed verbs therefore also results in a stable vocalic environment.

(25) čèt+[ə] 'read' (cf. prò+čit 'reading' noun masc.sg.)

	<i>present tense</i>	<i>aorist</i>	<i>imperfect</i>	<i>imperative</i>
1p.sg.	čèt+[ə]	čèt+o+x	čèt+[jà]+x	
2p.sg.	čèt+è+š	čèt+e	čèt+è+še	čèt+i
3p.sg.	čèt+è	čèt+e	čèt+è+še	
1p.pl.	čèt+è+m	čèt+o+xme	čèt+[jà]+xme	
2p.pl.	čèt+è+te	čèt+o+xte	čèt+[jà]+xte	čèt+è+te
3p.pl.	čèt+[ə]t	čèt+o+xa	čèt+[jà]+xa	
	čèl, aor.part. masc.sg., cf. (32)		čèt+[jà]+l, ipft.part. masc.sg.	
	čèt+en, passive part. masc.sg.		čèt+[jà]+št, pres.part. masc.sg.	
	čèt+è+jki, gerund		čèt+e+ne, verbal noun	

In (26) below the morphological decomposition for the different conjugational types is given with both the present tense and the aorist stem. Either stem may be composed of ‘verbalizing suffix (Vblz.sfx.) and/or thematic vowel (Th.V.) + inflections’. Only the last conjugational type attach directly the aorist desinences, but the root is vowel-final due to j-deletion: ču+x (< čuj+x), 1p.sg.aor. of čùj+[ə] 'hear', pi+x (< pij+x), 1p.sg.aor. of pìj+[ə] 'drink'.

(26)	Examples	Present tense stem				Aorist stem			
		Vblz.	Th.	Inflections		Vblz.	Th.	Inflections	
		sfx.	V.	1p.sg. 3p.pl.	2-3p.sg. 1-2p.pl.	sfx.	V.	2-3p. sg.	1p.sg., 1-3p.pl.
3rd	bj`ag+a+m	-(_)a-		-m, -t	-š, -Ø, -me, te	-(_)a-		-Ø	-x, -xme, -xte, -xa
2nd	č`ist+ĵ+ə,		- [ĵ]-	-ə,-ət		-i-		-Ø	-x, -xme, -xte, -xa
	gnezd+ĵ+ə		-i-		-š, -Ø, -me, te				
	let+ĵ+ə, v`id+ĵ+ə		-[ĵ]- -i-	-ə,-ət		-ĵa-		-Ø	
1st	ž`iv+èĵ+ə	-èĵ- -è-		-ə,-ət		-ĵa-		-Ø	
			-e-		-š, -Ø, -me, te				
	igr+`aj+ə	-`aj- -`a-		-ə,-ət		-`a-		-Ø	
			-e-		-š, -Ø, -me, te				
	m`in+ə, kov+`ə			-ə,-ət		-a-		-Ø	
		-e-			-š, -Ø, -me, te				
č`et+`ə, vlj`az+ə			-ə,-ət			-e-	-Ø		
		-e-			-š, -Ø, -me, te		-o-	-x, -xme, -xte, -xa	
	č`uj+ə			-ə,-ət				-Ø	
	p`ij+ə		-e-		-š, -Ø, -me, te				-x, -xme, -xte, -xa

A GV stem like *mădăr* 'wise' masc.sg., *mădr+i*, pl., thus never happens to find itself before a consonantal suffix in verbs. Consider the conjugation of the following three verbs derived from *mădăr*: the second-conjugation ipfv. *mădr+[ĵ+ə]* 'concoct, invent' (27), the first-conjugation pfv. *po+mădr+èĵ+[ə]* 'become wise' (28) and the corresponding secondary ipfv. *po+mădr+[ĵa]va+m* (29) which illustrates the productive third-conjugation verb class.

(27) mǎdr+[j+ǝ] 'concoct, invent' ipfv.

	<i>present tense</i>	<i>aorist</i>	<i>imperfect</i>	<i>imperative</i>
1p.sg.	mǎdr+[j+ǝ]	mǎdr+i+x	mǎdr+e+x	
2p.sg.	mǎdr+i+š	mǎdr+i	mǎdr+e+še	mǎdr+i
3p.sg.	mǎdr+i	mǎdr+i	mǎdr+e+še	
1p.pl.	mǎdr+i+m	mǎdr+i+xme	mǎdr+e+xme	
2p.pl.	mǎdr+i+te	mǎdr+i+xte	mǎdr+e+xte	mǎdr+è+te
3p.pl.	mǎdr+[j+ǝ]t	mǎdr+i+xa	mǎdr+e+xa	
	mǎdr+i+l, aor.part. masc.sg.		mǎdr+e+l, ipft.part. masc.sg.	
	mǎdr+en, passive part. masc.sg.		mǎdr+e+št, pres.part. masc.sg.	
	mǎdr+e+jki, gerund		mǎdr+e+ne, verbal noun	

(28) po+mǎdr+èj+[ǝ] 'become wise' pfv.

	<i>present tense</i>	<i>aorist</i>	<i>imperfect</i>	<i>imperative</i>
1p.sg.	po+mǎdr+èj+[ǝ]	po+mǎdr+[j`a]+x	po+mǎdr+è+e+x	
2p.sg.	po+mǎdr+è+e+š	po+mǎdr+[j`a]	po+mǎdr+è+e+še	po+mǎdr+èj
3p.sg.	po+mǎdr+è+e	po+mǎdr+[j`a]	po+mǎdr+è+e+še	
1p.pl.	po+mǎdr+è+e+m	po+mǎdr+[j`a]+xme	po+mǎdr+è+e+xme	
2p.pl.	po+mǎdr+è+e+te	po+mǎdr+[j`a]+xte	po+mǎdr+è+e+xte	po+mǎdr+èj+te
3p.pl.	po+mǎdr+èj+[ǝ]t	po+mǎdr+[j`a]+xa	po+mǎdr+è+e+xa	
	po+mǎdr+[j`a]+l, aor.part. masc.sg.		po+mǎdr+è+e+l, ipft.part.	

(29) po+mǎdr+[j`a]va+m 'become wise' ipfv.

po+mǎdr+[j`a]va+m, pres. 1p.sg.	po+mǎdr+[j`a]va+x, aor. & ipft. 1p.sg.
po+mǎdr+[j`a]va+š, 2p.sg.	po+mǎdr+[j`a]va, aor. 2&3p.sg.
po+mǎdr+[j`a]va, 3p.sg.	po+mǎdr+[j`a]va+še, ipft. 2&3p.sg.
po+mǎdr+[j`a]va+me, 1p.pl.	po+mǎdr+[j`a]va+xme, aor. & ipft. 1p.pl.
po+mǎdr+[j`a]va+te, 2p.pl.	po+mǎdr+[j`a]va+xte, aor. & ipft. 2p.pl.
po+mǎdr+[j`a]va+t, 3p.pl.	po+mǎdr+[j`a]va+xa, aor. & ipft. 3p.pl.
po+mǎdr+[j`a]va+j, imper.sg.	po+mǎdr+[j`a]va+j+te, imper. pl.
po+mǎdr+[j`a]va+l, aor. & ipft. part.	po+mǎdr+[j`a]va+št, pres.part. masc.sg.
po+mǎdr+[j`a]va+jki, gerund	po+mǎdr+[j`a]va+ne, verbal noun

i. The aorist participle suffix -l/-l-

The only case in conjugation, where an unsuffixed first-conjugational consonant-final stem (C-stem) is found in adjacency with a consonantal suffix, is the aorist participle. The suffix in question is -l /-l- and is attached directly (without thematic vowel) to the

aorist stem, see (30). The other *l*-participle, the imperfect participle, takes as the basis for its formation the imperfect, which is always vowel-final; see (31).

We can see that the aorist participle suffix is consonantal if we look at the phonological shape of participles from vocalic verb stems (V-stems). The examples given in (26) and (31) below are from *vljáz+[ə]* 'enter', *za+nes+[ə]* 'bring', *rek+[ə]* 'say', *číst+[j+ə]* 'clean', *kaž+[ə]* 'tell' and *čùj+[ə]* 'hear'. The aorist stem is found in the aor.1p.sg. before the inflection *-x*. Between a C-stem and the aorist inflection *-x*, the vowel *-o-* is inserted.

(30)		<i>masc.sg.</i>	<i>fem.sg.</i>	<i>neut. sg.</i>	<i>pl.</i>	
	C-stems	vljáz+ǎl	vljáz+l+a	vljáz+l+o	vlèz+l+i	
		za+nès+ǎl	za+ nès+l+a	za+ nès+l+o	za+ nès+l+i	
		rèk+ǎl	rèk+l+a	rèk+l+o	rèk+l+i	
	V-stems	číst+i+l	číst+i+l+a	číst+i+l+o	číst+i+l+i	
		kàz+a+l	kàz+a+l+a	kàz+a+l+o	kàz+a+l+i	
		čù+l	čù+l+a	čù+l+o	čù+l+i	
(31)		<i>pres.1p.sg.</i>	<i>aor.1p.sg.</i>	<i>aor.part.</i>	<i>ipft.1p.sg.</i>	<i>ipft.part.</i>
	C-stems	vljáz+[ə]	vljáz+o+x	vljáz+ǎl	vlèz+e+x	vlèz+e+l
		za+nes+[ə]	za+nès+o+x	za+nès+ǎl	za+nes+jà+	za+nes+jà+l
					x	
		rek+[ə]	rèk+o+x	rèk+ǎl	reč+à+x	reč+à+l
	V-stems	číst+[j+ə]	číst+i+x	číst+i+l	číst+e+x	číst+e+l
		kaž+[ə]	kàz+a+x	kàz+a+l	kaž+e+x	kaž+e+l
		čùj+[ə]	čù+x	čù+l	čù+e+x	čù+e+l

The issue here is what happens when the *-l* /*-l-* suffix is added to a consonantal verb stem. Two alternative processes are observed:

1) If the final consonant is a fricative or a velar stop, schwa epenthesis takes place: a schwa is inserted between the stem-final consonant and the *-l* suffix:

vljáz+l → vljáz+ǎl, za+nès+l → za+nès+ǎl, rèk+l → rèk+ǎl

2) If the final consonant is a coronal stop, cluster simplification occurs – the coronal stop is deleted before the *-l* /*-l-* suffix:

- (32) čèt+l → čèl, aor.part. masc.sg., čèl+a, fem., čèl+o, neut., čèl+i, pl. (čèt+[ə̃]
 'read' ipfv. pres.1p.sg., čèt+o+x, aor.1p.sg.)
 za+vèd+l → za+vèl, aor.part. masc.sg., za+vèl+a, fem., za+vèl+o, neut.,
 za+vèl+i, pl. (za+ved+[ə̃] 'lead' pfv. pres.1p.sg., za+vèd+o+x, aor.1p.sg.)

ii. GV alternations in Present tense vs. Aorist.

A subclass of verbs exhibit an '[e]/zero' alternation between the present tense stem and the aorist stem:

- (33) na+ber+[ə̃] 'pick', pfv.pres.1p.sg., na+ber+è, 3p.sg. — na+br+à+x, aor. 1p.sg.,
 na+br+à, 3p.sg.
 iz+per+[ə̃] 'wash', pfv.pres.1p.sg., iz+per+è, 3p.sg. — iz+pr+à+x, aor. 1p.sg.,
 iz+pr+à, 3p.sg.
 sã+der+[ə̃] 'tear', pfv.pres.1p.sg., sã+der+è, 3p.sg. — sã+dr+à+x, aor. 1p.sg.,
 sã+dr+à, 3p.sg.
 s+mèl+[j+ə̃] 'grind', pfv. pres.1p.sg., s+mèl+i, 3p.sg. — s+ml+[jà]+x, aor.1p.sg.,
 s+ml+[jà], 3p.sg.
 po+stèl+[j+ə̃] 'spread out', pfv. pres.1p.sg., po+stèl+i, 3p.sg. — po+stl+à+x,
 aor.1p.sg., po+stl+à, 3p.sg.¹⁵

Besides, this presumably ghost [e] alternates with [i] in secondary derived imperfectives:

- na+ber+[ə̃], pfv. — na+bìr+a+m, ipfv.
 iz+per+[ə̃], pfv. — iz+pìr+a+m, ipfv.
 sã+der+[ə̃], pfv. — sã+dìr+a+m, ipfv.
 s+mèl+[j+ə̃], pfv. — s+mìl+a+m, ipfv.
 po+stèl+[j+ə̃], pfv. — po+stìl+a+m, ipfv.

This seems to correlate with Derived Imperfective Raising in Slovak (Rubach 1993:149) and Polish (Rubach 1984:29):

¹⁵ These alternations occur also in the respective non-prefixed imperfective stems: ber+[ə̃] 'pick' ipfv. 1p.sg.pres. — br+à+x, aor.; per+[ə̃] 'wash' ipfv. 1p.sg.pres. — pr+à+x, aor.; der+[ə̃] 'tear, rip' ipfv. 1p.sg.pres. — dr+à+x, aor.; mèl+[j+ə̃] 'grind' ipfv. 1p.sg.pres. — ml+[jà]+x, aor.; stèl+[j+ə̃] 'spread out' ipfv. 1p.sg.pres. — stl+à+x, aor. Surprisingly, the verbal nouns for some of these verbs take the aorist stem instead of the present tense stem: br+a+nè, pr+a+nè, dr+a+nè.

- (34) Slk. za+tk+nú+t´ 'imprison' pfv. za+týk+aj+ú 'they imprison' ipfv.
 Slk. vy+sch+nú+t´ 'to dry' pfv. vy+sych+aj+ú 'they dry' ipfv.
 Pol. zamk+ną+ć 'to lock' pfv. zamyk+aj+ą 'they lock' ipfv.

But the difference is that in Bulgarian the [e] does not syncopate before the vocalic verbalizing suffix neither in the present tense nor in the other forms derived from the present tense stem, cf. ber+[Jà]+x, ipft. 1p.sg., ber+è+še, 2&3p.sg., ber+i, imper.sg, etc. So it is not a real ghost vowel. It seems preferable to analyze verb stems like *ber*+[\ə] 'pick' as allomorphic: the present stem contains a stable [e], whereas the aorist stem contains a ghost [e].

One verb exhibits a ghost [o] in present tense vs. aorist:

- (35) kòl+[J+ə] 'slay' ipfv. pres.1p.sg., kòl+i, 3p.sg. — kl+à+x, aor. 1p.sg., kl+à,
 2&3p. sg.; cf. za+kòl+[J+ə] 'slay' pfv.—za+kòl+va+m, derived ipfv.

This should also be considered a case of allomorphic verb stems. More on derived imperfectives is found in 1.1.2.2.4 and 1.1.2.2.5 below.

1.1.2.2. Ghost vowel alternations with derivation

1.1.2.2.1. Ø-inflected ghost vowel root + Vocalic suffix

GV syncopation systematically occurs before vocalic suffixes in various derivational patterns where a GV root is involved.

1) Adjectivization of GV root nouns by means of different vocalic suffixes (-*ov*, -*at*, -*est*, -*ičen*, -*eški*, -*even*, -*i*, etc.):

- àgāl 'corner'—àgl+ov, adj. masc.sg.
 bòbār 'beaver'—bòbr+ov, adj.masc.sg.
 čèsān 'garlic'—česn+òv, adj.masc.sg.
 orèl 'eagle'—orl+òv, adj.masc.sg.
 tìgār 'tiger' —tìgr+ov 'tiger' adj.masc.sg.
 kòsām 'strand of hair'—kosm+àt 'hairy' masc.sg.
 àgāl 'corner'—àgl+est 'angular' masc.sg.
 vāzel 'knot' —vāzl+est 'knotty' masc.sg.
 nòkāt 'nail'—nòkt+est 'nailed' masc.sg.
 rìtām 'rhythm' —ritm+ičen 'rhythmical' masc.sg.

mètār 'metre'—metr+ičēn 'metric' masc.sg.
 ovèn 'ram'—òvn+eški 'mutton' adj. masc.sg.
 dèn 'day'—dn+èven 'day, daytime' adj. masc.sg.
 zàek 'rabbit'—zàjč+i 'rabbit' adj. masc.sg.¹⁶

2) Derivation of adjectives from adjectives.

The stem ghost vowel may be in an adjectival GV root or in the suffix *-en/-n-*.

dobār 'good'—dobr+ičāk, dimin. masc.sg.
 xìtār 'clever'—xìtr+ičāk, dimin. masc.sg.
 bòl+en 'sick' masc.sg., bòl+n+i, pl. — bol+n+àv 'sickly' masc.sg.
 drèb+en 'small' masc.sg., drèb+n+i, pl. — dreb+n+àv 'petty' masc.sg.

3) Nominalization of adjectives.

The stem GV may be in the root or in one of the suffixes *-en/-n-* or *-āk/-k-*.

nàgāl 'arrogant'—nàgl+ost 'arrogance'
 màdār 'wise'—màdr+ost 'wisdom'
 bèd+en 'poor'—bèd+n+ost 'poverty', bed+n-otà 'poverty', bed+n+jàk 'poor man'
 rjād+āk 'rare'—rjād+k+ost 'rareness'
 pàstār 'variegated'—pàstr+ot+à 'variegation'
 tòpāl 'warm'—topl+ot+à 'warmth', topl+in+à 'heat'
 svèt+āl 'clear'—svet+l+in+à 'light' noun
 dobār 'good'—dobr+in+à 'goodness'
 dālāg 'long'—dālž+in+à 'length'¹⁷
 màrtāv 'dead'—mārtv+ìl+o 'dead season, deadness'

4) Derivation of nouns from nouns:

ògān 'fire'—ogn+išt+e 'fireplace'
 zālāk 'mouthful, bite'—zàlč+e, dimin.¹⁸
 kotèl 'cauldron'—kotl+è, dimin.
 orèl 'eagle'—orl+è, 'young eagle', orl+ìc+a 'female eagle'

¹⁶ The root-final velar changes to [č] by 1st Velar Pal., cf. 1.4.2. As for the change e → j, see 1.1.4.5.

¹⁷ The change g → ž is due to 1st Velar Pal., see 1.4.2.

¹⁸ With k → č due to 1st Velar Pal., see 1.4.2.

tìgǎr 'tiger' — tigr+è 'yound tiger', tigr+ìc+a 'tigress'
čèxǎl 'slipper' — čexl+àr 'maker of slippers'

5) Derivation of nouns and adjectives from numerals:

sèdem 'seven' — sedm+ìc+a 'the figure seven', sèdm+i 'seventh' masc.sg.
òsem 'eight' — osm+ìc+a 'the figure eight', òsm+a 'eighth' fem.sg.

6) Verbalization of nouns (all verb forms are pres. 1p.sg.):

vìxǎr 'whirlwind' — raz+vìxr+[Ja]+m se 'rage, storm' verb ipfv.
vjătǎr 'wind' — pro+vetr+[J+ə] 'ventilate' pfv.
kòsǎm 'strand of hair' — o+bez+kosm+[J+ə] 'dehair' pfv.
fìltǎr 'filter' — filtr+ìram 'filtrate', ipfv. & pfv.

7) Verbalization of adjectives (all verb forms are pres. 1p.sg.):

dobǎr 'good' — o+dobr+[J+ə] 'approve' pfv., o+dobr+[Jà]va+m, ipfv.
xìtǎr 'clever' — xitr+ùva+m 'play tricks', ipfv., nad+xitr+[J+ə] 'outwit' pfv.,
nad+xìtr+[Ja]+m, ipfv.
bèd+en 'poor' — o+bed+n+èj+[ə] 'become poor' pfv., o+bedn+[Jà]va+m, ipfv.
mǎdǎr 'wise' — mǎdr+[J+ə] 'invent, concoct' ipfv., iz+mǎdr+[J+ə], pfv.,
iz+mǎdr+[Ja]+m, sec. ipfv.
mǎdǎr 'wise' — po+mǎdr+èj+[ə] 'become wise' pfv., po+mǎdr+[Jà]va+m, ipfv.

1.1.2.2.2. Ø-inflected ghost vowel root + Consonantal suffix

When a GV root finds itself before a consonantal suffix in derivation, syncope never applies. This can be observed with different types of derivational processes:

1) Adjectivization of nouns:

nègǎr 'Black' — nègǎr+ski 'Black' adj.
vjătǎr 'wind' — vjătǎr+ničav 'flighty, frivolous'
zàek 'rabbit' — zàeš+ki 'rabbit' adj. (š < č+s[k+i] by 1st Velar Pal. and cluster simplification, see 1.1.4.4)

2) Derivation of nouns from nominal stems:

nègār 'Black' — nègār+ka 'female Black', nègār+çe 'young Black'

àgāl 'corner' — àgāl+çe, dimin.

bòbār 'beaver' — bòbār+çe, 'young beaver'

vâzel 'knot' — vâzel+çe, dimin.

nòkāt 'nail' — nòkāt+çe, dimin.

3) Nominalization of adjectives:

ràven 'equal' masc. sg., ràvn+i, pl. — ràven+stv+o 'equality'

duxòv+en 'clerical' masc. sg., duxòv+n+a, fem. — duxòv+en+stv+o 'clergy'

4) Verbalization by means of the consonantal suffix *-stva-* (*-stvuv-*). This suffix is usually attached directly to nouns (kljukàr 'gossip' noun masc.sg. — kljukàr+stva+m 'gossip' 1p.sg.pres., plagiàt 'plagiarism' — plagiàt+stva+m 'plagiarize' 1p.sg.pres.), but we also find it with one GV adjectival stem:

bòdār 'alert' — bòdār+stva+m, bòdār+stvuv+m 'be awake' ipfv. pres. 1p.sg.

1.1.2.2.3. V-inflected ghost vowel roots

Some vowel-inflected (V-inflected) roots also exhibit GV alternations with derivation:

1.1.2.2.3.1. Neuter noun roots in *-o* and *-e*

(36) rebr+ò 'rib', rebr+à, pl. — rebār+c+è, dimin., rebār+c+à, pl.

stākl+ò 'glass' — stākāl+c+è 'a little piece of glass'

masl+ò 'butter' — masāl+c+è, dimin.

àgn+e 'lamb' — àgān+c+e, dimin.

petn+ò 'spot' — petān+c+è, dimin.

pism+ò 'letter' — pisām+c+è, dimin.

srebr+ò 'silver' — srebr+c+è 'a little piece of silver'

It can be seen from (36) that all these neuter roots present a cluster 'consonant + sonorant' before vocalic inflections. The ghost vowel that neuter V-inflected roots exhibit is always [ə], never [e]. The ghost schwa manifests itself before the

consonantal diminutive suffix for neuter nouns *-c+e* and, in one of these roots, before the GV adjectivizing suffix *-en/-n-*, see (37).

(37) *srebr+ò* 'silver' — *sřebār+en*, adj. masc. sg., *sřebār+n+i*, pl.

Apart from the root *srebr+ò* 'silver', the other roots listed in (36) select the non-GV adjectivizing suffix *-en/-en-*, cf. (67).

1.1.2.2.3.1. Feminine noun roots in *-a*

Several feminine V-inflected roots exhibit a ghost schwa in derived adjectives:

(38) *za+gàdk+a* 'puzzle', *zagàdk+i*, pl. — *zagàdāč+en* 'puzzling' masc. sg. — *zagàdāč+n+ij+[ə]*, def., *zagàdāč+n+a*, fem., *zagàdāč+n+o*, neut., *zagàdāč+n+i*, pl.
klèt+k+a 'cell (biol.)' — *klètāč+en*, 'cellular' masc.sg., *klètāč+n+a*, fem.
o+cènk+a 'evaluation' — *ocènāč+en* 'evaluational' masc.sg., *ocènāč+n+a*, fem.
rešètk+a 'grating' — *rešètāč+en* 'barred' masc., *rešètāč+n+a*, fem. sg.

The above noun roots manifest their ghost vowel in adjectives before the GV suffix *-en/-n-* (cf. 1.1.6.2.1). The change *k*—>*č* before the adjectivizing suffix is due to 1st Velar Pal., cf. 1.4.2. The ghost vowel of the feminine noun roots in (38) is not predictable from the phonetic structure. Not all nouns ending in 'consonant + k + a' have a ghost vowel:

sljùn+k+a 'saliva' — *sljùnč+en* (**sljunāč+en*) 'salivary' masc., *sljùnč+en+a*, fem.

In the above example, the non-GV suffix *-en/-en-* is used, as can be seen from the feminine form where [e] is retained.

1.1.2.2.4. Stabilized jers in perfectives vs. imperfectives

Most of the Bulgarian verbs related to the Slovak and Polish verbs undergoing Derived Imperfective Raising, cf. (34), developed a stable vowel from a previous jer in their root. Thus they became non-alternating, i.e. the vowel of the imperfective stem is retained in the perfective stem also:

- (39) Bg. iz+săx+n+[ə] 'dry' pfv. 1p.sg.pres. — iz+săx+va+m, ipfv.
 (cf. Slk. vy+sčh+nú+t' 'dry' pfv. infin. — vy+sych+aj+ú, ipfv. 3p.pl.pres.)
 Bg. na+ùik+a+m 'shove in' pfv. 1p.sg.pres. — na+ùik+va+m, ipfv.
 (cf. Slk. za+tk+nú+t' 'imprison' pfv. infin. — za+týk+aj+ú, ipfv. 3p.pl.pres.)
 Bg. pri+măk+n+[ə] 'drag up to' pfv. 1p.sg.pres. — pri+măk+va+m, ipfv.
 (cf. Rs. pri+mk+nu+t' 'drag up to' pfv. infin. — pri+myk+a+t', ipfv. infin.)
 Bg. na+èm+[ə] 'rent, hire' pfv. 1p.sg.pres. — na+èm+a+m, ipfv. (cf. nà+em
 'rent' sg., nà+em+i, pl.)
 (cf. Slk. ná+jom, 'hiring' nom.sg., ná+jm+u, gen.sg. — na+jím+aj+ú, 'hire' ipfv.
 3p.pl.pres.)
 Bg. na+zov+[ə] 'name' pfv. — na+zov+àva+m, ipfv (but cf. na+zv+àni+e
 'denomination')
 Bg. pri+zov+[ə] 'call on' pfv. — pri+zov+àva+m, ipfv., cf. pri+zv+àni+e
 'calling, vocation' (< pri+zv+à+n 'called on' adj.masc.sg.)
 (cf. Slk. ná+zov 'name' nom.sg., ná+zv+u, gen.sg. — na+zýv+aj+ú, 'name' ipfv.
 3p.pl.pres.)

In (40) we can see that the Bulgarian verbs corresponding to Slovak *n*-final verbs (Rubach 1993:152) have either stabilized their stem ghost vowel (cf. na+čèn+[ə], o+păn+[ə]) or dropped it everywhere (cf. pò+čn+[ə], ò+pn+[ə]), even before the consonantal imperfectivizing suffix *-va* (cf. pò+č+va+m, ò+p+va+m).

- (40) Bg. na+čèn+[ə] 'begin' pfv. 1p.sg.pres., na+čèn+a+x, aor. — na+čè+va+m,
 ipfv.pres.
 Bg. pò+čn+[ə] 'begin' pfv. 1p.sg.pres., pò+čn+a+x, aor. — pò+č+va+m, ipfv.
 pres.
 (cf. Slk. za+ča+t' 'begin' infin., za+ča+l, part. — za+čn+em, 1st sg. pres.; Rs.
 na+čà+t' 'begin', nà+ča+l, part. — na+čn+ù, 1p.sg.pres.)
 Bg. o+žăn+[ə] 'reap' pfv. 1p.sg.pres., o+žăn+a+x, aor., o+žăn+va+m, ipfv. pres.
 (cf. Slk. vy+ža+t' 'mow' infin., vy+ža+l, past part. — vy+žn+em, 1p.sg. pres.;
 Rs. po+žà+t' 'reap', po+žà+l, past part. — po+žn+ù, 1p.sg.pres.)
 Bg. na+păn+[ə] 'strain' pfv. 1p.sg.pres., na+păn+a+x, aor., na+pă+va+m, ipfv.
 pres.
 Bg. o+păn+[ə] 'stretch, strain' pfv. 1p.sg.pres., o+păn+a+x, aor., o+pă+va+m,
 ipfv.pres.
 Bg. ò+pn+[ə] 'stretch, strain' pfv. 1p.sg.pres., ò+pn+a+x, aor., ò+p+va+m,
 ipfv.pres.
 (cf. Slk. na+pä+t' 'strain' infin., na+pä+l, past part. — na+pn+em, 1p.sg. pres.)

Note that the root-final *-n* of this subclass of verbs is deleted before the consonantal *-va* suffix, which is not the case with other Bulgarian verb subclasses:

(41)	<i>pfv. 1p.sg.pres.</i>	<i>ipfv. 1p.sg.pres.</i>
Deleting root-final <i>-n</i>	po+tăn+[ə] 'sink' s+găn+[ə] 'fold' na+stìn+[ə] 'catch cold'	po+tă+va+m s+gă+va+m na+stì+va+m
Non-deleting root-final <i>-n</i>	iz+gòn+[j+ə] 'chase off' pro+dăn+[j+ə] 'break down'	iz+gòn+va+m pro+dăn+va+m

As for the suffixal *-n-* in derived semelfactive and inchoative perfectives, it is always deleted before *-va* in derived imperfectives:

(42)	<i>pfv. 1p.sg.pres. (< primary ipfv.)</i>	<i>derived ipfv.</i>
Deleting suffixal <i>-n-</i>	kòp+n+[ə] 'dig' (< kop+àj+[ə]) mìg+n+[ə] 'wink' (< mìg+a+m) po+bjàg+n+[ə] 'flee' (< bjàg+a+m)	kòp+va+m mìg+va+m po+bjàg+va+m

1.1.2.2.5. GV alternations in Derived imperfectives vs. Perfectives

A subclass of first-conjugation verbs with no vowel in the root exhibit what seems to be a GV alternation with the introduction of the vowel [i] in their derived imperfectives:

(43)	<i>pfv. 1p.sg.pres.</i>	<i>pfv. 1p.sg.aor.</i>	<i>ipfv. 1p.sg.pres.</i>	<i>related noun</i>
	pod+pr+[ə] 'prop up'	pod+pr+[jà]+x	pod+pìr+a+m	pod+pòr+a 'prop'
	pro+str+[ə] 'hang out'	prostr+[jà]+x	pro+stìr+a+m	pro+stòr 'clothes line'
	s+pr+[ə] 'stop'	spr+[jà]+x	s+pìr+a+m	
	za+vr+[ə] 'thrust'	za+vr+[jà]+x	za+vìr+a+m	
	s+vr+[ə] 'thrust'	svr+[jà]+x	s+vìr+a+m	
	să+zr+[ə] 'catch sight of'	să+zr+[jà]+x	să+zìr+a+m	
	v+zr+[ə] se 'gaze, peer'	v+zr+[jà]+x se	v+zìr+a+m se	v+zor 'gaze'
	u+mr+[ə] 'die'	u+mr+[jà]+x	u+mìr+a+m	mor 'plague'
	za+mr+[ə] 'decline'	za+mr+[jà]+x	za+mìr+a+m	

With this subclass we have systematic syncopation in the perfective stem and systematic maintenance of the vowel [i] in the derived imperfective stem. Should we

consider that there is a ghost vowel [e] in the perfective that raises to [i] in the imperfective? Consider the related nouns that are given for some of these verb stems: they all contain [o] which is not a ghost vowel, cf. *pro+stòr* 'clothes line' masc.sg., *pro+stòr+i*, pl. We prefer to consider the roots in question as allomorphic. They exhibit three different allomorphs: /CoC/ in nouns — /CC/ in perfective verbs — /CiC/ in derived imperfectives. Allomorphy in pfv./ipfv. verb pairs is systematic with verbs that take the imperfectivizing suffixes -a-, -[Ja]- and can be achieved by means of a variety of phonological changes. A non-exhaustive list of some of the most frequent changes is given in (44) below. Note that the latter only accompany the change of conjugational type: all derived imperfectives in Bulgarian are of the productive and regular third conjugation.

- (44) [e]-Raising, i.e. stable [e] vs. [i]
 na+mèr+[J+ə] 'find' pfv. pres.1p.sg., na+mèr+i+x, aor.1p.sg. — na+mìr+a+m,
 ipfv. pres.1p.sg., na+mìr+a+x, aor. & ipft. 1p.sg.

[o]-Lowering, i.e. [o] vs. [a]
 ot+vòr+[J+ə] 'open' pfv. pres.1p.sg., ot+vòr+i+x, aor. 1p.sg. — ot+vàr+[Ja]+m,
 ipfv. pres. 1p.sg., ot+vàr+[Ja]+x, aor.&ipft. 1p.sg.

Stressless root¹⁹ (pfv.) vs. Stressed root (ipfv.)
 ot+káč+[ə] 'unhook, unhinge' pfv. pres.1p.sg., ot+káč+i+x, aor. 1p.sg. —
 ot+káč+a+m, ipfv. pres. 1p.sg., ot+káč+a+x, aor. & ipft. 1p.sg.

t —> št, d —> žd
 iz+pràt+[ð+ə] 'send' pfv. 1p.sg.pres., iz+pràt+i+x, aor. — iz+pràšt+a+m, ipfv.
 ubed+[J+ə] 'persuade' pfv. 1p.sg.pres., ubed+i+x, aor. — ubežd+àva+m, ipfv.

One verb exhibits a GV alternation in perfective pres. tense vs. perfective aorist & imperfective:

- (45) za+káln+[ə] 'swear', pfv. pres.1p.sg., za+káln+è, 3p.sg. — za+klè+x, aor.
 1p.sg., za+klè, 3p.sg. — za+klè+va+m, ipfv. pres.1p.sg.

¹⁹ Following Daniels (1976) based on Halle (1973), we assume that Bulgarian morphemes fall into two classes: lexically stressed and lexically stressless (unstressed). The latter lack inherent stress. A stressless root typically shifts the stress to the inflection, see 1.3.1.

In (45) the [e], that surfaces in the aorist (before the consonantal inflection *-x*) and in the imperfective (before the consonantal suffix *-va*), is syncopated in the present tense. Where the ghost [e] manifests itself, the root-final [n] is deleted. Such nasal deletion has been already observed with imperfectives, cf. (41). Root-final nasal deletion is observed in some aorist forms also, cf. *vzèm+[ə]* 'take' pfv. 1p.sg.pres., *vzè+x*, aor.1p.sg., cf. *vzìm+a+m*, ipfv. pres. 1p.sg.

In the related verb given in (46) below, the GV alternation is restricted to the present tense vs. aorist of the perfective. Here too, the surfacing of the ghost [e] vowel in the aorist combines with root-final *n*-deletion, cf. (41). As for the imperfective *pro+klìn+a+m*, it is the result of [e]-raising (44) without *n*-deletion.

(46) *pro+kǎln+[ə]* 'curse', pfv. pres.1p.sg., *pro+klè+x*, aor. — *pro+klìn+a+m*, ipfv. pres.

1.1.2.2.6. Prefixes

Unlike other Slavic languages, Bulgarian does not exhibit ghost vowels in prefixes. *v-/vǎ-* and *s-/sǎ-* are the only prefixes to manifest themselves in two alternative surface forms. In some cases the selection of one or the other form is phonologically-conditioned. The forms *sǎ-*, *vǎ-* systematically appear to avoid a sequence of two identical consonants (a geminate) word-initially:

sǎ+stàv+[J+ə] 'compose', *sǎ+zìd+am* 'build up', *sǎ+zr+[ə]* 'catch sight of';
vǎ+vlek+[ə] 'drag, involve', *vǎ+ved+[ə]* 'lead in, introduce'

s+kriǰ+[ə] 'hide' pfv. (< *kriǰ+[ə]* 'hide' ipfv.), *s+plàš+[ə]* 'frighten' pfv.
 (< *plàš+[ə]* 'frighten' ipfv.), *s+čùp+[J+ə]* 'break' pfv. (< *čùp+[J+ə]* 'break' ipfv.)
v+koren+[J+ə] 'root' pfv. (< *kòren* 'root'), *v+tečn+[J+ə]* 'liquefy' pfv. (< *tečen* 'liquid')

But the selection of *sǎ-* and *vǎ-* can be lexically-conditioned in other cases:

sǎ+der+[ə] 'tear, wear out' *sǎ+greš+[ə]* 'sin', *sǎ+postàv+[J+ə]* 'juxtapose';
vǎ+dvor+[J+ə] 'intern', *vǎ+plăt+[J+ə]* 'embody'

Geminates are admitted at the 'prefix+stem' boundary, but only in 'coda+onset' clusters:

iz+zìd+a+m 'build' (cf. zid 'wall'), raz+sìp+[j+ə] 'spill' (< sìp+[j+ə] 'pour'),
iz+sek+[ə] 'cut out' (< sek+[ə] 'cut'), bez+zăb 'toothless' (cf. zăb 'tooth')

The schwa in *să-*, *vă-* does not interact with ghost vowels in GV roots, see (47). Therefore, it cannot be considered a ghost vowel itself. *să-* (*vă-*) and *s-* (*v-*) are two prefixal allomorphs, one with a stable schwa, the other with no schwa, whose selection is partly phonologically and partly lexically conditioned.

- (47) Bg. *să+zr+[ə]* 'catch sight of' pfv. 1p.sg.pres. — *să+zìr+a+m* [**s+zìr+a+m*], ipfv.
Bg. *să+der+[ə]* 'tear, wear out' pfv. — *să+dìr+a+m* [**s+dìr+a+m*], ipfv.
Rs. *so+dr+àt'* 'tear', pfv. infin. — *s+dir+àt'*, ipfv.
Bg. *raz+der+[ə]* 'tear apart' pfv. 1p.sg.pres. — *raz+dìr+a+m*, ipfv.
Rs. *razo+dr+àt'* 'tear apart' pfv. infin. — *raz+dir+àt'*, ipfv.
Bg. *iz+gòn+[j+ə]* 'chase off' pfv. 1p.sg.pres. — *iz+gòn+va+m*, ipfv.
Rs. *so+gn+àt'* — *s+gon+jàt'* (cf. *gn+àt'* 'drive out' ipfv. infin., *gon+jù*, 1p.sg.pres.)

1.1.2.3. Ghost vowel alternations with compounding

GV root (Root 1) + Linking vowel (-o-, -e-) + Root 2

- (48) *vetr+o+pokazàtel* 'weather-vane' (< *vjàtăr* 'wind' + *pokàzvam* 'show')
ogn+e+dìšašt 'fire-breathing' (< *ògăn* 'fire' + *dìšašt* 'breathing')
krăgl+o+lìk 'round-faced' (< *krăgăl* 'round' + *lìk* 'face')
dobr+o+namèren 'well-intentioned' (< *dobăr* 'good' + *namerènie* 'intention')
păstr+o+cvèten 'multicolored' (< *păstăr* 'variegated' + *cvjàt* 'color')
kratk+o+tràen 'short-lived' (< *kràtăk* 'short' + *tràjen* 'lasting')
dălg+o+nòs 'long-nosed' (< *dălăg* 'long' + *nòs* 'nose')

1.1.3. Ghost vowel root types: an overview

1.1.3.1. Ø-inflected and V-inflected ghost vowel roots

Ø-inflected GV roots may be nominal masculine, cf. (8), (9), nominal feminine, cf. (10), or adjectival, cf. (11). V-inflected GV roots are either neuter, cf. (36), or feminine, cf. (38), nominal roots.

1.1.3.2. Sonorant and obstruent GV roots. Special status of [v].

Most of the Ø-inflected roots containing ghost vowels are sonorant-final, but a limited set of them are obstruent-final. All sonorants are found as root-final in GV roots: [r], [l], [n], [m], cf. (8), (9), (10) and (11). Obstruents attested at the end of syncope roots are [k], [t], [c], cf. (8), (9), and [g], cf. (11). In (11) root-final [v] is also found. Some of the [v]-final GV adjectival roots combine with the *-ec/-c-* GV suffix, see (71).

Note that all neuter V-inflected GV roots are sonorant-final, cf. (36). As for feminine V-inflected GV roots, they all end in the obstruent [k], cf. (38).

In Bulgarian, [v], phonetically a voiced labio-dental fricative, behaves as a sonorant in some respects. Obstruents undergo voice assimilation before another obstruent, see (49), except before [v]. Thus, [v] like the consonants of the sonorant class — [r], [l], [m] and [n] — cannot assimilate a preceding voiceless consonant (cf. Tilkov & Bojadžiev 1981:139), see (50). Acoustically, it also resembles very much sonorants: unlike other voiced obstruents, [v] is characterized by the presence not only of a voice bar, but also of clear-cut formants on spectrograms (Tilkov 1982:82).

- (49) žăt+va [t] 'harvest' svăt+ba [d] 'wedding'
rez+bà [z] 'carving' rez+kà [s] 'cut, notch'

- (50) do+kò[s]+na 'touch' pfv.3p.sg.aor. do+kò[s]+va 'touch' ipfv.3p.sg.pres.
mà[z]+n+a 'smear' pfv.semelf.3p.sg.aor. na+mà[z]+va 'smear' ipfv.3p.sg.pres.
snjàg [sn] 'snow', znàme 'flag' svètäl [sv] 'light, bright', zvezdà 'star'

However, unlike sonorants, but like obstruents, [v] undergoes voice assimilation from a following obstruent and word-final devoicing; see (51).

- (51) rev+[ə̃] rèv+l'ó [v] rèv+če [f] rèv [f]
'roar, cry' 'cry-baby' 'cry' dimin. 'roar, cry'

kərv+av	krəv+n+a [v]	krəv+tà [f]	krəv [f]
'bloody'	'blood' adj.fem.sg.	'blood' def.	'blood'

1.1.3.3. GV roots in derivation only. Cases of allomorphy.

If a root manifests itself as a GV root in inflection, in the vast majority of cases it behaves as a GV root in derivation, as well. However, a limited number of roots that are GV roots in derivation, behave as non-GV roots with inflection:

- (52) gābār 'hornbeam', gābār+i, pl.— gabr+āk 'grove of hornbeams', gabr+òv
'hornbeam' adj. masc. sg.
pìsāk 'scream' noun sg., pìsāc+i, pl. (*k* → *c* by 2nd Velar Pal.)— pìsk+a+m
'scream' verb pres.1p.sg.

1.1.4. Ghost vowels in suffixes

One nominalizing suffix (*-ec*) and several adjectivizing suffixes (*-āk*, *-ičāk*, *-en*) exhibit GV alternations. First, examples demonstrating the suffixal alternations will be given. Then, special attention will be paid to sequences of two successive ghost vowels, i.e. to combinations of a GV root with a GV suffix.

1.1.4.1. The nominalizing suffix *-ec/-c-*

Nouns derived from adjectives and verbs with the nominalizing suffix *-ec*, lose the ghost vowel of the suffix before the plural inflection *-i* and, if the suffix has a lexical accent²⁰, they shift the stress to the inflection:

- (53) xubav+èc 'handsome man' (< xùbav 'handsome'), xubav+c+i, pl.
lov+èc 'hunter' (< lov+[j+è] 'hunt'), lov+c+i, pl.
zvān+èc 'bell' (< zvān+[j+è] 'ring'), zvān+c+i, pl.

²⁰ The nominalizing suffix *-ec* is generally inherently stressed (see 1.3.1) except in some lexical items as for instance, skitàl+ec 'wanderer' (< skìta+m 'wander', cf. skìta+l, aor.part.), skitàl+c+i, pl., stār+ec 'old man' (< star 'old'), stār+c+i, pl., that rather represent the marked case.

1.1.4.2. Adjectivizing suffixes with ghost schwa

The vowel of the adjectivizing suffix *-ǎk-* systematically syncopates before vocalic inflections:

blìz+ǎk 'near' (< blìz+o 'near' adverb) — blìz+k+i, pl., blìz+k+ij+[ə], masc.sg. def., blìz+k+a, fem.

žàl+ǎk 'pitiful' (< žal 'pity') — žàl+k+i, pl.

kràtāk 'short' (cf. sǎ+krat+[j+ə] 'shorten') — kràt+k+i, pl.

màlāk 'small' (cf. o+mal+èj+[ə] 'become small') — màl+k+i, pl.

rjàdāk 'rare' (cf. raz+red+[j+ə] 'rarify') — rəd+k+i²¹, pl.; rjàd+k+ost 'rarity' (noun derived from the adjectival stem)

tànāk 'thin' (cf. iz+tăn+[j+ə] 'make thinner') — tăn+k+i, pl.; tăn+k+ost 'subtlety' (noun derived from the adjectival stem)

The diminutive and/or emotive (endearing) suffix for adjectives *-ičǎk* also contains a ghost *ǎ*-vowel:

xùbav 'beautiful' — xùbav+ičǎk 'somewhat beautiful, pretty' masc. sg. —

xùbav+ičk+ij+[ə], def., xùbav+ičk+a, fem., xùbav+ičk+i, pl.

dobǎr 'good' — dobr+ičǎk, adj.dimin. masc.sg., dobr+ičk+a, fem.

1.1.4.3. The -EN adjectivizing suffixes

-EN is one of the most productive adjectivizing suffixes in Bulgarian. It is found not only in native adjectives, but also in borrowings where it is added to a foreign suffixal formative (*-al-*, *-ar-*, *-iv-*, *-oz-*, *-on-*, *-ik-* becoming *-ič-* by 1st Velar Pal.): geni+àl+en 'of genius, great' (cf. gènij 'genius'), avtorit+àr+en 'authoritarian' (cf. avtoritèt 'authority'), obekt+ìv+en 'objective' (cf. obèkt 'object'), luks+òz+en 'luxurious' (cf. lù uks 'luxury'), senzaci+òn+en 'sensational' (cf. senzàcij+a 'sensation'), klimat+ič+en 'climatic' (cf. klìmat 'climate'). In all borrowed adjectives, -EN has a GV that syncopates before a vocalic inflectional or derivational suffix:

obekt+ìv+en 'objective' masc.sg. — obekt+ìv+n+ij+[ə], def., obekt+ìv+n+a,

fem., obekt+ìv+n+o, neut., obekt+ìv+n+i, pl.; obekt+ìv+n+ost 'objectivity'

luks+òz+en 'luxurious' masc.sg. — luks+òz+n+a, fem., luks+òz+n+i, pl.

²¹ This is an instance of the *jat'* alternation, cf. () in

1.1.4.3.1. -en/-n- and -en/-en-

Historically, all adjectives derived with the -EN suffix contained a front jer (ĩ) which should have given rise to a ghost [e] everywhere. However, a number of modern Bulgarian adjectives ending in suffixal -en in the masc.sg. indefinite, exhibit a non-GV suffix, i.e. a suffix -en/-en- where [e] is not a ghost, but a stable vowel. Tilkov (1982:230) mentions two different reasons for the choice of a non-GV -en/-en- suffix:

1.1.4.3.2. Semantically-conditioned selection of -en/-en-

It is often the case that derived adjectives which denote the material from which an object is made take the suffix -en/-en- with a stable [e]. For instance, there are two adjectives derived from *kal* 'mud, clay': one, meaning 'muddy', takes the GV suffix -en/-n-, while the second, meaning 'made of clay, earthen', takes the non-GV suffix -en/-en-:

kàl+en, kàl+n+i 'muddy' adj. sg., pl. kàlni ùlici 'muddy streets'

kàl+en, kàl+en+i 'clay' adj. sg., pl. kàleni panìci 'clay bowls'

Other examples of adjectives derived from nouns denoting the material of which the determinee is made include: stomàn+en (< stomàn+a 'steel') 'steel' adj. masc.sg., stomàn+en+a, fem.²²; xartì+en (< xartìj+a 'paper') 'paper' adj. masc.sg., xartì+en+a, fem.

The relationship between the non-GV variant of the -EN suffix and the meaning 'made of such material' is far from systematic.

Some adjectives, where neither the semantic nor the phonological reason (see 1.1.4.3.3) is discernable, nevertheless take the non-GV suffix -en/-en-, e.g., bìr+en (< bìr+a 'beer') 'beer' adj. masc.sg., bìr+en+a, fem., e.g. in *bìrena čàša* 'beer-glass', *bìrena fàbrika* 'beer factory, brewery'.

(54) gives a minimal pair of adjectives differing by the presence of a ghost/stable [e] in the suffix, based on the homophony in Bulgarian between the base forms of *med* 'honey' and *med* 'copper' (the inflected forms are not homophonous, given that *med* 'honey', *med*+[\ə], def., is a masculine noun, whereas *med* 'copper', *med*+tà, def., is a feminine noun with a Ø-inflected root).

²² Bulgarian allows a geminate -nn- at morpheme boundaries, e.g., cèn+en 'precious' (< cen+à 'price') masc.sg. indef., cèn+n+a, fem.

- (54) m̀ed+en, m̀ed+en+i 'honey' adj. sg., pl. m̀edeni p̀iti 'honeycombs'
 m̀ed+en, m̀ed+n+i 'copper' adj. sg., pl. m̀edni s̀adove 'copper vessels'

The form *medni s̀adove* 'copper vessels' demonstrates that the meaning 'made of such material' is not systematically represented by the non-GV suffix *-en/-en-*.

1.1.4.3.3. Phonologically-conditioned selection of *-en/-en-*. CS-roots

The second reason for a root to select the non-GV suffix is purely phonological. Adjectives systematically take the suffix *-en/-en-*, instead of *-en/-n-*, when the nominal root ends in a cluster 'consonant + sonorant' (a CS-root):

- m̀ostr+en (< m̀ostr+a 'sample') 'sample' adj. masc.sg., m̀ostr+en+i, pl., e.g. in *m̀ostreni dr̀exi* 'sample clothes'
 `ıgl+en 'of a needle' adj. masc.sg. (< `ıgl+a 'needle'), `ıgl+en+o, neut., e.g. in *`ıgleno ux̀o* 'eye of a needle'
 `ustn+en 'labial' (< `ustn+a 'lip') masc.sg., `ustn+en+a, fem., e.g. in *`ustnena s̀agl̀asna* 'labial consonant'
 k̀otv+en (< k̀otv+a 'anchor')²³ 'anchor' adj. masc. sg., k̀otv+en+a, fem., e.g. in *k̀otvena ver̀ıga* 'anchor chain'
 v̀aln+en (< v̀aln+a 'wool') 'woollen' masc. sg., v̀aln+en+a, fem., e.g. in *v̀alnena žıletka* 'woollen cardigan'

A root ending in a consonant cluster that is not sonorant-final (that is not a CS-root) does not necessarily select the non-GV suffix *-en/-en-*.

Below we give examples of nominal roots that end in a cluster 'obstruent + obstruent', (namely [zd] and [st]) or 'sonorant + obstruent' (namely [rt]). In both cases the final consonant of the cluster is not a sonorant, and the GV suffix *-en/-n-* is selected.

- (55) zv̀ezd+en (< zvezd+a 'star') 'star, starry' adj. masc. sg., zv̀ezd+n+a, fem.
 `ust+en 'oral' (< ust+a 'mouth') masc. sg., `ust+n+a, fem., e.g. in *`ustna r̀eč* 'oral speech'
 sp̀ort+en (< sport 'sport') 'sports' adj. masc. sg., sp̀ort+n+a, fem.

²³ Phonologically [v] behaves like a sonorant in Bulgarian, cf. 1.1.3.2

It appears that modern Bulgarian has developed two alternative adjectivizing suffixes whose base forms (that we find in the Ø-inflected masc. sg. indefinite form of adjectives) are identical, but their V-inflected forms differ because of the presence of a stable [e] in one of the suffixes and of a ghost [e] in the other one. A given nominal root selects one or the other suffix. Even though a phonological conditioning is easily discernable in some cases (namely, with CS-roots), the selection of the GV or the non-GV variant of the -EN suffix is lexically-conditioned in the remaining cases.

While there are two alternative adjectivizing -EN suffixes, a GV and a non-GV one, there is only one -en/-en- suffix that derives past passive participles from verbs and it is always non-GV. Compare the past participle of *obìd+[j+ə]* 'offend' and the adjective derived from *obìd+a* 'offence':

obìd+en (< *obìd+[j+ə]* 'offend' 1p.sg.pres.) 'offended' past passive part.

masc.sg., *obìd+en+a*, fem.

obìd+en (< *obìd+a* 'offence' fem.sg.) 'offending' adj. masc.sg., *obìd+n+a*, fem.

1.1.4.4. Allomorphy of the suffixes -stvo/-estvo and -ski/-eski/-ki

Consider the nouns in (56) and (57). Both lists give derivatives of nouns with a nominalizing suffix. According to the principle that ghost vowels are posited where real alternations between presence/absence of a vowel can be observed phonetically, one could analyze -estv+o and -stv+o as phonetic realizations of a hypothetical GV suffix -estv+o/-stv+o with a ghost vowel [e].

(56) *càr+stv+o* 'kingdom' (< *càr* 'king'), *oxòl+stv+o* 'affluence' (*oxòl+en* 'affluent'), *stràn+stv+o* 'foreign countries' (< *stràn+en* 'strange'), *kmèt+stv+o* 'town hall' (< *kmèt* 'mayor');

(57) *čovèč+estv+o* 'mankind' (< *čovèk* 'man'), *bož+estv+ò* 'godness' (< *bòg* 'God'); *nevèž+estv+o* 'ignorance' (< *nevèž+a* 'ignoramus' noun masc.)

However, the conditions for selecting the -estv+o variant are not of the same nature as for selecting the non-GV variant -en/-en- of the -EN suffix, cf. 1.1.4.3.3. The -estv+o suffix, like -stv+o, appears after a single consonant, not after a CS cluster. The selection seems to be conditioned by the type of stem-final consonant. In (57) the stem-final consonants are all [–anterior] coronal continuants. The [–anterior] coronal

can be non-alternating (e.g. in *nevěž+a*, *nevěž+estv+o*) or involved in an alternation with a velar stop by means of 1st Velar Pal. (in the remaining examples).

Therefore, it is preferable to consider *-estv+o* and *-stv+o* a case of allomorphy, where the vocalic allomorph of the nominalizing suffix with a stable [e] is selected by a preceding [-anterior] coronal.

Independent support for the above assumption is given by the fact that [e] in *-estv+o* does not interact with a ghost vowel in the preceding syllable. When *-estv+o* happens to follow the GV suffix *-ec/-c-*, it triggers the syncopation of the latter's ghost vowel; see (58), i.e. it produces the effect of a vocalic suffix with a stable vowel, not that of a GV suffix, cf. (64).

(58) *tvor+èc* 'creator', *tvor+c+i*, pl. — *tvòr+č+estv+o* 'creation'²⁴, **tvòr+èč+stv+o*

Likewise, *-esk+i*, see (60), must be analyzed as a vocalic allomorph with a stable [e] of the adjectivizing suffix *-sk+i*, see (59), not as realization of a hypothetical GV suffix *-esk+i/-sk+i* with a ghost vowel [e]. The conditioning context for selecting *-esk+i* is the same as for *-estv+o*.

(59) *gràd+sk+i*, adj.masc.sg. (< *grad* 'town'), *prijàtel+sk+i* 'friendly' (< *prijàtel* 'friend'), *kòn+sk+i* (< *kon* 'horse'), *sãdij+sk+i* (< *sãdij+à* 'judge')

(60) *monàš+esk+i* 'monastic' (< *monàx* 'monk'), *vřàž+esk+i* 'inimical' (< *vřag* 'enemy'), *prevodàč+esk+i* (< *prevodàč* 'translator, interpreter')

When *-esk+i* follows the GV suffix *-ec/-c-*, it triggers the syncopation of the latter's ghost vowel; see (61). This means that the vowel [e] of *-esk+i* acts as a stable, not as a GV vowel.

(61) *stàr+ec* 'old man', *stàr+c+i*, pl., *stàr+č+e*, vocative — *stàr+č+esk+i*, adj., **stàr+eš+k+i* (< **stàr+èč+ski*, with hypothetical cluster simplification, cf. (62))

A third allomorph of the *-SKI* suffix is *-k+i*; see (62). Here too, the result avoids the sequence '[-anterior] coronal + [s]'. But this is achieved by means of cluster simplification (*čs* = [□s] → [ʃ] = š, or simply, šs → š) instead of selecting an alternative vocalic allomorph as is the case in (57) and (60).

²⁴ In *tvòr+č+estv+o*, [c] in the suffix changes into [č] by Affricate Pal., see 1.4.2.

- (62) junàš+k+i, *junač+esk+i (< junàk 'hero, fine boy'), kovàš+k+i, *kovač+esk+i (< kovač 'blacksmith'), siromàš+k+i, *siromaš+esk+i (< siromàx 'poor man')

The allomorphs *-esk+i* (or *-k+i*) and *-estv+o*, non-suppletive allomorphs, are selected according to a phonological criterion: after a stem that ends in a [–anterior] coronal continuant. This is a case in which phonology feeds morphology. The choice between *-esk+i* and *-k+i* seems to be made entirely on lexical grounds.

1.1.4.5. GV suffix after a j-root. The root *zaek*, *zajc+i*.

Consider (63). What seems to be an alternation [e]/[j] is rather the result of root-final [j]-deletion. Root-final [j] is deleted before [e], a front vowel (cf. Scatton 1983:§2.224), i.e. when the ghost vowel of the suffix is present, and it surfaces only when the ghost vowel [e] of the suffix is syncopeated with inflection or derivation.

- (63) bò+en 'fighting' adj.masc.sg (< boj 'fight, battle'), bòj+n+a, fem., bòj+n+o, neut., bòj+n+i, pl., bòj+n+i+a, def.; bo+èc 'soldier' masc.sg., bo+èc+[ə], def. —
boj+c+i, pl.
trò+en 'triple' masc.sg. (cf. tròj+ka 'triad'), tròj+n+a, fem.
kità+ec 'Chinese' sg. (< Kitàj 'China'), kitàj+c+i, pl., kitàj+k+a 'female Chinese',
kitàj+sk+i 'Chinese' adj.masc.sg.
belgì+ec 'Belgian' sg. (< Bèlgij+a 'Belgium'), belgìj+c+i, pl., belgìj+k+a
'female Belgian', belgìj+sk+i 'Belgian' adj.masc.sg.

[j]-deletion before a front vowel is a common process in Bulgarian:

stroj+[ə] 'build' ipfv. 1p.sg.pres. (< stroj 'order'), stro+i+š, 2p.sg.; stro+i+tel
'builder', stro+èž 'building'

In the GV noun root *zàek* 'rabbit' there seems to be a stem-internal [j] that does not manifest itself in the Ø-inflected form, where a front vowel [e] follows. But it happens that the latter is a ghost vowel. In the plural *zàjc+i*, and in the derived adjective *zàjč+i*, where the ghost [e] syncopeates before a vocalic suffix, the underlying [j] emerges: *zaek* < /zàj<e>k/, *zàjc+i* < /zàj<e>k+i/, *zàjč+i* < /zàj<e>k+i/²⁵, where <e> stands for a ghost vowel [e].

²⁵ In the plural 2nd Velar Pal. applies giving [c], while the [č] in the adjective comes from 1st Velar Pal., see 0

1.1.6.2. Phonologically-conditioned suspensions

1.1.6.2.1. GV roots that select the GV suffix *-en/-n-*: suspended syncope

What happens if the syllable immediately following a ghost vowel itself contains a ghost vowel? In the great majority of cases, the syncope of the first ghost vowel is suspended. This happens in the case of adjectives derived with the GV suffix *-en/-n-*, when the nominal root with which it combines is itself a GV morpheme. This suspension of the GV alternation is characteristic of V-inflected feminine GV roots (see 0) and one neuter GV root (37) that manifest their root GV only in the context of a following GV *-en/-n-* suffix.

The suspension is systematic also with \emptyset -inflected GV roots. (64) illustrates some -EN adjectives that contain two successive syllables with ghost vowels. In the masc.sg., the root GV does not syncope before the phonetically realized GV of the suffix.

- (64) $\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{en}$ [$*\grave{\text{a}}\text{gl}+\text{en}$] 'corner' adj. masc.sg. (< $\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}$ 'corner' noun masc.sg., $\grave{\text{a}}\text{gl}+\text{i}$, pl.), $\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{n}+\text{a}$, fem., $\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{n}+\text{o}$, neut., cf. also in compounds: $\text{pr}\text{av}+\text{o}+\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{en}$ 'rectangular' masc.sg., $\text{pr}\text{av}+\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{n}+\text{a}$, fem., $\text{tr}\text{i}+\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{en}$ 'triangular' masc.sg., $\text{tr}\text{i}+\grave{\text{a}}\text{g}\grave{\text{a}}\text{l}+\text{n}+\text{a}$, fem.
 $\text{f}\grave{\text{i}}\text{l}\text{t}\grave{\text{a}}\text{r}+\text{en}$ [$*\text{f}\text{i}\text{l}\text{tr}+\text{en}$] 'filter' adj. masc.sg. (< $\text{f}\grave{\text{i}}\text{l}\text{t}\grave{\text{a}}\text{r}$ 'filter' noun masc.sg., $\text{f}\grave{\text{i}}\text{l}\text{tr}+\text{i}$, pl.), $\text{f}\grave{\text{i}}\text{l}\text{t}\grave{\text{a}}\text{r}+\text{n}+\text{a}$, fem.
 $\text{r}\grave{\text{i}}\text{t}\grave{\text{a}}\text{m}+\text{en}$ [$*\text{r}\text{i}\text{t}\text{m}+\text{en}$] 'rhythmic' masc.sg. (< $\text{r}\grave{\text{i}}\text{t}\grave{\text{a}}\text{m}$ 'rhythm', $\text{r}\grave{\text{i}}\text{t}\text{m}+\text{i}$, pl.), $\text{r}\grave{\text{i}}\text{t}\grave{\text{a}}\text{m}+\text{n}+\text{a}$, fem.
 $\text{l}\grave{\text{a}}\text{k}\grave{\text{a}}\text{t}+\text{en}$ [$*\text{l}\text{a}\text{k}\text{t}+\text{en}$] 'elbow' adj. masc.sg. (< $\text{l}\grave{\text{a}}\text{k}\grave{\text{a}}\text{t}$ 'elbow', $\text{l}\grave{\text{a}}\text{k}\text{t}+\text{i}$, pl.), $\text{l}\grave{\text{a}}\text{k}\grave{\text{a}}\text{t}+\text{n}+\text{a}$, fem.
 $\text{n}\grave{\text{o}}\text{k}\grave{\text{a}}\text{t}+\text{en}$ [$*\text{n}\text{o}\text{k}\text{t}+\text{en}$] 'nail' adj. masc.sg. (< $\text{n}\grave{\text{o}}\text{k}\grave{\text{a}}\text{t}$ 'nail', $\text{n}\grave{\text{o}}\text{k}\text{t}+\text{i}$, pl.), $\text{n}\grave{\text{o}}\text{k}\grave{\text{a}}\text{t}+\text{n}+\text{a}$, fem.
 $\text{p}\grave{\text{e}}\text{s}\text{en}+\text{en}$ [$*\text{p}\text{e}\text{s}\text{n}+\text{en}$] 'song' adj. masc.sg. (< $\text{p}\grave{\text{e}}\text{s}\text{en}$ 'song' noun fem.sg., $\text{p}\grave{\text{e}}\text{s}\text{n}+\text{i}$, pl.), $\text{p}\grave{\text{e}}\text{s}\text{en}+\text{n}+\text{a}$, fem.
 $\text{k}\text{o}\text{t}\grave{\text{e}}\text{l}+\text{en}$ [$*\text{k}\text{o}\text{t}\text{l}+\text{en}$] 'boiler' adj. masc.sg. (< $\text{k}\text{o}\text{t}\grave{\text{e}}\text{l}$ 'cauldron' sg., $\text{k}\text{o}\text{t}\text{l}+\grave{\text{i}}$, pl.), $\text{k}\text{o}\text{t}\grave{\text{e}}\text{l}+\text{n}+\text{o}$ 'steamshop' neut. substantivized adj.
 $\text{f}\grave{\text{a}}\text{k}\text{e}\text{l}+\text{en}$ [$*\text{f}\text{a}\text{k}\text{l}+\text{en}$] 'torch' adj. masc.sg. (< $\text{f}\grave{\text{a}}\text{k}\text{e}\text{l}$ 'torch', $\text{f}\text{a}\text{k}\text{l}+\text{i}$, pl.), $\text{f}\grave{\text{a}}\text{k}\text{e}\text{l}+\text{n}+\text{a}$, fem.

In this environment, in our view, the suspension of the GV syncope is regularly phonologically-conditioned. Alternatively, the non-suspension (i.e. the occurrence) of

syncopation in a limited set of lexical items is the marked case. The cases of non-suspension are those where the non-GV suffix *-en/-en-* is selected.

1.1.6.2.2. GV roots that select the *-en/-en-* suffix: regular syncopation

Ø-inflected nominal roots that select the *-en/-en-* suffix are listed below:

- (65) ògǎn 'fire' — ògn+en [*ògǎn+en], 'fire' adj. masc.sg., ògn+en+a, fem.
 pǎkǎl 'hell' — pǎkl+en [*pǎkǎl+en], 'hellish' masc.sg., pǎkl+en+a, fem.
 vîxǎr 'windwhirl' — vîxr+en [*vîxǎr+en], adj. masc.sg., vîxr+en+a, fem.
 mîsǎl 'thought' — mîsl+en [*mîsǎl+en], adj. masc.sg., mîsl+en+a, fem.
 neprijǎzǎn 'enmity' — neprijǎzn+en [*neprijǎzǎn+en], adj. masc.sg.,
 neprijǎzn+en+a, fem.

Two alternative *-EN* adjectives are derived from *vjâtǎr* 'wind', one with the GV suffix *-en/-n-*, the other with the non-GV suffix *-en/-en-*:

- (66) vjâtǎr 'wind' — vjâtǎr+en 'wind' adj., vjâtǎr+n+a, fem.
 — vètr+en²⁶ 'wind' adj., vètr+en+a, fem.

All neuter GV roots, cf. (36), except *srebr+ò* 'silver', cf. (37), select the non-GV adjectivizing suffix *-en/-en-*.

- (67) stǎkl+ò 'glass' — stǎkl+en [*stǎkǎl+en], 'glass' adj. masc.sg., stǎkl+en+a, fem.
 rebr+ò 'rib' — rèbr+en [*rebǎr+en], 'rib' adj. masc.sg., rèbr+en+a, fem.
 masl+ò 'butter' — màsl+en [*masǎl+en], 'butter' adj. masc.sg., màsl+en+++a,
 fem.
 pism+ò 'letter' — pism+en [*pisǎm+en], 'written' adj. masc.sg., pism+en+a,
 fem.

All V-inflected GV roots in (67), as well as the Ø-inflected roots in (65), end in a 'consonant + sonorant' cluster when their ghost vowel (a schwa in all cases) is syncopated. Therefore, they could be interpreted as CS-roots like those in 1.1.4.3.3., if we assume that the schwa which appears in their derivatives before a consonantal

²⁶ Here [a] in the stem changes into [e] before a front vowel in the next syllable and [vʲ] depalatalizes before a front vowel.

suffix, e.g. the diminutives in (36), and in Ø-inflected forms like those in (65) is epenthetic (not underlying).

1.1.6.3. GV roots in combination with the GV suffix *-ec/-c-*: two alternative patterns

In derivative,s there are also cases of non-suspension of the ghost vowel alternations: in derived nouns where the GV suffix *-ec/-c* is added to a GV root.

Some adjectival roots ending in a CS cluster (e.g. *-dl*, *-gl*, *-br*, *-dr*, *-tr*, *-tv*) exhibit a ghost vowel [ə] in their root:

- (68) *bègāl* 'cursory' masc.sg., *bègl+ij+[ə]*, def.
mădăr 'wise' masc.sg., *mădr+a*, fem.
mărtăv 'dead' masc. sg., *mărtv+i*, pl.

When the suffix *-EC* with a ghost vowel (see 1.1.4.1) is added to the above adjectival roots, contrary to what happens with the *-EN* derivatives in (64), the root GV syncope in the masc.sg. is not suspended (69).

- (69) *begl+èc* 'fugitive' [**bègāl+èc*]
mădr+èc 'wise man' [**mădăr+èc*]
mărtv+èc 'deceased' [**mărtăv+èc*]

These ghost vowels that are not sensitive to the suspending effect of a following ghost are all [ə]. Hence, their phonetic content is predictable: it coincides with the default vowel in the Bulgarian phonemic system. Moreover, these [ə]-ghosts appear always in roots that can be interpreted as ending in a CS cluster (if we accept that [v] is sonorant in Bulgarian, see 1.1.3.2). Insofar as they appear systematically in word-final position or before a consonant, see (70), they could be analyzed as triggered by epenthesis. Thus, not present in the lexical representation of the root morpheme, they avoid the suspending effect of a following ghost.

- | | | |
|------|--|---|
| (70) | <i>bègāl</i> 'cursory' masc.sg. | <i>begāl+c+ì</i> 'fugitive' pl. |
| | <i>mărtăv</i> [mərtəf] 'dead' masc.sg. | <i>mărtăv+c+ì</i> [mərtəfçì] 'deceased' pl. |
| | <i>mădăr</i> 'wise' masc.sg. | <i>mădăr+c+ì</i> 'wise men' pl. |

There are two alternative plural forms for nouns derived with the suffix *-EC* (*-ec/-c-* or *-ec/-ec-*) from CS-roots (Stojanov 1983: 50 & 107, notes):

- either the GV of the suffix is regularly deleted (see 1.1.4.1) before the vocalic plural desinence *-i* and a schwa manifests itself to split up the CS cluster;
 - or the ghost vowel of the suffix is retained and there is no schwa insertion.
- Both plurals, see (71), avoid the sequence 'consonant + sonorant + consonant' that would result if neither repair strategy were applied.

(71)	mădr+èc 'wise man'	mădăr+c+ì & mădr+ec+ì, pl.
	begl+èc 'fugitive'	begăl+c+ì & begl+ec+ì, pl.
	podl+èc 'scoundrel'	podăl+c+ì & podl+ec+ì, pl.
	xrabr+èc 'brave man'	xrabăr+c+ì & xrabr+ec+ì, pl.
	xitr+èc 'sly person'	xităr+c+ì & xitr+ec+ì, pl.
	mărtv+èc 'deceased'	mărtăv+c+ì & martv+ec+ì, pl.

According to Stojanov (1983:107, note), the forms showing the first alternative are to be preferred. But it seems that usage favours one or the other form on the basis of idiosyncratic properties of each noun. The orthographic dictionary (Georgieva 1983) reflects this differentiation: it cites only one form for some of the plurals: *mărtăvcî*; *podlecî*, *xitrecî*, *xrabrecî*. The dictionary gives both variants for *begălci*/*beglecî* and *mădrecî*/*mădărci*²⁷. However, at least two of the three nouns that prefer the plural form with suffixal GV syncopation (i.e. with syncope of [e]) and schwa insertion, namely *begălci* and *mărtăvcî*, seem to be plural-dominant, which is not the case for the nouns that favour the other form (with no suffixal syncopation and no schwa insertion).

The alternative plurals can be attributed to the existence of two alternative lexical representations for nouns composed of CS-root and -EC suffix, like those in (71): the first with a GV *-ec/-c-* suffix and the second with a non-GV *-ec/-ec-* suffix, cf. 1.6.4. The noun *nîkakv+ec* 'good-for-nothing' can be added to those listed by Stojanov. The orthographic dictionary gives only one plural for this noun – with a deleted [e] in the suffix and an epenthetic [ə] in the root: *nîkakăv+c+i*.

²⁷ The orthographic dictionary (Georgieva 1983) gives two entries for *mădrèc* and the form *mădărci* is listed only with the second entry, most probably the one meaning 'wisdom-tooth', for only the latter admits the count plural. Being a personal noun, *mădrèc* 'wise man' has no count plural.

1.2. Data on liquid-schwa metathesis

Metathesis in Bulgarian involves the alternation between 'liquid + schwa' (Lă) and 'schwa + liquid' (ăL) sequences in inflection and derivation.

As far as metathesis is concerned, two problems, parallel to those for GV syncope, are to be distinguished:

- (72) The distribution of roots that contain a 'liquid/schwa' sequence ($\{L; \grave{a}\}$), i.e. 'liquid + schwa' (Lă) or 'schwa + liquid' (ăL), in two paradigms: the non-metathesizing paradigm vs. the metathesizing paradigm.
- (73) The distribution of metathesized vs. non-metathesized allomorphs within the metathesizing paradigm.

The morphemes in (74) belong to the metathesizing paradigm, while those in (75) never undergo metathesis, even in contexts where a metathesizing morpheme would metathesize.

Our claim is that (72) is lexically-conditioned, while (73) is phonologically-conditioned, except in the case of imperfectivization of prefixed verbs where a morphophonological suspending effect is observed (1.2.7.2).

- | | | |
|------|-------------------------|--|
| (74) | grăk 'Greek' | gărk+[ə], def., gărc+i, pl. |
| | grăm 'thunder' noun sg. | gărm+[J+ə̃] 'thunder' verb |
| | mlăk 'shut up' interj. | za+mălč+[ə̃] 'shut up' pfv. pres.1p. sg. |
| (75) | străk 'morsel' | străk+[ə], def., străk+ove, pl. |
| | krăg 'circle' noun sg. | krăž+[ə̃] 'circle' verb |
| | plăt 'flesh' | vă+plăt+[J+ə̃] 'incarnate' |

1.2.1. Ø-inflected roots with a sequence 'liquid/schwa'

In monosyllabic forms with only one consonant following the 'liquid/schwa' sequence both orders occur: *Lă* and *ăL*. However, roots that select the *ăL* sequence when found as Ø-inflected, generally belong to the non-metathesizing paradigm, see (76). Only two of them exhibit metathesis, and in this case it is restricted to derivation; see (77).

- (76) smărt 'death' — smărt+tà, def., smărt+n+i 'mortal' pl., smărt+n+ost 'mortality'
xălm 'hill' — x ălm+če, dimin.

- (77) *dǎlg* 'debt'—*dǎlg+ove*, pl.
dǎlg — *dlǎž+en* 'obliged' masc. sg., *dlǎž+n+a*, fem. vs. *dǎlž+[ǣ]* 'owe' verb ipfv.
tǎrg 'auction'—*tǎrg+ove*, pl.
tǎrg — *tǎrž+en* 'auction' adj. masc. sg. vs. *trǎž+n+a*, fem.

Roots that select the order *Lǎ* may belong either to the metathesizing or the non-metathesizing paradigm. A limited number of them have differently with inflection and derivation: metathesis applies only in derivation or only in compounding, but not in inflection:

- (78) *prǎč* 'male goat'—*prǎč+ove*, pl.
prǎč — *pǎrč+òtina* 'goatish smell'
trǎn 'thorn'—*trǎn+i*, pl., *trǎn+est* 'thorny'
trǎn — *tǎrn+o+kòp* 'pickaxe'

But as far as regular metathesizing roots are concerned (i.e., roots that systematically metathesize with both inflection and derivation), the sequence exhibited by the \emptyset -inflected root is always *Lǎ*, see (80) and (82) below.

1.2.2. Domain of metathesis

Metathetic alternations like those in (74) occur only within the phonological word. The conditioning context for metathesis of 'liquid/schwa' never goes beyond the word boundaries. We can test this by adding the clitic form *e* 'be' 3p.sg.pres. of the copula/auxiliary to the alternating forms listed in (74):

- (79) *Grǎk e* 'He is Greek', **Gǎrk e*
Grǎm e, *kakvò da e?* 'It's a thunder, what could it be?' **Gǎrm e*, ...
Mlǎk' e kàzal, *kakvò drùgo?* 'He has said "shut up", what else?',
 **Mǎlk e kàzal* ...

As can be seen from (79), the vowel that metathesizes with [r] or [l] in (74) before a vocalic inflection (*-[ǣ]* or *-i*), does not metathesize before the vocalic clitic form *e*.

1.2.3. Metathesis with inflection

With inflection only the rhotic [r] is involved in metathesis with [ə]. Metathesis of the lateral [l] is limited to derivation.

1.2.3.1. Metathetic root + Vocalic inflection

1.2.3.1.1. In noun declension

Vocalic inflectional suffixes can trigger metathesis only in Ø-inflected roots.

Here are some masculine noun metathetic roots:

- (80) vrăx 'top' — văr^hx+ovè, pl., văr^hx+[ə̀], văr^hx+ăt, def., văr^hx+a, count pl., văr^hx+o, vocative (with personification)
grăb 'back' — găr^hbovè, pl., găr^hb+[ə̀], găr^hb+ăt, def., găr^hb+a, count pl.
grăk 'Greek' — găr^hc+i, pl. (with k → c by 2nd Velar Pal.), găr^hk+[ə̀], găr^hk+ăt, def., găr^hk+o, voc.
grăm 'thunder' — găr^hm+ove, pl., găr^hm+[ə̀], găr^hm+ăt, def., găr^hm+a, count pl.

In (80) metathesis applies without exception before all vocalic inflections in masc. noun declension: the plural inflections *-ove*, *-i*, the def. sg. postpositive article *-a* [ə̀], *-ăt* [ət], the count plural inflection *-a* [a], the vocative affix *-o*.

The masculine noun root *grăm* 'thunder' exhibits two sets of forms for the plural and the count plural: with and without metathesis (81).

- (81) găr^hm+ove & grăm+ove²⁸, pl., dvà găr^hm+a & dvà grăm+a²⁹ 'two thunders'.

There are also some feminine noun Ø-inflected roots that metathesize before the plural inflection *-i* (82) and in derivation (90).

- (82) vrăv 'twine' — văr^hv+i, pl.
grăd 'bosom' — găr^hd+i, pl.
krăv 'blood' — kăr^hv+i, pl.
skrăb 'sorrow' — skăr^hb+i, pl.

²⁸ The alternative forms for the normal plural are found both in the orthographic dictionary (Georgieva & Stankov 1983) and in the orthoepic dictionary (Pašov & Pärvev 1975).

²⁹ Two alternative count plurals are given only in the orthoepic dictionary (Pašov & Pärvev 1975).

1.2.3.1.2. In adjectival declension

The ordinal numeral *prǎv* 'first' can be added to the list of metathetic roots (83). It metathesizes before all vocalic inflections that characterize adjectival (and ordinal numeral) declension in Bulgarian: the fem. and neut. sg. endings *-a*, *-o*; the postpositive masc.sg. def. article *-ija(t)*, the plural inflection *-i*.

- (83) *prǎv* 'first' masc.sg.— *pǎrv+a*, fem., *pǎrv+o*, neut., *pǎrv+ija(t)*, masc.sg. def., *pǎrv+i*, pl.

1.2.3.1.3. In verb conjugation

One verb root exhibits metathesis between the imperative and the indicative (84). Prefixed forms of the verb are also involved in the alternation.

- (84) *drž* 'hold' imper. sg. — *dǎrž+[ə]*, 1p.sg. pres.
po+drž 'hold for a while' imper.sg. — *po+dǎrž+[ə]*, 1p.sg.pres.
za+drž 'withhold' imper. sg.— *za+dǎrž+[ə]*, 1p.sg.pres.

1.2.3.2. Metathetic root + Consonantal inflection

Before a consonantal inflection, a metathetic root exhibits no metathesis, in contrast to vocalic inflections.

1.2.3.2.1. In noun declension

In noun declension, the only consonantal inflection is the fem.sg. definite article *-tǎ*. Examples are given in (85), where we first list the definite forms for the nouns in (82) and then we add two uncountable feminine nouns: they have no plural, but exhibit metathesis with derivation.

- (85) *vrǎv+tǎ*, *grǎd+tǎ*, *krǎv+tǎ*, *skrǎb+tǎ*
glǎč 'clamor' (cf. *gǎlč+[ə]* 'scold') — *glǎč+tǎ*, def.
strǎv 'bait' (cf. *na+stǎrv+èn* 'fierce') — *strǎv+tǎ*, def.

1.2.3.2.2. In verb conjugation

In conjugation, there is only one instance of metathetic root adjacent to consonantal suffix: when the irregular truncated imperative of *dǎrž+[ə]* 'hold' takes the pl. inflection *-te*:

(86) *drǎž* 'hold' imper. sg. — *drǎž+te* 'hold' imper. pl.

Otherwise, metathesis is not to be observed with conjugation. This has been noted by Koorbanoff: "Given a certain configuration in one form of a verb, be it CLăCC (most verbs in *-na*), CăLCV (the most common pattern), CăLCC (frequently in derived imperfectives) or CLăCV (limited), that pattern is maintained throughout the paradigm, including all tenses, participles and other deverbative formations." (Koorbanoff 1992: p.27-8) The explanation is the same as for the absence of GV alternations with conjugation (1.1.2.1.3.2). Below we demonstrate how a metathetic root — *grǎm* 'thunder', *gǎrm+[J+ə]*, 'shoot', see (87) — systematically happens to find itself in pre-consonantal position in conjugation with the verbalizing suffixes *-n-* (88) and *-va-* (89).

(87) *grǎm* 'thunder' — *gǎrm+[J+ə]*, same conjugational class as *čist+[J+ə]*, *gnezd+[J+ə]*, see (24)

(88) *grǎm+n+[ə]* pfv. (< *grǎm* 'thunder')

	<i>present tense</i>	<i>aurist</i>	<i>imperfect</i>	<i>imperative</i>
1p.sg.	<i>grǎm+n+[ə]</i>	<i>grǎm+n+a+x</i>	<i>grǎm+n+e+x</i>	
2p.sg.	<i>grǎm+n+e+š</i>	<i>grǎm+n+a</i>	<i>grǎm+n+e+še</i>	<i>grǎm+n+ì</i>
3p.sg.	<i>grǎm+n+e</i>	<i>grǎm+n+a</i>	<i>grǎm+n+e+še</i>	
1p.pl.	<i>grǎm+n+e+m</i>	<i>grǎm+n+a+xme</i>	<i>grǎm+n+e+xme</i>	
2p.pl.	<i>grǎm+n+e+te</i>	<i>grǎm+n+a+xte</i>	<i>grǎm+n+e+xte</i>	<i>grǎm+n+è+te</i>
3p.pl.	<i>grǎm+n+[ə]t</i>	<i>grǎm+n+a+xa</i>	<i>grǎm+n+e+xa</i>	
	<i>grǎm+n+a+l</i> , aor.part. masc.sg.	<i>grǎm+n+e+l</i> , ipft.part.	<i>grǎm+n+a+t</i> , passive part.	

(89)	grãm+va+m, ipfv. (< grãm 'thunder')	
	grãm+va+m, pres. 1p.sg.	grãm+va+x, aor. & ipft. 1p.sg.
	grãm+va+š, 2p.sg.	grãm+và, aor. 2&3p.sg.
	grãm+va, 3p.sg.	grãm+va+še, ipft. 2&3p.sg.
	grãm+va+me, 1p.pl.	grãm+va+xme, aor. & ipft. 1p.pl.
	grãm+va+te, 2p.pl.	grãm+va+xte, aor. & ipft. 2p.pl.
	grãm+va+t, 3p.pl.	grãm+va+xa, aor. & ipft. 3p.pl.
	grãm+va+j, imper.sg.	grãm+va+j+te, imper. pl.
	grãm+va+l, aor. & ipft. part.	grãm+va+št, pres.part.
	grãm+va+jki, gerund	grãm+va+ne, verbal noun

1.2.4. Metathesis with derivation

1.2.4.1. Ø-inflected metathetic root + Vocalic derivational suffix

First, consider derivatives from roots containing '[r]/schwa' sequences already presented in (80), (82), (83) and (84):

- (90) vrãx 'top' — vãrx+òven 'supreme' adj. masc. sg.
 grãb 'back' — gãrb+av 'humpbacked', gãrb+ica 'hump', za+gãrb+[j+ə] 'turn one's back to' pfv., iz+gãrb+en 'humped'
 grãk 'Greek' noun masc. — gãrk+ìn[j+a] 'female Greek', gãrc+èj+[ə] se 'follow Greek fashions'
 grãm 'thunder' — gãrm+èž 'shot', gãrm+[j+ə] 'shoot, thunder' verb ipfv.
 skrãb 'sorrow' noun — skãrb+[j+ə] 'sorrow' verb ipfv.
 strãv 'bait' — na+stãrv+[j+ə] 'enrage' verb pfv.
 prãv 'first' — pãrv+ìçen 'primary', pãrv+enèc 'winner'
 drãž 'hold' imper. sg. — dãrž+ànie 'behaviour', dãrž+elìv 'hardy, enduring'

One exceptional form is *grãm+ovìt* 'thunderous' with no metathesis, but its root exhibits variation also in inflection; see (81). The derivative seems to take the available non-metathesizing allomorph of the root.

All roots that exhibit metathesis before vocalic inflections do so before vocalic derivational suffixes.

With derivation, also a number of roots containing a sequence "[l]/schwa" are involved in metathesis. They exhibit *lã* word-finally and *ãl* before a vocalic suffix:

glǎč 'clamour' — gǎlč+[ǝ] 'scold' ipfv. 1p.sg.pres.
 mlǎk 'shut up' interj. — mǎlč+[ǝ] 'be silent' ipfv. 1p.sg.pres., mǎlč+a+ni+e
 'silence', mǎlč+a+lív 'taciturn' masc. sg.

Interjections derived by truncation from verbs meaning a sound exhibit metathesis. In the interjection, where the root is at the word-end, the sequence is realized without exception as *Lǎ*:

- (91) xǎlc+a+m 'hiccup' ipfv. 1p.sg.pres. — xlǎc 'hiccup' interj.
 skǎrc+a+m 'squeak' ipfv. 1p.sg.pres. — skrǎc, interj.
 kǎlc+a+m 'mince' ipfv. 1p.sg.pres. — klǎc, interj.
 mlǎk+n+[ǝ] 'shut up' pfv. 1p.sg.pres. — mlǎk, interj. (old imper.sg., but
 synchronically it has no imper.pl. counterpart; cf. mlǎk+n+ì, imper. sg.,
 mlǎk+n+è+te, pl.)
 prǎc+n+[ǝ] 'fart' pfv. semelfactive 1p.sg.pres. — prǎc, interj.

1.2.4.2. Ø-inflected metathetic root + Consonantal derivational suffix

- (92) vrǎx 'top' — vrǎx+če, dimin.
 krǎv 'blood' — krǎv+čìc+a, dimin.
 vrǎv 'twine' — vrǎv+čìc+a, dimin.
 grǎb 'back' — grǎb+nàk 'backbone'
 grǎk 'Greek' — grǎc+k+i 'Greek' adj.
 grǎm 'thunder' — grǎm+n+[ǝ] 'shoot, thunder' pfv.
 glǎč 'clamour' — glǎč+k+a 'clamor'
 drǎž 'hold' imper. sg. — drǎž+k+a 'handle', iz+drǎž+lív 'tenacious'
 mlǎk 'shut up' interj. — mlǎk+n+[ǝ] 'shut up' pfv., mlǎk+va+m 'shut up' ipfv.

Some lexical exceptions to metathesis before a consonantal derivational suffix are probably due to Russian influence in borrowings (93).

- (93) po+vǎrx+nost 'surface' (cf. Rs. povrǎxnost'), po+vǎrx+nin+à 'surface, area'—
 vrǎx 'top'
 o+skǎrb+lènie 'insult' (cf. Rs. oskorblènie) — skrǎb 'sorrow'
 bez+mǎlv+n+o 'speechlessly' (cf. Rs. bezmòlvno) — mǎlv+à 'rumour',
 ne+do+mlǎv+k+a 'understatement'

Another exception, which cannot be attributed to Russian influence, is:

pod+smårk+na 'sniffle' pfv. — smråk+na 'sniff' pfv.

1.2.4.3. V-inflected metathetic root + Consonantal derivational suffix

For the most part, these are cases of diminutives derived by means of the suffix *-c+e* from *o*-inflected neuter noun roots:

- (94) kårb+ò 'globe', kårb+à, pl. — klåb+c+è 'globe' dimin., klåb+c+à, pl.
zårn+ò 'grain', zårn+à, pl. — zrån+c+è 'grain' dimin., zrån+c+à, pl.
dårv+ò 'wood', dårv+à, pl. — dråv+c+è 'a small piece of wood', dråv+c+à, pl.

Also some feminine V-inflected nominal roots metathesize before consonantal derivational suffixes:

- (95) vårb+à 'willow', vårb+i, pl. — Vrårb+nica 'Palm Sunday'
sårn+à 'doe', sårn+i — srån+dàk 'deer'

sålz+à has a non-metathesizing root like *jåbålk+a* (96). The *-en/-n-* adjective of *sålz+à* exhibits metathesis, whereas that of *jåbålk+a* is without alternation:

- (96) sålz+à 'tear' — sålz+lìv 'tearful'
jåbålk+a 'apple' — jåbålc+nik 'apple pie'
sålz+en 'lachrymal' masc.sg. — slåz+n+a, fem.
jåbålc+en 'apple' adj. masc.sg. — jåbålc+n+a, fem.

1.2.4.4. Metathesis in V-suffixed derivatives vs. C-suffixed derivatives

Some metathesizing roots do not exist as bare stems and their alternation can be observed only in derivatives with vocalic vs. consonantal suffixes:

- (97) sårb+in 'Serb', sårb+i, pl. — sråb+kìn[^j+a] 'female Serb', sråb+sk+i 'Serb' adj. masc.sg.
påřž+[ə] 'fry' ipfv. 1p.sg. pres. — præž+ka 'crackling'
påln+[^j+ə] 'fill' ipfv. 1 p.sg. pres. — plån+k+a 'filling' noun fem.sg.
sårð+ìt 'grumpy' — sråd+l'ó 'grumbler'

The pattern of (97) is productive in derivation of semelfactive and inchoative *-n-* suffixed perfectives (and the respective secondary *-va-* suffixed imperfectives) from third-conjugation *-a-* suffixed verbs (98), but also from first- and second-conjugation primary imperfectives (99).

- (98) mǎrd+a+m 'move' ipfv. — mrǎd+n+[ə], pfv. semelfactive, mrǎd+va+m 'move' sec. ipfv.
 gǎlt+a+m 'swallow' ipfv. — glǎt+n+[ə], pfv. semelfactive, glǎt+va+m, sec. ipfv., glǎt+k+a 'gulp' noun fem.sg.
 bǎrk+a+m 'thrust one's hand' ipfv. — brǎk+n+[ə], pfv. semelfactive, brǎk+va+m, sec. ipfv.
 na+xǎlt+a+m 'burst in' pfv. — xlǎt+n+[ə] 'sag' pfv., xlǎt+va+m, ipfv.
- (99) palz+[j+ə] 'creep' ipfv. — plǎz+n+[ə], pfv., plǎz+va+m, sec. ipfv.
 vǎrt+[j+ə] 'turn' ipfv. — vrǎt+n+[ə], pfv. semelfactive, vrǎt+va+m, sec. ipfv.
 kǎlv+[ə] 'peck' ipfv, kǎlv+ǎč 'woodpecker' — klǎv+n+[ə], pfv. semelfactive, klǎv+va+m, sec. ipfv.³⁰

Some verb roots exhibiting an alternation between *-n-* and *-št-* in pfv. vs. ipfv., metathesize *ǎL* to *Lǎ* before *-št-* with concomitant deletion of [n].

- (100) vǎrn+[ə] 'give back' pfv. — vrǎšt+a+m, ipfv.
 obǎrn+[ə] 'reverse' pfv. — obrǎšt+a+m, ipfv.
 pre+gǎrn+[ə] 'hug' pfv. — pre+grǎšt+a+m, ipfv.
 po+gǎln+[ə] 'engulf' pfv. — po+glǎšt+a+m, ipfv.

1.2.5. Metathesis with compounding

1.2.5.1. Metathetic root (Root 1) + Linking vowel + Root 2

Besides some regular cases, where metathesis applies before the linking vowel *-o-* (101), there are numerous exceptions in compounds whose first root happens to be metathetic (102).

³⁰ The geminate in the secondary imperfective *klǎvnam* results from *n-* deletion, see (42), which simplifies the consonantal cluster: *vnv* > *vv*.

- (101) pãrv+o+stèpen+en 'first-rate' (< pãrv 'first', pãrv+a, fem. & stèpen 'grade, rate'),
dãrv+o+dèl+ec 'carpenter' (< dãrv+ò 'wood', drãv+cè, dimin. & dèl+o 'act')
- (102) grãm+o+glàs+en 'loud-voiced', grãm+o+otvòd 'lightning-rod'; krãv+o+darìtel
'blood donor', krãv+o+žàden 'bloodthirsty', grãd+o+bòlen 'consumptive' (< grãd
'bosom' & bòl+en 'ill')

1.2.5.2. Root 1 + Linking vowel + Metathetic root (Root 2)

Compounds of this type are mostly adjectives or nouns derived from adjectives where the second root is nominal. In some cases metathesis applies regularly:

- (103) ostr+o+vřãx 'pointed, peaked' (< òstãr 'pointed' & vřãx 'top') — ostr+o+vãrx+i,
pl.
dv+u+grãb 'two-humped' (dvã 'two' & grãb 'back') — dv+u+gãrb+a, fem.

However, exceptions to metathesis in compounds before a vocalic suffix are frequent:

- (104) tesn+o+grãd 'narrow-minded' (< tèsen 'narrow' & grãd 'bosom') masc.sg.,
tesn+o+grãd+a, fem.
pãln+o+krãv+ie 'plethora' (< pãlen 'full' & krãv 'blood')
xlãdn+o+krãv+ie 'coolness' (< xlãden 'cool' & krãv, 'blood')
tesn+o+grãd+ie 'narrow-mindedness'

1.2.6. The general pattern for metathesis

From our survey of metathetic alternations with inflection (cf. 1.2.3), derivation (cf. 1.2.4) and compounding (cf. 1.2.5), it results that metathesizing roots exhibit the sequence $\check{a}L$ before a vocalic (inflectional or derivational) suffix, whereas, when the same roots are found before a consonantal (inflectional or derivational) suffix or at the word-end (if \emptyset -inflected), the sequence is turned to $L\check{a}$:

$$\check{a}L / \text{---} C + V$$

$$\{ L ; \check{a} \} \longrightarrow$$

$$L\check{a} / \text{---} C \left\{ \begin{array}{l} + C \\ \# \end{array} \right\}$$

A number of lexical exceptions have been noted: mostly in compounding, see (102) and (104), but also in (76), (77), (78), (93) and (96).

Some systematic deviations from the above general pattern can also be observed: in some specific contexts the metathetic alternation seems to be suspended. Now we go on to the analysis of the conditioning factors for these suspensions.

1.2.7. Suspensions of metathesis

1.2.7.1. No suspensions in the declension of masc. nouns

The inflections that suspend GV alternations in masculine nouns (cf. 1.1.6.1) have no effect on metathetic roots. Metathesis occurs regularly even before these inflections: the masc. sg. definite article, the count plural suffix, the vocative suffix *-o*; see (80).

1.2.7.2. Morphophonologically-conditioned suspension before the imperfectivizing suffix *-va-*

The only affix that may exert a suspending effect on metathesis is the suffix *-va-* that derives imperfective verbs from perfectives. The *-va-* suffix suspends metathesis when the verb is prefixed. Consider the following triplets:

	<i>primary (non-derived) imperfective verb</i>	<i>prefixed perfective verb</i>	<i>derived imperfective verb</i>
	I	II	III
a	skǎrc+a+m 'squeak'	iz+skǎrc+a+m	iz+skǎrc+va+m [*iz+skrǎc+va+m]
b	kǎlc+a+m 'mince'	na+kǎlc+a+m	na+kǎlc+va+m [*na+klǎc+va+m]
c	xvǎřč+[ǎ] 'fly'	pre+xvǎřč+[ǎ]	pre+xvǎřč+a+m
d	pǎlz+[j+ǎ] 'creep'	iz+pǎlz+[j+ǎ]	iz+pǎlz+[jǎ]va+m

In *-va-*-suffixed imperfectives (IIIa-b) derived from prefixed perfectives (IIa-b) the sequence *ǎL* appears systematically instead of the expected *Lǎ* before a consonantal suffix, i.e., metathesis is suspended.

Other triplets are obtained if the same primary imperfectives are taken together with the corresponding semelfactive *-n-*-suffixed perfectives and their derived, but non-prefixed, imperfective counterparts, e.g.:

	<i>primary (non-derived) imperfective verb</i>	<i>semelfactive perfective verb</i>	<i>derived imperfective verb</i>
	I	IV	V
a	skãrc+a+m 'squeak'	skrãc+n+[ə]	skrãc+va+m
b	kãlc+a+m 'mince'	klãc+n+[ə]	klãc+va+m
c	xvãrč+[ə̃] 'fly'	xvrãk+n+[ə]	xvrãk+va+m
d	pãlz+[j+ə̃] 'creep'	plãz+n+[ə]	plãz+va+m

The imperfectives (Va-d) derived from semelfactive perfectives (IVa-d), which are not prefixed, employ the imperfectivizing suffix *-va-* with the concomitant loss of the semelfactive *-n-*.

Thus, there are two conditions for suspension of metathesis:

- the verb must be derived with the *-va-* suffix;
- it must be prefixed.

If the first condition is not satisfied, metathesis is not suspended. As has been noted by Scatton (1974:88), the imperfectivizing suffix *-va-* is used almost exclusively with roots that are inherently stressed in the perfective.³¹ If the root of a prefixed perfective verb is inherently stressless, i.e., the stress is on the verbalizing suffix, other imperfectivizing suffixes are used: *-a+m*, *-[ja]+m*, *-ava+m*, *-[jə̃]va+m*. Being vocalic, the latter do not suspend metathesis, see IIIc-d and the following additional examples:

za+dãrž+[ə̃] 'retain' pfv. — za+dãrž+a+m, sec.ipfv.
 iz+gãlč+[ə̃] 'chide' pfv. — iz+gãlč+ava+m, sec.ipfv.
 pro+dãlž+[ə̃] 'continue' pfv. — pro+dãlž+ava+m, sec.ipfv.

If the second condition is not satisfied (the verb is not prefixed), there is no suspension of metathesis before *-va-*:

(105) vãrž+[ə̃] 'tie, bind' pfv. — vrãz+va+m 'tie, bind' ipfv.

When both conditions are satisfied, metathesis is systematically suspended:

(106) pre+pãrž+[ə̃] 'fry' perf. — pre+pãrž+va+m, sec.ipfv.
 o+stãrž+[ə̃] 'scrape off' perf. — o+stãrg+va+m, sec.ipfv.
 za+vãrž+[ə̃] 'bind' pfv. — za+vãrž+va+m, sec.ipfv.

³¹ One exception is kač+[ə̃] 'carry up' — kãč+va+m.

Even if there is no primary imperfective, an imperfective derived from a prefixed perfective by means of the *-va-* suffix suspends metathesis:

raz+gãrd+[J+ə] 'bare the bosom of' pfv. — raz+gãrd+vam, ipfv.
 na+tãrt+[J+ə] 'bruise' pfv. — na+tãrt+vam, ipfv.

All conjugational forms, including verbal nouns, from prefixed imperfectives suspend metathesis: iz+skãrc+va+ne 'squeaking', na+kãlc+va+ne 'mincing', na+tãrt+va+ne 'bruising'.

GV roots in secondary prefixed imperfectives always occur before vocalic suffixes, e.g., *u+dãlž+áva+m* 'prolong, lengthen' [*u+dãlg+va+m], cf. *dãlãg* 'long', *dãlg+a*, fem.; *u+venč+áva+m* 'crown' [*u+vènč+va+m], cf. *ven+èc* 'wreath', *ven+c+i*, pl. Therefore, the suspending effect that the *-va-* suffix exerts on metathesis cannot be tested with GV-alternation.

1.2.7.3. Phonologically-conditioned suspensions

1.2.7.3.1. Metathetic roots in combination with GV suffixes

When a metathetic root combines with the adjectivizing GV suffixes *-en/-n-* (107) or *-ãk/-k-* (108), metathesis is suspended in the masc.sg. of the adjective.

- (107) krãv — krãv+en 'blood' adj., krãv+n+a, fem. vs. kãrv+[J+ə] 'bleed'
 vrãx — vrãx+en 'top' adj., vrãx+n+a, fem. vs. vãrx+òven 'supreme'
 skrãb — skrãb+en 'sorrowful', skrãb+n+a, fem. vs. skãrb+[J+ə] 'sorrow' verb
 ipfv.
 strãv — strãv+en 'rapacious', strãv+n+a, fem. vs. na+stãrv+[J+ə] 'enrage' verb
 pfv.
 dlãž+en 'obliged', dlãž+na, fem. vs. dãlž+[ə] 'owe'
 krãš+en 'lively', krãš+n+a, fem. vs. raz+kãrš+[ə] se 'stretch'
 mrãš+en 'dirty', mrãš+n+a, fem. vs. mãrs+[J+ə] 'dirty' verb ipfv.
 krãm+en 'fodder', krãm+n+i, pl. vs. kãrm+à 'fodder', kãrm+[J+ə] 'suckle, nurse'
 verb ipfv.
- (108) grãm+ãk 'loud', grãm+k+a, fem.—gãrm+[J+ə] 'thunder' verb ipfv.
 prãx+ãk 'crumbly', prãx+k+a, fem.—pãrx+a+m 'flutter' ipfv.

1.2.7.3.2. -en/-en- adjectives from metathetic CS-roots

Other metathetic roots, including neuter roots listed in (94), select the non-GV allomorph of the suffix -en/-en-. In this case metathesis applies regularly in the masc.sg. of the adjective before the stable [e] vowel:

- (109) vrāv 'twine' — vārv+en 'twine' adj. masc. sg., vārv+en+a, fem.
dārv+ò 'wood', drāv+nìk 'chopping log', drāv+cè 'a small piece of wood' —
dārv+en 'wooden', dārv+en+a, fem.
zārn+ò 'grain', zrān+c+è, dimin. — zārn+en 'grain' adj. masc.sg., zārn+en+a,
fem.
sārn+à 'doe', srān+dàk 'deer' — sārn+en, adj., sārn+en+a, fem.

All roots in (109) end in a sonorant in a voiced labiodental [v] or in a nasal [n]. They all manifest a sequence *Lǎ* when found at the word-end, cf. *vrāv*, or before a consonantal suffix, cf. *drāv+nìk*, *zrān+c+è*.

1.2.7.4. Metathetic root + Ø-inflected GV -ec/-c- suffix: regular metathesis

Metathetic roots are subjected to a special effect exerted by the realized ghost of the Ø-inflected form -ec of the GV suffix -ec/-c-.

When phonetically realized, the ghost [e] of the suffix -ec does not suspend metathesis. We saw that this is the case with syncopation in GV roots also. Syncopation is not suspended by the -ec suffix; cf. (65). But this can be attributed to the fact that all GV roots that occur before the -ec/-c- suffix are CS-final. Moreover, they only optionally select the GV allomorph of the -EC suffix, cf. *begl+èc*, *begl+ec+i* is possible beside *begl+èc*, *begǎl+c+i*, cf. (67).

As far as metathetic roots are concerned, the situation is different. They never select the non-GV -ec/-ec- allomorph of the -EC suffix, even when CS-final (110). Before the Ø-inflected -ec, we do not find the expected *Lǎ*, but the *ǎL* sequence normally not found before a GV suffix; cf. (107) and (108).

Thus, the pattern of -ec/-c- derivatives from metathetic roots is different from that of -en/-n- (107) and -ǎk/-k- (108) derivatives from the same roots. There seems to be a special effect that the ghost vowel of -ec exerts on metathetic roots. The sequence we find before -ec is *ǎL* (110), normally found before suffixes beginning with a stable vowel, cf. 1.2.6.

When the ghost [e] of *-ec/-c-* is syncopated, i.e. before the vocalic plural inflection, the special effect on metathesis does not occur. In the plurals we find the regular *Lǎ* sequence.

- (110) *gǎrn+èc* 'big pot' (cf. *grǎn+čàr* 'potter') [**grǎn+ec*], *grǎn+c+i* 'pottery' pl.
sǎrn+èc 'deer' (cf. *srǎn+dàk* 'deer') [**srǎn+ec*], *srǎn+c+i*, pl. (cf. the orthographic dictionary, Georgieva & Stankov 1983)
samo+dǎrž+ec 'autocrat' (cf. *drǎž* 'hold' imper.sg.) [**samo+drǎž+ec*],
samo+drǎž+c+i, pl.

1.2.7.5. Special effect of other GV suffixes on some metathetic roots

Some metathetic roots seem to be lexically marked to undergo the special effect described in 1.2.7.4 (as due to the suffix *-ec*) also before the other GV suffixes, namely *-en/-n-* and *-ǎk/-k-*. As in (110), metathesis of these roots is not suspended by a following realized ghost vowel in the suffix:

- (111) *tǎrž+en* 'auction' adj.—*trǎž+n+a*, fem.
sǎlz+en 'lachrymal'—*slǎž+n+a*, fem.
dǎrž+ǎk 'audacious'—*drǎž+k+a*, fem.

Compare (111) with the following derivatives in (112), where the roots are not lexically marked to undergo the special effect:

- (112) *krǎš+en* 'lively', *krǎš+n+a*, fem.
dlǎž+en 'obliged', *dlǎž+n+a*, fem.
grǎm+ǎk 'loud', *grǎm+k+a*, fem.

Without the special effect the masc.sg. forms of the adjectives in (111) would be: **trǎž+en*, **slǎž+en*, **drǎž+ǎk*, like those in (112). The forms *sǎlz+en*, *sǎlz+n+a* constitute an alternative paradigm for the *-en/-n-* adjective from *sǎlz+à* 'tear', whose root behaves as non-metathetic in other derivatives also, cf. (96).

1.3. Ghost vowels and stress in Bulgarian

1.3.1. The Bulgarian stress system.

According to the stress taxonomy of Roca (1992), based on Halle & Vergnaud (1987), Bulgarian is a language with a purely lexical accent system. Some syllables are provided with a lexical accent underlyingly, others not.³²

In Bulgarian some morphemes are inherently stressed and others are inherently stressless. Depending on their accentual properties, nominal, adjectival and verbal roots in Bulgarian fall into two paradigms: stressed roots and stressless roots. Suffixes (derivational and inflectional) are also either stressed or stressless. Inherently stressed roots and suffixes include a syllable provided with a lexical accent. As for inherently stressless roots and suffixes, none of their syllables have a lexical accent.

Inherently stressed roots give rise to fixed accentual paradigms, where stress is on the same syllable of the stem throughout the paradigm.³³

Inherently stressless roots give rise to paradigms where stress is on the suffix (on one of the suffixes)³⁴. But there may be stress-shifts to the root if an inherently stress-retracting suffix is added.

Scatton's analysis of the Bulgarian verbal system (Scatton 1975:135sq.) distinguishes between "stem-stressed" verbal stems, that can be "root-stressed" or "suffix-stressed", and "stressless" verbal stems. The former, but not the latter are "phonemically marked for stress".

When suffixes without lexical accent are added to roots, the accentuation of the word is determined by the stress type of the root:

- if the root is stressed, the stress in inflected/derived forms remains unchanged, see (113)
- if the root is stressless, the inflected/derived form receives stress on the suffix, see (114)

³² The Macedonian stress system, analyzed in Roca (1992), is a mixed system: partly a covert rhythmic system (as opposed to overt rhythmic systems where all secondary stresses are phonetically realized) and partly a lexical accent system.

³³ Inherently stressed roots correspond to the thematically stressed or "acute" stems in traditional descriptions (cf. Stankiewicz 1993).

³⁴ Inherently stressless roots correspond to desinentially stressed or "oxytone" stems in traditional descriptions (cf. Stankiewicz 1993).

(113) a	/xlàb/	xljàb 'bread'	xljàb+ove, pl.	xlèb+ec, dimin.
b	/gàb/	gàb+a, 'mushroom'	gàb+i, pl.	gàb+ičk+a, dimin.
c	/cvèt/	cvèt+e 'flower'		cvèt+enc+e, dimin.
d	/sìn/	sìn 'blue'	sìn+ij+[ə], def. sìn[J]+a, fem.	sìn+ičãk, dimin.
e	/mìn/	mìn+[ə] 'pass' 1p.sg. pres.	mìn+a+x, aor.	mìn+e+x, ipft.
f	/pràv/	pràv+[J+ə] 'make' 1p.sg.pres.	pràv+i+x, aor.	pràv+e+x, ipft.
(114) a	/snäg/	snjäg 'wind'	sneg+ove, pl.	snež+èc, dimin.
b	/žen/	žen+à, 'woman'	žen+i, pl.	žen+ičk+a, dimin.
c	/mor/	mor+è 'sea'		mor+ènc+e, dimin.
d	/sam/	sàm 'sole'	sam+ij+[ə], def. sam+à, fem.	sam+ičãk, dimin.
e	/kov/	kov+[ə] 'forge' 1p.sg. pres.	kov+à+x, aor.	kov+jà+x, ipft.
f	/smen/	smen+[J+ə] 'change' 1p.sg.pres.	smen+i+x, aor.	smen+jà+x, ipft.

The process of suffixation may remove an inherent stress from the root. This happens when an inherently stressed suffix, e.g. the agentive nominalizing suffix - àč, is added to a root with a lexical accent:

/čìst/	čìst+[J+ə] 'clean', 1p.sg.pres.	čìst+i+x, aor.	čìst+àč 'cleaner'
/pàz/	pàz+[J+ə] 'keep', 1p.sg.pres.	pàz+i+x, aor.	paz+ àč 'guard'

1.3.2. Additional lexical marks regarding stress

In pure lexical accent systems, there are often additional lexical marks regarding stress on certain specific morphemes (cf. Halle 1973 for Russian).

In Bulgarian, some inflectional suffixes systematically produce forms with pre-final stress. Daniels (1976:332) gives a list of endings that can never receive stress, even when all the remaining morphemes in the word are lexically stressless. In Daniels' interpretation such inflectional suffixes bear a special lexical mark that prevents them from receiving phonetic stress. These are the count plural ending -a, the vocative

endings (for masculine and feminine nouns) and, with some exceptions³⁵, the definite articles. Some of the above inflectional suffixes behave as stress-retracting: they provoke a stress-shift to the root in a paradigm where stress is normally found on the suffix:

zvjàr 'beast'	zver+ovè, pl. zver+čè, dimin.	zvjàr+[ə], def. zvjàr+a, count pl.
bòg 'God'	bog+ovè, pl.	bòg+[ə], def. bòž+e, vocative

The masculine singular definite article $[-\text{ə}(t)]$ is normally inherently unstressable and it produces stress-shift to the stem. However, a limited set of stressless monosyllabic masculine nouns are specially marked to neutralize the stress-retracting property of the definite article, e.g. *sneg*+ $[\text{ə}]$ 'snow' def., *krak*+ $[\text{ə}]$ 'leg' def.

1.3.3. Stress patterns with ghost vowels

In (114a) we saw that a monosyllabic masculine noun root can be stressless. As for polysyllabic noun roots, the great majority are inherently stressed in Bulgarian, i.e., one of their syllables is provided with a lexical accent. That is why the plural inflection $-i$ never receives phonetic stress with polysyllabic masculine roots:

(115) lèbed 'swan'	lèbed+i, pl.
komìn 'chimney'	komìn+i [$*\text{komin}+\text{i}$], pl.

However, the plural $-i$ is systematically stressed in the cases of ghost vowel syncope when the corresponding singular form bears stress on the ghost vowel. As can be seen in (116a), stress-shift to the right occurs before some other inflectional and derivational suffixes also, namely, in the feminine and in diminutives.

³⁵ As reported by Mayer (1987:144), the Bulgarian definite article is stressed in some masculine monosyllabic nouns, e.g. *sneg*+ $[\text{ə}]$ 'snow' def., and in certain categories of words, namely in feminine singular \emptyset -inflected nouns, e.g. *pesen*+ $\text{t}\grave{\text{a}}$ 'song' def., *krǎv*+ $\text{t}\grave{\text{a}}$ 'blood' def. (cf. *žen*+ $\text{a}\grave{\text{t}}\text{a}$ 'woman' def., where the stem is V-inflected), and in most cardinal numerals, e.g. *sèdem* 'seven' with stem stress, *sedem*+ $\text{t}\grave{\text{e}}$, def.

- (116) a dobăr 'good' dobr+ì, pl. dobr+à, fem. dobr+ičăk, dimin.
 b petèl 'cock' petl+i, pl.
 c vjătăr 'wind' vetr+ovè, pl. vetr+èc, dimin.

Words that exhibit a stressed ghost vowel in their Ø-inflected form, always shift stress to the suffix in inflected and derived forms: they are inherently stressless roots.

Compare (116) with the stress patterns of GV roots where stress in the singular is not on the syllable containing the ghost vowel (117). There is no stress-shift in inflected and derived forms of such roots:

- (117) a xităr 'clever' xitr+i, pl. xitr+a, fem. xitr+ičăk, dimin.
 b săblăzăn 'temptation' săblăzn+i, pl.
 c vâzel 'knot' vâzl+i, pl.

Metathetic roots can also be either inherently stressed or stressless:

- (118) a krăv 'blood' kărv+i, pl.
 b grăd 'bosom' gărd+i, pl.

Stressless Metathetic roots, like stressless GV roots, shift the stress to the plural *-i*, as in (118b) above.

1.4. Interaction of ghost [e]'s with palatalization

1.4.1. Restrictions for palatalization in Bulgarian

All consonants (obstruents and sonorants) except the [–anter] coronals, i.e. [š], [ž], [č] and [ǰ] can be underlyingly palatalized.

Underlying palatalized consonants, see (119), always surface as plain, non-palatalized consonants at the word-end (i), before another consonant (ii) and before front vowels (iii).

(119)		(i)	(ii)	(iii)
	ogn[^j]+òve, pl.	ògǎn 'fire'	ògǎn+če, dimin.	ògn+en, adj.
	ogn[^j +à]r, 'stoker'			ogn+ìšt+e, 'fireplace'
	ògǎn[^j +ə], def.			
	kon[^j +à]r, 'groom'	kon 'horse'	kòn+sk+i, adj.	kòn+en, adj.
	kon[^j +ù]šn+a, 'stable'		kòn+če, dimin.	kon+è, pl.
	kòn[^j +ə], def.			
	kràl[^j +ə], def.	kral[^y] 'king'	kràl[^y]+sk+i, adj.	kral+è, pl.
	kral[^j +ù], vocative			kral+ìc+a, 'queen'

The non-palatalized /l/ or depalatalized /lʲ/ is velarized: [l^y]. This is not the case before front vowels.

On the surface, consonant palatalization in Bulgarian is distinctive only word-internally before a back vowel.

1.4.2. Interaction of Velar/Affricate Palatalization with ghost [e]'s

First Velar Palatalization (1st Velar Pal.) turns velars into postalveolars mostly before front vowels, but also before some consonantal derivational suffixes (e.g. -k+a: knìg+a 'book' — knìž+k+a, dimin.). In addition, the voiceless stop is affricated.

1st Velar Pal.

$$\left\{ \begin{array}{c} k \\ g \\ x \end{array} \right\} \longrightarrow \left\{ \begin{array}{c} č \\ ž \\ š \end{array} \right\} / \text{ ______ front V}$$

Second Velar Palatalization (2nd Velar Pal.) turns velars into alveolars before the front vowel of the plural inflection -i in nouns only. Here too, the voiceless stop undergoes affrication.

bàbrek 'kidney'	bàbrec+i, pl.
kovčèg 'coffin'	kovčèž+i, pl.
siromàx 'poor man'	siromàs+i, pl.

2nd Velar Pal.

$$\left\{ \begin{array}{c} k \\ g \\ x \end{array} \right\} \longrightarrow \left\{ \begin{array}{c} c \\ z \\ s \end{array} \right\} / \text{ — front V }]_{N:pl.}$$

Affricate Palatalization (Affricate Pal.) turns the alveolar affricate into postalveolar before a front vowel.

Affricate Pal.

$$c \longrightarrow \check{c} / \text{ — front V}$$

Even though not surfacing, the front ghost [e] of the *-en/-n-* suffix causes palatalization of a preceding velar or affricate (120). Therefore, 1st Velar Pal. and Affricate Pal. must have taken place before the deletion of [e].

(120) mràk 'dark' noun	mràč+n+a, adj. fem.sg.	mràč+en, masc.
rek+à 'river'	rèč+n+a, adj.fem.sg.	rèč+en, masc.
sn[^{jà}]g 'snow'	snèž+n+a 'snowy' fem.	snèž+en, masc.
stràx 'fright'	stràš+n+a 'frightful' fem.	stràš+en, masc.
sm[^{jà}]x 'laughter'	smèš+n+a 'ridiculous' fem.	smèš+en, masc.
mèsec 'month'	mèsec+n+a 'monthly' fem.	mèsec+en, masc.

1.5. Ghost [e]'s and the ä-alternation

The ä-alternation of the Bulgarian literary language is a lexically restricted alternation conditioned by phonological factors. It comes from the characteristic North-Eastern Bulgarian treatment of the Proto-Slavic vowel *ä³⁶ "jat", a low front tense vowel. When stressed, it gave [ja], i.e. [a] with palatalization of the preceding consonant, elsewhere, [e]. Such [ja]'s coming from ä yielded a synchronic alternation: they turn into [e] if the next syllable contains a front vowel, a palatalized consonant (i.e. a consonant that has a coronal specification under its V-place node) or a [-anter] coronal.

³⁶ Other notations for this vowel in Slavic historical phonology are *ě and *æ.

The ghost vowel [e] triggers almost systematically the change of [ja] (< *ä) in the preceding syllable to [e]. This occurs even in cases where the ghost [e] syncopates before a vocalic suffix:

(121)	m[jà]st+o	mèst+en	mèst+n+a	mest+à
	'place' sg.	'local' masc.sg.	'local' fem.	'place' pl.

In (121) the *ä*-alternation in both the third and fourth forms occurs before the back vowel [a]. In the last form [ja] becomes [e] because of the stress-shift: *ä* is never realized as [ja] in unstressed syllables. However in the third form *ä* is stressed. Here, the occurrence of [e] in the surface form seems to be due only to the GV alternation in the suffix containing the front ghost vowel, cf. the masc. sg. *mest+en*. Consider now:

(122)	rjàd+ǣk	rjàd+k+ost	rèd+k+i	raz+red+[j+ǣ]
	'rare' masc.sg.	'rareness'	'rare' pl.	'rarify'

In *rèd+k+i*, we cannot claim that the occurrence of [e] instead of [ja] is due to the GV alternation in the suffix, because the ghost vowel that is involved here is the back vowel [ǣ] (cf. *rjàd+ǣk*). The *ä*-alternation seems to take place because the alternating [ja] finds itself in the syllable preceding the front vowel [i] in the surface form.

1.6. Generalizations

1.6.1. GV-alternating vs. Metathetic roots

From the presentation of data in 1.1. and 1.2 it results that GV-alternation and Metathesis exhibit considerable symmetry, but also some asymmetry:

- Both occur only within word boundaries.
- Both occur before vocalic (inflectional and derivational) suffixes, but not before consonantal (inflectional and derivational) suffixes or at the end of words. The formulas we arrived at in 1.1.5 and 1.2.6 are repeated below:

$$\begin{array}{l}
 \text{GV} \quad \longrightarrow \quad \emptyset / \text{ ____ } C + V \\
 \\
 [V] \quad / \text{ ____ } C \left\{ \begin{array}{l} +C \\ \# \end{array} \right\}
 \end{array}$$

$$\begin{array}{l} \text{ǎL} / \text{ ______ C + V} \\ \{ \text{L} ; \text{ǎ} \} \longrightarrow \\ \text{Lǎ} / \text{ ______ C } \left\{ \begin{array}{l} +\text{C} \\ \# \end{array} \right\} \end{array}$$

GV alternations are suspended by some vocalic inflectional suffixes in masculine noun declension (see 1.1.6.1), while metathesis is suspended before the consonantal imperfectivizing suffix *-va-* when added to prefixed perfective stems (1.2.7.2).

- Both show lexical exceptions in derivation; see 1.1.3.3 for GV roots and (76), (77), (78), (93), (96), (102) and (104) for metathesis. Lexical exceptions are more frequent with metathesis than with GV-alternation.
- Both are more frequent with Ø-inflected roots than with V-inflected roots. GV alternation and metathesis of V-inflected roots are limited to derivation; see 1.1.2.2.3 and 1.2.4.3.

Metathesis of [l] / schwa occurs only in derivation, whereas metathesis of [r] / schwa occurs in both inflection and derivation.

- With inflection, both GV-alternation and metathesis are much more frequent in noun declension than in verb conjugation.
- Both are suspended before a ghost vowel in the following syllable (in the suffix); see 1.1.6.2 for GV alternation and 1.2.7.3 for metathesis.
- Both GV-alternating (see 1.1.6.2.2) and metathetic (see 1.2.7.3.2) roots ending in 'consonant + sonorant' (CS-roots) may select the non-GV allomorph of the adjectivizing suffix *-en/-en-*. In both types of CS-roots, a schwa is regularly inserted before a consonantal suffix or word-finally, cf. (36), (70) and (109).
- GV-alternating CS-roots may combine optionally with the GV allomorph *-ec/-c-* of the *-EC* suffix, cf. (71). Metathesizing roots unexceptionally select the same allomorph (110).

Metathetic roots undergo a special effect before the GV of the uninflected *-ec* suffix (1.2.7.4). A limited set of metathesizing roots exhibit the same behaviour with other GV suffixes also (1.2.7.5).

Asymmetry is found mostly in the morphophonological suspending effects on GV syncopation and on metathesis: the vocalic inflections that suspend GV syncopation in noun declension (cf. 1.1.6.1) do not suspend metathesis. Conversely, the suspending effect of the *-va-* suffix with imperfectivization (cf. 1.2.7.2) can be observed only with metathesis.

Asymmetries between GV-alternating vs. Metathetic roots are at least partly phonologically-conditioned: in GV-syncopating roots the ghost vowel is followed mostly by a sonorant (see 1.1.3.2), while in metathetic roots, the metathesizing schwa is always preceded by a sonorant (a liquid) and can be followed by either an obstruent or a sonorant.

1.6.2. Inventory of underlying representations

The considerable parallels in the phonological properties of GV-alternating vs. Metathetic roots should be encoded by the same specific underlying structure in lexical representations of both types of roots. The claim is that metathetic roots, as well as GV-roots, contain ghost vowels. It will be claimed that not only GV-roots, but also metathetic roots contain a ghost vowel. Henceforth, I represent the underlying structure corresponding to a ghost vowel as <V>. The exact nature of <V> is discussed in the next chapter. In GV-alternating roots, <V> is [e] or [ə]; in metathetic roots, it is only [ə].

1.6.2.1. GV-alternating roots

It is now possible to specify the underlying representations that result from the analysis of the different subsets of data. This anticipates the phonological treatment in the next chapter, where stronger justification is provided for this treatment.

The underlying representation of Ø-inflected nominal roots that select the *-en/-n-* (hence *-<e>n*) suffix, cf. (64), must contain <ə> or <e>:

(123) /ə̀g<ə>l/, /fìlt<ə>t/, /rìt<ə>m/, /fàk<e>l/, /lák<ə>t/, /pès<e>n/

As for Ø-inflected nominal roots that select the *-en/-en-* (hence *-<en>*) suffix, cf. (65), and if masculine, the *-ove* plural restricted to monosyllables, cf. (13), their underlying representation should end in adjacent 'consonant + sonorant', i.e., not separated by a <V>; see (124)³⁷.

Thus, underlyingly, the root *ògǎn* 'fire' is monosyllabic: /ogn^l/. In this way, we see why it takes the *-ove* plural inflection, which never occurs with bisyllables. The schwa in the singular *ògǎn* results from epenthesis triggered by the final sonorant.

³⁷ In the attested Old Church Slavonic (OCS) forms of the nouns listed in (124), the consonant and sonorant were contiguous, i.e. there was no *jer* between them: *ognǎ* 'fire', *vixrǔ* 'whirlwind', *myslǔ* 'thought'.

(124) /ògnʲ/, /pə̀kl/, /vìxr/, /mìsl/, /neprijàzn/

The noun *vjatār* 'wind' gives two alternative -EN adjectives: one with the -/⟨e⟩n/ suffix, the other with the -/en/ suffix; see (66). There are probably two alternative underlying forms of the root: resp. /vʲat⟨ə⟩r/ and /vʲatr/³⁸. /vʲat⟨ə⟩r/ selects the -/⟨e⟩n/ suffix, whereas /vʲatr/, ending in a CS cluster, selects the -/en/ suffix:

(125) *vjatār+en* < /vʲat⟨ə⟩r+⟨e⟩n/, *vjatār+n+a* < /vʲat⟨ə⟩r+⟨e⟩n+a/
vetr+en < /vʲatr+en/, *vetr+en+a* < /vʲatr+en+a/ (as for the alternation /ʲa/—[e], see 1.5)

V-inflected neuter nominal roots (except *srebr+ò*) select the -/en/ suffix, cf. (67). They are all CS-final, see (36). Therefore, their underlying forms should not contain a <V>:

(126) /rebr+o/, /stə̀kl+o/, /àgn+e/, /pism+o/

The schwa that manifests itself in the above roots before a consonantal suffix, cf. (36), will be considered epenthetic and triggered by the following sonorant:

(127) *stəkāl+c+è* < /stə̀kl+c+e/, *àgān+c+e* < /àgn+c+e/, *pisām+c+è* < /pism+c+e/

Among the neuter GV roots only *srebr+ò* 'silver' selects the -/⟨e⟩n/ suffix, cf. (37), and therefore its representation must be:

(128) /sreb⟨ə⟩r+o/

V-inflected feminine noun roots select the -/⟨e⟩n/ suffix, cf. (38); hence they must be represented with an underlying <ə> (129). Moreover, their final consonant is not a sonorant, but the obstruent [k], which cannot trigger schwa epenthesis.

(129) /klèt⟨ə⟩k+a/, /rešèt⟨ə⟩k+a/, /zagàd⟨ə⟩k+a/, /ocèn⟨ə⟩k+a/

As for verb roots that exhibit a GV alternation in present tense vs. aorist, cf. (33), we posit two allomorphs: /ber/, /per/, /mèl/, /stèl/, found in the present stem, and /br/, /pr/,

³⁸ The attested OCS form is *vātrŭ* with adjacent consonant and sonorant.

/ml/, /stl/, found in the aorist stem. Likewise, for $k\grave{o}l+[j+\text{ə}]$ 'slay', cf. (35), the allomorph in the present stem is / $k\grave{o}l$ /, while the aorist allomorph is / kl /.

The i / \emptyset alternation in derived imperfectives vs. perfectives described in (43) will be attributed to allomorphy of the verb root: / pir /, / $stir$ /, / vir /, / zir /, / mir / vs. / pr /, / str /, / vr /, / zr /, / mr /.

As for ex. (45), it can be considered a regular case of the ghost vowel <e> in combination with stem-final [n]-deletion. The lexical representation of the verb is: / $kl\langle e \rangle n$ / for both the perfective (present and aorist stem) and the imperfective.

1.6.2.2. GV suffixes

The underlying form of the aorist participle's suffix should be / l / (30). Thus, the surface schwa in the masc. sg. participle of C-stem verbs results from pre-liquid epenthesis.

The -EC suffix has two allomorphs, whose lexical representations should be / $\langle e \rangle c$ / and / ec /; cf. (71) and 1.6.4 below.

For the -EN suffixes we posited respectively underlying / $\langle e \rangle n$ / and / en /.

Two other GV adjectivizing suffixes have been listed; see 1.1.4.2. Their lexical representations must be / $\langle \text{ə} \rangle k$ / and / $i\check{c}\langle \text{ə} \rangle k$ /, respectively.

We analyze $-estv+o$ and $-esk+i$ (cf. 1.1.4.4) not as coming from underlying */ $\langle e \rangle stv+o$ /, */ $\langle e \rangle sk+i$ /, but rather as vocalic allomorphs / $estv+o$ /, / $esk+i$ / of the respective consonantal suffixes / $stv+o$ /, / $sk+i$ /.

1.6.2.3. Metathetic roots

The [CəLC] realizations of metathetic roots before vocalic suffixes can be analyzed as resulting from the simultaneous syncopation of <ə> in an underlying / $CL\langle \text{ə} \rangle C$ ³⁹ and epenthesis of [ə] (the default vowel in Bulgarian) before the liquid.

Thus for metathetic roots that select a GV suffix, / $\langle e \rangle n$ / or / $\langle \text{ə} \rangle k$ /, cf. (107) and (108), the underlying forms must be:

(130) / $kr\langle \text{ə} \rangle v$ /, / $vr\langle \text{ə} \rangle x$ /, / $skr\langle \text{ə} \rangle b$ /, / $str\langle \text{ə} \rangle v$ /, / $dl\langle \text{ə} \rangle g$ ⁴⁰/, / $gr\langle \text{ə} \rangle m$ /, / $pr\langle \text{ə} \rangle x$ /

³⁹ Most OCS and Old Bulgarian attested written forms for words that later developed metathetic roots contain a jer letter, ŭ or ĭ, after the liquid, i.e. CLŭC, CLĭC. This is in accordance with the Proto-Slavonic rule of the open syllable requiring that every syllable ends in the nucleus. The nucleus could be a jer, i.e. a high lax vowel, or a syllabic liquid, orthographically represented by Lŭ, Lĭ.

As for metathetic roots in (109), no <V> should be posited in the lexical representation:

(131) /vr̩v/, /drv+o/, /zrn+o/, /sr̩n+a/

Because these roots are underlyingly CS-roots, they select the -/en/ suffix.

1.6.2.4. Allomorphy of roots

In cases of allomorphy like those in 1.1.3.3, two different lexical representations for the same root morpheme must be adopted. The inflected forms represent a deviation from the general pattern for GV syncopation given in 1.1.5. Thus, we posit a GV root (/gàb<ə>r/, /pìs<ə>k/) in derived forms and a stable vowel root (/gàbər/, /pìsək/) in inflected forms of the non-derived nouns:

gàbār+i < /gàbər+i/, gabr+àk < /gàb<ə>r+àk /
 pìsāc+i < /pìsək+i/, pisk+a+m < /pìs<ə>k+a+m/

Likewise, the various exceptions to metathesis of roots in inflection, derivation or compounding are to be related to two allomorphic lexical representations: one containing a stable vowel and another containing a <V>:

cf.(77) dǎlg+ove, pl. < /dǎlg+ove/, dlǎž+en < /dl<ə>g+en/
 tǎrg+ove, pl. < /tǎrg+ove/, tǎrž+en < /tr<ə>g+en/

cf.(78) prǎč+ove, pl. < /prǎč+ove/, pǎrč+òtin+a < /pr<ə>č+òtin+a/
 trǎn+i, pl. < /trǎn+i/, trǎn+est < /trǎn+est/, tǎrn+o+kòp < /tr<ə>n+o+kòp/

cf.(81) gǎrm+ove < /gr<ə>m+ove/, grǎm+ove < /grǎm+ove/

cf.(93) po+vǎrx+nost < /po+vǎrx+nost/ ≠ vrǎx /vr<ə>x/
 o+skǎrb+lènie < /o+skǎrb+lènie/ ≠ skrǎb /skr<ə>b/
 bez+mǎlv+n+o < /bez+mǎlv+n+o/ ≠ mǎlv+à /ml<ə>v+a/
 pod+smǎrk+n+a < /pod+smǎrk+n+ə/ ≠ smrǎk+n+a /smr<ə>k+n+ə/

⁴⁰ This is the GV allomorph found in derivation, while in inflection the stable vowel allomorph /dǎlg/ is used, see (107).

cf.(96) $s\grave{a}lz+en$, $sl\grave{a}z+n+a </sl<\grave{a}>z+<e>n/$, $/sl<\grave{a}>z+<e>n+a/$; $s\grave{a}lz+l\grave{i}v </s\grave{a}lz+l\grave{i}v/$

The second root allomorph for $s\grave{a}lz+a$ 'tear', with a stable schwa, gives the following alternative -EN-adjectival forms:

$s\grave{a}lz+en </s\grave{a}lz+<e>n/$, $s\grave{a}lz+n+a </s\grave{a}lz+<e>n+a/$

Here the non-GV allomorph of the -EN suffix is selected because the root-final cluster /lz/ is not a CS cluster, but a sequence 'sonorant + obstruent'.

For the compounds listed in (102) and (104) we posit the allomorphs /grəm/ vs. /gr<ə>m/, /krəv/ vs. /kr<ə>v/, /grəd/ vs. /gr<ə>d/.

1.6.3. <V>-roots vs. CS-roots. -EN derivatives.

The roots in (123), (128), (129) and (130) share the property of selecting the -/<e>n/ suffix. The underlying forms adopted for them contain the same structure: a ghost vowel <V>.

Conversely, the roots listed in (124), (126) and (131) share the property of selecting the -/en/ suffix. Their representations also share the same structure: they all end in a 'consonant + sonorant' (CS) cluster.

Stem type		Lexical representations		Surface forms			
				Context 1	Context 2	Context 3	
				_____ +V	_____ + $\left\{ \begin{matrix} C \\ \# \end{matrix} \right\}$	_____ +EN	
GV-altern. roots	A	<V>-roots	-/C<e>C/ (123) -/C<ə>C/ (128) (129)	(123)	-[CC]-	-[CeS] -[CəS]	-[CeS +en] -[CeS +n+a] -[CəS +en] -[CəS +n+a]
	B	CS-roots	-/CS/ ± -o, -e	(124) (126)	-[CS]-	-[CəS]	-[CS+en] -[CS+en+a]
Metath. roots	C	<V>-roots	-/CL<ə>C/ (130)	(130)	-[CəLC]-	-[CLəC]	-[CLəC+en] -[CLəC+n+a]
	D	CS-roots	-/CLS/ ± -a, -o	(131)	-[CəLS]-	-[CLəS]	-[CəLS+en] -[CəLS+en+a]

Table 1

Table 1 gives the synopsis of:

1) The 4 types of GV roots:

- A: <V>-roots that give rise to GV alternations
- B: <V>-roots that give rise to metathesis
- C: CS-roots that give rise to GV alternations
- D: CS-roots that give rise to metathesis

2) The 3 main contexts where the alternations occur, yielding different surface forms for the same root type:

- Context 1: before a vocalic suffix (inflectional or derivational)
- Context 2: before a consonantal suffix (inflectional or derivational) and word-finally
- Context 3: before the -EN adjectivizing suffix (where -EN can be -/en/ or -/<e>n/)

It can be seen that root types A and C give identical surface forms in contexts 2 and 3, whereas root types B and D give identical surface forms in contexts 1 and 3.

The following generalizations emerge:

(132) (i) <V>-roots of both types (root types A and C) exhibit identical surface forms (with retention of the ghost vowel) in Context 2 (__ +C, __ #) vs. Context 3 (__ +<e>n).

(ii) Context 1 has slightly different effects on root type A vs. root type C:

- in root type A: loss of the ghost vowel
- in root type C: loss of the ghost vowel + pre-liquid schwa insertion

(iii) As for roots containing underlying CS clusters (root types B and D), we find identical surface forms in Context 1 (__ +V) vs. Context 3 (__ +EN).

These surface forms result from:

- in root type B: no change
- in root type D: pre-liquid schwa insertion

(iv) Context 2 (__ +C, __ #) for CS-roots is characterized by schwa insertion that splits up the CS cluster (root type B) or the LS cluster (root type D), yielding:

- in root type B: CəS
- in root type D: CLəS

(v) All schwa insertions are pre-sonorant:

- in context 2, root types B and D
- in context 1, root types C and D (pre-liquid schwa)
- in context 3, root type D (pre-liquid schwa)

It can also be seen that surface ghost [ə] can be derived in two different ways:

1) by retaining underlying <ə> as surface [ə] :

- root type A
- root type C (Context 2)

2) by epenthesis :

- root types B and D
- root type C (Contexts 1 and 3)

On the other hand, surface ghost [e] always results from retention of the first type:

<e> → [e].

A phonological analysis of GV alternations in Bulgarian based on the above underlying representations should therefore be able to account for two processes:

- $\langle V \rangle \rightarrow V$
- $\emptyset \rightarrow [\text{ə}]$

1.6.4. -EC derivatives from CS-roots. Allomorphy of the suffix.

To account for the existence of two alternative plurals for the nouns listed in (71), I assume that the -EC suffix has two allomorphs: *-ec/* and *-<e>c/*. Unlike the -EN-derivatives, which obligatorily select the *-en/* allomorph with CS-roots, the -EC-derivatives from CS-roots can take both the non-GV allomorph *-ec/* and the GV allomorph *-<e>c/*.

We posit the following lexical representations for the roots in these examples:

(133) */bɛgl/, /mǎdr/, /pɔdl/, /xrabr/, /xitr/, /mǎrtv/*

Whatever allomorph of the -EC suffix that is chosen, the singular derivatives show the same surface forms:

(134) *bɛgl+ɛc < /bɛgl+ɛc/, mǎrtv+ɛc < /mǎrtv+ɛc/, mǎdr+ɛc < /mǎdr+ɛc/*

(135) *bɛgl+ɛc < /bɛgl+<ɛ>c/, mǎrtv+ɛc < /mǎrtv+<ɛ>c/, mǎdr+ɛc < /mǎdr+<ɛ>c/*

By contrast, the plural forms of the -EC derivatives differ according to the suffixal allomorph that is chosen:

(136) *bɛgl+ec+i < /bɛgl+ec+i/, mǎdr+ec+i < /mǎdr+ec+i/*

(137) *bɛgǎl+c+i < /bɛgl+<e>c+i/, mǎrtǎv+c+i < /mǎrtv+<e>c+i/*

1.6.5. -EC derivatives from metathetic roots. The Fratricidal Ghost Effect.

Which underlying representations should we adopt for -EC-suffixed nouns derived from metathetic roots listed in (110)?

As for *sǎrn+ɛc*, we have already adopted the lexical representation */srn/* for its root, because it selects the *-en/* suffix (131). Because */srn/* is a CS-final root, we can attribute the unexpected metathesis in this form before a GV suffix to the CS (LS) cluster; the underlying forms are sg. */srn+<e>c/* and pl. */srn+<e>c+i/*.

(138) /srn+<e>c/ > sãrn+èc

(139) /srn+<e>c+i/ > srãn+c+i

The metathetic root in the second -EC derivative — samo+dãrž+ec — is not CS-final, the root-final cluster being [r ž]. Therefore, we cannot analyze the schwa in the plural — samo+drãž+c+i — as related to the presence of a CS cluster. A possible solution is to posit an underlying ghost schwa (<ə>) in the lexical representation of the root, i.e. /dr<ə>ž /, and to assume that the latter is subsequently modified by the special effect of the -EC suffix described in 1.2.7.4. The effect can then be viewed as deletion of the root <V> in the presence of a suffixal <V>. In the unmarked case, the co-presence of a suffixal and a root ghost vowel involves the retention of both ghosts. We saw in (60) and (101)-(102) that syncope and metathesis are suspended before the phonetically realized ghost vowel of the suffix in Ø-inflected forms. The suspension of the alternations means mutual reinforcement of the ghosts. By contrast, when a lexically-marked GV suffix like -EC combines with a <V>-root, this produces the opposite effect: the suffixal ghost eliminates the root ghost. We call this effect the Fratricidal Ghost Effect (FGE) and consider it to be due to a special lexical mark.

(140) /samo+dr<ə>ž+<e>c^{FGE}/ > /samo+drž+<e>c/ > samo+dãrž+ec

Before a vocalic inflection, the -EC suffix has no FGE mark:

(141) /samo+dr<ə>ž+<e>c+i/ > samo+drãž+c+i

The mark can be either on the suffix — -EC is a FGE suffix, i.e. a suffix marked to provoke the FGE — or on the root. A number of metathetic roots seem to be marked to undergo the FGE.

The lexically-marked FGE roots are listed in (111). Here too, the root <V> undergoes deletion before another <V> in the suffix and only if there is no vocalic inflection.

(142) /tr<ə>ž^{FGE}+<e>n/ > /trž+<e>n/ > tãrž+en
/dr<ə>z^{FGE}+<ə>k/ > /drz+<ə>k/ > dãrz+ãk
/sl<ə>z^{FGE}+<e>n/ > /slz+<e>n/ > sãlz+en

The third -EC derivative from a metathetic root, *gãrn+èc*, for which there is no -EN adjective, is derivable either like *samo+dãrž+ec* or like *sãrn+èc*.

Stem type		Lexical representation		Surface form in _____ +EC	
GV- alternating roots	A	<V>- roots		—	
	B	CS-roots	-/CS+<e>c/	(135)	sg. [CS+ec]
			-/CS+<e>c+i/	(137)	pl. [CəS+c+i]
			-/CS+ec/	(134)	sg. [CS+ec]
		-/CS+ec+i/	(136)	pl. [CS+ec+i]	
Metathetic roots	C	<V>- roots	-/CL<ə>C+<e>c ^{FGE} /	(140)	sg. -[CəLC+ec]
			-/CL<ə>C+<e>c+i/	(141)	pl. -[CLəC+c+i]
	D	CS-roots	-/CLS+<e>c/±-a,-e	(138)	sg. -[CəLS+ec]
			-/CLS+<e>c+i/	(139)	pl. -[CLəS+c+i]

Table 2

Table 2 gives the surface forms for the 4 types of GV roots in the context before the -EC suffix. When added to GV-alternating roots, -EC can be either /<e>c/ or /ec/. Metathetic roots obligatorily select the GV allomorph /<e>c/. Thus, the surface forms in Table 2 differ from those for context 3 in Table 1 (before -EN) for two reasons:

- Stems of type B select the /ec/ allomorph only optionally, whereas the same root type obligatorily selects the /en/ suffix.
- Stems of type D select the /<e>c/ allomorph, while the same root type selects the non-GV /en/ suffix.

1.6.6. List of examples for testing the phonological models

Table 3 below gives examples for each type of root (A, B, C and D) in combination with the suffixes -EN (Table 1) and -EC (Table 2). These examples will be used to test the different phonological treatments for GV alternations in Bulgarian discussed in the following chapter.

Ex N ^o	Stem type	context 1		context 2		context 3					
		__ +V		__ #		__ +C		__ +EN		__ +EN+V	
		a		b		c		d		e	
1	<V>-root	filtr+i	filtăr	filtăr+če	filtăr+en	filtăr+n+a	/filt<ə>r+i/	/filt<ə>r/	/filt<ə>r+če/	/filt<ə>r+<e>n/	/filt<ə>r+<e>n+a/
		pesn+i	pesen	pesen+ta	pesen+en	pesen+n+a	/pes<e>n+i/	/pes<e>n/	/pes<e>n+ta/	/pes<e>n+<e>n	/pes<e>n+<e>n+a/
2	CS-root	misl+[j+ə]	misăl	misăl+ta	misl+en	misl+en+a	/misl+j+ə/	/misl/	/misl+ta/	/misl+en/	/misl+en+a/
3	Metathetic <V>-root	kărv+av	krăv	krăv+ta	krăv+en	krăv+n+a	/kr<ə>v+av/	/kr<ə>v/	/kr<ə>v+ta/	/kr<ə>v+<e>n/	/kr<ə>v+<e>n+a/
4	Metathetic CS-root	vărv+olic+a	vrăv	vrăv+čic+a	vărv+en	vărv+en+a	/vrv+olic+a/	/vrv/	/vrv+čic+a/	/vrv+en/	/vrv+en+a/
					__ +EC	__ +EC+V				f	g
5	CS-root + <e>c	begl+a	begăl	—	begl+ec	begăl+c+i	/begl+a/	/begl/		/begl+<e>c/	/begl+<e>c+i/
6	CS-root + ec				begl+ec	begl+ec+i				/begl+ec/	/begl+ec+i/
7	Metathetic <V>-root	dărž+[ə]	drăž	drăž+k+a	samo+dărž+ec	samo+drăž+c+i	/dr<ə>ž+j+ə/	/dr<ə>ž/	/dr<ə>ž+k+a	-/dr<ə>ž+<e>c/	/dr<ə>ž+<e>c+i/
8	Metathetic CS-root	sărn+a	—	srăn+dak	sărn+ec	srăn+c+i	/srn+a/		/srn+dak/	/srn+<e>c/	/srn+<e>c+i/
9	Lexically- marked metathetic <V>-root	dărz+ost	—	drăz+n+a	dărz+ăk	drăz+k+a	/dr<ə>z+ost/		/dr<ə>z+n+ə/	/dr<ə>z+<ə>k/	/dr<ə>z+<ə>k+a/

Table 3

In (143) below we give the translation and morphology of all examples in Table 3. Stress is added also.

- (143) (1b) fîltăr 'filter' masc.sg., (1a) fîltr+i, pl., (1c) fîltăr+če, dimin., (1d) fîltăr+en, adj. masc.sg., (1e) fîltăr+n+a, fem.
- (1b) pèsen 'song' fem.sg., (1a) pèsn+i, pl., (1c) pesen+tà, definite sg., (1d) pèsen+en, adj. masc.sg., (1e) pèsen+n+a, fem.
- (2b) mìsăl 'thought' fem.sg., (2a) mìsl+[ɟ+ə] 'think' imperf. 1p.sg.pres., (2c) misăl+tà 'thought' definite sg., (2d) mìsl+en, adj. masc.sg., (2e) mìsl+en+a, fem.
- (3b) krăv 'blood' fem.sg., (3a) kărv+av 'bloody' masc.sg., (3c) krăv+tà, 'blood' definite sg., (3d) krăv+en '(of) blood' adj. masc.sg., (3e) krăv+n+a, fem.
- (4b) vrăv 'twine' fem.sg., (4a) vărv+oîic+a 'file, string', fem.sg., (4c) vrăv+čic+a, 'twine' dimin. fem.sg., (4d) vărv+en '(of) twine' adj. masc.sg., (4e) vărv+en+a, fem.
- (5b) bègeăl 'cursory' masc.sg., (5a) bègl+a, fem., (5f) & (6f) begl+èc 'fugitive' masc.sg., (5g) begăl+c+ì & (6g) begl+ec+ì, pl.
- (7a) dărž+[ə] 'hold' ipfv. 1p.sg.pres., (7b) drăž'hold', imper. sg., (7c) drăž+k+a, 'handle' fem.sg., (7f) samo+dărž+ec 'autocrat' masc.sg., (7g) samo+drăž+c+i, pl.
- (8a) sărn+à 'doe, female deer' fem.sg., (8c) srăn+dàk 'deer' masc.sg., (8f) sărn+èc 'deer', masc.sg., (8g) srăn+c+ì, pl.; cf. sărn+en '(of) deer', adj. masc.sg., sărn+en+a, fem.
- (9a) dărž+ost 'audacity', (9c) drăž+n+a 'dare' pfv. 1p.sg.pres., (9f) dărž+ăk 'audacious' masc.sg., (9g) drăž+k+a, fem.

2. Phonological treatments of the Bulgarian data

2.1. *Jer accounts for the Bulgarian ghost vowel alternations*

2.1.1. Scatton's treatment of ghost vowel syncope: DEL and LOW

Scatton (1975) argues for the existence of underlying jers (high lax vowels) in modern Bulgarian: /ũ/, the back jer, and /ĩ/, the front jer. One rule (DEL) deletes some of the jers; the others are changed into mid vowels by another rule (LOW), namely:

$$\begin{array}{ll} \text{ũ} \longrightarrow \text{ə} & \text{ĩ} \longrightarrow \text{e} \end{array}$$

This is a case of absolute neutralization.

Scatton's proposals were entirely in keeping with the then totally accepted principles of SPE phonology.

The jer solution first appears in Lightner's analysis of Russian (Lightner 1965). Lightner introduces the distinctive feature of tenseness in underlying representations. Underlyingly, jers are lax vowels. However, they never surface as lax. All phonetically manifested jers are mid tense vowels. Tenseness is not distinctive in surface phonetic forms.

Here is the formulation of the two rules (DEL and LOW) from Scatton (1975):

$$\begin{array}{ll} \text{DEL} & \left[\begin{array}{l} + \text{syll} \\ - \text{tense} \\ + \text{high} \end{array} \right] \longrightarrow \emptyset \ / \ # \ \text{X} \ \text{---} \left(\text{C}_0 \left[\begin{array}{l} [+ \text{syll}] \\ [+ \text{tense}] \\ [- \text{high}] \end{array} \right] \text{Y} \right) \# \\ \\ \text{LOW} & \left[\begin{array}{l} + \text{syll} \\ - \text{tense} \end{array} \right] \longrightarrow [- \text{high}] \end{array}$$

"High lax vowels delete before a syllable containing any non-high or any tense vowel and in word-final position; they are lowered when they occur in a syllable followed by a syllable containing another high lax vowel." (Scatton 1975:17).

Below, we give the following simpler forms for DEL and LOW without feature matrices. We put Y instead of ũ for the back jer and E instead of ĩ for the front jer. V stands for a non-jer vowel and # for the word-end.

$$\text{DEL} \quad \left\{ \begin{array}{c} \text{Y} \\ \text{E} \end{array} \right\} \longrightarrow \emptyset \quad / \quad \text{---} \quad \left\{ \begin{array}{c} \text{C}_0\text{V} \\ \# \end{array} \right\}$$

A jer is deleted before a non-jer vowel, with or without intervening consonant(s), and at the word-end.

$$\begin{array}{ll} \text{LOW} & \text{Y} \longrightarrow \text{ə} \\ & \text{E} \longrightarrow \text{e} \end{array}$$

As LOW is ordered after DEL, this means that all jers that remain after DEL has applied must be lowered to mid vowels.

2.1.1.1. Abstract segments: inflectional jers

The above analysis works if a back jer (Y) is posited at the end of every consonant-final (\emptyset -inflected) word. The presence of a jer inflection at the end of masculine singular nouns is motivated by a tendency for the article to repeat the vowel of the number/gender marker. But this repetition is not systematic. The \emptyset -inflected feminine nouns, for instance, take an *a*-final article (*-ta*) like *a*-inflected feminine nouns, e.g. *pèsen* 'song' — *pesen+tà*, def.; cf. *žen+à* 'woman' — *žen+à+ta*, def.¹ All neuter singular nouns, regardless of whether their inflection is *-o* or *-e*, take the same article (*-to*), cf. *ok+ò* 'eye' — *ok+ò+to*, def., where the vowel of the article is identical to that of the inflection, and *det+è* 'child' — *det+è+to*, def., where these vowels differ. Plural *i*-inflected nouns take the article *-te*, which does not reproduce exactly the vowel of the plural inflection: *vòpl+i* 'wails' — *vòpl+i+te*, pl. def.; *žen+i* 'women' — *žen+i+te*, pl. def. However, the repetition tendency is corroborated by neuter nouns that admit of alternative plurals, e.g. *rà+m+o* 'shoulder' — *ram+enè*, pl., *ram+enè+te*, pl. def., and *ram+enà*, alternative pl., *ram+enà+ta*, pl. def., as well as by *a*-inflected masculine singular nouns, e.g. *bašt+à* 'father' — *bašt+à+ta*, def.

Scatton motivates his positing a jer inflection in e.g. *nos* 'nose' (/nos+Y/) by admitting underlying *-tY/* for the masculine singular article with repetition of the inflectional vowel /Y/ of /nos+Y/, thus deriving the definite form *nos+ăt* [nosət] 'the nose' from an

¹ As for stress, the two *-ta* articles differ. The latter is inherently stressless, whereas the former is provided with a lexical accent. Some speakers tend to pronounce stressed *-ta* as [tə] in colloquial speech, but the unstressed *-ta* is also pronounced with a final schwa-like sound due to vowel reduction, e.g. /že'nata/ is realized as [že'nata].

underlying /nos+Y+tY/, where the *ǎ* [ə] results from the retention and lowering of the inflectional jer before the final jer of the article. It is clear that the jer inflection, necessary to correctly derive the forms of Ø-inflected feminine nouns like *pèsen* 'song' /pesEn+Y/, cannot be given such motivation, the definite form being *pesen+tà*, not **pèsen+ǎt*.

In order to derive the correct surface forms with the rules DEL and LOW, similar inflectional jers should be posited at the end of all Ø-inflected forms in Bulgarian:

- the singular indefinite forms of Ø-inflected masculine nouns
- the singular indefinite masculine forms of adjectives, participles and ordinal numerals
- the singular indefinite forms of Ø-inflected feminine nouns
- the singular forms of the truncated imperatives of *dǎržà* 'hold' and its prefixed derivatives (cf. 1.2.3.1.3)

Consider the derivations for *lovèc+ǎt* 'hunter' def., and *lovci+i*, pl., as required by Scatton's analysis:

lov+Ec+Y+tY	lov+Ec+i	
lovEcYt	lovci	DEL
lovecət		LOW

2.1.1.2. How to order DEL and LOW ?

As reported by Scatton himself, the same result is obtained if DEL and LOW are applied in inverted order.² In this case, first LOW' applies to jers that find themselves before another jer with intervening consonant(s).

$$\text{LOW}' \quad \left\{ \begin{array}{c} \text{Y} \\ \text{E} \end{array} \right\} \longrightarrow \left\{ \begin{array}{c} \text{ə} \\ \text{e} \end{array} \right\} \quad / \quad \text{--- C}_1 \left\{ \begin{array}{c} \text{Y} \\ \text{E} \end{array} \right\}$$

Then DEL' deletes all surviving jers.

$$\text{DEL}' \quad \left\{ \begin{array}{c} \text{Y} \\ \text{E} \end{array} \right\} \longrightarrow \emptyset$$

² «In the discussion above I took for granted that DELETE precedes LOWER. However, it is possible to formulate these two rules in such a way that the opposite order holds, LOWER — DELETE, without affecting the outcome of derivations in any way.» (Scatton 1975:18)

Assuming the above formulations for LOW' and DEL' with inverted order of the rules, we obtain the following alternative derivations for *lověc+ǎt* 'hunter' def., and *lovci+i*, pl.,

lovEc+Y+tY	lovEc+i	
lovecǎtY		LOW'
lovecǎt	lovci	DEL'

2.1.1.3. Deriving the object definite forms (*kratāk člen*)

In Scatton's analysis, whatever order of the rules is adopted, the object form of the masc.sg. definite form *lověc+[ǎ]* cannot be derived without introducing an additional rule: the object form must be obtained from the non-object one by means of truncation of the final [t]. Moreover, T-Truncation must be ordered after LOW or after DEL' according to which order DEL–LOW is adopted:

lovEc+Y+tY		lovEc+Y+tY	
lovEcYt	DEL	lovecǎtY	LOW'
lovecǎt	LOW	lovecǎt	DEL'
lovecǎ	T-Truncation	lovecǎ	T-Truncation

2.1.1.4. Is the schwa of the postpositive masc.sg. definite article a ghost vowel ?

The *ǎ* [ǎ] of the definite masc.sg. article does not alternate with zero. According to the definition of ghost vowels adopted here (vowels that alternate with zero in surface forms), it must be viewed as a stable vowel /ǎ/. Our principle is to posit underlying structures (either jers or the alternative structures — floating segments — that we introduce further on, cf. 2.2) only where an alternation with zero actually occurs. This is not the case with the vowel [ǎ] of the definite article. Therefore, the underlying forms of the masc.sg. definite article should be: +/ǎ/, not +/<ǎ>/, for the *kratāk člen*, and +/ǎt/, not +/<ǎ>t/, for the *pǎlen člen*.

It is preferable to attribute the retention of ghost vowels before the masc.sg. definite article to a morphophonological effect than to the presence of another underlying ghost vowel. Moreover, the definite article for the masc.sg. is not the only vocalic inflection to have such suspending effect on GV alternations, see 1.1.6.1.

2.1.1.5. Derivational jers

Another problem with the jer analyses of Slavic ghost vowels is that one has to assume not only that every zero-inflection is an underlying (and never surfacing) jer, but also that some of the suffixes that we interpret as consonant-initial are jer-initial.

Scatton (1975:32) posits two jer-initial suffixes: the adjectivizing *-sk+i* and the nominalizing *-stv+o* whose lexical representations are assumed to be *-/Esk+i/* and *-/Estv+o/*, respectively.

Unlike inflectional jers, derivational jers do have phonetic realization, but their distribution is different from that of root-internal jers and jers in suffixes with ghost vowels (e.g. *-en/-n-*, *-äk/-k-*). The surfacing of so-called derivational jers is conditioned not by the nature of the following vowel (jer or non-jer), but by the nature of the preceding consonant (a [-anter] coronal requires the manifestation of [e], cf. 1.1.4.4). We prefer interpreting *-estv+o* as a separate allomorph of the nominalizing suffix *-stv+o*, with stable underlying */e/*, not with jer */E/*. The *-estv+o* allomorph is selected at the level of lexical representations by roots that end in a [-anter] coronal (see 1.1.4.4). The same is valid for *-esk+i* vs. *-sk+i*, where a third allomorph *-k+i* can be observed (see chapter 1, ex. 62).

2.1.1.6. Distinguishing CS-roots from roots with an underlying <V>

Scatton does not distinguish underlyingly <V>-stems from CS-stems (see 1.5.3). In his analysis *misāl* 'thought' like *filtār* 'filter', *rebro* 'rib' like *srebro* 'silver' must contain a stem-internal jer, i.e. their underlying representation is */misYl+Y/*, */filtYr+Y/*, */rebYr+o/*, */srebYr+o/* from more abstract */##misl#Y##/*, */##filtr#Y##/*, */##rebr#o##/*, */##srebr#o##/*. The stem jer is inserted at the level of lexical representations by means of the rules of SYL' and ũL (hence, YL), cf. Scatton (1975:33-34). Thus, the difference between GV roots that take the non-jer allomorph of the adjectivizing suffix -EN, e.g. *misl+en*, *misl+en+a*, *rebr+en*, *rebr+en+a*, and GV roots that select the jer allomorph of the same suffix, e.g. *filtār+en*, *filtār+n+a*, *srebār+en*, *srebār+n+a*, is not encoded in the respective underlying forms. The analysis cannot account for the existence of two alternative EN-adjectives from *vjatār* 'wind' — *vjatār+en*, *vjatār+n+a*, with the jer allomorph, and *vetr+en*, *vetr+en+a* with the non-jer allomorph of the suffix (cf. 1/129), given that the sole possible representation of the root is */vʲatYr+Y/* from more abstract */##vʲatr#Y##/*. In our opinion, it should be possible to posit two alternative underlying forms for a stem like *vjatār* 'wind', each giving rise to a different -EN adjective.

2.1.2. Zec's Lexical Phonology analysis of GV alternations in Bulgarian

Zec (1988) assumes the existence of two levels in the lexical component of Bulgarian phonology: a cyclic and a postcyclic one. Her rule of Jer Vocalization that corresponds to Scatton's LOW is a cyclic rule, while Jer Deletion (equivalent to Scatton's DEL) is post-cyclic. In Zec's interpretation the latter cannot apply before the rule of Jer Vocalization (i.e. LOW) has lowered all the jers that could be lowered. Jer Deletion applies before Final Devoicing, a post-cyclic lexical rule that devoices obstruents in word-final position. That is why Jer Deletion itself must apply at the post-cyclic lexical level.

Let us consider the derivation of *lovèc+ăt* 'fool', def., and *lovci+î*, pl. in Zec's interpretation:

Cycle 1	lovEc	lovEc	
	—	—	Jer Vocalization (LOW')
Cycle 2	lovEc]Y	lovEc]i	
	lovec]Y	—	Jer Vocalization (LOW')
Cycle 3	lovec]Y]tY	—	
	lovec]ə]tY	—	Jer Vocalization (LOW')
Output of Cyclic Level	lovecətY	lovEci	
	lovecət	lovci	Jer Deletion (DEL')

The rule describing jer surfacing (Scatton's LOW) does not need to apply cyclically. There is no reason for LOW to apply after each word formation rule or in derived environments. Actually, in Scatton's analysis the rule of LOW applies simultaneously on all jers that find themselves in its context of application, thus yielding the correct outcomes.

2.1.3. Doing without inflectional jers

If we want to capture the generalization stated in 1/136-v, we can re-formulate the rule of LOW as follows:

$$(i) \quad \text{LOW}'' \quad \left\{ \begin{array}{c} \text{Y} \\ \text{E} \end{array} \right\} \longrightarrow \left\{ \begin{array}{c} \text{ə} \\ \text{e} \end{array} \right\} / \text{--- } C_0 \left\{ \begin{array}{c} \text{Y} \\ \text{E} \\ \text{C} \\ \# \end{array} \right\} \quad \begin{array}{l} (i)a \\ (i)b \\ (i)c \end{array}$$

Here (i)**b** and (i)**c** represent the two subcontexts of context 2 in Table 1 (1.6.3), whereas (i)**a** refers to context 3 in the same table.

Thus reformulating the rule of LOW, we can get rid of inflectional jers and posit jers only where ghost vowel alternations are actually observed.

LOW'' is followed by the rule DEL': jers that are not lowered have to be deleted.

$$(ii) \quad \text{DEL}'' \quad \left\{ \begin{array}{c} \text{Y} \\ \text{E} \end{array} \right\} \longrightarrow \emptyset \quad (ii)$$

The order LOW-DEL will be preferred to DEL-LOW.³

2.2. Accounts for Metathesis in Bulgarian

2.2.1. Scatton's treatment of metathesis

Scatton (1975:30) treats the metathetic alternation as "a special case of the vowel-zero alternation". He demonstrates that most of the forms of metathesizing roots, namely those where the sequence is *Lǎ*, are derivable by means of the same rules — DEL and LOW — that are needed to account for vowel/zero alternations.

To derive the *ǎL* forms of metathesizing roots, Scatton introduces a rule of syllabification (SYL) which attributes a syllabic status to those liquids that, after the deletion of jers, find themselves in inter-consonantal position. But syllabicity of liquids is only an intermediate state: two rules of syllabic reinterpretation (*Lə* and *əL*) are ordered immediately after SYL in the course of derivation, inserting a schwa in the neighbourhood of syllabic liquids.

³ According to Velcheva (1993), historically the even-numbered jers in sequences of contiguous syllables containing jers dissimilated by vowel height. Only after the dissimilation process had taken place the remaining jers underwent a process of weakening which ended in their loss.

SYL L → Ḷ / #(XC) ___ (CY)#

Lə Ḷ → Lə / #X ___ C₂ Y#

əL Ḷ → əL

Here are the derivations for examples (3a)–(3e), Table 3, as required by Scatton's analysis of metathesis:

krYv+av+Y	krYv+Y	krYv+Y+ta	krYv+En+Y	krYv+En+a	
krvav	krYv	krYvta	krYvEnY	krYvna	DEL
	krəv	krəvta	krəven	krəvna	LOW
ḳrvav					SYL
					Lə
kərvav					əL

It can be seen that rule «Lə» remains unexploited. The latter is necessary for morphemes that contain a non-alternating sequence *Lă* as in *krăst+ove*, pl. of *krăst* 'cross', *tlăst+a*, fem. of *tlăst* 'fat'. As Scatton (1975:34) posits an underlying jer (derived by means of the rules of SYL' and LY, see 0, that apply at the level of lexical representation of morphemes) in such forms, he needs the rule «Lə» in order to reinterpret the syllabic liquids that are triggered before a vocalic suffix, e.g.:

krYst+Y	krYst+ove	tlYst+Y	tlYst+a	
krYst	krstove	tlYst	tlsta	DEL
krəst		tləst		LOW
	ḳrstove		ṭlsta	SYL
	krəstove		tləsta	Lə

Following the principle of positing underlying structures only where an actual alternation can be observed, we prefer to posit not a jer, but a schwa in the lexical representation of nonalternating roots like *krăst* 'cross', *tlăst* 'fat':

(1)	krəst+Y	krəst+ove	tləst+Y	tləst+a	
	krəst	krəst+ove	tləst	tləst+a	DEL

Thus, in our interpretation, no syllabic liquids can be obtained in the course of derivation when roots like those in (1) take a vocalic suffix. Therefore, the rule «Lə» proves unnecessary if such perspective is adopted.

2.2.1.1. Double application of Syllabification + Syllabic reinterpretation

The rules of SYL', LY and YL in Scatton (1975:33), "apply at the level of lexical representation":

SYL'	$L \rightarrow L_1 / C _ C$
LY	$L_1 \rightarrow LY / _ C_2$
YL	$L_1 \rightarrow YL$

This subset of rules is necessary, as Scatton assumes a more abstract underlying form for non-metathetic roots containing a non-alternating *Lă* or a non-alternating *ăL*: a liquid between consonants, e.g. /##krst#Y##/, /##tlst#Y##/. The surface (and non-alternating) schwa in non-metathetic roots is then inserted by the above rules.

Following the principle of positing underlying structures only where surface alternations occur, we assume that only the metathetic roots with alternating sequences *Lă/ăL* (e.g. *krăv* 'blood', *kărv+i*, pl., *pălz+[j+ə]* 'creep' ipfv., *plăz+n+a*, pfv.semelfactive) should contain a jer in their lexical representations. All forms with metathesis, unless they select the non-jer *-en/* suffix (cf. 1.2.7.2.2), can be viewed as coming from underlying /CLYC/. As for the non-alternating *Lă* sequences (e.g. *krăst* 'cross', *krăst+ove*, pl.), they are the manifestation of an underlying /CLəC/. Likewise, the nonalternating *ăL* sequences (e.g. *žălt* 'yellow', *žălt+a*, fem.) are the manifestation of an underlying /CəLC/. Assuming such lexical representations, we do not need the rules of SYL', LY and YL, i.e. the double application of the rules of syllabification and syllabic reinterpretation before and after LOW-DEL is no more required.

2.2.1.2. Word-initial sequences "sonorant + schwa"

The final form of the rules of SYL', LY, YL, SYL, Lə and əL (Scatton 1975:37-38) is a step towards a unified account of metathesis and ghost vowels in sonorant-final stems. It includes nasals, but not [v] in the focus of these rules.

Scatton also posits underlying pre-consonantal sonorants for word-initial sequences of "sonorant + schwa" (Scatton 1975:37). But the latter sequences are never alternating.

Hence, in our interpretation they will be represented as /#Sə/, i.e. with stable schwa instead of jer. Thus, instead of /##rk#a##/ giving /rYk+a/ for *rǎka* 'hand' and /##mx#Y##/ giving /mYx+Y/ for *mǎx* 'moss', cf. *mǎx+ove*, pl., we posit underlying /rək+a/ and /məx/ with stable schwa.

2.2.1.3. About Scatton's treatment of suspended metathesis before -va-

Scatton (1972:42, 1974) treats the imperfectivizing suffix *-va-* that exerts a suspending effect on metathesis (cf. 1.2.7) as derived from an underlying /ava/. Actually, *-ava-* is another productive imperfectivizing suffix in Bulgarian, used with stressless verb roots. When a stressless root is combined with the suffix /ava/, stress is shifted to the suffix-initial vowel, e.g. /s+pest+J+ə/ 'save' pfv. 1p.sg.pres., /s+pest+J+əva+m/ ipfv. 1p.sg. pres. In Scatton's analysis stress-assignment is followed by a rule of A-Deletion that deletes the initial /a/ of the suffix /ava/, when the latter remains unstressed. A-Deletion must be ordered after Metathesis, i.e. after the set of rules that regard jers, syllabification and syllabic reinterpretation, in order to achieve the imperfectives with suspended metathesis (cf. 1.2.7.2):

iz+skrYc+ava+m	
iz+skrẎc+ava+m	Stress-assignment
izskṛcavam	DEL
izskṛ̣cavam	SYL
izskə̣rcavam	əL
izskə̣rcvam	A-Deletion

To derive secondary imperfectives from semelfactive perfectives by means of the *-va-* suffix, e.g. *skrǎc+va+m* 'squeak' ipfv. 1p.sg.pres., coming from *skrǎc+n+ə*, pfv. 1p.sg.pres., a rule of N-Deletion is needed. In Scatton's analysis, this rule of consonant deletion has to apply in pre-vocalic context, given that it must precede A-Deletion:

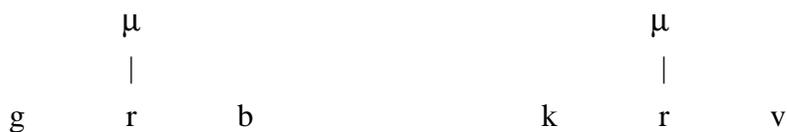
skrẎc+n+ava+m	
skṛcnavam	DEL
skṛ̣cnavam	SYL
skrə̣cnavam	Lə
skrə̣cnavam	N-Deletion
skrə̣cnvam	A-Deletion

It is preferable to posit a consonant-initial lexical form /va/, instead of /ava/, for the suffix *-va-*, thus treating the deletion of the semelfactive *-n-* before [v] as a case of cluster simplification (*skrəcnvam* > *skrəcvam*; *cnv* > *cv*). The suspension of metathesis, restricted to prefixed derived imperfectives, will then be attributed to a morphophonological effect exerted by the imperfectivizing suffix *-va-* in combination with a prefix (cf. 1.2.7.).

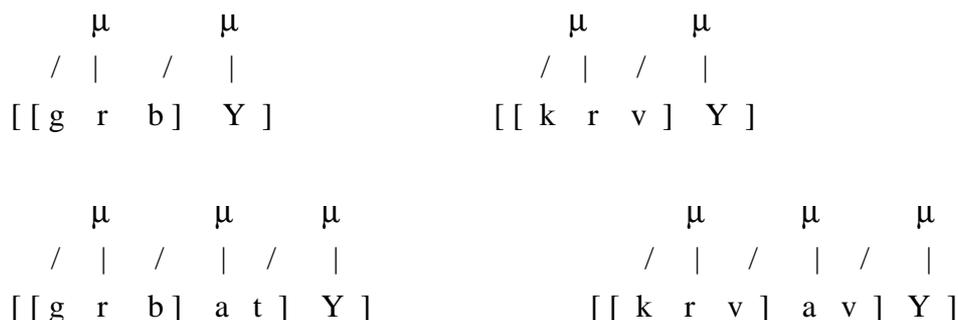
2.2.2. Zec's treatment of metathesis

Zec (1988) posits a lexical representation for metathesizing roots with no underlying jer and with an interconsonantal liquid, i.e. the same representation that Scatton assigns to non-metathesizing roots containing a stable *Lǎ* or a stable *ǎL* sequence. The problem with Zec's analysis is that it neglects part of the data on metathesis in Bulgarian, namely the forms where a metathetic root combines with a suffix which exhibits a ghost vowel alternation. These forms are impossible to derive with the representations and rules adopted by Zec.

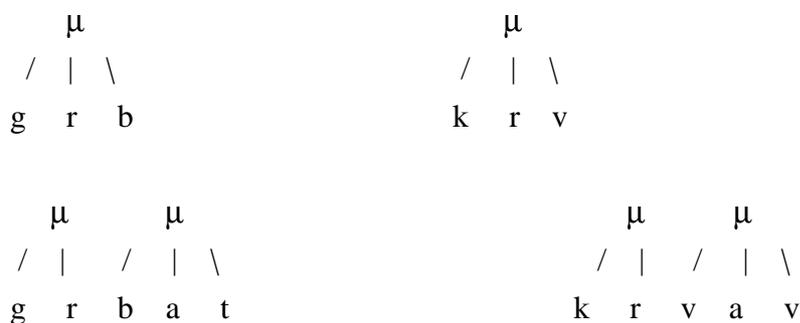
Since liquids are never syllabic in surface Bulgarian forms, Zec assumes that they cannot be syllabic at the post-cyclic lexical level either. What provides them with prosodic licensing at this level is not their integration in syllables, but in moras – subsyllabic prosodic units. In Bulgarian, in addition to vowels, some liquids (those in metathetic roots) can be viewed as underlyingly moraic, i.e. sufficiently sonorous to form moraic peaks. Thus, in Zec's analysis, the underlying forms for *krǎv* 'blood' and *grǎb* 'back' contain a liquid with a prelinked mora:



Moraic structure is built in a cyclic fashion: "moraification obeys the strict cycle and will operate throughout the cyclic component" (Zec 1988:562).

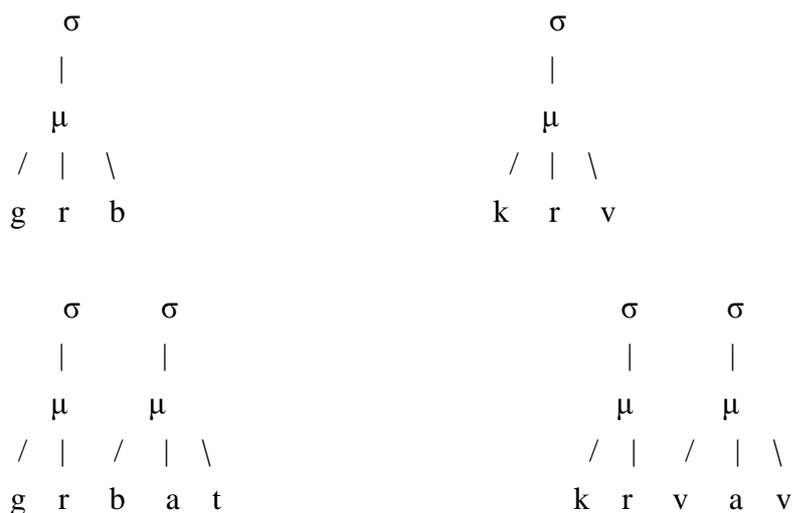


After Jer Deletion has removed jers (see 2.1.2) we obtain:



At the post-cyclic lexical level syllables are created by mora-to-syllable mapping. Since all Bulgarian syllables are monomoraic, this is a one-to-one mapping. The internal constituency of each mora is preserved under this mapping.

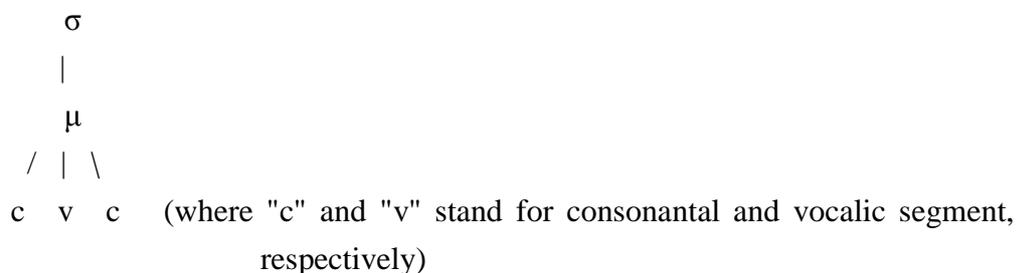
The output of the mapping is:



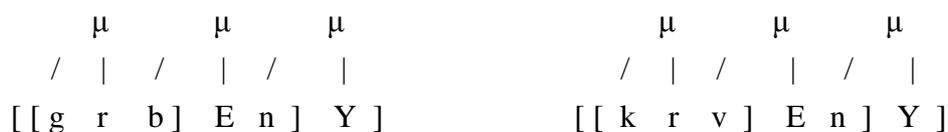
Further Zec assumes that moras and syllables posit different requirements: not every segment that can serve as a moraic peak can also serve as a syllabic peak. In particular, Bulgarian liquids are sufficiently sonorous to serve as proper moraic peaks, but not to serve as proper syllable nuclei. The single mora in the syllable will have to conform to the sonority requirements imposed by syllables. This is done by means of a rule of (Schwa) Epenthesis which acts as a kind of repair strategy. It is predictable where the epenthesized vowel will appear with regard to syllable structure. If two vowels were inserted, i.e. both to the left and to the right of the moraic liquid (e.g. *gərəb, *gərəbat, *kərəv, *kərəvav), the resulting form would require a disruption of moraic structure. This is not allowed under the mora-to-syllable mapping defined by Zec.

In addition to the general syllable structure constraint in Bulgarian, which allows at most one consonant in the coda, the Epenthesis rule poses a further constraint: it obligatorily creates closed syllables:

Epenthesis (Zec 1988:565):



However, in derivatives where metathetic roots like *krāv* 'blood' and *grāb* 'back' find themselves before a ghost vowel (jer) suffix, e.g. *krāv+en* 'bloody', *krāv+n+a*, fem., and *grāb+en* 'back' adj., *grāb+n+a*, fem., the rule of Epenthesis as formulated above gives wrong outputs. This subset of data seems to have been ignored in Zec's analysis.



After Jer Vocalization and Jer Deletion:



After mora-to-syllable mapping:



The rule of Epenthesis then gives the following forms that are incorrect:

*	σ		σ		*	σ		σ
	μ		μ			μ		μ
	/ \		/ \			/ \		/ \
	g ə r		b e n			k ə r		v e n

2.3. An Only-Stem-Internal (OSI) Jer Analysis

In this section we discuss a unified treatment of metathesis and ghost vowels in CS-stems.

2.3.1. Enlarging the focus of SYL: Sonorant Syllabification

We would like to reconsider the following generalization stated in chapter 1, (132)-v, based on Table 1, and repeated in (2) below:

- (2) All schwa insertions are pre-sonorant:
- in context 2 (stem types B, D)
- and some of them are pre-liquid:
- in context 1 (stem types C, D)
 - in context 3 (stem type D).

To this purpose, we will enlarge the focus of the rule SYL by including, beyond liquids, all other sonorants, i.e. the nasals [m, n] (as Scatton does in the final form of his rule, 1975:37) and [v], which functions, at least in some aspects, as a sonorant in Bulgarian: like sonorants and unlike voiced obstruents, it does not spread [+voiced], cf. 1.1.3.2. This will give the following rule of Sonorant Syllabification (SYL'')

$$(iii) \text{ SYL''} \quad S \rightarrow \text{\$} / C \text{ ___ } \begin{cases} C \\ \# \end{cases} \quad \begin{matrix} (iii)a \\ (iii)b \end{matrix}$$

It is easy to see that thus reformulated, the rule covers all the contexts listed in (2).

2.3.2. Pre-Sonorant Schwa Epenthesis

The syllabic sonorants generated in intermediate representations will trigger schwa epenthesis only when followed by a (non-syllabic) consonant or when found at the word-end. If the consonant that follows the focus sonorant is another sonorant that has

been turned syllabic by means of rule (iii), rule (iv) is inapplicable. We thus exclude context 2 for stem type D (see Table 1), where no schwa surfaces before the liquid.

$$(iv) \text{ ə-Epenthesis} \quad \mathring{S} \longrightarrow \text{əS} / \text{---} \begin{Bmatrix} \text{C} \\ \# \end{Bmatrix} \quad \text{where } C \neq \mathring{S} \quad (iv)a$$

$$(iv)b$$

2.3.3. Sonorant Desyllabification

Those syllabic \mathring{S} 's that have not triggered schwa-epenthesis, i.e. remain unchanged after application of rule (iv), must undergo a rule of desyllabification, see (v). This is necessary because Bulgarian has no syllabic sonorants in its inventory of surface segment realizations.

$$(v) \text{ Son Desyll} \quad \mathring{S} \longrightarrow S \quad (v)$$

The rules of SYL''(iii), ə-Epenthesis (iv) and Son Desyll (v), in addition to LOW''(i) and DEL''(ii), will suffice to generate all forms from all stem types recapitulated in Table 3. Here we repeat the entire rule set for an only-stem-internal jer treatment of Bulgarian GV alternations:

$$(i) \quad \text{LOW''} \quad \begin{Bmatrix} \text{Y} \\ \text{E} \end{Bmatrix} \longrightarrow \begin{Bmatrix} \text{ə} \\ \text{e} \end{Bmatrix} / \text{---} C_0 \begin{Bmatrix} \text{Y} \\ \text{E} \\ \text{C} \\ \# \end{Bmatrix} \quad (i)a$$

$$(i)b$$

$$(i)c$$

$$(ii) \quad \text{DEL''} \quad \begin{Bmatrix} \text{Y} \\ \text{E} \end{Bmatrix} \longrightarrow \emptyset \quad (ii)$$

$$(iii) \quad \text{SYL''} \quad S \longrightarrow \mathring{S} / C \text{---} \begin{Bmatrix} \text{C} \\ \# \end{Bmatrix} \quad (iii)a$$

$$(iii)b$$

$$(iv) \quad \text{ə-Epenthesis} \quad \mathring{S} \longrightarrow \text{əS} / \text{---} \begin{Bmatrix} \text{C} \\ \# \end{Bmatrix} \quad \text{where } C \neq \mathring{S} \quad (iv)a$$

$$(iv)b$$

$$(v) \quad \text{Son Desyll} \quad \mathring{S} \longrightarrow S \quad (v)$$

2.3.4. Testing the rule set of the OSI Jer Analysis

We will now test this rule set with the examples of Table 3. In Table 4 below, we use capital Y for the back jer (corresponding to our ghost schwa <ə> and to Scatton's high lax ŭ) and capital E for the front jer (corresponding to our ghost <e> and to Scatton's high lax ĭ).

1	filtYr+i filtri	filtYr filtər (c)	filtYr+če filtərče (b)	filtYr+En filtəren (a),(c)	filtYr+En+a filtərEna (a) filtərna	(i) (ii)
1'	pesEn+i pesni	pesEn pesen (c)	pesEn+ta pesenta (b)	pesEn+En pesenen (a),(c)	pesEn+En+a pesenEna (a) pesenna	(i) (ii)
2	misl+Ĳ+ə	misl misł (b) misəl (b)	misl+ta misłta (a) misəлта (a)	misl+en	misl+en+a	(iii) (iv)
3	krYv+av krvav křvav (a) kərvav (a)	krYv krəv (c)	krYv+ta krəvta (b)	krYv+EN krəven (a),(c)	krYv+En+a krəvna (a)	(i) (ii) (iii) (iv)
4	vrv+olic+a vřvolica (a) vərvolica (a)	vrv vřv vřəv (b) vrəv (b)	vrv+čic+a vřvčica (a) vřəvčica (a) vrəvčica (a)	vrv+en vřven (a) vərvən (a)	vrv+en+a vřvena (a) vərvəna (a)	(iii) (iv) (v)
5	begl+i	begl begł (b) begəl (b)	—	begl+Ec beglec (c)	begl+Ec+i begłci begłci (a) begəlci (a)	(i) (ii) (iii) (iv)
6				begl+ec	begl+ec+i	(i-v)

7	drYž+ə držə dřžə (a) dəržə (a)	drYž drəž (c)	drYž+k+a drəžka (b)	-dr(Y)ž+Ec ^{FGE} * -držec (c) -dřžec (a) -dəržec (a)	-drYž+Ec+i -drəžci (a)	* (i) (ii) (iii) (iv)
8	srn+a sřna (a) sərna (a)	—	srn+dak sřndak (a) sřəndak (a) srəndak	srn+Ec srnec (c) sřnec (a) sərnec (a)	srn+Ec+i srnci sřnci (a) sřənci (a) srənci	(i) (ii) (iii) (iv) (v)
				srn+en (like 4: vrv+en)	srn+en+a (cf.4: vrv+en+a)	
9	drYz+ost drzost dřzost (a) dərzost (a)	—	drYz+na drəzna (b)	dr(Y)z ^{FGE} +Yk * držək (c) dřžək (a) dəržək (a)	drYz+Yk+a drəzka (a)	* (i) (ii) (iii) (iv)

Table 4

* (Y) denotes the deletion of the root jer in the underlying form of derivatives (when Ø-inflected) from roots that are lexically marked to manifest the Fratricidal Ghost Effect (FGE); see 1.6.5.

- in the case of the lexically-marked FGE suffix -EC — ex. 7c; cf. ex.(140) in ch.1
- in the case of lexically-marked FGE metathetic roots — ex. 9c; cf. ex. (142) in ch.1

The morphological decomposition and translation for the examples in table 4 can be found in (143) of chapter 1. The first column gives the example number. The last column specifies the rule (i, ii, iii, iv or v) that is responsible for the forms at the respective line. The letters (a), (b) and (c) to the right of some examples specify which subpart of rules (i), (iii) and (iv) is involved.

2.3.5. Problems relating to the rules of the OSI Jer Analysis

Rules (i), (ii) and (iv) contain heterogeneous contexts inside the disjoint brackets. It is not obvious why a the word-end and a following consonant should trigger the same structural change. Neither is it understandable how a following jer is related to a consonant cluster/a consonant at the word-end to provoke the same effect: the lowering of a preceding jer.

Rule (iii) produces sounds that are not possible as surface phonetic realizations in Bulgarian, namely syllabic sonorants: [ɾ], [l̩], [ŋ̩], [m̩] and [ɣ̩].

2.4. Harmonic Phonology account for the Bulgarian data

2.4.1. Some principles of Harmonic Phonology

2.4.1.1. Levels and representations in Harmonic Phonology

Goldsmith (1993:26) considers that traditional structuralist phonology, with its three levels of representation and two rule components relating the levels (fig.1), establishes an inherent ordering of the rules of these two components.

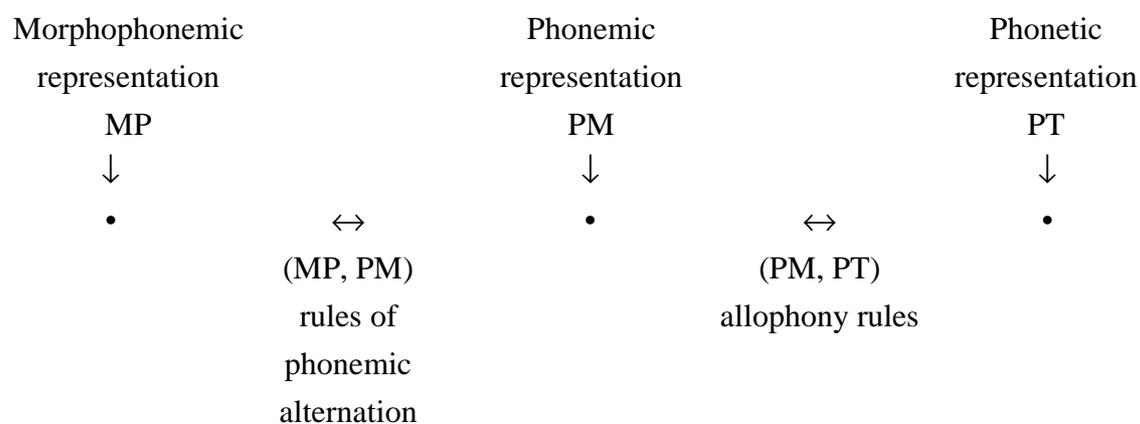


fig.1

Halle & Chomsky (1968) use only two levels of representation (MP, PT) and only one set of principles relating them. The rules do not directly relate the levels. Rules create entities which are not representations on any particular linguistic level — the intermediate stages of derivations. Ordering of rules is not the function of relations across levels.

A harmonic grammar consists of 2 types of relations:

- rules that relate distinct levels
- rules that decrease the complexity of representation on a single linguistic level

A level is a way of describing an utterance. Analysis makes specific generalizations about each level: about its tactics and well-formedness conditions. Each level contains complexity measures, which evaluate the degree of complexity of representations.

A level (L) consists of:

- a vocabulary of items (a set of features, an inventory of permitted segments, associations, etc.)
- a set of relations expressing relative well-formedness (a measure of well-formedness)

- a set of intralevel (L, L) rules: possible paths for a representation to achieve maximal well-formedness

The representation of a given expression on level L is a pair of representations (L_i , L_f ; where i = initial, f = final) and L_f is the best-formed representation accessible to L_i given the (L, L) rules.

Harmonic Phonology makes use of the M/W/P model.

There are three levels of phonological interest. Bleeding and counterfeeding relations, common in natural languages, establish the need for more than 2 levels. The three levels are:

- M-level: a morphophonemic level, the level at which morphemes are phonologically specified
- W-level: the level at which expressions are structured into well-formed syllables and well-formed words (with a minimum of redundant phonological information)
- P-level: a level of broad phonetic description; the interface with articulatory/acoustic devices

The M-level is essentially devoid of phonological motivation. Its representation may violate all conceivable phonotactics. Its sole function is as a repository of the minimal information necessary to capture the sound characteristics of the morpheme. It is a structure that incorporates the morphemes that provide the realization of the morphosyntactic information. Its initial state M_i is the representation that provides the interface with the morphosyntax.

It is on the W-level that the bulk of the significant well-formedness conditions (tactics) are stated. The W-level representation expresses the form the language squeezes its morphemes into in order to satisfy the alternation of consonants and vowels, licensed coda and syllable material, tonal association, etc. (W,W) rules are ways of manipulating the phonological substance present at the deeper M-level.

Language-particular W-level phonotactics consist entirely of syllable structure conditions and autosegmental phonotactics (autosegmental licensing specifications, autosegmental restrictions on the minimal/maximal number of associations). Other W-level phonotactics are universal.

P-level is the level of systematic phonetics. Its final state P_f serves as the interface with the phonetic component.

2.4.1.2. Two types of rules: intra-level and cross-level. No extrinsic ordering of rules.

The Harmonic Phonology model decomposes the phonological analysis into intralevel and cross-level components. It thus emphasizes the tactics specific to autonomous levels of the phonological component (Goldsmith 1993:46).

The following types of phonological rules exist:

- 3 intralevel rule types: (M,M), (W,W) & (P,P);
- 2 cross-level rule types: (M,W), (W,P), where the order of the symbols is irrelevant.

Neither intralevel nor cross-level rules are ordered. They operate simultaneously. Within a level, rules apply in the manner generally referred to as ‘free reapplication’, subject to the Elsewhere Condition, in the sense that, when a language has two competing repair strategies for a phonotactic violation within a given level, it chooses the one that is more specific for the task at hand.

Cross-level rules do not give rise to derivations with intermediate stages.

While intralevel rules must be harmonic, cross-level rules need not be harmonic, i.e. their application needs not increase the well-formedness of the representation.

2.4.1.3. Syllabification. Autosegmental licensing.

Early M-level syllabification serves the purpose of exposing problems for the phonology, generally in the guise of unsyllabified (i.e. unsyllabifiable) material.

A general well-formedness condition is imposed on W-level that syllabification must be total.

Syllables are constructed in such a way as to build the largest syllables (i.e. the smallest number of syllables) consistent with the language's restrictions on possible syllables. The maximal number of segments possible must be covered with the minimal number of syllables.

There are prosodic units that are licensors. The syllable node is the primary licensor. It acts as licensor for the onset and the nucleus. Secondary licensors can be the coda node, a word-final appendix and some word-final morphemes.

The licensor is endowed with the ability to license a set of features (autosegments) – point of articulation, continuancy, voiceness, etc. A given licensor can license no more than one occurrence of the autosegment in question.

When the syllables of a language have a coda position, the coda is a secondary licensor, a node that also serves as the point of origin of a licensing path down to the skeleton. The language will assign a subset (typically, a small subset) of the features of the language to the coda position.

The Ω -licenser (Ω = word-final appendix) is another kind of secondary licenser at word-boundary. It licenses word-final extrasyllabicity: the features that appear in word-final appendices. For instance, in English word-internal syllables any single consonant can appear in the coda, but word-finally obstruent clusters may appear. Goldsmith (1990:147) attributes the possibility of the second consonant to a word-final appendix (Ω) position. Moreover, only coronals may be extrasyllabic in English, i.e. only segments not specified for point of articulation. The English word-final appendix licenses only the features [voice] and [continuant].

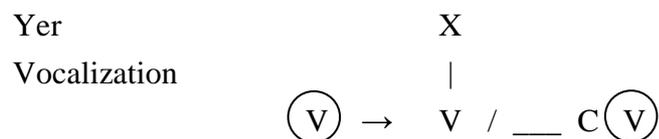
All autosegmental material must be licensed at W-level. Elements not licensed at this level will not proceed to the P-level, i.e. are deleted.

2.4.2. Underlying structures for ghost vowels

2.4.2.1. Ghost vowels in autosegmental (multilinear) frameworks

As reported by Szpyra (1992:278), the multilinear jer approaches distinguish jers from the other vowels by representing them underlyingly only on the skeletal tier (Spencer 1986) or only on the segmental tier (Rubach 1986, 1993). As for non-jer vowels, they are represented on both tiers.

In Rubach (1986:259), Rubach (1993:141) and Kenstowicz & Rubach (1987) the surfacing (vocalization) of jers is described as a skeletal point (X slot) assignment: \rightarrow



The circled V stands for a floating vowel, that is, a segment without an associated X slot.

Jers that remain without an X slot cannot be licensed prosodically and hence are never realized phonetically. At the end of phonology they are deleted by the Stray Erasure convention: "Erase segments and skeleton slots unless attached to higher levels of structure. [...] By 'higher levels of structure' I mean either a position in the syllable or one in a morphological template. [...] in surface structure all strings are exhaustively syllabified." (Steriade 1982:89)

Following Paradis & El Fenne (1995)⁴ we assume that floating segments are visible to syllabification rules. In Bulgarian the presence of an underlying floater blocks the process of syllabification. The syllable cannot span an unsyllabified element. The unsyllabified segmental material (cf. Goldsmith's contingent extrasyllabicity) can be only peripheral. Contrary to what is alleged by Szpyra (1992:297), it seems that Polish jers do not always block syllabification, at least in some imperatives (cf. Rubach 1993:641, note 11). However, in Bulgarian the blocking effect of floaters is systematic. For Szpyra (1992) the surfacing of jers serves as repair strategy to satisfy the requirement of full syllabification (prosodification). When the next consonant is already prosodified, the preceding jer does not vocalize. The vocalization of jers creates new syllable nuclei to which hitherto unsyllabified consonants can attach and become prosodically licensed. Thus, the function of jer vocalization is to ensure the syllabic well-formedness of lexical items.

Itô (1989) describes two strategies for dealing with unsyllabified consonants:

- vowel epenthesis (the epenthesis site being determined by the direction of syllabification)
- erasure of unsyllabified consonants

Szpyra (1992) adds a third strategy: the vocalization of adjacent unsyllabified jers.

In Szpyra's analysis a jer, underlyingly, is an “empty root node devoid of any melodic features”. The empty node acquires the feature [-cons] when preceding an unsyllabified (stray) consonant. Thus, Szpyra posits an underlying segment that is fully underspecified: it is neither a vowel nor a consonant. However, an empty root node always surfaces as a vowel in Polish.

2.4.2.2. Floating vowels and epenthetic schwas instead of jers

Some schwas in Bulgarian are stable vowels, i.e. they are not involved in GV (or metathetic) alternations. We assume that a stable schwa comes from an underlyingly anchored schwa, i.e. a schwa which is provided with a skeletal point:

$$/ə/ = \begin{array}{c} \bullet \\ | \\ \text{ə} \end{array}$$

⁴ «We maintain that segments are visible to syllabification rules, whether they are, with respect to these rules, well-formed (anchored) or not» (Paradis & El Fenne 1995:188)

As for surface schwas that are GV-alternating (or metathetic) vowels, we distinguish between two possible origins. They may come from an underlying floating schwa, i.e. a floating segment [ə] that is not linked to the skeleton:

$$\langle \text{ə} \rangle = \text{ə}$$

But they can also be not represented by any underlying structure at all. In the latter case, they result from a default epenthesis.

As demonstrated by Anderson (1996), based on data from vowel reduction in informal modern Bulgarian (cf. Pettersson & Wood 1987), *ǎ* (/ə/) is the minimally specified (unspecified) vowel in Bulgarian. Three distinct notational systems (a Dependency Phonology notation and two under-specified binary-feature systems – a radical and a non-radical one) provide characterizations which display detailed equivalences.

The Dependency Phonology notation proposed by Anderson represents /ə/ as the only vowel not reducible to combinations of *i*, *u* and *a*:

$$\begin{array}{ll} \{i\} & /i/ \\ \{a, i\} & /e/ \\ & \{ \} & /ə/ \\ & \{a\} & /a/ \end{array} \qquad \begin{array}{ll} \{u\} & /u/ \\ \{a, u\} & /o/ \end{array}$$

There are difficulties in providing a generalization appropriate to the reduction phenomena in Bulgarian in terms of the standard binary features (cf. Pettersson & Wood 1987:§3). By contrast, a unitary characterization based on underspecified traditional binary features is available. Actually, Anderson translates the 'Jakobsonian' features of the Aronson's classification of the Bulgarian vowels (acute/grave, plain/flat and diffuse/compact; cf. Aronson 1968:32) into the following radical underspecified account invoking the traditional binary features [back], [round] and [low]:

$$\begin{array}{ll} [-\text{bck}] & /i/ \\ & [\quad] & /ə/ \\ [-\text{bck}, +\text{lw}] & /e/ \\ & [+lw] & /a/ \end{array} \qquad \begin{array}{ll} [+rd] & /u/ \\ [+rd, +lw] & /o/ \end{array}$$

An alternative solution, which is "less radically relativistic", assumes an underspecified interpretation using the traditional markedness values (cf. Chomsky & Halle 1968:405), except that /a/ is specified as [-high] to differentiate it from /ə/:

[-bck] /i/	[+bck] /u/
[-bck,-hg] /e/	[+bck,-hg] /o/
[] /ə/	
[-hg] /a/	

All three notations represent /ə/ as the unspecified member of the Bulgarian vowel system. Therefore, it is not surprising that /ə/ functions as the default vowel in the cases of epenthesis.

As for surface [e]'s that are involved in GV alternations, they are of only one possible origin: they must come from an underlying floater <e>, i.e. a segment [e] that lacks a skeletal slot underlyingly:

$$\langle \text{ə} \rangle = \text{ə}$$

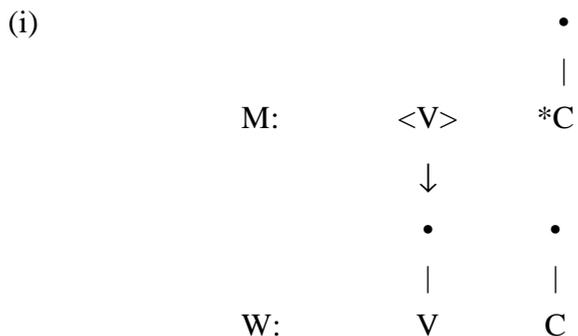
2.4.3. Rules regarding ghost vowels

The complicated pattern of GV and metathetic alternations/ suspensions of alternations in Bulgarian can be given a unified account with only two rules in the Harmonic Phonology framework. The first rule anchors floaters, i.e. provides some /<ə>/ and /<e>/ with a skeletal slot. The second one inserts the default vowel [ə]. Both rules are syllabically-conditioned: the anchoring/insertion is triggered by an unsyllabified consonant.

A third rule is necessary to cover the special behaviour of lexically-marked FGE metathetic roots and of metathetic roots before the lexically-marked FGE suffix -ec/-c-, see 1.5.5. The latter rule adjusts certain sequences of floaters in M-level representations.

2.4.3.1. The cross-level (M,W) rule of Floater Anchoring

M/W level: <V>-before-*C Anchoring (*C=unsyllabified consonant), see (i) below.

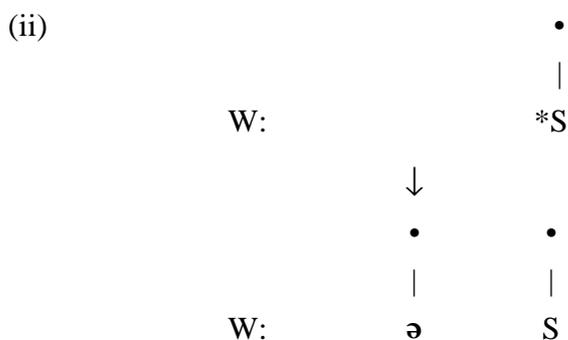


If more than one consonants remain unsyllabified and if they are all preceded by a floater, each of these floaters undergoes the rule of Anchoring.

No doubt <V>-Anchoring contributes to syllabification of otherwise unsyllabifiable material, but it sometimes overgenerates vocalic nuclei and hence produces some extra syllables. It is not entirely harmonic, i.e. not completely or, perhaps, not only conditioned by syllable structure. That is why we consider it to be a cross-level rule. A cross-level rule need not be harmonic.

2.4.3.2. The intra-level (W,W) rule of Schwa Epenthesis

W/W level: ə-before-*S Epenthesis (*S=unsyllabified sonorant), see (ii) below.



If more than one adjacent sonorants remain unsyllabified (and cannot trigger the rule of Anchoring), only the last one triggers Epenthesis. This yields one of the preferred syllable types in Bulgarian: CVC in the case of two sonorants and CCVC from a sequence of three unsyllabified consonants.

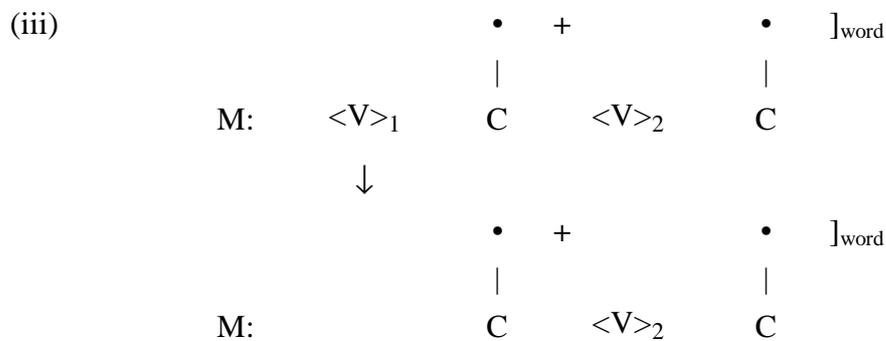
ə-Epenthesis seems to be a harmonic rule. It contributes to syllabification of otherwise unsyllabifiable material, and it never overgenerates vocalic nuclei. Hence, no extra syllables are produced by means of ə-Epenthesis. ə-Epenthesis yields only the preferred syllable types CVC and CCVC. Thus, we consider it to be an intra-level rule. It applies at W-level, where total syllabification is a well-formedness condition. Schwa epenthesis

in Bulgarian is just a repair strategy to rescue sonorants that would otherwise be subjected to Stray Erasure. As an intra-level W/W rule it takes place after <V>-Anchoring, a M/W cross-level rule.

2.4.3.3. A rule adjusting M-level representations to describe the FGE

What we called the Fratricidal Ghost Effect (see 1.5.5) must apply on M-level, i.e. at the level of morpheme concatenation, and before the application of early M-level syllabification.

M/M level: <V>-before-<V> Deletion, see (iii) below.



where

(iii a) <V>₁ is in a metathetic root that is lexically-marked to undergo the FGE and <V>₂ is in a GV suffix (-/<e>n/, -/<ə>k/, -/<e>c/); see ex. (142) in ch.1

or

(iii b) <V>₂ is in the suffix -/<e>c/ that is lexically-marked to provoke the FGE and <V>₁ is in a metathetic root; see ex. (140) in ch.1.

In both cases the suffix must be uninflected; i.e. it must find itself at the word-end.

2.4.4. Harmonic Phonology account for examples 1-9, Table 3

Now rules (i), (ii) and (iii) will be tested with the example sample of Table 3, chapter 1.

2.4.4.1. <V>-roots, examples 1a-e

In the plural (example 1a) the stem-final consonant syllabifies at M-level with the vowel of the inflection. There are no unsyllabified consonants.

ex.2b M: • • • •
 | | | |
 (m i s) * l

W: • • • •
 | | | |
 (m i s) ° l

(5) ex.2b W: • • • •
 | | | |
 (m i s) ° l

 ↓
 W: • • • • •
 | | | | |
 (m i) (s ə l)

(ii)

ex.2c M: • • • • + • •
 | | | | | |
 (m i s) * l (t a)

W: • • • • • •
 | | | | | |
 (m i s) ° l (t a)

ex.2c W: • • • • • •
 | | | | | |
 (m i s) ° l (t a)

 ↓
 W: • • • • • • •
 | | | | | | |
 (m i) (s ə l) (t a)

(ii)

Being a CS-stem, /misl/ selects the non-GV suffix $\begin{array}{c} \bullet \\ | \\ e \end{array} \begin{array}{c} \bullet \\ | \\ n \end{array}$ instead of $\begin{array}{c} \bullet \\ | \\ e \end{array} \begin{array}{c} \bullet \\ | \\ n \end{array}$.

Both the masculine (ex.2d) and the feminine (ex.2e) of the adjective are completely syllabified since M-level:

ex.2d M: $\begin{array}{cccccc} \bullet & \bullet & \bullet & \bullet & + & \bullet & \bullet \\ | & | & | & | & & | & | \\ (m & i & s) & (l & & e & n) \end{array}$

ex.2e M: $\begin{array}{ccccccc} \bullet & \bullet & \bullet & \bullet & + & \bullet & \bullet & + & \bullet \\ | & | & | & | & & | & | & & | \\ (m & i & s) & (l & & e) & (n & & a) \end{array}$

2.4.4.3. Metathetic <V>-roots, examples 3a-e

(6) ex.3a M: $\begin{array}{cccccc} \bullet & \bullet & & \bullet & + & \bullet & \bullet \\ | & | & & | & & | & | \\ k & r & \emptyset & (v & & a & v) \end{array}$

In (6) two unsyllabified consonants arrive at W-level. The second one is a sonorant. It triggers ə-Epenthesis inside the W-level in order to satisfy the well-formedness condition on total syllabification:

ex.3a W: $\begin{array}{cccccc} \bullet & & \bullet & & \bullet & + & \bullet & \bullet \\ | & & | & & | & & | & | \\ k & & \text{°}r & \emptyset & (v & & a & v) \end{array}$

↓

W: $\begin{array}{cccccc} \bullet & \bullet & \bullet & & \bullet & + & \bullet & \bullet \\ | & | & | & & | & & | & | \\ (k & \emptyset & r) & \emptyset & (v & & a & v) \end{array}$ (ii)

By Stray Erasure the floater that remains unanchored is eliminated. At P-level we obtain:

ex.3a P: $\begin{array}{cccccc} \bullet & \bullet & \bullet & \bullet & \bullet & \bullet \\ | & | & | & | & | & | \\ (k & \emptyset & r) & (v & a & v) \end{array}$

ex.4a W: • • • • • • • •
 | | | | | | | |
 (v ə r) (v o) (l i) (c a)

(11) ex.4b M: • • •
 | | |
 v r v

In (11) three adjacent sonorants remain unsyllabified. There is no floater, so no cross-level rule applies. At W-level only one of the unsyllabified sonorants may trigger schwa epenthesis. The last one is selected, because inserting a syllabic nucleus before it gives one of the preferred syllable types in Bulgarian: CCVC (see chapter 1, 1.2.6).

ex.4b W: • • •
 | | |
 ° v ° r ° v
 ↓
 W: • • • •
 | | | |
 (v r ə v)

(ii)

ex.4c W: • • • • • • •
 | | | | | | |
 ° v ° r ° v (č i) (c a)
 ↓
 W: • • • • • • •
 | | | | | | |
 (v r ə v) (č i) (c a)

(ii)

Being a CS-stem, /vrv/ selects the non-GV suffix $\begin{array}{c} \bullet \\ | \\ e \quad n \end{array}$ instead of $\begin{array}{c} \bullet \\ | \\ e \quad n \end{array}$.

The M-level representation of the adjective in the masculine sg. is:

ex.4d M: • • • + • •
 | | | | |
 v r (v e n)

and in the feminine:

ex.4e M: • • • + • • + •
 | | | | | |
 v r (v e) (n a)

At W-level a schwa is inserted between the two unsyllabified sonorants to yield a CVC syllable both in the masculine and in the feminine:

ex.4d W: • • • • •
 | | | | |
 ° v ° r (v e n)
 ↓
 W: • • • • • •
 | | | | | |
 (v ə r) (v e n)

(ii)

ex.4e W: • • • • • • + •
 | | | | | | |
 (v ə r) (v e) (n a)

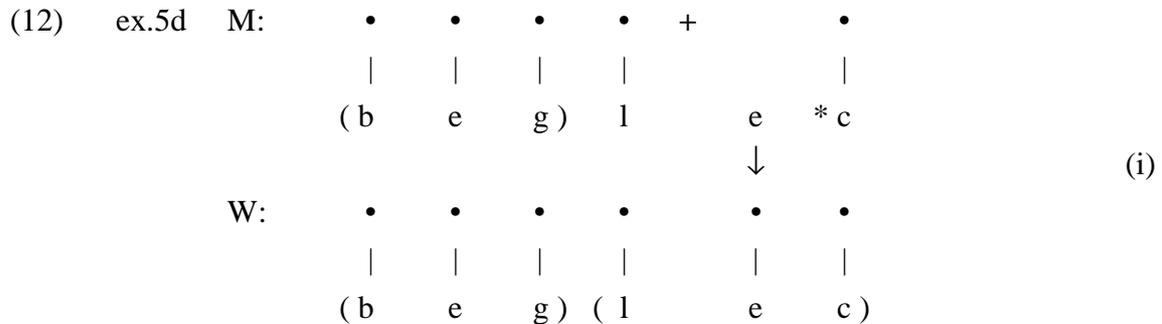
2.4.4.5. CS-roots + -EC, examples 5 & 6

In the fem. *begl+a* (example 5a) neither rule applies:

ex.5a P: • • • • + •
 | | | | |
 (b e g) (l a)

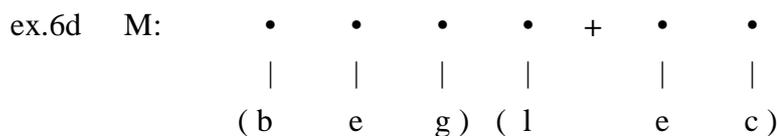
The derivation of the masc. *begāl* (ex.5b) is like that of ex. 2b, *misāl*, see (5).

Being a CS-stem, /begl/ may select either the GV allomorph $\begin{array}{c} \bullet \\ | \\ e \quad c \end{array}$ or the non-GV allomorph $\begin{array}{c} \bullet \quad \bullet \\ | \quad | \\ e \quad c \end{array}$ of the suffix -EC. When it selects the GV allomorph, the derivation is:

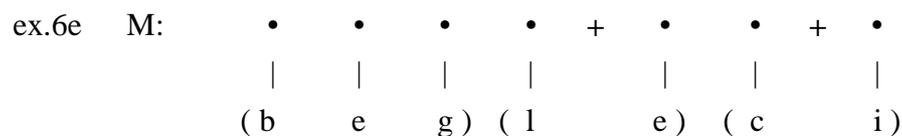


The floater is anchored because it finds itself before the unsyllabied *c. Clearly, ə-Epenthesis must not apply at this level. Otherwise it would yield the erroneous form *begəlec with a schwa inserted before the unsyllabified ʔ. As ə-Epenthesis applies at W-level, it follows syllabification triggered by the cross-level M/W rule of Floater Anchoring. The anchored floater [e] provides a nucleus for syllabification not only for the word-final [c], but also for the preceding as yet unsyllabified [l]. Thus the context for application of Schwa-before-*S Epenthesis is no longer present at W-level, for the sonorant has already been syllabified.

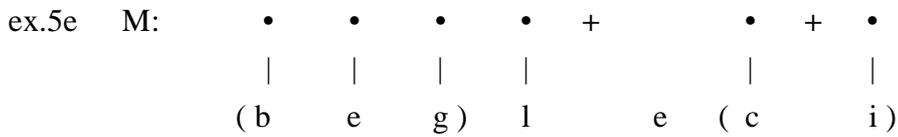
The form obtained in (12) above coincides with the -EC derivative of the same word when the non-GV allomorph is selected:



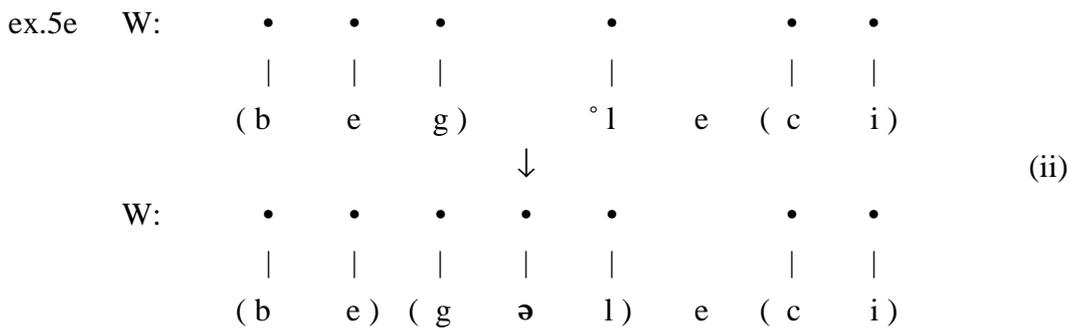
The two allomorphs of -EC give different derivations only in the plural. When the non-GV allomorph is selected, the M-level representation of the plural (example 6e) is entirely syllabifiable, and neither rule applies:



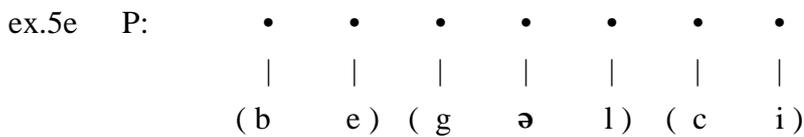
This is not the case of the M-level form with the GV suffix, where the unsyllabified [l] cannot trigger the anchoring of the floater, because the latter follows the former:



Because [l] arrives unsyllabified at W-level, it triggers ə-Epenthesis:



The floater remains unanchored and undergoes Stray Erasure:



2.4.4.6. Metathetic <V>-roots + -EC, examples 7a-e

Metathetic stems always select the GV suffix /-<e>c/.

Ex.7b *dráž* is derived like ex.3b *krāv* (7), while ex.7c *dráž+ka* copies the derivation of ex.3c *krāv+ta*.

Consider the derivation of ex.7a in (13), where we find the same verbalizing suffix as in ex.2a, *misl*[^j+ə] (both verbs belonging to the same conjugation type). The suffix consists of a schwa preceded by the floating node [coronal]. In (4), ex.2a, the floating node associates to the preceding stem-final consonant, causing its palatalization. But in Bulgarian the [coronal] node under V-place is incompatible with the [coronal] node under C-place when the latter is linked to the feature [-anterior]. This is the case for [ž]. [ž], like the other [-anter] coronal continuants (š, č), has no palatalized counterpart. So the floating [coronal] node from the suffix remains unlinked and finally undergoes Stray Erasure.

ex.7e P: + • • • • • •
 | | | | | |
 (d r ə ž) (c i)

2.4.4.7. Metathetic CS-roots + -EC, examples 8

Being metathetic, the stems illustrated by examples 8 select the GV suffix -<e>c.
Consider the following derivations:

(14) ex.8a M: • • • + •
 | | | |
 s r (n a)

The unsyllabified sonorant in (14) triggers ə-Epenthesis at W-level:

ex.8a W: • • • •
 | | | |
 s ° r (n a)
 ↓
 W: • • • • •
 | | | | |
 (s ə r) (n a) (i)

(15) ex.8c M: • • • + • • •
 | | | | | |
 s r n (d a k)

In (15) we have two consecutive unsyllabified sonorants. At W-level only one schwa may be inserted, and the ə-before-*S Epenthesis takes place before the last sonorant, yielding the preferred syllable type CCVC: (srən); see (16). If epenthesis took place before the first unsyllabified sonorant, a CVCC syllable with a complex coda would result: *(sərn). This goes against the well-formedness conditions of the W-level. As a harmonic rule, ə-Epenthesis is entirely conditioned by well-formedness constraints on syllabification. It yields the best possible syllables.

2.4.5. Generalizations. Comparison with the linear analysis.

With only two rules (an M/W cross-level rule and a W/W intra-level rule) that need not be extrinsically ordered, the proposed Harmonic Phonology analysis accounts for both GV alternations and metathetic alternations in Bulgarian. The rules (<V>-Anchoring and Schwa Epenthesis) derive all the forms from both types of GV-alternating roots: roots containing a floater and roots ending in a CS-cluster (with no floater). For derivatives from metathetic roots with the -<e>c suffix and for a limited number of roots that are lexically marked we need a third rule (<V>-before-<V> Deletion) that serves to adjust the M-level representations of uninflected suffixed forms.

2.4.5.1. The Harmonic Phonology treatment of GV syncopation and Metathesis

GV syncopation in <V>-roots is the result of the non-application of <V>-Anchoring (example 1a). The forms that retain the ghost vowel are those in which the same rule has applied in order to rescue otherwise unsyllabifiable consonants (examples 1b, 1c).

Likewise, Metathesis (the realization of ăL instead of Lă) in <V>-roots is observed where <V>-anchoring (example 3a) fails to apply. By contrast, where the application of this rule is necessary to rescue otherwise unsyllabifiable consonants, there is no metathesis, i.e. the sequence remains Lă (examples 3b, 3c)

GV alternations in CS-roots are due to the application/non-application of ə-before-*S Epenthesis: the latter applies only where an otherwise unsyllabifiable consonant must be rescued (cf. examples 2b-c as opposed to ex.2a, 2d-e).

Metathesis in CS-roots is due to the variable site of application of the rule of ə-before-*S Epenthesis. Metathetic CS-roots contain a sequence of two sonorants (CS here is LS, a sequence of a liquid and another sonorant), and Schwa Epenthesis applies either before the first or the second sonorant according to the subsequent context (examples 4a-c).

2.4.5.2. The Harmonic Phonology treatment of the phonologically-conditioned suspension of GV syncopation and metathesis

The suspending effect of GV suffixes (when uninflected) on both syncopation (example 1d) and metathesis (example 3d) is due to the double and simultaneous application of <V>-anchoring: on the floater of the root and on the floater of the suffix.

There is no suspension of syncopation or metathesis in CS-roots in combination with a GV suffix. This is explained by the fact that the CS-root, whether non-metathetic

(examples 2d and 5d) or metathetic (examples 4d and 8d), contains no floater. With only one floater available — in the suffix — there is no room for double application of Floater Anchoring between levels M and W. Thus, neither GV syncopation nor metathesis can be suspended in a CS-root.

As for examples 7d and 9d, the non-suspension of the metathetic alternation is due to the deletion of the root floater in the M-level representation — a manifestation of the Fratricidal Ghost Effect that characterizes the suffix *-<e>c/* (example 7d) and the lexically-marked root */dr<ə>z/* (example 9d).

In sum, suspension of both alternations (syncopation and metathesis) can be observed only where two floating vowels find themselves separated by no other vowel in M-level representations.

2.4.5.3. Advantages of the Harmonic Phonology analysis

- 1) The Harmonic Phonology analysis, compared to the OSI Jer analysis, has the advantage of reducing the inventory of underlying segments. It posits no underlying jers /Y/ or /E/. Instead, it uses two of the six vowels found in surface representations of Bulgarian words — /ə/ and /e/ — as floating segments.
- 2) The surfacing of ghost vowels (all ghost [e]'s and part of the ghost [ə]'s) is viewed as the result of providing a floating vowel with a skeletal slot. Floaters anchor only when immediately followed by an unsyllabified consonant.
- 3) The surfacing of remaining ghost [ə]'s is interpreted as epenthesis of the default vowel [ə]: epenthetic schwa is inserted when immediately followed by a sonorant that remains unsyllabified after the anchoring of floaters.
- 4) Thus, the surfacing of all ghost vowels, be they underlying floaters or epenthetic schwas, is treated as the direct consequence of the process of syllabification. Both Floater Anchoring and Schwa Epenthesis are repair strategies aiming to provide full syllabification of the segmental string.
- 5) The Harmonic Phonology analysis does not introduce syllabic sonorants in the course of derivation. This is an advantage with respect to the OSI Jer analysis, because in modern standard Bulgarian syllabic sonorants are not part of the surface segmental inventory. In the Harmonic Phonology treatment, sonorants trigger epenthesis of schwa not because they become syllabic, but because they remain

unsyllabified up to W-level representations.

- 6) As in other multilinear analyses of vowel-zero alternations in Slavic (cf. Kenstowicz & Rubach 1987, Farina 1991) a rule deleting floaters is not needed. The floaters that remain unanchored are eliminated by Stray Erasure.

2.5. Optimality Theory account for the Bulgarian data

2.5.1. Some principles of Optimality Theory

Optimality Theory (OT) uses output-based well-formedness constraints instead of input-based rewrite rules. In OT it is necessary to allow for the specification of a large set of candidate outputs. The candidate set is evaluated by the system of constraints. The latter selects the actual output (the optimal candidate) from the available candidates.

Constraints are ranked in a hierarchy. Lower-ranked constraints can be violated in an optimal output form when such violation guarantees success on higher-ranked constraints. Individual grammars impose a ranking on the universal constraint set, possibly with some setting of parameters and fixing of arguments within the constraints.

If just one candidate passes the highest-ranked constraint, it best satisfies the system of constraints and is the optimal candidate. Constraint violation is not necessarily the end of a candidate's chances. In case of ties, e.g. when all candidates fail the highest-ranked constraint, the failure on this constraint is not fatal for the candidates. Once a victor emerges, the remaining, lower-ranked constraints are irrelevant. Whether the optimal candidate obeys them or not is irrelevant. Likewise, the evaluation of failed candidates by lower-ranked constraints is also irrelevant.

2.5.2. A two-level OT account for Bulgarian ghost vowels

We adopt here a two-level version of OT known as Correspondence Theory (McCarthy & Prince 1994). The constraints serve to match different surface forms (outputs) with a given underlying form; i.e. each output is evaluated for every constraint with respect to the corresponding underlying form.

In our OT analysis of Bulgarian ghost vowels, we use the traditional OT formalism: the constraint tableau. Constraints are arrayed across the top of the tableau in domination order. Constraints that are not crucially ranked with respect to each other are separated in the tableau by dashed, rather than solid, lines and by the comma'd grouping when giving the constraint ranking, e.g. PARSE, FILL >> *COMPLEX\Coda. The latter indicates that there is no implication about the relative ranking of PARSE and FILL. Each of them dominates *COMPLEX\Coda.

A blank cell in the constraint tableau corresponds to success of the respective constraint, an asterisk * in a cell – to violation of the constraint. ! marks the exact

point where a candidate loses out to other candidates. Cells that do not participate in the decision are shaded. ↗ indicates the optimal candidate.

For each candidate set we first give the underlying representation to be matched. The underlying representations we use are those we arrived at after the analysis of the data in chapter 1.

The meaning of angled brackets is different at the level of underlying representations and in the representations of output candidates. In the latter case, they indicate unparsed segments, as is usual in OT formalism. For instance, <n> in an output candidate — e.g., .pes.<n> — represents a segment [n] that is provided with a skeletal slot, but remains outside syllable structure because of the sonority sequencing hierarchy, for [n] is peripheral and more sonorous than [s]. In underlying representations, e.g. in the underlying form /pes<e>n/ of *pesen* 'song', a segment between angled brackets represents a floater, i.e. <e> is a floating vowel, a segment [e] with no skeletal slot.

2.5.2.1. Constraints

Three of the seven constraints that we use to account for Bulgarian ghost vowel alternations and metathesis in a two-level OT framework are among the basic syllable structure constraints: PARSE, FILL and *COMPLEX (cf. Prince & Smolensky 1993). The first two are known as the Faithfulness family of constraints: "They declare that perfectly well-formed syllable structures are those in which input segments are in one-to-one correspondence with syllable positions" (Prince & Smolensky 1993:88). In our analysis of Bulgarian ghost vowels, all three universal constraints are to be augmented with language-particular parameters.

With two levels of representation and with underlying structures that contain floating segments, a language-specific parameter is necessary to restrict PARSE to non-floating segments, i.e. to segments that are provided with a skeletal slot underlyingly. The non-parsing of a floater, i.e. the fact that a floating segment remains unsyllabified and, therefore, not included in higher-level structures, is not a violation of PARSE in Bulgarian.

C1: PARSE\non-Floaters

PARSE NON-FLOATERS:

All non-floating segments of the underlying representation must be parsed.

The universal constraint FILL must also be parameterized. Apparently, FILL is not violated in Bulgarian, if a syllable position is filled with a segment (schwa) that is not underlyingly present, but represents the nucleus of a syllable whose coda is occupied by a sonorant. An additional condition is that there must be no floater available to fill the nucleus position in question.

C2: FILL\sonorant; closed σ

FILL with the default vowel (schwa) only if:

- a. before a SONORANT [r, l, m, n, v]
AND
- b. the sonorant is in coda position, i.e. the schwa is in a CLOSED SYLLABLE
AND
- c. there is NO FLOATER AVAILABLE to be anchored before the sonorant

The universal constraint *COMPLEX (cf. Prince & Smolensky 1993:87 and 109) is restricted to codas in Bulgarian. This means that it bans branching codas, but allows branching onsets as well-formed syllable structures. This constraint should be parameterized as *COMPLEX\Coda:

C3: *COMPLEX\Coda

AVOID COMPLEX CODAS:

A complex coda must be avoided.

Another constraint, which is lower-ranked, proscribes open syllables whenever the nucleus is a floater that has been parsed.

C4: AVOID OPEN σ \Floater

AVOID OPEN SYLLABLES WITH A PARSED FLOATER AS NUCLEUS:

If there are two candidates with parsed floaters, the one whose floaters are all in closed syllables is the better candidate.

The first four constraints all refer to syllable structure. They interact with certain other constraints that relate more specifically to floaters: all floaters (C5), floaters of the root morpheme (C6), and floaters of the root in interaction with suffixal floaters in derivatives — lexically-marked cases (C7).

Generally, parsing of floaters is to be avoided. In French, what is traditionally called "mute E", or schwa, can be treated as a floater. In an OT framework, Tranel (1995:3) introduces the constraint AIF: "I regulate the appearance of floaters by introducing the universal constraint AIF (Avoid Integrating Floaters). The force of AIF is to prohibit the 'insertion' of whatever higher structural node would turn a floater into a regular segment. AIF thus belongs to the group of faithfulness constraints." PARSE bans underparsing: leaving underlyingly anchored segments unparsed. FILL bans overparsing: parsing of a segment which is not underlyingly present or 'total epenthesis'. According to Tranel, "AIF can be seen as banning a type of 'partial epenthesis' whereby a higher structural node would be 'inserted'". In my treatment, the latter constraint bans parsing of segments that are underlyingly present on the segmental ("melodic") tier, but lack a skeletal slot. Therefore, it bans parsing of floating segments or floaters, and is, in a sense, the opposite of PARSE\non-Floaters, which requires parsing of anchored (non-floating) segments. For this reason I prefer to call this constraint differently:

C5: AVOID PARSE\Floaters

AVOID PARSING FLOATERS:

A candidate with no parsed floaters is better than a candidate that contains at least one parsed floater.

Formulated in this way, AVOID PARSE\Floaters is a binary constraint, unlike PARSE\Non-floaters, which is non-binary. AVOID PARSE imposes a single violation mark on every candidate that contains one or more parsed floaters. The number of unparsed floaters is irrelevant. Conversely, when evaluated for PARSE, a candidate receives as many violation marks as the number of non-floaters that remain unparsed; i.e. different degrees of violation of PARSE are possible.

But floaters that are part of the root morpheme, unlike suffixal floaters, tend to be parsed. This constraint is lower-ranked, and it requires that the parsing of the root segments be exhaustive.

C6: EXHAUSTPROOT

EXHAUSTIVE PARSING OF THE ROOT :

All underlying segments of the root morpheme, including floating segments, must be parsed.

The last constraint is needed to account for words that contain an FGE-marked morpheme: ex.7d and ex.9d. It bans the parsing of a floater in the root when the

suffixal floater is parsed. A form must contain the nominalizing suffix *-/⟨e⟩c/* (ex.7d) or be lexically-marked for this constraint (ex.9d).

C7: *ROOT FLOATER\Suffixal Floater

Do not allow a ROOT FLOATER to be parsed before a PARSED SUFFIXAL FLOATER if:

- a. the suffix is *-/⟨e⟩c/*
- OR
- b. the root is lexically-marked for this constraint (it carries the FGE lexical mark)

2.5.2.2. Constraint ranking

{PARSE\⟨non-Floaters, FILL\⟨sonorant;closed σ⟩} >> *COMPLEX\Coda >>
 >> {AVOID PARSE\Floaters, *ROOT FLOATER\Suffixal Floater} >>
 EXHAUSTP ROOT >>> AVOID OPEN σ\Floater

		PARSE \non- Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER \SuffFloater	EXHAUSTP ROOT	AVOID OPEN σ\ Floater
(18)	/kɔst/							
	.kɔs.<t>	*					*	
☞	.kɔst.			*				
	.kɔ.sət.		*a					
	.kɔs.tə.		*a,b					
(19)	/or⟨e⟩l/							
	.or.<l>	*					*	
	.orl.			*			*	
☞	.o.rel.				*			
	.o.rəl.		*c				*	
	.or.lə.		*a,b				*	
(20)	/mal+⟨ə>k/							
	.mal.<k>	*						
	.malk.			*				
☞	.ma.lək.				*			
	.mal.kə.		*a,b					

(18) above demonstrates that in Bulgarian FILL dominates *COMPLEX\Coda:

(21) FILL >> *COMPLEX\Coda

When there is no floater in the underlying representation of a given word, e.g. /kost/ for *kost* 'bone' fem.sg., a consonant cluster that is an admissible complex coda (cf. candidate .kost.) is preferred to a violation of FILL (cf. candidates .ko.sət. or .kos.tə.). From (19) and (20) we can see that *COMPLEX\Coda is higher-ranked than AVOID PARSE \Floaters:

(22) *COMPLEX\Coda >> AVOID PARSE \Floaters

With words containing an underlying floater, as part of the root (19) or of a suffix (20), to parse the floater (as in the optimal candidates .o.rel. and .ma.lək.) is a smaller violation than to create a syllable with complex coda (cf. the suboptimal candidates .orl. and .malk.).

2.5.3. OT accounts for the patterns of examples 1-9, Table 3

2.5.3.1. <V>-roots, examples 1

Examples 1a, 1'a reveal the domination of AVOID PARSE on EXHAUSTPROOT. The optimal candidates (ii) satisfy the former and violate the latter, which must therefore be lower-ranked:

(23) AVOID PARSE >> EXHAUSTPROOT

Candidates (iii) in examples 1b, 1'b involve a violation of AVOID PARSE. Nevertheless, they are optimal, because the other candidates violate higher-ranked constraints: PARSE or FILL. Candidates (ii) in examples 1'b, 1'c receive violation marks for FILL, because they contain a schwa insertion in a site where a floater, <e>, is available at the level of underlying representations. Candidates (ii) in 1b, 1c are attempts to avoid violation of *COMPLEX, but this leads to a more serious violation: a second unparsed underlying segment, which involves a second violation mark for PARSE.

Ex. n°	C. n°		PARSE \non- Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
1a		/filt<ə>r+i/							
	i.	.fil.tə.ri.				* !			*
	☞ ii.	.fil.tri.						*	
1'a		/pes<e>n+i/							
	i.	.pe.se.ni.				* !			*
	☞ ii.	.pes.ni.						*	
1b		/filt<ə>r/							
	i.	.filt.<r>	*		*			*	
	ii.	.fil.<tr>	**					*	
	☞ iii.	.fil.tər.				*			
1'b		/pes<e>n/							
	i.	.pes.<n>	*					*	
	ii.	.pe.sən.		* _c				*	
	☞ iii.	.pe.sen.				*			
1c		/filt<ə>r+če/							
	i.	.filt.<r>.če.	*		*			*	
	ii.	.fil.<tr>.če.	**					*	
	☞ iii.	.fil.tər.če.				*			
1'c		/pes<e>n+ta/							
	i.	.pes.<n>.ta.	*					*	
	ii.	.pe.sən.ta.		* _c				*	
	☞ iii.	.pe.sen.ta.				*			

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPEN σ \Floater
1d		/filt<ə>r+<e>n/							
	i.	.filt.<rn>	* *					*	
	ii.	.fil.tørn.			*	*			
	iii.	.fil.tren.				*		* !	
☞	iv.	.fil.tə.ren.				*			*
1'd		/pes<e>n+<e>n/							
	i.	.pes.<nn>	*					*	
	ii.	.pe.sen.<n>	*			*			
	iii.	.pes.nen.				*		* !	
☞	iv.	.pe.se.nen.				*			*
1e		/filt<ə>r+<e>n+a/							
	i.	.filt.<r>.na.	*					*	
	ii.	.fil.tre.na.				*		* !	*
☞	iii.	.fil.tør.na.				*			
	iv.	.fil.tə.re.na.				*			* !
1'e		/pes<e>n+<e>n+a/							
	i.	.pes.<n>.na.	*					*	
	ii.	.pes.ne.na.				*		* !	*
☞	iii.	.pe.sen.na.				*			
	iv.	.pe.se.ne.na.				*			* !

In examples 1d, 1'd EXHAUSTROOT violations play a decisive role. Candidate (iii) and candidate (iv) tie on AVOID PARSE\Floaters. Otherwise, both candidates receive another violation mark: candidate (iii) for EXHAUSTROOT and candidate (iv) for AVOID OPEN σ \Floater. The correct outputs are obtained by ranking EXHAUSTROOT higher than AVOID OPEN σ \Floater:

(24) EXHAUSTROOT >> AVOID OPEN σ \Floater

2.5.3.2. Metathetic <V>-roots, examples 3

In 3a the decisive role is played by the relative ranking of AVOIDPARSE and EXHAUSTROOT.

(25) AVOIDPARSE >> EXHAUSTPROOT

In 3b, 3c candidates (ii) are the winners, because they incur the least serious violation – that of AVOIDPARSE which is lower-ranked with respect to PARSE, FILL and *COMPLEX.

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
3a		/kr<ə>v+av/							
	i.	<kr>.vav.	* *					*	
	ii.	.krə.vav.				* !			
☞	iii.	.kər.vav.						*	
	iv.	.kə.rə.vav.		* _b		*			*
3b		/kr<ə>v/							
	i.	<krv>	*					*	
☞	ii.	.krəf.				*			
	iii.	.kərf.			*			*	
	iv.	.kə.rəf.		* _b		*			
3c		/kr<ə>v+ta/							
	i.	<krv>.ta.	* * *						
☞	ii.	.krəf.ta.				*			
	iii.	.kərf.ta.			*			*	
	iv.	.kə.rəf.ta.		* _b		*			

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPEN σ \Floater
3d		/kr<ə>v+<e>n/							
	i.	<krvn>	*					*	
	ii.	<kr>.ven.	*			*		*	
	iii.	.krəv.<n>	*			*			
☞	iv.	.krə.ven.				*			*
	v.	.kər.ven.				*		* !	
	vi.	.kə.rə.ven.		* _b		*			
3e		/kr<ə>v+<e>n+a/							
	i.	<krv>.na.	*					*	
	ii.	<kr>.ve.na.	*			*		*	*
	iii.	.krə.ve.na.				*			* !
	iv.	.kər.ve.na.				*		* !	*
	v.	.kə.rə.ve.na.		* _b		*			*
	vi.	.kə.rəv.na.		* _b		*			
	vii.	.kərv.na.			*			*	
☞	viii.	.krəv.na.				*			

In 3d, candidates (iv) and (v) are tied until the evaluation for AVOID PARSE. They both receive a single violation mark for AVOID PARSE, a binary constraint, even though candidate (iv) contains two parsed floaters, while candidate (v) presents a single parsed floater. We see that, as in 1d, the decisive role for selecting (iv) as optimal candidate is played by the higher ranking of EXHAUSTPROOT over AVOID OPEN σ \Floater, cf. (24).

2.5.3.3. CS-roots, examples 2 and 4

The optimal candidates in CS-roots are those with no violation marks. They all fill a nucleus with schwa in a closed syllable before a sonorant, which does not involve a FILL violation.

Ex. n°	C. n°		PARSE \non- Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPEN σ Floater
2a		/misl+j+ə/							
	i.	.mis.lʲə.							
	ii.	.mi.sə.lʲə.		* _b					
2b		/misl/							
	i.	.mis.<l>	*					*	
	ii.	.mi.səl.							
2c		/misl+ta/							
	i.	.mis.<l>.ta.	*					*	
	ii.	.mi.səl.ta.							
2d		/misl+en/							
	i.	.mis.len.							
	ii.	.mi.sə.len.		* _b					
2e		/misl+en+a/							
	i.	.mis.le.na.							
	ii.	.mi.sə.le.na.		* _b !					
	iii.	.mi.səl.<e>.na.	* !						

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ Floater
4a		/vr̩v+olic+a/							
	i.	<vr̩>.vo.li.ca.	* *						
	ii.	.vr̩ə.vo.li.ca.		* _b					
	☞ iii.	.vər.vo.li.ca.							
	iv.	.və.rə.vo.li.ca.		* * _b					
4b		/vr̩v/							
	i.	<vr̩v>	* * *						
	☞ ii.	.vr̩f.							
	iii.	.vər̩f.			*				
	iv.	.və.rəf.		* _b					
4c		/vr̩v+čic+a/							
	i.	<vr̩v>.či.ca.	* * *						
	☞ ii.	.vr̩f.či.ca.							
	iii.	.vər̩f.či.ca.			*				
	iv.	.və.rəf.či.ca.		* _b					
4d		/vr̩v+en/							
	i.	<vr̩>.ven.	* *						
	ii.	.vr̩ə.ven.		* _b					
	☞ iii.	.vər̩.ven.							
	iv.	.və.rə.ven.		* * _b					
4e		/vr̩v+en+a/							
	i.	<vr̩>.ve.na.	* *						
	ii.	.vr̩ə.ve.na.		* _b					
	☞ iii.	.vər̩.ve.na.							
	iv.	.və.rə.ve.na.		* * _b					

2.5.3.4. CS-root + -/⟨e⟩c/, examples 5

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
5a		/begl+a/							
	i.	.be.gla.							
	ii.	.be.gə.la.		* !					
5b		/begl/							
	i.	.beg.<l>	* !					*	
	ii.	.be.gəl.							
5d		/begl+⟨e⟩c/							
	i.	.beg.<lc>	* *					*	
	ii.	.be.gəlc.			*				
	iii.	.be.gə.lec.		* b		*			
	iv.	.be.gləc.		* c					
	v.	.be.glec.				*			
5e		/begl+⟨e⟩c+i/							
	i.	.beg.<l>.ci.	*					*	
	ii.	.be.gle.ci.				*			*
	iii.	.be.gə.le.ci.		* b		*			*
	iv.	.be.gəl.ci.							

2.5.3.5. Metathetic <V>-root + -/<e>c/, examples 7

Ex. n°	C. n°		PARSE \ non-Floaters	FILL \ sonorant; closed σ	*COMPLEX \ Coda	AVOID PARSE \ Floaters	*ROOT FLOATER \ SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
7a		/dr<ə>ž+j+ə/							
	i.	<dr>.žə.	* *						
	ii.	.drə.žə.				* !			*
	iii.	.də.rə.žə.		* b		*			*
☞	iv.	.dər.žə.						*	
7b		/dr<ə>ž/							
	i.	<drž>	* * *					*	
	ii.	.dərž.			* !			*	
☞	iii.	.drəž.				*			
	iv.	.də.rəž.		* b		*			
7c		/dr<ə>ž+k+a/							
	i.	<drž>.ka.	* * *					*	
	ii.	.dərž.ka.			* !			*	
☞	iii.	.drəž.ka.				*			
	iv.	.də.rəž.ka.		* b		*			
7d		/+dr<ə>ž+<e>c/							
	i.	<držc>	* * * *					*	
	ii.	<dr>.žec.	* *			*		*	
	iii.	.dərž.<c>	*		*				
	iv.	.drəžc.			*	*			
	v.	.drə.žec.				*	* !		*
☞	vi.	.dər.žec.				*		*	
7e		/+dr<ə>ž+<e>c+i/							
	i.	<drž>.ci.	* * *					*	
	ii.	<dr>.že.ci.	* *			*		*	*
☞	iii.	.drəž.ci.				*			
	iv.	.drə.že.ci.				*	*		*
	v.	.dər.že.ci.				*		* !	*
	vi.	.dərž.ci.			*				
	vii.	.də.rə.že.ci.		* b		*		*	
	viii.	.də.rəž.ci.		* b		*			

Candidate (v) and (vi) demonstrate that *ROOT FLOATER\Suffixal Floater must be higher-ranked than EXHAUSTPROOT, because (vi), with a violation mark for EXHAUSTPROOT, is the optimal candidate:

(26) *ROOT FLOATER\Suffixal Floater >> EXHAUSTPROOT

2.5.3.6. Metathetic CS-root + -/e>c/, examples 8

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant ;closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
8a		/srn+a/							
	i.	<sr>.na.	* *					*	
	ii.	.srə.na.		* b					
☞	iii.	.sər.na.							
	iv.	.sə.rə.na.		* b					
8c		/srn+dak/							
	i.	<srn>.dak.	* * *					*	
	ii.	.sərn.dak.			* !				
	iii.	.sər.nə.dak.		* a, b					
☞	iv.	.srən.dak.							
	v.	.sə.rən.dak.		* b					

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant ;closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
8d		/sɾn+<e>c/							
	i.	<sɾnc>	* * * *					*	
	ii.	<sɾ>.nec.	* *			*		*	
	iii.	.səɾn.<c>	*					*	
	iv.	.sɾənc.			* !				
	v.	.sɾə.nec.		* b		*			
☞	vi.	.səɾ.nec.				*			
	vii.	.sə.rə.nec.		* b		*			
8e		/sɾn+<e>c+i/							
	i.	<sɾn>.ci.	* * *					*	
	ii.	.səɾn.ci.			*				
☞	iii.	.sɾənci.							
	iv.	.səɾ.ne.ci.				* !			*
	v.	.sə.rən.ci.		* b					
	vi.	.səɾ.nə.ci.		* a, b, c					

2.5.3.7. FGE-marked roots, examples 9

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ\ Floater
9a		/dɾ<ə>z ^{FGE} +ost/							
	i.	<dɾ>.zost.	* *						
	ii.	.dɾə.zost.				* !			*
☞	iii.	.dəɾ.zost.						*	
	iv.	.də.rə.zost.		* b					*
9c		/dɾ<ə>z ^{FGE} +n+ə/							
	i.	<dɾz>.nə.	* *					*	
☞	ii.	.dɾəz.nə.				*			
	iii.	.dəɾz.nə.			* !			*	
	iv.	.də.rəz.nə.		* b		*			

Ex. n°	C. n°		PARSE \non-Floaters	FILL \sonorant; closed σ	*COMPLEX \Coda	AVOID PARSE \Floaters	*ROOT FLOATER SuffFloater	EXHAUSTP ROOT	AVOID OPENσ Floater
9d		/dr<ə>z ^{FGE} +<ə>k/							
	i.	<drzk>	* * * *					*	
	ii.	<dr>.zək.	* *					*	
	iii.	.dərz.<k>	*		*			*	
☞	iv.	.dər.zək.				*		*	
	v.	.drə.zək.				*	* !		*
	vi.	.drəzk.			*	*			
9e		/dr<ə>z ^{FGE} +<ə>k+a							
	i.	<drz>.ka.	* * *					*	
	ii.	<dr>.zə.ka.	* *			*		*	*
	iii.	.drə.zə.ka.				*			* !
☞	iv.	.drəz.ka.				*			
	v.	.dərz.ka.			*				
	vi.	.dər.zə.ka.				*			* !
3d		/gr<ə>m+<ə>k/							
	i.	<grmk>	* * * *					*	
	ii.	<gr>.mək.	* *			*		*	
	iii.	.gərm.<k>	*						
	iv.	.gər.mək.				*		* !	
☞	v.	.grə.mək.				*			*
	vi.	.grəmk.			*	*			

If we compare the OT analysis for ex. 9d — /dr<ə>z+<ə>k/ — with that for /gr<ə>m+<ə>k/ 'loud', which parallels /kr<ə>v+<ə>n/, ex. 3d, we can see that the different outputs from structurally identical underlying forms are due to the fact that *ROOT FLOATER is ranked higher than AVOID OPEN σ.

(27) *ROOT FLOATER >> AVOID OPEN σ

The root /gr<ə>m/ does not obey *ROOT FLOATER, because it lacks the lexical mark FGE. Thus, candidate (v) .grə.mək., with a parsed root floater in the presence of a suffixal floater that is also parsed, does not receive a violation mark for *ROOT

FLOATER. The decisive role for selecting the optimal candidate here is played by the domination order of EXHAUSTPROOT and AVOID OPEN σ , cf. (24).

Candidate (v) for ex. 9d receives the same marks as candidate (v) for /gr<ə>m+<ə>k/; however /dr<ə>z/ is a lexically-marked FGE root. Therefore, the simultaneous parsing of the root and the suffixal floater in the suboptimal candidate .drə.zək. is a violation of *ROOT FLOATER. The latter violation is fatal, because *ROOT FLOATER dominates AVOID OPEN σ .

2.5.4. Conclusion

An OT analysis accounts for the Bulgarian data presented in chapter 1 by means of seven constraints and their relative ranking.

The constraints can be distributed in two groups:

Constraints that refer to syllable structure:

- PARSE, FILL, AVOID PARSE (constraints that belong to the Faithfulness family of basic syllable structure constraints)
- *COMPLEX\Cod
- AVOID OPEN σ \Floater

Constraints that regard floating vowels:

- AVOID PARSE
- EXHAUSTPROOT (with additional reference to morpheme structure)
- *ROOT FLOATER (with additional reference to both morpheme structure and lexical marks)
- AVOID OPEN σ \Floater.

Some of the constraints, namely AVOID PARSE and AVOID OPEN σ \Floater, are found in both groups.

The underlying representations of the OT analysis are built on the same assumptions as those of the Harmonic Phonology (HP) account for ghost vowels in Bulgarian. The FGE lexical mark on a subset of metathetic roots and on the suffix -EC as needed in both treatments.

The ordering of rules in the HP analysis follows from the relation between rules and constraints on syllabification that characterize specific levels. Thus, the Rule of Floater Anchoring affects floaters that are followed by consonants remaining unsyllabified after M-level syllabification has applied, while the rule of Schwa

Epenthesis is triggered by consonants that are still left unsyllabified after W-level syllabification has applied. Consequently, the rule conditioned by M-level syllabification (Floater Anchoring) takes precedence over the rule associated with W-level syllabification (ə -Epenthesis).

By contrast, the ranking of constraints, established by eliminating all rankings that do not select the right output as optimal candidate, is rather arbitrary. Moreover, the two conflicting constraints AVOID PARSE and EXHAUSTROOT, see (23), require exactly the opposite as far as floaters of the root are concerned: AVOID PARSE requires them to remain unparsed, whereas EXHAUSTROOT necessitates their parsing. The definition of the former as a binary constraint (the number of parsed floaters being irrelevant) is also motivated solely by the necessity to achieve the correct outputs.

3. A diachronic view on the Bulgarian data

The modern Bulgarian alternations involving ghost vowels (including metathesis) can be viewed as resulting from a series of sound changes affecting Old Church Slavonic (OCS) reduced vowels (jers) and syllabic liquids.

3.1. *Jers and liquids*

Our claim is that OCS had in its inventory of phonemes both reduced vowels (the front jer *ь* and the back jer *ѣ*) and syllabic liquids (orthographically, *r* or *l* followed by either the front or the back jer; i.e. *rь*, *лъ*, *rѣ*, *лѣ*).

3.1.1. Strong and weak jers. Havlík's Law

The jers were "basically high lax vowels, but subject to considerable phonetic variation according to phonological surroundings" (Lunt 1974:2.11). They are "traditionally viewed as a special case of *reduced vowels* and opposed to all the other *full vowels*" (Lunt 1974:2.5).

In so-called *strong* positions – before another jer in the next syllable – jers were lowered to mid vowels: the front jer was replaced by *e* and the back jer by *o* in orthography.¹ When several jers occurred in successive syllables in a single word², every second jer, counting from the end of the word, was in strong position and could be lowered. This process is known in Slavic historical phonology as Havlík's Law (cf. Carlton 1991:165). Thus, the stem *възѣм-* 'take', containing two jers in successive syllables, occurred with the first jer lowered in *възѣми*, imper. 2p.sg., where the second jer is in weak position, because followed by the non-jer vowel 'i' in the next syllable, and with the second jer lowered in *възѣмѣ*, past active part. nom.sg.masc.neut., where the second jer of the stem is in strong position, because followed by the jer vowel 'ѣ' in the next syllable.

¹ This was most probably a process of regressive dissimilation for vowel height (cf. Velcheva 1988:123, Velcheva 1990).

² The phonological word in OCS could include neighbouring clitics, e.g. prepositions.

3.1.2. Two types of 'liquid-jer' sequences in Old Church Slavonic

It is well known that "Old Church Slavonic orthography fails to make a distinction between syllables originally containing $\text{b/b} + \text{r/l}$ and those with original $\text{r/l} + \text{b/b}$, but regularly puts the jer after the liquid" (Lunt 1962:350).

For simplicity, we use Y for b/b and L for r/l . Thus, we distinguish between two types of LY ('liquid-jer') sequences in OCS:

$LY_1 (< *LY)$

$LY_2 (< *YL)$

The two types of LY sequences behave differently in identical phonological contexts. $LY_2 (< *YL)$ "shows no signs of behaving like syllables containing jers" (Lunt 1962:351).

Jers in LY_1 sequences were involved in lowering according to Havlík's Law: $krbstb$ and $krestb$ 'cross', $slbzь$ and $slezь$ 'tear' gen.pl., $krьvb$ and $krovь$ 'blood' nom.sg., $plьtb$ and $plotь$ 'flesh' are attested alternative forms in OCS manuscripts (cf. Vaillant 1964:33).

Conversely, jer lowering was impossible in LY_2 sequences: $*prevь$, $*vrexь$, $*skrobь$ were impossible, and are not attested, as variants with lowered "jers" for $prьvb$ 'first', $vrьxь$ 'top' and $skrьbb$ 'sorrow', respectively, where rb , $rь$ are LY_2 sequences, coming from older $*br$, $*brь$.

As for the distribution of strong and weak jers, a LY_2 sequence produced the effects typical of a full vowel, not those of a jer:

- It could trigger the loss of a previous jer: $s'mrbti$, 'death' gen. sg., is an attested form (Suprasliensis 489.16) for $sьmrьti$.
- It was not to be counted in a sequence of contiguous syllables containing jers, when determining the distribution of weak and strong jers: $oto sьmrьti$ 'from death' is an attested (Psalterium Sinaiticum CXIV,7) alternative form for $otь sьmrьti$. The lowering of the jer at the end of the preposition means that the initial jer of $sьmrьti$ is in weak position even though it is followed by another jer. But rb in $sьmrьti$ is a LY_2 sequence and its "jer" is not to be counted as a real jer for Havlík's Law: $otь sьm(rь)ti$, yielding $oto sьm(rь)ti$.

Lunt (1962) makes the following assumptions about the phonetic value of jers in the Cyrillic texts and the Kiev Fragment: the symbols ѣ and ѓ have a double function:

- they have no phonetic value of their own, but just denote the quality of the consonant they follow (palatalized or not) ³
- "under proper conditions", they denote an independent vowel phoneme ə

According to Lunt, this schwa-like phoneme ə is found:

- in the place of the old strong jers⁴
- in the place of the weak jers which were retained in certain roots
- as the basis of the back nasal vowel: ѣ > ə̃⁵

Moreover, Lunt assumes that the phoneme ə was identified "with the vocalic element accompanying the syllabic liquids (and also the new syllabic nasals)" (Lunt 1962:356).

Lunt (1962) concludes that, although OCS did not distinguish orthographically CLY₁C and CLY₂C sequences, it clearly made a phonological distinction between them. However, Lunt (1962) does not make any assumption about the exact nature, phonemic and phonetic, of the contrast: "The exact nature of the phonological distinction between *prѣstѣ* (< ѣr)⁶ and *krѣstѣ*⁷ escapes us, but it must have lain in the quality and prosody of the liquid." (Lunt 1962:355).

My claim is that LY₁ corresponded to a biphonemic sequence of a liquid and a schwa-like vowel /Lə/, while LY₂ stood for a syllabic liquid /L̩/. This phonological distinction was most probably realized, in the case of rhotics, as the contrast between a schwa vowel of normal duration (as in the modern Bulgarian *rhotic-schwa* and *schwa-rhotic* sequences) and a much shorter vocoidal phase with schwa-like formant structure (as in the syllabic rhotics of other modern Slavic languages, e.g. Czech and Serbocroatian).

³ This is similar to the function of the more modern 'hard-' and 'soft-signs' in Russian.

⁴ "The *krѣvѣ/krѣvѣ* and *plѣtѣ/plѣtѣ* of Supr. [Codex Suprasliensis] and Sav. [Savvina Kniga] might very well have represented a phonetic *krəv, plət*, entirely parallel to the *krov, plot* forms which the Mac. [Macedonian] spellings in glagolitic reveal clearly." (Lunt 1962:356)

⁵ The nasal element could be simultaneous with the vowel – [õ] > [ə̃] – or follow the vowel – [oN] > [ə̃N]; cf. Lunt (1962:356, footnote 14) and Velcheva (1988:150).

⁶ *prѣstѣ* 'finger' contains a LY₂ sequence.

⁷ *krѣstѣ* 'cross' contains a LY₁ sequence.

3.1.3. Acoustics: syllabic liquids vs. sequences 'liquid-schwa'

To give an idea of what the situation in OCS could be, let us consider the acoustics of the sequences *rhotic-schwa* in modern Bulgarian and the *syllabic rhotics* in one of the modern Slavic languages that has retained syllabic liquids in its inventory of phonemes, namely Czech. A comparison between the sequence 'rhotic-schwa' in post-consonantal position in Bulgarian and a syllabic rhotic in Czech (always in post-consonantal position) reveals considerable similarity in the respective acoustic images.

Consider the oscillograms of the Bulgarian word *grǎb* 'back', phonetically [gɾǎp] (fig.1), where the sequence 'rhotic-schwa' is preceded by [g] and followed by another stop [p], and the Czech word *trpět* 'endure', phonetically [tɾpʲɛt] (fig.2), where the syllabic rhotic [ɾ] is also found between stops: [t] and [pʲ]. In Bulgarian as in Czech, the closure of the apical tap, an almost empty space on the oscillogram, is both preceded and followed by a vocoidal phase.

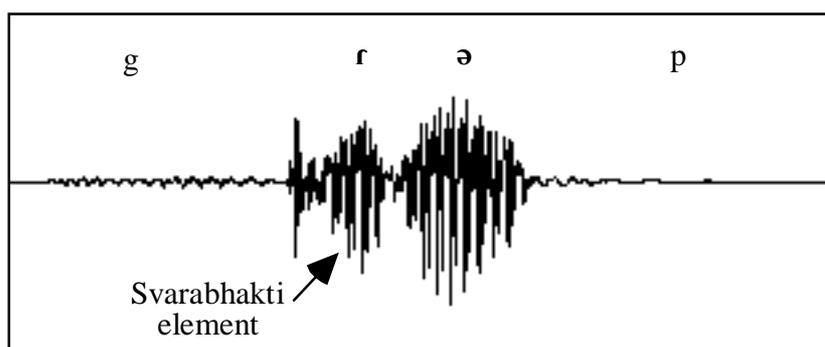


Figure 1. Oscillogram of a Bulgarian pre-consonantal rhotic in *grǎb*

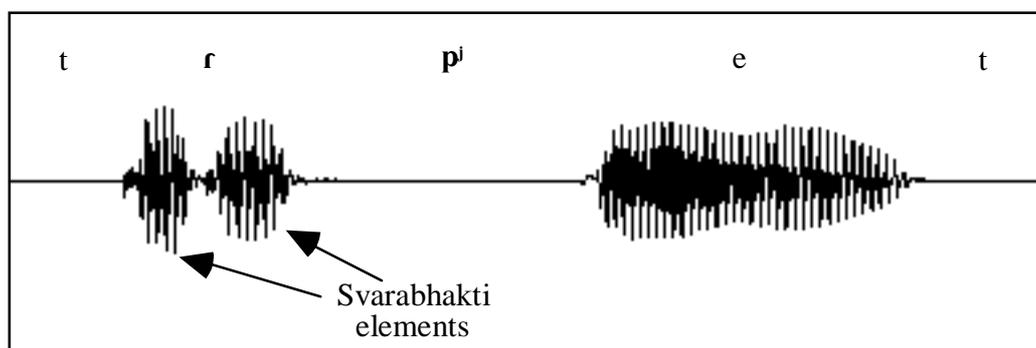


Figure 2. Oscillogram of a Czech inter-consonantal syllabic rhotic in *trpět*

Compare the left and the right vocoidal part in both cases. In the case of the Bulgarian word, the preceding vocoid is shorter and of lower intensity than the following

vocoid. This makes the acoustic image of the Bulgarian sequence *rhotic-schwa* asymmetrical.

Following Quilis (1987:296), we call the vocoidal phase between the initial consonant and the closure of the apical tap a svarabhakti element (*elemento esvarabático*). It is an automatic vocoid that inserts itself between the burst of the preceding stop and the closure of the apical tap (fig.1).

With pre-consonantal rhotics, e.g. in *gǎrbav* ['gǎrbaf] 'hunchbacked' (fig.3), the oscillogram of a sequence *schwa-rhotic* is the mirror image of fig.1:

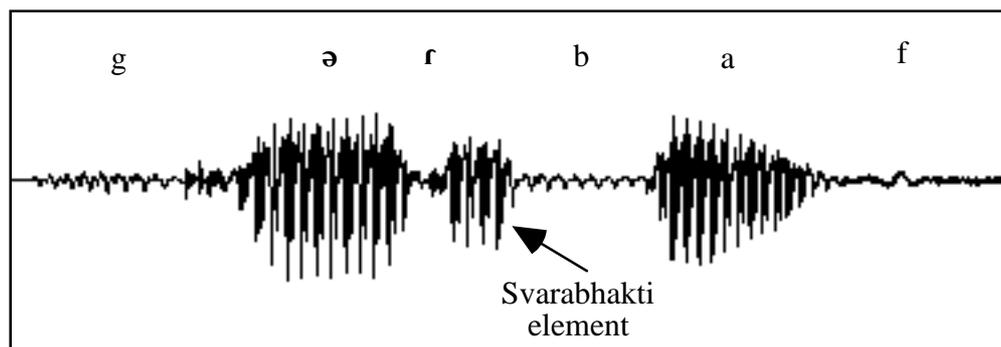


Figure 3. Oscillogram of a Bulgarian pre-consonantal rhotic in *gǎrbav*

In the Czech word (fig.2), the two vocoidal parts are roughly of equal duration and intensity. The acoustic image of the Czech syllabic rhotic is rather symmetrical. Both vocoids of the syllabic rhotic function as svarabhakti elements.

The following phonetic differences between a *rhotic-schwa* sequence and a *syllabic rhotic* has been noted in the literature:

- the duration of svarabhakti elements (about 30 ms; cf. Quilis 1987:298 for Spanish and Jetchev 1995 for Bulgarian and Czech) is shorter than the average duration of a Bulgarian schwa (80 ms if stressed, 74 ms if unstressed, according to Lehiste & Popov 1970);
- svarabhakti elements are of lower intensity
- the duration of the vocoidal part of a syllabic /r/ is inversely correlated to the number of closures: the overall duration of the sequence *svarabhakti element + closure + svarabhakti element* is approximately equal to the average duration of a vowel in Serbocroatian; the average duration of one-closure /r/ and two-closure /r/ is roughly the same in Serbocroatian, while in Bulgarian liquid-schwa and schwa-liquid sequences, /ə/ maintains its duration independently of the manifestation of the liquid as one-closure tap or two-closure trill (Lehiste & Popov 1970:45)
- the relative value of durations as ratio of [ə]:[r] (Cubberley 1987:9) is significantly greater in Bulgarian 'rhotic-schwa' sequences (the average ratio for

Bulgarian is of 1.46) than in syllabic rhotics of other Slavic languages (the average ratios are: for Czech 0.76, for Slovak 0.60, for Serbocroatian 0.89).⁸

3.1.4. Sound changes: schwa epenthesis and schwa loss

When perceiving the acoustic signal containing svarabhakti elements, the listener normally factors them out. However, if the listener fails to correct the acoustic signal, he will perceive additional vowels. This kind of misperception (hypo-correction, according to Ohala 1992:348) will produce a sound change: the epenthesis of a vowel. This sound change is largely attested in different languages. In informal style of Spanish, the svarabhakti element in CL sequences produces the phenomenon traditionally known as 'vocal relajada': insertion of a vowel which is identical to that of the next syllable, e.g. *Inglaterra* > *Ingalaterra* 'England', *crónica* > *corónica* 'chronicle', *iglesia* > *igelesia* 'church', etc. (Ohala 1992:348). An epenthetic schwa ('Sproßvokal') occurred in the Middle High German (MHG) period, as can be seen if the MHG forms are compared to the corresponding Modern Standard German (MSG) forms: *Middle Bavarian* *zoren*, *arem*, *melichen*, *galigen*; cf. *MSG* *Zorn* 'anger', *Arm* 'arm', *melken* 'to milk', *Galgen* 'gallow-trees' (Noske 1996:15).

The pattern of this sound change can be reversed: then, a vowel is erroneously factored out (misperceived as a svarabhakti element) in the neighborhood of a liquid and the resulting sound change is a vowel loss, e.g. the early vowel deletions that took place in Pre-Classical Latin: *calidus* > *caldus*, *laridus* > *lardus*, *validus*, adj., without vowel loss vs. *valde*, adv., etc. (Zink 1986:38). Vowel deletions also characterized Early New High German, where a progressive development towards the MSG situation can be observed, e.g., *beliben* > *bliben*, *bleiben* 'to stay', *genade* > *Gnade* 'mercy', *anefang* > *anfang* 'begin' (Noske 1996:14).

As for syllabic laterals, additional length is used as a durational cue by the listener to identify them (Prince 1980, Fokes & Bond 1993). Some mechanism, similar to the misperception of svarabhakti elements of rhotics as schwa vowels, must be responsible for the schwa epenthesis in the neighborhood of laterals. Probably, the extra length portion of syllabic laterals is misperceived as an independent vowel. Conversely, a vowel adjacent to a lateral can be factored out (misperceived as the extra length portion of a syllabic lateral) and the resulting sound change will be a vowel loss. However, from a purely phonetic point of view, the explanation of vowel

⁸ A ratio of 1.00 means equal proportions of vocalic/consonantal part; a ratio < 1.00 corresponds to a syllabic (vocalic) /r/.

epenthesis and vowel loss with adjacent laterals is less obvious than with adjacent rhotics.

In Bulgarian, the formant structure of the vocoidal part of /r/ is identical to that of a schwa (approximately, F1 = 500 Hz, F2 = 1500 Hz, F3 = 2400 Hz; cf. Lehiste & Popov 1970, *table I* for independent schwa and *table III* for vocoidal part of /r/). Therefore, the epenthetic vowel is expected to be a schwa.

Moreover, schwa is an independently existing vowel phoneme in Bulgarian.

It will be claimed that the following mechanism distinguished the asymmetrical [ʳrə] sequences (fig.1) from the symmetrical [ʳrʳ] sequences (fig.2) in OCS: the former were phonologically interpreted, by factoring out only the first schwa-like segment, as sequences of a rhotic and an independent schwa-like vowel (jer), while the latter were phonologically interpreted, by factoring out both schwa-like vocoids, as syllabic rhotics.

3.2. Merger of syllabic sonorants and sequences 'sonorant-jer'

The fall of weak jers created new syllabic liquids. The result was a merger of LY₁ sequences, where Y₁ was a weak jer, with LY₂ sequences, interpreted here as representing OCS syllabic liquids. The sequences 'liquid-weak jer' gave rise to 'syllabic liquids', e.g. in *kr̃sta* 'cross' gen.sg., *sl̃za* 'tear' nom.sg., *kr̃vi* 'blood' gen..sg., *pl̃ti* 'flesh' gen.sg. The newly created syllabic liquids in the above words were merged with the old syllabic liquids in words like *vr̃xa* 'top' gen.sg. and *skr̃bi* 'sorrow' gen.sg.

Jers in weak position were located in two contexts: at the word-end and word-internally at morpheme boundaries, when followed by a syllable whose nucleus was a non-jer vowel.

The deletion of word-final jers produced new syllabic liquids, but also some syllabic nasals ([ŋ] and [ɱ]) and labiodentals ([ɣ]).

The normal spelling for all syllabic sonorants (and [ɣ]) was *SY*, where *S* stands for *r*, *l*, *n*, *m*, *v*, i.e. *SY* could be *ñ*, *m̃*, *ṽ*, *ñ*, etc. Here are some forms from the Manasi Chronicle, a 14th-century manuscript: *m̃dr̃* 'wise', *m̃sl̃* 'thought' acc.sg., *ž̃zl̃* 'sceptre', *p̃asñ* 'song', *k̃zñ* 'craft', *kos̃m̃* 'strand of hair', *m̃r̃tṽ* 'dead'. My claim is that the italicized letters in the above examples corresponded to syllabic consonants.

The deletion of weak jers at morpheme boundaries gave rise also to some word-internal syllabic sonorants, including [ɣ], that were normally spelled in the same way as word-final syllabic sonorants (as *SY*): *s̃rebr̃ñ* 'silver' adj., *m̃dr̃c̃* 'wise man' acc.pl., *k̃zññymi*, 'craft' adj., instr.pl., *m̃r̃tṽci*, 'deceased' nom.pl. (Manasi Chronicle).

However, in manuscripts from the 13th (Dobrejšov Gospel, Bologna Psalter, Grigorovič Parimeinik) and 14th centuries (Manasi Chronicle), the spelling *SY* was often replaced by *YSY* or *YS*. The variety of spellings for the sequences of a sonorant, including *v*, and a former weak jer (*SY*, *YSY*, *YS*) indicates that their actual pronunciation was subjected to variation.

Mirčev (1978:141) reports that in the Dobrejšov Gospel the spellings *LY* prevail, but many forms exhibit deviating spellings: *YLY* (*сѣвѣръшеніе* 'accomplishment', *мѣръзостѣ* 'abomination', *тѣрѣми* 'three' instr., *вѣлъкъ* 'wolf', *мѣлъва* 'rumor'), *YL* (*хѣлъмѣ* 'hill', *мѣлъчѣ* 'be silent' 1p.sg.pres., *рѣлъти* 'flesh' gen.sg., *кълънетсѣ*, 'swear' 3p.sg.pres.)

Similar deviations can be found with the sequences *vY* and *nY*: *дѣврехѣ* vs. *дѣврехѣ* 'gate' loc.pl. (Bologna Psalter), *сѣвтѣше* vs. *сѣвтѣше*, 3p.sg.pres. of *сѣвтѣти* 'shine' infin., *мрътъвци* vs. *мрътъвци* 'deceased' nom.pl. (Manasi Chronicle), *кѣтъвна* vs. *кѣтъвна*, fem.nom.sg. of *кѣтъвнѣ*, adjective derived from *кѣтъва* 'oath' (Grigorovič Parimeinik); *къзънми* vs. *къзънми* 'craft', instr.pl., *къзъннѣми* vs. *къзъннѣми*, instr. pl. of *къзъннѣ*, adjective derived from *къзънѣ* 'craft' (Manasi Chronicle).

Syllabic liquids could develop from liquids adjacent to strong jers as well. If strong jers in *LY₁* sequences were identified with a schwa-like vowel, as claimed by Lunt (see footnote 4), they could be misperceived, by hyper-correction, as svarabhakti elements of the adjacent liquids, and finally, be lost. This would result in syllabic liquids in the place of sequences 'liquid-strong jer' as well. The latter process could be favored by a constraint on the amount of morphophonological variation in stem (see 3.5).

Koorbanoff (1992:49) assumes that in Bulgarian strong jers were preserved in the neighborhood of liquids. In her interpretation, adjectives like *крѣвнѣ* 'blood' and *грѣмѣкъ* 'loud' developed a syllabic liquid only in the masculine singular, where the jer adjacent to *r* found itself in weak position: *крѣвнѣ*, *грѣмѣкъ*. By contrast, in the feminine, neuter and plural of the same adjectives, the root jer adjacent to *r* was in strong position: *крѣвна*, *крѣвно*, *крѣвни*; *грѣмка*, *грѣмко*, *грѣмки*. According to Koorbanoff, the latter forms did not give rise to syllabic liquids. However, if we assume that jer loss by hyper-correction took place next to liquids in OCS, then all adjectival forms of the type *крѣвнѣ*, *крѣвна*, *грѣмѣкъ*, *грѣмка*, regardless of whether the jer in the *LY₁* sequence was strong or weak, must have developed syllabic liquids.

3.3. Schwa- and [e]-epenthesis

A later stage of Middle Bulgarian did not tolerate the occurrence of sonorants as syllable peaks. During this period leftward or rightward anaptyxis of a mid vowel— /ə/ or, rarer, /e/ — took place in the neighborhood of formerly syllabic sonorants.

Some anaptyctic [ə] developed before a formerly syllabic sonorant that had become word-final after the loss of a final jer: mōdrъ > mādār 'wise', myslъ > misāl 'thought', žьzlъ > žezāl 'sceptre', kosmъ > kosām 'strand of hair', mrъtvъ > märtāv 'dead'. As for rhotics, this sound change consisted in a reanalysis of the svarabhakti element between the preceding consonant and the closure of the syllabic rhotic, e.g. mōdrъ [mōd^or], as an independent vowel schwa: [mōdər]. For laterals, nasals and voiced labiodentals, what was erroneously perceived as a vowel is probably the extra length portion of the syllabic sonorant. Before a word-final nasal, the epenthetic vowel was sometimes [e] instead of [ə]: desnъ > desen 'right-hand', tāsнъ > tesen 'narrow', pāsнъ > pesen 'song', plāsнъ > plesen 'mould'. This anomaly could be due to confusion with the productive adjectivizing suffix *-en* (< *-enъ*).

Other anaptyctic [ə] appeared before a word-internal, formerly syllabic sonorant in pre-consonantal position: mlъčati 'be silent' infin. [mltʃati] > mālča 'be silent' 1p.sg.pres.; cvъtitъ > cāfti 'blossom' 3p.sg.pres. After a [-anterior] coronal consonant, the epenthetic vowel could be [e] instead of schwa: črъpati > čerpja 'ladle out', črъta > čerta 'line', žrъtva > žertva 'victim'.

Before two consonants, the syllabic liquid was desyllabified by means of rightward, rather than leftward, anaptyxis: *tълstъ (cf. Rs. *tolstj*) > tlāst 'fat'; *pъrstъ (cf. Rs. *perst*) > OCS pъrstъ, pъrstъ > prāst 'finger'; *krъstъ (cf. Rs. *krest*) > OCS krъstъ > krāst 'cross'.

When a syllabic liquid immediately preceded a single word-final consonant, the direction of anaptyxis could be either leftward or rightward. Examples with rightward schwa epenthesis: *vъrxъ (cf. Rs. *verx*) > vrxъ, OCS vъrxъ > vrāx 'top'; *mъlkъ (cf. Rs. *molk* 'become silent' past tense masc.sg.), cf. OCS mlъčati 'be silent' infin. > mlāk 'be silent' interj. Examples with leftward schwa epenthesis: *xълmъ (cf. Rs. *xolm*) > OCS xълmъ > xālm 'hill'; *vълkъ > OCS vълkъ, vълkъ > vālk 'wolf'. Words that chose leftward epenthesis do not belong to the metathesizing paradigm in modern Bulgarian.

Koorbanoff (1992:47) assumes that all forms with a CLY₂CY# sequence "passed through a stage with a syllabic liquid [...], followed by a reinterpretation of the syllabic liquid as /ɤL/, since the segment was followed by a single consonant". Therefore, such forms should not have given rise to metathetic roots in modern Bulgarian. However, forms like *vrъxъ* 'top' (< *ɤr) and *skrъbbъ* 'sorrow' (< *ɤr) 'top'

developed a post-liquid, instead of pre-liquid, schwa (*vrǎx, skrǎb*) and they do belong to the metathesizing paradigm in the modern language (cf. the respective plurals *vǎrxove, skǎrbi*) even though they came from OCS words with CLY₂CY# sequences. The schwa-like reflexes of the back nasal vowel ǫ (cf. Velcheva 1988:156) must also have given rise to syllabic liquids, when preceded by *r* or *l*. Thus, we can explain why some OCS words containing the nasal ǫ in adjacency with a liquid developed metathetic roots in modern Bulgarian: grǫdъ > grǎd 'bosom' fem.sg., grǫdi > gǎrdi, pl., meaning 'breast'. Another example that can be accounted for by assuming a syllabic [l] from former *lǫ* is: glǫbokъ 'deep' masc.sg. (> glǎbok > gl̥bok > d̥bok) > dǎlbok.

In sum, our assumptions are:

1) In Middle Bulgarian manuscripts, the word-final *sonorant-jer* (SY) orthographic sequences represented phonemic syllabic sonorants /S/. So did word-internal SY sequences at morpheme boundaries where Y was in weak position. Even SY sequences with a strong jer could correspond to syllabic sonorants, assuming that the schwa-like reflex of the strong jer could be misperceived as a svarabhakti element (extra length portion) of a syllabic rhotic (or a lateral, nasal, voiced labiodental).

2) Word-internally, if followed by a single consonant, these syllabic sonorants later gave rise to leftward schwa epenthesis:

$$(1) \quad \S \rightarrow \text{əS} / _ \text{CV}$$

Conversely, if followed by more than one consonant, they yielded rightward epenthesis:

$$(2) \quad \S \rightarrow \text{Sə} / _ \text{C}_2\text{V}$$

3.4. *Reanalysis of Havlík's Law*

After the loss of weak jers, the lowered strong jers are involved in morphophonological *vowel ~ zero* alternations.

Consider one of the modern Bulgarian GV roots that end in an obstruent: *lakăt* 'elbow', *lakt+i*, pl. The corresponding OCS forms were:

lakътъ lakъti lakътъпъ lakътъпа

These forms are subjected to the changes required by Havlík's Law. This yields the following pattern:

(3) lakə̃t lakti lakten lakə̃tna

Note that the difference between the singular and the plural of the noun is limited to the presence/absence of a single vowel (ə̃), while the masc.sg. and the fem.sg. of the adjective differ by the presence/absence of two of their vowels (ə̃, e). This is not the case with the modern Bulgarian forms where the difference within both the nominal and the adjectival paradigm is reduced to the presence/absence of only one vowel:

lakẵt lakt+i lakẵt+en lakẵt+n+a

The mid vowels [ə̃] and [e], reflexes of the retained strong jers, alternate with zero. If we represent them as underlying floaters, the lexical forms will be:

lak<ə̃>t lak<ə̃>t+i lak<ə̃>t+<e>n lak<ə̃>t+<e>n+a

During Middle Bulgarian, Havlík's Law has been replaced by a rule of floater anchoring. Originally, as a corollary of the older Havlík's Law, floaters anchored only when a consonant would otherwise remain unsyllabifiable. The rule was most probably an intra-level (W,W) rule. This yielded the forms in (3).

Havlík's Law, and the resulting rule of floater anchoring, created a situation where two ghost vowels in successive syllables were never both retained. Either the first or the second of the two successive ghost vowels could manifest itself. This means that a floater was anchored only when the subsequent consonant was otherwise by no means syllabifiable. Hence, at that stage of Middle Bulgarian, the rule that anchored floaters was harmonic, not arbitrary.

But this manner of application of the rule created considerable morphophonological variation in stems containing two successive syllables with floaters. In a later stage of Middle Bulgarian a constraint on the amount of variation in stems developed. It required that different forms of one and the same stem exhibit no more than one discrepancy in vowels between them.

Probably, to reduce variation in stems, the status of the rule of floater anchoring was changed: it became a cross-level (M,W) rule, thus applying on every floater followed by a consonant that was not yet syllabified on M-level (see 2.4.3.1). Thus, the rule of floater anchoring ceased to be entirely conditioned by syllabification. In its new version, the rule triggered the anchoring of some floaters that were not followed by unsyllabifiable consonants.

The change in the rule that anchored floaters can be viewed as a kind of repair strategy that served to reduce morphophonological variation in stems.

3.5. *Reanalysis of lexical representations*

Middle Bulgarian developed some other strategies aiming to reduce morphophonological variation in stems. They were also used when a twofold discrepancy between vowels in forms of the same stem was created.

Consider the following inflectionally and derivationally related forms of the OCS nouns *ǫglъ* 'corner' (I), *pāsнь* 'song' (II) and *skъbbъ* 'sorrow' (III)⁹. (a) gives the masc.sg.nom. of the noun, (b) the pl.nom., (c) the masc.sg.nom. short form of the *-bn-* suffixed adjective and (d) the fem.sg.nom. of the same adjective.

(4)	a	b	c	d
I	ǫglъ	ǫgli	ǫglънь	ǫglъна
II	pāsнь	pāsni	pāsньнь	pāsньна
III	skъbbъ	skъbbi	skъbbънь	skъbbъна

Imagine a regular development for all the forms according to the assumptions we made in section 3.3. The jers were subjected to Havlík's Law. At an earlier stage, weak jers adjacent to liquids were lost, giving rise to syllabic liquids. Thus, the pronunciation for the above forms after the loss of weak jers and the lowering of strong jers should have been as follows:

(5)	a	b	c	d
I	ǫgl̩	ǫgli	ǫglen	ǫgl̩na
II	pās̩	pāsni	pāsnen	pās̩na
III	sk̩rb	sk̩rbi	sk̩rben	sk̩rbna

Later, all forms with syllabic sonorants should have developed leftward anaptyctic mid vowels except *sk̩rbna*, where the epenthesis should have been rightward, because the syllabic *r̩* is followed by 2 consonants. This should have yielded the following pattern:

⁹ *skъbbъ* 'sorrow' contains a LY₂ sequence; cf. Russian *skorb'*.

(6)	a	b	c	d
I	ǣgǣl	ǣgli	ǣglen	ǣgǣlna
II	pesen	pesni	pesnen	pesenna
III	skrǣb	skrǣbi	skrǣben	skrǣbna

Now compare these with the modern standard forms:

(7)	a	b	c	d
I	ǣgǣl	ǣgl+i	ǣgǣl+en	ǣgǣl +n+a
II	pesen	pesn+i	pesen+en	pesen+n+a
III	skrǣb	skrǣb+i	skrǣb+en	skrǣb+n+a

Next consider the same inflectional and derivational forms of the OCS nouns *myslъ* 'thought' (IV), *ognъ* 'fire' (V) and *vrъvъ* 'twine' (VI)¹⁰:

(8)	a	b	c	d
IV	<i>myslъ</i>	<i>mysli</i>	<i>myslъnъ</i>	<i>myslъna</i>
V	<i>ognъ</i>		<i>ognъnъ</i>	<i>ognъna</i>
VI	<i>vrъvъ</i>	<i>vrъvi</i>	<i>vrъvъnъ</i>	<i>vrъvъna</i>

According to Havlík's Law, these forms should have yielded the following:

(9)	a	b	c	d
IV	<i>mysl̥</i>	<i>mysli</i>	<i>myslen</i>	<i>mysl̥na</i>
V	<i>ogn̥</i>		<i>ognen</i>	<i>ogn̥na</i>
VI	<i>vr̥v</i>	<i>vr̥vi</i>	<i>vr̥ven</i>	<i>vr̥vna</i>

After the reanalysis of syllabic liquids by mid vowel anaptyxis, the forms should have been as follows:

¹⁰ *vrъvъ* 'twine' also contains a LY₂ sequence.

(10)	a	b	c	d
IV	misəł	misli	mislen	misəłna
V	ogən		ognen	ogənna
VI	vrəv	vərvi	vərven	vrəvna

Now compare the above forms with the actual forms of the modern language:

(11)	a	b	c	d
IV	misāl	misl+i	misl+en	misl+en+a
V	ogǎn		ogn+en	ogn+en+a
VI	vrǎv	vǎrv+i	vǎrv+en	vǎrv+en+a

Note that the differences between (6) and (7) are located in their column 'c', while (10) and (11) differ in their column 'd'.

My hypothesis is that the anaptyctic vowels /ə/ and /e/ that can be seen in (6) and (10) were later treated in two different manners in Bulgarian. Some were reanalyzed as underlying floating vowels. This was the case of the epenthetic schwa in Ia and Id, IIIa and IIIId, as well as of the epenthetic [e] in IIa and IId. Others kept their epenthetic nature, e.g. in IVa, Va and VIa. In IV-VI it is the /e/ in the suffix that changed its status from floating to stable. This is why IV-VId in (10) and (11) are different.

The patterns of (6) and (10) would be obtained if the underlying forms were:

	a	b	c	d
I	əgl	əgl+i	əgl+<e>n	əgl+<e>n+a
II	pesn	pesn+i	pesn+<e>n	pesn+<e>n+a
III	krv	krv+i	krv+<e>n	krv+<e>n+a
IV	misl	misl+i	misl+<e>n	misl+<e>n+a
V	ogn		ogn+<e>n	ogn+<e>n+a
VI	vrv	vrv+i	vrv+<e>n	vrv+<e>n+a

To achieve the modified patterns in (7) and (11), the above underlying forms must have been reanalyzed in the following way:

	a	b	c	d
I	əg<ə>l	əg<ə>l+i	əg<ə>l+<e>n	əg<ə>l+<e>n+a
II	pes<e>n	pes<e>n+i	pes<e>n+<e>n	pes<e>n+<e>n+a
III	kr<ə>v	kr<ə>v+i	kr<ə>v+<e>n	kr<ə>v+<e>n+a
IV	misl	misl+i	misl+en	misl+en+a
V	ogn		ogn+en	ogn+en+a
VI	vrv	vrv+i	vrv+en	vrv+en+a

IV-VI choose the non-GV variant of the -EN suffix, because the underlying form of their root ends in a 'consonant-sonorant' (CS) sequence. This is not the case with I-III, where a floater separates the root-final consonant and sonorant in the underlying form.

The double treatment of anaptyctic vowels accounts for the existence of two different patterns of alternation in derivatives from roots with a formerly syllabic sonorant where the suffix contained another jer.

The first pattern (with reanalysis of the root) is illustrated by I-III. It involves suspension of the mid vowel syncope before another alternating vowel, the reflex of a former jer.

The second pattern (with reanalysis of the suffix) is illustrated by IV-VI. It involves regular syncope of the alternating mid vowel in the root. In this case another allomorph of the adjectivizing suffix, with a non-alternating /e/, began to be used.

Both treatments applied on stems whose morphophonological variation went beyond a given limit.

All stems that were subjected to reanalysis exhibit a twofold discrepancy in vowels between their surface forms of column 'c' and column 'd'.

Consider the forms of I-IIIc vs. I-IIIId taken from (6) above:

(12)	c	d
I	əgØ ₁ le ₂ n	əgə ₁ lØ ₂ na
II	pesØ ₁ ne ₂ n	pese ₁ nØ ₂ na
III	skə _r <u>1</u> be ₂ n	skrə ₁ bØ ₂ na

In each of the above pairs, the double difference between its members is as follows:

I. 1) Ø ~ ə ; 2) e ~ Ø ; II. 1) Ø ~ e ; 2) e ~ Ø ; III. 1) ə_r ~ rə ; 2) e ~ Ø .

The situation is similar in IV-VIc vs. IV-VId of (10) above.

I conclude that the reanalysis of the forms in (6) as (7) and the reanalysis of the forms in (10) as (11) took place in order to satisfy the constraint on the amount of morphophonological variation that operated at a given stage of Middle Bulgarian.

This constraint restricted the discrepancy between forms of the same stem to a single difference in absence/presence of vowels and/or sequential order of vowel-liquid. A twofold discrepancy required restructuring of the lexical representation of the stem.

3.6. Conclusion

To sum up, we give a synopsis of the sound changes that were described in the different sections of this chapter:

Section	Type of diachronic change	Reanalysis of representations and rules
3.1.1	Lowering of strong jers and Loss of weak jers	reduced vowels → floaters Havlík's Law → Rule of Floater Anchoring
3.2	Syllabification of sonorants	sequences 'sonorant-jer' → syllabic sonorants
3.3	Desyllabification of sonorants by means of Mid vowel epenthesis	syllabic sonorants → sequences 'mid vowel-sonorant' or 'sonorant-mid vowel'
3.4	Change in the rule of Floater Anchoring: it ceased to be entirely conditioned by the process of syllabification	(harmonic) intra-level rule → (arbitrary) cross-level rule
3.5	Reanalysis of lexical representations in order to minimize morphophonological variation in stems	epenthetic vowel → underlying floater; suffixal floater → stable vowel

Thus, in our interpretation, the synchronic alternations involving ghost vowels in modern Bulgarian (GV alternation and metathesis) are the product of three types of diachronic changes that took opposite directions in different stages of Middle Bulgarian:

- loss of vowels vs. anaptyxis of vowels
- syllabification of sonorants vs. desyllabification of sonorants
- creation of floaters vs. stabilization of epenthetic/floating vowels

As for the phonologically conditioned suspensions of GV alternations and metathesis, they can be viewed as a corollary of the constraint on the amount of morpho-phonological variation in stems, that later developed.

4. Ghost [œ] vowels in French

4.1. Discussion of the data

Being one of the main domains of phonological variation in French, together with liaison, the phenomenon traditionally referred to as 'French E muet' or 'French schwa' is often subjected to analyses that are based on heterogeneous data, i.e. data that belong to "qualitatively different varieties of French" (Morin 1987). There is often strong disagreement concerning even the basic data on 'French E muet'. Morin (1987) points out the risks that runs the phonologist who tackles the problem of French schwa:

"Data on which recent theoretical analyses have been based are not always homogeneous. Even statistical surveys do not necessarily represent a coherent system [...]. Often, analyses are based on traditional presentations to which new data are added, whose sources are rarely identified. [...] Another source of disagreement is what I called monitored French, which is analyzed on a par with other more traditional data. Its interpretation is often presented as unambiguous, whereas duplicate experiments show much more variability." (Morin 1987:837-8).

Morin exemplifies the first typical misuse of data with Noske's earlier treatment of French schwa (Noske 1982)¹ based on markedness of syllable types: part of the data contradict the traditional accounts of standard French.² In another article, Morin (1988:252) cites Rialland's work (Rialland 1986) as providing data that are obtained in monitored experimental conditions and "not yet independently supported". This is an instance of the second typical misuse according to Morin. Thus, a problem with Hyman's analysis of French schwa as a weightless vowel (Hyman 1985:60-64) could be that it is entirely based on Rialland's data.

Some of the recent phonological developments based on French schwa take into account specific varieties of French. Durand (1990:27-30), for instance, is a standard generative treatment of schwa in Midi French, while Durand (1995) accounts for the same data³ in a Dependency Phonology framework. The main work on French schwa

¹ The questionable data from Noske (1982) are abandoned in Noske's unified account for schwa and gliding in French (Noske 1993:192-240).

² Noske assumes that schwa is deleted after a single consonant (*froidement*), after a sequence 'liquid+obstruent' (*débarquement*, *sveltement*) or '/s/+obstruent' (*manifestement*), but not after other sequences of two consonants (*exactement*).

³ A detailed description of the data on schwa in Midi French can be found in Durand, Slater & Wise 1987.

in the framework of Government Phonology - Charette's thesis (1988) - uses subsets of data that are specific for the author's dialect of Quebec French: in some cases, reference to this variety is explicit (p.89, ex.14), in other cases, the significant deviation from other authors' data for the Parisian varieties of French could be attributed to specific patterns of Quebec French (for instance, p.117 ex.24 and p.339 ex.8). A positive aspect of Scheer's analysis of French schwa (1996:330-358) is that it accounts for two different groups of French speakers: those that can realize *fort(e)resse* 'fortress' and *le d(e)gré* 'the degree' without a schwa (group A) and those that cannot (group B). Scheer is also aware of the existence of many additional subgroups of speakers (Scheer 1996:336). The problem is that the empirical data on which the distinction of the two main varieties (A and B) has been done are not included in Scheer's thesis.

The analysis that I propose here is based on data from Dell (1985), the most exhaustive description available in the literature on French schwa I know about, and some additional examples found in articles by the same author, namely Dell (1976), Dell (1978) and Dell (1984). Unfortunately, these data have not been tested by empirical inquiry with a larger group of speakers. The author says his goal is to provide a thorough description of his own variety of French, being aware of the disagreements that it will arouse:

"Le comportement de schwa est l'un des domaines où les variations d'un locuteur à l'autre sont très fréquentes, même entre gens dont les prononciations sont très semblables. Il est donc à prévoir que de nombreux lecteurs, même universitaires, parisiens, et de la même génération, se trouveront en désaccord sur un point ou sur un autre avec les données qui servent de base à notre discussion."

(Dell 1985:195)

However, there is one advantage of Dell's data: they are homogeneous. The variety they represent can be characterized as a rather 'conservative' (as Dell himself recognized in a personal communication) variety of the language spoken by educated Parisian speakers of standard French.

The two most typical characteristics of this variety, as far as schwa is concerned, are formulated by Morin (1987) as follows:

- the phonetic distinction between nondeleted schwa and [œ]⁴, the mid front rounded vowel, has been neutralized (Morin 1987:825);
- schwa, i.e. alternating [œ], does not delete when it is preceded by a group of two consonants word-internally, even when the result is syllabifiable (Morin 1987:835).

⁴ The exact meaning of the capital 'œ' as phonetic symbol is given below .

Dell's data on French schwa have been taken as a point of reference by some French-speaking phonologists looking for a description of schwa in a variety of French that is close to what they consider to be the "social norm". These data are the basis for the description of French 'E muet' in Tranel's *The Sounds of French* (1987), whose main goal is to teach standard pronunciation to foreign students of French phonetics. When specifying the behavior of schwa in the Saint-Etienne regional variety of French, Morin (1983) also takes as a point of reference the variety of standard French described by Dell (1973).⁵

The variety described by Dell (1973, 1985) coincides neither with group A nor with group B of Scheer (1996). Like group A it admits of schwa syncope in *le d(e)gré* 'the degree' but like group B it prevents schwa from deleting in *fort(e)resse* 'fortress'.

4.1.1. The system of mid vowels in modern standard French

Following Wioland (1991), we assume that the Parisian variety of standard French neutralizes the opposition between mid-open and mid-close vowels, $\epsilon \sim e$, $\text{ɔ} \sim o$ and $\text{œ} \sim \text{ø}$, respectively, in syllables that Wioland refers to as "unstressable" ("inaccentuables"), namely those that never find themselves at the end of a rhythmic unit and, therefore, never receive final stress. However, many of these "unstressable" syllables can bear emphatic stress ("accent d'insistance"). Given that in French emphatic stress is incompatible with lengthening (it uses only pitch and intensity, to the exclusion of duration, as perceptual cues, cf. Mertens 1987:85-88, Vaissière 1991) and that final stress systematically requires lengthening of the syllable, a more adequate term for Wioland's "unstressable" would be "non lengthenable" syllables. Wioland assumes that the realizations of the mid vowels in closed "non lengthenable" syllables are rather open and recommends to transcribe them as $[\epsilon]$, $[\text{ɔ}]$, $[\text{œ}]$. As for open "non lengthenable" syllables, the mid vowels that appear in them may cover a range of different realizations from mid-close to mid-open and Wioland recommends to transcribe them with the capital letters $[E]$, $[O]$, $[Œ]$.⁶ French schwa is always

⁵ "La description de Dell est la plus précise de toutes. Elle comporte un assez grand nombre de règles qui peuvent être obligatoires ou facultatives; la chute ou l'épenthèse des *e* muets y est conditionnée non seulement par la suite des phonèmes en présence, mais aussi par la présence de frontières prosodiques (début et fin d'énoncé), de frontières de mots et de frontières morphologiques." (Morin 1983:73)

⁶ «L'oreille française, du fait de la rapidité de l'articulation dans cette position peu importante, n'est pas sensible à une différenciation des timbres vocaliques respectifs. Aussi est-il pédagogiquement préférable de transcrire respectivement par les archiphonèmes $[O]$, $[Œ]$ et $[E]$ afin de ne pas donner à la prononciation de ces voyelles une importance qu'elles n'ont pas.» (Wioland 1991:82)

found in an open "non lengthenable" syllable. The phonetic realization of nondeleted schwa coincides with [œ].⁷ Only where a closed syllable is created as a consequence of the deletion of another schwa in the immediately following syllable (see 4.2.3.1), the realization of nondeleted schwa is mid-open [œ], e.g. *je n(e) sais pas*, with the first schwa realized and the second schwa deleted, will be transcribed [.ʒœn.sɛ .pa.] with [œ] instead of [œ̃], because the non-realization of schwa in *ne* makes the preceding syllable closed.

Table 1 below sums up the different realizations of the mid vowels in all four syllable types. Where the opposition mid-close vs. mid-open is possible, I give both vowels related by '~'. In the cases of neutralization of the opposition, the actual realization of the respective mid vowel is given: mid-close (o, ø), mid-open (ɛ, ə, œ), or the whole range from mid-close to mid-open (E, O, Œ).

French mid vowels	Non lengthenable syllables		Lengthenable syllables	
	Closed	Open	Closed	Open
front unrounded	ɛ	E	ɛ	e ~ ɛ
back rounded	ɔ	O	ɔ ~ o	o
front rounded	œ	Œ	œ ~ ø ⁸	ø

Table 1

4.1.2. Alternating and non-alternating [œ̃] in French

I assume that, phonetically, nondeleted schwa (traditionally transcribed by means of the IPA symbol [ə̃]) is not different from the realization of the nonalternating mid front rounded vowels in open non lengthenable syllables: [œ̃]. The difference is that schwa is a ghost [œ̃] vowel, a vowel that alternates with zero. Not all [œ̃] vowels in French are involved in vowel-zero alternations. Some of them are stable vowels and never undergo syncope.

⁷ «La graphie «e» suit donc les mêmes tendances générales de prononciation que les autres voyelles inaccentuées à deux timbres et ne relève pas d'un cas particulier.» (Wioland 1991:82)

⁸ [ø] is pronounced for 'eu' when the syllable is closed by [z] or [t]. Otherwise [œ] is pronounced.

According to Tranel (1987:87), the two sequences given in (1a-b) below are homophonous when the alternating [œ] in (1a) is pronounced. Likewise, those in (2a-b) are homophonous according to Dell (1984:99) if the alternating [œ] at the end of *autre* is realized. The difference is that the sequences in (1a) and (2a) contain an alternating [œ] (respectively, in the article *le* and at the end of *autre*), while those in (1b) and (2b) contain an [œ] which is non-alternating (namely, in *leur* and *œuf*, respectively): a realization with syncope of [œ] is unacceptable for the latter sequences.

(1)a	dans le rétablissement 'in the re-establishment'	dãlœrEtablismã	dãlrEtablismã
(1)b	dans leur établissement 'in their shop'	dãlœrEtablismã ⁹	* dãlrEtablismã
(2)a	l'autre faux plat 'the other false dish'	lotrœfopla	lotfopla
(2)b	l'autre œuf au plat 'the other fried egg'	lotrœfOpla	* lotfOpla

Alternating [œ] is found in monosyllabic clitics like *le* (namely *je, me, te, se, ce, de, ne, que*), but also in the initial syllable of polysyllables (e.g. *neveu, demain, repartir, tenailles, (ça) sera, (on) devrait, secrétaire, monsieur*), in prefixes (*re-, de-*, e.g. in *repartir, devenir*), and at the end of words like *autre* (e.g. *pauvre, possible, taxe, casque, (il) parle*).¹⁰ The behavior of French prefixes being similar to that of proclitics¹¹, we consider internal syllables that immediately follow a prefix as initial of phonological word, e.g. *re+demande, de+venir* contain alternating [œ] both in the prefix and in the initial syllable of the root.¹²

⁹ In transcribing our examples, including those taken from other authors, we follow the principles established in Wioland 1991. Thus, we transcribe [œ] in *leur*, as it is in a stressable syllable, even though it does not happen to be under stress in the example in question, but cf. *Je connais votre établissement, mais je préfère le leur*. 'I know your shop, but I prefer theirs.' In the latter example *leur* finds itself in a stressed syllable.

¹⁰ All French words that end in a consonant cluster exhibit an alternating [œ] word-finally even when the latter is not orthographic and not etymological like in *ours[œ] blanc* 'polar bear'.

¹¹ Slavic prefixes also behave like proclitics, see Booij & Rubach (1994).

¹² Glide formation and nasalization provide additional evidence for the stronger boundary between prefix and root compared to root and suffix in French (cf. Basbøll 1981:262 and Hannahs 1995).

Nonalternating [œ] is usually related to complex spellings like «eu», «œu» and «ue» (e.g. *jeunesse*, *leurrer*, *cueillir*, *sœurette*, *creuser*), but can also be orthographically represented, like most alternating [œ]'s, by a simple «e» without diacritic, e.g. *crevasse*, *grenier*, *premier*, *bredouiller*, *mercredi*, *saugrenu*, *amplement* where [œ] occurs after two consonants that are analyzed in a branching onset; *forgeron*, *gouvernement*, *hurlement*, *calmement*, *brusquement*, *fumisterie*, where the two consonants preceding [œ] are distributed in two different syllables (the first one is in the coda of the preceding syllable, the second one builds the onset of the syllable whose nucleus is [œ])¹³; *dehors*, *rehausser* where we find a non-syncopating [œ] in a prefix before a stem which coincides with an 'h-aspiré' word; (*des*) *querelles*, (*du*) *fenouil*, (*agent*) *secret*, (*la*) *femelle*, (*la*) *guenon*, (*à*) *peser*, (*la*) *vedette*, (*il faut*) *sevrer* where a process of stabilization of a previous alternating [œ] seems to have taken place¹⁴. There are also some cases of allomorphic roots: the base form exhibits an alternating [œ], e.g. in *mener* 'to lead', *chemin* 'path', *semer* 'to sow', whereas some derivatives present a stable, non-syncopating [œ], e.g. in *meneur* 'leader' *cheminer* 'to walk', *semilles* 'sowing' (cf. Dell 1985:229).

4.1.3. Two classes of alternating [œ]'s

Alternating [œ]'s display two different patterns of alternation in identical segmental and prosodic environment.

[œ]'s of initial syllable of polysyllables (*secoue*) and [œ]'s in monosyllables (*se*, *le*) can be dropped after one consonant as in (3a), but not after two consonants as in (3b).

¹³ The presence of non-alternating [œ] in this series of examples characterizes the standard variant of French spoken in Paris. Some dialects of French, e.g. French spoken in the region of Saint-Etienne described in Morin (1983), have not stabilized [œ] after two consonants that constitute an inter-constituent cluster (coda+onset). In the Saint-Etienne dialect, the same words contain an alternating [œ].

¹⁴ The Saint-Etienne dialect of French allows syncopation of [œ] in the initial syllable of the same words, see Morin (1983:84-85).

(3)a	Jean <i>secoue</i> (la branche) 'John is shaking (the branch)'	ʒãsku	ʒãsʅEku
	Jean <i>se courbe</i> 'John is bending down'	ʒãskurb	ʒãsʅEkurb
	Henri <i>le soutient</i> 'Henry supports him'	ãrilsutjẽ	ãrilʅEsutjẽ
(3)b	Jacques <i>secoue</i> (la branche) 'Jack is shaking (the branch)'	* ʒaksku	ʒaksʅEku
	Jacques <i>se courbe</i> 'Jack is bending down'	* ʒakskurb	ʒaksʅEkurb
	Pierre <i>le soutient</i> 'Peter supports him'	* pjɛrlsutjẽ	pjɛrlʅEsutjẽ

By contrast, polysyllable-final [ʅ]'s, i.e. word-final [ʅ]'s that do not constitute the only syllable of the word, e.g. in *taxe*, (*il*) *parle*, allow of syncopation after more than one consonant, as demonstrated in (4); cf. also *match* (*nul*) [matʃ(ʅ)nɥl], *ours* (*blanc*) [urs(ʅ)blã], where an [ʅ] may appear word-finally in the absence of orthographic «e».

(4)	toutes <i>taxes</i> comprises 'inclusive of tax'	tuttakskɔ̃priz	tuttaksʅEkɔ̃priz
	duplex confortable 'comfortable duplex'	dɥplɛkskɔ̃fɔ̃rtabl	dɥplɛksʅEkɔ̃fɔ̃rtabl
	il <i>parle</i> souvent 'he often speaks'	ilparlɥvã	ilparlʅɥsuvã

[ʅ]'s that exhibit the second pattern of alternation (see 4) cannot receive emphatic stress (Dominicy 1984:8). Conversely, alternating [ʅ]'s displaying the first syncopation pattern (see 3), including [ʅ] in prefixes, can bear emphatic stress; e.g. in *re+demande* 'ask again' the syllables containing [ʅ] can be emphasized

(REdemander, reDEmander), because they are initial in their phonological domain (prefix and stem, respectively); cf. Dominicy 1984:20.¹⁵

For convenience, I call Class 1 [œ]s those that exhibit the pattern in (3) and may receive emphatic stress, while [œ]s that display the pattern illustrated in (4) and cannot bear emphatic stress will be further referred to as Class 2 [œ]s.

Additional evidence for the special status of Class 2 [œ]s is provided by the patterns of manifestation of [œ] in sequences of two contiguous syllables, where the first one contains a Class 2 [œ], while the second one contains a Class 1 [œ], see the examples in (5) taken from Dell (1973) and Dell (1978). The pattern is different in sequences where the two contiguous syllables contain both Class 1 [œ]s, see (6). In (5) one can see that the first (Class 2) [œ] cannot be retained if the second (Class 1) [œ] is dropped. It seems that a Class 1 [œ] is more resistant to syncopation than a Class 2 [œ]. The pattern of (6a), which is the opposite of (5) is due to the impossibility of Class 1 [œ]s to be realized after two consonants, cf. (3b). This is not the case in (6b) where both [œ]s are of Class 1 and both can be syncopated, because the first one is preceded by only one consonant.

(5)	on aborde le virage	ɔ̃nabœrdœlœviraɜ	ɔ̃nabœrdlœviraɜ	* ɔ̃nabœrdœlviraɜ
	'we enter the curve'			
	ils partent demain	ipartœdœmɛ̃	ipartdœmɛ̃	* ipartœdmɛ̃
	'they leave tomorrow'			
	la veste de Paul	lavEstœdœpœl	lavEstdœpœl	* lavEstœdpœl
	'Paul's jacket'			
	quatorze devoirs	katœrzœdœvwar	katœrzdœvwar	* katœrzœdvwar
	'fourteen pieces of homework'			
	l'autre melon	lotrœmœlɔ̃	lotmœlɔ̃	* lotrœmlɔ̃
	'the other melon'			
	porte-fenêtre	pœrtœfœnœtr	pœrtfœnœtr	* pœrtœfnœtr
	'French window'			
(6a)	une patte de renard	patdœrœnar	* patdrœnar	patdœrnar
	fox's paw			

¹⁵ Emphatic stress is marked by capitalization of the respective syllable.

	elle <i>te</i> demande	ɛltʰEdʰEmãd	* ɛltdʰEmãd	ɛltoedmãd
	'she asks for you'			
(6)b	une queue <i>de</i> renard	kødʰErʰEnar	kødrʰEnar	kødœrnar
	'fox's tail'			
	on <i>te</i> demande	ʔtʰEdʰEmãd	ʔtdʰEmãd	ʔtoedmãd
	'they ask for you'			

4.1.4. Sensitivity to rhythm

The syncopation of Class 1 alternating [ʰE]'s can be sensitive or not sensitive to rhythm according to the number of consonants that immediately precede [ʰE]. As for Class 2 [ʰE]'s, their distribution (occurrence/non-occurrence) seems to be always constrained by rhythm.

4.1.4.1. Rhythm-insensitive [ʰE]-syncopation

The syncopation of Class 1 alternating [ʰE]'s depends first of all on the number of preceding consonants: if only one consonant precedes, syncopation is always possible, i.e. it cannot be blocked by the rhythmic pattern of the utterance; if two consonants precede, syncopation is restricted to certain rhythmic configurations.

The examples in (7) below, taken from Dell (1984:75), exhibit identical segmental strings and different rhythmic structure. Dell represents (7a) with a primary stress (level 1 stress) on the final syllable of *demain*, a secondary stress (level 2 stress) on the final syllable of *préférerais* and no stress on *pas*. Conversely, in (7b) there is a level 2 stress on *pas* and no stress on *préférerais*. Thus, the alternating [ʰE] of *venir* finds itself in an internal syllable of the second rhythmic unit in (7a), but in the initial syllable of the second rhythmic unit in (7b). In both cases syncopation can occur.

(7)a	tu préférerais / pas venir demain?		
	2 0 1	typrEfer'rɛ	typrEfer'rɛ
		pavʰEnirdʰmɛ̃	pavnirdʰmɛ̃
	'Would you prefer not to come tomorrow ?'		
(7)b	tu préférerais pas / venir demain?		
	0 2 1	typrEfer'rɛ'pa	typrEfer'rɛ'pa
		vʰEnirdʰmɛ̃	vnirdʰmɛ̃
	'Wouldn't you prefer to come tomorrow ?'		

As can be seen in (8), which repeats an example found in Delattre (1966:21), syncopation of [œ] in *venir* is also allowed in pre-stress syllable if there is only one consonant preceding it.

- (8) il veut venir ivøvœ'nir ivøv'nir
 'he wants to come'
 il veulent venir ivœlvœ'nir *ivœlv'nir
 'they want to come'

4.1.4.2. Rhythm-sensitive [œ]-syncopation

When a Class 1 [œ] is preceded by more than one consonant, its syncopation is still not impossible, but it seems to be restricted to some speakers of Standard French only and to very fast speech. Consider the following statements by Dell:

"il semble que **dans la parole très rapide** le schwa d'un petit nombre de mots commençant par #Cœ puisse tomber même si le mot précédent est terminé par une consonne [...] Les faits touchant ce point **varient d'un locuteur à l'autre**. Certains semblent se tenir toujours strictement à VCE1 [Dell's rule that prevents schwa from deleting in this context] même dans le débit le plus rapide."
 (Dell 1983:230)

Moreover, the latter type of [œ]-syncopation is impossible in pre-stress syllable (see 9a). It is allowed only in a syllable separated from the stressed one by at least one intervening syllable (see 9b). The examples in (9) are taken from Dell (1985:231).

- (9a) la terre se vend latɛrsœvã *latɛrsvã
 'the land sells'
 (9b) la terre se vend bien latɛrsœvãbjɛ̃ latɛrsvãbjɛ̃
 'the land is selling well'

As reported by Morin (1983:82), for speakers of the Parisian variant of standard French, the deletion of [œ] after two consonants is the easier the more distant is [œ] from the following stressed syllable (within the same rhythmic unit):

- (10) au bord de l'eau Obœrdœ'lo ?? Obœr'dlo

'at the water's edge'			
au bord de la mer	ObɔrdɕEla'mɛr	? Obɔrdla'mɛr	
'at the seaside'			
au bord de l'Atlantique	ObɔrdɕElatlã'tik	ObɔrdlatlAã'tik	
'on the coast of the Atlantic'			

The same sensitivity to rhythm is observed with [ɕ]-syncopation in utterance-initial syllable (i.e. after a pause): the longer the distance from stress, the easier the syncopation of [ɕ]. Consider the following data from Morin (1983:76)¹⁶.

(11)	<i>ce gars</i>	'that lad'	sɕ'ga	?? 'sga
	<i>ce garçon</i>	'that boy'	sɕEgar'sɔ̃	? sgar'sɔ̃
	<i>ce garçon-là</i>	'that boy'	sɕEgarsɔ̃'la	sgarsɔ̃'la

Class 2 [ɕ]'s exhibit a similar sensitivity to the rhythmic pattern of the utterance. Look at the examples in (12) taken from Tranel (1987:table 6.24). The manifestation of [ɕ] is favored before a monosyllabic stressed word and disfavored when the hypothetical syllable that would result from the phonetic realization of [ɕ] is at least one syllable distant from the final stressed syllable in the rhythmic unit. A similar rhythm-sensitive pattern of [ɕ]-alternation is found in compounds where the first constituent has two consonants before its final «e». This «e» may or may not be pronounced if the second constituent contains more than one syllable and must be pronounced if the latter is monosyllabic, see (13).

(12)	<i>la carte verte</i>	'the green card'	lakartɕ'vɛrt	? lakart'vɛrt
	<i>la carte vermeille</i>	'the red card'	? lakartɕvɛr'mɛj	lakartvɛr'mɛj
	<i>il parle trop</i>	'he talks too much'	ilparlɕ'tro	? ilparl'tro
	<i>il parle trop peu</i>	'he talks too little'	? ilparlɕtro'pø	ilparltro'pø

¹⁶ «en effet la syncope est plus facile dans *ce garçon-là*, que dans *ce garçon*, et surtout dans *ce gars*.» (Morin 1983:76)

(13)	<i>garde-meuble</i>	'furniture storehouse'	gardœ'mœbl	*gard'mœbl
	<i>garde-malade</i>	'home nurse'	gardœma'lad	gardma'lad
	<i>ouvre-boîte</i>	'can opener'	uvrœ'bwat	*uv'bwat
	<i>ouvre-bouteille</i>	'bottle opener'	uvrœbu'tɛj	uvbu'tɛj

The non-manifestation of Class 2 [œ]'s, like that of Class 1 [œ]'s after two consonants, is hardly possible in pre-stress position. As for syncope of Class 1 [œ]'s after only one consonant, there seems to be no restriction related to rhythm.

4.1.5. The nature of Class 1 and Class 2 alternating [œ]'s: underlying or epenthetic?

As for Class 1 alternating [œ]'s, their distribution cannot be accounted for by epenthesis. Consider the following data:

(14)	Jacques secoue ...	ʒaksœku	*ʒaksku
	'Jack is shaking ...'		
	Jacques skie	*ʒaksœki	ʒakski
	'Jack is skiing'		
	cette pelouse	sɛtpœluz	?sɛtpluz
	'this lawn'		
	cette place	*sɛtpœlas	sɛtplas
	'this place'		

Except Hirst (1985:96-97), who treats every complex onset that cannot be split up by schwa in French as a single segment, the few treatments that deny phonological status to French schwa and consider it to be an automatic vowel, "lubrifiant phonique" (Martinet 1972 and some followers of his school of Functionalist Linguistics, e.g. François 1974 and Bazylko 1981), are unable to account for the data in (14), as was demonstrated by Dell (1985:187).

All other phonological theories propose a specific underlying structure to encode Class 1 alternating [œ]'s in the lexical form of words that exhibit them. Linear phonology posits an underlying segment /ə/; multilinear phonologies use different underlying structures for schwa: a combination of a floating vowel and a floating skeletal slot or a floating skeletal slot with no segment (Three-dimensional Phonology, Encrevé 1988:212-232.), an underlyingly present empty nucleus

(Government Phonology, Charette 1988, 1991), an empty nucleus with a lexically encoded "melody" [ə] underneath¹⁷ (the CVCV version of Government Phonology, Scheer 1996).

As for the status of Class 2 alternating [ɛ]s, opinions are divided. Most authors, including Dell, consider orthographic word-final [ɛ]s to be underlyingly present. I will claim that they need not be represented in lexical forms and can be triggered by epenthesis.

Words with final orthographic (and etymological) alternating [ɛ] do not behave differently from consonant-final words in French. Dell states that, except in poetry and songs, «tout mot qui se prononce [XCC] devant une pause ou une voyelle peut se prononcer [XCCə] devant une consonne ... Cette généralisation vaut pour tous les mots, qu'ils prennent ou non un «e muet» final dans l'orthographe.» (Dell 1985:236)

In «verlan», a way of pronouncing some French words based on a linguistic game that inverts the order of syllables, consonant-final monosyllables with and without a final orthographic «e» give identical forms, cf. Méla (1991:77). According to Méla's analysis, both *mère* 'mother' and *mer* 'sea' give [mE.rɛ] by «resyllabification» at an intermediate stage and [rɛ.mE] by «permutation» that may become [rœm] by «truncation».

Tranel (1981:286) gives some additional arguments against the alleged evidence for the underlying presence of so-called «protective schwas» that correspond to our Class 2 alternating [ɛ]s. He demonstrates that for all three contexts of phonetic manifestation of protective schwas (at the end of words ending in a consonant cluster before a consonant-initial word, as in *texte possible* [tɛkstɛpOsibl] 'possible text'; before *rien* 'nothing', as in *il ne mange rien* [ilnɛmɑ̃ʒɛrjɛ̃] 'he eats nothing'; before «h-aspiré» words, as in *cette haie* [sɛtɛɛ] 'this hedge') it is possible to detect realizations of words without final orthographic (and etymological) «e» that take phonetic [ɛ], e.g., *contact possible* 'possible contact' pronounced [kɔ̃taktɛpOsibl]; *il ne perd rien* 'he loses nothing' realized as [ilnɛpɛrɛrjɛ̃]; *sept haies* 'seven hedges' with the phonetic realization [sɛtɛɛ]. The latter pronunciations are less frequent than the former, but Tranel attributes this to the influence of orthography: even when they correspond to orthographic «e»s, these phonetically realized [ɛ]s «are not the phonetic reflexes of final protective schwas, because they also occur in words where no such schwas may be postulated. [...] In addition, the insertion is constrained by the

¹⁷ As opposed to empty nuclei devoid of "melodicity", i.e. without segmental content, that correspond to consonant clusters which are traditionally analyzed as complex onsets.

orthography: the presence/absence of a final 'e' at the end of the preceding word tends to reinforce the occurrence/nonoccurrence of the schwa.» (Tranel 1981:289)

Another alleged argument for positing underlying word-final schwas is their functioning as morphological markers: according to many phonologists of French, the feminine marker, the first-conjugation thematic vowel and the subjunctive marker are schwas. These schwas are eliminated by late rules that are extrinsically ordered after such phonological processes as vowel nasalization and consonant deletion. In an autosegmental phonological framework, the markers in question may be encoded as skeletal slots (cf. Tranel 1995:807, Paradis & El Fenne 1995:187). The phonological difference between the masculine *petit* 'little' (15a) and the feminine *petite* (15b), the indicative *(il) sort* 'he goes out' (16a) and the subjunctive *(qu'il) sorte* (16b), can be attributed to the underlying floating/anchored final [t]. Skeletal slots are provided by the feminine and subjunctive morphology, respectively, in order to anchor the final floating [t].

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4.2. Harmonic Phonology analysis

The analysis put forward here is in the framework of Harmonic Phonology (cf. Goldsmith 1990, Goldsmith 1993:21-33). It makes use of the three-level M/W/P model with three levels of representation, see chapter 2 (2.4.1). This will enable us to compare the account for the French data with that for the Bulgarian ghost vowels.

Our analysis aims at accounting for the different patterns of alternating [œ]'s described above:

- for the distinction between Class 1 and Class 2 alternating [œ]'s

- for the distinction between rhythm-sensitive and rhythm-insensitive syncope of Class 1 alternating [Œ]'s.

Class 1 alternating [Œ]'s are assumed to be present in M-level representations. To distinguish them from non-alternating [Œ]'s, we will represent the former as floating segments [Œ], i.e. underlying segments with no skeletal slot to be anchored to¹⁸. Conversely, non-alternating [Œ]'s have their own skeletal slot and are underlyingly anchored to the skeleton. Compare the M-level representations of *neveu* 'nephew' with an alternating Class 1 [Œ] and *jeunesse* 'youth' with a stable non-alternating [Œ]:



Following Goldsmith (1990:123), I assume that French syllables are constructed at W-level («the deepest level at which phonotactic conditions can be stated») in such a way as to build the largest syllables (i.e. the smallest number of syllables) consistent with the language's restrictions on possible syllables. A segment can be syllabified only if it is provided with a skeletal slot. Therefore, anchoring is a pre-condition for syllabification of floaters. In this analysis I use the symbol <Œ> for a floating [Œ] at M-level.

4.2.1. The French syllable: structural restrictions

An important assumption in the present analysis is that the French syllable can have a complex (branching) onset, but only a simple (non-branching) coda.

Some descriptions of French syllabification (Wioland 1985, Laks 1995) include superheavy syllable types with complex 'codas' such as (C)VCCC, CGVCCC, e.g. quartz /kwartz/ 'quartz', etc. These complex 'codas' are restricted to word-final position

¹⁸ This is an instance of what Tranel erroneously calls «skeletal flotation»: segments that are viewed as «lexically marked as unable to project their own skeletal slot» (Tranel 1995:801) as opposed to «syllabic flotation» and to «double flotation», the latter being represented by Encrevé's 1988 three-dimensional analysis (cf. Tranel 1995a). As Pierre Encrevé pointed out to me, the skeleton cannot float if there is no skeletal slot available. What floats is the segment [Œ].

Word-internal three- and four-consonantal clusters can be decomposed in a simple coda and a complex onset, e.g. *mercredi* [mɛr.krɛ.di], *abstrait* [ab.strɛ]. The only French words whose word-internal clusters escape such decomposition I know about are *arctique* 'Arctic' and the two compounds *parcmètre* (with the alternative form *parcomètre*) 'parking meter' and *voltmètre* 'voltmeter'.

Plénat (1987) describes the syllable structure only of words "with masculine final endings", i.e. with no final orthographic 'e'. Many of them end in two (*ours* 'bear', *film* 'film', *ouest* 'west', *concept* 'concept') or three consonants (*hertz* /ɛrts/). Rialland (1994) includes in the inventory of word-final clusters also words with "feminine endings", i.e. with final orthographic 'e'. She proposes the following maximal template for word-final clusters in French: "coda + extrasyllabic consonant + potential branching onset":

"The coda position has only one slot [...] the structure of the remaining part of the cluster is the same as the one we find in word-initial position. To account for this similarity we posit the same constituents in the template, that is, an extrasyllabic position preceding a potential onset which can itself contain two positions. [...] Moreover, the potential syllable becomes a full syllable when the schwa is pronounced. These consonants in post-coda position can be considered a special type of extrasyllabic consonants, since they are only potentially syllabified." (Rialland 1994:§3.2)

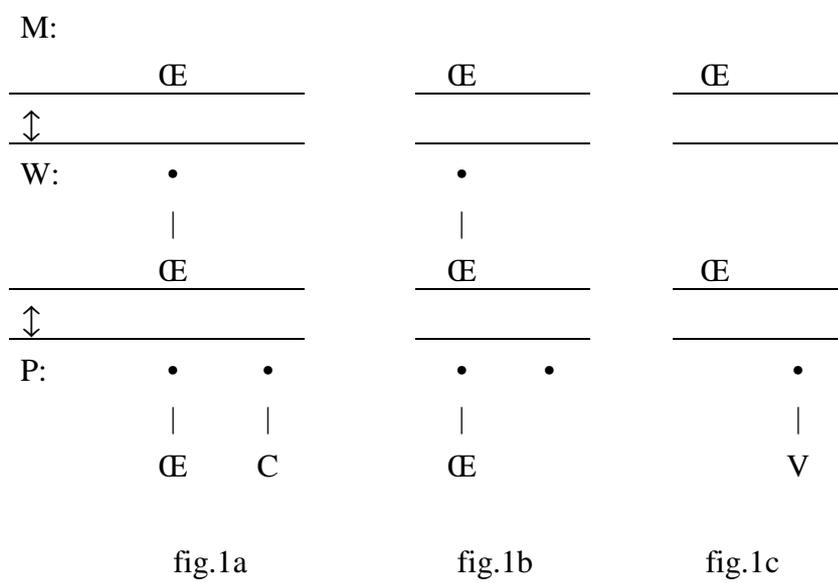
The maximal template is illustrated by *dextre* /dɛkstr/ 'right-hand' and *cepstre* 'cepstrum'.

The same assumptions about French syllable structure are made by Bouchard (1980:20): «there can only be one consonant in the coda in the French syllable». Bouchard also admits the existence in French of a third constituent besides the onset and the rime: the appendix, which is found only in word-final syllables (Bouchard 1980:39, note 10). In the framework of Harmonic Phonology, the occurrence of consonant clusters word-finally can be attributed to the property of the word-end to function as an additional licenser (the Ω -licenser, cf. Goldsmith 1990:127). In French, the word-end licenses word-final extrasyllabicity, see 4.2.4.1 below. The Ω -constituent in French words can be composed of a single consonant (*herbe* 'grass' /[\ɛr]_o[b]_Ω/, *peste* 'plague' /[\pɛs]_o[t]_Ω/, *mettre* 'put' /[\mɛt]_o[r]_Ω/, *table* 'table' /[\tab]_o[l]_Ω/), of two consonants (*ordre* 'order' /[\ɔr]_o[dr]_Ω/, *cercle* 'circle' /[\sɛr]_o[kl]_Ω/) or of three consonants (*dextre* 'right-hand' /[\dɛk]_o[str]_Ω/).

4.2.2. <Œ>-Anchoring

(M,W) <Œ>-ANCH: A floater <Œ> anchors between levels M and W if it does not find itself before an onsetless syllable at P-level.

So-called 'h-aspiré' words that prevent liaison consonants from anchoring into the skeleton and (optionally, at least for some speakers and some 'h-aspiré' words) word-final fixed consonants from 'enchaînement' (Encrevé 1988:196-203) are assumed to begin with a floating (empty) skeletal slot (cf. Goldsmith 1990:57). Hence, their first syllable is not onsetless: it is provided with an empty onset. Thus, a floater that finds itself before an 'h-aspiré' word on P-level undergoes <Œ>-Anchoring (see fig.1b) as if it found itself before a consonant-initial word (see fig.1a).



Consequently, a floating <Œ> does not anchor only when it is followed immediately by a vowel at P-level. In the latter case, <Œ> remains unassociated to the skeleton at W-level and is deleted by Stray Erasure at P-level (fig.1c).

4.2.3. Œ-Deletion

(W,P) Œ-DEL: An Œ may delete between levels W and P if 1) it matches a floater <Œ> at M-level; and 2) it is followed by a consonant at P-level; and 3) the preceding consonant is allowed to resyllabify at P-level.

The first condition for deletion of Œ refers to level M in a cross-level rule that relates levels W and P. This is not a problem in the framework of Harmonic Phonology,

given that levels (M, W, P) are only different ways of describing the same linguistic expression (Goldsmith 1993:30). The representations of all three levels may interact between them. According to Goldsmith the existence of (M,P) rules is not excluded even though it is denied by the traditional hierarchical conception of phonology (Goldsmith 1993:32).

The second condition is needed to exclude Œ -Deletion before the empty skeletal slot in the onset of the initial syllable of an 'h-aspiré' word (fig. 2c). Actually, an alternating Class 1 [Œ] never deletes before an 'h-aspiré' word. This is an essential difference between consonant-initial words and 'h-aspiré' words; see (17). As has been pointed out by Tranel (1995:811), 'h-aspiré' words exhibit some properties of their own.

- (17) dans le haut 'at the top' $[\text{d}^{\text{h}}\text{ɔ}^{\text{h}}\text{l}\text{œ}^{\text{h}}\text{o}]$ * $[\text{d}^{\text{h}}\text{ɔ}^{\text{h}}\text{l}^{\text{h}}\text{o}]$
 dans le bas 'at the bottom' $[\text{d}^{\text{h}}\text{ɔ}^{\text{h}}\text{l}\text{œ}^{\text{h}}\text{b}^{\text{h}}\text{a}]$ $[\text{d}^{\text{h}}\text{ɔ}^{\text{h}}\text{l}^{\text{h}}\text{b}^{\text{h}}\text{a}]$

The resyllabification of the preceding consonant at P-level can be leftward or rightward. In the former case the consonant is reanalyzed as coda of the preceding syllable (fig.2a), while in the latter case a complex onset is created in the following syllable (fig.2b).

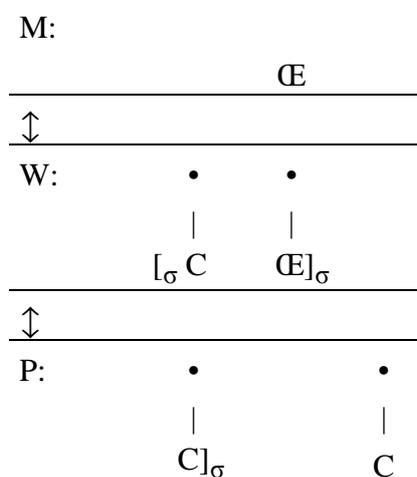


fig.2a

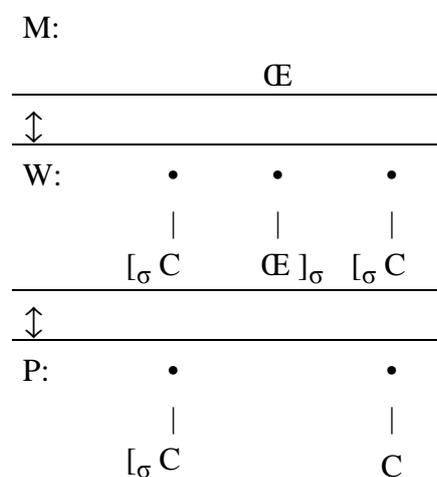


fig.2b



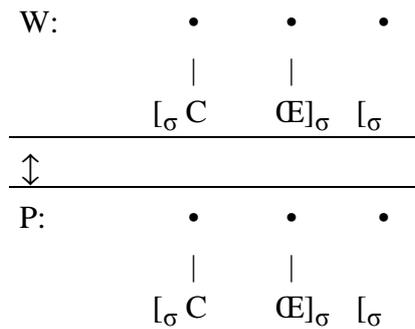


fig. 2c

For all speakers of French, there are no restrictions to the resyllabification of a consonant as coda of the preceding syllable at P-level. That is why the deletion of a W-level Œ that matches an <Œ> at M-level is always possible when it is preceded by a single consonant which is syllabifiable to the left at P-level.

At least for some speakers of French (represented by Dell's pronunciation), there are some restrictions to the P-level resyllabification of a consonant in a complex onset:

- it is restricted to very fast speech;
- it is constrained by rhythmic structure: a complex onset cannot be created at P-level in a stressed syllable.

The above restrictions affect only P-level resyllabification, not W-level syllabification, where complex onsets do occur in stressable syllables, i.e. syllables that may be stressed at P-level.

Consider the examples in (18) from Morin (1983:74):

- | | | | | |
|-------|-------------------------------|--------------|-------------|--------------|
| (18)a | (il n'a) pas de scrupule | padskrɥpyl | padœskɥpyl | |
| | 'he has no scruples' | | | |
| (18)b | (je ne veux) pas de ce crétin | * padskretɛ̃ | padsœkretɛ̃ | padœsœkretɛ̃ |
| | 'I don't want this cretin' | | padœskretɛ̃ | |

Together, the rules of <Œ>-ANCH and Œ-DEL account for the fact that [dskr] ([tskr] with voice assimilation) is a possible sequence in (18a), but not in (18b). In (18a) [skr] is built as a complex onset on W-level; [d] finds the coda of the preceding syllable vacant at P-level and resyllabifies to the left, see (19). This gives [dskr]. In (18b) the onset that is created on the word-level is [kr]. When the first Œ deletes, see (20a), the coda has been already occupied by [d]; therefore, [s] is unable to resyllabify as coda and the second Œ cannot be deleted. The second Œ may undergo Œ-DEL

only if the first Œ has been retained, see (20b). In the latter case, [s] resyllabifies as coda of the syllable created with the retained Œ as nucleus: [dœs].

(19)	M	pa	d<Œ>	skrypyl	
			↓		<Œ>-ANCH
	W	[pa] _σ	[dŒ] _σ	[skry] _σ [pyl] _σ	
			↓		Œ-DEL
	P	[pad] _σ		[skry] _σ [pyl] _σ	

(20)a	M	pa	d<Œ>	s<Œ>	kretĕ	
			↓	↓		<Œ>-ANCH
	W	[pa]	[dŒ]	[sŒ]	[kre][tĕ]	
			↓			Œ-DEL
	P	(i) [pad]		[sŒ]	[kre][tĕ]	

(20)b	M	pa	d<Œ>	s<Œ>	kretĕ	
			↓	↓		<Œ>-ANCH
	W	[pa]	[dŒ]	[sŒ]	[kre][tĕ]	
				↓		Œ-DEL
	P	(ii) [pa]	[dœs]		[kre][tĕ]	

In (21) below I give the account for example (9). The coda of the preceding syllable being occupied by [r], [s] cannot resyllabify to the left. However, given that [sv] is a possible onset in French (cf. *velte* 'slender'), [s] resyllabifies into the onset of the following syllable. Resyllabification is possible, because the following syllable is not stressed at P-level. Therefore, the deletion of Œ is also possible.

(21)	M	la	tɛr	s<Œ>	vã	bjẽ	
				↓			<Œ>-ANCH
	W	[la] _σ	[tɛr] _σ	[sŒ] _σ	[vã] _σ	[bjẽ] _σ	
				↓			Œ-DEL
	P	[la] _σ	[tɛr] _σ		[svã] _σ	[bjẽ]_σ ¹⁹	

In (22) the deletion of Œ in *de* is impossible, because the consonant cluster that would result – [dkr] or [tkr] with voice assimilation – is not an admissible onset.

(22) un bac de crapauds 'a tub of toads' ɛ̃bakdŒkra'po *ɛ̃bakdkra'po

The deletion in (23a) is much easier than in (23b), cf. Dell (1985:231), because [sp] is a well-formed onset in French (cf. *sport*, *perspicace* [pɛr.spi.kas]), whereas [tp] is hardly possible as a complex onset.

(23a) pour se peigner 'to comb oneself' pursŒpE'ne purspE'ne

(23b) pour te peigner 'to comb yourself' purtŒpE'ne ? purtpE'ne

At the beginning of an utterance, i.e. for the syllable that immediately follows a pause, there is a considerable loosening of the restrictions on admissible consonant clusters in French (Dell 1985:226): after a pause we can even observe deletions that generate sequences with sonority reversals, e.g. 'liquid+fricative' as in *r(e)venez demain* 'come back tomorrow', 'fricative+stop' as in *j(e)tez-y un coup d'œil* 'take a glance at it', 'liquid+stop+liquid' as in *r(e)trouvez-moi cet argent* 'find again that money for me'. However, a sequence of two stops is inadmissible, e.g. in *debout sur une table* 'get up on a table' a pronunciation [dbu] for *debout* is excluded.

4.2.3.1. Two and more Œ's in contiguous syllables

(20a) and (20b) are instances of the more general pattern of ghost [Œ] alternation in sequences of two and more contiguous syllables containing Œ's. The derivations in (24) account for three of seven possible realizations of the sequence (*j'ai envie de te le demander* 'I feel like asking you about it': (i) [ãvidŒtŒlŒdŒmãde]; two of four [Œ]'s are deleted: (ii) [ãvidtœldŒmãde], (iii) [ãvidœtlœdmãde],

¹⁹ This syllable and the other syllables in bold type are the stressed syllables in the respective rhythmic units. We assume that stress in French is assigned at P-level.

(iv) [ãvidtɕlœdmãde]; one of four [ɕ]'s is deleted: (v) [ãvidtɕlɕEdɕEmãde], (vi) [A]vidœtɕEdɕEmAde], (vii) [ãvidɕtœldɕEmãde], (viii) [ãvidɕtɕlœdmãde]. The following generalizations can be drawn: 1) it is impossible to drop more than two ɕ's in a sequence of four; 2) it is impossible to delete simultaneously two ɕ's in contiguous syllables. Both generalizations are direct consequences of the way of application of ɕ-DEL.

(24)a

M	ãvi	d<ɕ>	t<ɕ>	l<ɕ>	d<ɕ>mãde	
		↓	↓	↓	↓	<ɕ>-ANCH
W	[ã] _σ [vi] _σ	[dɕ] _σ	[tɕ] _σ	[lɕ] _σ	[dɕ] _σ [mã] _σ [de] _σ	
		↓		↓		ɕ-DEL
P (ii)	[ã] _σ [vid] _σ		[tœl] _σ		[dɕ] _σ [mã] _σ [de] _σ	

(24)b

M	ãvi	d<ɕ>	t<ɕ>	l<ɕ>	d<ɕ>mãde	
		↓	↓	↓	↓	<ɕ>-ANCH
W	[ã] _σ [vi] _σ	[dɕ] _σ	[tɕ] _σ	[lɕ] _σ	[dɕ] _σ [mã] _σ [de] _σ	
			↓		↓	ɕ-DEL
P (iii)	[ã] _σ [vi] _σ	[dœt] _σ		[lœd] _σ	[mã] _σ [de] _σ	

(24)c

M	ãvi	d<ɕ>	t<ɕ>	l<ɕ>	d<ɕ>mãde	
		↓	↓	↓	↓	<ɕ>-ANCH
W	[ã] _σ [vi] _σ	[dɕ] _σ	[tɕ] _σ	[lɕ] _σ	[dɕ] _σ [mã] _σ [de] _σ	
		↓			↓	ɕ-DEL
P (iv)	[ã] _σ [vid] _σ		[tɕ] _σ	[lœd] _σ	[mã] _σ [de] _σ	

4.2.3.2. Special behaviour of certain sequences of monosyllables

According to Morin (1983:77-78) and Tranel (1987:92-93), some sequences of monosyllabic clitics with alternating [ɕ] tend to have a fixed pronunciation, e.g. *je ne* with the first [ɕ] always pronounced; *ce que* with the second [ɕ] always pronounced. However, when a vowel-initial word follows, the first [ɕ] in *je n'* can be dropped and that of *ce qu'* can be retained, see (25).

(25)	<i>je ne sais pas</i>	ʒŋEneɥepa	ʒœneɥepa	* ʒnEneɥepa
	'I don't know'			
	<i>je n'ose pase</i>		ʒŋEnozpa	ʒnozpa
	'I don't dare'			
	<i>ce que j'ai vu</i>	sŋEkeɥɛvy	* sœkeɥɛvy	skEɥɛvy
	'what I saw'			
	<i>ce qu'on voit</i>		sŋEkɔ̃vwa	skɔ̃vwa
	'what I see'			

Morin analyzes *je ne* and *ce que* as "amalgams" only when they are found before a consonant, i.e. *je ne* /ʒŋE n<ŋE>/ with stabilization of the first ŋE, *ce que* /s<ŋE>kŋE/ with stabilization of the second ŋE, while before a vowel they are ordinary sequences of monosyllabic clitics containing floaters: *je n'* /ʒ<ŋE>n<ŋE>/, *ce qu'* /s<ŋE>k<ŋE>/.

4.2.4. Rules relating to Class 2 [ŋE]'s

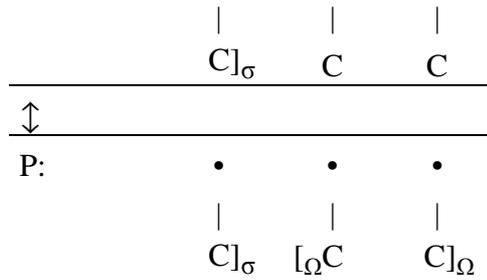
In French there is additional loosening of restrictions to syllabification in word-final position also. Some licensed extrasyllabic material is allowed word-finally. There are two possibilities for licensed extrasyllabic consonants in French: they may be anchored or floating. The latter function as liaison consonants: if skeletal slot insertion occurs (cf. Tranel 1995:806), they become anchored and may syllabify with the following vowel or as a coda of the preceding syllable in the cases of «liaison sans enchaînement» (cf. Encrevé 1988:177).

Licensed extrasyllabic consonants that are anchored may either be integrated in syllable structure by means of creating an appendix (cf. Goldsmith's Ω-licenser) or remain extrasyllabic. Even in the latter case, being underlyingly anchored, they cannot be deleted: they remain as an ill-formed structure at P-level. The intra-level rule of [ŋE]-Insertion (see 4.2.4.3) is a kind of repair strategy aiming at well-formed syllabification of such anchored unsyllabified consonants.

4.2.4.1. Ω-Creation

(P/P) Ω-CRE (blocked in pre-stress position): Optionally create a Ω-appendix with anchored consonants that remain unsyllabified at the word-end at P-level, unless the following syllable is stressed.

W: • • •

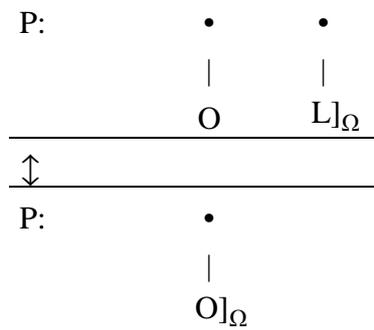


Ω-CRE

Ω-CRE does not apply if the following word is vowel-initial and not a syllable island, because in this case «enchaînement» takes place, i.e. the word-final consonant gets syllabified with the following vowel at P-level.

4.2.4.2. Liquid Deletion

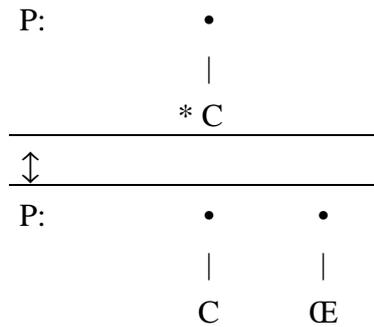
(P/P) L-DEL (optional before a pause): Delete the final liquid in a Ω-appendix if preceded by an obstruent. (L=liquid, O=obstruent)



L-DEL

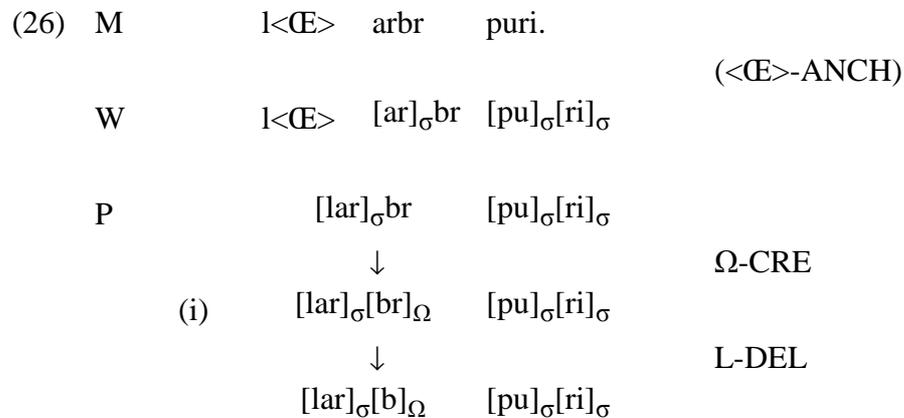
4.3.4.3. [Œ]-Insertion

(P/P) Œ-INS: An [Œ] is inserted after an anchored consonant or after a cluster of anchored consonants that would otherwise remain unsyllabified at P-level. (*C = unsyllabified consonant)



Œ-INS

The three (P,P) rules – Ω -CRE, L-DEL and [Œ]-INS – suffice to account for the two possible realizations of *l'arbre pourri* 'the rotten tree' – [larbpuri] and [larbrŒpuri], see (26) and (27) below – as well as for the impossibility of *[larbrpuri] and *[larbŒpuri]. The first is impossible because L-DEL is obligatory, once a Ω -appendix has been created. Otherwise there would be an [Œ]-insertion. The second one is excluded as the liquid deletion implies a previous Ω -appendix creation, i.e. syllabification of [br] as [br] _{Ω} which prevents Œ-INS from applying on [b] _{Ω} , already syllabified.



(27)	M	l<Œ>	arbr	puri.	
					(<Œ>-ANCH)
	W	l<Œ>	[ar] _σ br	[pu] _σ [ri] _σ	
	P		[lar] _σ br	[pu] _σ [ri] _σ	(Ω-CRE)
	(ii)		[lar] _σ br	[pu] _σ [ri] _σ	
			↓		Œ-INS
			[lar] _σ [brŒ] _σ	[pu] _σ [ri] _σ	

All three (P,P) rules are repairs for getting well-formed syllabification. Ω-CRE and L-DEL are more specific than Œ-INS. The first two rules regard only certain classes of unsyllabified consonants: only word-final unsyllabified consonants (Ω-CRE), only unsyllabified liquids (L-DEL). Being more specific, Ω-CRE and L-DEL precede Œ-INS in accordance with the Elsewhere Condition. By definition, L-DEL can be undergone only by liquids that are part of a Ω-constituent. Therefore, it cannot take place before Ω-CRE. Œ-INS applies after every anchored consonant (consonant cluster) that has not been rescued (by Ω-CRE) or eliminated (by L-DEL).

4.2.5. Interaction of Œ-Deletion and [Œ]-Insertion

Being a (W,P) rule, Œ-DEL takes precedence over Œ-INS, a (P,P) rule. This accounts for the patterns of [Œ]-manifestation in (5) above. Let's look at the derivation of some of the examples: (*la veste de Paul*, see (28) and (29), and *l'autre melon*, see (30) and (31).

(28)	M	vest	d<Œ>	pɔl	
			↓		<Œ>-ANCH
	W	[ves] _σ t	[dŒ] _σ	[pɔl] _σ	
					(Œ-DEL)
	P	[ves] _σ t	[dŒ] _σ	[pɔl] _σ	
			↓		Ω-CRE
	(i)	[ves] _σ [t] _Ω	[dŒ] _σ	[pɔl] _σ	
					(Œ-INS)
		[ves] _σ [t] _Ω	[dŒ] _σ	[pɔl] _σ	

(29)	M	vest	d<Œ>	pəl	
			↓		
	W	[ves] _σ t	[dŒ] _σ	[pəl] _σ	(Œ-DEL)
	P	[ves] _σ t	[dŒ] _σ	[pəl] _σ	(Ω-CRE)
	(ii)	[ves] _σ t	[dŒ] _σ	[pəl] _σ	Œ-INS
		↓			
		[ves] _σ [tŒ] _σ	[dŒ] _σ	[pəl] _σ	
(30)	M	l<Œ> otr	m<Œ>lɔ̃		<Œ>-ANCH
			↓		
	W	l<Œ> [ot] _σ r	[mŒ] _σ [lɔ̃] _σ		(Œ-DEL)
	P	[lot] _σ r	[mŒ] _σ [lɔ̃] _σ		Ω-CRE
		↓			
	(i)	[lot] _σ [r] _Ω	[mŒ] _σ [lɔ̃] _σ		L-DEL
		↓			
		[lot] _σ	[mŒ] _σ [lɔ̃] _σ		
(31)	M	l<Œ> otr	m<Œ>lɔ̃		<Œ>-ANCH
			↓		
	W	l<Œ> [ot] _σ r	[mŒ] _σ [lɔ̃] _σ		
	P	[lot] _σ r	[mŒ] _σ [lɔ̃] _σ		(Ω-CRE)
	(ii)	[lot] _σ r	[mŒ] _σ [lɔ̃] _σ		Œ-INS
		↓			
		[lo] _σ [trŒ] _σ	[mŒ] _σ [lɔ̃] _σ		

4.2.5.1. The treatment of *quelques*, *presque*

A small set of words, namely *presque* 'almost' and *quelques* 'a few', exhibit a pattern of [Œ]-manifestation which is different from that illustrated in (5) and accounted for in (28)-(31), where two contiguous syllables contain a «Class 2 [Œ] + Class 1 [Œ]»

entre Genève et Paris	ãtrɛʒɛnɛvɛpari	* ãtʒɛnɛvɛpari	ãtroɛʒnɛvɛpari
'between Geneva and Paris'			
contre le mur	kõtʀɛlmɛmyr	* kõtʀlmɛmyr	kõtʀoɛlmɛmyr
'against the wall'			

As for the examples in (35) taken from Dell (1985:240), the deletion of the final <ɛ> there occurs before a pause (which could be a silence or a psychological pause). The floater cannot anchor by <ɛ>-ANCH, for the pause exerts the same effect as an immediately following vowel; see (36).

(35)	(il faut) s'asseoir entre pour être à l'aise	saswarãtpuretralez	saswarãtrɛpuretralez
	'one must sit in between to be comfortable'		
	ceux qui sont contre lèvent la main	søkisøkõtlevlamẽ	søkisøkõtʀɛlevlamẽ
	'those who are against raise their hand'		

(36)	M	kõtʀ<ɛ>	
			<ɛ>-ANCH
	W	[kõt] _σ r<ɛ>	
			ɛ-DEL
	P	[kõt] _σ r<ɛ>	(pause)
			Ω-CRE
		[kõt] _σ [r] _Ω <ɛ>	(pause)
			L-DEL
		[kõt] _σ <ɛ>	(pause)
			Stray Erasure
		[kõt] _σ	(pause)

4.2.5.3. The treatment of words like «pègre», «astre», «buffle»

In the variety of French described by Dell, words like *pègre* 'underworld', *astre* 'star', *buffle* 'buffalo' never lose their final liquid despite the fact that they end in an «obstruent+liquid» cluster, see (37) (cf. Dell 1976, Dell 1985:238)²¹.

²¹ Laks (1977), who studied the loss of French /r/ as a sociolinguistic variable in the speech of 6 teenagers from Villejuif, a suburban area of Paris, distinguished four possible realizations of /r/: voiced, voiceless, zero realizations and 'residual trace'.

- (37) (la) pègre parisienne pɛgrɛparizjɛn * pɛgparizjɛn
 'the Parisian underworld'
 (c'est le roi de) la pègre lapɛgr * lapɛg
 'he is the king of the underworld'

In our framework, these words should be treated as lexically marked not to undergo Ω -CRE. As only liquids inside a Ω -constituent are subjected to the effects of L-DEL, the words in question cannot undergo L-DEL and, therefore, their final liquid will always be preserved.

4.3. Conclusion

The distinction between Class 1 and Class 2 [ɛ]’s is encoded in M-level representations. I assume that only Class 1 [ɛ]’s are present underlyingly. Class 2 [ɛ]’s are introduced by a rule of epenthesis (ɛ-INS).

Among Class 1 [ɛ]’s, those whose manifestation is sensitive to rhythm were distinguished from those whose syncope occurs independently of rhythm according to the type of resyllabification that takes place at P-level (creation of a coda/creation of a complex onset). Assuming that in French constraints on (re)syllabification are different at W- and P-level, we can account for the fact that (at least in the variety of French described by Dell) speakers much more easily drop ghost [ɛ] after a single consonant, which resyllabifies leftwards in coda position, than after a group of two consonants, where the second consonant resyllabifies rightwards, thus creating a complex onset at P-level. Complex onset creation on W-level is restricted only by the Sonority Sequencing Generalization, while on P-level it is much more constrained, being hardly possible for some speakers and possible only in very fast speech for others and only in syllables that are not stressed. Creation of word-final appendices from licensed extrasyllabic consonants, which is a specific P-level syllabification procedure, is also prevented when the immediately following syllable is stressed (Ω -Creation, 4.2.4.1). As for coda creation, it is equally constrained on both levels W and P: it may always apply if the coda position is vacant and if only a single consonant is (re)syllabified as coda.

Our Harmonic Phonology analysis of ghost [ɛ] vowels in French need not establish extrinsic ordering of rules. As an (M,W) rule <ɛ>-ANCH precedes ɛ-DEL that is a (W,P) rule. The (P,P) rules relating to Class 2 [ɛ]’s (cf. 4.2.4.1, 4.2.4.2 and 4.2.4.3) are intra-level rules. They apply after the cross-level rule of ɛ-deletion. [ɛ]-INS

systematically inserts [ɛ] in pre-stress position, because the rule of Ω-CRE that precedes it in accordance with the Elsewhere Condition (being a more specific repair for unsyllabified consonants), is rhythm-sensitive: the latter rule is blocked when the immediately following syllable is the stressed syllable of the rhythmic unit. Thus, the consonants left unsyllabified after the application of Ω-CRE, namely those in pre-stress position, have to undergo the more general repair rule: [ɛ]-INS.

The system of cross-level and intra-level rules adopted here is able to account for the main patterns of ghost [ɛ] alternation in the variety of French described here, cf. (19), (20), (21), (26), (27), (28), (29), (30), (31).

Moreover, the formalism admits of either positing underlying floaters for ghost [ɛ] vowels or introducing them by the rule of [ɛ]-INS in contrast to underlyingly anchored [ɛ] vowels that are not ghosts. Thus, it is possible to account for some special cases that characterize the variety of French described here: «amalgams» of monosyllabic clitics (4.2.3.2) ; words like *presque*, *quelques* (4.2.5.1), *entre*, *contre* (4.2.5.2) that exhibit more complex patterns of [ɛ]/zero alternations.

4.4. Contrasting the Bulgarian and French ghost vowel alternations

Both in Bulgarian and French a threefold distinction has been established for part of the mid vowels:

	Bulgarian	French
stable vowels	ə, e	ɛ
ghost vowels that are underlying floaters	ə, e	ɛ
ghost vowels that are default vowel insertions	ə	ɛ

Between the rules that account for the ghost vowel alternations there are some similarities and many differences.

Similarities:

- 1) The rule that anchors floaters is a (M,W) cross-level rule in both language.
- 2) In both Bulgarian and French the rule that is responsible for default vowel insertions is an intra-level obligatory rule triggered by unsyllabified consonants.

Differences:

- 1) The rule that anchors floaters is differently conditioned in Bulgarian and in French:
 - in Bulgarian it depends on M-level syllabification: a floater anchors iff the next consonant remains unsyllabified at M-level

- in French W- and P-levels are also involved: a floating vowel anchors if the next syllable is provided with an onset (be it empty) at W- or P-level

2) French has a rule that deletes [Œ]-vowels matching a floater at M-level: Œ-DEL. Œ-DEL is an optional cross-level rule and it is conditioned by possible resyllabification of consonants at P-level.

Bulgarian has no such rule. Consequently, possible resyllabification at P-level is irrelevant for ghost vowel realizations in this language.

3) The Bulgarian Rule of Schwa Epenthesis obligatorily applies to every unsyllabified consonant at W-level. The corresponding French rule (Œ-INS) is also compulsory: it applies to anchored unsyllabified consonants (floating unsyllabified consonants that represent so-called 'liaison consonants' escape this rule and are eventually subjected to Stray Erasure), but is preceded by two optional rules that are more specific repairs aiming at total syllabification: a rule creating word-final appendices that optionally syllabifies word-final anchored consonants (Ω-CRE); a rule that deletes unsyllabified liquids (L-DEL). Thus, Œ-INS is triggered only where neither Ω-CRE nor L-DEL have applied.

4) In Bulgarian the default vowel – [ə] – is inserted to the left of the unsyllabified consonant, while in French the default vowel – [Œ] – is inserted to the right of the unsyllabified consonant.

5) The Bulgarian rule of default vowel epenthesis is a W-level rule, while the corresponding French rule applies at P-level. Both are intra-level harmonic rules.

6) The Bulgarian rules of Floater Anchoring and Schwa Epenthesis are related to the two lower levels (M and W); cf. fig.3a. In French, the set of rules responsible for ghost vowel alternations involves P-level also (fig.3b).

M:	M:
<hr/> \updownarrow \updownarrow Floater Anch <hr/>	<hr/> \updownarrow \updownarrow <Œ>-Anch <hr/>
W: \leftrightarrow ə-Epenthesis	W:
<hr/> \updownarrow <hr/>	<hr/> \updownarrow \updownarrow Œ-Deletion <hr/>
P:	P: \leftrightarrow [Œ]-Insertion

fig.3a

fig.3b

7) As far as the Bulgarian ghost vowel alternations are concerned, the P-level is not involved at all. Consequently, in Bulgarian the alternations are restricted within word boundaries.

8) The French rule Œ-DEL and the rules that interact with Œ-INS at P-level (Ω-CRE and L-DEL) are always optional. This yields a great amount of variation in realizations of (sequences of) words containing ghost vowels in French. As for Bulgarian, a given inflected or derived form of an alternating (GV or metathetic) root systematically exhibits either the form with the ghost vowel realized or that without the ghost vowel, thus excluding variable realizations of the same form.

9) Stress being assigned at different levels in Bulgarian (W-level) and in French (P-level), the interaction of ghost vowel alternations with stress patterns is located at W-level in Bulgarian, whereas in French, the rules and constraints that are rhythm-sensitive (Ω-CRE, Œ-INS, resyllabification of a consonant in a complex onset) are located at P-level.

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