

Hungarian Vowel Basics (data from Siptár and Törkenczy 2000)

Although Hungarian is arguably most famous for its vowel harmony, the vowel system is actually much more interesting and complex. It has many interactions among harmony, length, morphology, ‘unstable’ vowels, epenthesis and deletion. I will briefly describe each of these phenomena, describe the ways in which they interact, and provide a representational analysis of them using the Parallel Structures Model.

Surface Vowel Inventory

There are 14 surface vowels in Hungarian. These can be described as phonetically dispersed in that they make use of at least four places (front-back-round dimension), five heights and two lengths. These are shown in (1).

(1) Surface Vowel Inventory (14 “segments”)

	Front	Front/ Round	Central	Back/ Round	
high	i: i	y: y		u	u:
upper mid	e:	ø:			o:
lower mid		œ		ɔ	
upper low	ɛ			ɒ	
lower low			a:		

Vowel Length Pairs

Not surprisingly, these vowels fall into length pairs that show the active alternations in (2).

(2) Vowel Length Correspondences

	Front	Front/ Round	Central	Back/ Round	
high	i: — i	y: — y		u	— u:
upper mid	e: ↘	ø: ↘			o: ↗
lower mid		œ		ɔ ↗	
upper low	ɛ			ɒ	
lower low			a: ↗		

- (3) a. [hi:d] híd ‘bridge’ ~ [hid-ɒk] hidak ‘bridge’-plur.
 b. [ku:t] kút ‘well’ ~ [kut-ɒk] kutak ‘well’-plur.
 c. [ty:z] tűz ‘fires’ ~ [tyz-ɛk] tüzek ‘fire’-plur.
 d. [lo:] ló ‘horse’ ~ [lɔv-ɒk] lovak ‘horse’-plur.
 e. [tʃø:] cső ‘tube’ ~ [tʃœv-ɛk] csövek ‘tube’-plur.
 f. [ke:z] kéz ‘hand’ ~ [kez-ɛk] kezek ‘hand’-plur.
 g. [ɲa:r] nyár ‘summer’ ~ [ɲɒr-ɒk] nyarak ‘summer’-plur.

Although the claim has been that vowel length is contrastive but subject to context- and dialect-specific neutralizations, the length of at least some of the vowels seems to be almost

entirely predictable. Because the factors involved in the distribution of length are quite complex, I will leave a full discussion for a later date.

Morpheme-internal Hiatus

In addition to length alternations, the surface vowels show a number of restrictions on morpheme-internal adjacency (i.e. hiatus). Ignoring length, the distribution of vowels under morpheme-internal hiatus is given in (4), based on the data in (5). The dark shaded cells indicate unattested sequences according to S&T. We will return to this chart below and I will provide a principled account for most of the gaps, as well as suggest that some of them are accidental. And, I will show that simply looking at surface realizations is somewhat misleading since the set of actual phonological vowels is larger than that given here.

(4) Morpheme-internal VV sequences

	i	y	u	e	ø	o	a
i			x	x	x	x	x
y				x			x
u	x			x		x	x
e	x		x			x	x
ø			x				
o	x			x			x
a	x		x	x		x	

- (5)
- [ju:liuʃ] July, [kieʃ] picturesque, [liliəm] lily, [riɒt] frightened, [fiu:] boy, [die:tə] diet, [miliø:] milieu, [dio:] walnut, [kia:lt] shout
 - [mɛnyɛt:] minuet, [nyɒns] nuance, [hɒbitye:] regular visitor
 - [jɛsuitə] Jesuit, [ɪnfluɛnzə] flu, [fluɔreska:l] fluoresce, [pa:pʊə] Papuan, [ɪntui:ʃiə:] intuition, [duo:] duo, [jɒnuɑ:r] January
 - [kɔf:ɛɪn] caffeine, [mu:zɪəm] museum, [nɛɔn] neon, [tɛə] tea, [stɛrɛo:] stereo, [lɛɑ:n] girl
 - [sœul] Seoul
 - [stɔɪkʊs] stoic, [pɔɛnti:rɔz] embellish with jokes, [bɔə] boa, [pɔɛ:n] punchline, [ɔɑ:ziʃ] oasis
 - [mɔzɒɪk] mosaic, [pʊto:] car, [ɪzraɪl] Israel, [ɔɔrtə] aorta, [nɔi:v] naive, [kɔkɔ:] cocoa
 - [ka:ɪn] Cain, [ka:ɔs] chaos

Harmony

In addition to length alternations and hiatus restrictions, the surface vowels also show a number of harmony and neutralization patterns. Surface harmony alternations are restricted to affixes and never occur within roots.¹ This is an important fact that is often obscured in the literature because of the traditional habit of referring to roots containing only “back” or “non-back” vowels as “harmonic roots”, while those that have a mix of “back” and “non-back” vowels are called “disharmonic roots”. The implication of such terms is that some

¹ This will be revised slightly below.

roots undergo harmony, while others do not. Since there are no root-internal harmony alternations, such an implication seems unjustified and the language might best be described as not having root harmony at all. The chart in (6) shows the fairly random co-occurrence of vowels within roots, with the “disharmonic” combinations indicated by shading. That said, I will return to the root harmony question below and show that it does occur, but only in a very limited (and sometimes covert) way.

(6) Some combinations of vowels within roots **find the rest of the combos!**

		non-back				back		
		i:/i	e:/ɛ	y:/y	ø:/œ	u:/u	o:/ɔ	a:/ɒ
non-back	i:/i	x	x	x	x	x	x	x
	y:/y	x	x	x	x			x
	e:/ɛ	x	x	x	x	x	x	x
	ø:/œ	x	x	x	x	x	x	x
back	u:/u	x	x				x	x
	o:/ɔ	x	x	x	x	x	x	
	a:/ɒ	x	x	x	x		x	x

- (7) a. [bili] bili ‘potty’ b. [fil:e:r] fillér ‘penny’
 c. [ɒt:ity:d] attitűd ‘attitude’ d. [sti:lus] stílus ‘style’
 d. [ripø:k] ripők ‘cad’ e. [bito:] bitó ‘gallows’
 f. [bikɒ] bika ‘bull’
 g. [hybris] hübrisz ‘hubris’ h. [dʒylɛvɛ:s] gyülevész ‘riff raff’
 i. [] ‘ ‘ j. [tykær] tükör ‘mirror’
 k. [] ‘ ‘ l. [] ‘ ‘
 m. [byrɒkra:tsin] bürokrácia ‘bureaucrat’
 n. [fe:ri] férfi ‘man’ o. [sege:n] szegény ‘poor’
 p. [re:sy:] rézsű ‘slope’ q. [estendø:] esztendő ‘year’
 r. [] ‘ ‘ s. [betɒn] beton ‘concrete’
 t. [te:glɒ] téglá ‘brick’
 u. [rœvid] rövid ‘short’ v. [tø:zeg] tőzeg ‘peat’
 w. [kœsœry:] köszörű ‘grinder’ x. [kœsœry:] köszörű ‘grinder’
 y. [] ‘ ‘ z. [pœZo:] pözsó ‘Peugeot’
 aa. [ɒmø:bɒ] amőba ‘amoeba’
 bb. [kuvik] kuvik ‘owl’ cc. [dʒungɛl] dzsungel ‘jungle’
 dd. [] ‘ ‘ ee. [] ‘ ‘
 ff. [] ‘ ‘ gg. [] ‘ ‘
 hh. [kupɒ] kupa ‘goblet’
 ii. [ɔksige:n] oxigén ‘oxygen’ jj. [ko:dɛks] kódex ‘codex’
 kk. [kɔstym] kosztüm ‘costume’ ll. [Sɔfø:r] sofőr ‘driver’
 mm. [kɔsɒru:] koszorú ‘wreath’ nn. [kɔsɒru:] koszorú ‘wreath’
 oo. [] ‘ ‘
 pp. [ɒt:ity:d] attitűd ‘attitude’ qq. [høvɛr] haver ‘pal’
 rr. [ɒl:y:r] allűr ‘mannerism’ ss. [kɔskɒdø:r] kaszkadőr ‘stuntman’
 tt. [] ‘ ‘ uu. [va:rɔs] város ‘town’
 vv. [kɔskɒdø:r] kaszkadőr ‘stuntman’

Interestingly, “disharmonic” roots are “usually recent loanwords” (S&T p.67 fnt 26), and those ending in unrounded front vowels tend to vacillate between sometimes selecting front-vowel suffixes and sometimes back-vowel suffixes. The missing “harmonic” combinations in (6) seem to be accidental gaps and are no less prevalent than the missing “disharmonic” combinations. Although it is quite possible that native and loan words are treated differently by the grammar, I will ignore this possibility for the moment and analyze the language to account for the loanword data.

Non-harmonic Suffixes

Before looking at the harmony behavior of suffixes, it is important to note that not all suffixes are subject to harmony. High front unrounded vowels in suffixes never alternate on the surface regardless of the preceding vowel (to be returned to below).

- (8) a. [ɲa:r-i] nyári ‘summer’-adj.
 b. [tɒn-i:t] tanít ‘teach’
 c. [fut-ni] futni ‘to run’
 d. [kɒp:-int] koppint ‘knock’
 e. [i-i]
 f. [e-i]
 g. [y-i]
 h. [ø-i]

Some suffixes consistently have [e:], [u], [ɔ], [o:], [ɒ] and [a:]. Note that [e:] and [a:] normally alternate with one another via harmony (discussed below). The fact that they can both appear in non-harmonic suffixes means that some morphemes are not subject to harmony for morphological, not phonological, reasons.

- (9) a. [ɒd-ne:k] adnék ‘I would give’
 b. [kultʃ-ke:nt] kulcsként ‘as a key’
 c. [i-e]
 d. [e-e]
 e. [y-e]
 f. [ø-e]
 g. [o-e]
 h. [tsits-uʃ] cicus ‘kitten’
 i. [u-u]
 j. [e-u]
 k. [y-u]
 l. [ø-u]
 m. [o-u]
 n. [a-u]
 o. [ybɛr-ɔl] überol ‘outdo’
 p. [œt-kɔr] øtkor ‘at five’
 q. [hɔt-kɔr] hatkor ‘at six’
 r. [he:t-kɔr] hétkor ‘at seven’
 s. [fɛrk-o:] Ferkó ‘Frank’-dim.
 t. [i-o]

u.	[u-o]		
v.	[y-o]		
w.	[o-o]		
x.	[il-ɒ]	Ila	‘Hellen’-dim.
y.	[reʦsɛnz-a:l]	recenzál	‘review’-verb
z.	[u-a]		
aa.	[y-a]		
bb.	[o-a]		
cc.	[ø-a]		
dd.	[a-a]		

Binary Harmony

Most suffix vowels that display harmony have binary alternations triggered by the quality of the immediately preceding vowel. These are depicted in (10). The lower mid vowels do not participate in this pattern, as indicated by the shaded cells.

(10) Vowel Binary Harmony Alternations

	Front	Central	Back
high	y: y	_____	u u:
upper mid	e: ø:	_____	o:
lower mid			
upper low	ε	_____	ɒ
lower low		a:	

- (11)
- | | | | | | |
|---------------|--------|------------------|-------------|----------|-------------------|
| a. [la:b-u:] | lábú | ‘legged’ | ~[fej-y:] | fejÛ | ‘headed’ |
| b. [ha:z-unk] | házunk | ‘our house’ | ~[kɛrt-yŋk] | kertünk | ‘our garden’ |
| c. [va:r-o:] | váró | ‘waiting’-adj. | ~[ke:r-ø:] | kérő | ‘asking’-adj. |
| d. [va:r-na:] | várná | ‘he would wait’ | ~[ke:r-ne:] | kérné | ‘he would ask’ |
| e. [ha:z-bɒŋ] | házban | ‘in (the) house’ | ~[kɛrt-bɛŋ] | kert-ben | ‘in (the) garden’ |

[more data with the other stem vowels -ablative suffix -tól~-től]

Ternary Harmony

The lower mid vowels participate in a ternary alternation that involves the upper low vowel, as shown in (12) and (13).

(12) Vowel Ternary Harmony Alternations

	Front	Central	Back
high			
upper mid			
lower mid	œ	_____	ɔ
upper low	ε	_____	
lower low			

- (13) a. [ha:z-hɔz] házhoz ‘to (the) house’
 b. [kɛrt-hɛz] kerthez ‘to (the) garden’
 c. [fœld-hœz] földhöz ‘to (the) land’
 d. [ty:z-hœz] tűzhöz ‘to (the) fire’
 e. [i-hɛz]
 f. [u-hɔz]
 g. [o-hɔz]

[What is the evidence that this is not an epenthetic vowel?]

“Quaternary” Harmony and Lowering Stems

On the surface, it looks as if Hungarian also has quaternary alternations, as a comparison of the suffixes in (15) might suggest.

(14) “Quaternary” harmony

	Front	Central	Back
high			
upper mid			
lower mid	œ		ɔ
upper low	ɛ		ɒ
lower low			

- (15) a. [ha:z-ɒk] házak ‘house’-plur. [note no shortening!]
 b. [ga:z-ɔk] gázok ‘-plur.
 c. [tœk-œk] tökök ‘-plur.
 d. [fyl-ek] fülek ‘-plur.

[What is the evidence that this is not an epenthetic vowel? Double check the data here. The original examples I had included the accusative suffix as well.]

However, note that (a) and (b) have no obvious reason for different plural suffix vowels since the preceding vowel context is identical in both cases. What is important here is that (a) involves what is called a “lowering stem”, which seems to be an independent morphological class that has unexpected vowel length alternations in addition to a lowering (and unrounding) effect on otherwise ternary harmony vowels (compare (17d) with (13d)).

(16) Exceptional Binary Harmony in the “Lowering Stem” Environment

	Front	Central	Back
high			
upper mid			
lower mid			
upper low	ɛ		ɒ
lower low			

- (17) a. [hi:d] híd ‘bridge’ ~ [hid-ɒk] hidak ‘bridge’-plur.
 b. [zu:g] zúg ‘rumble’ ~ [zug-ɒk] zugak ‘rumble’-plur.
 c. [ty:z] tűz ‘fire’ ~ [tyz-ɛk] tűzek ‘fire’-plur.
 d. [i-ɛk]
 e. [e-ɛk]
 f. [e-ɒk]
 g. [o-ɒk]
 h. [ø-ɛk]

“Schizophrenic” Front Unrounded Vowels

Before moving on from harmony, it should be noted that there is a somewhat schizophrenic behavior of the unrounded front vowels in that they sometimes participate in harmony, but other times do not. In fact, we saw an example of this in (17). Some lexical items with these vowels in the final syllable always take harmonizing suffixes that are back, as in (18).

- (18) a. [hi:d-nɒk] hídnak ‘bridge’-dat.
 b. [i-nɒk]
 c. [tse:l-nɒk] célnak ‘aim’-dat.
 d. [dere:k-nɒk] deréknak ‘waist’-dat.
 e. [pɒpi:r-nɒk] papírnak ‘paper’-dat.
 f. [ai-nɒk]
 g. [ka:ve:-nɒk] kávének ‘coffee’-dat.
 h. [bɒlek-nɒk] baleknak ‘dupe’-dat.

Some lexical items always take harmonizing suffixes that have front vowels, as in (19).

- (19) a. [vi:z-nɛk] víznek ‘water’-dat.
 b. [i-nɛk]
 c. [kɛrt-nɛk] kertnek ‘garden’-dat.
 d. [sege:j-nɛk] szegénynek ‘poor’-dat.
 e. [ai:-nɛk]
 f. [ai-nɛk]
 g. [ae:-nɛk]
 h. [aE-nɛk]

Some lexical items seem to be able to take a front or back vowel harmonizing suffix depending on the speaker (perhaps register). Note that these are (mostly?) loans since they are also “disharmonic”.

- (20) a. [ɒnɒli:zis-nɒk] or [ɒnɒli:zis-nɛk]
 b. [ai-nɒk] or [ai-nɛk]
 c. [tiɒme:r-nɒk] or [tiɒme:r-nɛk]
 d. [hɒtɛl-nɒk] or [hɒtɛl-nɛk]

This split behavior of front non-round vowels is not unusual in languages with harmony (e.g. Kàlòng and Nez Perce dorsal harmony - Morén 2006).

“Unstable” Vowels

Hungarian also has a set of vowels that are very similar to the ‘yer’ vowels of Slavic. These are often called “unstable” vowels and participate in vowel-zero alternations. They are found in both stems and suffixes and only surface in final and/or closed syllables. They come in four flavors on the surface depending on the context: [ɛ, œ, ɔ, ɒ]. Note that the surface quality of these unstable vowels is described by the ternary harmony system combined with lowering in lowering stem environments.

In (21), the roots have underlying unstable vowels followed by a consonant. In these cases, the vowel surfaces in isolation and when followed by a consonant-initial suffix, but does not surface when followed by a vowel-initial suffix.

(21)	#	inessive	plural	accusative	gloss
a.	[tɛɹ̥m]	[tɛɹ̥m-bɛn]	[tɛrm-ɛk]	[tɛrm-ɛt]	hall
b.	[tɛl̥k]	[tɛl̥k-bɛn]	[tɛlk-ɛk]	[tɛlk-ɛt]	land
c.	[kœj̥œk]	[kœj̥œk-bɛn]	[kœjk-œk]	[kœjk-œt]	kid
d.	[vœd̥œr]	[vœd̥œr-bɛn]	[vœdr-œk]	[vœdr-œt]	bucket
e.	[bøk̥ɔr]	[bøk̥ɔr-bɒn]	[bøkr-ɔk]	[bøkr-ɔt]	bush
f.	[søb̥ɔr]	[søb̥ɔr-bɒn]	[søbr-ɔk]	[søbr-ɔt]	statue
g.	[tør̥ɔn]	[tør̥ɔn-bɒn]	[tørn-ɔk]	[tørn-ɔt]	tower
h.	[mɒj̥ɔm]	[mɒj̥ɔm-bɒn]	[mɒjm-ɔk]	[mɒjm-ɔt]	monkey
i.	[bɒg̥ɔj]	[bɒg̥ɔj-bɒn]	[bɒgj-ɔk]	[bɒgj-ɔt]	owl

Compare (21) with (22) in which there is no vowel deletion in the suffixed form because the root does not contain an unstable vowel.

(22)	#	inessive	plural	accusative	gloss
a.	[pɛr̥ɛm]	[pɛr̥ɛm-bɛn]	[pɛr̥ɛm-ɛk]	[pɛr̥ɛm-ɛt]	edge
b.	[sur̥ɔn]	[sur̥ɔn-bɒn]	[sur̥ɔn-ɔk]	[sur̥ɔn-ɔt]	bayonet
c.	[ta:b̥ɔr]	[ta:b̥ɔr-bɒn]	[ta:b̥ɔr-ɔk]	[ta:b̥ɔr-ɔt]	camp
d.	[CVC̥œC]				

Specifically, compare the data in (23). (a) has [rɲ] throughout, (b) has [rVɲ] throughout, and (c) sometimes has [rɲ] and sometimes [rVɲ]. The latter has an underlying “unstable” vowel.

(23)	#	inessive	plural	accusative	gloss
a.	[sœrɲ]	[sœrɲ-bɛn]	[sœrɲ-œk]	[sœrɲ-œt]	monster
b.	[sur̥ɔn]	[sur̥ɔn-bɒn]	[sur̥ɔn-ɔk]	[sur̥ɔn-ɔt]	bayone
c.	[tør̥ɔn]	[tør̥ɔn-bɒn]	[tørn-ɔk]	[tørn-ɔt]	tower

Suffixes can also have unstable vowels. Here, the vowel surfaces except when following a vowel-final stem. [Double check the data here! How do we know these are unstable and not

epenthetic? Need to find those examples with two suffixes, where the first has an unstable vowel and the second does not.]

(24) a. [la:j̥] ~ [la:j̥-ɔk] ~ [la:j̥-ɔn] ~ [la:j̥-ɔm]

b. [hɔllo:] ~ [hɔllo:-k] ~ [hɔllo:-n] ~ [hɔllo:-m]

[Find better data with other vowels and clear evidence of unstable status]

Epenthetic Vowels

Hungarian has a set of epenthetic vowels ensuring that the phonotactic conditions of the language are met. The quality of the epenthetic vowel is dependent on the ternary harmony system and the “lowering” status of the preceding stem.

(25) a. [hɔllo:-t] [o:n-t] [ɲɔm-ɔt]

b. [tɛve:-t] [re:s-t] [ke:p-ɛt]

c. [tø:-t] [sœr-t] [tœk-æt]

[more data, etc. here]

“Unstable” and Epenthetic Vowel Interaction

Unstable vowels and epenthesis can interact in a given form. In this situation, the unstable vowel does not appear and the epenthetic vowel does.

(26) a. [kasɔn] ~ [kasn-ɔt] *[hasn-t] *[hasɔn-ɔt] *[hasɔn-t]

b. [œkœr] ~ [œkr-æt] *[œkr-t] *[œkœr-æt] *[œkœr-t]

[more data, etc. here]

Vowel Deletion

Finally, some vowels delete when morpheme concatenation creates hiatus.

(27) a. [bot-unk] versus [fa:-nk]

b. [hɔllo:-k] versus [la:j̥-ɔk]

c. [hɔllo:-n] versus [la:j̥-ɔn]

d. [hɔllo:-m] versus [la:j̥-ɔm]

e. [i-k]

f. [u-k]

g. [y-k]

h. [e-k]

i. [ø-k]

j. [a-k]

[more data on vowels across morpheme boundaries and their repair strategies - check on the effects of length and lowering stems (possible?)]

Vowel Summary

- Hungarian has 14 surface vowels that form seven long-short pairs displaying 11 distinct qualities - [i:, i, y:, y, u:, u, e:, ε, ø:, œ, o:, ɔ, a:, ɒ].
- The long-short pairs participate in productive length alternations.
- Limited morpheme-internal hiatus is allowed.
- Roots do not seem to have any restrictions on the quality of the vowels they contain. There is no surface evidence of root harmony.
- There is a set of suffixes that consistently have the same vowel - [i, i:, e:, u, ɔ, ɒ, a:].
- There is a set of suffixes that display vowel alternations depending on the nature of the preceding vowel and/or the morphological class of the root.
 - There are binary front-back harmony alternations - [u:~y:, u~y, o:~ø:, ɒ~ε].
 - There are binary front-back, low-upper mid harmony alternations - [e:~a:].
 - There are ternary front-back-round harmony alternations - [ε~œ~ɔ].
 - The “lowering stems” condition the ternary harmony suffixes such that they show only a lowered binary harmony pattern - [ɒ~ε].
- Front unrounded vowels sometimes participate in harmony and sometimes do not.
- There is an “unstable” vowel that displays vowel-zero alternations depending on the context. When this vowel is realized, it is subject to the ternary harmony pattern (including lowering when relevant).
- Vowel epenthesis occurs to repair syllable structure. The epenthetic vowel also is subject to the ternary harmony pattern.
- When unstable and epenthetic vowels are combined within the same form, the unstable vowel does not surface.
- When some vowels are adjacent across a morpheme boundary, one of them deletes.

Applying the Parallel Structures Model to Hungarian Vowels

Given the data presented and the restrictions placed on feature specification imposed by the PSM, what overt, positive evidence is there that individual segments have particular feature specifications and how do we explain the behavior the vowels given those features?

- Let us assume that the epenthetic vowel is featurally minimal.
- Let us assume that the unstable vowel is featurally identical to the epenthetic vowel since it shows the same harmony behavior.
- Let us assume that the front round vowels have V-place[cor] and V-place[lab].
- Let us assume that front-back harmony involves the feature V-place[cor].
- Let us assume that rounding harmony involves the feature V-place[lab].
- Let us assume (following the analysis of Kàlòng and Nez Perce) that the surface vowels that show dual behavior in the harmony system (sometimes participate, sometimes do not) are actually different phonological vowels - /i:, i, I:, I, e:, e, E:, E/. The lower-case symbols represent those vowels that participate in harmony (i.e. have V-place[cor]), while the upper-case symbols represent that vowels that do not participate in harmony (i.e. have no place features).
- Let us assume that because the full vowels [u:, u, o:, ɔ] surface as front rounded as a result of V-place[cor] harmony, that they were underlyingly specified with a V-place[lab] feature.
- Let us assume that the low vowels [a:, ɒ] are phonologically low - V-manner[open].

- Let us assume that the low “round” vowel is phonetically, not phonologically, round since it does not surface as round front when participating in fronting harmony. Its phonetic rounding is a default phonetic enhancement strategy resulting from phonetic dispersion.
- Let us assume that the high vowels /i:, i, I:, I, y:, y, u:, u/ are phonologically high - i.e. V-manner[closed].
- Let us assume that the fronted low vowel that occurs as the result of fronting harmony (particularly in the lowering stem environment) is both V-manner[open] and V-place[cor] - /æ/.
- Importantly, we have phonetically identical (or very similar) vowels that behave quite differently in the phonology. [i:, i, e:] sometimes trigger harmony and sometimes do not. Therefore, they map to six phonological segments (including length): /i:, i, e:, I:, I, E:/, [ɔ] sometimes alternates with just [ɛ] and sometimes with both [ɛ] and [œ]. Therefore, it maps onto two phonological segments: /o/ and /O/. [ɛ] sometimes triggers harmony and sometimes not, it sometimes alternates with [ɔ], and it alternates with [ɒ] in lowering stem environments. Therefore, it maps onto three phonological segments: /e/, /E/ and /æ/.

Combined with the PSM requirement that more complex combinations of features imply less complex combinations of features (including single-featured segments), this leads to the following set of feature specifications:

(28)

			V-place		V-manner		phenomena	lowering?	suffix?
			lab	cor	closed	open			
//O//	/O/	[ɔ]					--> /o/+lab, /ø/+lab+cor, /e/+cor		yes
//o://	/o:/	[o:]	✓				--> /ø:/+cor, trigger lab		yes - split
//o//	/o/	[ɔ]	✓				not target, trigger lab		no/yes
//e://	/e:/	[e:]		✓			not target, trigger cor		yes?
//e//	/e/	[ɛ]		✓			not target, trigger cor		yes?
//ø://	/ø:/	[ø:]	✓	✓			not target, trigger lab, cor		no
//ø//	/ø/	[œ]	✓	✓			not target, trigger lab, cor		no
//I://	/I:/	[i:]			✓		target of +cor: --> /i:/?		yes?
//I//	/I/	[i]			✓		target of +cor: --> /i/?		yes?
//u://	/u:/	[u:]	✓		✓		--> /y:/+cor, trigger lab		yes
//u//	/u/	[u]	✓		✓		--> /y/+cor, trigger lab		yes - split
//i://	/i:/	[i:]		✓	✓		not target, trigger cor		yes?
//i//	/i/	[i]		✓	✓		not target, trigger cor		yes?
//y://	/y:/	[y:]	✓	✓	✓		not target, trigger lab, cor		no
//y//	/y/	[y]	✓	✓	✓		not target, trigger lab, cor		no
//E://	/E:/	[e:]			✓	✓	not target, not trigger		yes?
//E//	/E/	[ɛ]			✓	✓	not target, not trigger		yes?
	/æ:/	[e:]		✓		✓	Only results from harmony?	yes	yes?
	/æ/	[ɛ]		✓		✓	Only results from harmony?	yes	yes?
//a://	/a:/	[a:]				✓	--> /æ:/ +cor	yes	yes - split
//a//	/a/	[ɒ]				✓	--> /æ/ +cor	yes	yes - split

Legend: //__// = phonological UR. /___/ = phonological SR. [___] = phonetic form. “yes?” = insufficient evidence. “split” = sometimes target, sometimes not.

In this chart, there are 21 surface phonological vowels that correspond to 20 underlying vowels mapping to 14 phonetic forms. Note that only four features are used to distinguish

among this rather large group. The seven “extra” vowels are the two sets of long-short front non-rounded vowels that do not participate in harmony (i.e. /I:, I, E:, E/), the set of fronted low vowels (i.e. /æ:, æ/), and the “unstable”/epenthetic vowel, which is an empty root node (i.e. /O/) and is the only vowel to undergo overt labial harmony. With regard to the phonetic interpretation of the empty vowel when it is not subject to harmony and/or lowering, it is in the less crowded and more articulatorily neutral “mid” vowel space (like a schwa), but it has a default rounding similar to that found in the short low vowel. Note that there is pattern evidence for each of these “covert” vowels, i.e. phonetically similar/identical vowels behave differently in the phonology.

Hiatus

With these feature specifications, we actually derive most of the phonological behavior of the vowels. Let us begin with the hiatus patterns. Recall that sequences of two adjacent vowels are allowed within morphemes, but with certain restrictions. The chart of adjacent surface vowel combinations within mono-morphemes was given in (4).

Let us assume that a sequence of two identical vowels is not allowed and that long vowels are exclusively the result of moraicity, not root node sequences.² In addition, let us assume that subset phonological representations are absorbed into superset representations (similar to the coalescence of common feature analysis of Kàlòng - Morén 2006). This would mean that potential (i.e. RotB) morpheme-internal VV sequences should surface in the ways indicated in (29).

² This needs to be explored more thoroughly. According to S&T, geminate consonants are “false” in that they are the result of adjacent root nodes that have undergone total assimilation. If this is a general strategy in Hungarian, then long vowels may be sequences of assimilated root nodes. This would have profound consequences for both the overall vowel length analysis, but also the hiatus analysis. Because there are cases of vowel deletion in response to hiatus due to morpheme concatenation, I will begin with the assumption that deletion is the general strategy. More work is necessary here.

(29) Predicted response to morpheme-internal hiatus

	i	y	u	e	ø	o	a	E	I	O
i	i	y	iu	i	<u>iø</u>	<u>io</u>	<u>ia</u>	<i>iE</i>	i	i
y	y	y	y	y	y	[y]	ya	<i>yE</i>	y	y
u	ui	y	u	<u>ue</u>	(uø)	u/'uo'	ua	<u>[uE]</u>	u	u
e	i	y	<u>eu</u>	e	ø	<u>eo</u>	ea	<i>[eE]</i>	<i>eI</i>	e
ø	(øi)	y	øu	ø	ø	ø	[øa]	<i>[øE]</i>	<i>[(øI)]</i>	ø
o	<u>oi</u>	[y]	<u>[u](ou)</u>	<u>oe</u>	ø	o	oa	<i>[oE]</i>	<i>[oI]</i>	o
a	<u>ai</u>	(ay)	au	ae	[aø]	ao	a	<i>E</i>	<i>[aI]</i>	a
E	<i>Ei</i>	(Ey)	<i>[Eu]</i>	<i>[Ee]</i>	<i>[Eø]</i>	<i>[Eo]</i>	<i>E</i>	<i>E</i>	<i>E</i>	<i>E</i>
I	i	y	u	<i>Ie</i>	<i>[Iø]</i>	<i>[Io]</i>	<i>[Ia]</i>	<i>E</i>	<i>I</i>	<i>I</i>
O	i	y	u	e	ø	o	a	<i>E</i>	<i>I</i>	<i>O</i>

Legend: black shading=predicted singleton output of input sequence, i.e. illicit sequence.

[]=not attested in S&T. ()=no data for this order, but opposite order is found. Light shading=wrong prediction. Bold italics=non-harmonizing “front” vowel. Underline=could be non-harmonizing or not. Blue shading=possible accidental gap.

Note: the non-harmonizing “front” vowels (particularly /I:, I/) may be subject to harmony with an adjacent V-place[cor] vowel, thus eliminating some of the predicted hiatus sequences. More work is needed here.

Assuming the absorption strategy, correct predictions are made for most gaps in the data (black shading). The only incorrect prediction is the lack of surface [uo], which is expected to surface as [u]. I have nothing to say about this exception except that it is only found in loans, so perhaps is subject to exceptional loanword phonology (e.g. extra faithfulness). Several other predictions are made here. First, an adjacent sequence of transparent vowels should not exist (see lower right). Second, an unstable vowel should never be found adjacent to another vowel. Third, “transparent” vowels in hiatus should be visible as such only when adjacent to [u], [o] and [a]; and these are potentially contrastive with “non-transparent” vowels in the same contexts - so, we might expect to find roots with this type of hiatus that trigger front harmony or not **[look for these cases!]**.

To summarize, the PSM feature specifications in (28) combined with an absorption/coalescence strategy correctly predicts most of the hiatus pattern of Hungarian. Some of the predictions need to be verified and the one false prediction, specific to loanwords, needs to be investigated.

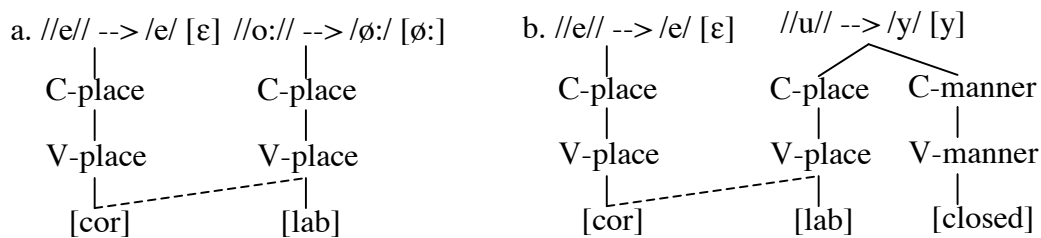
Binary Harmony

Returning to the binary harmony pattern (see (10)), most of the vowel alternations are quite straightforward. Surface harmony of this type involves the spread of a V-place[cor] feature to an underlyingly non-coronal vowel.

(30)

- a. //eC+o:// --> /eCø:/ [ɛCø:]
- b. //eC+u// --> /eCy/ [ɛCy]
- c. //eC+u:// --> /eCy:/ [ɛCy:]

(31)

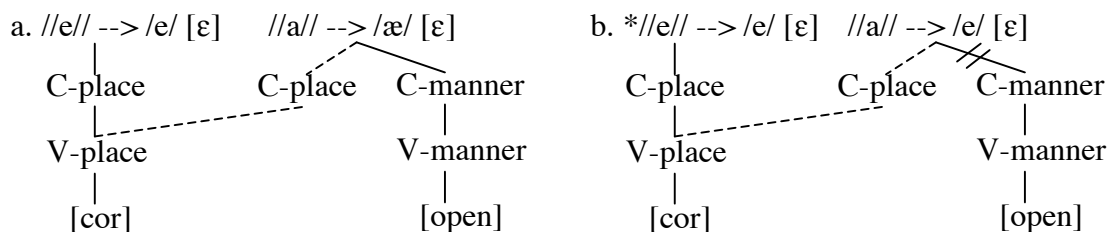


In the case of the low vowels following a non-labial vowel, there are two potential ways to derive the correct surface form. One strategy is to disallow the combination of V-manner[open] and place features. This would force the low vowel to lose its manner under pressure to assimilation in coronal place. A second strategy is to allow the combination of V-manner[open] and V-place[cor]. Both of these options are demonstrated in (33). However, manner deletion makes the incorrect prediction that the low vowel should participate in the ternary harmony pattern to be discussed. This is shown in (34).

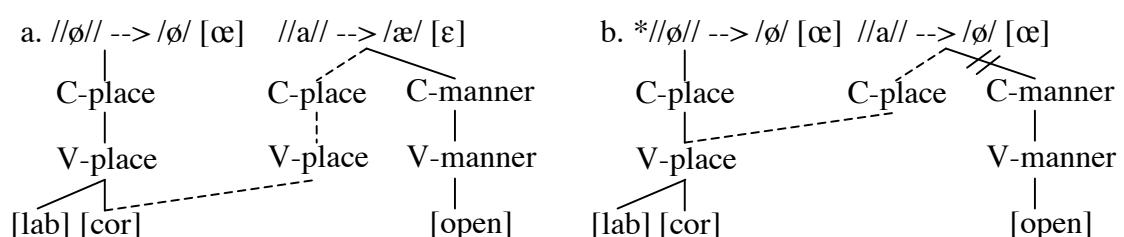
(32)

- a. //eC+a// --> /eCe/ [ɛCɛ]
- b. //eC+a:// --> /eCe:/ [ɛCe:]
- c. //øC+a// --> /øCe/ [œCɛ] *[œCœ]
- d. //øC+a:// --> /øCe:/ [œCe:] *[œCø:]

(33) Low front vowel creation versus manner deletion - correct surface results for both



(34) Low front vowel creation versus manner deletion - incorrect surface results for one

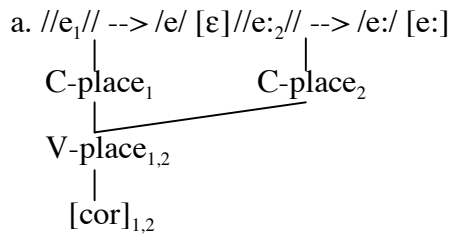


If we assume the segment-internal absorption strategy outlined above, there is also covert coronal harmony when the suffix has an underlyingly coronal vowel.

(35)

- a. //eC+e:// --> /eCe:/ [ɛCe:]
- b. //eC+i:// --> /eCi:/ [ɛCi:]
- c. //eC+i// --> /eCi/ [ɛCi]

(36)



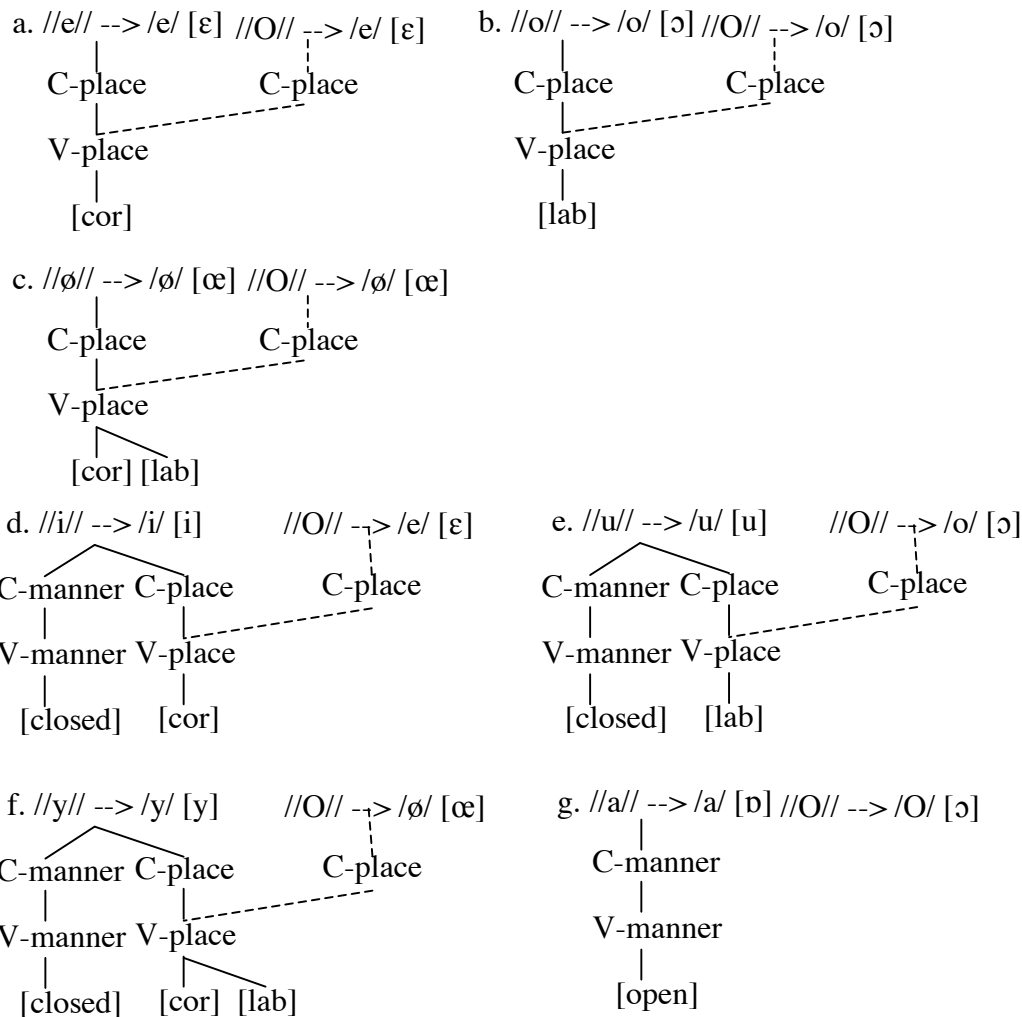
Ternary Harmony

Recall that the “unstable” vowel and the epenthetic vowel have a ternary harmony pattern (if we ignore lowering stem environments). I suggest that these vowels are empty root nodes that gain the place features of the preceding vowel. Here, both V-place[cor] and V-place[lab] assimilate. However, height structure does not. Therefore, these vowels never surface as high or low when harmony adjacent to a high or low vowel.

(37)

- a. //eC+O// --> /eCe/ [ɛCɛ]
- b. //oC+O// --> /oCo/ [ɔCɔ]
- c. //øC+O// --> /øCœ/ [æCœ]
- d. //iC+O// --> /iCe/ [iCɛ]
- e. //uC+O// --> /uCo/ [uCɔ]
- f. //yC+O// --> /yCœ/ [yCœ]
- g. //aC+O// --> /aCO/ [ɒCɔ]

(38)

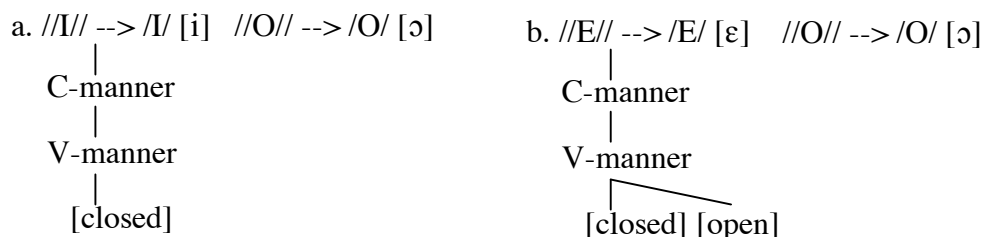


Note that a mannerless segment following a front round vowel becomes front round. Comparing (38c) with the incorrect result of low vowel fronting harmony given in (34b) shows us that the correct analysis of low vowel fronting harmony is the creation of a phonologically low front vowel.

Non-participating Vowels

Recall that $[i:, i, e:, \epsilon]$ do not always participate in harmony. I suggested above that those that do not are actually phonologically distinct and do not have place features: $/I:, I, E:, E/$. Since they do not have place features, and harmony in this language involves phonological place, then they have no effect on harmonizing vowels. This is particularly clear in the case of unstable and epenthetic vowels, which remain featureless in this environment and surface with default realization.

(39)



“Lowering” Stems

Recall that lowering stems cause the following unstable/epenthetic vowel to lower and display only a binary harmony pattern - i.e. [ɒ~ɛ] rather than [ɔ~ɛ~œ]. I propose that the lowering stems form a coherent morphological class that chooses lexically stored allomorphs containing a low vowel. For example, we have the following lexical items given in (40) combined as in (41).

(40)	a. //vi:z// _N	b. //ʉl:d// _{N,lower}	c. //by:z// _N	d. //sy:z// _{N,lower}
	e. //bot// _N	f. //fog// _{N,lower}	g. //-Ok// _{pl}	h. //-ak// _{pl,lower}

(41)	a. //vi:z// _N	+ //-Ok// _{pl}	-->	/vi:zek/	[vi:zek]
	b. //ʉl:d// _{N,lower}	+ //-ak// _{pl,lower}	-->	/ʉldak/	[hidɒk]
	c. //by:z// _N	+ //-Ok// _{pl}	-->	/by:zøk/	[by:zæk]
	d. //ty:z// _{N,lower}	+ //-ak// _{pl,lower}	-->	/tyzæk/	[tyzæk]
	e. //bot// _N	+ //-Ok// _{pl}	-->	/botok/	[bɒtɒk]
	f. //fot// _{N,lower}	+ //-ak// _{pl,lower}	-->	/fotak/	[fɒtɒk]

[glosses and /a/ stems]

The non-lowering stems condition both coronal and labial harmony, while the lowering stems condition only coronal harmony.

An alternative analysis would be to say that the lowering stems end in a floating V-manner[open] feature that attaches to an empty root node (unstable and epenthetic vowels) when available. The problem with such an approach is that it would predict that all suffixes containing unstable or epenthetic vowels would necessarily undergo lowering. This is clearly not the case as the //ʉOz// suffix demonstrates. It does not lower and harmonizes with the labiality of the preceding vowel, even in lowering stems.

(42)	a. //vi:z// _N	+ //-ʉOz// _{all.}	-->	/vi:zuhez/	[vi:zhɛz]
	b. //ʉl:d// _{N,lower}	+ //-ʉOz// _{all.}	-->	/ʉldʉOz/	[hidhɔz]
	c. //by:z// _N	+ //-ʉOz// _{all.}	-->	/by:zuøz/	[by:zhœz]
	d. //ty:z// _{N,lower}	+ //-ʉOz// _{all.}	-->	/tyzuøz/	[tyzhœz]
	e. //bot// _N	+ //-ʉOz// _{all.}	-->	/botʉoz/	[bɒthɔz]
	f. //fot// _{N,lower}	+ //-ʉOz// _{all.}	-->	/fotʉoz/	[fɒthɔz]

[glosses and /a/ stems]

Vowel Summary

Hungarian has a very complex vowel system. It has 14 long-short pairs, including two sets of front round vowels. In addition, it displays a variety of hiatus restrictions and a wealth of harmony patterns. Roots and some suffixes do not display overt harmony, but some suffixes do. Binary harmony is along the front-back dimension, affects most of the vowels, and includes a somewhat unexpected alternation between the low vowels and phonetic mid vowels. This pattern has been analyzed here as involving V-place[cor] spread. The target of binary harmony is claimed to be all vowels in participating suffixes that would not become illicit by the addition of the coronal feature. Ternary harmony only affects the short mid vowels. It has been analyzed as the spread of both V-place[cor] and V-place[lab] to an otherwise empty root node (unstable and epenthetic vowel). There is a class of stems that condition a binary harmony pattern in suffixes that normally exhibit ternary harmony. These are called lowering stems, and I have analyzed them as a morphological class that selects lexical allomorphs containing a low vowel. This low vowel participates in coronal harmony, but not labial harmony, because of feature co-occurrence restrictions. The unrounded front vowels in this language have a dual nature with respect to harmony. They sometimes trigger it and sometimes not depending on their lexical affiliation. I analyzed this as evidence of two sets of “front” vowels, one of which has a V-place[cor] feature, and the other does not. The vowels that participate in ternary harmony fall into two distinct classes - the unstable vowel, which are similar to the Slavic *yer* in that it is underlying but surfaces only under appropriate conditions, and the epenthetic vowel, which serves to repair syllable structure. Both of these vowels are analyzed here as empty root nodes that gain place, but not manner, features from the preceding vowel.

[Blah, blah, blah!]

Surface Consonant Inventory

The surface inventory of consonants is given in (43) using fairly standard phonetic descriptors.³ I do not have anything to say about their participation in the phonology (including their feature specifications) at this time. I provide the inventory here for completeness and to give you something to think about for next week.

(43) Surface Phonetic Consonant Inventory (36 “segments”)

Passive	Upper lip		Upper teeth		Alveolar ridge				Palate		Velum				Larynx			
Active	Lower lip				Tongue blade				Tongue body									
Laryn.	plain	voi	plain	voi	plain	voi	plain	voi	plain	voi	plain	voi	plain	voi	plain	voi	plain	voi
Stop	p	b			t	d					c	ɟ	ç	g	k	g		
Aff.							ts	dz	tʃ	dʒ								
Fric.			f	v			s	z	ʃ	ʒ	ç	ɟ	x		x		h	ɦ
Nas.		m		ɱ		n				ɳ		ɲ				ŋ		
Lat.						l												
Rhot.						r												
App.				ʋ								j						

Not all of these surface consonants are phonologically contrastive, and it looks as if some of them are strictly the result of phonetic effects (e.g. articulator overlap). Although it is beyond

³ Note that even this is a simplification since there are several co-articulations that are excluded from this chart.

the scope of this discussion to delve into all of the details of the phonetics and phonology of Hungarian consonants, it is instructive to view the basic facts to better understand the feature system of the language.

The first thing to note about the surface inventory is that it is quite phonetically dispersed. Seven manners, five passive articulators, four active articulators and three laryngeal configurations are used to differentiate among 36 different phonetic consonants. Further, all the obstruents form plain-voiced pairs, with the exception of the velar fricative, which is never voiced on the surface in this language.

Although the inventory in (43) is beautifully symmetrical, several members are non-contrastive and occur only in very restricted environments. In addition, there is evidence from the phonological patterning of the consonants that there is not a 1:1 mapping between the traditional phonetic descriptions and the phonological feature specifications. (44) abstracts away from the phonetically based descriptions and allophony and presents only the surface phonological consonants. Note that the descriptors used here are now still quite “phoneticky”, but they hint at a phonological analysis to be provided next week.

(44) Surface Phonological Consonant Inventory (26 “segments”)

	lab				cor		dor	
		voi		voi		voi		voi
stop	p	b	t	d	c	ɟ	k	g
stop&cont.			ts	dz	tʃ	dʒ		
cont.	f	v	s	z	ʃ	ʒ		
nasal	m		n		ɲ			
stop&high			l					
cont.&high			r					
	ʋ				j		ɰ	

The chart in (45) shows the contrastive inventory of the language. Note that one of the voiced fricatives and one of the voiced affricates is missing. These, I will claim, only surface as the result of phonological processes and do not seem to be contrastive.

(45) Contrastive Phonological Consonant Inventory (24 “segments”)

	lab				cor		dor	
		voi		voi		voi		voi
stop	p	b	t	d	c	ɟ	k	g
stop&cont.			ts		tʃ	dʒ		
cont.	f		s	z	ʃ	ʒ		
nasal	m		n		ɲ			
stop&high			l					
cont.&high			r					
	ʋ				j		ɰ	

I hope things weren't too incomprehensible. See you Friday!

Alternative - S&T(2000) using PSM

Interestingly, the analysis above is very similar to that given by S&T. If one abstracts away from their mix of SPE-like binary features and element-like unary features, the only substantive difference are 1) they use five features, while I use four; 2) they do not require that more complex structures imply less complex structures; and 3) they characterize the harmony in terms of labial and dorsal place, while I characterize it in terms of labial and coronal place. To be quite honest, I had considered their approach (translated into the PSM) because other than requiring the use of an additional feature, it has many advantages. First, it requires fewer covert vowels. One set of “unrounded mid front” vowels is unnecessary. Second, the chart below shows that the explanation of non-harmonizing and harmonizing suffixes is much neater in a S&T-like analysis. That is, there is no need to morphologically restrict harmony. All vowels (except /I:/, /I/, perhaps) may be in suffixes and only those that meet the right phonological structural description undergo harmony, while the rest do not harmonize. In my story above, I had to claim that certain classes of morphemes were exempt from harmony for morphological reasons.

(46)

		C-place			C-manner		phenomenon	lowering context?	suffix?
		lab	cor	dor	closed	open			
/ə/	[ɛ]						--> /o/+dor, /ø/+lab, /e/+cor		yes
/ø:/	[ø:]	✓					--> /o:/+dor-lab, trigger lab		yes
/ø/	[œ]	✓					--> /o/+dor-lab, trigger lab		yes
/e:/	[e:]		✓				not target		yes-no change
/e/	[ɛ]		✓				not target		??-no change
/o:/	[o:]			✓			trigger dor		yes-no change
/o/	[ɔ]			✓			trigger dor		yes-no change
/I:/	[i:]				✓				no?-no change?
/I/	[i]				✓				no?-no change?
/y:/	[y:]	✓			✓		--> /u:/+dor-lab, trigger lab		yes
/y/	[ɥ]	✓			✓		--> /u/+dor-lab, trigger lab		yes
/i:/	[i:]		✓		✓		not target		yes-no change
/i/	[ɪ]		✓		✓		not target		yes-no change
/u:/	[u:]			✓	✓		trigger dor		??-no change
/u/	[ʊ]			✓	✓		trigger dor		yes-no change
/æ:/	[e:]					✓	--> /a:/ +dor	yes	yes
/æ/	[ɛ]					✓	--> /a/ +dor	yes	yes
/a:/	[a:]			✓		✓	trigger dor	yes	yes-no change
/a/	[ɒ]			✓		✓	trigger dor	yes	yes-no change

This approach captures all of the harmony, unstable vowel and epenthetic vowels facts. The major problem that it seems to run into is in accounting for lowering stem behavior. Recall that lowering stems select for lexical allomorphs that contain a placeless low vowel rather than one containing the empty vowel. While this works quite nicely for most cases, it runs into an interesting problem when it encounters those lowering stems that contain only non-back vowels, as shown in (48b). There seems to be no immediate way to force the vowel to surface as back. This was the primary reason I abandoned this analysis. Recall that my analysis handled this by claiming that the harmony was of coronal place and then claiming that the front vowels that do not trigger fronting are unspecified for place (see (41b) and (42b)).

- (47) a. //vi:z//_N b. //ʷi:d//_{N,lower} c. //by:z//_N d. //syz//_{N,lower}
 e. //bot//_N f. //fog//_{N,lower} g. //-Ok//_{pl} h. //-æk//_{pl, lower}

- (48) a. //vi:z//_N + //-Ok//_{pl} --> /vi:zek/ [vi:zek]
 b. //ʷi:d//_{N,lower} or //ʷI:d//_{N,lower} + //-æk//_{pl, lower} --> */ʷi:dæk/ or */ʷI:dæk/ *[hidæk]
 c. //by:z//_N + //-Ok//_{pl} --> /by:zøk/ [by:zæk]
 d. //ty:z//_{N,lower} + //-æk//_{pl, lower} --> /tyzæk/ [tyzæk]
 e. //bot//_N + //-Ok//_{pl} --> /botøk/ [botøk]
 f. //fot//_{N,lower} + //-æk//_{pl, lower} --> /fotæk/ [fotøk]

However, S&T provide an ingenious solution to this. They claim that these exceptionally behaving lowering roots are phonologically specified with a floating dorsal feature that associates with the suffix vowel.

- (49) a. //vi:z//_N + //-Ok//_{pl} --> /vi:zek/ [vi:zek]
 b. //ʷi:d^{dor}//_{N,lower} + //-æk//_{pl, lower} --> /ʷi:dæk/ [hidøk]

- (50) a. //vi:z//_N + //-ʷOz//_{all.} --> /vi:zuwez/ [vi:zhæz]
 b. //ʷi:d^{dor}//_{N,lower} + //-ʷOz//_{all.} --> /ʷiduwoz/ [hidhæz]
 c. //by:z//_N + //-ʷOz//_{all.} --> /by:zuwøz/ [by:zhæz]
 d. //ty:z//_{N,lower} + //-ʷOz//_{all.} --> /tyzuwøz/ [tyzhæz]
 e. //bot//_N + //-ʷOz//_{all.} --> /botuwoz/ [bøthæz]
 f. //fot//_{N,lower} + //-ʷOz//_{all.} --> /fotuwoz/ [føthæz]

(these should be plural!)

Which analysis to use?

1) I have worked out the harmony details for my approach, but not for the updated S&T approach. So, much hinges on the intuition that the S&T-like approach works fully.

2) Both analyses have their advantages and disadvantages:

	<u>Morén</u>	<u>S&T-like</u>	
# features	4 ✓	5	
# segments	21	19 ✓	
Simple hiatus account	yes ✓	no	(absorption)
Need root harmony	no ✓	yes	
Need feature deletion	no ✓	yes	(lab deletes under harmony)
Need different place behaviors	no ✓	yes	(lab deletes, cor does not)
Need transparent Vs	no ✓	yes	
Need floating feature	no ✓	yes	
Need suffix classes	yes	no ✓	
Connection with Cs	semi	directly parallel ✓	
Easily mapped to phonetics	no	yes ✓	

				V-place		V-manner	
				lab	cor	closed	open
Epenthetic/unstable	//O//	/O/	[ɔ]				
Mannerless “mid”	//o:/	/o:/	[o:]	✓			
	//o/	/o/	[ɔ]	✓			
	//e:/	/e:/	[e:]		✓		
	//e/	/e/	[ɛ]		✓		
	//ø:/	/ø:/	[ø:]	✓	✓		
	//ø/	/ø/	[œ]	✓	✓		
“High”	//ɪ:/	/ɪ:/	[i:]			✓	
	//ɪ/	/ɪ/	[i]			✓	
	//u:/	/u:/	[u:]	✓		✓	
	//u/	/u/	[u]	✓		✓	
	//i:/	/i:/	[i:]		✓	✓	
	//i/	/i/	[i]		✓	✓	
	//y:/	/y:/	[y:]	✓	✓	✓	
	//y/	/y/	[y]	✓	✓	✓	
Phonological “mid”	//E:/	/E:/	[e:]			✓	✓
	//E/	/E/	[ɛ]			✓	✓
“Low”	???	/æ:/	[e:]		✓		✓
	???	/æ/	[ɛ]		✓		✓
	//a:/	/a:/	[a:]				✓
	//a/	/a/	[ɒ]				✓