CHAPTER 3

SEGMENTAL PHENOMENA INFLUENCED BY STRESS

3.1 Introduction

Previously in this dissertation, we established that prominence and foot structure are two distinct entities in the grammar, and discussed several ways in which these entities might interact. Stress and foot structure can be misaligned if there are constraints that outrank Prominence Alignment constraints that refer to alignment of prominence with edges of feet. In Nganasan, misalignment is caused, under the present proposal, by WORDFINALITY, sonority of stressed vowels, and CLASH constraints all outranking the Prominence Alignment constraint. In Meadow Mari, binary foot structure evidenced by full/reduced vowel alternations appears to have no effect on the pattern of stress assignment, because constraints relating stress to Prosodic Word edges, morphological class (root vs. affix) to which stressed vowels belong, and on sonority of stressed vowels all outrank the Prominence Alignment constraint.

The main task of this chapter, as well as Chapter 4, is to investigate whether prominence and foot structure, being distinct in the grammar, can have different effects on segmental alternations. In cases where we find the position of stress and position of foot boundaries misaligned, we will investigate what kind of constraints cause the disparity. The present chapter will discuss cases where prominence influences segmental alternations, proceeding to cases where binary foot structure has effect on segmental alternations in Chapter 4.

By far, the two most common straightforward conditions on segmental alternations that we seem to encounter are (i) on vowel harmony where the trigger has to be stressed, and (ii) conditions on appearance of certain consonants within stressed syllables vs. consonants in unstressed syllables. At this point, we will remain largely agnostic as to whether this is a condition that is better defined using prominence or unbounded foot structure. We will start with some examples of vowel harmony in section 3.2 and then

proceed to the discussion of other phenomena where the same kind of prosodic notion seems to play a role in section 3.3.

3.2 Vowel Harmony

It appears that most, if not all types of vowel harmony can be influenced by position of stress/head of unbounded foot within a Prosodic Word.

Lhasa Tibetan (Sino-Tibetan language family) provides an example of vowel harmony for the feature [±high]. In Lhasa Tibetan (Chang and Chang (1967), Majors (1998)), unstressed vowels are raised by adjacent high stressed vowels: before suffixes with high stressed vowels (e.g. negative suffix), vowels in roots are raised.

The Applecross dialect of **Scottish Gealic** (Oftedal (1956), Borgstrøm (1940), Ternes (1973)), a Celtic language spoken in Scotland, has nasal harmony, where nasality spreads rightward from a stressed nasal vowel (usually in the initial syllable) blocked by an obstruent stop. It also nasalizes the onset of the syllable containing the stressed vowel, provided the onset is not an obstruent stop.

In **Chamorro** (Topping (1968), Majors (1998), Flemming (1994)), a language spoken in Guam, there is height harmony that applies only morpheme-internally. In morphemes of the form $(X)CV_1CV_2$ non-low vowels are subject to height harmony triggered by preceding stressed non-low vowels. In addition, if the stressed vowel is low, a mid vowel may not follow.

Breton is reported (Falc'hun (1951), Majors (1998)) as a language where a stressed /e/, /o/ or /œ/ transmits this height to adjacent unstressed mid vowels. The language has three variants of mid vowels in stressed syllables. It appears that instead of a directionality condition (pre-tonic or post-tonic syllables), the condition on this vowel harmony is immediate adjacency, in addition to the stressed/unstressed asymmetry that triggers the harmony.

In **Koya** (Tyler (1969)), the short high vowels [i] and [u] harmonize in unstressed syllables with respect to all vowel features with a following long, and therefore stressed, vowel.

Another well-known case of prosody-dependent harmony (nasal harmony in particular) is presented by **Guaraní**. The language has received a lot of attention among phonologists (Flemming (1994), van der Hulst & Smith (1982), Walker (1998), Beckman (1998), Sportiche (1977), Vergnaud and Halle (1978)) due to several aspects of theoretical interest of the phenomenon of nasalization that include the transparency of voiceless segments, the effect of spreading across morphemes, and the role of prenasalized segments. In this dissertation, we will concentrate on the interaction of nasalization with prosody. The following description of the phenomenon draws on Gregores and Suárez's (1967), Rivas's (1975) grammars, as well as on the data from Walker's (1998) study.

Nasal harmony in Guaraní produces cross-segmental spans of nasalization within words. Bidirectional nasal spreading in the word is initiated by a nasal vowel in a stressed syllable. Nasalization spreads to all voiced segments and is reported to skip voiceless consonants. Spreading is blocked by a stressed syllable containing an oral vowel. In blocking syllables, both the vowel and onset consonant remain oral. In general, all segments in a syllable in Guaraní agree in orality and nasality; in the case of prenasalized segments, they qualify as oral by their oral release.

Nasal spreading is also triggered by nasal closure of a prenasalized stop. In this case, as would be expected, spreading is always regressive:

(1)

a.	/ro-^{m}bo-he^{n}dú/ I-you-CAUS-hear	[r̃õmõñẽ^{n}dú]	'I made you hear' (Rivas 1975)
b.	/ro-^{m}bo-ɣ^{w}atá]	[r̃õ^{m}boɣ^{w}atá]	'I made you walk' (Rivas 1975)
	I-you-CAUS-walk		
c.	/a-je-re^{n}dú/	[ãɲẽr̃ẽ^{n}dú]	'I hear myself' (Rivas 1975)

In words with prefixes, nasalization in the root spreads to the prefix. The situation is somewhat more complicated with suffixes. In general, suffixes can be grouped into two classes. One suffix class is characterized by undergoing spreading of nasalization from the root. Suffixes in the other class are characterized by having a fixed oral or nasal quality.

Suffixes that alternate are unstressed, except two derivational suffixes *-ʔó/-ʔṍ* and *-sé/-sẽ́* (Gregores and Suarez 1967:103), which I will treat as having two allomorphs each for present purposes. The non-alternating oral suffixes are always stressed, and the non-alternating nasal suffixes can be stressed or unstressed. Fixed suffixes do not usually affect the nasal/oral quality of the roots. However, if a suffix contains a stressed vowel and there is a voiced stop between the stressed suffix vowel and a stressed nasal vowel in the root, then nasalization spreads only as far as the voiced (prenasalized) stop. This produces a root with a nasal span followed by an oral span induced by the oral suffix (Rivas 1975). The pattern is illustrated below with the non-alternating oral suffix /ré/. In (2a), this suffix remains oral after a nasal stem. In (2b), it produces orality on the final syllable of an otherwise nasal root:

(2)

a.	/irũ̲-ré/ friend-PAST	[ĩr̃ũ̲ré]	‘ex-friend’ (Rivas 1975)
b.	/^{m}bẽ̲^{n}da-ré/ marry-PAST	[mẽ̲^{n}daré]	‘widow(er)’ (Rivas 1975)
c.	/^{m}bẽ̲nda/	[mẽ̲nã̲]	‘husband’ (Gregores and Suárez 1967)

As mentioned before, the spreading of nasality is blocked by stressed oral vowels, and this blocking creates, in effect, alternating nasal and oral spans:

(3)

a. /laʃeraʔí-ijakãxatã-itereílaek^{w}élape/
[laʃeraʔiʔĩŋãkã xãtã ĩtẽreílaek^{w}élape]

'my child is just too stubborn at school'

b. /rojotopapá^{m}barõroxóvarã/ [rojotopapámãrõrõxóvãrã]
'if now we meet all of us, we will have to go'

c. /^{m}baʔèmbiaʃi/ [^{m}baʔèmbiaʃi]
'sadness'

What is mostly important to us in this dissertation is that Guaraní nasalization is clearly sensitive to stress. This has led some researchers to posit nasalization as limited by rightheaded unbounded feet (Flemming 1994, van der Hulst & Smith 1982), or to utilize feature percolation through a metrical tree (Sportiche 1977, Vergnaud and Halle 1978). Beckman (1998) takes a somewhat different approach suggesting that faithfulness constraints may be sensitive to prosodically prominent positions. She proposes that one such constraint, IDENT-ǵ [nasal], which enforces nasal feature identity in stressed syllables and can derive the effect of metrical domain-bounded nasal harmony in Guaraní. In combination with featural markedness constraints, Beckman (1998) shows that faithfulness to stressed positions is also capable of deriving the limitation of phonemic nasality to stressed vowels. Therefore, just as in cases of vowel harmony we have seen before, one of the conditions on the nasal harmony in the language can be analyzed as both dependent on stress, and as dependent on unbounded foot structure. The choice between the two analyses appears to be purely theory-internal rather than empirical.

We will now turn to a case of vowel harmony that, as we show, must be analyzed as dependent on the position of stress rather than metrical constituency, which is manifested differently in the language. The choice of the prosodic category in these cases is empirically determined rather than purely theory-internal.

3.2.1 Case Study: Southwestern Khanty Vowel Harmony

Khanty (Xanty, Ostyak) is a Uralic Ob-Ugrian language that is the closest relative of Maŋşi that we discuss in some detail in the following chapter. In fact, Khanty is a continuum of dialects, some of which are quite different grammatically, and most of which are not mutually comprehensible. The dialect I am describing here is spoken near Krasnojarsk (Russia).

Ten subjects were interviewed in the summer and fall of 2006, all of them in their 50s (three women, seven men). The speakers all live in the same community of about 20 households. The community appears to be somewhat mixed historically: most of the Ostyaks in the community report that their ancestors came from other communities in the beginning of the 20th century, to the best of their recollection, but were not sure where their families lived before the move. Two of the speakers interviewed were third-generation migrants from area around Surgut, where a clearly eastern dialect of Khanty is spoken. I have not noticed any difference in their language with respect to the phenomena I investigate here. However, they were able to pick out some words they comprehend from a recording (made in Khanty-Mansijsk in the spring and summer of 2005) of an eastern dialect, though they could not understand complete sentences from the recording, and pointed out that they pronounced the words they picked out differently than what they heard on the tape. All the speakers are completely fluent in Russian, barring words for some household items and traditional activities.

The dialect differs from dialects of Khanty that were previously described in some detail, which are various Eastern (see Schteinitz (1937), Životikov (1942), Gulya (1966), Katz (1975), Honti (1993), Abondolo (1998)) or Northern or Northwestern (Paasonen (1965), Nikolaeva (1995, 1999), Ackerman and Nikolaeva (1997), Kovgan (1991)) varieties. The dialect is not unlike Northwestern dialects in that it has a reduced vowel inventory compared to Eastern dialects, a reduced consonant inventory, and loss of some case markings (but not as drastic a loss as in Northern dialects that are reported to have only three cases), but it shows vowel harmony that is present in Eastern dialects (though different in details), but is missing in Northwestern dialects.

3.2.1.1 Relevant basics

The dialect of Khanty under investigation has the following vowel system:

(4)

	Short			**Long**		
	front	central	back	front	central	back
high	i		u	ii		uu
mid	e, ö		o	ee, öö		oo
low			a			aa

The short back mid vowel is slightly higher that its long counterpart (possibly [ɔ]). Long and short [a] (and allophonic [ä]) appear in complementary distribution in non-initial syllables: short [a] appears in final and closed syllables, and long [aa] in open non-final syllables. Hence, there are synchronic alternations with suffixation, e.g.:

(5)

jeernäs ‘dress’	jeernääs-əŋän ‘two dresses’
kuuṣa ‘master’	kuuṣaa-ŋan ‘two masters’

In initial syllables, however, the contrast is preserved:

(6)

taaṣ ‘herd’	* taṣ	taaṣ-əŋan ‘two herds’	
tal ‘year’		tal-əŋan ‘two years’	*taal-əŋan

Long [ee] alternates with short [i] in non-initial syllables: [i] (and its back counterpart [ï]) appears in final syllable, while [ee] in non-final (suffixed forms) syllables, both open and closed:

(7)

söörɲi ‘gold’	söörɲee-nä ‘gold’ (Loc)
kasï ‘pain’	kasee-nä ‘pain’ (Loc)

Long [ee], however, can appear in final syllables, and does not change if followed by a suffix:

(8)

ɲawreem ‘child’	*ɲawrïm	ɲawreem-ənä ‘child’ (Loc)
nareem ‘bridge’	*narïm	nareem-ənä ‘bridge’ (Loc)
aaŋkee ‘mother’	*aaŋkï	aaŋkee-nä ‘mother’ (Loc)
oopee ‘older sister’	*oopï	oopee-nä ‘older sister’ (Loc)

Vowels [ï], [ä], and [ü] do not appear contrastively, and never appear in initial syllables, but only as results of vowel harmony, to be discussed next.

Schwas can always be analyzed as epenthetic, as they (i) never appear in initial syllables, and (ii) serve to break up illicit consonant clusters in the language. There are no complex onsets in Khanty, consonant clusters are allowed inside roots only, and not within suffixes or at morpheme boundaries in the data collected. Finally, a coda can contain two consonants, but only if they have the same place of articulation:

(9)

xatl ‘sun’	*xatəl	cf.	xatl-ənа ‘sun’ (Loc)
peeŋk ‘tooth’	*peeŋək		peeŋk-ənä ‘tooth’ (Loc)
čeeɲc ‘joint’	*čeeɲəc		čeeɲc-ənä ‘joint’ (Loc)
jiŋk ‘water’	*jiŋək		jiŋk-ənä ‘water’ (Loc)
öömp ‘dog’	*öömәp		öömp-ənä ‘dog’ (Loc)
lunt ‘wild goose’	*lunət		lunt-ənа ‘wild goose’ (Loc)

Schwa is epenthesized if the potential root-final coda contains consonants with different places of articulation:

(10)

ɲeeləm ‘tongue’	*ɲeelm	cf.	ɲeelm-ənä ‘tongue’ (Loc)
piixəl ‘fishing line’	*piixl		piixl-ənä ‘fishing line’ (Loc)
nömәs ‘mind’	*nöms		nöms-ənä ‘mind’ (Loc)

laajəm ‘axe’	*laajm	laajm-əna ‘axe’ (Loc)
owəŋ ‘stream’	*owŋ	owŋ-əna ‘stream’ (Loc)

In Locative forms in (10), the consonant clusters are neither complex codas, nor do they appear across a morpheme boundary, hence there is no schwa epenthesis between the last two consonants. In Nominative/Absolutive forms (unaffixed), the complex coda is broken up by a schwa. It is possible to analyze all schwas in the language as derived, even though some suffixes always appear with one, e.g. 2nd person plural possessive *-lən*.

3.2.1.2 Stress

The dialect of Khanty under discussion has only primary stress that falls on the leftmost syllable in a word with light syllables only (including closed syllables), both in underived and derived forms:

(11)

tútjux ‘firewood’	tútjux-ətï ‘firewood’
kólxoz ‘farm’	kólxoz-ətï ‘farm’
nőməs ‘mind’	nőms-əti ‘mind’
wóntut ‘pine forest’	wóntut-ətï ‘pine forest’
ŋóxəs ‘sable’	ŋóxs-ətï ‘sable’

If, however, a word has a long vowel, whether initial or not, it is the long vowel that receives stress:

(12)

xóotjux ‘log’	wixéeta ‘cry, shout’
xörpáaləx ‘(physically) disabled person’[1]	xörpáaləx-ətï ‘disabled person’
sáawï ‘guard, shepherds’	naréem ‘bridge’
léetit ‘food’	ŋawréem ‘child’
kúuşa ‘master’	uléem ‘sleep’

If there is more than one heavy syllable in a word, it is the leftmost heavy syllable that gets stressed, both within roots and when a suffix with a long vowel is added (below,

[1] Originally probably a compound (‘half’ + ‘leg’), ‘a person who limps’, but lexicalized now, speakers revealed no awareness that the word is derived, and use it to describe any physically disabled person.

suffix *-jiin/-iin/-jïïn/-ïïn* forming adverbs from nouns (with the meaning ‘N-ly’, ‘in a manner of N’):

(13)

áaŋkee ‘mother’	áaŋkee-jiin ‘in a motherly fashion’
xőöseeŋk ‘fish soup’	xőöseeŋk-iin ‘like fish soup’
xőöxeeʌ́ ‘female (animal)’	xőöxeeʌ́-iin ‘like a female (animal)’
óopee ‘older sister’	óopee-jiin ‘older sisterly’
jóoxeel ‘bow’	jóoxeel-iin ‘like a bow’

Even if a long vowel is derived rather than underlying, the stress still falls on the long vowel, drawing the stress away from the initial syllable (if the initial syllable is light):

(14)

púsï ‘tail’	pusée-ti ‘tail’ (Transl)
ǰítä ‘enemy’	jitáa-ti ‘enemy’ (Transl)
őxsäm ‘scarf’	öxsáam-ətï ‘scarf’ (Transl)
ŋőxä ‘meat’	ŋöxáa-tï ‘meat’ (Transl)
sárï ‘salmon’	sarée-ti ‘salmon’ (Transl)
xúlï ‘dirt’	xulée-ti ‘dirt’ (Transl)
púwləpsï ‘tumor’	puwləpsée-ti ‘tumor’ (Transl)

Finally, a word is evaluated as a whole, i.e. if the leftmost long vowel occurs in a suffix rather than in a root, the suffix vowel receives stress:

(15)

sus ‘autumn’	sus-ín ‘in an autumn(ly) fashion’
tin ‘price’	tin-ín ‘pricily’
loş ‘snow’	loş-ín ‘like snow’
kuʌ́ ‘devil’	kuʌ́-ín ‘in devil-like fashion’
röp ‘mountain’	röp-ín ‘like a mountain’
sam ‘heart’	sam-ín ‘warmly, sensitively’
xir ‘sack’	xir-ín ‘like a sack’
tútjux ‘firewood’	tutjux-ín ‘like firewood’
népək ‘letter’	nepk-ín ‘like a letter’
kólxoz ‘farm’	kolxoz-ín ‘like on a farm’
nőməs ‘mind’	nöms-ín ‘rationally, cerebrally’

To show that it is not the particular (adverb forming) suffix that causes the stress shift from the root but rather a general pattern of stressing the leftmost heavy syllable, we can take a look at forms that have long vowels in roots:

(16)

óoxsar ‘fox’	óoxsaar-ïïn ‘like a fox’
sőörŋi ‘gold’	sőörŋee-jiin ‘like gold’
úuxəl ‘sledge’	úuxəl-ïïn ‘like a sledge’
őömp ‘dog’	őömp-iin ‘like a dog’
áaş ‘father’	áaş-ïïn ‘fatherly’
íki ‘old man; an ancient’	ikée-jiin ‘like an old man; an ancient’
mútra ‘miracle’	mutráa-jïïn ‘miraculously’
mójpar ‘young bear’	mojpáar-ïïn ‘like a young bear’
rásï ‘fringe’	rasée-jiin ‘like fringe’
jőxän ‘river’	jöxáan-ïïn ‘like a river’

As we can see from the data above, regardless of whether a long vowel belongs to a root or a suffix, it is the leftmost long vowel that receives the stress, which can therefore be assigned to either first, second, or third syllable of the word, depending on what syllable contains the leftmost heavy syllable.

To summarize, the stress pattern of the dialect of Khanty under discussion can be characterized as a ‘default-to-same’ pattern: stress falls on the leftmost heavy syllable; if a word contains no heavy syllable, the leftmost syllable receives the stress. Stress assignment is not dependent on whether a long vowel is underlying or derived. Neither does it depend on the morphological constituency of a word, as derived and underived words are treated in the same manner for the purposes of stress assignment.

3.2.1.3 Vowel Harmony

As we have mentioned before in this chapter, the dialect of Khanty we are investigating has vowel harmony. In particular, we can observe the type of vowel harmony that affects the feature [±front]. However, we can see that some roots are disharmonic with respect to this feature. In underived environment, there are two types of roots that can be disharmonic:

(17)

a. naréem ‘bridge’
uléem ‘sleep’
ɲawréem ‘child’
apsəjée ‘bear’
nuʌ́éex ‘ceremonial ring’

b. ɲő̈örəm ‘swampy place’
nő̈məs ‘mind’
kʹiimpəl ‘scale (of a cone)’
néepək ‘book’
pʹiixəl ‘fishing line’
jeertəp ‘fence’
xörpáaləx ‘disabled person’

In (17a), the initial [-front] vowel is followed by a front vowel, long [ee] (with another front vowel [ə] in between in case of *apsəjée* ‘bear’). The long vowel, being the peak of the leftmost heavy syllable in a word, also bears stress. In (17b), in contrast, a [+front] initial vowel, whether long or short, is followed by [-front] schwa, which does not bear stress. In fact, since schwas are never initial or long, they never bear stress in the language. Both long [ee] and [ə] can appear in harmonic roots as well:

(18)

a. jéewee ‘sister’
xő̈öseeŋk ‘fish soup’
lixéen ‘fire’
xő́jéeʌ ‘son-in-law’
xő̈öxeeʌ ‘female (animal)’

b. tóxəl ‘wing’
ówəŋ ‘stream’
úuxəl ‘sledge’
láajəm ‘axe’
wóoləx ‘wolf’

The data in (18) above suggest that neither [ee] nor [ə] are subject to vowel harmony. The two, however, behave differently in derived environments: while long [ee], if it is the leftmost long vowel in a word, causes every vowel to the right of it to harmonize and show up as [+front] (19a), schwa has no effect on vowels that follow it, and vowels to the right of it can be either [+front] or [-front], depending on the specification of a vowel that precedes schwa and is stressed (19b):

(19)

a. apʂée-nä ‘younger brother’ (Loc)
xulée-nä ‘dirt’ (Loc)
taxtée-nä ‘skin’ (Loc)

b. kʹiimpəl-nä ‘scale (of a cone)’ (Loc)
nő̈məs-nä ‘mind’ (Loc)
láajəm-na ‘axe’ (Loc)

sarée-nä ‘salmon’ (Loc)	lóŋkər-na ‘mouse’ (Loc)
uxée-nä ‘head’ (Loc)	xörpáaləx-na ‘disabled person’ (Loc)

The data in (19) show that even though neither [ee] nor schwa can be a target of [±front] harmony in the language, [ə] is always neutral, whereas [ee] can be a trigger of the vowel harmony. Note, however, that if [ee] is preceded by a stressed (i.e. another long) vowel, it is the front/back specification of the stressed vowel that defines whether vowels that follow are front or back:

(20)

a.	áaŋkee ‘mother’	áaŋkee-ja ‘mother’ (Lat)	*áaŋkee-jä
	óopee ‘older sister’	óopee-ja ‘older sister’ (Lat)	*óopee-jä
	xúunteeɲc ‘backpack’	xúunteeɲc-a ‘backpack’ (Lat)	*xúunteeɲc-ä
	jóoxeel ‘bow’	jóoxeel-a ‘bow’ (Lat)	*jóoxeel-ä
b.	xőöseeŋk ‘fish soup’	xőöseeŋk-ä ‘fish soup’ (Lat)	*xőöseeŋk-a
	xőöxeeʎ ‘female (animal)’	xőöxeeʎ-ä ‘female (animal)’ (Lat)	*xőöxeeʎ-a
	jéewee ‘sister’	jéewee-jä ‘sister’ (Lat)	*jéewee-ja
	píixeeʎ ‘patch (on a boat)’	píixeeʎ-ä ‘patch (on a boat)’ (Lat)	*píixeeʎ-a

Even though it is unclear in (20b) whether the harmonic alternations of the Lative suffix is caused by the initial or the second vowel of the root, the data in (20a) show that it is the stressed vowel that triggers the vowel harmony.

When there is an alternation within the root in derived environments, the generalization is even more clear: it is the stressed vowel, whether it is underlyingly short or long, that triggers the harmony forcing vowels to its right (barring short and long [e] and schwa) to surface with the same [±front] specification as the stressed vowel itself:

(21)

a.	rásï ‘fringe’	rasée-t-ix ‘my fringes’	*rasée-t-ïx
	úxï ‘head’	uxée-t-ix ‘my heads[2]’	*uxée-t-ïx
	sárï ‘salmon’	sarée-t-ix ‘my salmon (pl)’	*sarée-t-ïx
	nárï ‘bench’	narée-t-ix ‘my benches’	*narée-t-ïx

[2] Refers to heads of animals killed by the same person.

	púsï ‘tail’	pusée-t-ix ‘my tails[3]’	*pusée-t-ïx
	xónï ‘stomach’	xonée-t-ix ‘my stomachs’	*xonée-t-ïx
	jántït ‘toy’	jantéet-ət-ix ‘my toys’	*jantéet-ət-ïx
	púwləpsï ‘tumor’	puwləpsée-t-ix ‘my tumors’	*puwləpsée-t-ïx
b.	jïtä ‘enemy’	jitáa-t-ïx ‘my enemies’	*jitáa-t-ix
	ŋőxä ‘meat’	ŋöxáa-t-ïx ‘my (pieces of) meat’	*ŋöxáa-t-ix
	péʌäŋ ‘cloud’	peʌáaŋ-ət-ïx ‘my clouds’	*peʌáaŋ-ət-ix
	cőräs ‘trader’	cöráas-ət-ïx ‘my traders’	*cöráas-ət-ix
	pőskän ‘gun’	pöskáan-ət-ïx ‘my guns’	*pöskáan-ət-ix
	jïnäp ‘hook’	jináap-ət-ïx ‘my hooks’	*jináap-ət-ix
	őxsäm ‘scarf’	öxsáam-ət-ïx ‘my scarves’	*öxsáam-ət-ix
	jőxän ‘river’	jöxáas-ət-ïx ‘my rivers’	*jöxáas-ət-ix

In the data in (21a) above stress alternates between the initial syllable in underived environment and last syllable of the root in derived environment, since the last syllable surfaces as heavy. The possessive suffix /ix/ (1st person singular possessor, plural possessed) appears with the underlying front vowel when it follows a stressed front vowel [ee]. In contrast, in (21b), the same suffix surfaces with a back vowel following stressed [-front] [aa], despite the initial syllables in these words being [+front]. The roots in derived environment in both (21a) and (21b), therefore, are disharmonic. In fact, the quality of vowels that precede the stressed syllable, and the quality of the stressed vowel itself, is determined purely by the underlying specification. Note that since there are no underlying high non-front vowels or low front vowel in the inventory, there are no such vowels on the surface pre-tonically or in a stressed syllable. Post-tonically, however, both long and short variants of [ï], [ä], and [ü][4] appear as a result of vowel harmony:

(22)

a.	rex ‘berry’	rex-əʌix ‘berry’ (Abess)
	weer ‘business’	weer-əʌix ‘business’ (Abess)
	čeeŋc ‘joint’	čeeŋc-əʌix ‘joint’ (Abess)

[3] Refers to tails of animals killed by the same person.

[4] [ü] and [u] are rare in non-initial syllables and seem to point to borrowed words, both recent or old. There is, however, at least one suffix with underlying [u], /ut/ ‘the thing/person that/who (always) Vs (repeatedly or habitually)’, so the restriction might have only be relevant for roots. Alternatively, this suffix might be formerly a second part of compounds, cf. *ut* ‘thing’

	lil ‘soul’	lil-əʎix ‘soul’ (Abess)
	piixəl ‘fishing line’	piixl-əʎix ‘fishing line’ (Abess)
	pöx ‘boy’	pöx-əʎix ‘boy’ (Abess)
	öömp ‘dog’	öömp-əʎix ‘dog’ (Abess)
b.	uw ‘door’	uw-əʎïx ‘door’ (Abess)
	kuurt ‘village’	kuurt-əʎïx ‘village’ (Abess)
	ş̡uuŋ ‘corner’	ş̡uuŋ-əʎïx ‘corner’ (Abess)
	loş̡ ‘snow’	loş̡-əʎïx ‘snow’ (Abess)
	xoop ‘boat’	xoop-əʎïx ‘boat’ (Abess)
	ɲaɲ ‘bread’	ɲaɲ-əʎïx ‘bread’ (Abess)
	laaŋk ‘larch’	laaŋk-əʎïx ‘larch’ (Abess)

All the roots in (22a) are monosyllabic and contain a long or short front vowel. Hence, the vowel in the Abessive suffix (which means ‘without N’, ‘N-less’) is always [+front] after a front stressed vowel of the root. In contrast, the roots in (22b) have non-front vowels, causing the vowel in the suffix to surface as [-front] as well, despite the absence of a high non-front vowel in the underlying inventory. Similarly, appearance of front long or short [ä] is restricted to contexts where vowel harmony applies (see examples with Locative suffix in (19) and Lative in (20)). Deverbal nominalizer /ut/ appears with the front vowel [ü] following, whether immediately or not, a stressed front vowel:

(23)

a.	lipət- ‘feed’	lipt-üt ‘the one who (always) feeds’
	xöʎ- ‘disappear’	xöʎ-üt ‘the one who (always) disappears’
	weel- ‘kill’	weel-üt ‘serial killer’
	exət- ‘cut’	ext-üt ‘the one who (always) cuts’
	pööt- ‘freeze’	pööt-üt ‘the one who (always) freezes’
	lip- ‘eat’	lip-üt ‘glutton’
	wiiş̡k- ‘throw’	wiiş̡k-üt ‘the one who (always) throws’
	söj- ‘spit’	söj-üt ‘the one who (always) spits’
b.	ruupït- ‘work’	ruupeet-ut ‘hard-working person’
	aʎ- ‘sleep’	aʎ-ut ‘person in a coma’
	part- ‘order’	part-ut ‘leader’
	oom- ‘sit’	oom-ut ‘the one who (always) sits’
	poosa- ‘drip’	poosaa-ut ‘the thing that (always) drips’
	kaas- ‘doubt’	kaas-ut ‘indecisive person’
	aara- ‘break’	aaraa-ut ‘the one who (always) breaks something’

por- ‘bite’	por-ut ‘the one who (always) bites’
paajət- ‘drop’	paajt-ut ‘the one who (always) drop’
ɲuuxəl- ‘follow’	ɲuuxl-ut ‘follower’
jowa- ‘wrap (skins)’	jowaa-ut ‘the one who (always) wraps (skins)’

The data in (23) show, among other things, that verbs work the same way nouns do, at least with respect to vowel harmony. The suffix appears with the front vowel following a front stressed vowel in (23a), and with the back vowel after a stressed back vowel. The derived nouns in (23) take the same number, possessive and case suffixes underived nouns do, as illustrated below:

(24)

a.	**+Number (dual)[5]**	**+Possessive (3rd p sg)**	**+Case (Abess)**
	lipt-üt-əŋän	lipt-üt-əŋil-äl	lipt-üt-əŋil-äl-əʎix
	xöʎ-üt-əŋän	xöʎ-üt-əŋil-äl	xöʎ-üt-əŋil-äl-əʎix
	weel-üt-əŋän	weel-üt-əŋil-äl	weel-üt-əŋil-äl-əʎix
	ext-üt-əŋän	ext-üt-əŋil-äl	ext-üt-əŋil-äl-əʎix
	pööt-üt-əŋän	pööt-üt-əŋil-äl	pööt-üt-əŋil-äl-əʎix
	lip-üt-əŋän	lip-üt-əŋil-äl	lip-üt-əŋil-äl-əʎix
	wiiṣk-üt-əŋän	wiiṣk-üt-əŋil-äl	wiiṣk-üt-əŋil-äl-əʎix
	söj-üt-əŋän	söj-üt-əŋil-äl	söj-üt-əŋil-äl-əʎix
b.	ruupeet-ut-əŋan	ruupeet-ut-əŋïl-al	ruupeet-ut-əŋïl-al-əʎïx
	aʎ-ut-əŋan	aʎ-ut-əŋïl-al	aʎ-ut-əŋïl-al-əʎïx
	part-ut-əŋan	part-ut-əŋïl-al	part-ut-əŋïl-al-əʎïx
	oom-ut-əŋan	oom-ut-əŋïl-al	oom-ut-əŋïl-al-əʎïx
	poosaa-ut-əŋan	poosaa-ut-əŋïl-al	poosaa-ut-əŋïl-al-əʎïx
	kaas-ut-əŋan	kaas-ut-əŋïl-al	kaas-ut-əŋïl-al-əʎïx
	aaraa-ut-əŋan	aaraa-ut-əŋïl-al	aaraa-ut-əŋïl-al-əʎïx
	por-ut-əŋan	por-ut-əŋïl-al	por-ut-əŋïl-al-əʎïx
	paajt-ut-əŋan	paajt-ut-əŋïl-al	paajt-ut-əŋïl-al-əʎïx
	ɲuuxl-ut-əŋan	ɲuuxl-ut-əŋïl-al	ɲuuxl-ut-əŋïl-al-əʎïx
	jowaa-ut-əŋan	jowaa-ut-əŋïl-al	jowaa-ut-əŋïl-al-əʎïx

[5] It appears that the number markers used with possessive suffixes differ from the number markers used with non-possessive forms. /ŋan/ is used with non-possessive nouns to mark dual, while /ŋil/ is used before possessive suffixes to mark that the possessed is dual.

The data above confirm the generalization we have made: despite the length of a word or a number of affixes, every post-tonic vowel has the same specification for the feature [front] as the stressed vowel.

The generalizations about vowel harmony in the dialect of Khanty discussed here can be summarized as follows:

(25)

a. every vowel to the right of a stressed vowel agrees with the stressed vowel with respect to the feature [±front];

b. schwa, which is always epenthetic in the language, does not alternate, and there are no stressed (or long) schwas;

c. long or short front central [e] can be a trigger for vowel harmony, causing all post-tonic vowels to be [+front], but does not alternate itself even when in post-tonic position;

d. pre-tonic vowels can agree or disagree with each other or with the tonic vowel with respect to feature [±front], depending on underlying representation;

e. the propagation of the feature [±front] does not depend on morphological structure or length of the word.

So far, this case of [±front] harmony looks exactly like the cases mentioned previously in this chapter: we have seen no evidence to distinguish between stress and head of an unbounded right-headed foot as a trigger of the vowel harmony. There is, however, some evidence that the language has binary foot structure, independent of the accent position. The evidence comes from two similar types of allomorphy, which we will be discussing next.

3.2.1.4 Rhythmic Allomorphy

There are at least a few suffixes in the dialect of Khanty under discussion, whose distribution depends on the prosodic shape of the stem. The distribution of these suffixes can only be predicted from binary foot structure, but not from the position of stress. One of these suffixes is the suffix marking the infinitive. In contrast with Eastern dialects, where the suffix appears optionally as /ta/ or /taɣə/ according to Honti (1993), (the first

part of the suffix, /ta/, is the same as present tense participial suffix, and the second part, /ɣə/, has the same form as Translative case suffix), in the dialect of Khanty we are investigating, the infinitive suffix appears as /ta/ if the base is completely parsed into a (moraic) binary foot and ends in a consonant, but as /taxi/ if there is material in the stem that is not parsed into binary feet:

(26)

a.

taal- 'carry'	(taa)(l-əta) 'to carry'	*(taa)(l-əta)xï
paajət- 'drop'	(paaj)(t-əta) 'to drop'	*(paaj)(t-əta)xï
kaas- 'doubt'	(kaa)(s-əta) 'to doubt'	*(kaa)(s-əta)xï
weel- 'kill'	(wee)(l-ətä) 'to kill'	*(wee)(l-ətä)xi
oom- 'sit'	(oo)(m-əta) 'to sit'	*(oo)(m-əta)xï
pööt- 'freeze'	(pöö)(t-ətä) 'to freeze'	*(pöö)(t-ətä)xi
laax- 'wait'	(laa)(x-əta) 'to wait'	*(laa)(x-əta)xï
wiiṣk- 'throw'	(wiiṣ)(k-ətä) 'to throw'	*(wiiṣ)(k-ətä)xi
ruupït- 'work'	(ruu)(pee)(t-əta) 'to work'	*(ruu)(pee)(t-əta)xï
wuuj- 'see'	(wuu)(j-əta) 'to see'	*(wuu)(j-əta)xï
ɲuuxəl- 'follow'	(ɲuux)(l-əta) 'to follow'	*(ɲuux)(l-əta)xï

b.

lip- 'eat'	(lip-ə)(täxi) 'to eat'	*(lip-ə)tä
xoc- 'remain'	(xoc-ə)(taxï) 'to remain'	*(xoc-ə)ta
aara- 'break'	(aa)(raa)-(taxï) 'to break'	*(aa)(raa)-ta
xöʌ- 'disappear'	(xöʌ-ə)(täxi) 'to disappear'	*(xöʌ-ə)tä
töj- 'have'	(töj-ə)(täxi) 'to have'	*(töj-ə)tä
lipət- 'feed[6]'	(lipt-ə)(täxi) 'to feed'	*(lipt-ə)tä
aʌ- 'sleep'	(aʌ-ə)(taxï) 'to sleep'	*(aʌ-ə)ta
part- 'order'	(part-ə)(taxï) 'to order'	*(part-ə)ta
soṣ- 'walk'	(soṣ-ə)(taxï) 'to walk'	*(soṣ-ə)ta
pax- 'burst'	(pax-ə)(taxï) 'to burst'	*(pax-ə)ta
exət- 'cut'	(ext-ə)(täxi) 'to cut'	*(ext-ə)tä
ʌaŋ- 'enter'	(ʌaŋ-ə)(taxï) 'to spit'	*(ʌaŋ-ə)ta
söj- 'spit'	(söj-ə)(täxi) 'spit'	*(söj-ə)tä
poɲc- 'ripen'	(poɲc-ə)(taxï) 'to ripen'	*(poɲc-ə)ta
por- 'bite'	(por-ə)(taxï) 'to bite'	*(por-ə)ta

[6] Causative from *lip-* 'eat'

jowa- ‘wrap (skins)’	jo(waa)-(taxï) ‘to wrap (skins)’	*jo(waa)-ta
poosa- ‘drip’	(poo)(saa)-(taxï) ‘to drip’	*(poo)(saa)-ta
xölä- ‘hear’	xö(laa)-(taxï) ‘to hear’	*xö(laa)-ta

Evidently, the distribution of the infinitive allomorphs depends on bimoraic foot parsing, i.e. the choice between allomorphs is determined by a requirement on complete parsing of a Phonological Word. In Maŋşi, the language that is the closest relative of Khanty, we see cases of similar allomorphy (see Chapter 5 for a more detailed discussion). Note that the stems themselves are not altered, indicating that the alternation is indeed a case of genuine allomorphy rather than segmental alternation (deletion of the last syllable) of suffixes. Note also that epenthetic schwas are parsed into feet the same way underlying vowels are, and there is no change in epenthesis conditions to accommodate the requirement on complete parsing.

Within nominal domains, there are also a few suffixes that exhibit distribution of allomorphs similar to the infinitive. A suffix that attaches to nouns to form nouns with the meaning ‘the one possessing N’ has two allomorphs, /ŋ/ and /pi/. The suffix surfaces in several forms: *-ŋ/-əŋ/-pi/-pï/-əpi/-əpï*. The suffix is very productive, though not absolutely, and allomorphy seems to depend on the same requirement for complete parsing as the infinitival suffix:

(27)

a.	söörŋi ‘gold’	(söör)(ŋee-ŋ) ‘a rich person’
	ooxtï ‘snake’	(oox)(tee-ŋ) ‘the one who has a snake’
	keesi ‘knife’	(kee)(see-ŋ) ‘the one who has a knife’
	kuuşa ‘master’	(kuu)(şaa-ŋ) ‘slave’
	pusï ‘tail’	pu(see-ŋ) ‘the one who has a tail’
	apşï ‘younger brother’	ap(şee-ŋ) ‘the one who has a younger brother’
	sarï ‘salmon’	sa(ree-ŋ) ‘the one who has salmon’
	soxa ‘partridge’	so(xaa-ŋ) ‘the one who has a partridge’
	saa ‘tea’	(saa-ŋ) ‘grocery store’
	maşeenä ‘car’	ma(şee)(nää-ŋ) ‘the one who has a car’
	ruupeeta ‘work’	(ruu)(pee)(taa-ŋ) ‘an employed person’
	oopee ‘older sister’	(oo)(pee-ŋ) ‘the one who has an older sister’
	şeemjä ‘family’	(şeem)(jää-ŋ) ‘a family man’

	aaxee ‘daughter’	(aa)(xee-ŋ) ‘the one who has a daughter’
	puwləpsï ‘tumor’	(puwləp)(see-ŋ) ‘a cancer patient’
	apsəjee ‘bear’	(apsə)(jee-ŋ) ‘the one who has a bear’
b.	jiŋk ‘water’	(jiŋk-əŋ) ‘a spring’
	jik ‘son’	(jik-əŋ) ‘the one who has a son’
	kew ‘stone’	(kew-əŋ) ‘the one that has stone[7]’
	xul ‘fish’	(xul-əŋ) ‘the one who has fish’
	ɲaɲ ‘bread’	(ɲaɲ-əŋ) ‘the one who has bread’
	lil ‘soul’	(lil-əŋ) ‘the one who has a soul’
	tut ‘fire’	(tut-əŋ) ‘the one who has fire’
	sam ‘heart’	(sam-əŋ) ‘kind person’
	pöx ‘boy’	(pöx-əŋ) ‘mother of a boy’
	nepək ‘letter’	(nepk-əŋ) ‘the one who has a letter’
	toxəl ‘wing’	(toxl-əŋ) ‘an airplane[8]’
	toorum ‘god’	(too)(rum-əŋ) ‘shaman, priest’
	xootjux ‘log’	(xoot)(jux-əŋ) ‘the one who has a log’

In (27a), the roots in derived environment end in a vowel and in a heavy syllable that is parsed into a bimoraic foot by itself, regardless of whether it is preceded by another bimoraic foot or a (parsed or unparsed) light syllable. The roots in (27b), on the other hand, differ from roots in (27a) in two respects: they end in a consonant, and they end in an unparsed light syllable. In both cases in (27) the allomorphs are distributed in such a way as to make the whole word parsed into bimoraic feet.

After roots that end in a consonant but can be parsed completely into binary feet, the allomorphs *-əpi/-əpï* are concatenated with the roots, instead of the *-əŋ/-ŋ* allomorphs:

(28)

a.	kolxoz[9] ‘farm’	(kolxo)(z-əpï) ‘the one who has a farm’
	malat ‘depth’	ma(laa)(t-əpï) ‘the one that has depth’
	tutjux ‘firewood’	(tutju)(x-əpï) ‘the one that has firewood’
	xoram ‘beauty’	xo(raa)(m-əpï) ‘a beauty, beautiful person’
	wontut ‘pine forest’	(wontu)(t-əpï) ‘pine forest owner’

[7] the meaning is lexicalized somewhat, ‘a place where one can get stones to use for different needs’.

[8] Only acceptable to two of the speakers, and only as an outdated word, could be used in the ‘we used to call it …’ context. Modern word for ‘airplane’ is a Russian borrowing *saamolt* < Russ. *samoľot* (самолет).

[9] Fairly recent borrowing from Russian.

	kalaŋ ‘reindeer’	ka(laa)(ŋ-əpï) ‘the one who has reindeer’
	uunltətït ‘teacher’	(uunl)tə(tee)(t-əpï) ‘school principal’
	palat ‘hight’	pa(laa)(t-əpï) ‘a tall person’
	mojpar ‘young bear’	moj(paa)(r-əpï) ‘bear who recently had cubs’
	xuunteeɲc ‘backpack’	(xuu)(ntee)(ɲc-əpï) ‘hiker, tourist’
	pöskän ‘gun’	pös(kaa)(n-əpï) ‘the one who has a gun’
	peʌäŋ ‘cloud’	pe(ʌaa)(ŋ-əpï) ‘thunderstorm’
	jöxän ‘river’	jö(xaa)(n-əpï) ‘terrain near a river’
b.	nareem ‘bridge’	na(ree)(m-əpi) ‘the one (river) with a bridge’
	ɲawreem ‘child’	ɲaw(ree)(m-əpi) ‘a pregnant woman’
	weer ‘business’	(wee)(r-əpi) ‘boss’
	neepək ‘book’	(neep)(k-əpi) ‘library’
	lixeen ‘fire’	li(xee)(n-əpi) ‘a burnt place’
	xöjeeʌ ‘son-in-law’	xö(jee)(ʌ-əpi) ‘mother-in-law’[10]
	leetit ‘food’	(lee)(tee)(t-əpi) ‘(free) diner’
	ɲeeləm ‘tongue’	(ɲeel)(m-əpi) ‘chatterbox, a talkative person’
	xööxeeʌ ‘female (animal)’	(xöö)(xee)(ʌ-əpi) ‘the one who has a mate’
	öömp ‘dog’	(öö)(mp-əpi) ‘the one who has a (hunting) dog’

The remaining two shapes of the allomorph /pi/, *-pi*/*-pï*, are fairly rare, but just because the type of stems they attach to, that end in a vowel and an unparsed syllable, are rare. We do see these in some words, however, mostly with stems that are either borrowed or derived:

(29)

a.	luuče ‘incident’	(luu)(če-pï) ‘famous person’
	aakse ‘post office’	(aak)(se-pï) ‘mailman’
	aarne ‘rent’	(aar)(ne-pï) ‘landlord’
	toŋheto ‘little piece’	(toŋhe)(to-pï) ‘poor man[11]’
	wuuloomu ‘grandmother’	(wuu)(loo)(mu-pï) ‘the one who has a large family’
	uurŋo ‘reason’	(uur)(ŋo-pï) ‘a useful thing’
	kaano ‘space’	(kaa)(no-pï) ‘the one that space’

[10] Rarely used, usually in context ‘she has her daughters married off, she is a mother-in-law’.
[11] Pejorative.

b. röömö ‘darkness’ (röö)(mö-pi) ‘lunar eclipse’
koleeʎü ‘fiancé [12]’ ko(lee)(ʎü-pi) ‘engaged, spoken for girl’
siijü ‘reindeer calf’ (sii)(jü-pi) ‘reindeer who recently had calves’
kuteeʂü ‘a drunk’ ku(tee)(ʂü-pi) ‘a bar, known drinking spot’
weelpe ‘criminal’ (weel)(pe-pi) ‘holding facility, jail’

In the data above, again, we see the confirmation of the generalizations we have made: the allomorphs of this suffix are distributed according to the requirement that the entire phonological word be parsed bimoraic feet. The generalizations about vowel harmony in the language are not changed: it is triggered by a stressed vowel and applies to all vowels to the right of it, regardless of the binary footing that is responsible for the allomorphy.

An inflectional suffix that also shows rhythmic allomorphy, though of a slightly different type, is the 1st person singular possessive suffix that is used with nouns that are also singular. The suffix has two allomorphs, /m/ and /eem/:

(30)

laaŋk ‘larch’ (laa)(ŋk-eem) ‘ my larch’
weer ‘business’ (wee)(r-eem) ‘my business’
kuurt ‘village’ (kuu)(rt-eem) ‘my village’
xoot ‘house’ (xoo)(t-eem) ‘my house’
öömp ‘dog’ (öö)(mp-eem) ‘my dog’
taaʂ ‘herd’ (taa)(ʂ-eem) ‘my herd’
piixəl ‘fishing line’ (piix)(l-eem) ‘my fishing line’
neepək ‘book’ (neep)(k-eem) ‘my book’
jeernäs ‘dress’ (jeer)(nää)(s-eem) ‘my dress’
xöjeeʎ ‘son-in-law’ xö(jee)(ʎ-eem) ‘my son-in-law’
mojpar ‘young bear’ moj(paa)(r-eem) ‘my young bear’
pöskän ‘gun’ pös(kaa)(n-eem) ‘my gun’
xuunteeɲc ‘backpack’ (xuu)(ntee)(ɲc-eem) ‘my backpack’

In contrast, if a stem ends in an unparsed syllable also ending in a consonant, the variant of the suffix concatenated with such a stem is *-əm*:

[12] In a pre-arranged marriage.

(31)

xatl ‘sun’	(xatl-əm) ‘my sun’
lunt ‘wild goose’	(lunt-əm) ‘my wild goose’
jik ‘son’	(jik-əm) ‘my son’
rex ‘berry’	(rex-əm) ‘my berry’
xul ‘fish’	(xul-əm) ‘my fish’
ɲaɲ ‘bread’	(ɲaɲ-əm) ‘my bread’
lil ‘soul’	(lil-əm) ‘my soul’
sam ‘heart’	(sam-əm) ‘my heart’
mit ‘salary’	(mit-əm) ‘my salary’
pöx ‘boy’	(pöx-əm) ‘my boy’
ox ‘head’	(ox-əm) ‘my head’
loŋkər ‘mouse’	(loŋkr-əm) ‘my mouse’
nepək ‘letter’	(nepk-əm) ‘my letter’
ɲoxəs ‘sable’	(ɲoxs-əm) ‘my sable’
xootjux ‘log’	(xoot)(jux-əm) ‘my log’

In cases where a stem ends in a vowel that is parsed into a bimoraic foot within the stem, *-m* is the allomorph that surfaces:

(32)

söörɲi ‘gold’	(söör)(ɲee-m) ‘my gold’
ooxtï ‘snake’	(oox)(tee-m) ‘my snake’
keesi ‘knife’	(kee)(see-m) ‘my knife’
kuuşa ‘master’	(kuu)(şaa-m) ‘my master’
jitä ‘enemy’	ji(taa-m) ‘my enemy’
ruupeeta ‘work’	(ruu)(pee)(taa-m) ‘my work’
xonï ‘stomach’	xo(nee-m) ‘my stomach’
şeemjä ‘family’	(şeem)(jää-m) ‘my family’
ɲöxä ‘meat’	ɲö(xaa-m) ‘my meat’
taxtï ‘skin’	tax(tee-m) ‘my skin’
maşeenä ‘car’	ma(şee)(nää-m) ‘my car’
aaŋkee ‘mother’	(aa)(ŋkee-m) ‘my mother’
oopee ‘older sister’	(oo)(pee-m) ‘my older sister’

Note that another allomorph, *-jeem*, could be concatenated with the stems above and result in complete parsing. [j] is routinely epenthesized to avoid hiatus in the language, but this allomorph is ungrammatical for the speakers. One possible explanation is that, other things being equal, epenthesis is avoided, and the allomorph that is completely faithful to its underlying representation is selected.

Finally, when a stem ends in an unparsed vowel, we see the suffix surface in form *-jem*. It is difficult to say whether it is the third genuine allomorph of this possessive suffix or there is shortening of the long [ee] and [j] epenthesis. It is certainly the case that long [ee] is not shortened in closed syllables within roots, and there are suffixes of the same form /VVC/ that are **not** shortened to accommodate the requirement on foot structure, which I take as an indication that /-jem/ is the third allomorph. I could not, however, find another suffix with the long [ee] rather than [aa] or [ii]/[ïï], and I leave the question whether *-jem* is the third allomorph of this suffix open here. The examples with this variant are below:

(33)

luuče 'incident'	(luu)(če-jem) 'my incident'
uurŋo 'reason'	(uur)(ŋo-jem) 'my reason'
röömö 'darkness'	(röö)(mö-jem) 'my darkness'
kuteeşü 'a drunk'	ku(tee)(şü-jem) 'my drunk'
aakse 'post office'	(aak)(se-jem) 'my post office'
koleeʌü 'fiancé'	ko(lee)(ʌü-jem) 'my fiancé'
kaano 'space'	(kaa)(no-jem) 'my space'
aarne 'rent'	(aar)(ne-jem) 'my rent'

When we combine the two suffixes with foot structure-dependent allomorphy, the derivational suffix with the meaning 'the one who has N' /pi/ ~ /ŋ/ and the inflectional 1st person possessive suffix /eem/ ~ /m/ ~ /jem/, it is only the longest allomorph of the latter suffix that attaches to the stem ending in a consonant ([ŋ]) and the shortest allomorph surfaces with the stem ending in a vowel ([i] or [ï]):

(34)

a.	(şeem)(jää-ŋ) 'a family man'	(şeem)(jää)-(ŋ-eem) 'my family man'
	(too)(rum-əŋ) 'shaman, priest'	(too)(rum-ə)(ŋ-eem) 'my shaman, priest'
	(ruu)(pee)(taa-ŋ) 'bread-winner'	(ruu)(pee)(taa)-(ŋ-eem) 'my bread-winner'
	(sam-əŋ) 'kind person'	(sam-ə)(ŋ-eem) 'my kind person'
b.	(uunl)tə(tee)(t-əpï) 'school principal'	(uunl)tə(tee)(t-əpï-m) 'my school principal'
	pa(laa)(t-əpï) 'a tall person'	pa(laa)(t-əpï-m) 'my tall person'
	(wee)(r-əpi) 'boss'	(wee)(r-əpi-m) 'my boss'
	(neep)(k-əpi) 'library'	(neep)(k-əpi-m) 'my library'

Note that the alternating suffix /ŋ/ ~ /pi/ has the same distribution when followed by the (also alternating) /eem/ ~ /m/ ~ /jem/ as when it ends the word, so both the derived stem and the whole phonological word are parsed into bimoraic feet. In fact, the only morphological constituent here that might or might not be completely parsed into bimoraic feet is the root. One explanation would be a constraint that forces every morphological constituent (not just the entire grammatical word that seems to be equal to Prosodic Word) to be parsed, unless prevented from it by faithfulness constraints. Alternatively, these data might be explained by cyclic derivation within serial rule-based theory, and referring to a model that uses output-output constraints within OT, like Steriade's (1996) theory of Paradigm Uniformity, or Kenstowicz' (1995) theory of Uniform Exponence. The following set of data, however, rather points to the former type of analysis.

In contrast with the previous combination of two alternating suffixes, when an alternating suffix (the same /ŋ/ ~ /pi/ we previously discussed) is followed by a non-alternating one, the alternating suffix does not have the same distribution as without the non-alternating suffix (Lative /a/ in the examples below):

(35)

a.	pe(ʎaa)(ŋ-əpï) ‘thunderstorm’	pe(ʎaa)(ŋ-əŋ-a) ‘thunderstorm’ (Abess) *pe(ʎaa)(ŋ-əpï)-ja
	(neep)(k-əpi) ‘library’	(neep)(k-əŋ-ä) ‘library’ (Abess) *(neep)(k-əpi)-jä
	xo(raa)(m-əpï) ‘a beauty’	xo(raa)(m-əŋ-a) ‘a beauty’ (Abess) *xo(raa)(m-əpï)-ja
	li(xee)(n-əpi) ‘a burnt place’	li(xee)(n-əŋ-ä) ‘a burnt place’ (Abess) *li(xee)(n-əpi)-jä ‘a burnt place’
b.	(aar)(ne-pï) ‘landlord’	(aar)(ne-ŋ-a) ‘landlord’ (Abess) *(aar)(ne-pï)-ja
	(weel)(pe-pi) ‘holding facility, jail’	(weel)(pe-ŋ-ä) ‘jail’ (Abess) *(weel)(pe-pi)-jä
	(aak)(se-pï) ‘mailman’	(aak)(se-ŋ-a) ‘mailman’ (Abess) *(aak)(se-pï)-ja

	ku(tee)(ʂü-pi) ‘a bar’	ku(tee)(ʂü-ŋ-ä) ‘a bar’ (Abess) *ku(tee)(ʂü-pi)-jä
c.	(söör)(ɲee-ŋ) ‘a rich person’	(söör)(ɲee)-(pi-jä) ‘a rich person’ (Abess) *(söör)(ɲee)-ŋ-ä
	(puwləp)(see-ŋ) ‘a cancer patient’	(puwləp)(see)-(pi-jä) ‘a cancer patient’ (Abess) *(puwləp)(see)-ŋ-ä
	(saa-ŋ) ‘grocery store’	(saa)-(pï-ja) ‘grocery store’ (Abess) *(saa)-ŋ-a
	(kuu)(ʂaa-ŋ) ‘slave’	(kuu)(ʂaa)-(pï-ja) ‘slave’ (Abess) *(kuu)(ʂaa)-ŋ-a
d.	(toxl-əŋ) ‘an airplane’	(toxl-ə)(pï-ja) ‘an airplane’ (Abess) *(toxl-ə)ŋ-a
	(sam-əŋ) ‘kind person’	(sam-ə)(pï-ja) ‘kind person’ (Abess) *(sam-ə)ŋ-a
	(jiŋk-əŋ) ‘a spring’	(jiŋk-ə)(pi-jä) ‘a spring’ (Abess) *(jiŋk-ə)ŋ-ä
	(pöx-əŋ) ‘mother of a boy’	(pöx-ə)(pi-jä) ‘mother of a boy’ (Abess) *(pöx-ə)ŋ-ä

As you can see from the data, the distribution of the /pi/ ~ /ŋ/ allomorphs is the opposite from the one we saw before, where the suffix is either word-final or followed by an alternating suffix. When followed by the Abessive suffix /a/, a variant of allomorph /ŋ/ is attached to the same stems that are concatenated with /pi/ otherwise, and a variant of /pi/ surfaces with the stems that take /ŋ/ when not followed by a non-alternating suffix. The opposite distribution makes sense if we consider the form of Abessive suffix that can surface as *-ja, -a, -jä,* and *-ä*, where all the forms are monosyllabic. The distribution of the suffix /ŋ/ ~ /pi/ is adjusted so that the monosyllabic Abessive suffix can attach to an unparsed syllable and ensure the complete bimoraic parsing of the resulting phonological word. Such a distribution rules out a cyclic analysis, as well as an output-output effect, and shows that there are two requirements on parsing, where a constraint requiring that every morphological constituent be parsed into bimoraic feet ranks lower than the constraint requiring every phonological word is parsed exhaustively. The latter constraint itself is outranked by constraints on syllable structure (schwa epenthesis is never

compromised to satisfy the binary parsing constraint), phonotactic constraints on roots (like complementary distribution of [aa] and [a] within roots), and phonotactic constraints on affixes (no alternations within suffixes, except the ones that are needed for syllable structure or vowel harmony).

To sum up, the dialect of Khanty under discussion has two separate phenomena that are influenced by word-internal prosody:

(36)

a. [± front] vowel harmony that depends on the position of stress, since the trigger must be stressed; and

b. allomorph selection that depends on binary (on the moraic level) foot structure of the language.

Since one of our tasks in this chapter is to discover whether or not the grammar refers to unbounded feet to account for segmental alternations, the case we have just investigated is of importance: the vowel harmony clearly depends on prominence and not constituency. We cannot refer to the notion of constituency (unbounded foot) to model the prosodic condition on vowel harmony, since the language has constituency that is incongruent with unbounded feet, namely bounded bimoraic feet that are marked by the allomorphic alternations.

The case we have just investigated also confirms one of the main theoretical proposals of the thesis, namely the hypothesis that prominence and constituency are distinct notions that may or may not be distinguishable in any particular language.

Note also, that while prominence and foot structure in the language are mismatched, it is not the constraint that forces all prominence to be aligned with an edge of a foot that is violated: stress is always aligned with the left of some foot in any word. However, because of rhythmic allomorph selection, we know that words in Khanty are parsed into multiple binary feet when the length allows, and not every foot has a prominent syllable in it. In other words, the constraint on aligning every edge of a foot to a gridmark is violated:

Tableau 1

/pöx/-/pi/-/ja/ 'mother of a boy' (Abess)	WTS	ALIGN-L ǵ, PWD	ALIGN-L (FT, LEV$_n$GRID)
☞ a. (pő̆x-ə)(pi-jä)			*
b. (pő̆x-ə)(p̀i-jä)		*!	

The Weight-to-Stress constraint outranks the constraint on aligning the stressed syllable with the left edge of a word, as demonstrated by the following example:

Tableau 2

/wixeeta/ 'cry, shout'	W-t-S	ALIGN-L ǵ, PWD	ALIGN-L (FT, LEV$_n$GRID)
☞ a.wi(xée)ta		*	
b. wí(xee)ta	*!		*

Since the foot type in the language is moraic, and the Weight-to-Stress principle is violated only when there is more than one syllable containing a long vowel, the stress in the language is always aligned with the left edge of **some** foot, so the ALIGN-L (LEV$_n$GRID, FT) is never violated; the mismatch, however is caused by not all feet receiving a degree of prominence. The parsing of words into binary moraic feet is manifested by rhythmic allomorph selection. Vowel harmony, however, takes into account only prominence, and not the foot structure of the language.

Recall that another case similar to Khanty that we examined in the preceding chapter of this thesis is the case of Meadow Mari vowel harmony. We will briefly return to the Mari case to compare it with Khanty and because it also presents a type of prosody-dependent vowel harmony that we have been investigating in this chapter.

3.2.2 Eastern Mari Rounding Harmony Revisited

In the previous chapter of this dissertation we examined vowel alternations in Meadow Mari with respect to the features [±round] and [±front]. While both types of vowel harmony are present in the language, only the rounding harmony, and not the [±front] harmony, has a prosodic condition on the trigger. The contrast is shown below:

(37)

a.	kəʌmó ‘shovel’	kəʌmó-šö ‘his/her/its shovel’
	kaβún ‘pumpkin’	kaβún-əško ‘pumpkin’ (Ill)
	ʃeʌő ‘wheat’	ʃeʌő-škö ‘wheat’ (Ill)
b.	kögörčén ‘dove’	kögörčén-še ‘his/her/its dove’
	ürémə ‘street’	ürémə-ške ‘street’ (Ill)
	čödrå ‘forest’	čödrå-še ‘his/her/its forest’

In (37a), the roots are disharmonic in that the initial vowel of the root is [-round], and the second vowel, which is always stressed in both derived and underived forms, is [+round]. The vowel of the suffixes surfaces as a [+round] vowel, harmonizing with the stressed, rather than the initial vowel of the root.

The data in (37b) illustrates the same generalization: the condition on the trigger of the rounding harmony is stress. The roots have a round initial vowel, but the stressed vowel is [-round]. The vowel of the possessive or the Illative suffix, therefore, harmonizes with the stressed vowel and shows up unrounded.

Similar to what we see in the dialect of Khanty we discussed in the previous subsection, such a pattern can be analyzed either as triggered by the stressed vowel, or by the head of an unbounded foot. Just as in Khanty, however, we see a phenomenon in Meadow Mari that suggests that an unbounded foot cannot be relevant here, because the language also has a binary foot structure, not an unbounded one. While in Khanty the phenomenon is unrelated to vowel harmony, in Meadow Mari binary foot structure restricts the stress-triggered (as well as [±front] harmony that is triggered by initial vowel regardless of whether or not it is stressed) rounding harmony itself. Recall that only foot-final, but not foot-initial underlying schwas are subject to vowel harmony. Therefore, while the **trigger** of IDENT-violating rounding harmony has the same ‘must bear stress’ condition as in DEP-violating harmony (schwa vocalization), foot structure of the language **restricts** the former, but not the latter type of rounding harmony. Our analysis of DEP-violating harmony in chapter 2, therefore, should be essentially the same for the IDENT-violating

rounding harmony, where the foot structure restriction just does not apply when the underlying target is not a schwa:

Tableau 3

/kaβun/-/škV$_{[-high, -low, -round]}$/ 'pumpkin' (Ill)	**DEP$_{[±round]}$** & **ALIGN-R (V, FT)**	**AGREE-R (V$_{[±round]}$, V́)**	**IDENT$_{[±round]}$**
☞ a. (kaβú)(n-əško)	✔		*
b. (kaβú)(n-əške)	✔	*!	

Neither of the candidates in the tableau above violates the highest-ranked (conjoined) constraint, since there is no [round] feature in any of the outputs that is not present in the input. Candidate (b) violates the AGREE-R constraint, since the final vowel in this candidate does not agree with the stressed vowel with respect to the specification of the feature round. Therefore, even though candidate (a) violates the IDENT$_{[±round]}$ constraint, it is still the optimal candidate. The restriction of the binary footing has no effect here, simply because it is a restriction on DEP-violating harmony (schwa vocalization), not on IDENT-violating one, i.e. it is a restriction on the target of the rounding harmony that is not relevant for the candidates in the tableau above.

To summarize, the case of Meadow Mari rounding harmony is similar to the [±front] harmony in Khanty in that (i) both have a prosodic condition on the trigger of the respective types of harmony, and (ii) both have evidence of binary foot structure that excludes analyses utilizing a notion of unbounded foot, as done in Flemming (1994), among other similar analyses. The difference between the two cases of rounding harmony lies in the fact that while the evidence of binary foot structure in Khanty comes from a phenomenon unrelated to vowel harmony (restriction on allomorph selection), binary footing in Meadow Mari restricts the rounding (as well as [±front]) harmony itself, when the harmony would result in a DEP violation.

Thus, at least in the two cases of vowel harmony just discussed, the notion of unbounded foot cannot be the right notion to use to model these patterns.

3.2.3 Preliminary Remarks on Stress-dependent Vowel Harmony

There are a few preliminary typological remarks on the prosodic conditions that stress or head of an unbounded foot imposes on vowel harmony. First of all, the influence of stress always seems to be on the trigger rather than on the target of a segmental alternation, namely that the trigger must be stressed/be the head of an unbounded foot. Secondly, the appearance of stress never seems to restrict vowel harmony, only to serve as a cause for it. Guaraní might be considered a counterexample to this claim, but the data can be analyzed as involving **triggering** of [-nasal] harmony to its right by a stressed oral vowel rather than **restricting** preceding [+nasal] percolation. Finally, the domain of all the harmony phenomena considered above seems to be a Prosodic or morphological word, not a sub-word constituent like a foot.

With these preliminary typological generalizations in mind, we now turn to other most typical set of phenomena that can be influenced by prominence/unbounded foot boundary, various consonantal alternations in the onset of an accented or unaccented syllable.

3.3 Consonants In Tonic and Post-tonic Syllables

Lenition is one of the most commonly mentioned phenomena influenced by the position of accent.

According to Christmas and Christmas (1975), intervocalic consonants in **Kupia** are generally more lenis in non-prominent syllables than word-initial consonants that are onsets of stressed syllables. /p, ʈ, ɖ/ are reported to have distinctive variants in this position. /p/ is optionally realized as lenis intervocalically in the onset of unstressed syllables. Unfortunately, Christmas and Christmas (1975) do not mention whether the preceding syllable has to be stressed or not.

The realization of lenis /p/ is unclear. Kirchner (1998) represents this segment as [ɸ], so the change can be either in voicing, or frication, or both.

Kupia also has another stress-sensitive alternation: the retroflex coronal /ʈ/ is optionally flapped intervocalically in onsets of unstressed syllables, according to Christmas and Christmas (1975).

In contrast, the retroflex voiced stop /ɖ/ is always flapped intervocalically, i.e. in onsets of unstressed syllables.

In **Silacayoapan Mixteco**, /t/ and /ʒ/ lenite in onsets of unstressed syllables (North and Shields 1977). The consonant inventory of the language is /p, t, c, k, k^w, ʔ, ^{m}b, ^{n}d, ^{ɲ}ɟ, ^{ŋ}g, β, s, ʃ, ʒ, h, m, n, ɲ, l, r, j/. The language has only primary stress that is assigned to the first part of a leftmost foot. All feet are aligned with the right edge of the word, so the stressed syllable might be either word-initial or the second syllable in the word.

Voiceless stops are unaspirated except for word-initial [t], which has some aspiration. Lenition of /t/ applies in onsets of unaccented syllables. The reflex of this lenition is unclear: North and Shields (1977) describe it as 'softened' and represent with [ɗ̶]. In addition, /ʒ/ in the language alternates with [j] in post-tonic syllables in rapid speech. It is unclear what, if any, role tone plays in these alternations.

Possibly another expression of lenition comes from voicing of prenasalized stops foot-initially. According to North and Shields (1977), prenasalized stops are also optionally devoiced in onsets of unaccented syllables. Glottal stop is inserted word-initially in underlyingly onsetless syllables and in onsets of stressed syllables.

In **Djabugai**, /r/ is pronounced as [ɾ] between a stressed and an unstressed vowels (Patz (1991)). According to Patz, the flapping is more noticeable between two low [a]s, less obvious between identical high vowels, and least obvious between different vowels. Between different vowels, [r] and [ɾ] are in free variation.

The opposite of lenition, various phenomena involving fortition, are also fairly commonly triggered by stress.

For example, **Gualavia Zapotec** has a contrast between fortis and lenis consonants. Fortis consonants are /p, t, k, ts, tʃ, ʈʃ, s, ʂ, ɕ, m̲, n̲, l̲/. According to Jones and Knudson (1977), these consonants are generally longer and more tense than lenis consonants. Although Jones and Knudson do not discuss what the difference between the fortis /m̲, n̲, and l̲/ on the one hand, and the lenis /m, n, and l/, on the other hand, is, it appears to be a voicing contrast: the rest of the fortis/lenis distinction certainly seems to be that of voicing (possibly in addition to length distinction, or even the primary distinction as opposed to length or 'tensing').

Lenis consonants are /b, d, g, dz, dʒ, z, ʐ, j̵, m, n, l, ɾ/. Lenis consonants make the preceding oral vowel lengthen.

The language has both stress and tone. There is one stress per word, usually in the penultimate syllable. Stressed syllables are reported to have higher pitch. Fortis consonants geminate intervocalically after stressed vowels. Fortis stops and the nasal are also geminated after stressed vowels before the glides /j, w/ or before a voiced consonant. Gemination does not occur word-initially or in onset of stressed syllables.

(38)

[ɕîttja^{ʔ}]	'my onion'	cf.	[ɕágа^{ʔ}]	'my tree' *[ɕágga^{ʔ}]
[ɕlámma^{ʔ}]	'my boss'			
[ɕapînna^{ʔ}]	'my pine tree'			
[ɕpákka^{ʔ}]	'my tadpole'			
[dɛ́ttsa^{ʔ}]	'my back'			
[náɕɕɨŋ]	'it is sweet'			
[nánna^{ʔ}]	'I know'			
[ɾáppa^{ʔ}]	'I have'			

Additional durational processes occur in stressed vowels. Stressed oral vowels lengthen before lenis consonants (that presumably cannot geminate), as in /ragoʔ/ [ɾáaɣoˀ] 'you bite'. Stressed laryngeal vowels become interrupted, as in /tiˀ.sj/ [tíˀɨ.s̰j]. It could be that all of these phenomena are caused by the requirement that stressed syllables must surface heavy. If this is the case, gemination should be considered 'real' gemination, where the first part of the geminate closes a syllable and contributes to the syllable's weight, rather than 'lengthening' or 'tensing' of voiceless consonants.

Kakumasu (1986) reports that in **Urubu-Kaapor**, oral stops /p, t, k, kʷ, ʔ/ lengthen in the onsets of syllables that receive primary stress (39 a-c). Primary stress is assigned to the ultimate syllable in a word. Lengthening does not occur in secondary-stressed syllables (39c), or in primary-stressed syllables for nasals, sonorants or fricatives (39d-f):

(39)

a.	/katu/	[kattú]	'it is good'
b.	/kaʔa/	[kaʔʔá]	'forest'
c.	/nupãta/	[nupãttá]	'he will hit'
d.	/uruma/	[urumã]	'duck'
e.	/waruwa/	[wàruwá]	'glass'
f.	/ixa/	[i.ʃá]	'it is a fact'

It is unclear how stress assignment works in this language. However, the data in (39) suggests that secondary stress is assigned to heads of moraic iambs where the last (or the only) foot is aligned with the right edge of the Prosodic Word. In cases of 'lengthening', secondary stress can precede the primary stress, so it is possible that, once again, the gemination makes the antepenultimate syllable heavy.

In **West Tarangan** (Nivens (1992)), /j/ affricates and /w/ occlusivizes in word-initial (40a) and in onsets of stressed syllables (40b). In onsets of unstressed non-initial syllables, the glides surface as such, without affrication or occlusivization (40c). The language has moraic trochees, with parsing starting from the right.

(40)

a.	/wɔwa/	[gɔ́wə]	‘blossom’
	/wajmoj+na/	[gajmójnə]	‘slow’ 3sg
	/jabin/	[dʒábin]	‘many’
	/jirua/	[dʒ́iruə]	‘(sp. of) tree’
b.	/suwakan/	[sugákən]	‘elephant tusk’
	/bijarum/	[bidʒárum]	‘whale’
	/i/-/jɔw/	[idʒɔ́w]	‘see’ 3 sg
c.	/kawar/	[káwər]	‘(sp. of) fish’
	/rajan/	[rájan]	‘boat shelter’
	/rɔraw/	[rɔ́.rəw]	‘heat’

Given that the fortition of the glides applies to both onsets of stressed syllables and word-initial glides, it is possible that the phenomenon is foot-dependent rather than stress-dependent if the language allows degenerate feet, so every word-initial glide is also foot-initial, and the constraint that drives this type of fortition is similar to an Onset Condition, requiring that every foot start with the strongest (or least sonorous) possible consonant.

In **Guayabero**, stress-sensitive fricativization of /w/ is reported in Keels (1985) (see also Kirchner (1998)). Stress falls on the last or penultimate syllable of the stem, and it does not to seem to be predictable which one of the two.

There are additional conditions on fricativization of the glide: it fricativizes to [β] before a stressed front vowel, and after a front or high central vowel. After a back or low vowel, /w/ is realized as a high back rounded off-glide [^{u}] in codas. In all other contexts, /w/ is pronounced as [w].

In **Los Reyes Metzontla Popoloca** (Veerman-Leichsenring (1984)), onset liquids, approximants and voiced nasals are geminated after a stressed syllable. Stress in the language generally falls on the penultimate syllable of the word. Stressed syllables have a coda or a long vowel or diphthong.

In addition, according to Veerman-Leichsenring's analysis, complex segments such as prenasalized, aspirated and voiceless nasal consonants are 'disintegrated' into a coda and an onset.

Since there are no actual alternations shown in the source, it is hard to see whether 'disintegration' really does happen, though the description presumably reflects speakers' intuitions. Both gemination and disintegration appear to be similar to some of the above examples in that they are caused by the position of stress, where stressed syllables are required to be heavy. The cases of lenition we saw in this chapter above, as well as additional examples in Lavoie (2001) and González (2003), seem to also be **caused** rather than restricted by stress, though additional restrictions like the word-initial vs. non-initial environment, height of vowels etc. might apply.

We will now turn to another case of similar lenition before stressed vowels (with additional restrictions), where we can actually see synchronic alternations that are due to the different position of stress in different morphophonological environments.

3.3.1 Mokša Lenition

Mokša is a Uralic Mordvin (Mordovian) language spoken in western part of Autonomous Republic of Mordva in Russia, as well as in Samara, Orenburg, Nizhni Novgorod, Saratov and Penza regions; some scattered speakers can be found in many other parts of Russian Federation. Mokša's closest relative is Erzja; the two differ mostly in phonology, and in lesser degree in morphology.

The data presented here was collected in summer (2006) only in Nizhni Novgorod region. The speakers interviewed are all bilingual in Russian and Mokša, though all identify themselves as Mokša-Mordva ethnically. I interviewed 14 subjects total, 7 men and 7 women, from 45 to 60 years old. The judgments of speakers were consistent, with some minor exceptions that are noted below.

Mokša has stress-sensitive lenition of some consonants that is of interest to us, since stress shifts cause synchronic alternations of lenited and non-lenited consonants. One unusual property of Mokša consonant system is that it includes both voiced and voiceless liquids and glide underlyingly. Voiceless liquids and glide are marked with a circle (l̥, r̥ and j̥) under the consonant; the superscript (^{j}) indicates palatalized consonants.

3.3.1.1 Stress

There is one stressed syllable per word in Mokša that depends on relative sonority of vowels and their position. Below is the vowel inventory of the dialect of Mokša under investigation:

(41)

i		u
e	ə	o
ä	a	

For the purposes of stress assignment, there are two classes of vowels in the language: lower-sonority [i, u, ə], and higher-sonority [a, ä, o, e]. Here, as in Nganasan, we see some sonority conflation. When a word contains only vowels of the same sonority class, the stress is assigned to the initial syllable in the word:

(42)

a.
tʲáđʲä ‘mother’
kózjä ‘rich person’
lópa ‘leaf’
érʲgʲä ‘force’
áka ‘older sister; aunt’
rádnʲä ‘family, a relative’
ármak ‘money’
pángo ‘mushroom’
móda ‘earth’

b.
bʲóʼnʲəč ‘boat’
ínʲzʲəts ‘raspberry’
məkur ‘buttocks’
kəšnʲi ‘iron’
júžə ‘skin’
kúšin ‘jug’
pəjəl̥ʲ ‘knife’
sʲɨr̥ək ‘elm’
kílʲuj̥ ‘birch’

sʲéja ‘goat’	púr̥ʲkinə ‘thunder’
ézna ‘brother-in-law’	účitʲəlʲ ‘teacher’
sʲélʲmʲä ‘eye’	sə́ku ‘tuft’

Note that there is no difference in sonority within a sonority class, at least as far as stress is concerned: in (42a), all the vowels in the examples are of higher-sonority class, and the position of stress does not vary dependent on what particular vowel is in the initial syllable, even though if the second or third syllable contains a more sonorous vowel according to universal sonority hierarchy. For example, a word for ‘earth’ *móda* has a mid vowel [o] followed by a higher-sonority [a], but the stress is assigned to the initial syllable nevertheless. Similarly, the words in (42b) contain vowels of the lower-sonority class only, and the initial syllable is always prominent, even if a schwa is followed by [u], as in the word for ‘tuft’ *sə́ku*, or [i], as in *kə́šnʲi* ‘iron’.

Stress, however, is not restricted to the initial syllable in the language. Below we can see the distribution of stress in nouns that have vowels of different sonority classes:

(43)

a.	pár̥si ‘silk’	b.	ulá ~ uwá ‘car’
	šánžə ‘spider’		viná ‘alcohol’
	šári ‘wheel’		rʲibʲéž ~ rʲiβʲéž ‘fox’
	âši ‘well’		kurká ~ kurgá ‘turkey’
	kʲénkʲəš ‘door’		kir̥ʲká ~ kirʲgá ‘neck’
	kágəd ‘paper’		tʲəbʲé ~ tʲəβʲé ‘work’
	stólpə ‘pillar’		kundə́j ~ kunðə́j ‘catcher’
	ál̥kəs ‘bed’		əzná ‘older sister’s husband’
	kánʲəst ‘hemp’		pingə́ ~ pinɣə́ ‘period of time’
	bálʲmi ‘window’		tsʲərə́ ‘son’
	bárəs ‘lamb’		mirʲdʲə́ ~ mirʲðʲə́ ‘man, husband’
	čár̥ə ‘acorn’		čutó ~ čudó ‘tree’
	lʲéngə ‘(tree) bark’		kərʲsʲə́ ~ kərʲzʲə́ ‘bread’
	ájkər ‘stallion’		tʲətrátʲka ~ tʲədrátʲka ‘notebook’

[13] Two of the speakers have voiced liquid in this word instead of the voiceless liquid the rest of the speakers have. It is also worth mentioning that the two speakers who have voiced liquid are illiterate in Moksa, while the rest are not, and that the (Cyrillics based) writing system does reflect the voiceless liquids and the glide with a combination of letters (*лх* for [l̥], *льх* for [l̥ʲ], *рх* for [r̥], *рьх* for [r̥ʲ], and *ўх* for [j̊]).

We can tell from the data above that when a higher-sonority vowel is followed by a lower-sonority vowel (43a), the stress is still assigned to the initial syllable. When, however, a lower-sonority vowel is followed by a higher-sonority vowel (43b), it is the higher-sonority vowel that receives the stress. When there are two higher-sonority vowels following a lower-sonority vowel, like in the word for 'notebook' *tʲətrátʲka ~ tʲədrátʲka*, it is the leftmost higher-sonority vowels that emerges as the prominent one. In short, the pattern is a 'default-to-same': stress is assigned to the leftmost higher-sonority vowel, otherwise, to the leftmost.

Derived words are apparently evaluated the same way as underived. If a suffix with a higher-sonority vowel is added to a root with all lower-sonority vowels, stress surfaces on the vowel of the suffix. If, on the other hand, there is a higher-sonority vowel in the root, the stress is assigned to the same vowel in derived and underived words:

(44)

a.	tul 'fire'	tul-gá ~ tul-ɣá 'fire' (Prol)
	kud 'house'	kud-gá 'house' (Prol)
	pilʲžʲ 'leg'	pilʲžʲ-gá 'leg' (Prol)
	idʲ 'baby'	idʲ-gá 'baby' (Prol)
	virʲ 'forest'	virʲ-gá ~ virʲ-ɣá 'forest' (Prol)
	sʲtʲirʲ 'girl, young woman'	sʲtʲirʲ-gá ~ sʲtʲirʲ-ɣá 'girl, young woman' (Prol)
	kud 'house'	kud-gá 'house' (Prol)
	piks 'rope'	piks-ká 'rope' (Prol)
	bʲánʲəč 'boat'	bʲənʲəč-ká 'boat' (Prol)
	ínʲzʲəts 'raspberry'	inʲzʲəts-ká 'raspberry' (Prol)
	pə́jə̯lʲ 'knife'	pəjə̯lʲ-ká ~ pəjə̯lʲ-ga ~ pəjəlʲ-ɣa 'knife' (Prol)
	kə́šnʲi 'iron'	kəšnʲi-gá ~ kəšnʲi-ɣá 'iron' (Prol)
	sʲímənʲ 'tribe'	sʲimənʲ-gá ~ sʲimənʲ-ɣá 'tribe' (Prol)
	júžə 'skin'	južə-gá ~ južə-ɣá 'skin' (Prol)
	sʲíɾ̥ək 'elm'	sʲiɾ̥ək-ká 'elm' (Prol)
	púɾ̥ʲkinə 'thunder'	puɾ̥ʲkinə-gá ~ puɾ̥ʲkinə-ɣá 'thunder' (Prol)
b.	mólatka 'hammer'	mólatka-ga 'hammer' (Prol)
	kárəskə 'shoelace'	kárəskə-ga 'shoelace' (Prol)
	mälʲ 'desire, hope'	mə́lʲ-ga 'desire, hope' (Prol)

kʲedʲ ‘(animal) skin’	kʲédʲ-ga ‘(animal) skin’ (Prol)
val ‘word’	vál-ga ‘word’ (Prol)
pr̥ʲa ‘head’	pr̥ʲá-ga ‘head’ (Prol)
kanʲp ‘hemp’	kánʲp-ka ‘hemp’ (Prol)
ấrmak ‘money’	ấrmak-a ‘money’ (Prol)
pángo ‘mushroom’	pángo-ga ‘mushroom’ (Prol)
kárdaž[14] ‘yard’	kárdaž-ga ‘yard’ (Prol)
álʲä ‘young man’	álʲä-ga ‘young man’ (Prol)
kudá ~ kuðá ‘matchmaker’	kudá-ga ~ kuðá-ga ‘matchmaker’ (Prol)
kənák ‘guest’	kənák-a ‘guest’ (Prol)
čutó ~ čudó ‘tree’	čutó-ga ~ čudó-ga‘tree’ (Prol)
kərʲsʲấ ~ kərʲzʲấ ‘bread’	kərʲsʲấ-ga ~ kərʲzʲấ-ga ‘bread’ (Prol)

Note again that sonority of the vowels matters only as far as the distinction of [i, u, ə] vs. [e, o, a, ä] is concerned. There is no more detailed division within these sonority classes, i.e., for the purposes of stress assignment, [i] is not more sonorous than [ə], and [a] is not more sonorous than [o]. There is a stressed vowel sonority constraint that we need to account for the stress pattern in the language (see more general stressed vowel sonority constraints formulated in chapter 2), in addition to the constraint that draws prominence to the left edge of a Prosodic Word:

(45)

*GRID$_n$/*ə,ï, i•u*	There must not be *ə*, *ï* or *i•u* with a gridmark on Level$_n$[15]
ALIGN-L (ǵ, PWD)	Align the left edge of a stressed syllable with the left edge of a Prosodic Word

The sonority of the stressed vowel constraint does not make a distinction between different vowels within the set, so a stressed vowel that belongs to the set above equally violates the constraint.

[14] Two of the speakers do not use this word, though they do recognize it; they use what appears to be a Russian borrowing *dur* < Russ. *dvor* ‘yard’

[15] *ï* is not part of vowel inventory of the language, so its inclusion in this constraint is for the purposes of consistency.

Suffixes that have one of the lower-sonority vowels do not attract stress from the root, even if the root itself contains only lower-sonority vowels itself (46b):

(46)

a.	ấkšama ‘cold’	ấkšama-ndi ‘cold’ (Dat)
	pótalak ‘ceiling’	pótalak-əndi ‘ceiling’ (Dat)
	kárəskə ‘shoelace’	kárəskə-ndi ‘shoelace’ (Dat)
	kumánža ‘knee’	kumánža-ndi ‘knee’ (Dat)
	tsʲərɑ̃ ‘son’	tsʲərɑ̃-ndi ‘son’ (Dat)
	kudá ~ kuðá ‘matchmaker’	kudá-ndi ~ kuðá-ndi ‘matchmaker’ (Dat)
	ájkər ‘stallion’	ájkər-əndi ‘stallion’ (Dat)
	bálʲmi ‘window’	bálʲmi-ndi ‘window’ (Dat)
b.	sʲʴ̆ibəsʲ ‘collar’	sʲʴ̆ibəsʲ-əndi ‘collar’ (Dat)
	bʲónʲəč ‘boat’	bʲónʲəč-əndi ‘boat’ (Dat)
	lúgə ‘meadow’	lúgə-ndi ‘meadow’ (Dat)
	îrʲdʲəzʲ ‘rib’	îrʲdʲəzʲ-əndi ‘rib’ (Dat)
	pə́jə̯lʲ ‘knife’	pə́jə̯lʲ-əndi ‘knife’ (Dat)
	kə́rkəs ‘belt’	kə́rkəs-əndi ‘belt’ (Dat)
	sʲə́lʲbʲedʲ ‘tear’	sʲə́lʲbʲedʲ-əndi ‘tear’ (Dat)
	kílʲuj̯ ‘birch’	kílʲuj̯-əndi ‘birch’ (Dat)
	úškər ‘drawstring’	úškər-əndi ‘drawstring’ (Dat)
	júžə ‘skin’	júžə-ndi ‘skin’ (Dat)
	sə́ku ‘tuft’	sə́ku-ndi ‘tuft’ (Dat)
	kúšin ‘jug’	kúšin-əndi ‘jug’ (Dat)
	sʲʴ̆i̯rək ‘elm’	sʲʴ̆i̯rək-əndi ‘elm’ (Dat)
	sʲʴ̆ímənʲ ‘tribe’	sʲʴ̆ímənʲ-əndi ‘tribe’ (Dat)
	súrə ‘millet’	súrə-ndi ‘millet’ (Dat)

The data above confirm our generalization about the principles of stress assignment in Mokša: prominence is assigned to the leftmost vowel of the higher-sonority set of vowels {a, ä, o, e}. If there is no higher-sonority vowel in the word, stress falls on the leftmost vowel. Morphological makeup of the word is not significant for stress assignment that treats derived words the same way as underived. Within each of the two sonority classes, there is no difference in sonority with respect to stress assignment.

The pattern of stress assignment in the language, therefore, can be accounted for by the two constraints formulated in (45) above, with the stressed vowel sonority constraint outranking the constraint that requires that prominence be aligned with the left edge of a Prosodic Word:

Tableau 4

/piks/-/ka/ 'rope' (Prol)	*GRID$_n$/*ə,ï, i•u*	ALIGN-L (ǵ, PWD)
☞ a. piks-ká		*
b. píks-ka	*!	

As the tableau above shows, the candidate with the stress on the initial syllable, while satisfying the alignment constraint, violates the higher-ranking constraint on the sonority of stressed vowels and is, therefore, discarded.

The following tableau shows that the same constraints with the same ranking will pick a candidate with the leftmost higher-sonority vowel:

Tableau 5

kumánža-ndi 'knee' (Dat)	*GRID$_n$/*ə,ï, i•u*	ALIGN-L (ǵ, PWD)
☞ a. kumánža-ndi		*
b. kumanžá-ndi		**!
c. kúmanža-ndi	*!	

Candidate (c) in the above tableau has stress on the initial vowel [u], which belongs to the lower-sonority set and is therefore banned by the sonority constraint. Of the remaining two candidates, candidate (b) has its stress assigned one syllable further away from the left edge than candidate (a). In this case, therefore, candidate (a), with the stress on the second syllable, emerges as the winner.

Finally, the next tableau illustrates that the same constraints with the same ranking account for stress in examples with only lower-sonority (the upper part of the tableau) and with only higher-sonority vowels (the lower part of the tableau):

Tableau 6

/puɽ̥ʲkinə/ 'thunder'	*GRID$_n$/*ə,ɨ, i•u*	ALIGN-L (ǵ, PWD)
☞ a. púɽ̥ʲkinə	*	
b. puɽ̥ʲkǵnə	*	*!
c. puɽ̥ʲkinǵ	*	*!*
/pango/-/ka/ 'mushroom' (Prol)		
☞ a. pángo-ga		
b. pangó-ga		*!
c. pango-gá		*!*

In both cases in the above tableau, the sonority constraint is inactive: in the upper part of the tableau, the candidates contain only vowels of the lower-sonority set; hence, each of these candidates violates the constraint, regardless of stress placement. The decision is made by the constraint aligning the stressed syllable to the left edge of a Phonological Word, and only candidate (a) satisfies this constraint.

Similarly, in the lower part of Tableau 6, all the candidates satisfy the sonority constraint, since none of them contain the vowels to which the constraint refers; the alignment constraint bans candidates (b) and (c), where stressed syllables are not aligned with the left edge of the Phonological Word.

Note that we have accounted for the pattern of stress placement in Mokša without any reference to foot structure of the language. The reason for such an account is that, even though Mokša also has a pattern of prosody-dependent lenition, discussed in detail below, there is no empirical evidence of foot structure in the language. Under the present proposal, however, constraints on Prominence Alignment will cause the stressed syllable to be aligned with an edge of a foot, if the constraints we have used above do not outrank Prominence Alignment constraints. Given that there is no empirical evidence of such a situation, economy dictates that prominence and foot structure in the language match.

3.3.1.2 Lenition

As the reader might have noticed from the previous subsection, certain consonants can appear in two variants in Mokša. The variation appears only in onsets of stressed syllables. It appears that a stressed vowel is triggering optional lenition of a consonant preceding it. Word-initial consonants, even if they are onsets of stressed syllables, never lenite. There is also no lenition if the target consonant is preceded by an obstruent[16], and voiced sonorants are not subject to lenition. Below are the reflexes of the lenition:

(47)

Underlying	p p^j	t t^j	k k^j	b b^j	d d^j	g g^j	r̥ $r̥^j$	l̥ $l̥^j$	j̥	s s^j	š $š^j$	č	ts	m	n
Onset of a stressed syllable	b b^j	d d^j	g g^j	β $β^j$	ð $ð^j$	ɣ $ɣ^j$	r r^j	l l^j	j	z z^j	ž $ž^j$	dʒ^j	dz	w	Ø[17]

Voiced liquids[18] and the glide do not lenite. Note that there is a chain shift in lenition of obstruents, e.g. /p/ surfaces as [b] in onset of a stressed syllable, and /b/ surfaces as [β]. Note also that lenited voiced stops have reflexes that do not belong to the set of consonants in the inventory of (at least this dialect of) Mokša.

Whether the word is derived or underived, does not matter for onset lenition. Even if the stress position in the derived word does not match the position of stress in corresponding underived word, it is the onset of the syllable that receives stress in any given form that is subject to lenition:

(48)

a. $r^jib^jéž$ ~ $r^jiβ^jéž$ ‘fox’ — $r^jib^jéž$-eze ~ $r^jiβ^jéž$-eze ‘my fox’
kurká ~ kurgá ‘turkey’ — kurká-ze ~ kurgá-ze ‘my turkey’
kukó ~ kugó ‘cuckoo’ — kukó-ze ~ kugó-ze ‘my cuckoo’

[16] Though if a voiced sonorant is preceded by a voiceless obstruent, the obstruent itself surfaces as voiced (only if the sonorant is the onset of a stressed syllable).
[17] With nasalization of the stressed vowel.
[18] Speakers claim a ‘weaker’ pronunciation for voiced liquids in onsets of stressed syllables; it is not audible, and the only difference I was able to notice on spectrograms is occasional [r] with one roll, compared to two or three rolls of [r] in other positions.

kiɾʲká ~ kirʲgá ‘neck’	kiɾʲká-ze ~ kirʲgá-ze ‘my neck’
tʲəbʲé ~ tʲəβʲé ‘work’	tʲəbʲé-ze ~ tʲəβʲé-ze ‘my work’
sʲərpé ~ sʲərbé ‘heart’	sʲərpé-ze ~ sʲərbé-ze ‘my heart’
kundáj ~ kunðáj ‘catcher’	kundáj-oze ~ kunðáj-oze ‘my catcher’
pingã́ ~ pinɣã́ ‘period of time’	pingã́-ze ~ pinɣã́-ze ‘my period of time’
kənák ~ kəák ‘guest’	kənák-oze ~ kəák-oze ‘my guest’
kudá ~ kuðá ‘matchmaker’	kudá-ze ~ kuðá-ze ‘my matchmaker’
mirʲdʲã́ ~ mirʲðʲã́ ‘man, husband’	mirʲdʲã́-ze ~ mirʲðʲã́-ze ‘my man, husband’
pʲimá ~ pʲiwá ‘large cup, mug’	pʲimá-ze ~ pʲiwá-ze ‘my large cup, mug’
kiɾčén ~ kirdʒén ‘swamp’	kiɾčén-eze ~ kirdʒén-eze ‘my swamp’
čutó ~ čudó ‘tree’	čutó-ze ~ čudó-ze ‘my tree’
bujã́ ~ bujã́ ‘end’	bujã́-ze ~ bujã́-ze ‘my end’
kərʲsʲã́ ~ kərʲzʲã́ ‘bread’	kərʲsʲã́-ze ~ kərʲzʲã́-ze ‘my bread’
kušmá ~ kužmá ‘radish’	kušmá-ze ~ kužmá-ze ‘my radish’
tʲətrátʲka ~ tʲədrátʲka ‘notebook’	tʲətrátʲka-ze ~ tʲədrátʲka-ze ‘my notebook’

b.

sʲĭbəsʲ ‘collar’	sʲibəsʲ-óze ~ sʲibəzʲ-óze ‘my collar’
kum ‘(close) friend’	kum-óze ~ kuw-óze ‘my (close) friend’
bʲə́nʲəč ‘boat’	bʲənʲəč-óze ~ bʲənʲədʒ-óze ‘my boat’
kud ‘house’	kud-óze ~ kuð-óze ‘my house’
ĭnʲzʲəts ‘raspberry’	inʲzʲəts-óze ~ inʲzʲədz-óze ‘my raspberry’
bʲinʲ ‘stump’	bʲinʲ-éze ~ bʲi-ẽze ‘my stump’
rug ‘horn’	rug-óze ~ ruɣ-óze ‘my horn’
kə́rkəs ‘belt’	kərkəs-óze ~ kərkəz-óze ‘my belt’
lʲik ‘face (in a painting or statue)’	lʲik-éze ~ lʲig-éze ‘my face (in a painting or statue)’
sʲə́lʲbʲedʲ ‘tear’	sʲəlʲbʲedʲ-éze ~ sʲəlʲbʲeðʲ-éze ‘my tear’
idʲ ‘baby’	idʲ-éze ~ iðʲ-éze ‘my baby’
kĭ́lʲuj ‘birch’	kilʲuj-óze ~ kilʲuj-óze ‘my birch’
kurg ‘mouth’	kurg-óze ~ kurɣ-óze ‘my mouth’
pə́jəl̥ʲ ‘knife’	pəjəl̥ʲ-óze ~ pəjəlʲ-óze ‘my knife’
sʲĭɾək ‘elm’	sʲiɾək-óze ~ sʲiɾəg-óze ‘my elm’
púrtəb ‘ox’	purtəb-óze ~ purtəβ-óze ‘my ox’

In (48a), there is variation within the root, since the consonants are not word-initial and are in onsets of stressed syllables. When concatenated with the 1st person singular possessive suffix that surfaces as *-ze*, *-oze* (after a stem preceded by a [-front] vowel), or as *-eze* (after a stem ending in a consonant preceded by a front vowel), the variation in the stem remains the same, since there is no stress shift because the root itself contains a vowel from the higher-sonority set. In (48b), on the other hand, there is no variation of

consonants within roots, since stress is always assigned to the word-initial syllable. In derived forms with the same possessive suffix, however, stress is assigned to the suffix, since it contains the leftmost higher-sonority vowel in a word. Consequently, the last consonant of a root varies between lenited and non-lenited consonant, being the onset of a stressed syllable.

Note a few properties of the stress (or unbounded foot)-dependent phenomenon of lenition that we can observe here:

(49)

a. surface segments are often allophones, e.g. there is no underlying /w/ in consonant inventory of the language;

b. the lenition occurs only when a consonant or consonants are adjacent to the triggering stressed vowel;

c. the lenition itself is optional, i.e. consonants in the relevant position are in free variation[19];

d. the lenition appears to be **triggered** by stress rather than a more general phenomenon like intervocalic lenition and restricted to onsets of stressed syllables.

With these properties in mind, we will now make some preliminary remarks on the phenomena we discussed in this chapter so far.

3.4 Preliminary Remarks on Stress-dependent Alternations

Before we move on to see some cases where segmental alternations are influenced by binary feet, let us try and make some generalizations about the cases we have discussed in this chapter.

It appears that all the cases of segmental alternations that depend on stress/unbounded feet have some properties in common. First, all the prosodic conditions in these cases are

[19] The only preference for one or the other option I could find is the preference to use the lenited version when word stress is also phrasal stress. Otherwise, the speakers judged lenited and non-lenited versions as equally acceptable in any register; none of the options sounds stylistically marked to them.

conditions on triggers of the alternations: it is the trigger in all the vowel harmony cases that must be stressed, and a vowel before/after an alternating consonant must be stressed as well. In some cases of fortition that involve gemination, stress is a condition that influences the alternation through the requirement of maximizing the weight of the stressed syllable. In cases of lenition, on the other hand, the condition on the trigger seems to be more phonetically grounded, basically making a transition between a consonant and a stressed vowel easier by leniting the consonant.

Both alternations in cases of stress-triggered vowel harmony and stress-triggered cases of lenition often produce allophonic alternations, i.e. the alternations are not restricted to producing only segments present in the underlying segmental inventories, these alternations are not 'structure-preserving' in Lexical Phonology terminology (Kiparsky (1982), among others).

Another notable characteristic of stress-dependent segmental alternations seems to be optionality. A lot of phenomena, most notably lenition alternations discussed above, are optional in whether or not alternation occurs, and in what segments are involved in alternations.

Finally, the stress-triggered alternations appear to be strictly local, where affected segments have to be immediately adjacent to the stressed vowel or to a segment affected by the alternation, with other factors overriding this strict locality in some cases.

Keeping these preliminary generalizations in mind, we now move on to examine some alternations that depend prosodic structure, i.e. bounded feet. If there are no typological differences between how the two prosodic entities, prominence and constituency, influence segmental generalizations, it is possible that the cases we have discussed in the present chapter also depend on constituency, and not on prominence itself, i.e. it is unbounded foot boundaries and headedness that influence the segmental alternations. If, on the other hand, there are any noticeable typological differences between stress-dependent and bounded foot-dependent alternations, it is more likely that we should refer

to prominence directly, without utilizing the notion of ‘unbounded foot’ that would not be a possible prosodic constituent.