

LTP-08

ASPECTS OF PHONOLOGY AND MORPHOLOGY  
OF  
SHIMAKONDE

DISSERTATION

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By

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## ABSTRACT

This dissertation examines the phonology and morphology of the Bantu language Shimakonde. This study provides the first extensive description of the language and explores contemporary issues in the phonological and linguistic theory. Along with a descriptive account of the aspects of phonology and morphology of the language, this dissertation also investigates in depth the core phonological processes of segmental phonology, syllable prosody, nominal and verbal tone, and nominal phrase phonology and raises a number of problems which have some theoretical interest. Specifically, this dissertation documents a large range of types of phonological processes, such as V-V sequences and shows that there are many patterns of V-V resolution including Glide Formation, coalescence, fusion, deletion of the first vowel of the sequence and homorganic glide deletion. An examination of the patterns of hiatus resolution reveals that although V-V resolution in Bantu languages has been investigated before, predictions made by a theory of phonological timing do not reflect a universal account of V-V sequences. Namely, a prevocalic mid vowel undergoes Glide Formation just like a prevocalic high vowel does, and Glide Formation is obligatory in the penult, and optional before the penult. The position-induced optional Glide Formation introduces a new pattern of V-V resolution which has not been documented yet. The bases for optional Glide Formation are not clear, so this fact requires further investigation.

Second, this dissertation deals with unfamiliar process of stress-induced phonological vowel reduction in a typically Bantu tone language. In Shimakonde, both short mid vowels /e, o/ and long mid vowels [ee, oo] derived from /a+e/ and /a+o/, respectively, reduce to [a] in unstressed syllables. Reduction interacts with V-V resolution and also with harmony, and reduction should apply after V-V resolution creates long vowels. Harmony feeds into reduction, and reduction makes harmony to be opaque, because reduction removes all relevant vocalic features which are crucial for proper application of harmony. Furthermore, there is a restriction in the pattern of reduction when this process involves a sequence of contiguous reducible vowels. This restriction requires that vowel reduction applies to a vowel beginning at one point from the left edge of the stem to the right, and once the rule stops applying, it cannot restart applying again. Acoustic measurements and perceptual test show that the surface [a] derived from reduction of mid vowels is indistinguishable phonetically from the surface stressed vowel [a].

Finally, this dissertation examines phonological rules that apply at the phrase level. This investigation provides data which are counterexamples to all current theories of syntax-phonology interaction. Although syntax-phonology interaction has been investigated before, this study is the first to examine structures involving a noun before multiple modifiers.

All current theories of syntax-phonology interaction predict correctly, that a noun and a modifier phrase together phonologically, if the two words are within the same maximal projection, i.e. the syntactic constituent XP. Shimakonde shows that the combination of a noun before multiple modifiers triggers the same phonological changes which apply to a noun before a single modifier. Surprisingly these phonological changes also apply to a modifier before another modifier. Phrasal phonological rules apply to two elements even if they are in separate clauses. These facts cannot be explained by the major theories of syntax-phonology interaction. I propose an account which claims that a phonological rule applies between two words if the trigger and the target words are bounded within the same NP, and any relevant phrasal phonological rule applies to elements which are contained in different XP constituents.

Dedicated to

My Father Liphola (Akanalombe) Ndhinuûngu

My Father-in-Law Mzee (Luis Abraão) Mmúule

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NINGUÉM DISSE

Para Nkúwaana & Nancélu:

Se se continuar a fazer o que sempre se fez, vai-se  
continuar a obter o que sempre se obteve.

## CHAPTER 1

### INTRODUCTION

#### 1.0 Introduction

This dissertation has both descriptive and theoretical goals. First, I present data and analysis of the morphology and phonology of Shimakonde. Second, I provide the first extensive description of the language and explore contemporary issues in phonological and linguistic theory based upon the data findings presented. This dissertation documents some of the range of phonological patterns found in Shimakonde, specifically this dissertation investigates in depth the core phonological processes of segmental phonology, syllable prosody, tone and phrasal phonology. This dissertation is not a complete grammar of Shimakonde. But, it represents a thorough account of several phonological phenomena encountered in the language. In addition to describing the phonology and morphology of the language, this dissertation raises a number of theoretical questions.

This dissertation is organized as follow. Following the introductory chapter, there is a discussion of the preliminaries of morphology presented in chapter 2. In chapter 3 and 4 I deal with segmental phonology focusing on consonantal and vocalic alternations.

In chapter 5 I analyze harmony and vowel reduction. In chapter 6 I deal with the verbal tone system and provide a theoretical account of the major tonal processes. In chapter 7 I discuss nominal phrase phonology, and finally, in chapter 8, I present conclusions.

### **1.1 Facts about Shimakonde**

Shimakonde is a Bantu language spoken in Northeastern Mozambique and Southern Tanzania, but it is not possible to cite the exact number of speakers in each country where it is spoken. According to Yukawa (1985) the number of Shimakonde speakers in Tanzania is around 400,000. According to the report of the 1990 census, in Mozambique, Shimakonde is spoken in various districts of Cabo Delgado Province, namely in Ancuabe, Macomia, Mocímboa da Praia, Mueda, Muidumbe, Nangade, Palma and Quissanga. According to this report there were 224,662 native speakers of Shimakonde. Due to recent migrations of the population particularly after independence (in 1975), speakers of the Shimakonde language may be found in a significant numbers in various districts throughout the country. This includes Shimakonde speakers in the Ibo district, in the city of Pemba, Meluco, Nampula Province, Niassa Province, Zambezia Province and Maputo, where Shimakonde is not spoken by original populations.

In Guthrie's (1967-71) classification of Bantu languages, Shimakonde is placed in Zone P, Group 23, hence coded as P<sub>23</sub>, making this language genetically close to better-attested languages like Emakhuwa, Ciyao, and Kimatumbi. Emakhuwa is discussed in

Cheng and Kisseberth (1979, 1980, 1981). Kimatuumbi is analyzed in Odden (1996) and details of Ciyao are presented in Whiteley (1966), Odden (1987) and Ngunga (1997).

In Mozambique, there are two dialects of Makonde, namely Shímákonde and Shimakoõnde, the later also know as Cíndoonde spoken in the West low land area along the Rovuma river basin. In Tanzania, there are reported two dialects of Makonde, namely Chimahuta and Chimaraba (Odden, 1990). There are considerable lexical, phonetic and tonal differences between the variety of Shímákonde spoken in the northern Mozambique and the dialects spoken in Tanzania. Within the Mozambican varieties there are small differences in the lexicon, phonetics and tone between the speakers of the low land areas and speakers of the plateaus of Mueda and Macomia areas.

There is a wide spread misconception, sometimes among the Shimakonde speakers that the linguistic nucleus or historical origin of Shimakonde is located in the plateau of Mueda district, also referred to as *Planalto dos Makondes* (Makonde Plateau), though there is no linguist and historical evidence yet to support such claim. From a geographical standpoint, the plateaus of Cabo Delgado Province where Shimakonde is spoken comprehend two distinct areas, namely, the plateau of Macomia in the South, and the Mueda plateau in the North. The Mueda plateau in particular covers an area which includes the districts of Mueda, Muidumbe and Nangade. Excluding the district of Muidumbe, the districts of Mueda and Nangade are also included on the Northern plateau of Newala in Tanzania, where Shimakonde is also spoken.

Moreover, the plateau of Mueda also covers the Western area of the Mocímboa da Praia district including Diaca area and Nániili (see the map of the plateau region of Cabo Delgado in the appendix A).

This dissertation describes the variety of Shimakonde spoken in Mocímboa da Praia and includes the contiguous areas including the Eastern part of Mueda and Muidumbe districts as well as the northern part of Macomia district and the southern area of Palma district which border on Mocímboa da Praia. The choice of this variety was governed by the fact that the author is a native speaker of this Shimakonde variety, which has not been described yet.

## **1.2 Previous Works**

The first written works in Western languages about Shimakonde include works written by German missionaries and published in Germany. The best known written works are "Grundriss einer Grammatik der Kondesprache" by van Schumann (1898) and "Entwurf einer Kimakonde Grammatik" by van Lorenz (1914). An examination of these preliminary written works show that they do not include any relevant linguistic data which correspond to the actual variety of Shimakonde spoken in present day. It can be concluded from these previous works that what van Schumann and van Lorenz consider as Shimakonde data are collections of linguistic data from various related languages spoken in southern Tanzania.

Relevant linguistic data included in this previous studies suggest that German missionaries may have included in the survey data from Mwera (Chimweela) described in Harries (1950), Nyakyusa, Cimakwe spoken in Palma district, Ciyao and some dialects of Cingoni (Nguni) spoken in Nangade district (for details see NELIMO, 1991/1993).

Almost half of a century since the first works were published, the first attempt at describing the basic linguistic facts about the variant of Shimakonde spoken in Mozambique is found in Guerreiro (1963), who provides an incomplete survey. Recent written works on Shimakonde include Yukawa (1985), Odden (1989, 1990) and Liphola (1991). All the previous works are preliminary and none of the previous studies deal with the morphology of the language and how this component of grammar interacts with other levels of grammar.

Like most Bantu languages of Zone P, Shimakonde has not been fully described, but there are some theoretical aspects of the grammar of the language which are known from previous works (Yukawa, 1985 and Odden 1989, 1990) and from other genetically closely related languages. Yukawa (1985) describes the tonology of Makonde verbs focusing on the variant spoken in Tanzania. Odden (1989, 1990) examines tone in two dialects of Makonde, namely Chimahuta and Chimaraba, both spoken in Tanzania. Liphola (1991) provides a preliminary analysis of nominal tone system in the Shimakonde variety spoken in Mozambique.

### 1.3 Theoretical Implications

Given the problems raised in describing the phonology and morphology of Shimakonde, I begin with a summary of theoretical issues. First, this dissertation shows that predictions made by the theory of phonological timing proposed by Clements (1986) do not reflect a universal account of the resolution of Vowel-Vowel sequences for underlying identical vowels.

Second, there is a question about how to account for the interaction between the principles of tone assignment, spreading processes and tone delinking rules which derive different surface tones depending on the length of the verb stem. It will be shown that surface tone differences are due to interaction between tone assignment, spreading and tone delinking rules which prevent H from appearing on the original vowel. These surface tone patterns cannot be explained in a theory where there are no steps in a derivation or specific instructions for how to repair constraint violations. One other related phenomenon found in Shimakonde involves the interaction between Vowel Harmony and Vowel Reduction and this interaction has no explanation in a theory which neither has sequential steps in a derivation, nor specific repair strategies.

The third area of theoretical interest involves phonological changes in nasal +consonant (N+C) interaction found in various languages. In many languages, N+C sequences trigger the same unified set of assimilatory changes. In Shimakonde, different N+C sequences trigger different phonological changes, because these changes depend on the class of prefixes that are involved and also on whether the process applies to verbs or nouns. The question is what is the basis for the distinction in changes involving N+C sequences, and ultimately, how this distinction relates to typological questions. Finally, this dissertation presents data which are a counterexample of all current theories of syntax-phonology interaction. Theories of syntax-phonology interaction predict that nouns and modifiers phrase together phonologically if they are within the same maximal syntactic projection, and words outside of that domain phrase separately. Predictions made by the main theories of syntax-phonology interaction account correctly for Shimakonde phrase phonology only in the case of nouns combined with a single modifier, but there is no explanation of phonological changes affecting nouns before multiple modifiers found in the language.

#### **1.4 Sound Inventory and Orthography**

The sound inventory of Shimakonde found in previous works has been presented using different orthographic systems. Guerreiro (1963) does not present an exhaustive sound system of the language, but he transcribes the phonemes of the language based on Portuguese orthography.

Yukawa (1985) prefers to follow the “traditional orthography of the language”, which reflects the orthographic system of Kiswahili, since the author has developed his research on dialects of Shimakonde spoken in Tanzania, where Kiswahili has a long written tradition. However, Yukawa also uses simultaneously the IPA system for phonetic transcriptions. Odden (1990) examines the Chimahuta and Chimaraba dialects without making any explicit claim about the system used in transcribing the sound system of Makonde dialects, but it can be extracted that his transcriptions follow the informal American system. In this dissertation, I use the standard orthography approved by NELIMO (1989) for Shimakonde to spell out the phonemes. The only exceptions to NELIMO’s standard orthography is that instead of using the symbol *ny* for the palatal nasal [ɲ], I use the symbol /*ñ*/ for the palatal nasal. The symbol *ny* is reserved for a palatalized alveolar nasal which is contrastive with the previous sound. In addition, vowel length and tone are marked, which are not included in the NELIMO’s standard orthography<sup>1</sup>.

---

<sup>1</sup>In Shimakonde the palatal nasal *ñ* is contrastive with the palatalized alveolar nasal *ny*.

Thus, *kú-nyeéla* ‘to eat on his/her behalf’ contrasts with *kú-ñeéla* ‘to defecate on him/her’.



### 1.4.1 The Vocalic Phonemes

There are 5 phonemic vowels in Shimakonde, namely, /a, e, i, o, u/. There is no underlying contrast between short and long vowels in the language and long vowels that appear on the surface are derived from various phonological rules.

The vocalic phonemes are shown in (1.1).

(1.1) Vocalic phonemes:

kú-páát-a	'to get'
kú-péét-a	'to sift'
kú-píít-a	'to pass'
kú-póót-a	'to twist'
kú-púút-a	'to wash'

Shimakonde has a five-way tone contrasts and all of them can be found in the penult. Level high H (á) or (áá), where "a" stands for a tone bearing unit; unmarked low L (aa), rising LH (aá), falling HL (áa) and rise-fall LHL (aâ) as illustrated in the examples in (1.2).

(1.2) Surface tones	Tone marking	Gloss
a. Level H:	as in ly-úúku	'type of basket'
b. Rising LH:	as in ly-uúngu	'medicinal root'

- |                   |       |          |                  |
|-------------------|-------|----------|------------------|
| c. Falling HL:    | as in | ly-úungu | 'type of squash' |
| d. Rise-fall LHL: | as in | ly-uûngu | 'caterpillar'    |
| e. Level L:       | as in | my-uuku  | 'pockets'        |

The vowel in the penultimate syllable in (1.1) – (1.2) becomes long, and the question is why the vowel in the penult should be lengthened.

### 1.4.2 Penultimate Vowel Lengthening

In Shimakonde, the penultimate vowel within the word or phrase is lengthened as shown in the following examples in (1.3).

(1.3) Penult vowel lengthening:

kú-pííma	'to measure'
kú-pímííla	'to measure for'
kú-pímáána	'to measure each other'
kú-pímánííla	'to measure for each other'
kú-pímápímáánga	'to measure repeatedly'

I suggest that the reason why penultimate vowel gets lengthened is because of stress assigned to the penult syllable, and lengthening in the penult is a correlate of that stress.

The stress assignment rule is formalized in (1.4).

(1.4) Stress-Lengthening:

$$\begin{array}{c} [+stress] \\ \sigma \\ \vdots \\ \emptyset \rightarrow \mu \end{array}$$

The rule (1.4) says that a stressed vowel gets an extra mora. In Shimakonde, stress is phonetically more obvious in utterance-final position due to extra vowel length, but it is not phonetically obvious in utterance-medial words, because stress-induced lengthening is reduced by a late post lexical rule. Details and discussion about stress are presented in chapter 5.

### 1.4.3 Consonantal Phonemes

Shimakonde has 18 consonantal phonemes, namely, /b, c, d, g, j, k, l, m, n, ñ, n' p, s, sh, t, v, w, y/, which can be grouped according to the chart shown in (1.5) below.

(1.5) Consonantal phonemes of Shimakonde:

	Labial	Coronal	Palatal	Dorsal
Stop	p	t		k
	b	d		g
Fricative	v	s	sh	
Affricate			c	
			j	
Liquid		l		
Nasal	m	n	ñ	n'
Glide	w		y	

The following examples in (1.6) illustrate each of the phonemes presented in alphabetic order followed by a phonetic description.

(1.6) Illustration of the consonantal phonemes:

/b/: voiced bilabial stop [b], as in:	<b>báaba</b>	'father'
	i- <b>ba</b> kúuli	'bowl'
	kú- <b>béé</b> ba	'to carry'
/c/: voiceless alveopalatal affricate [tʃ], as in:	<b>caá</b> có	'wow!'
	i- <b>ca</b> âma	'party'
	kú- <b>cúú</b> gwa	'to bark'
/d/: voiced alveolar stop [d], as in:	<b>dé</b> engu	'name of glass beads'
	li- <b>do</b> ôdo	'leg'
	kú- <b>dé</b> enga	'to construct'

/g/: voiced velar stop [g], as in:	<b>galoóla</b>	'lock!'
	<b>li-gaâga</b>	'dry cassava'
	<b>kú-góóma</b>	'to strike'
/j/: voiced alveopalatal affricate, [dʒ] as in:	<b>jújúmuunu</b>	'mother'
	<b>lí-jáanga</b>	'stone'
	<b>kúu-ja</b>	'to come back'
/k/: voiceless velar stop [k], as in:	<b>káaka</b>	'brother'
	<b>kú-kámúúla</b>	'to hold'
	<b>kú-kákóóva</b>	'be slow'
/l/: alveolar lateral [l], as in:	<b>laála</b>	'sleep!'
	<b>li-laála</b>	'coconut leaf'
/m/: bilabial nasal [m], as in:	<b>máama</b>	'mother'
	<b>kú-mámééna</b>	'to gnaw'
/n/: alveolar nasal [n], as in:	<b>námáako</b>	'non-initiated girl'
	<b>nánuunu</b>	'baby-caring mother'
/ñ/: palatal nasal [ɲ], as in:	<b>ñanúuka</b>	'little girl'
	<b>kú-ñóoña</b>	'to make a noise'
/nʔ/: velar nasal [ŋ], as in:	<b>nʔúuku</b>	'chicken'
	<b>nʔúnʔúúni</b>	'a bed bug'
/p/: voiceless bilabial stop [p], as in:	<b>páamba</b>	'cotton'
	<b>lí-páápa</b>	'broken basket'
/s/: voiceless alveolar fricative [s], as in	<b>sy-aamuúlo</b>	'comb'
	<b>kú-sáídííla</b>	'to help'

/sh/: voiceless alveopalatal fricative [ʃ] as in:	shií-ja	'thigh'
	kú-pwáshééla	'to help'
/t/: voiceless alveolar stop [t], as in:	tatakeéla	'give up!'
	kú-túúta	'to pop'
/v/: voiced labio-dental [v], as in:	vaáva	'scratch!'
	kú-víína	'to dance'
/w/: bilabial glide [w], as in:	wiíno	'paint'
	kú-wééna	'to walk'
/y/: palatal glide [j], as in:	yaána	'morning sun shining'
	yóomba	'fish'

There is a phonetic /sh/ ~ /c/ ~ /s/ dialect distinctions in Makonde found in Shimakonde, not \*Cimakonde vs. Cimahuta, where this distinction is reflected in the names of the two variants. However, the pattern of /sh/ ~ /c/ ~ /s/ alternations is not clear, because the voiceless fricatives /s/, /sh/ and the voiceless palatal affricate /c/ show a very highly marginal phonemic contrast in Shimakonde. Generally, the voiceless palatal /c/ is pronounced as fricative /sh/ for some speakers, but this alternation is not applicable in all words. Due to highly marginal contrast, some speakers also alternate /sh/ ~ /s/ in certain words. There are a few words where /c/ is always [c] vs. /sh/ which is realized [sh] as shown in (1.7).

(1.7) /c/ vs. /sh/ contrast:

i-caáma	'party'	cf. shy-aándo	'plait of palm lives'
caámbo	'allurement'	cf. shi-ngaânga	'name of a drum'
kú-cúnjífla	'to spy'	cf. kú-shííma	'to close'

The data in (1.7) establish that marginally *sh* and *c* are phonemes. The examples in (1.8a) show /s/ which is always realized as [s], and in (1.8b) I provide some examples involving /s/ ~ /sh/ alternation.

(1.8) /sh/ ~ /s/ alternation:

a.	sííma		*shííma	'well'
	ku-seêna		*ku-sheêna	'to the hell'
b.	shíínu	~ síínu	*cíínu	'thing'
	sheépo	~ seépo	*ceépo	'fruit'
	kú-shííma	~ kú-sííma	*kú-cííma	'to close'

We see that (1.8a) establishes that *sh* and *s* are phonemes, but (1.8b) contradicts the treatment of these sounds as different phonemes. Additional reasons for why /c/ ~ /sh/ ~ /s/ alternations occur are explained in chapter 3.

## CHAPTER 2

### PRELIMINARIES ON MORPHOLOGY AND GRAMMATICAL STRUCTURE OF SHIMAKONDE

#### 2.0 Introduction

This chapter provides the basic facts about the morphology of Shimakonde. The purpose of this chapter is to provide a quick reference to the major grammatical categories and the general principles of Shimakonde morphology. The topics discussed in this chapter include noun classes and class-agreement, tenses of the language, and a brief survey on verb extensions. It will be shown that there are many inflectional categories of the verb in the language, so certain examples are given as representative to illustrate each tense-aspect. The description of the basic facts about the morphology also includes an examination of derivational morphology in verbs which shows that a number of suffixes also known as verb extensions can be added to simpler verbal stems to derive an extended stem.

## 2.1 Noun Morphology

Like most Bantu languages, each noun in Shimakonde belongs to a particular noun class. The class of the noun is indicated by a prefix. The semantics of the noun class prefixes is not transparent, because while some noun classes are associated with particular semantics (e.g., class 1/2 includes only people) this fact is not completely consistent in other noun classes. In (2.1) I provide a full list of underlying noun class prefixes of Shimakonde.

### (2.1) Shimakonde noun class prefixes:

Prefix	Class #	Example Noun	Gloss
mu-	1	muú-nu	'person'
va-	2	vaá-nu	'people'
mu-	3	muú-ti	'head'
mi-	4	mií-ti	'heads'
li-	5	li-doôdo	'leg'
ma-	6	ma-doôdo	'legs'
shi-	7	shi-puûla	'knife'
vi-	8	vi-puûla	'knives'
(i)-N	9	(i)-mbúúdi	'goat'
di-	10	dí-mbúúdi	'goats'

lu-	11	lú-ngaau	'net'
	(10)	dí-ngaau	'nets'
ka- (dim.)	12	ka-puûla	'small knife'
tu- (augm.)	13	tu-puûla	'big knife'
u-	14	u-koóti	'neck'
	(6)	ma-koóti	'necks'
ku- (infin.)	15	kú-káláánga	'to fry'
pa- (locat.)	16	pa-dí-ngaau	'on the nets'
ku- (locat.)	17	ku-Mosiímbwa	'to/at Mocímboa'
mu- (locat.)	18	mu-li-doôdo	'into the leg'

The classes group as follows (singular/plural): 1/2, 3/4, 5/6, 7/8, 9/10, 11/10, 12/13, 14/6, 15, 16, 17, 18. In most Bantu languages including Shimakonde, class 14 comprises mainly mass or abstract nouns like *ú-túúúli* 'brain', *u-gwaáli* 'corn paste', *ú-kálaau* 'cruelness', etc.). In this respect Shimakonde is similar to other Bantu languages.

However, unlike other Bantu languages, Shimakonde shows that class 14 groups three sub-categories of nouns in terms of plural marking. One sub-class comprises countable nouns which include parts of the human body like *u-tuúmbu* 'intestine', *u-koóti* 'neck', *ú-túún'u* 'cheek', etc., which have obligatory corresponding plural forms selecting the prefix *ma-* of class 6 as in *ma-tuúmbu* 'intestines', *ma-koóti* 'necks' and *ma-túún'u* 'cheeks'.

Within the category of countable nouns of class 14, there is a sub-class of nouns which includes names of animals like *uú-ndi* 'eagle', *uú-ngo* 'civet', and *uú-shwa* 'termite'. These nouns obligatorily select the plural prefix of class 2 (*va-*) as in *vá-úúndi* 'eagles' *vá-úungo* 'civets', etc.

Finally, there is a third sub-category of class 14 nouns which do not select either the plural prefix of class 6 (*ma-*) or the plural prefix of class 2 (*va-*). This class includes mass nouns like *úu-shi* 'honey', *uú-pi* 'ashes', etc., which have no corresponding plural. In Shimakonde, there are mass nouns belonging to other class nouns which have no corresponding plural. For example, class 5 has a singular prefix *li-* and the corresponding plural prefix is *ma-* of class 6. Certain nouns of this class like *lií-u* 'ashes', *lií-pa* 'name of alcoholic drink' have no corresponding plural prefix *ma-*, so *\*maá-u* and *\*maá-pa* do not exist in the language.

## 2.2 Number Pairings

Number pairings in Shimakonde show that for the classes 1-10 and 12-13, the singulars and plurals are paired. So, class 1 and class 2 represent the singular and plural of the noun. Optionally, class 3 and class 9 pair with class 8 and 2, respectively. Excluding the pairing of 12-13, above class 10, the singular and plural do not pair with the numerically adjacent classes. Number pairing is shown in (2.2).

## (2.2) Noun class pairings:

Noun class	Singular/Plural	Gloss
1, 2	muú-nu uú-mo (sg.)	'one person'
	~ muú-nu juú-mo (sg.)	=
	vaá-nu va-vifli (pl.)	'two people'
3, 4	muú-ti uú-mo (sg.)	'one head'
	mií-ti mi-vifli (pl.)	'two heads'
~ 8	~ mií-ti vi-vifli (pl.)	=
5, 6	li-doôdo lí-mo (sg.)	'one leg'
	ma-doôdo ma-vifli (pl.)	'two legs'
7, 8	shi-puûla shíí-mo (sg.)	'one knife'
	vi-puûla vi-vifli (pl.)	'two knives'
9, 10	í-mbúúdi íí-mo (sg.)	'one goat'
~ 9	~ mbúúdi uú-mo ~ juúmo (sg.)	=
(10)	dí-mbúúdi m-bifli (pl.)	'two goats'
~ 2	vá-mbúúdi va-vifli (pl.)	=
11, 10	lú-ngaaú luú-mo (sg.)	'one net'
(10)	dí-ngaaú m-bifli (pl.)	'two nets'
12, 13	ka-puûla kaá-mo (sg.)	'one small knife'
	tu-puûta tu-vifli (pl.)	'two big knives'

14, 6	u-koóti	uú-mo	(sg.)	'one neck'
	ma-koóti	ma-vifli	(pl.)	'two necks'
15	kú-káláánga	kuú-mo	_____	'one frying'

---

What we see that class 5 and class 14 pair with class 6 to form the plural and class 9 and 11 both take the plural in class 10.

### 2.3 Class Agreement

In Shimakonde there is agreement within NP between the head noun and the modifier. There is also agreement between the subject NP and the verb. Finally, there is no agreement for objects, rather, object prefixes (OP) reflect the noun class of the pronominalized object. Thus when adjectives, numbers, demonstratives and determiners combine with a noun they have a class prefix that is the same morphological class of the noun they modify. This section provides an overview of the most common nominal complements, and the class agreement of subject and object prefixes.

### 2.3.1 Subject Prefixes

In Shimakonde, verbs do not use noun class prefixes, but for every noun class, except locative classes, there is a subject prefix (SP). The SP and the noun-class prefix for classes 5, 7, 10,11, 12, 13, 14 and 15 are phonologically identical, but in some classes including classes 1, 3, 4, 6 and 9 the SP has a different shape from the noun-class prefix as seen in (2.3).

#### (2.3) Subject prefixes:

SP's	Class		Illustration	Gloss
ni-	1	(1 <sup>st</sup> sg.)	<b>ní</b> -ndí-guguvaâla	'I had kneeled'
tu-	1	(1 <sup>st</sup> pl.)	<b>tú</b> -ndí-guguvaâla	'we had kneeled'
u-	1	(2 <sup>nd</sup> sg.)	<b>ú</b> -ndí-guguvaâla	'you had kneeled'
mu-	1	(2 <sup>nd</sup> pl.)	<b>mú</b> -ndí-guguvaâla	'you had kneeled'
a-	1	(3 <sup>rd</sup> sg.)	<b>á</b> -ndí-guguvaâla	'(s)/he had kneeled'
va-	2	(3 <sup>rd</sup> pl.)	<b>vá</b> -ndí-guguvaâla	'they had kneeled'
u-	3	muú-ti	<b>ú</b> -ndí-tumbukaânga	'the head had broken'
vi-	4	mií-ti	<b>ví</b> -ndí-tumbukaânga	'the heads had broken'
li-	5	li-putipuúti	<b>lí</b> -ndí-guguvaâla	'the sheep had kneeled'
a-	6	ma-putipuúti	<b>á</b> -ndí-guguvaâla	'the sheep had kneeled'
shi-	7	shi-puûla	<b>shí</b> -ndí-pindikuûka	'the knife had turned over'
vi-	8	vi-puûla	<b>ví</b> -ndí-pindikuûka	'the knives had turned over'

(i)m-	9	(i-)mbúúdi	í-ndí-guguvaâla	'the got had kneeled'
a-	(1)	mbúúdi	á-ndí-guguvaâla	'the goat had kneeled'
di-	10	dí-mbúúdi	dí-ndí-guguvaâla	'the goats had kneeled'
lu-	11	lu-ngaájo	lú-ndí-pindikuûka	'the foot had turned over'
	(10)	di-ngaájo	dí-ndí-pindikuûka	'the feet had turned over'
ka-	12	ka-puûla	ká-ndí-pindikuûka	'the small knife had turned over'
tu-	13	tu-puûla	tú-ndí-pindikuûka	'the big knives had turned over'
u-	14	u-tuúmbo	ú-ndí-pindikuûka	'the intestine had turned over'
a-	(6)	ma-tuúmbo	á-ndí-pindikuûka	'the intestines had turned over'
ku-	15	kú-káláanga	kú-ndí-maliliîka	'frying had finished'

### 2.3.2 Object Prefixes

The object prefixes (OP's) also reflect class agreement. However, unlike other class agreement where every noun class has the corresponding prefix, OP's are very restricted in Shimakonde. In the most Bantu languages almost every noun class has an OP. For example, Odden (1990) points out that in Chimahuta dialect of Makonde, the verbs like *ku-chi-teleeka* 'cook it' are possible, where the morpheme *-chi-* is the OP of the verb cook for class 7. Unlike Chimahuta and other Bantu languages, verbs in Shimakonde only take OP's of classes 1 and 2, which have a feature [+human]. Thus, there are only six OP's corresponding to the three pairs of the singular vs. plural of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> grammatical persons.

(2.4) Object prefixes:

OP's	Class		Illustration	Gloss
ngu-	1	(1 <sup>st</sup> sg.)	vá-ndí-ngú-talakeêla	'they had cooked for me'
tu-	1	(1 <sup>st</sup> pl.)	vá-ndí-tú-talakeêla	'they had cooked for us'
ku-	1	(2 <sup>nd</sup> sg.)	vá-ndí-kú-talakeêla	'they had cooked for you'
n- (mu-)	1	(2 <sup>nd</sup> pl.)	vá-ndí-n-talakeêla	'they had cooked for you'
n- (mu-)	1	(3 <sup>rd</sup> sg.)	vá-ndí-n-talakeêla	'they had cooked for him/her'
va-	2	(3 <sup>rd</sup> pl.)	vá-ndí-vá-talakeêla	'they had cooked for them'

In addition to the OP's in (2.4) there is a reflexive prefix *-li-* which is common to all classes as shown in (2.5).

(2.5) Reflexive prefix:

SP's	Reflexive	Gloss
ni-	ni-nku-lí-loóla	'I am looking at myself'
tu-	tu-nku-lí-loóla	'we are looking at our selves'
u-	u-nku-lí-loóla	'you are looking at yourself'
mu-	mu-nku-lí-loóla	'you are looking at yourselves'
a-	a-nku-lí-loóla	'he is looking at himself'
va-	va-nku-lí-loóla	'they are looking at themselves'

In Shimakonde, any object can be realized as the reflexive prefix *-li-*, provided that the verb is transitive. We see that different grammatical persons are realized as reflexive *-li-*.

### 2.3.3 Adjectives

In Shimakonde, all adjectives take agreement prefixes. There are many adjectives in the language and the adjective prefixes are mostly the same as the noun class prefixes. The modifier of class 3 agrees with the preceding noun, but it has a different shape from that used in the noun. In addition, class 4 has two options in terms of agreement between the noun and the modifier. One option is to agree with the class of the preceding noun and another option is to agree in class 8.

(2.6) Nouns before Adjective:

Class	Noun + Adjective	Agreement Prefix	Gloss
1	mú-nú n-gúlúguuma	n- (mu-)	'round person'
2	vá-nú vá-mboône	va-	'good people'
3	mú-tí ú-gúlúguuma	u-	'round head'
4	mí-tí mí-gúlúguuma	mi-	'round heads'
~ 8	mí-tí vy-áámboône	vy- (vi-)	'good heads'
5	lí-dódó lí-gúlúguuma	li-	'round leg'
6	mádódó má-gúlúguuma	ma-	'round legs'

7	shí-púlá	<b>shy</b> -áámboône	shy- (shi-)	'good knife'
8	ví-púlá	<b>ví</b> -gúlúguuma	vi-	'round knives'
9	(í)m-búdí	(í)n-gúlúguuma	(i)N-	'round goat'
10	dí-mbúdí	<b>dy</b> -áámboône	dy- (di-)	'good goats'
11	lú-ngáú	<b>lú</b> -gúlúguuma	lu-	'round net'
(10)	dí-ngáú	<b>dí</b> -gúlúguuma	di-	'round nets'
12	ká-púlá	<b>ká</b> -mboône	ka-	'small good knife'
13	tú-púlá	<b>tú</b> -gúlúguuma	tu-	'big round knives'
14	ú-túmbó	<b>ú</b> -gúlúguuma	u-	'round intestine'
15	kú-kálángá	<b>kw</b> -áámboône	kw- (ku-)	'good fry'
16	pá-dí-ngáú	<b>pá</b> -gúlúguuma	pa-	'on the round nets'
17	kú-Mósímbwá	<b>kw</b> -áámboône	kw- (ku-)	'at good Mocímboa'
18	mú-lí-dódó	<b>mú</b> -gúlúguuma	mu-	'into round leg'

The adjectives that modify the class 3 nouns pattern morphologically the same as the class 14 nouns. The adjective prefix of class 1 is a syllabic nasal which derives from deletion of the underlying vowel of the prefix /mu-/. The surface outcome of the agreement prefix may differ from its underlying form due to phonological rules, which are discussed in chapter 3 and 4.

### 2.3.4 The Possessives

Possessives take an agreement marker determined by the class of the noun that they modify. However, there are differences in the phonological shape of the class agreement of classes 3, 4, 6 and 9. First, the concord possessive prefix for class 6 is *la-* which differs from the noun class prefix (*ma-*). Second, the possessive prefix of class 1 is /u-/, which differs from the prefix of the head noun (*mu-*). Class 3 behaves like the adjective which has the agreement marker *u-*. Class 9 has two options. If the noun prefix *i-* is overtly expressed, the possessive takes the agreement marker *y-*. If the prefix *i-* is not overtly expressed, then the class agreement of the possessive is *w-*. Finally, class 4 obligatorily takes the agreement marker *vy-* /*vi-*/ and there is no optional form with *\*mi-*. The surface outcome of the possessive prefix can differ from its underlying form due to glide formation when two vowels are brought together. Discussion of segmental vocalic phonology is presented in chapter 4. The forms of the possessive change to agree with the noun class of the head noun. The following examples in (2.7) show the agreement between the possessor and the possessed.

## (2.7) Nouns before Possessive:

Class	Noun + Possessive	Agreement Prefix	Prefix	Gloss
1	mú-nú	w-áangu	w- (u-)	'my person'
2	vá-nú	v-áangu	va-	'my people'
3	mú-tí	w-áangu	w- (-u)	'my head'
4	mí-tí	vy-áangu	vy- (vi-)	'my heads'
5	lí-dódó	ly-áangu	ly- (li-)	'my leg'
6	má-dódó	l-áangu	la-	'my legs'
7	shí-púlá	shy-áangu	shy- (shi-)	'my knife'
8	ví-púlá	vy-áangu	vy- (vi-)	'my knives'
9	í-mbúdí	y-áangu	y- (i-)	'my goat'
	~ mbúdí	w-aáangu	w- (u-)	'my goat'
10	dí-mbúdí	dy-áangu	dy- (di-)	'my goats'
11	lú-ngáú	lw-áangu	lw- (lu-)	'my net'
12	ká-púlá	k-áangu	ka-	'my small knife'
13	tú-púlá	tw-áangu	tw- (tu-)	'my big knives'
14	ú-túmbó	w-áangu	w- (u-)	'my intestine'
(6)	má-túmbó	l-áangu	la-	'my intestines'
15	kú-kálángá	kw-áangu	kw- (ku-)	'my frying'

16	pá-dí-ngáú	p-áangu	pa-	'on my nets'
17	kú-Mósímbwá	kw-áangu	kw- (ku-)	'to my Mocímboa'
18	mú-lí-dódó	mw-áangu	mw- (mu-)	'into my leg'
	~ mú-lí-dódó	ly-áangu	ly- (li-)	=

The optional form of the last example of class 18 shows that the possessive may optionally agree with the second noun prefix in a sequence (*li-*), but not both. As we can see, in many cases, the possessive prefix is identical to the noun prefix.

### 2.3.5 Demonstratives and Determiners

Demonstratives and determiners also take a class prefix to indicate the agreement. In Shimakonde, these grammatical categories generally follow the nouns they modify, but in emphatic speech, demonstratives can precede the noun they modify.

The following examples in (2.8) show the agreement markers between the noun classes and the demonstratives. The shape of the agreement for a demonstrative is very much like the possessive agreement. The demonstrative is formed of the linking vowel /a/ which is followed by the corresponding class agreement morpheme. Note that class 4 patterns the same as class 8, and this pattern is identical to that of the possessive class agreement.

(2.8) Nouns before Demonstratives:

Class	Noun + Demonstrative	Gloss
1	mú-nw      áá-ju	'this person'
2	vá-nw      áá-va	'these people'
3	mú-ty      áá-u	'this head'
4	mí-ty      áá-vi	'these heads'
5	lí-dódy    áá-li	'this leg'
6	má-dódy    áá-la	'these legs'
7	shí-púl'    áá-shi	'this knife'
8	ví-púl'      áá-vi	'these knives'
9	í-mbúdy    áá-i	'this goat'
10	dí-mbúdy    áá-di	'these goats'
11	lú-ngáw    áá-lu	'this net'
(10)	dí-ngáw    áá-di	'these nets'
12	ká-púl'      áá-ka	'this small knife'
(13)	tú-púl'      áá-tu	'these big knives'
14	ú-túmbw    áá-u	'this intestine'
(6)	má-túmbw    áá-la	'these intestines'

- (15) kú-káláng' áá-ku 'this frying'
- (16) pá-shínw áá-pa 'on this place'
- (18) mú-lídódw áá-mu 'into this leg'

### 2.3.6 Numbers

In Shimakonde, only the digits one, two and three have class agreement. All other digits have no agreement marker. Consider the following examples in (2.9).

(2.9) Nouns before numbers:

Class #	Noun + Numeral	Numeral prefix	Gloss
1	muú-nu <b>juú-mo</b> ~ <b>uú-mo</b>	(j)u-	'one person'
2	vaá-nu <b>va-viíli</b>	va-	'two people'
2	vaá-nu <b>va-taátu</b>	va-	'three people'
3	muú-ti <b>uú-mo</b>	u-	'one head'
4	mií-ti <b>mi-viíli</b>	mi-	'two heads'
4	mií-ti <b>mi-taátu</b>	mi-	'three heads'
5	li-doôdo <b>lií-mo</b>	li-	'one leg'
6	ma-doôdo <b>ma-viíli</b>	ma-	'two legs'
6	ma-doôdo <b>ma-taátu</b>	ma-	'three legs'

7	shi-puûla	<b>shii</b> -mo	shi-	'one knife'
8	vi-puûla	<b>vi</b> -vifli	vi-	'two knives'
8	vi-puûla	<b>vi</b> -taátu	vi-	'three knives'
9	í-mbúúdi	<b>ii</b> -mo	i-	'one goat'
9	~ mbúúdi	<b>juú</b> -mo	ju-	=
10	dí-mbúúdi	<b>m</b> -bifli	m-	'two goats'
11	lú-ngaau	<b>luú</b> -mo	lu-	'one net'
(10)	dí-ngaau	<b>m</b> -bifli	m-	'two nets'
(10)	dí-ngaau	<b>n</b> -naátu	n-	'three nets'
12	ka-puûla	<b>kaá</b> -mo	ka-	'one small knife'
13	tu-puûla	<b>tuú</b> -vifli	tu-	'two big knives'
(13)	tu-puûla	<b>tu</b> -taátu	tu-	'three big knives'
14	u-tuúmbo	<b>uú</b> -mo	u-	'one intestine'
6	ma-tuúmbo	<b>ma</b> -vifli	ma-	'two intestines'
6	ma-tuúmbo	<b>ma</b> -taátu	ma-	'three intestines'

We also see that there are phonetic differences between [bili] ~ [vili] 'two' (cf. class 2, 4, 6, and 10) and [tatu] ~ [natu] 'three' (class 2, 4, 6, and 10). The [v] ~ [b] and [t] ~ [n] alternations are conditioned by the noun-prefix /N-/ which triggers nasal + consonant interaction discussed in chapter 3.

The following examples in (2.10) show that the digits from four and higher have no agreement marker, and the lack of the agreement marker is indicated by zero.

(2.10) Numerals lacking class agreement:

Class #	Noun + Numeral	Numeral prefix	Gloss
2	vaá-nu nceece	∅	'four people'
2	vaá-nu mwaánu	∅	'five people'
2	vaá-nu mwaánu na juú-mo	∅	'six people'
2	vaá-nu kuúmi	∅	'ten people'
4	mií-ti nceece	∅	'four heads'
4	mií-ti mwaánu	∅	'five heads'
4	mií-ti mwaánu na uú-mo	∅	'six heads'
4	~ mií-ti kuúmi	∅	'ten heads'
6	ma-doôdo nceece	∅	'four legs'
6	ma-doôdo mwaánu	∅	'five legs'
6	ma-doôdo mwaánu na líí-mo	∅	'six legs'
6	ma-doôdo kuúmi	∅	'ten legs'
8	vi-puûla nceece	∅	'four knives'
8	vi-puûla mwaánu	∅	'five knives'
8	vi-puûla kuúmi	∅	'ten knives'

10	dí-mbúúndi	nceece	∅	'goats'
10	dí-mbúúdi	mwaánu	∅	'five goats'
10	dí-mbúúdi	mwaánu na nceece	∅	'nine goats'
10	dí-mbúúdi	kuúmi	∅	'ten goats'
10	dí-mbúúdi	ma-kumi kuúmi	∅	'100 goats'

Recall from the previous table in (2.9) that the digits 1 – 3 have numeral class agreement prefixes for all nouns. The data in (2.10) show that the class agreement prefix is never realized for numerals four, five and ten. So the lack of the numeral agreement prefix in (2.10) is not due to the noun-class, but rather to the digits four, five, ten and due to a combination of these decimal numeric values.

#### 2.4 Verbal Tense-aspects and Inflectional Prefixes

In Shimakonde there are 23 positive verbal tenses. Almost every tense has a corresponding negative form, so the total number of verbal tenses is 45, because there is one tense, namely the volitional future, which has no a corresponding negative form. The inflectional category of the verb is marked by segmental tense-prefixes and tone, or both. It is not the goal of this section to provide a full description of verbal system of Shimakonde, instead it provides a general review of tenses, focusing on tense-prefixes and how each inflectional category differs from other tenses both segmentally and tonally.

In certain tenses there are optional patterns of tone spreading, so *vá-ndá-guguvaâla* and *vá-ndá-gúgúvaâla* 'they kneel' are tonally possible outcomes, but the discussion and details of the underlying principles which govern the verbal tone system are presented in chapter 6. In this review section only one tone option is considered. However, optional segmental alternations involving tense-prefixes are included in the transcriptions, so that we can see what the segmental differences of tense-prefixes are. The relevant examples of verbal tenses of Shimakonde are given in (2.11).

(2.11) Verbal tenses:

Tenses:	Positive	Negative
(11a) <b>Infinitive:</b>		
	kú-gúgúváála	meé(ne) kú-gúgúváála
	'to kneel'	'to not kneel'
(11b) <b>Recent past:</b>		
	va-ndi-gúgúvaála	a-va-gúgúveéle
	'they kneeled'	'they did not kneel'
(11c) <b>Remote Past:</b>		
	vá-ndí-guguvaâla	a-va-guguveêle
	'they had kneeled'	'they had not kneeled'

**(11d) Present Habitual:**

va-ndá-guguvaâla	-va-na-guguváála
~ va-ná-guguvaâla	~ a-va-na-guguváála
'they kneel'	'they do not kneel'

**(11e) Present Progressive:**

va-nku-guguváála	a-va-na-guguválá siinu
'they are kneeling	'they are not kneeling'

**(11f) Volitional Present Progressive:**

va-lota kú-gúgúváála	a-va-nalótá sinu kú-gúgúváála
'they are intending to kneel'	'they are not intending to kneel'

**(11g) Present Progressive Relative:**

va-guguvaâla	vá-ká-guguvaala
'that they are kneeling'	'that they are not kneeling'

**(11h) Progressive Imperfective:**

vá-sí-ndá-guguvaâla	a-va-si-guguváála
'they were kneeling'	'they were not kneeling'

**(11i) Past Progressive Relative:**

vá-sí-gúgúváála	vá-ká-sí-gúgúváála
'that they were kneeling'	'that they were not kneeling'

**(11j) Present Habitual Relative:**

vá-ná-gúgúváála	vá-ká-ná-gúgúváála
'that they kneel'	'that they do not kneel'

**(11k) Future:**

va-nda-gúgúváála	
~ va-na-gúgúváála	a-va-guguvaala
'they will kneel'	'they will not kneel'

**(11l) Volitional Future:**

vá-lótá ~ vá-lámbé' kú-gúgúváála
'they intend to kneel'

**(11m) Imperative:**

guguvaála	a-va-na-gúgúvaale
'kneel!'	(they) do not kneel!'

**(11n) Conditional:**

va-ka-guguvaála	va-ka-guguvaale
'if they kneel'	'if they do not kneel'

**(11o) Participial /Gerund:**

vá-gúgúvaala	va-ka-na-guguváála
'(they) kneeling'	'(they) not kneeling'

(11p) **Subjunctive:**

va-guguvaále	'let them kneel'
a-va-na-gúgúvaale	'let them not kneel'

(11q) **Suggestive:**

vá-ká-ndí-guguvaâla	vá-ká-ná-guguvaale
'they should kneel'	'they should not kneel'

(11r) **Perfective-when:**

va-guguveele	va-ka-gúgúveéle
'when they have kneeled'	'when they have not kneeled'

(11s) **Recent Past Perfective-when:**

pá-vá-gúgúveele	pá-vá-ká-guguveéle
'when they kneeled'	'when they did not kneel'

(11t) **Remote Past Perfective-when:**

pa-va-guguveéle	pá-vá-ká-guguveéle
'when they had kneeled'	'when they had not kneeled'

(11u) **Imperfective-when:** pá-vá-sí-gúgúváála

'when they were kneeling'	'when they were not kneeling'
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(11v) **Present Progressive-when:**

pá-vá-gúgúvaala	pá-vá-ká-guguvaala
'when they are kneeling'	'when they are not kneeling'

(11w) Present Habitual-when:

pá-vá-ná-gúgúváála	pá-vá-ná-ká-gúgúváála
'when they kneel'	'when they do not kneel'

2.4.1 Tense-Aspect Morphology

In Shimakonde, there are 9 tense-aspect prefixes illustrated in (2.12).

(2.12) Tense-prefixes in Shimakonde:

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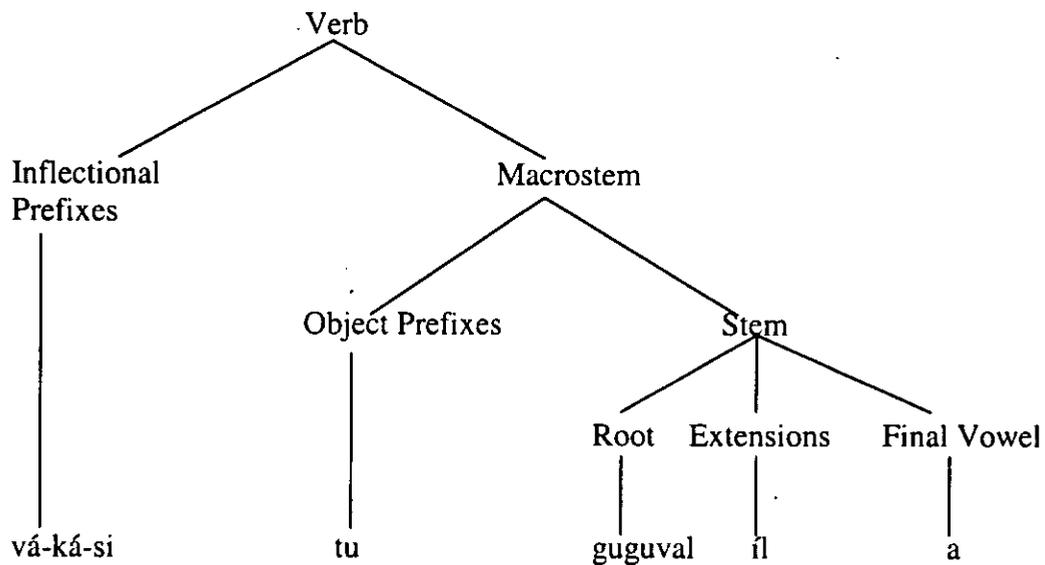
Prefix	Possible environment	Examples	Gloss
ku-	Infinitive	kú-gúgúváála	'to kneel'
-nku-	Present progressive	va-nku-gúgúváála	'they are kneeling'
-ndi-	Past tense	va-ndi-gúgúváála	'they kneeled'
-si-	Subordinate tenses	vá-sí-gúgúváála	'that they were kneeling'
a-	Negative	a-va-si-guguváála	'they were not kneeling'
-nda-	Future	va-nda-gúgúváála	'they will kneel'
-na-	Negative	a-va-na-guguváála	'they do not kneel'
-ka-	Conditional	va-ka-guguvaála	'if they kneel'
pa-	When-tenses	pá-gúgúvaala	'when (s)he is kneeling'

We see that though the verb stem in (2.11) – (2.12) is the same, there are segmental differences on the pre-stem prefixes. Specifically, all verbs in the infinitive have the H toned tense-prefix *ku-*, which belongs to the noun class 15. This tense-prefix also appears in volitional tenses.

## 2.5 Verbal Morphology

Following recent works in Bantu verb morphology (Odden 1996a, Downing 1997), I analyze the verb structure as shown in figure (2.13).

(2.13) Verb structure in Shimakonde:



The macrostem includes the stem and the object prefixes. The stem includes the verbal root (*guguval*), derivational suffixes also known as extensions (*-il-*) and the final vowel morpheme (*-a*).

The inflectional component of the verb stem may contain the subject prefix (SP) (*va-*), the tense-aspect and relative markers (*si-*) and a negative prefix (*ka-*).

### 2.5.1 Verbal Root

In Shimakonde, the verbal root, which never stands on its own, has different syllabic structures. The basic verbal root is CV, but the full set of common root types includes a number of different verbal roots shown in (2.14).

(2.14) Common verbal roots in Shimakonde:

Root type	Illustration	Gloss
a. Roots with plain consonants:		
Root	Illustration	Gloss
C	kúú-p-a	'to give'
CV	kú-jáá-a	'to throw away'
VC	kw-éév-a	'to segregate'
CVC	kú-páát-a	'to get'
VCVC	kw-íítík-a	'to respond'
CVCVC	kú-kámúúl-a	'to hold'
VCVCVC	kw-íípípáál-a	'to be short'
CVCVCVC	kú-gúgúváál-a	'to kneel'

b. Roots with stem glides:

CG	kúú-py-a	'to burn'
CGV	kú-byáá-a	'to kill'
CVG	kú-júúgw-a	'to request'
CGVC	kú-twáál-a	'to take'
NGVC	kú-n'wáát-a	'to stretch an arrow bow'
CVNCG	kú-lóombw-a	'to be married'

c. Roots with nasal plus an oral consonant:

NC	kúú-mb-a	'to mold clay'
VNC	kw-óómb-a	'to beat'
CVNC	kú-lóómb-a	'to marry'
VNCVCVC	kw-ínglíít-a	'to roll down'

The verbal root may be a single consonant as in *kúú-p-a* or a combination of nasal plus an oral consonant or a nasal plus an oral consonant plus a glide.

### 2.5.2 Verbal Stem

The verb stem includes necessarily the root of the verb, followed by various verb extensions and a final vowel morpheme. Like in many Bantu languages the stem-final vowel is usually the morphologically default low vowel *-a* as seen previously in (2.14).

Some exceptions are found specifically, in certain verbs borrowed from Arabic and Kiswahili where the stem-final vowel is a high vowel /i/ or /u/ as shown in (2.15).

(2.15) Exceptions to morphologically default stem-final vowel:

Tense:	Illustration	Gloss
Infinitive:	kú-kúbaal-i	'to accept'
	kw-áámíín-i	'to trust'
	kú-shúkúúl-u	'to thank'
	kú-kúpúúl-u	'to blaspheme'
Recent past positive:	va-ndi-kúbaal-i	'they agreed'
	va-ndi-shúkuúl-u	'they thanked'

In Shimakonde, the morphologically default stem-final morpheme *-a* appears in the indicative verbs, but certain tenses like the subjunctive and the perfective-when select the final morpheme *-e*.

The following examples in (2.16) include the subjunctive positive and negative tenses which have the final vowel morpheme *-e*, since these verbs do not select the morphologically default vowel *-a*.

(2.16) Stem-final vowel in the subjunctive:

Positive		Negative	
vaa-p-é	'let them give'	a-va-naâ-p-e	'let them not give'
vaa-ñ-é	'let them defecate'	a-va-naâ-ñ-e	'let them not defecate'
vaa-gw-é	'let them fall down'	a-va-naâ-gw-e	'let them not fall down'
vaa-ly-é	'let them eat'	a-va-naâ-ly-e	'let them not eat'
va-paát-e	'let them get'	a-va-na-páat-e	'let them not get'
va-píít-e	'let them pass'	a-va-na-píit-e	'let them not pass'
va-tukuút-e	'let them run'	a-va-na-túkuut-e	'let them not run'
va-takatuúk-e	'let them stand up'	a-va-na-tákátuuk-e	'let them not stand up'
va-guguvaál-e	'let them kneel'	a-va-na-gúgúvaal-e	'let them not kneel'

What (2.16) shows is that though the final morpheme is not a morphologically default low vowel, that final morpheme is still a single vowel.

### 2.5.3 Perfective Stem

Verbs in the perfective also do not take the morphologically default stem-final low vowel. Instead, there are four separate patterns of the perfective. There is one general pattern in which the perfective stem ends with the suffix *-ile* as in *avalék-íle* 'they did not leave'.

The second pattern of the perfective stem selects the morpheme *-idyē*, just in case the stem ends in a glide as in *ava-tuúdiidyē* from */-tu-uudy-a/* ‘they did not ask us’. The third class includes perfective stems which undergo “imbrication”, a process by which there is a morphological overlap, when the perfective morpheme follows another morpheme that ends in a coronal as *ava-tóngweél-e* derived from */ava-tongo-il-l-el/* ‘they did not talk’. Finally, Shimakonde has a class of a very marked verb stems that ends in the perfective *-ite* morpheme, which may in certain cases alternate with the morpheme *-ile*.

### 2.5.3.1 Perfective with Plain C-Final Stem

Most C(VC) perfective stems take the morpheme *-ile* as shown in the following examples in (2.17).

(2.17) C(VC) roots with *-ile* morpheme:

avá-ñ-íle	‘they did not defecate’	cf. ñ-aa	‘defecate!’
ava-pát-íle	‘they did not get’	cf. paát-a	‘get!’
ava-lék-íle	‘they did not leave’	cf. leék-a	‘leave!’
ava-líp-íle	‘they did not pay’	cf. líp-a	‘pay!’
ava-dív-íle	‘they did not close’	cf. dív-a	‘close!’
ava-pínd-íle	‘they did not bend’	cf. pínd-a	‘bend!’
ava-tón-íle	‘they did not pinch’	cf. toón-a	‘pinch!’
ava-dób-íle	‘they did not get tired’	cf. doób-a	‘get tired!’

ava-kút-ífle	'they did not scream'	cf. kuút-a	'scream!'
ava-pút-ífle	'they did not wash'	cf. puút-a	'wash!'
ava-shúm-ífle	'they did not buy'	cf. shuúm-a	'buy!'
ava-úm-ífle	'they did not get out'	cf. uúm-a	'get out!'

Some roots ending in a coronal // take the general *-ile* morpheme, but the root-final consonant changes to [d] due to an independent phonological rule of consonant hardening as shown in (2.18).

(2.18) // hardening:

ava-pád-ífle	'they did not scratch'	cf. paál-a	'scratch!'
adi-méd-ífle	'they did not sprout'	cf. meél-a	'sprout!'
ava-péd-ífle	'they did not die'	cf. peél-a	'die!'
ava-líd-ífle	'they did not cry'	cf. líl-a	'cry!'
ava-lód-ífle	'they did not look at'	cf. loól-a	'look at!'
ava-túd-ífle	'they did not unload'	cf. tuúl-a	'unload!'
ava-tétéd-ífle	'they did not crow'	cf. teteél-a	'crow!'
ava-kúmbíd-ífle	'they did not drink'	cf. kumbiíl-a	'drink!'
ava-ívílíd-ífle	'they did not cover'	cf. iviliíl-a	'cover!'

However, not all roots ending in a coronal /l/ undergo /l/ → [d] alternation or take the morpheme *-ile*. Shimakonde has a class of verbal roots about to be described which end in /l/ and do not pattern with those in (2.18).

### 2.5.3.2 Perfective with Stem-Final Glide

If the perfective stem ends in a glide (CVCG), the perfective morpheme is realized as *-idye* as in the following examples in (2.19). This pattern also includes certain roots ending in a palatal consonant which can be analyzed as having an underlying stem-final glide (for discussion of the patterns glides in Shimakonde see Liphola and Odden (2000)).

(2.19) CVCG with *-idye* perfective morpheme:

a. Glide final stem:

ava-úd-ídye	'they did not ask'	cf. uudy-a	'ask!'
ava-tu-úm-ídye	'they did not cause us get out'	cf. uumy-a	'cause to get out!'
ava-lód-ídye	'they did not point out'	cf. loody-a	'point out!'
ava-túndún-ídye	'they did not rebound'	cf. tunduuny-a	'rebound!'
ava-shélégw-ídye	'they were not late'	cf. sheleegw-a	'be late!'

b. Palatal root-final:

ava-kásh-ídye	'they did not slice'	cf. kaash-a	'slice!'
ava-tísh-ídye	'they did not threaten'	cf. tiish-a	'threaten!'
ava-shúlúsh-ídye	'they did not sell'	cf. shuluush-a	'sell!'
ava-ñóñ-ídye	'they did not make noise'	cf. ñooñ-a	'make noise!'
ava-ñákóñ-ídye	'they did not make noise'	cf. ñakooñ-a	'make noise'

In Shimakonde, stems ending in a glide or in a palatal consonant show two separate patterns. In one pattern these stems select the suffix *-idy*e as in (2.19). The second pattern follows the larger set of stems which take the suffix *-ile* as in (2.20).

(2.20) Glide and palatal root-final:

ava-gw-ífle	'they did not fall down'	cf. gw-aa	'fall down!'
ava-júgw-ífle	'they did not ask'	cf. juúgw-a	'ask!'
ava-péñ-ífle	'they did not skip'	cf. peéñ-a	'skip'
ava-bóñ-ífle	'they did not crush'	cf. boóñ-a	'crash!'
ava-míñ-ífle	'they did not squeeze'	cf. míñ-a	'squeeze!'

### 2.5.3.3 Perfective with Imbrication

When the perfective morpheme follows certain disyllabic stems, there is a process of morphological overlap or infixation referred to as “imbrication”. I will not be exploring the mechanics of this process in Shimakonde. However, in (2.21) I provide a few examples that show a third pattern of the perfective.

#### (2.21) Imbrication:

ava-gagadwifile	/-gagadu-il-l-e/	‘they did not bite’	cf. gagaduúl-a	‘bite!’
avá-tweéte	/-twa-il-l-e/	‘they did not take’	cf. twaál-a	‘take!’
ava-típwiíle	/-tipu-il-l-e/	‘they did not pound’	cf. tipuúl-a	‘pound!’
ava-típwiíke	/-tipu-il-k-e/	‘they did not run away’	cf. tipuúk-a	‘run away!’
ava-tóngweéle	/-tongo-il-l-e/	‘they did not talk’	cf. tongoól-a	‘talk!’
ava-lúmbeéte	/-lumba-il-t-e/	‘they did not hunt’	cf. lumbaát-a	‘hunt!’
ava-túkwiíte	/-tuku-il-t-e/	‘they did not run’	cf. tukuút-a	‘run!’
ava-púmwiíle	/-pumu-il-l-e/	‘they did not breath’	cf. pumuúl-a	‘breath!’
ava-úlwiíke	/-ulu-il-k-e/	‘they did not fly’	cf. uluúk-a	‘fly!’

### 2.5.3.4 Perfective with Final *-ite* ~ *-ile* Alternation

The last pattern of the perfective includes a class of marked CVC stems which take the morpheme *-ite*. Generally any stem ending in a perfective morpheme *-ite* also allows *-ile* ~ *-ite* alternation, and this alternation shows that these stems also follow the general pattern which takes the morpheme *-ile* as shown in the following examples in (2.22).

(2.22) CVC roots with *-ile* ~ *-ite* alternation:

---

a-i-tóñ-íite	~ a-i-tóñ-íile	'it did not rain'
ava-já-íite	~ ava-já-íile	'they did not throw away'
ava-tá-íite	~ ava-tá-íile	'they did not pour'
ava-új-íite	~ ava-új-íile	'they did not come back'
a-va-míñ-íite	~ a-va-míñ-íile	'they did not squeeze'
a-va-máñ-íite	~ a-va-máñ-íile	'they did not know'
a-va-júgw-íite	~ a-va-júgw-íile	'they did not request'
a-va-shúgw-íite	~ a-va-shúgw-íile	'they did not bark'
a-va-mámán-íite	*a-va-mámán-íile	'they did chew'
a-va-mímín-íite	*a-va-mímín-íile	'they did not pour'

We see that stems which take *-ite* also take *-ile*, except that the last two examples of (2.22) only select *-ite*. I will assume that there is exceptional treatment of stems like *memena* 'chew' due to lexicon properties of certain words.

The following table presents the summary of the stem-final inflectional suffix. As seen, the final morpheme can be a single vowel as in the indicative and the subjunctive or that final morpheme can be a disyllabic morpheme, not a single vowel.

(2.23) Stem-final morphemes:

Morpheme	Tense/Aspect	Examples	Gloss
-a	Default/Indicative:	va-ndí-loómb-a	'they got married'
-e	Subjunctive:	va-loómb-e	'let them marry'
-ile	Perfective:	a-va-lómb-ífle	'they did not marry'
-idye	Glide final stem perfective:	a-va-lómbw-íidye	'they did not get married'
CV-il-C-e	Imbrication:	ava-tangol-ile → ava-tángw-eél-e	'they did not talk'
-ile ~ -ite	Marked perfective stems:	a-va-míñ-íite	'they did not request'
		~ ava-míñ-ífle	=

### 2.5.4 Verbal Extensions

The most common verb extensions in Shimakonde extracted from the structure in (2.13) are given in (2.24). The verbal root may combine with a single verb extension or a number of verb extensions.

(2.24) Verb extensions in Shimakonde:

Extension	Suffix	Illustration	Gloss
Applied	-il-	kú-lím-a	'to cultivate'
		kú-lím-ífl-a	'to cultivate for'
Causative direct	-iy-	kú-lím-iiy-a	'to cause cultivate'
Causative indirect	-shy- + -y-	kú-lím-iishy-a	'to cause cultivate'
	-id- + -y-	kú-lím-iidy-a	'to cause cultivate'
Impositive	-ik-	kú-lím-ífk-a	'to be cultivated'
	-uk-	kú-shím-a	'to close'
		kú-shím-úúk-a	'to be open'
Intensive	-ish- + -y-	kú-lím-iish-y-a	'to make cultivate intensive'
		kú-túkuu-sh-y-a	'to make run intensively'
	-iy-	kú-pwámw-iiy-a	'to urinate intensively'
Passive	-w-	kú-lóómb-a	'to marry'
		kú-lóomb-w-a	'to be married'
	-igw-	kú-lím-iigw-a	'to be cultivated'

Repetitive	-ang <sup>1</sup> -	kú-lím-ááng-a	'to cultivate repeatedly'
Reversive	-ul-	kú-shím-a	'to close'
		kú-shím-úúl-a	'to open'
		kú-únga	'to tie'
		kú-úng-úl-a	'to untie'
Reciprocal	-an-	kú-shéém-a	'to call'
		kú-shém-áán-a	'to call each other'
Stative	-ik-	kú-lím-íík-a	'to be able be cultivated'

---

<sup>1</sup> Harries (1950) designates -ang- suffix as an "excessive" derivative which is merged with the "intensive". -ang- indicates an action that is extended in time or space and in some Bantu languages there is an idea of "plurality".

If more than two verb extensions combine with the verbal root, there are a number of constraints which dictate what suffixes and in which order must combine. For example, when the reciprocal *-an-*, the repetitive *-ang-* and the applied *-il-* suffixes come in a sequence, the reciprocal must follow immediately the verbal root and the applied suffix is the last in a sequence as shown in (2.25).

(2.25) Suffix precedence ordering:

kú-shém-án-áng-ííl-a	'to call for each other repeatedly'
kú-lókót-án-áng-ííl-a	'to to pick up for each other repeatedly'
* kú-lókót-áng-án-ííl-a	
* kú-shém-áng-án-ííl-a	

The morphological principle governing the combination of suffixes in (2.25) is the precedence with respect to the verbal root. The precedence principle simply says that given suffixes X and Z in a sequence, Z must follow or precede X. This sequence is independently stipulated and the template of the order of the extensions in Shimakonde is given in (2.26).

(2.26) Template of the extensions:

Root	-an-	-ang-	-il-	-w-	-V
	Reciprocal	Repetitive	Applied	Passive	Final vowel

## CHAPTER 3

### CONSONANTAL PHONOLOGY

#### 3.0 Introduction

This chapter describes the basic phonological rules involving consonants. The most common segmental rules found in Shimakonde are also found in most Bantu languages, but it will be seen that there are differences between Shimakonde and other Bantu languages.

#### 3.1 Nasal Assimilation

One of the most common segmental processes found in many languages is nasal place assimilation. This process simply says that a nasal assimilates the place of articulation of the following consonant.

(3.1) Nasal place assimilation:

$$n \quad \rightarrow \quad [\alpha \text{ place}] / \text{---} \left[ \begin{array}{c} \text{Stop} \\ \alpha \text{ place} \end{array} \right]$$

The following examples provided in (3.2) show nasal place assimilation. As we can see, the nasal assimilates the place of articulation of the following consonant.

(3.2) Simple pattern of nasal place assimilation:

kú-muú-pa	/kú-mú-pa/	'to gibe him/her'
kú-muu-ña	/kú-mú-ña/	'to defecate him/her'
kú-m-palakeéla	/kú-mu-palakéla/	'to see him/her off'
kú-n-tuúma	/kú-mu-túma/	'to order him/her'
kú-ñ-jeleéla	/kú-mu-jeleéla/	'to throw something to him/her'
kú-n'-kamuúla	/kú-mu-kamúla/	'to hold him/her'

The last four examples of (3.2) show that the vowel of the 3 sg. object prefix *mu-* deletes as long as the vowel is not stressed and lengthened, and the resulting syllabic nasal assimilates the place of articulation of the following vowel. The type of nasal-consonant interaction seen above is the most common case of nasal assimilation where the nasals condition the same unified set of assimilatory changes.

### 3.1.1 Prefixal Reduction and Nasal + Consonant Interaction

Shimakonde has a complex kind of nasal assimilation where the patterns of alternations in N + C sequences differ depending on the noun class of the prefix that is involved and also on whether the process applies to verbs or nouns.

The following examples in (3.3) show that just like the previous data in (3.2), the sequence N + C can derive from deletion of the vowel of the prefix. Here deletion of high vowels /i/ and /u/ is optional.

(3.3) Complex pattern of N + C interaction:

ní-shí-ná-taleêka	~ n-cí-ná-taleêka	'I was cooking'
ní-ná-taleêka	~ n-ná-taleêka	'I cook'
ngú-táleeka	~ n-náleeka	'when I was cooking'
ngú-tángoola	~ n-nángoola	'when I was talking'

There are two ways of explaining the data in (3.3). One way is to say that there are three underlying allomorphs /ngu-/ , /ni-/ and /n-/ for the 1sg. subject prefix, and the morpheme /n-/ can be selected most of the time. So the surface form *n-náleeka* 'when I was cooking' could come from either /ngú-táleeka/ or /n-táleeka/. In case the underlying form /n-taleeka/ is assumed, we can explain the nasalization of the stem-initial consonant due to the preceding nasal. One other way of explaining these data is to assume that the subject prefix for the 1sg. *ni-* and *ngu-* reduces to just a nasal due to deletion of the vowel prefix. In the case of *ngu-* prefix, there is also deletion of the obstruent consonant which creates a sequence N + C.

The following examples in (3.4) show that the prefix *ngu-* also reduces to a nasal if used as an object prefix. Due to reduction, that prefix is realized as a nasal.

(3.4) Complex N + C interaction:

va-nku-ngú-shulushiidya	~ va-nkú-ñ-ñulushiidya	'they are selling for me'
va-nku-ngú-talakeéla	~ va-nkú-n-nalakeéla	'they are cooking for me'
va-nku-ngú-tangoodya	~ va-nkú-n-nangoodya	'they are causing me to speak'

The data in (3.3) and (3.4) are similar in terms of prefix-to-nasal reduction. Specifically, the high vowel of the *ni-/ngu-* prefixes in the first column deletes before the tense-prefix or before the root-initial vowel giving a sequence NC seen in the second column. I refer to this as prefix-to-nasal reduction. There are two independent rules which derive the surface forms in (3.3) and (3.4) as formalized in (3.5).

- (3.5) a.  $\left[ \begin{array}{l} +\text{syll} \\ +\text{high} \\ +\text{Pref. 1sg} \end{array} \right] \rightarrow \emptyset / \text{---} +\text{C}$  Prefix V-deletion
- b.  $\left[ \begin{array}{l} -\text{syll.} \\ -\text{voice} \end{array} \right] \rightarrow [+nasal] / [+nasal] \text{---}$  C-nasalization

The rule (3.5a) feeds the rule in (3.5b), since the first one derives the N+C sequence by deleting the prefix vowel. Later, the derived nasal triggers nasalization of the following consonant by (3.5b).

### 3.1.2 Nasalization of Voiceless Consonants

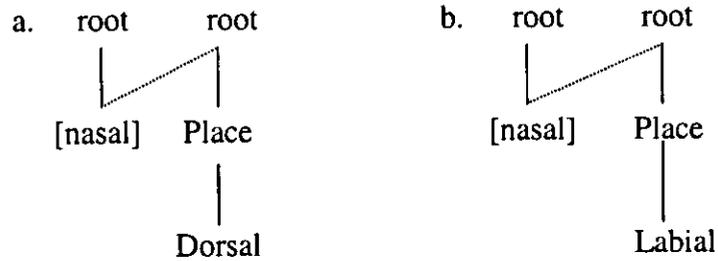
The generalization about the process that nasalizes voiceless consonants after a nasal due to the rule in (3.5b) is that all of the voiceless stops become a nasal after a nasal, if the trigger nasal derives from prefix-to-nasal reduction. The data in (3.4) show that along with prefix-to-nasal reduction, there is another process which turns a voiceless consonant into a nasal after a nasal. Additional data of C-nasalization are given in (3.6).

#### (3.6) C-nasalization:

va-nku-ngú-pambiíla	~ va-nkú-m-mambiíla	'they are clasping for me'
va-nku-ngú-talakeéla	~ va-nkú-n-nalakeéla	'they are cooking for me'
va-nku-ngú-kamuliíla	~ va-nkú-n'-n'amuliíla	'they are holding for me'
va-nku-ngú-shameéla	~ va-nkú-ñ-ñameéla	'they are calling me for'
va-nku-ngú-saidiíla	~ va-nkú-ñ-ñaidiíla	'they are helping me'

We see that all of the voiceless stops become a nasal after the nasal and the resulting surface nasal retains the place node of the underlying consonant. The change that turns /k/ into a dorsal nasal [n'] and /p/ → [m] after a nasal can be represented as in (3.7a) and (3.7b), respectively.

(3.7) Voiceless consonant nasalization:



Since C-nasalization only changes nasality of the consonant, when a voiceless bilabial consonant becomes a nasal, the corresponding nasal will be a bilabial, because the place of articulation of the underlying consonant is retained, except that the /sh, s/ → [ ñ ] change requires some explanation. The relationship between the place of articulation of the underlying voiceless consonant and its corresponding nasal is shown in (3.8)

(3.8) Predictable consonant-to-nasal change:

Underlying consonant	Surface nasal
/p/	[m]
/t/	[n]
/k/	[n']
/sh/	[ñ]
/s/	[ñ]

We see that the voiceless palatal fricative /sh/ becomes a palatal nasal [ɲ]. The same alternation also affects the voiceless alveolar fricative /s/ which becomes a palatal nasal. The nasalization of the voiceless alveolar fricative [s] is because of the existence of the marginal phonemic contrast involving /s, sh, c/. Furthermore, there is a /c/ and /sh/ dialect distinction. However, the basis for why this alternation applies only to certain words is not clear. Due to marginal phonemic contrast and because of the dialect distinction some speakers interchange /s/, /sh/ and /c/ in certain words as shown in (3.9).

(3.9) [sh] ~ [c] ~ [s] alternation:

kú-shúúgwa	~ kú-súúgwa	~ kú-cúúgwa	'to bark'
kú-shééma	~ kú-sééma	~ kú-cééma	'to call'
kú-shángúúla	~ kú-sángúúla	~ kú-cángúúla	'to cut hair'
kú-shúúnga	~ kú-súúnga	*kú-cúúnga	'to watch for'
kú-sháídiila	~ kú-sáídiila	*kú-cáídiila	'to help'
i-shaâma	*i-saâma	icaâma	'party'
i-shaâ.a	~ i-saâ.a	*a-caâ.a	'watch'
*shíi-ma	síi-ma	*cíi-ma	'well'
*ku-sheêna	ku-seêna	*ku-ceêna	'to the hell'

One other analogous process that relates to the /c/ ~ /sh/ ~ /s/ alternation involves the sequence /N+ sh/. The voiceless palatal fricative and alveolar fricative are always pronounced as [c] after a nasal, since the sequences /N+ sh/ and /N+s/ are never pronounced in Shimakonde. The relevant examples are given in (3.10).

(3.10) /sh/ ~ /c/ ~ /s/ alternation:

a.	n-ciîma	*n-siîma	/mu-siîma/	'in the well'	(cl. 18-3)
	n-cííla	*n-shííla	/mú-shííla/	'tail'	(cl. 3)
	mí-shííla	~ mí-cííla	/mí-shííla/	'tails'	(cl. 4)
	mu-n-cííla	*mu-n-shííla	/mu-mu-shííla/	'in the tails'	(cl. 18-3)
b.	va-nku-ngú-sheéma	~ va-nkú-ceéma	/vanku-ngú-shéma/	'they are calling me'	
		~ va-nkú-ñ-ñeéma	=		
	va-nkú-n-ceéma	* va-nkú-n-sheéma	/vanku-mú-shéma/	'they are calling him'	
		* va-nkú-ñ-ñeéma	=		

The examples of the (10a) show that when the vowel of the class 3 (*mu-*) deletes, the voiceless fricative is realized as a voiceless palatal affricate. The examples of (3.10b) show that /sh/ nasalizes after the nasal derived from *-ngu-* reduction, but /sh/ does not nasalize when the object prefix 3 sg. *mu-* reduces to a nasal. So, different prefixes trigger different phonological processes in Shimakonde.

What the examples in (3.6) and (3.10) show is that some prefixes trigger one set of consonantal changes, and other prefixes trigger different consonantal changes. I will consider this second set of prefixes, exemplified by the class 3 prefix, later.

The summary of different effects of N + C between (3.10a) and (3.10b) is seen in (3.11).

(3.11) Summary of the effects on N + C sequences:

- a.     N + C            →     N    C  
           [-voi]                    [+nasal] as in /N +p/ → [mm]
- b.     N + C            →     N    C  
           [+cont]                   [-cont] as in /N +sh/ → [Nc]

### 3.1.3 Non-nasalization of Voiced Consonants

This section deals with N + C patterns affecting voiced consonants. Nasalization does not apply to voiced consonants /b, d, g, j, l, v/ and the question that still needs further investigation is what is the basis for the different phonological behavior of N + C interaction.

#### 3.1.3.1 Consonant Hardening

The next process is hardening which involves voiced consonants. First, voiced continuants /l, v/ become voiced alveolar and voiced bilabial stops [d, b] respectively, after a nasal derived from prefixes *ni-* and *ngu-* reduction as shown in (3.12).

(3.12) C-hardening:

va-nku-ngú-leéka	~	va-nkú-n-deéka	'they are leaving me'
va-ná-ngú- <del>l</del> îpa	~	va-ná-n-diîpa	'they pay me'
va-nku-ngú-viniíla	~	va-nkú-m-biniíla	'they are dancing for me'
va-nku-ngú-valeéka	~	va-nkú-m-baleéka	'they are holding on to me as a baby'

Hardening is formalized in (3.13).

(3.13) Voiced consonant hardening:

$$\left[ \begin{array}{l} +\text{cont.} \\ +\text{voice} \\ -\text{syll} \end{array} \right] \rightarrow [-\text{cont}] / [+nasal] \text{ —}$$

The rule in (3.13) eliminates a sequence of nasal plus voiced continuants /l, v/ explaining why N + l and N + v sequences are lacking in Shimakonde. The examples in (3.12) show that the preceding nasal does not trigger C-nasalization on the following consonant, instead there is consonant hardening.

Second, voiced stops /b, d, g/ and the voiced palatal affricate /j/ are totally immune to C-nasalization after a nasal derived from *-ngu-* reduction, so C-nasalization does not apply to voiced stops that follow the nasal as in (3.14).

(3.14) No C-nasalization of voiced stops:

va-nku-ngú-byaáa	~	va-nkú-m-byaáa	'they are killing me'
va-nku-ngú-duúma	~	va-nkú-n-duúma	'they are counseling me'
va-nku-ngú-galoleéla	~	va-nkú-n'-galoleéla	'they are locking me in for'
va-nku-ngú-juúgwa	~	va-nkú-n-juúgwa	'they are requesting me'

We see that C-nasalization after *ni-* and *ngu-* reduction does not apply in (3.14), since this process only applies to voiceless stops. There is one exceptional word found in the language in which the voiced velar stop undergoes optional C-nasalization after *ngu-* reduction as illustrated by the examples in (3.15).

(3.15) Optional voiced velar stop nasalization:

va-nku-ngú-guguvaadya	~	va-nkú-n'-n'uguvaadya	'they are making me kneel'
va-nku-ngú-gan'oóla		*va-nkú-n'-n'an'oóla	'they are pushing me'
va-nku-ngú-galoleéla		*va-nkú-n'-n'-aloleéla	'they are locking me in for'

I explain nasalization of the voiced velar stop in (3.15) in terms of a lexically restricted rule, since we do not see any apparent phonological reason why this process should only apply to the voiced velar stop. The rule which nasalizes the voiced velar stop is formalized in such a way that only this voiced consonant is subject to nasalization, but in addition, only this one root undergoes the rule.

(3.16) Voiced velar stop nasalization:

/g/ → [+nasal] / [+nasal] —

Now I consider the surface patterns derived from deletion of the vowel /u/ of the 3sg. object prefix and 2<sup>nd</sup> pl. object prefix *mu-*. In Shimakonde, the object prefix of the 2<sup>nd</sup> pl. is phonologically identical to the object prefix of the 3sg. We shall see that Shimakonde has a distinction on the surface patterns derived from N + C sequences depending on the noun class prefix which is involved. Specifically, some prefixes trigger one set of consonantal changes and other prefixes trigger different consonantal changes.

The next examples in (3.17) motivate the underlying 2pl. and 3sg. object prefixes, *mu-*, which appear without vowel deletion in a stressed penult syllable.

(3.17) Underlying object prefix /*mu-*/:

va-nkú-muú-pa	'they are giving him/you'	cf. va-nkúú-pa	'they are giving'
va-nkú-muu-shya	'they are removing him/you'	cf. va-nkuû-shya	'they are removing'
va-nkú-muu-dya	'they are asking him/you'	cf. va-nkuû-dya	'they are asking'
va-nkú-mw-auliíla	'they are telling him/you'	cf. va-nkw-aúúla	'they are telling'
va-nkú-mw-eéka	'they are laughing him/you'	cf. va-nkw-ééka	'they are laughing'
va-nkú-mw-oóna	'they are seeing him/you'	cf. va-nkw-oóna	'they are seeing'

The vowel of the prefix *mu-* (also pronounced *mw-* before a vowel) appears in the prefix if that prefix is located in the stressed penult syllable. However, the vowel of the prefix *mu-* deletes when it appears in the pre-penult position giving the sequence N + C.

A nasal derived from *mu-* reduction will always assimilate the place of articulation of the following consonant by the rule seen in (3.1). Nasal place assimilation is shown in the following examples in (3.18).

(3.18) Prefix vowel deletion and N-assimilation:

	va-nkú-m-pííma	'they are measuring him/you'
cf.	va-nku-pííma	'they are measuring'
	va-nkú-m-beéba	'they are carrying him/you as a baby'
cf.	va-nku-bééba	'they are carrying as a baby'
	va-nkú-n-toóta	'they are sewing him/you'
cf.	va-nku-tóóta	'they are sewing'
	va-nkú-n-daán'a	'they are jumping on him/you'
cf.	va-nku-dáán'a	'they are jumping'
	va-nkú-n'-koóma	'they are beating him/you'
cf.	va-nku-kóóma	'they are beating'
	va-nkú-n'-guguvaadya	'they are causing him/you to kneel'
cf.	va-nku-gúgúvaadya	'they are causing to kneel'

	va-nkú-n-cuúnga	'they are taking care of him/you'
cf.	va-nku-shúúnga	'they are taking care of'
	va-nkú-n-juúgwa	'they are asking him/you'
cf.	va-nku-júúgwa	'they are asking'

We see that the nasal derived from *mu-* reduction does not trigger nasalization of the following voiceless consonant. In this respect, the prefix *mu-* differs from the 1sg. *ngu-* and *ni-* prefixes in terms of triggering different consonantal changes.

Surprisingly, the voiced continuants /v, l/ are subject to C-nasalization after a nasal derived from *mu-* reduction as seen in (3.19)

(3.19) Nasalization of voiced continuants:

	va-nkú-m-miniíla	'they are dancing for him'
cf.	va-nku-vínííla	'they are dancing for'
	va-nkú-m-miíka	'they are putting him/you'
cf.	va-nku-vííka	'they are putting'
	va-nkú-n-noóla	'they are looking at him/you'
cf.	va-nku-lóóla	'they are looking at'
	va-nku-ú-n-nimiíla	'they are cultivating for him/you'
	va-nku-límííla	'they are cultivating for'

Recall from the previous examples in (3.12) that /l, v/ becomes [d, b] respectively after a nasal due to hardening. Furthermore, the data in (3.19) show that the sequences /N + l/ and /N + v/ are never pronounced, but the actual surface outcome differs depending on the trigger prefix.

The data in (3.20) shows the different outcomes of the N + C interaction.

(3.20) Outcomes of N+C interaction:

Trigger	Segment type	Example	Process	
/ngu-/ → N	[-syll -voice]	ngú-táleeeka ~ n-náleeeka	'cooking' C-nasalization	
		/ni-/	[+cont +voice]	ngú-líipa ~ n-díipa
[-cont +voice]	ngú-víina ~ m-bíina			'dancing' N-assimilation
	/mu-/ → N			[-syll]
[+cont +voice]		kú-límííla ~ kú-n-nimííla	'to cultivate' 'to cultivate for him' C-nasalization	

The patterns of C-nasalization triggered by *ni-* and *ngu-* and *mu-* reduction discussed previously include verbs. Now I consider the patterns of N + C in nouns. There are two patterns triggered by N + C in nouns. First, the noun prefix of the class 1 and 3 is *mu-* and the vowel of that prefix deletes before the continuant /l/ giving the sequence /N + l/. Second, the voiced continuant /l/ changes to an alveolar nasal [n] after a nasal due to C-nasalization, since the sequence [N + l] is unpronounceable in Shimakonde, but that voiced alveolar consonant never undergoes hardening.

The examples in (3.21) motivate the underlying noun class prefix which is /*mu-*/.

(3.21) Noun class prefix *mu-*:

muú-nu	(cl. 1)	'person'
mw-áana	(cl. 1)	'child'
muú-ti	(cl. 3)	'head'
mw-áaka	(cl. 3)	'year'

The next examples in (3.22) show the prefix *mu-* in the pre-penult position where the vowel of the prefix is unstressed and subject to deletion. The resulting combination of nasal plus /l/ then undergoes nasalization.

(3.22) Voiced continuant /l/ nasalization:

a.	n-núúme	*m-lúúme	/mú-lúme/	(cl. 1)	'male person'
		*n-dúúme			
	va-lúúme	*vá-núúme	/vá-lúme/	(cl. 2)	'male people'
	n-naángo	*m-laángo	/mu-lángo/	(cl. 3)	'entrance'
		*n-daángo			
	mi-laángo	*mi-naángo	/mi-lángo/	(cl. 4)	'entrances'
	n-niíngo	*m-liíngo	/mu-língo/	(cl. 3)	'measure'
		*n-diíngo			
	mi-liíngo	*mi-niíngo	/mi-língo/	(cl. 4)	'measures'
	n-náandi	*m-láandi	/mú-láandi/	(cl. 3)	'tree'
		*n-dáandi			
	mí-láandi	*mí-náandi	/mí-láandi/	(cl. 4)	'trees'
b.	n-neémba	*m-leémba	/mu-némba/	(cl. 1)	'boy'
		*va-deémba			
	va-neémba	*va-leémba	/va-némba/	(cl. 2)	'boys'
	n-nuúngu	*m-luúngu	/mu-núngu/	(cl. 1)	'god'
		*n-duúngu			
	vá-núúngu	*vá-lúúngu	/vá-núngu/	(cl. 2)	'gods'

Surprisingly, the examples in (3.22) show that the voiced continuant /l/ does not change to [d] by the C-hardening rule, but consistent with the examples seen in (3.19), which involves the verbal prefix /mu-/ this consonant becomes a nasal after a nasal derived from *mu-* prefix reduction. So, the question is why the sequence /N+l/ does not trigger the same unified segmental change?

Different prefixes have different effects on N + C interaction. So the distinctions in the surface forms derived from N + C reflect the differences of the prefixes which trigger these consonantal changes. Contrasting changes triggered by different prefixes can be seen in (3.23). The noun prefix /mu/ triggers nasalization, and the object prefix /ngu/ triggers hardening.

(3.23) Different effects of N + C:

a. n-núúme	* n-dúúme	/mú-lúme/	'male person'
n-naángo	* n-daángo	/mu-lángo/	'entrance'
n-náandi	* n-dáandi	/mu-láandi/	'tree'
m-miloôngo	~ mu-vi-loôngo	/mu-vi-lóngo/	'in the pan'
b. va-nkú-n-deéka	*va-nkú-n-neéka	/vanku-ngú-leéka/	'they are leaving me'
va-ná-n-díípa	*va-ná-n-níípa	/vana-ngú-liípa/	'they will pay me'

The data in (3.23a) simply show that C-hardening does not apply to a continuant /l/ after a nasal derived from *mu-* prefix, since that /l/ undergoes nasalization. However, C-hardening is obligatory in (3.23b) where the trigger is the prefix *ngu-*.

A Similar segmental distinction in the patterns of N+C phonology is found in nouns of class 3 and 4 in which the root begins in a stop consonant, where C-nasalization does not apply either. When the vowel of the prefix deletes before a root-initial stop, the preceding nasal assimilates the place of articulation of the following stop consonant due to nasal assimilation giving the patterns seen in (3.24).

(3.24) Non-nasalization of consonants in nouns:

m-pííni	*m-mííni	/mú-píni/	(cl. 3)	'handle'
mí-pííni		/mí-píni/	(cl. 4)	'handles'
m-búúbu	*m-múbu	/mú-búbu/	(cl. 3)	'head shaved'
mí-búúbu		/mí-búbu/	(cl. 4)	pl.
n-díídi	*n-níídi	/mú-dídi/	(cl. 3)	'rope'
mí-díídi		/mí-dídi/	(cl. 4)	pl.
n-tuúpa	*n-nuúpa	/mú-túpa/	(cl. 3)	'hole'
mi-tuúpa		/mí-túpa/	(cl. 4)	pl.
n'-kúpiita	*n'-n'úpiita	/mú-kúpita/	(cl. 1)	'passenger'
vá-kúpiita		/vá-kúpita/	(cl. 2)	'passengers'

The question that needs further research is how the distinction in the surface patterns resulting from N + C relates to typological questions, that is, why should some nasals behave one way and others behave differently.

Specifically, is this distinction triggered by a nasal at certain places of articulation, hence /m/ versus /n/, or would different prosodic properties of nasals be responsible for causing the nasals to act differently? The later solution is correct for Kimatuumbi (Odden, 1996), where moraic and non-moraic nasals trigger different rules. We see no clear answer at this time for this question in Shimakonde, which lacks phonological evidence for a distinction between moraic and non-moraic nasal. Since we do not find the same set of unified changes in N + C phonology, I simply conclude that in Shimakonde, some prefixes trigger one set of consonantal changes, and other prefixes trigger different consonantal changes.

### **3.1.3.2 Consonant with Labial Off-Glide**

One of the common characteristic features of Bantu is the possibility of having a sequence of consonant plus glide. In Shimakonde, any consonant can precede a labial glide when that consonant appears before back rounded vowels [u] or [o], except that there is no labial glide after a labial fricative consonant /v/. The discussion of processes which trigger consonant plus glide sequence is presented in chapter 4. The following chart in (3.25) gives all of the surface outputs of complex segments involving a consonant with a labial off-glide.

(3.25) C with labial off-glide:

	Labial	Coronal	Palatal	Dorsal
Stop	p <sup>w</sup>	t <sup>w</sup>		k <sup>w</sup>
	b <sup>w</sup>	d <sup>w</sup>		g <sup>w</sup>
Fricative	v	s <sup>w</sup>	sh <sup>w</sup>	
Affricate			c <sup>w</sup>	
Liquid		l <sup>w</sup>	j <sup>w</sup>	
Nasal	m <sup>w</sup>	n <sup>w</sup>	ñ <sup>w</sup>	n' <sup>w</sup>

The following data in (3.26) illustrate each of the consonants with a secondary articulation.

(3.26) [p <sup>w</sup> ]	kú-pwálééla	'to dry'	cf. kú-pálééta	'to pass through'
[b <sup>w</sup> ]	kú-bwááda	'to boil'	cf. kú-bééba	'to hold as a baby'
[t <sup>w</sup> ]	kú-twáála	'to take'	cf. kú-tééla	'to arm a trap'
[d <sup>w</sup> ]	Shi-dwáádwa	'name'	cf. shi-deéde	'trigger'
[k <sup>w</sup> ]	kú-kwááma	'to get stuck'	cf. kú-kááma	'to be tightened'
[g <sup>w</sup> ]	kú-gwáála	'to dress'	cf. kú-gáága	'to become complex'
[s <sup>w</sup> ]	kú-swééka	'to string'	cf. kú-séépa	'to be small'
[sh <sup>w</sup> ]	uú-shwa	'termites'	cf. uusha	'take it away!'
[l <sup>w</sup> ]	lw-aándo	'tattoo'	cf. lu-ngaájo	'foot print'

[m <sup>w</sup> ]	mw-áaka	'year'	cf. máa-ka	'condiment'
[n <sup>w</sup> ]	n-nwééle	'sick person'	cf. n-neéma	'bat'
{ñ <sup>w</sup> }	di-ñwaâshwa	'trash'	cf. di-ñaáama	'meat'
[n' <sup>w</sup> ]	di-n'weéna	'crocodiles'	cf. di-n'aáama	'paints'

### 3.1.3.3. Consonant with Palatal Off-Glide

In Shimakonde a consonant may be followed by a palatal glide when that consonant appears before the front vowels [i] or [e], except that velar consonants never precede a palatal glide, so \*[k<sup>y</sup>, g<sup>y</sup>, n'<sup>y</sup>] are not found in the language.

The table in (3.27) provides the surface outcomes of the consonant with a palatal glide.

(3.27) C with palatal off-glide:

	Labial	Coronal	Palatal	Dorsal
Stop	p <sup>y</sup>	t <sup>y</sup>		k
	b <sup>y</sup>	d <sup>y</sup>		g
Fricative	v <sup>y</sup>	s <sup>y</sup>	sh	
Affricate			c	
			j	
Liquid		l <sup>y</sup>		
Nasal	m <sup>y</sup>	n <sup>y</sup>	ñ	n'

There is no way one could tell whether palatal consonants can precede a palatal glide in Shimakonde, since these would be hard to hear and would be pronounced the same as the plain palatals.

The examples in (3.28) include some minimal pairs and near-pairs showing a consonant with off-glide contrasted with the corresponding plain consonants.

(3.28) C with palatal glide	Example	Gloss	Plain C	Gloss
[pʸ]	kúú-pya	'to burn'	cf. kúú-pa	'to give'
[bʸ]	kú-byáána	'to kill e. o'	cf. kú-báána	'to be loose'
[tʸ]	kú-túutya	'to cause pop'	cf. kú-túúta	'to pop'
[dʸ]	kú-dyúúka	'to resuscitate'	cf. kú-dúúma	'to advice'
[vʸ]	vy-áákuúlya	'food'	cf. vá-kuulya	'people who eat'
[lʸ]	ly-uúndi	'cloud'	cf. luú-ndi	'river'
[mʸ]	my-áaka	'years'	cf. máa-ka	'condiment'
[nʸ]	kú-n-nyeéla	'to eat for him'	cf. kú-n-neéla	'to look after him'
	kú-ñ-ñeéla	'to defecate on him'		

One observation about the data above is that apart from the surface distinction between consonant plus glide clusters and plain consonants, the last example of (3.28) shows that there is a triple pair involving the plain coronal nasal (*kú-n-neéla*), coronal nasal plus glide (*kú-n-nʸeéla*) and the plain palatal nasal (*kú-ñ-ñeéla*).

### 3.2 Consonant Mutation

In this section I deal with special cases of consonantal phonology, namely C-hardening of the lateral /l/ in verbs and consonant frication when a consonant appears before certain verb extensions. The major difference between the processes treated in this section and those discussed in previous sections is that the conditioning factor for consonantal changes is not a preceding nasal, instead the trigger of consonantal changes is a specific verb extension. I begin illustrating consonantal changes in the verbal root triggered by the suffix by examining the process of consonant hardening of the voiced continuant /l/ of the root-final position before the causative verb extension. I then extend the analysis to other processes which affect the root-final consonants.

In Shimakonde, the causative verbal suffix triggers phonological changes on the preceding root-final consonant. There are two causative suffixes and only one of the suffixes conditions the consonant changes.

#### 3.2.1 Voiced Lateral Hardening

In Shimakonde, the root-final coronal continuant /l/ becomes a voiced stop [d] before the causative -y-.

(3.29) l-hardening before suffix -y-:

- |     |                   |               |                |                          |
|-----|-------------------|---------------|----------------|--------------------------|
| a.  | anku-gúgúvaad-y-a | *gúgúvaal-y-a | /-gúguval-y-a/ | 'he is causing to kneel' |
| cf. | anku-gúgúváál-a   |               | /-guguval-a/   | 'he is kneeling'         |

b.	anku-tángood-y-a	*tángool-y-a	/-tongol-y-a/	'he is causing to talk'
cf.	anku-tángóól-a		/-tongol-a/	'he is talking'
c.	anku-málaad-y-a	*málal-y-a	/-malal-y-a/	'he is causing to be quite'
cf.	anku-máláál-a		/-malal-a/	'he is quite'
d.	anku-péed-y-a	*péel-y-a	/-pel-y-a/	'he is causing to die'
cf.	anku-péél-a		/-pel-a/	'he is dying'
e.	anku-míid-y-a	*míil-y-a	/-mil-y-a/	'he is causing to swallow'
cf.	anku-mííl-a		/-mil-a/	'he is swallowing'

The examples in (3.29) show that the root-final liquid changes to a voiced alveolar stop before the causative glide.

The following examples in (3.30) show that there are root-penult glides in the language, but they do not trigger the same phonological change.

(3.30) Blocking of /l/ hardening before -Iy- morpheme:

ly-aa	*dy-aa	/l-i-a/	'eat!'
liiy-a	*d-iiy-a	/l-iy-a/	'cause to eat!'
anku-gúgúvaliyya	*anku-gúgúvad-iyya	/-guguval-iy-a/	'he is well kneeling'
anku-tángáleeey-a	*anku-tángád-eeey-a	/-tongol-ey-a/	'he is well talking'
anku-mlíiyya	*anku-míid-iyy-a	/-mil-iy-a/	'he is well swallowing'
anku-l-íiy-a	*anku-d-íiy-a	/l-iy-a/	'he is causing to eat'

The major segmental difference between the examples in (3.29) and (3.30) is that only one morpheme *-y-* triggers the change of the root-final consonant, but the suffix *[-iy-]* does not trigger the change. Note that in the first example of (3.30) there is a glide after the consonant, but that glide is not a morpheme and it does not trigger the change on the preceding consonant. The pattern of root-final consonant in (3.30), where the coronal liquid resists hardening is similar to the pattern found in all verbs when they take the causative morpheme *-iy-*.

The next data in (3.31) show that the root-final lateral consonant does not undergo hardening before the causative *-iy-*.

(3.31) Blocking of hardening of the root-final consonant in the indirect causative:

anku-gúgúval-iiy-a	*gúgúvad-iiy-a	/-guguval-iy-a/	'he is causing to kneel'
anku-tóngól-eey-a	*tóngóð-eey-a	/-tongol-iy-a/	'he is causing to talk'
anku-míl-iiy-a	*míð-iiy-a	/-mil-iy-a/	'he is causing to swallow'

I posit that the reason why hardening does not apply to the root-final consonant in (3.31) is because there is a vowel before the root-final consonant and the penult glide is the onset of the final syllable. I argue that the blocking of hardening on the root-final consonant is not governed by the morphological category of the causative suffix *per se*, but rather because of the differences in the prosodic structure.

The following examples include verbal roots, where the root-penult coronal liquid also does not undergo hardening before the underlying root-final glide as seen in (3.32).

(3.32) Blocking of hardening before root-final underlying glides:

vanku-kúuly-a \*/vanku-kúl-a/ \* va-nku-kúudy-a 'they are digging with finger nails'

vanku-kéely-a \*/vanku-kél-a/ \* va-nku-kéedy-a 'they are rasping'

va-nku-tóoly-a \*/vanku-tól-a/ \* va-nku-tóody-a 'they are taking care of'

The explanation for why there is no hardening in (3.32) is because the root-final glide is not a morpheme. Moreover, these examples still show that it is the prosodic structure which triggers hardening of the root-final coronal consonant, not the presence of the root-final glide by itself.

### 3.2.2 Consonant Frication

Another process which affects the root-final consonant is frication. Frication says that voiceless coronal and dorsal stops become a voiceless coronal fricative before the causative suffix. Observe the relevant examples of consonant frication in (3.33).

(3.33) Consonant frication before direct causative suffix:

anku-túkuus-y-a \*anku-túkuut-y-a /-tukut-/ 'he is causing to run'

cf. anku-túkúút-a 'he is running'

anku-tákoos-y-a	*anku-tákoot-y-a	/-takot-/	'he is causing to cook a lot'
cf. anku-tákóót-a			'he being cooked'
anku-pálees-y-a	*anku-pálet-y-a	/-pelet-/	'he is causing to pass'
cf. anku-páléét-a			'he is passing through'
vanku-shúus-y-a	*anku-shúuk-y-a	/-shuk-/	'they are causing the trap to fall'
cf. anku-shúúk-a			'they are falling'
anku-lées-y-a	*anku-léek-y-a	/-lek-/	'he is causing to be prohibit'
cf. anku-léék-a			'he is leaving'

Let's assume that the alveolar stop and velar stop become alveolar fricative by a special phonological rule formalized in (3.34).

(3.34) Frication of /t/ and /k/:

$$/t, k/ \rightarrow [s] / \text{---} + y$$

The reason why /t, k/ become [s] before the causative suffix is because of the restriction against [ty-] and [ky-] sequences. In Shimakonde, there are few verb stems which have a [ty-] sequence on the surface. Representative examples are given (3.35).

(3.35) Blocking of frication of /t/:

	vanku-túut-y-a	*vanku-túus-y-a	'they are causing to pop'
cf.	vanku-túút-a		'they are popping'
	vanku-ngú-tiit-y-a	*vanku-ngú-tiis-y-a	'they are causing me to blind'
cf.	vanku-ngú-tiít-a		'they are blinding me'

Verbs like those in (3.35) can be treated as exceptions. The conclusion is that the consonantal phonology of Shimakonde presents the most common processes found in the most Bantu languages such as nasal place assimilation, nasalization and hardening. These processes can be treated as repair strategies which avoid having unwanted surface forms.

## CHAPTER 4

### HIATUS RESOLUTION

#### 4.0 Introduction

This chapter deals with processes that apply when two vowels are brought together word internally or at the phrase level. I will first consider the outcomes of vowel-vowel sequences word-internally and then examine the patterns of hiatus resolution at the phrase level. There are two outcomes which relate to hiatus resolution word-internally: (1) glide formation and compensatory lengthening (CL) and (2) assimilation of the first vowel to the second. The process of assimilation of the first vowel to the second can be divided into two subcategories, namely vowel coalescence and identical vowel fusion. At the phrasal level, there is no coalescence or CL, but a vowel deletion process applies.

#### 4.1 Hiatus Resolution

When two vowels come together word-internally or phrasally, the sequence is eliminated by a number of phonological processes. There is compensatory lengthening associated with all of the word-internal vowel fusion processes. Prevocalic non-low vowels undergo glide formation, a process by which a vowel delinks from its moraic anchor like in *kw-óómáána* derived from *kú-omána* 'to pierce each other'.

However, a high front vowel does not glide before another high front vowel, and a high back vowel does not glide before a high back vowel. A sequence of identical high vowels /i+i/ and /u+u/ optionally undergoes fusion giving a single long high vowel like *muukoóti* from *mu-ukoti* 'in the neck'. Although sequences of identical high vowels look like potential candidates for the glide formation rule, it is impossible to get a sequence of a glide plus homorganic vowel. In this respect, Shimakonde is similar to most Bantu languages like Kimatuumbi (Odden, 1986), Luganda (Clements, 1986), just to mention a few examples, where \*yi and \*wu are eliminated. Thus, the rule of glide formation needs to be formalized in a way so that it does not apply to identical vowels. There is also a process of vowel coalescence by which a low vowel fuses with the following vowel giving a single non-high vowel which contains properties of both underlying vowels as in *véénjiila* from /vá-ínjiila/ 'getting in'.

In Shimakonde, glide formation and vowel coalescence are generally optional. However, there are complications pertaining to whether hiatus is resolved optionally or obligatorily in the language. We shall see that glide formation is only optional in syllables which precede the penult like in *tw-oovééle* ~ *tu-ovééle* 'let us play'. However, the process is obligatory when V-V which undergoes glide formation appears in the penult as in *vandí-tw-eéka* ~ \**vandi-tú-eéka* 'they laugh at us'.

There are three separate patterns of vowel coalescence. In one pattern there is obligatory vowel fusion as in *meémbe* from *lma-émbel* 'mango', where *\*ma-eémbe* is prohibited. The second pattern has optional vowel fusion like *meéki* ~ *maiiki* 'stumps'. The third pattern is one where vowel fusion does not apply at all as in *má-úúta* ~ *\*móóta* 'oil'. The issue of such lexically controlled optionality of hiatus resolution will not be addressed in full detail in this dissertation, and requires further research. However, in the subsequent sections I include all of the patterns of hiatus resolution, so that we can see what the alternations are.

#### 4.1.1 Glide Formation

The generalization about the glide formation rule (GF) is that a prevocalic high vowel turns into a glide and the neighboring vowel is lengthened due to Compensatory Lengthening (CL), except that glide formation does not apply to identical high vowels. Furthermore, glide formation is optional in syllables which precede the penult, but the process is obligatory in the penult. I begin motivating the glide formation rule word-internally in the morphological context of a noun-class prefix plus root.

This is the context where all theories of vowel/glide alternation correctly predict that a high vowel glides before another vowel and there is also CL. In discussing hiatus resolution word-internally I will group vowel sequences in three categories as indicated in (4.1).

(4.1) Vowel sequences word-internally:

- a. High vowel + V (as in /i + V; u + V/)
- b. Low vowel + V (as in /a + V/)
- c. Identical high vowels (as in /i+ i/; u + u/)

Sequences of mid vowels before another vowel are not attested word-internally, because there is no prefixes with mid vowels.

(4.2) Non-occurring underlying vowel sequences word-internally:

*\*/e + V/*

*\*/o + V/*

The examples in (4.3) show that a pre-vocalic high vowel of the prefix turns into a glide, and the following vowel is lengthened.

(4.3) GF word-internally:

a. /i+a/:

li-papáatu		'bark of a tree'	(cl. 5)
ly-aanjaala	~ li-anjaala	'rag'	(cl. 5)
ly-aambwaambwe	~ li-ambwaambwe	'lot of water'	(cl. 5)

b. /u+a/:

mú-tuuka		'car'	(cl. 3)
* mw-áá <u>nduugwa</u>	~ mú-á <u>nduugwa</u>	'potato'	(cl. 3)
kú-ká <u>dúúla</u>		'to break'	(cl. 15)
kw-áá <u>dúúla</u>	~ kú-á <u>dúúla</u>	'to destroy'	(cl. 15)

c. /i+e/:

lí-té <u>tééle</u>		'cucumber'	(cl. 5)
ly-é <u>émbééñu</u>	~ lí-é <u>mbééñu</u>	'fool'	(cl. 5)

d. /u+e/:

kú-pé <u>tééla</u>		'to sift for'	(cl. 15)
kw-é <u>épééla</u>	~ kú-é <u>pééla</u>	'to harvest for'	(cl. 15)
kw-é <u>épúúka</u>	~ kú-é <u>púúka</u>	'to sprout'	(cl. 15)

e. /i+o/:

lí-tó <u>ógwa</u>		'liver'	(cl. 5)
ly-ó <u>ókóveele</u>	~ lí-ó <u>kóveele</u>	'hyena'	(cl. 5)

f. /u+o/:

kú-lá <u>kóóta</u>		'to pick up'	(cl. 15)
kw-áá <u>lóóta</u>	~ kú-á <u>lóóta</u>	'to point'	(cl. 15)
kw-áá <u>mbóola</u>	~ kú-á <u>mbóoka</u>	'to liberate'	(cl. 15)



	ly-óókóveele	~	lí-ó.kóveele	'hyena'
	My-áángáleewa	~	Mí-ángáleewa	'name of a village'
b.	my-áaka		*mí-áaka	'years'
	my-áadi		*mí-aadi	'blood'
	ly-éeve		*lí-éeve	'name of fruit'
	ly-eémbe		*li-eémbe	'mango'
	kw-éénga		*kú-énga	'to cut'
	kú-tw-eéka		*kú-tú-eéka	'to laugh at us'

The data in (4.4) show that there are two patterns of GF in Shimakonde. One pattern includes optional GF before the penult and the second pattern shows that GF is obligatory if the stem has two syllables. We see that GF is optional in (4.4a) where stems have more than two syllables, but this process is obligatory in (4.4b) when the vowel-vowel sequence appears in the penult.

The next data in (4.5) show that GF is not conditioned by whether the target vowel is word-initial. Note that in Kimatuumbi (Odden, 1986) this is a conditioning factor for GF.

(4.5) Glide formation in non-word-initial position:

kú-tw-eéka		*kú-tú-eéka	'to laugh at us'
kú-tw-éékeéla	~	kú-tú-ekeéla	'to laugh at us for'
kú-tw-oóna		*kú-tú-oóna	'to see us'

kú-tw-óoneéla	~ kú-tú-oneéla	'to see for us'
kú-tw-aáka	*kú-tú-aáka	'to chase us'
kú-tw-áakiíla	~ kú-tú-ákiíla	'to chase for us'

What we see is that GF applies optionally before the penult and the processes is not concerned with the vowel quality of the second vowel.

The additional examples in (4.6) include the 1<sup>st</sup> sg. and 1<sup>st</sup> pl. object prefixes *ngu-* 'me', and *tu-* 'us', respectively which glide before another vowel.

(4.6) GF in word-initial and medial syllable positions:

a. /u+a/:

tu-pakiila		'give us a ride!'
ngu-pakiila		'give me a ride!'
tw-aandikiila	~ tu-andikiila	'write for us!'
ngw-aandika	~ ngu-andiika	'write me!'
ngw-aaka	*ngu-aaka	'chase me!'
ngw-aata	*ngu-aata	'follow me!'

b. /u+e/:

kú-tú-leéka		'to leave us'
kú-tw-éenguliíla	~ kú-tú-enguliíla	'to open a path for us'
kú-tw-éepangiíla	~ kú-tú-epangiíla	'to harvest continuously for us'
kú-tw-eéka	*kú-tú-eéka	'to laugh at us'
kú-ngw-eéka	*kú-ngú-eéka	'to laugh at me'

c. /u+i/:

vá-tú-píima		'when measuring us'
vá-tw-ííviila	~ vá-tú-íviila	'when robbing from us'
vá-ngw-íívíliila	~ vá-ngú-ívíliila	'when covering me up'
vá-tw-ííima	*vá-tú-ííima	'when denying us'
vá-ngw-ííita	*vá-ngú-ííita	'when refusing me'

d. /u+o/:

vaka-tú-koôma		'if they beat us'
vaka-tw-ooveleêla	~ vaka-tú-oveleêla	'if they joke with us'
vaka-ngw-ooveleêla	~ vaka-ngu-oveleêla	'if they joke with me'
vaka-ngw-oôna	*vaka-ngu-oôna	'if they see me'
vaka-ngw-oôda	*vaka-ngu-oôda	'if they follow me'

One other context analogous to the examples in (4.6) involves a prevocalic high vowel of the perfective tense-aspect *-ndi-* and the present progressive *-nku-* which are subject to GF before another vowel as in (4.7).

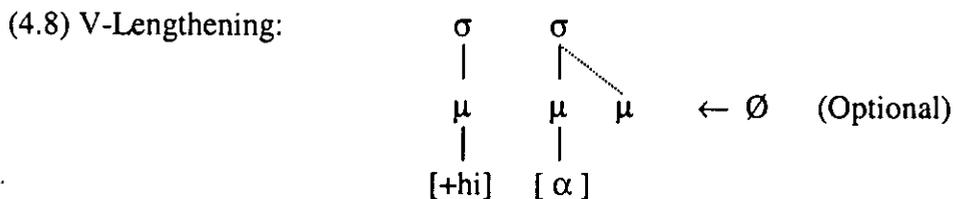
(4.7) GF with tense-aspect morpheme:

a.	va-ndy-aáduúla	~ va-ndi-áduúla	'they destroyed'
	va-ndy-eépánííla	~ va-ndi-épánííla	'they harvested for each other'
	va-ndy-oóveéla	~ va-ndi-óveéla	'they played'
	va-ndy-uúluúka	~ va-ndi-úluúka	'they flew'
b.	va-nkw-aadúúla	~ va-nku-adúúla	'they are destroying'
	va-nkw-eepanííla	~ va-nku-epanííla	'they are harvesting for each other'
	va-nkw-oovééla	~ va-nku-ovééla	'they are playing'
c.	vá-ndy-aâma	*vá-ndí-aâma	'they had moved'
	vá-ndy-eêpa	*vá-ndí-eêpa	'they had harvested'
	va-nkw-óóma	*va-nku-óóma	'they are piercing'
	va-nkw-ééka	*va-nku-ééka	'they are laughing'

The examples in (4.5) – (4.7) show that glide formation is optional before the penult, but it is obligatory in the penult. Furthermore, we see that the obligatory GF in the penult is not dictated by tone or by any particular morphological category.

To explain the patterns of GF in Shimakonde I will adopt an approach according to which glide formation applies obligatorily before a long vowel. Since Shimakonde has no underlying contrast between short and long vowels, and all of the long vowels that appear on the surface are derived by some rule, the assumption behind this analysis entails a two-step approach, specifically lengthening applies first and GF second. It follows that if the vowel length is lacking a prevocalic high vowel does not undergo GF. However, there are other possible approaches to GF which could handle the Shimakonde data. In the subsequent pages I will only give marginal consideration to these other analyses.

I posit that Shimakonde has a rule that lengthens a vowel after a high vowel, and that rule is optional. Optional vowel lengthening can be formalized as in (4.8).



Since the rule is optional, we would expect to get, at some relevant stage of derivation, surface forms like *vandi-épániíla* or *vandi-éépániíla* 'they harvested for each other', where both a short vowel and long vowel appear after a high vowel. However, *\*vandi-eepaniíla* is not a possible output. The reason why *\*vandi-eepaniíla* is impossible is that obligatory GF has not applied.



The derivations in (4.10) show that lengthening after a high vowel feeds into GF, and if lengthening does not apply first, there is no GF either. There are two reasons for adopting the two-step analysis for GF in Shimakonde.

The rule of GF is obligatory in the penult, and optional in syllables which precede the penult. This fact can be explained by simply stating that the penult is always long due to an independent stress rule, which assigns length to the penult. Thus, GF applies obligatorily to the penult once the stress rule has been applied. Since the penult is always long, there is obligatory GF in the penult. The only source of vowel length before the penult is the optional rule lengthening a vowel after a high vowel given in (4.8). Since this rule is optional, GF before the penult is not obligatory, because this is the context where we expect to get intermediate stages of V-V resolution. The second reason for adopting the two-step approach is that in Shimakonde, the identical high vowels /u+u/ and /i+i/ do not undergo any obligatory GF in the penult, where otherwise V-V should glide obligatorily.

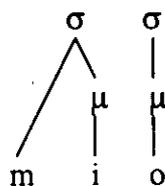
Due to the two-step approach adopted to account for GF in Shimakonde, I do not treat Lengthening as an automatic consequence of demorification. Instead, Lengthening is viewed as an independent process which accidentally has similar conditions as GF. For now, I should note that behind the optionality of V-V resolution, there is a revelation that GF only applies if also there is vowel lengthening, and this fact could explain why GF and Lengthening are not independent from each other.

Clements (1986) and Odden (1996) treat CL as an automatic side-effect of GF in Luganda and Kimatuumbi, respectively, where this process has to take place at the same time as GF. According to Odden (1986) CL needs to be treated as an automatic by-product of GF in Kimatuumbi, because a two-step analysis does not hold since there is an underlying contrast between long and short vowels, and yet GF is not obligatory before underlying long vowels. However, Shimakonde does not have underlying long vowels, yet GF is obligatory before derived long vowels. This fact leaves the possibility of one adopting either the one-step analysis or the two-step approach in Shimakonde, since there is no strong evidence for one particular analysis.

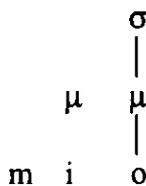
The complication that would be needed for Shimakonde is that GF becomes obligatory only in the penult, and it would be a coincidence that this is exactly where vowels are obligatorily long. According to Odden (1996), GF and CL can be illustrated as in (4.11), where virtual derivational steps are assumed. Lengthening is viewed as a compensation for the demorification in the input of an underlying vowel sequence (4.11a), which gives the output of glide formation in (4.11b), and CL in (4.11c).

(4.11) GF and CL:

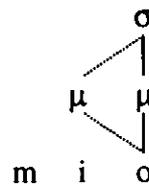
a.



b.

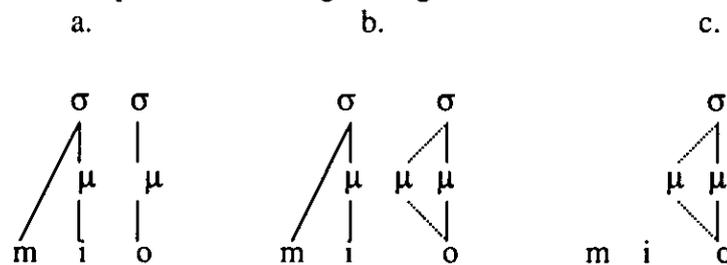


c.



The representation in (4.11) shows that CL results from linking the vowel to the mora which was deprived from its segmental material. From the two-step perspective, GF and post-vocalic lengthening can be illustrated as in (4.12), where there is insertion of the additional mora (4.12b) and the rule of mora insertion precedes the output of GF in (4.12c).

(4.12) GF and post-vocalic lengthening:

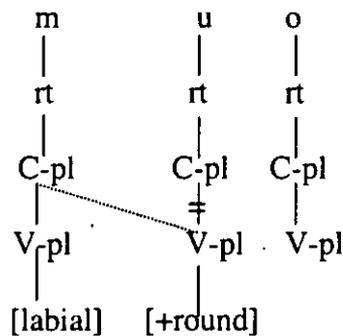


The representations in (4.12) are analogous to the representations in (4.11), and the only small difference is the insertion of additional mora after a high vowel, a crucial condition for proper application of obligatory GF.

Glide formation can also be represented in a feature geometry where the vocalic node of the high vowel disassociates with the respective root node and the feature of the vowel spreads from the vocalic node to the preceding consonant place node as shown in (4.13).



(4.13) Representation of GF in a feature geometry:



I should make clear that the presentations in (4.12) and (4.13) correspond to a possible view, but I do not have a clear evidence that selects between (4.12) vs. (4.13). We can see that the vocalic node spreads to the consonantal place node giving a complex onset [C<sup>w</sup>].

#### 4.1.2 Vowel Coalescence Word-internally

One other process that relates to hiatus resolution is vowel coalescence. Vowel coalescence is the fusion of the two adjacent vowels into a single vowel, which contains properties of both underlying vowels. Optionally, the two vowels in a sequence may be left as separate short vowels. There are three separate patterns of vowel fusion in Shimakonde: (1) obligatory vowel coalescence like in *meémbe* from *Ima-émbel* 'mango', (2) optional coalescence as in *moóka* ~ *ma-oóka* 'corpses' and (3) the pattern where coalescence does not apply at all as in *má-úúta* ~ *\*móóta* 'oil'. These patterns show that there is no general solution to vowel fusion in the language. The vowel sequence involving /a+a/ gives an ambiguous outcome, and I will treat /a+a/ separately.

I begin examining the patterns where there is fusion and later, I deal with cases where fusion does not apply. In (4.14) I show coalescence of a prevocalic low vowel in nouns.

(4.14) Vowel coalescence word-internally in nouns:

a. /a + e/:

ly-eémbe	*li-eémbe	'mango'	(cl. 5)
meémbe	*ma-eémbe	'mangos'	(cl. 6)
meendeleélo	~ ma-endeleéo	'development'	(cl. 6)

b. /a + i/:

li-íki		'stump'	(cl. 5)
meéki	~ ma-íki	'stumps'	(cl. 6)
meekalíflo	~ ma-ikalíflo	'stays'	(cl. 6)

c. /a + o/:

lyoóka	~ li-oóka	'corpse'	(cl. 5)
moóka	~ ma-oóka	'corpses'	(cl. 6)
lyóókóveele	~ lí-ókóveele	'hyena'	(cl. 5)
móókóveele	~ má-ókóveele	'hyenas'	(cl. 6)

d. /a + u/:

lyuuvíflo	~ li.uvíflo	'suffering'	(cl. 5)
moovíflo	~ ma.uvíflo	'sufferings'	(cl. 6)
moongaáno	~ ma.ungaáno	'unity'	(cl. 6)

Vowel coalescence also applies word-internally in verbs, when a prefix appears before another vowel. Coalescence in verbs is seen in the following examples in (4.15).

(4.15) Vowel coalescence in verbs:

a. Coalescence of the 3 pl. subject prefix *va-* with the root-initial vowel:

/a+e/:	véénguula	~ vá-énguula	'when opening a path'
/a+i/:	véétiika	~ vá-ítiika	'when responding'
/a+o/:	vóóloota	~ vá-óloota	'when pointing'
/a+u/:	vóóluuka	~ vá-úluuka	'when flying'

b. Coalescence with the 3 sg. subject prefix *a-* with the root-initial vowel:

/a+e/:	eéngiíle	~ a-éngiíle	'he did not cut'
	eengiíle	~ a-engiíle	'he had not cut'
/a+i/:	eegwiíte	~ a-igwiíte	'when he had heard'
	eegwiíte	~ a-igwiíte	'he had not hear'
/a+o/:	oóne	~ a-oóne	'let him see'
	óona	~ á-óona	'seeing'
/a+u/:	oolugweele	~ a-ulugweele	'when he was blind'
	óólúgwaala	~ á-úlúgwaala	'being blind'

c. Coalescence of the tense prefix *-nda-* with the root-initial vowel:

/a+e/:	va-ndeénguúla	~ va-nda-énguúla	'they will open the path'
	vá-ndéenguúla	~ vá-ndá-enguúla	'they open the path'

	vá-ndeênga	~ vá-ndá-eênga	'they cut'
/a+i/:	va-ndeémiíla	~ va-nda-ímiíla	'they will stand up'
	vá-ndéemiíla	~ vá-ndá-imiíla	'they stand up'
	vá-ndeêda	~ vá-ndá-íída	'they come'
/a+o/:	va-ndoómaána	~ va-nda-ómaána	'they will pierce each other'
	vá-ndóomaâna	~ vá-ndá-omaâna	'they pierce each other'
	vá-ndoôma	~ vá-ndá-oôma	'they pierce'
/a+u/:	va-ndoóluúka	~ va-nda-úluúka	'they will fly'
	vá-ndóoluúka	~ vá-ndá-uluúka	'they fly'
	vá-ndoônga	~ vá-ndá-uônga	'they tie'

d. Coalescence of the tense-prefix *-ka-* with the root-initial vowel:

/a+e/:	vá-kéenguula	~ vá-ká-enguula	'that they are not opening the path'
	va-keenguûla	~ va-ka-enguûla	'if they open the path'
	vá-keengà	~ vá-ká-eenga	'that they are not cutting off'
/a+i/:	vá-kéemiila	~ vá-ká-imiila	'that they are not standing up'
	va-keemiíla	~ va-ka-imiíla	'if they stand up'
	va-keêda	~ va-ka-íída	'if they come'
/a+o/:	vá-kóomaana	~ vá-ká-omaana	'that they are not piercing each other'
	va-koomaâna	~ va-ka-omaôna	'if they pierce each other'
	vá-kooná	~ vá-ká-oona	'that they are not seeing'

/a+u/:	vá-kóoluuka	~ vá-ká-uluuka	'that they are not flying'
	va-kooluûka	~ va-ka-uluûka	'if they fly'
	va-koôja	~ va-ka-uûja	'if they come back'

The examples in (4.15) are analogous to V-V combination in Luganda discussed by Clements (1986) where  $a+e \rightarrow ee$  and  $a+o \rightarrow oo$  and  $la+al \rightarrow aa$ , and these same surface patterns are also found in Shimakonde.

Vowel coalescence is also found in several languages like Sanskrit, Tigrinya, Sayanci (Parkinson, 1996) and Kimatuumbi (Odden, 1996). I will take a brief look at the Kimatuumbi data due to its similarity to Shimakonde not only in terms of the surface pattern of coalesced vowels, but also due to similarities in terms of the optionality of the process.

According to Odden (1996) Kimatuumbi has optional vowel coalescence if a low vowel is followed by prefixal high vowels. In this language coalescence applies only when the following high vowel is a prefix, and it does not apply when the low vowel is before a root high vowel or between the final low vowel of the verb and a following noun prefix. The relevant data of vowel coalescence in Kimatuumbi are given in (4.16).

(4.16) Kimatuumbi vowel coalescence (Odden, 1996):

- a. /a+i/: pa-bá-i-káatité ~ pa-bée-káatité 'when they cut them'  
           a-i-téliike ~ ee-téliike 'he cooked them'
- b. /a+u/: pa-ú-kaátité ~ poó-kaátité 'when you cut'  
           a-u-káatité ~ oo-káatité 'cut it'
- c. a-ínite \*eénite 'he danced'  
      a-útite \*oótite 'he pulled'

The data of (4.16c) shows that Kimatuumbi differs from Shimakonde in restricting coalescence for an initial root vowel, otherwise vowel sequences in (4.16c) would undergo vowel coalescence as they do in Shimakonde.

The table in (4.17) shows the summary of the outcomes of the underlying /a+V/ sequence for Luganda, Kimatuumbi and Shimakonde.

(4.17) Surface patterns of an initial low vowel:

Vowel sequence	Languages		
	LuGanda	Kimatuumbi	Shimakonde
/a + a/	aa	aa ~ a . a	aa ~ a . a
/a + e/	ee	ee ~ a . e	ee ~ a . e
/a + i/	N/A	ee ~ a . i	ee ~ a . i
/a + o/	oo	oo ~ a . o	oo ~ a . o
/a + u/	N/A	oo ~ a . u	oo ~ a . u

As seen, the effects of the vowel sequences in (4.17) are similar and the outcomes of the /a+i/ → [ee] and /a+u/ → [oo] involves preservation of vowel height from the underlying vowel /a/, combined with the place of articulation of the following vowel.

Parkinson (1996) examines vowel coalescence in a number of different languages including Kimatuumbi, Sanskrit, Tigrinya, Sayanci, just to mention few examples, and Parkinson found similarities between these languages in terms of how /a+V/ is resolved.

Up to this point the focus was on the pattern where coalescence applies optionally. In the next examples in (4.18) I consider the pattern where coalescence is obligatory in nouns. These data show that there is no option of keeping V-V in separate syllables. Contrast the data in (4.18a) with (4.18b).

(4.18) Obligatory vs. optional coalescence:

a. Obligatory coalescence in nouns:

méeno	*má-íno	'teeth'	cf. lí-ino	'tooth'
meémbe	*ma-eémbe	'mangos'	cf. ly-eémbe	'mango'
méeve	*má-eeve	'name of fruit'	cf. ly-éeve	'name of fruits'
méedi	*má-éedi	'water'		

b. Optional coalescence in nouns:

meéki	~ ma-íki	'stumps'	cf. li-íki	'stump'
meêndi	~ ma-iîndi	'basis'	cf. li-iîndi	'basis'
moóka	~ ma-oóka	'corpses'	cf. ly-oóka	'corpse'
mooviflo	~ ma-uviflo	'sufferings'	cf. ly-uuviflo	'suffering'
móongu	~ má-úungu	'name vegetable'	cf. ly-úungu	'name of vegetable'
m-oongaáno	~ ma-ungaáno	'unity'		

The examples in (4.18a) show that the singular forms of some nouns undergo GF and, the corresponding plural forms are subject to obligatory coalescence. The examples in (4.18b) show optional coalescence. The obligatoriness of vowel fusion is not dictated by the length of the stem, but rather by the lexicon properties of certain words.

In Shimakonde, verbs are always subject to the general pattern of optional vowel coalescence. Optional coalescence can be seen in the following examples in (4.19).

(4.19) Optional coalescence in verbs:

vá-ndoôka	~ vá-ndá-uúka	'they go'
vá-kooka	~ vá-ká-uuka	'that they are not going'
vá-ká-nóóka	~ vá-ká-ná-úúka	'that they do not go'
oolugweele	~ a- <u>u</u> lugweele	'when he was blind'
óólúgwaala	~ á-úlúgwaala	'being blind'
oónge	~ a-uúnge	'let him tie'
aveeda	~ a-va-iida	'they will not come'
vá-keeka	~ vá-ká-eeka	'that they are not laughing'
eédiíle	~ a-ídiíle	'he did not come'
óólooka	~ á-ólooka	'coming back'

We see that unlike nouns in (4.18b), the sequence of /a+V/ in verbs always undergoes optional coalescence.

#### 4.1.3 Identical High Vowels

We will see that with underlying identical high vowels /i+i/ and /u+u/ sequences there is no GF. Though the sequence of identical high vowels looks like a potential candidate for GF, V-V involving high vowels is subject to vowel fusion giving a single surface long vowel. Like coalescence, fusion of identical high vowels gives three separate outcomes.

There is one pattern where fusion is optional like in *vándiída* ~ *vándi-iída* 'they had come'. The second pattern of identical V-V gives obligatory fusion as in *líida* 'coming', where *\*lí-iída* is not a possible output. The third pattern is obligatory hiatus where identical high vowels are left in separate syllables like in *vandí-iída* 'they came', but the surface forms *\*vandiída* or *\*vandiída* are ungrammatical. I will first examine cases where identical high vowels get fused and later focus on the issue of non-fused identical vowels.

To explain identical high vowel fusion I posit a general rule formalized in (4.20).

(4.20) Identical high vowel fusion:

$$V_i + V_i \quad \rightarrow \quad V_i \\ [+long]$$

The rule of identical high vowel fusion says that a sequence of /u+u/ and /i+i/ becomes a single high long vowel. We shall see that the application of this rule is sometimes blocked in certain verbal tenses due to the presence of inflectional tones or the lexical properties of the word.

I begin considering sequences of identical high vowels in nouns and then examine identical high vowels in verbs. The following examples in (4.21) show that the combination of /i+i/ and /u+u/ gives a single high long vowel due to fusion.

(4.21) Identical high vowel fusion:

a. /i + i/:

líki		/li-íki/	'stump'	(cl. 5)
meéki	~ ma-íki	/ma-íki/	'stumps'	(cl. 6)
liigwilaníflo		/li-igwilaníflo/	'unity'	(cl. 5)
meegwilaníflo	~ ma-igwilaníflo	/ma-igwilaníflo/	'unities'	(cl. 6)

b. /u+u/:

muukoóti	/mu-u-kóti/	'in the neck'	(cl. 18/14)	cf. u-koóti	'neck'
muunoóni	/mu-u-noni/	'in the sleep'	(cl. 18/14)	cf. u-noóni	'sleep'
muûno	/mu-úno/	'in the mica'	(cl. 18/14)	cf. úu-no	'mica'

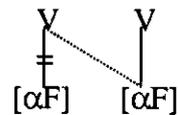
The next data in (4.22) provide further evidence for the prohibition of a glide before a homorganic vowel in word-initial position.

(4.22) Nouns beginning in /i/ and /u/:

íímu	*yíímu	/i-ímu/	'itch'	(cl. 9)
iimbwe	*yiimbwe	/i-imbwe/	'sand'	(cl. 9)
uúndi	*wuúndi	/u-undi/	'eagle'	(cl. 14)
uûngo	*wuûngo	/u-ungo/	'civet'	(cl. 14)

The examples in (4.21) - (4.22) are analogous to V-V in Luganda discussed by Clements (1986), where he claims that in LuGanda such identical vowel sequences undergo the twin vowel deletion rule formalized in (4.23).

(4.23) Twin vowel deletion (Clements, 1986: 49):



The rule in (4.23) says that the first vowel in sequence is deleted and the vocalic feature will spread to the vowel matrix left empty.

What we see is that the treatment of identical vowels is ambiguous, since one may either posit vowel deletion as Clements does, or vowel fusion, and the two analyses would give the same result. Thus, it is conceivable that the surface form *muukoóti* 'in the neck' is really *mu.ukoóti* with vowel hiatus maintained. However, there are contexts where reduction in the number of surface moras and the changes in tone due to restrictions on the kinds of tone sequences allowed on one syllable can diagnose the fusion of two vowels into one syllable. I will therefore not assume that identical high vowels systematically resist fusion, even if some cases like *muukoóti* are ambiguous.

As with all vowel sequences, as discussed previously, hiatus resolution is optional, so while a sequence of two short vowels [i.i] and [u.u] are possible outcomes for /i+i/ and /u+u/, these outputs are not the only results. So, one possibility is to posit a special phonological rule given previously in (4.20) which says that a sequence of identical underlying high vowels becomes a single high long vowel.

Consider the following examples in (4.24).

(4.24) Optional identical vowel fusion:

/u+u/:	va-nkú-tuúta	~ vanku-tú-uúta	'they are pushing us'
	vá-ndí-tuûta	~ vándí-tú-uûta	'they had pushed us'
	vá-ndí-tuûnga	~ vá-ndí-tú-uûnga	'they had tied us'
	va-nkú-muuluuwa	~ vanku-mú-uluuwa	'they are making him fly'
/i+i/:	vá-ndiîda	~ vá-ndí-iîda	'they had come'
	vá-ndímiidya	~ vá-ndí-imiidya	'they had caused to stop'
	ava-shiímífla	~ ava-shi-ímífla	'they were not standing up'

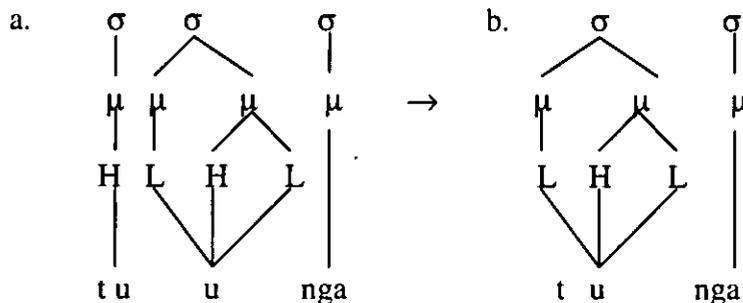
The data in (4.24) show one case where /u+u/ and /i+i/ remain unchanged if there is no fusion like in *vándí-tú-uûta* 'they had pushed us' or *vanku-tú-uúta* 'they are pushing us'. These examples show that the tone of the prefix *-tu-* remains unchanged before an identical vowel which also has a contour tone.

If the syllables get fused, the outcomes are *vándí-tuúta* and *vankú-tuúta*, respectively, where there is loss of a mora and phonetic duration and there is also tone simplification: H-LHL becomes LHL and H-LH changes simply to LH. I claim that the loss of a mora and tone simplification show that there is syllable merger.

The examples in (4.24) also show that a sequence of identical high vowels is not subject to GF. If GF did apply to identical vowels, we would expect obligatory GF in *vanku-tú-uúta* giving *\*vanku-tw-uúta* and *vándí-tú-uúta* would become *vándí-tw-uúta*, because this is the context where GF is obligatory in Shimakonde. Since I am not attributing the process *i+i → ii* to GF, and since therefore GF is assumed to only apply to non-identical vowels, there is no prediction that GF would apply obligatorily to *vándí-tú-uúta* 'they had pushed us'. The fact *i+i → ii* optionally in the penult but GF is obligatory in the penult, shows that *i+i → ii* does not involve GF.

The representations in (4.25) show that it is syllable merger which triggers the loss of a mora and phonetic duration as well as tone simplification.

(4.25) Fusion and tone simplification:



The input seen in (4.25a) shows that the sequence /u+u/ has the sequence of tones H-LHL. The outcome derived from syllable fusion in (4.25b) shows that only the LHL remains in the penult, because this is the only three-tone sequence that can occur on one syllable in the language.

Odden (1996) points out that in Kimatuumbi GF actually applies to a sequence of identical vowels. However, the glide does not show up before a homorganic vowel, due to an independent rule, which deletes a glide before a homorganic vowel because of an OCP-type deletion rule. The data we just have seen establish that the approach of GF followed by an independent rule deleting the glide would be a wrong direction to take for Shimakonde, since there is no context where identical high vowels are subject to obligatory GF in the penult. Odden (1996) also points out that deletion of a glide before a homorganic glide vowel in Kimatuumbi may be either obligatory or optional depending on whether the glide is preceded by a consonant or by a vowel. Relevant data from Kimatuumbi are given in (4.26).

(4.26) Homorganic glide deletion in Kimatuumbi (Odden, 1996: 108):

a.	wuúngo	~ uúngo	/u-uúngo/	'civet'
	wuúji	~ uúji	/u-uúji/	'porridge'
	yíinja	~ íinja	/i-íinja/	'cooking-places'
	yíiko	~ íiko	/i-íiko/	'pipes'

b. kínja	*kyínja	/ki-ínja/	'cooking-places'
kíró	*kyíró	/ki-író/	'pipes'

According to Odden (1996) homorganic glide deletion is obligatory in Kimatuumbi when the glide+vowel sequence comes after a consonant, otherwise the rule is optional. For Shimakonde, I claim that identical high vowels may fuse or be left in separate syllables, since the surface sequences \*yi, \*wu are totally lacking in the language, even if the sequence of identical high vowels appears in the penult where GF is obligatory.

The next examples in (4.27) include /i+i/ which gives optional fusion in the penult. Shimakonde has only three tense prefixes with the high front vowel, namely the recent past prefix *-ndi-*, the remote past prefix *-ndi-* which are distinguished tonally, and the prefix *-shi-* which appear in various tenses combined with other prefixes. However, there are various noun class prefixes with a front high vowel which combine with a root-initial identical high vowel.

(4.27) Optional identical vowel fusion:

vá-shíimba	~ vá-shí-íimba	'that they were singing'
ava-shíimba	~ ava-shi-íimba	'they were not singing'
ava-shíída	~ ava-shi-íída	'they were not coming'
vá-shíída	~ vá-shí-íída	'that they were coming'

vá-ndiîta	~ vá-ndí-iîta	'they had refused'
vá-ndiîda	~ vá-ndí-iîda	'they had come'
kú-liimiliya	~ kú-lí-imiliya	'to stand strong by itself'

The examples in (4.27) show that /i+i/ optionally gets fused, and the number of moras is reduced with subsequent tone simplification. Note that in the last example of (4.27) the reflexive prefix *-li-* is H toned when there is no fusion, but that prefix becomes L when it fuses with the identical root-initial vowel.

Contrast the data in (4.27) with the next examples in (4.28) involving subject agreement prefixes.

(4.28) Optional fusion and mora reduction:

liîda	~ li-iîda	'that it (cl. 5) is coming'
shiîda	~ shi-iîda	'that it (cl. 7) is coming'
viîpa	~ vi-iîpa	'that they (cl. 8) are giving'
liíde	~ li-iíde	'let it (cl. 5) come'
viíde	~ vi-iíde	'let them (cl. 8) come'
shiíde	~ shi-iíde	'let it (cl. 7) come'

The examples in (4.28) are similar to the data in (4.27) in terms of being subject to mora reduction. We see that this reduction only occurs when there is optional vowel fusion.

The following examples in (4.29) include /u+u/ and this vowel sequence patterns the same with the /i+i/ in terms of undergoing optional vowel fusion. As we can see, fusion also triggers mora reduction.

(4.29) Optional fusion:

va-tuûdya	~ va-tu-uûdya	'that they are asking us'
va-muûdya	~ va-mu-uûdya	'that they are asking you'
va-nkú-tuumya	~ va-nku-tú-uumya	'they are causing us to leave'
vá-ká-tuuunga	~ vá-ká-tú-uunga	'that they are not ting us'

The next data given in (4.30) show that unlike the previous examples where fusion is optional the V-V sequence gets fused obligatorily, since there is automatic mora reduction when the vowel of the object prefix *-tu-* or *-mu-* fuses with the identical root-initial vowel.

(4.30) Obligatory /u+u/ fusion:

a-va-shi-túúdya	*ava-shi-tu-úúdya	'they were not asking us'
váshíndá-muudya	*váshíndá-mu-uudya	'they were asking you'
	*váshíndá-mú-uudya	
vankú-muushya	*vanku-mú-uushya	'they are causing him to leave'
	*vankú-mu-uushya	

The examples in (4.30) include some complication, since we do not see an explanation for why there is obligatory fusion. Obligatory mora reduction also applies with /i+i/ as shown in the following examples in (4.31), but there it is not clear whether fusion is obligatory or optional.

(4.31) Obligatory mora reduction in /i+i/ fusion:

líida	~ lí-iida	'coming (cl. 5)'
víipa	~ ví-iipa	'giving (cl. 8)'
shíida	~ shí-iida	'coming (cl. 7)'

The data we have just considered show that fusion of /u+u/ and /i+i/ gives two patterns. One pattern shows optional fusion and the second option reveals obligatory vowel fusion. The conclusion is that just like fusion involving /a+V/ discussed previously, the sequence of identical high vowels presents three separate outcomes: optional fusion, obligatory fusion and the pattern where fusion does not apply at all. The last pattern where fusion is blocked is about to be discussed in the next section.

One last point to be made is that an examination of the outcomes of /u+u/ and /i+i/ in the penult, contrasted with the maximally similar /u+V/ and /i+V/ shows that there are differences in the way V-V are resolved. Identical high vowels never glide in the penult, while /u+V/ and /i+V/ are subject to obligatory GF in this same context. This supports the contention that i+i and u+u fusion is separate from GF.

The following examples in (4.32) involve V-V sequences which include an initial high back vowel. These data show that a prevocalic high vowel undergoes GF, but there is no GF when there is a sequence of identical high vowels.

(4.32) Penult contrast between identical V-V and /u+V/ vs. /i+V/:

a. /u+u/:	vá-ndí-tuúta	~ vá-ndí-tú-uúta	'they had pushed us'
	va-nkú-tuúta	~ va-nku-tú-uúta	'they are pushing us'
	va-nkú-tuuvya	~ va-nku-tú-uuvya	'they are causing us to suffer'
	vá-ndá-tuuvya	~ vá-ndá-tú-uuvya	'they cause us to suffer'
b. /u+V/:	vá-ndí-tw-aâka	*vá-ndí-tú-aâka	'they had chased us'
	vá-nkú-tw-eéka	*va-nkú-tú-eéka	'they are laughing at us'
	vá-ndá-tw-iigwa	*vá-ndá-tú-iigwa	'they hear us'
c. /i+i/:	vá-nd-iîmba	~ vá-ndí-iîmba	'they had sang a song'
	ava-sh-íîmba	~ ava-shi-íîmba	'they were not singing'
	va-nd-iîmiíla	~ va-ndi-ímiíla	
	va-ndí-l-iínga	~ va-ndi-lí-iínga	'they bathed by themselves'
d. /i+V/:	vá-ndy-aâka	*vá-ndí-aâka	'they had chased'
	ava-shy-ééka	*ava-shi-ééka	'they were not laughing'
	kú-ly-eéka	*kú-lí-eéka	'to one laugh by himself'
	kú-ly-oóna	*kú-lí-oóna	'to one see himself'
	kú-ly-uuvya	*kú-lí-uuvya	'to one makes suffer by himself'

It is a generalization about Shimakonde that a sequence of identical high vowels does not trigger obligatory GF in the penult, where otherwise a prevocalic high vowel is subject to obligatory GF.

#### 4.1.4 Identical Low Vowels

The output derived from an underlying sequence of identical low vowels is phonetically ambiguous. Consider the following examples in (4.33).

(4.33) Identical /a+a/:

vá-ndaâka	~ vá-ndá-aâka	'they chase'
va-ka-naakááta	~ va-ka-na-ákááta	'if they do not take a bit'
va-ka-naakáána	~ va-ka-na-ákáána	'if they do not chase each other'

The data in (4.33) show that when the sequence /a+a/ with different tones comes together there is tone simplification as seen in the first example which involves a simple process of mora reduction with automatic tone change. The last three examples seem to involve some other types of tone complication. I have considered tone simplification as a diagnostic for vowel fusion, so I will assume that the sequence of identical low vowels undergoes optional fusion.

Additional data of /a+a/ fusion are given in (4.34). A sequence of identical low vowels shows that there is optional vowel fusion. These data also show that tone is preserved.

(4.34) Mora reduction and tone preservation:

va-kaâma	~ va-ka-aâma	'if they move'
vá-ká-nááma	~ vá-ká-ná-ááma	'that they do not move'
va-ka-nááma	~ va-ka-na-ááma	'if they do not move'
vá-ká-naame	~ vá-ká-ná-aame	'they should not move'
vá-káakaata	~ vá-ká-akaata	'that they are not taking a bit'
ava-naákaate	~ ava-na-ákaate	'let them not take a bit'

Some cases, like *avanaákaate* 'let them not take a bit', are ambiguous because there is no mora loss or tone change. It is assumed that identical V-fusion applies nonetheless, even if it has no measurable phonetic consequence. The conclusion is that apart from the complication of optional V-V resolution word-internally, Shimakonde has a general pattern of hiatus resolution summarized in (4.35).

(4.35) Summary of the outcomes of hiatus resolution word-internally:

	a	e	i	o	u
i	yaa ~ i.a	yee ~ i.e	ii ~ i.i	yoo ~ i.o	yuu ~ i.u
u	waa ~ u.a	wee ~ u.e	wii ~ u.i	woo ~ u.o	uu ~ u.u
a	aa ~ a.a	ee ~ a.e	ee ~ a.i	oo ~ a.o	oo ~ a.u

#### 4.1.5 Exceptions to V-V Resolution

This section focuses on the few contexts where V-V is exceptionally treated differently from the general pattern of hiatus resolution discussed previously. I first examine exceptions to GF and vowel fusion in nouns then deal with exceptions in verbs.

##### 4.1.5.1 Exceptions in Nouns

Shimakonde presents a class of nominal roots which are not subject to the general pattern of V-V resolution. First, GF fails to apply in certain nouns as shown in (4.36), where V-V sequences are permitted on the surface root-initially or root-internally.

(4.36) Resistance to GF in nouns:

/i+u/:	ná-liú	'chameleon'
	lí-u	'ashes'
	mu-lií-u	'in the eye'
/u+i/	muú-i	'pestle'
	múu-i	'daylight'
/e+o/:	lu-kweéo	'line'
	n-kwééo	'your mother in law'
/e+u/:	shi-leú	'beard'
	Namajéú	'proper name'

The examples in (4.36) show that a prevocalic non-low vowel does not undergo GF. Furthermore, Shimakonde does not have an epenthetic glide to avoid V-V within the morpheme.

The next data in (4.37) show that a sequence of vowels fails to fuse root-internally in certain nouns.

(4.37) Resistance to fusion in nouns:

/a+i/:	shi-pyaái	'broom'
	my-áai	'yawn'
/a+u/:	lu-taáu	'slaver'
	lí-bááu	'slate'

Furthermore, in Shimakonde vowel coalescence does not apply to /a+u/ in nouns root-initially, if the V-V sequence appears in the penult. Thus, fusion fails totally to apply where otherwise we would expect vowel fusion. Consider the examples in (4.38).

(4.38) Resistance to penult root-initial /a+u/ vowel coalescence in nouns:

ma-uúndi	*m-oóndi	'clouds'
cf. ma-ungaáno	~ moongaáno	'unity'
ma-uúku	*m-oóku	'shrubs'

cf. ma-ukiflo	~ mookiflo	'going'
ma-uúlu	*m-oólu	'feet'
cf. ma-uviílo	~ mooviílo	'sufferings'
má-úúta	*m-óóta	'oil'

Recall that GF is obligatory root-initially in the penult and optional before the penult. These data we just saw in (4.38) show that vowel coalescence is not analogous to the GF, since we would expect obligatory vowel fusion in (4.38) as GF does in this same context. In this respect, vowel fusion differs from GF in Shimakonde. Historically, the resistance to fusion in nouns like *lutaáú* can be explained by assuming that these nouns might have included various consonants (/w, y, h/) in the root-penult position which were deleted in the modern Shimakonde. Thus, *lu-taáú* was from *lu-taáwu\** and *shipyaái* comes from *shipyaayi\**, but the voiceless glides were not preserved before a homorganic vowel in Shimakonde. So, I will treat these cases as ideosyncrasies of these nouns. Only one noun *má-úungu* ~ *móongu* 'type of vegetable' was found, which exceptionally undergoes /a+u/ fusion in the penult with mora reduction and tone change.

#### 4.1.5.2 Exceptions in Verbs

We have seen from the previous section that fusion of V-V gives one outcome where this process is optional also another option of obligatory fusion. The next data in (4.39) show that there is a third pattern in which V-V shows resistance to fusion.

(4.39) Resistance to vowel fusion in the verbal root:

/a+e/:

myaa.e	*my-ee	'kill him!'
n-jaa.e	*n-jee	'throw him away!'

/a+i/:

n-ta.iile	*n-teele	'pour/set a fire for him'
kú-tá.ífla	*kú-tééla	'to lay an egg'
kú-byá.ífla		'to kill for'
kú-pyá.ífla		'to sweep'

/a+u/:

kú-tá.úúla		'to remove food from a fire place'
kú-ta.úúka		'to argue'

/a+a/:

kú-byáá.a		'to kill'
kú-byá.áána		'to kill each other'
kú-jáá.a		'to throw away'
kú-já.áána	'to throw away each other'	cf. kú-jáána 'to give a try'
kú-jááníl-a	'to throw away for each other'	cf. kú-jáníla 'to give a try for'

We see that fusion fails to apply stem-internally in V-V sequences. The lack of fusion in (4.39) is not governed by the vowel quality or by the length of the stem, but rather by lexical properties of the word, because we have seen that these same V-V sequences are subject to optional or obligatory fusion in analogous cases. We can see in the last examples that /a+a/ does not trigger any mora reduction and tone simplification root-finally. Moreover, /a+i/ in *kubyaaila* is not realized as \**kubyeela* as a result of fusion. Instead, the underlying vowels are pronounced as such.



#### 4.2.1 Phrasal Low Vowel Deletion

In section 4.1 I motivated two independent processes, namely, GF and vowel coalescence word-internally. In this section I begin showing that the word-final low vowel does not coalesce at the phrase level, since coalescence does not apply at all. Instead the word-final vowel gets deleted phrase-medially. We have seen that within a word, the patterns /a+i/ → ee and /a+u/ → oo result from fusion, which keeps the height node of the lower vowel and the place node of the higher vowel in a combination.

The following examples in (4.41) show optional deletion of the word-final low vowel phrase-medially always giving a surface short vowel. The deleted vowel is indicated by the symbol “ ’ ”.

(4.41) Word-final low vowel deletion phrase-medially:

- |    |            |          |   |            |          |                                  |
|----|------------|----------|---|------------|----------|----------------------------------|
| a. | lí-kúk’    | engaánga | ~ | lí-kúka    | engaánga | ‘the trunk, cut it continuously’ |
|    | li-peêt’   | engaánga | ~ | li-peêta   | engaánga | ‘knapsack, cut it continuously’  |
| b. | n-neémb’   | idánaao  | ~ | n-neémba   | idánaao  | ‘the boy, bring him with’        |
|    | lí-kúk’    | iviliíla | ~ | lí-kúka    | iviliíla | ‘the trunk, cover it’            |
| c. | li-baát’   | odaniíla | ~ | li-baáta   | odaniíla | ‘the duck, follow it for e. o.’  |
|    | lí-lív’    | oónda    | ~ | lí-líva    | oónda    | ‘the trap, watch it’             |
| d. | li-mboónd’ | ukaánga  | ~ | li-mboónda | ukaánga  | ‘the pumpkin, wash it’           |
|    | li-papáaj’ | ukaánga  | ~ | li-papáaja | ukaánga  | ‘the papaya, wash it’            |

Not surprising, the data in (4.41) show that the low vowel before another vowel does not glide phrase-medially, since this vowel cannot form a complex onset. It is surprising, however, that the combination of /a+V/ gives only the pattern of vowel deletion and this V-V sequence does not undergo fusion to give a mid vowel from a high vowel at the phrase level. These data also show that the resolution of the prevocalic low vowel does not trigger CL: In Shimakonde there is CL phrasally.

I should clarify that deletion of the word-final low vowel in phrase-medial position is not an exception, since all vowels optionally get deleted in this context. What is exceptional is the fact that /a+V/ does not trigger vowel coalescence phrasally. If the prevocalic word-final vowel does not delete, we expect it to undergo GF, in case that vowel is non-low vowel, since a non-low vowel has ability to form a complex onset. If the vowel is low, there is coalescence, because a low vowel in a prevocalic position cannot form a complex onset.

The rule which deletes the word-final vowel phrase-medially is given in (4.42).

(4.42)            V        →    Ø / —# V        V-Deletion (Optional)

The best strategy for resolving V+V sequences involving the prevocalic low vowel in (4.41) would be to do vowel coalescence. However, vowel coalescence is prohibited at the phrase level, so deletion is the best outcome.

I now continue illustrating that at the phrase level, a prevocalic non-low vowel turns into a glide, just like we have seen application of GF word-internally, but V-V resolution does not trigger Lengthening. I first provide evidence supporting the existence of homorganic glide deletion at the phrase level.

The following examples in (4.43) show that when the stem ends in a glide plus vowel, and when the next word begins with a vowel that is homorganic to the glide, the glide does not show up on the surface, just in case the word-final vowel is deleted.

(4.43) Phrasal glide deletion:

lítóg'	uusha	~ lítógwa	uusha	'the liver, take it away'
lítóg'	ukaánga	~ lítógwa	ukaánga	'the liver, wash it'
lígwóg'	uúta	~ lígwógwe	uúta	'the lather, push it'
libweéb'	uluuwa	~ libweébwe	uluuwa	'the bird, make it fly'
lúkwíík'	utaánga	~ lúkwííkwi	utaánga	'the eyelash, push it repeatedly'
kúúd'	índífla	~ kúúdyá	í-ndífla	'to request for a way'
kúúmid'	ímúúla	~ kúúmídyá	í-múúla	'to make show up a nose'

The examples in (4.43) reflect two independent rules. One rule optionally deletes the word-final vowel phrase-medially (4.42). The second rule deletes the word-final glide before a homorganic vowel, depending on whether there is a consonant before the glide.

The following examples in (4.44) show that the word-final glide does not undergo deletion when there is a vowel before it, since the final vowel never deletes in this context, and the surface form such as \**kúléy # íñáama* is not a possible outcome.

(4.44) Blocking of word-final glide deletion:

kúléyá	íñáama	*kulé'	íñáama	'to prohibit meat'
kúvéyá	ímúúla	*kuvé'	ímúúla	'to blow a nose'
kújóowa	úgweeka	*kújóo'	úgweeka	'loneness is dangerous'

Following Odden (1996) the rule of glide deletion is formalized as in (4.45).

(4.45) Glide deletion rule:

$$\begin{array}{ccc}
 \langle C \rangle C & \rightarrow & \emptyset \\
 | & & | \\
 \text{Place}_i & & \text{Place}_j \\
 & & i = j
 \end{array}
 \quad \text{(Obligatory)}$$

The word-final vowel deletion rule feeds into the homorganic glide deletion rule, since (4.45) only applies just in case the final vowel is deleted by an independent phonological rule.

The next examples in (4.46) show that if the stem ends with a glide plus vowel and the next word begins with a vowel that is not homorganic to the glide, the glide deletion rule does not apply, even if the word-final vowel is deleted phrase-medially.

(4.46) Non-homorganic glide deletion:

lí-tógw'	ivilífla	~ lí-tógwa	ivilífla	'the liver, cover it'
lí-gwógw'	imiidya	~ lí-gwóógwe	imiidya	'the lather, cause it rise'
kúúmy'	úlúúlu	~ kúúmyá	úlúúlu	'to cause sap drop'

The data in (4.43) and (4.46) show that the word-final vowel deletion in phrase-medial position is optional, but homorganic glide deletion is obligatory if the glide appears after a consonant. What we see is that a glide may appear on the surface, provided that it is not immediately followed by a homorganic vowel. The data in (4.46) show that there is optional deletion of the word-final vowel phrase-medially, but glide deletion fails to apply, since the glide is not homorganic with the next vowel. These examples show that it matters whether the vowel and glide are homorganic in order the glide deletion rule to apply. These data also show that phrasal homorganic glide deletion is independently necessary.

#### 4.2.2 Glide Formation at the Phrase Level

This section focuses on the principle of V-V avoidance at the phrase level where GF is involved. I will then show the combined effect of glide formation and deletion of a glide before a homorganic vowel, due to the OCP. Finally, I illustrate that prevocalic mid vowels act exactly the same as prevocalic high vowels in terms of undergoing glide formation.

Consider the following examples in (4.47).

(4.47) GF of prevocalic high vowel phrase-medially:

a. /i+a/:

- |                 |         |               |        |                         |
|-----------------|---------|---------------|--------|-------------------------|
| liputipuúty     | ameéna  | ~ liputipuút' | ameéna | 'the sheep, eat it'     |
| cf. liputipuúti | paáta   |               |        | 'the sheep, receive it' |
| lipiíndy        | amiiya  | ~ lipíínd'    | amiiya | 'the rag, move it'      |
| cf. lipiíndi    | papuúla |               |        | 'the rag, tear off'     |

b. /i+e/:

- |            |           |          |           |                                   |
|------------|-----------|----------|-----------|-----------------------------------|
| lúkúny     | enganífla | ~ lúkún' | enganífla | 'the wood, cut it for each other' |
| cf. lúkúni | teéma     |          |           | 'the firewood, cut it'            |

c. /i+o/:

- |            |           |           |           |                                    |
|------------|-----------|-----------|-----------|------------------------------------|
| líkúty     | ombanífla | ~ lí-kút' | ombanífla | 'the drum, beat it for each other' |
| cf. líkúti | koóma     |           |           | 'the drum, beat it'                |

d. /i+u/:

liputipuúty	ukaánga	~ liputipuút'	ukaánga	'the sheep, wash it'
cf. liputipuúti	twaála			'the bowl, take it'

e. /u+a/:

úgwímbw	amuúla	~ úgwímb'	amula	'the hair, comb it'
cf. úgwímbu	kamuúla			'the hair, hold it'

f. /u+e/:

shiduúdw	eépa	~ shiduúd'	eépa	'cassava leaves, harvest them'
cf. shiduúdu	leéka			'cassava leaves, leave them'

g. /u+i/:

lyaátw	iigwa	~ lyaát'	iigwa/	'the ear, listen'
cf. lyaátu	tiíña			'the ear, pinch it'

h. /u+o/:

shikuúdw	oómba	~ shikuúd'	oómba	'the drum, play it'
cf. shikuúdu	koóma			'the drum, beat it'

The examples in (4.47) show two patterns of V-V resolution phrasally. One pattern seen in the first column shows that a prevocalic high vowel undergoes glide formation phrasally, following the same pattern found word-internally. The data in the second column show the pattern where the word-final vowel optionally gets deleted phrase-medially, rather than undergoing GF.

These data also show that glide formation at the phrase level does not trigger automatic lengthening of the neighboring vowel, although vowel lengthening does occur if the vowel is phrase-penultimate since it is stressed.

The following examples in (4.48) show V-V sequences involving underlying prevocalic front mid vowels.

(4.48) GF of prevocalic front mid vowel phrase-medially:

a. /e+a/:

likaândy	aduúla	~ likaând'	aduúla	'the mat, destroy it'
cf. likaânde	taáva			'the mat, wrap it up'

b. /e+e/:

lítátély	eépa	~ lítétél'	eépa	'the cucumber, harvest it'
cf. lítátéle	teénga			'the cucumber, sell it'

c. /e+o/:

lideéby	oómba	~ lideéb'	oómba	'the tin, play it'
cf. lideébe	leéka			'the tin, leave it'

d. /e+u/:

lijeémby	utíka	~ lijeémb'	utíka/	'the hoe, wrap it up'
cf. lijeémbe	twaála			'the hoe, take it'

The examples in (4.48) establish that in Shimakonde a prevocalic mid vowel is not excluded from the glide formation rule, since it acts the same as a prevocalic high vowel does.

The next examples in (4.49) show that glide formation also applies to a prevocalic mid back vowel.

(4.49) GF of prevocalic mid back vowel phrase-medially:

- |           |         |          |           |          |                               |
|-----------|---------|----------|-----------|----------|-------------------------------|
| a. /o+a/  | lidoôdw | aánda    | ~ lidoôd' | aánda    | 'the leg, make tattoo on it'  |
|           | cf.     | lidoôdo  |           | vaáva    | 'the leg, scratch it'         |
| b. /o+e/: | lidoôdw | engaánga | ~ lidoôd' | engaánga | 'the leg, cut it repeatedly'  |
|           | cf.     | lidoôdo  |           | leéka    | 'the leg, leave it'           |
| c. /o+i/: | lidoôdw | ingaánga | ~ lidoôd' | ingaânga | 'the leg, wash it repeatedly' |
|           | cf.     | lidoôdo  |           | piínda   | 'the leg, bend it'            |
| d. /o+o/: | lidoôdw | oóma     | ~ lidoôd' | oóma     | 'the leg, pierce it'          |
|           | cf.     | lidoôdo  |           | loóla    | 'the leg, look at it'         |

What we see is that a prevocalic mid vowel acts the same as a prevocalic high vowel in terms of undergoing GF. Moreover, the example of (4.49d) shows that GF also applies to /o+o/ sequence.

It is crucial to note from the examples above that a prevocalic mid vowel before an identical vowel acts just the same as the prevocalic high vowel does. The combinations of twin mid vowels /e#e/ and /o#o/ are subject to the same general pattern of GF phrase-medially, just like any non-low vowel does in Shimakonde. Specifically, since /o#o/ and /e#e/ actually do undergo GF, despite being identical vowel sequences, this shows that GF cannot be generally prohibited from applying in identical vowel sequences. It remains possible that GF is restricted from applying specifically to identical high vowel sequences as we have seen word-internally. It is also possible that GF is completely unrestricted at the phrase level and that glide deletion applies to the output of GF in the case of /i#i/ and /u#u/. These data also show that the word-final vowel deletion in phrasal context is not restricted to a particular vowel quality.

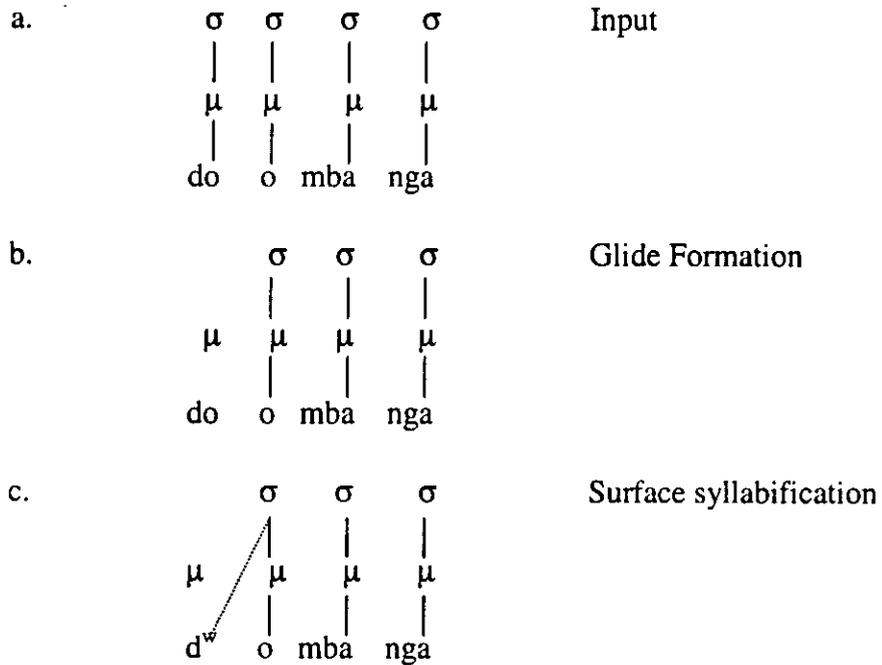
The data in (4.49) are in the context where twin vowel deletion (Clements, 1986) predicts that a vowel should delete, thus the glide formation rule should not apply. We have just seen that in Shimakonde, there is no coalescence phrasally at all.

One problem I address in this section is why there is no CL which accompanies V+V resolution at the phrase level. Recall from the previous section that GF applies obligatorily before long vowels and vowel fusion also gives the pattern of optional long vowels. It is a factual observation that CL fails to apply in all V-V resolution processes that apply phrasally.

In case of GF, one might attempt to explain the lack of CL by assuming that the vowel immediately after the glide undergoes an independent rule which deletes the first mora of a long vowel immediately after the glide. Thus, *lidoôdo engaánga* 'the leg, cut it' becomes *lidoôdw eengaánga* due to GF, then surfaces as *lidoôdw engaánga* by post-glide shortening. Basically this would be a reflex of the same rule which deletes the word-final vowel before another vowel phrase-medially. Since there is the option of applying GF, it would be conceivable to posit that first there is vowel lengthening after a non-low vowel, and later, the non-low vowel is subject to GF before long vowels. Since the word-final vowel has undergone GF, the optional phrase-medial mora deletion rule still would apply not to the word-final vowel, but to the first mora of the word-initial vowel.

However, this does not explain why there is no CL with the vowel deletion rule phrase-medially like in *lí-kúk' engaánga* where *\*lí-kúk' eengaánga* is the impossible output. Thus, the lack of CL at the phrase level seems totally arbitrary, in the sense that this fact cannot be predicted on the basis of any other fact of the language. It is the specific phrasal rules that give surface syllabification which prevent a mora from being preserved. GF results from delinking a vowel from its moraic anchor. In case CL applies, the floating mora of the deleted syllable is attached to the neighboring vowel. At the phrasal level, in contrast to the word level, the floating mora of the deleted syllable never attaches to the neighboring syllable. Subsequently, the vowel deprived from its moraic anchor is attached to the following syllable. The underlying mora of the /o/ is simply deleted as shown in the relevant derivation in (4.50c).

(4.50) Glide formation and the lack of CL: as in *lidoôdw ombaánga*



### 4.2.3 Phrasal Homorganic Glide Deletion

Further support for the OCP-driven glide deletion approach is seen in (4.51) in which the glide does not appear when a prevocalic mid vowel precedes a high vowel due to OCP.

(4.51) Phrasal homorganic glide deletion:

/e+i/:

lideéb'	ivilifla	/li-debe	ivilila/	'the tin, cover it'
in'aând'	imiidya	/i-n'ande	imidya/	'the house, make it stand'

/o+u/:

lidoôd'	utaniŋla	/li-dodo	ut-an-Ila/	'the leg, push for each other'
shiloông'	ukaánga	/shi-longó	ukanga/	'the pan, wash it'

What we see is that the examples in (4.51) only have the option where the word-final mid vowel gets deleted phrase-medially, and the option of turning the prevocalic vowel into a glide is impossible. It is not surprising that the examples in (4.51) surface without a glide as a result of V-V resolution. I argue that the reason why there is no surface glide in /e+i/ and /o+u/ is because of the OCP constraint which prevents an output with a glide before a homorganic vowel. So in Shimakonde, there are underlying vowel sequences which do not have a glide on the surface form due to the OCP. The representative examples are given in (4.52).

(4.52) OCP-type constraint:

a. Word-internal fusion:

i + i → ii      \*yi

u + u → uu      \*wu

b. Phrasal deletion:

e + i → i      \*yi

o + u → u      \*wu

#### 4.2.4 Phrasal Identical Low Vowel Deletion

The restriction against a prevocalic low vowel phrase-medially before another low vowel also applies to a sequence of identical low vowels. Low vowel deletion may apply either if the following vowel is the 3 sg. subject prefix *a-* (class 1) as in (4.53a) or if the following low vowel is stem initial vowel as in (4.53b).

(4.53) Prevocalic phrase-medial low vowel deletion:

- |    |           |           |             |           |                              |
|----|-----------|-----------|-------------|-----------|------------------------------|
| a. | n-neémb'  | ándiîda   | ~ n-neémba  | ándiîda   | 'the boy had come'           |
|    | m-maák'   | ándípiîta | ~ m-maáka   | ándípiîta | 'the cat had passed through' |
| b. | li-baát'  | ameéna    | ~ li-baáta  | ameéna    | 'the duck, eat it'           |
|    | shi-puûl' | aána      | ~ shi-puûla | aána      | 'the knife, forge it'        |

The actual surface patterns in (4.53) are ambiguous since one cannot tell which vowel in a sequence deletes. However, based on the previous analogous cases, I assume that the prevocalic word-final low vowel gets deleted phrase-medially.

#### 4.2.5 Phrasal Identical High Vowel Deletion

An optional phrase-medial vowel deletion is also found in a sequence of a prevocalic word-final high vowel before an identical high vowel. Vowel deletion applies either if the following vowel is a noun-prefix or vowel initial stem as in (4.54).

(4.54) Prevocalic phrase-medial identical high vowel deletion:

- |    |            |             |              |             |                             |
|----|------------|-------------|--------------|-------------|-----------------------------|
| a. | i-goôl'    | imiidya     | ~ i-goôli    | imidya      | 'the bed, make it stand up' |
|    | máa-v'     | iviliífla   | ~ máa-vi     | iviliífla   | 'the excrement, bury them'  |
|    | i-goôl'    | indiímiífla | ~ i-goôli    | indiímiífla | 'the bed stood up'          |
| b. | ly-aát'    | utiíka      | ~ ly-aátu    | utiíka      | 'the ear, wrap it up'       |
|    | shí-túund' | unguúla     | ~ shí-túundu | unguúla     | 'the cage, open it'         |
|    | u-luúl'    | undiígwa    | ~ u-luúlu    | undiígwa    | 'the sap felt down'         |

The data in (4.54) show that a sequence involving twin high vowels surfaces with a single short high vowel phrase-medially. Like the previous data, the examples of (4.54) are ambiguous in terms of determining which vowel in a sequence gets deleted.

I assume that the prevocalic word-final high vowel is directly deleted phrase-medially before an identical vowel. Alternatively, one can also assume that vowel deletion in (4.54) is driven by the GF feeding into the OCP-type glide deletion rule, where a homorganic glide is deleted due to the OCP. So, it is better to have vowel deletion than to have a sequence of underlying vowels.

The conclusion is that at the phrase level, there are limited processes which relate to V-V resolution. Basically, there is application of glide formation involving the prevocalic non-low vowels following the same general pattern found word-internally, except that the OCP prevents the output of GF from having surface homorganic vocalic sequences.

Furthermore, V-V sequences are subject to prevocalic phrasal vowel deletion and both phrasal glide formation and vowel deletion give a surface single short vowel. The summary of hiatus resolution at the phrase level is given in (4.55).

(4.55) Summary of phrasal hiatus resolution:

	a	e	i	o	u
i	ya ~ a	ye ~ e	i	yo ~ o	yu ~ u
e	ya ~ a	ye ~ e	i	yo ~ o	yu ~ u
u	wa ~ a	we ~ e	wi ~ i	wo ~ o	u
o	wa ~ a	we ~ e	wi ~ i	wo ~ o	u
a	a	e	i	o	u

The focus of this chapter has been how vowel-vowel sequences are resolved in Shimakonde, both word-internally and phrasally. It has been shown that the prevocalic non-low vowels turn into a glide and the neighboring vowel gets lengthened word-internally, but there is no vowel lengthening at the phrase level. A prevocalic low vowel undergoes vowel coalescence word-internally giving a single surface non-low long vowel which has properties of both underlying vowels. At the phrase level, there is no vowel coalescence even though there still is V+V resolution, implemented by deleting the prevocalic vowel phrase-medially. Phrase medial vowel deletion also applies to a prevocalic vowel before an identical vowel.

A simple answer for the surface differences for the combinations /a+i/ → *ee* word-internally, and /a+i/ → *i* at the phrase level is that in the former case there is an operation which changes the vocalic feature content of the underlying vowels in a sequence. In the latter case /a+i/ resolution does not involve any vocalic feature changes, since there is no coalescence. Similarly, the combination of /i+a/ becomes a glide both word-internally and phrasally by keeping the vocalic features of the underlying vowel sequence. It can simply be stated that glide formation, vowel coalescence and vowel deletion are parts of the same general strategy of vowel-vowel resolution.

## CHAPTER 5

### VOWEL HARMONY AND VOWEL REDUCTION

#### 5.0 Introduction

This chapter deals with two phenomena pertaining to vocalic phonology, namely vowel harmony and vowel reduction. A common feature characteristic of Bantu verb stems is vowel harmony, but vowel reduction in Bantu tone languages has not been documented yet. Apart from describing harmony and reduction as two separate processes, we shall see that vowel coalescence counterfeeds harmony in Shimakonde: for example the verbal form like *vá-ndá-iîma* 'they deny' has the corresponding applied form *vá-ndá-im-iîl-a* 'they deny for', where the verb suffix agrees in height with the preceding root-vowel. However, when the low vowel of the tense prefix *-nda-* fuses with the root-initial high vowel we get *vánd-éem-iîl-a* due to vowel fusion, not *\*vánd-éem-eêl-a*. The coalesced form of the verb for 'go' is *vánd-óok-iîl-a* from */vandá-uk-iîl-a/* 'they go for'. What we see is that vowel fusion creates mid vowels, but that the surface mid vowel does not cause harmony on the next suffix vowel. However, underlying mid vowels do condition harmony in height with the suffix vowel as in *vánd-éek-eêl-a*, not *\*vánd-éek-iîl-a* from *vándá-ek-eêl-a* 'they laugh for'.

Furthermore, vowel coalescence counterfeeds reduction, since the combination of /a+i/ and /a+u/ become [ee] and [oo] respectively, not \*[aa] because reduction does not apply to a high vowel or to a mid vowel derived from /a+i/ or /a+u/. We shall see that reduction only applies to the underlying mid vowels or mid vowels derived via harmony, and surface mid vowels derived from /a+e/ and /a+o/, when these vowels appear in unstressed syllable like in *vánd-áak-eêla*, from /vándá-ek-éla/ 'they laugh for'. I begin describing vowel harmony and then show the interaction between harmony and vowel reduction.

### 5.1 Vowel Harmony

Vowel harmony requires the non-low vowels of the verbal suffixes to harmonize in height with the preceding stem vowel. For the moment, consider the data given in (5.1) below.

(5.1) Vowel harmony:

- |    |                |                 |                   |
|----|----------------|-----------------|-------------------|
| a. | kú-píkíít-a    |                 | 'to play'         |
|    | kú-píkít-ííl-a | /kú-pikit-Íl-a/ | 'to play for'     |
| b. | kú-púkúút-a    |                 | 'to clean up'     |
|    | kú-púkút-ííl-a | /kú-pukut-Íl-a/ | 'to clean up for' |
| c. | kú-téléék-a    |                 | 'to cook'         |
|    | kú-télék-éél-a | /kú-télék-Íl-a/ | 'to cook for'     |

d.	kú-lókóót-a		'to pick up'
	kú-lókót-éél-a	/kú-lokot-Íl-a/	'to pick up for'
	kw-íídóóp-a		'to be heavy'
	kw-íídóp-éél-a	/kú-ídóp-Íl-a/	'to be heavy for'

The applied verbal extension *-il-* 'for' harmonizes to the height of the root-final vowel as in *vándá-im-iíl-a* 'they deny for', but if the root-final vowel is a mid vowel, the corresponding allomorph of the applied suffix is *-el-* like in *vándá-ek-eél-a* 'they laugh for'. In Shimakonde, the vowels of the verbal suffixes may be assumed to be underlyingly unspecified for height features, thus the applied suffix can be represented as */-Il-/*, the passive suffix as */-Iw-/* and the stative and causative suffixes as */-Ik-/* and */-Iy-/*, respectively. The assumption is that the vowels of the verbal suffixes get the surface height feature from spreading of the height of the root-final vowel. Thus, the height of the vowel suffix is dictated by the root-final vowel. I will consider later whether underspecification is crucial in accounting for harmony in the language.

The last example of (5.1d) has both high and mid vowels in the root and the surface form of the applied suffix is *-el-* due to spreading of the vowel height feature [-hi, -lo] from the root-final vowel. There is no spreading of height from the first vowel to the second vowel in that root.

In Shimakonde there are various classes of verbal suffixes described in chapter 2, and vowels of all the suffixes harmonize with the root-final vowel as shown in (5.2).

(5.2) Vowel harmony:

a. Applied suffix: *-il-*; *-el-*

kú-pút-ífl-a	'to wash for'	cf.	kú-púút-a	'to wash'
kú-pít-ífl-a	'to pass for'	cf.	kú-píít-a	'to pass'
kú-pét-éél-a	'to sift for'	cf.	kú-péét-a	'to sift'
kú-lókót-éél-a	'to pick up for'	cf.	kú-lókóót-a	'to pick up'

b. Causative suffix: *-iy-*; *-ey-*

kú-lúm-iiy-a	'to cause bite'	cf.	kú-lúúm-a	'to bite'
kú-lím-iiy-a	'to cause cultivate'	cf.	kú-líím-a	'to cultivate'
kú-télék-eey-a	'to cause cook'	cf.	kú-téléék-a	'to cook'
kú-lókót-eey-a	'to cause pick up'	cf.	kú-lókót-a	'to leave'

c. Impositive suffix: *-uk-*; *-ik-*; *-ek-*

kú-shím-úúk-a	'to be open'	cf.	kú-shíím-a	'to close'
kú-pím-íík-a	'to be measured'	cf.	kú-píím-a	'to measure'
kú-léng-éék-a	'to be sliced'	cf.	kú-lééng-a	'to slice'

d. Passive: *-igw-*; *-egw-*

kú-lúm-iigw-a	'to be bitten by'	cf.	kú-lúúm-a	'to bite'
kú-lím-iigw-a	'to be cultivated by'	cf.	kú-líím-a	'to cultivate'
kú-lék-eegw-a	'to be left by'	cf.	kú-léék-a	'to leave'
kú-lókót-eegw-a	'to be pick up by'	cf.	kú-lókóót-a	'to pick up'

e. Stative: *-ik-*; *-ek-*

kú-lúm-íík-a	'to be able be bitten'	cf. kú-lúúm-a	'to bite'
kú-píím-íík-a	'to be able be measured'	cf. kú-píím-a	'to measure'
kú-tót-éék-a	'to be able be sewed'	cf. kú-tóót-a	'to sew'
kú-lómb-éék-a	'to be able be married'	cf. kú-lóómb-a	'to marry'

f. Reversive: *-ul-*

kú-námáát-úúl-a	'to unglue'	cf. kú-námáát-a	'to glue'
kw-áánd-úúl-a	'to redo a tattoo'	cf. kw-áánd-a	'to make a tattoo'
kú-shím-úúl-a	'to open'	cf. kú-shíím-a	'to close'
kú-pínd-íík-úúl-a	'to turn over'	cf. kú-pínd-íík-a	'to be able be bent'
k-úúng-úúl-a	'to untie'	cf. k-úúng-a	'to tie'

The following examples in (5.3) show that Shimakonde has multiple harmony if two or more suffixes attach to the verbal root, and this fact shows that the rule iterates.

(5.3) Iterative V-harmony:

kú-pélévéél-a	'to lose balance'
kú-pélévéél-éél-a	'to lose balance for'
kú-pélévéél-él-éél-a	'to well lose balance for'



kú-pínd-a	'to bend'
kú-pínd-íík-a	'to be bent'
kú-pínd-íík-íík-a	'to well be able to be bent'
kú-pínd-íík-ííl-íík-a	'to well be able to be bent for'

The data in (5.3) show that there is harmony between the root-final vowel and the vowel of the immediately following suffix. Later the harmonized suffix vowel triggers harmony on the vowels of the following suffixes.

There are certain contexts where harmony fails to apply in Shimakonde. One context where there is no harmony is when the root begins with a mid front vowel which is followed by a high back vowel. Typically there is no harmony of the suffix vowel with the root-initial mid vowel in *-eCu* roots as illustrated in (5.4).

(5.4) Harmony in *eCu* roots:

kú-ténúk-ííl-a	* kú-ténúk-éél-a	'to imbalance for'
kw-éépúk-ííl-a	* kw-éépúk-éél-a	'to sprout for'
kw-ééngúl-íík-a	* kw-ééngúl-éék-a	'to be opened'
kw-ééngúl-íiy-a	* kw-ééngúl-éey-a	'to cause open the path'

We see that harmony applies between the suffix vowel and the root-final vowel and not between the suffix and the root-initial vowel as seen in the starred examples of (5.4).

The next data in (5.5) show that the high back vowel /u/ does not lower after the front mid vowel /e/, regardless whether the high vowel appears in root-final position or is a suffix vowel.

(5.5.) Lack of harmony in *eCu* stems:

kú-shéngúúl-a	*kú-shéngéél-a	'to cut a hair'
kú-téng-úúl-a	*kú-téng-éél-a	'to unset a fire place'
cf. kú-tééng-a	vs. kú-téng-éél-a	'to set a fire place for'
kú-jél-úúl-a		'to unsubmit to an initiation rites'
cf. kú-jéél-a	vs. kú-jél-éél-a	'to submit to an initiation rites for'

Harmony also does not cross the low vowel /a/, which itself fails to harmonize and does not trigger harmony on suffix vowels as shown in (5.6).

(5.6) Lack of harmony on the vowel /a/:

pakat-iíl-a		'hold for like a baby'
lek-an-iíl-a	*lek-an-eél-a	'leave for each other!'
	cf. lek-eél-a	'leave for!'

telek-an-iíl-a	*telek-an-eél-a	'cook for each other!'
	cf. telek-eél-a	'cook for!'
kolom-an-iíl-a	*kolom-an-eél-a	'snore for each other!'
	cf. kolom-eél-a	'snore for!'

The next data in (5.7) show that the harmony process does not affect the final vowel, but only the stem vowels. The lack of harmony on the final vowel can be seen in the following examples involving derived nouns and the subjunctive.

(5.7) Lack of harmony on the final vowel:

a. Derived nouns:

li-puwiíl-o	'happiness'	cf.	kú-púuw-a	'to be happy'
ly-uuviíl-o	'suffering'	cf.	k-úúv-ííl-a	'to suffer for'
mi-liíngo	'measurements'	cf.	kú-lííng-a	'to measure'
lw-eék-o	'laugh'	cf.	kw-éék-a	'to laugh'
li-teleék-o	'kitchen'	cf.	kú-téléék-a	'to cook'
li-kolomod-i	'cough'	cf.	kú-kólómóól-a	'to cough'
shi-tongoód-i	'speech'	cf.	kú-tóngóól-a	'to speech'

b. Subjunctive:

va-kulumuúk-e	'let them grow'	cf.	kú-kúlúmúúk-a	'to grow'
va-pikiít-e	'let them play'	cf.	kú-píkíít-a	'to play'
va-teleék-e	'let them cook'	cf.	kú-téléék-a	'to cook'
va-kolomoól-e	'let them cough'	cf.	kú-kólómóól-a	'to cough'

The final vowel does not harmonize because this vowel is generally a morpheme which marks the tense-aspect in verbs, or a nominal category in derived nouns, so it differs categorically from a stem vowel which is not a category marker morpheme.

One last context where harmony fails to apply is the perfective, where the vowel of this verbal suffix is never lowered after mid vowels as seen in (5.8).

(5.8) Lack of harmony in the perfective:

va-pit-iil-e		'when they have passed'
va-put-iil-e		'when they have washed'
va-pet-iil-e	*va-pet-eel-e	'when they have sifted'
va-tep-iil-e	*va-tep-eel-e	'when they have bent'
va-tot-iil-e	*va-tot-eel-e	'when they have saw'
va-lomb-iil-e	*va-lomb-eel-e	'when they have married'

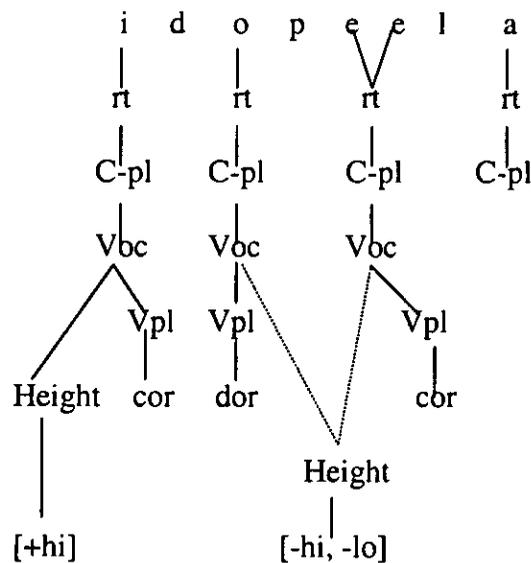
The data in (5.8) show that although harmony applies only to the derivational stem, the perfective suffix *-ile* fails to undergo harmony. There are two ways of explaining why the vowel *i* of the perfective suffix does not harmonize with the root-final vowel. First, from a historical standpoint, the perfective suffix is a reflex of the [superhigh] vowel from proto-Bantu \**i*, but the contrast between superhigh and high vowels is no longer maintained in Shimakonde. So the fact that the perfective suffix fails to undergo harmony can be treated as an idiosyncrasy of this one morpheme. Second one may posit that the perfective suffix fails to undergo harmony because this vowel differs from other suffixes in terms of being specified underlyingly for the height feature. Since we do not see an apparent phonological reason why the vowel of the perfective suffix should be specified for height feature while other suffix vowels are not, I take the first hypothesis as an appropriate explanation for why the perfective vowel suffix does not undergo vowel harmony. Synchronically, the perfective suffix will just be treated as an exception.

The assumption that alternating vowel suffixes are not underlyingly specified for height features in Shimakonde is made to explain in a simple way all cases where harmony applies including the presence of roots like *idop-* 'be heavy', where the harmonized surface form \**kw-íídóp-ííl-a* never shows up. I assume that the root *idop-* surfaces only with mid vowel on the suffix because the height feature, [-hi, -lo] spread from the root-final vowel to the unspecified vowel of the verb extension [-*ll-*]. Since the vowel /o/ spreads its features, it cannot be underspecified.

Since /o/ also does not undergo harmony but other affixes do, I assume the reason for this difference is that alternating non-initial vowels are unspecified for height, and non-alternating non-initial vowels are specified. We know from the previous examples that the root-final mid vowel triggers harmony on the following vowel suffix.

Spreading of the vowel height feature can be represented in a feature geometry representation (Odden, 1991 and Clements and Hume, 1995) in (5.9).

(5.9) Vowel height harmony in feature representation:



The representation in (5.9) shows that each of the mid vowels share a single vowel height (referred to as Aperture in Clements & Hume (1995)) as a result of harmony, which spreads height from the second vowel to the third vowel.

## 5.2 Stress-Dependent Vowel Reduction

I now turn to the issue of stress-induced vowel reduction which is one of the most productive processes of vocalic phonology of Shimakonde. It is a common observation in other languages that non-stressed vowels are subject to reduction, while stressed vowels do not reduce. The generalization about vowel reduction in Shimakonde is that within the stem, the underlying mid vowels /e, o/ may optionally reduce to a low vowel [a], except that in the penultimate stressed syllable there is no vowel reduction. Reduction also does not apply to a vowel in word-final position.

The process that reduces the underlying mid vowels to a low vowel affects all vowels starting at the left of the stem including surface short and long vowels. It is argued that in this language, it is more abstract stress, and not duration, that determines whether a vowel reduces. In the next section I show that acoustic analysis shows that the surface [a] derived from reduction of mid vowels is indistinguishable phonetically from the underlying /a/. Measurements also show that there is a difference in duration associated with stress. Specifically, stressed long vowels are longer than unstressed long vowels. Thus, phonetic duration and the lack of phonological reduction in the penult are the correlates of stress in Shimakonde.

We shall see that vowel reduction neutralizes the three-way phonemic contrast between /e, o, a/ found in the language, since unstressed reduced vowels are always pronounced [a]. Before describing stress-dependent vowel reduction, I begin with a brief overview of vowel reduction in other languages.

### 5.2.1 An Overview of Vowel Reduction

Previous research has classified languages as stress languages, or tone languages, but languages combining independent tone and phonologically significant stress are rare. There are apparently no languages previously documented with lexical tone, stress and directly measurable vowel reduction.

Previous works on vowel reduction include Chomsky and Halle, 1968, Thelin, 1971, Kenman, 1975, Hamilton, 1980, Mascaró, 1978, Piggott, 1980, Chung, 1983, Burquest and Laidig, 1992 and LeSourd, 1993. These studies reveal three common manifestations of reduction listed in (5.10).

(5.10) Manifestations of V-reduction across languages:

- (i) The reduced vowel becomes a phonetically novel vowel which is not found in underlying representation.
- (ii) The reduced vowel is deleted.
- (iii) The reduced vowel becomes neutralized with an existing underlying vowel found in the language.

Type (i) reduction generally gives a schwa-like vowel as in English (Chomsky and Halle, 1968), Ojibwa (Piggott (1980), and Tangaran (Burquest and Laidig, 1992). For these languages, it is assumed that the reduced vowel does not exist underlyingly.

Type (ii) reduction is found in Passamaquoddy (LeSourd, 1993). Type (iii) reduction is found in Russian (Thelin, 1971, Kenman, 1975, Hamilton, 1980), Catalan (Mascaró, 1978) and in Chamorro (Chung, 1983, Topping, 1968). Neutralization of contrast, e.g. /a, o/ in Russian, may yield a distinct vowel such as [ə] which does not exist in underlying representation. Furthermore there can be neutralization of contrast with the phonetic output being an existing vowel, e.g. in Russian unstressed /e/ → [i] which neutralizes the vowel /e/ with the independent phoneme /i/ which is also realized as [i] when unstressed.

The following data in (5.11) summarizes different outcomes of vowel reduction in various languages.

(5.11) Summary of vowel reduction:

Language	Underlying vowel	Surface reduced vowel
Ojibwa	/a/ →	[ə] (there is no /ə/)
	/o/ →	[ʌ] (there is no lax /ʌ/)
Tangaran	/a/ →	[ə] (there is no /ə/)
Passamaquoddy	/V <sub>short</sub> / →	[ə] ~ Ø
Russian	/a, o/ →	[ə] (there is no /ə/)
	/e/ →	[i] (there is /i/)

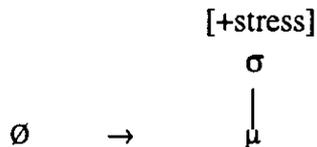
Catalan	/a, e/ →	[ə]	(there is no /ə/)
	/o/ →	[u]	(there is /u/)
Chamorro	/e, o/ →	[i, u]	(there are /i, u/)
Shimakonde	/e, o/ →	[a]	(there are /a, e, o/)

The focus of this chapter is the fact that reduction of mid vowels /e, o/ in Shimakonde gives a vowel that is identical to the underlying and stressed low vowel /a/.

### 5.2.2 Underlying Mid Vowel Reduction

There are two positional facts to consider in Shimakonde, namely, that underlying mid vowels become [a] except in the last two syllables. Furthermore, the penultimate vowel is always lengthened. These two positional facts suggest that in Shimakonde, stress falls in the penultimate syllable of the word and, a vowel in this position gets lengthened due to stress. The rule that assigns stress to the penult is repeated in (5.12).

(5.12) Stress-Lengthening:



The stress rule in Shimakonde can be stated as follows: stress the rightmost token of the heaviest syllable type in the last two syllables of the word. The stress rule in (5.12) causes

the insertion of an additional mora to the penultimate stressed syllable due to the *weight-to-stress* (WSP) principle proposed in Prince (1990), which states that “if heavy, then stressed”.

The following examples in (5.13) show that reduction which is optional, only applies to mid vowels before the penult. Cross-linguistically, vowel reduction entails vowel lowering or vowel raising. In Shimakonde, the reduced low vowel resulting from /e/ cannot be pronounced as a low front vowel [æ] since there is no low front vowel in this language, thus lowering reduction gives [a]. The surface vowels derived from reduction of the underlying mid vowels are underlined.

(5.13) Unstressed mid vowel reduction:

a.	kú-pééta	*kú-p <u>á</u> áta	/kú-pét-a/	‘to sift’
	kú-téépa	*kú-t <u>á</u> ápa	/kú-tép-a/	‘to bend’
	kú-póóta	*kú-p <u>á</u> áta	/kú-pót-a/	‘to twist’
	kú-tóóta	*kú-t <u>á</u> áta	/kú-tót-a/	‘to sew’
b.	kú-pétáána	~ kú-p <u>á</u> táána	/kú-pet-án-a/	‘to sift each other’
	kú-télékáána	~ kú-t <u>á</u> lákáána	/kú-telek-án-a/	‘to cook each other’
	kú-tótáánga	~ kú-t <u>á</u> táánga	/kú-tot-áng-a/	‘to sew repeatedly’
	kú-kólómóola	~ kú-k <u>á</u> lámóola	/kú-kolomól-a/	‘to cough’

Reduction of mid vowels is impossible in the penultimate syllable (5.13a). The reason why mid vowels do not reduce in (5.13a) is because of stress. In (5.13b) the underlying mid vowels outside of the last two syllables may optionally become [a] due to reduction.

The following examples in (5.14) show that reduction also applies to mid vowels in absolute word-initial position, provided that the vowel is not in the penult.

(5.14) Reduction in word-initial position:

eénga	* <u>a</u> ánga	'cut!'
engaána	~ <u>a</u> ngaána	'cut each other'
oómba	* <u>a</u> ámba	'beat the drum!'
ombaánga	~ <u>a</u> mbaánga	'beat the drum repeatedly!'
ombeéla	~ <u>a</u> mbeéla	'beat the drum for'

Reduction entails deletion of both height and place of articulation. It can be simply stated that reduction involves deletion of the vocalic node of a mid vowel. In Shimakonde, a vowel which is not specified for height and place of articulation is realized as [a], since there are no central vowels with specified height. Deletion of the vocalic node as a result of mid vowel reduction can be derived as in (5.15).



(5.16) Unreduced unstressed underlying high vowels /i, u/:

kú-pííta	* kú-pááta	'to pass'
kú-pítáána	*kú-pátáána	'to pass each other'
kú-púúta	*kú-pááta	'to wash'
kú-pútáána	*kú-pátáána	'to wash each other'
ukulaniífla	* <u>a</u> kalaniífla	dig for each other'
iviliífla	* <u>a</u> valiífla	'cover up!'

The next data show that the outcome of the underlying low vowel is ambiguous, since there is no way one could tell whether the underlying low vowel /a/ undergoes reduction, because reduction would give a low vowel [a], which is identical to the vowel that mid vowels are reduced to. The relevant examples involving an underlying low vowel are given in (5.17).

(5.17) Unreduced unstressed underlying low vowel /a/:

kú-tááva	/kú-táv-a/	'to wrap'
kú-táváána	/kú-tav-án-a/	'to wrap each other'
kú-pákááta	/kú-pakát-a/	'to hold as a baby'

kú-pákátáána	/kú-pakat-án-a/	'to hold each other as a baby'
akanaánga	/ak-an-áng-a/	'chase for each other repeatedly!'

We have seen from the representation in (5.15b) that reduction entails deletion of the vocalic node of non-high vowels. Since the underlying stem vowels in (5.17) are not specified for a height feature, I assume that the vowel /a/ does not undergo phonological reduction, but nothing of consequence depends whether one states reduction so that /a/ vacuously reduces to [a].

### 5.2.3 Non-reduction of Stressed Vowels

It is a generalization that across languages, stressed vowels tend not to reduce. Alderete (1995) discusses a similar problem found in Russian and he points out that certain underlying vocalic features are kept in the stressed syllables in the main stress foot of the word. Following Alderete's analysis I posit that non-reduction of stressed mid vowels in Shimakonde is because of stress which requires that certain underlying features of the vowel be kept in the stressed penult syllable.

#### 5.2.3.1 Non-reduction of Word-final Vowel

One other context where there is no vowel reduction involves the word-final vowel as illustrated by the examples in (5.18), where the final vowel does not undergo reduction.

(5.18) Unreduced word-final mid vowel:

a. Subjunctive:

va-teleéke	~ va-taleéke	*va-taleéka	'let them cook'
va-kolomoóle	~ va-ka <sub>l</sub> amoóle	*va-ka <sub>l</sub> amoóla	'let them cough'

b. Perfective negative:

a-va-téleéke	~ a-va-táleéke	*a-va-táleéka	'they did not cook'
a-va-kólómweéle	~ a-va-ka <sub>l</sub> ámweéle	*a-va-ka <sub>l</sub> ámweéla	'they did not cough'

c. Unreduced word-final vowel in nouns:

li-deébe	*li-deéba	(cl. 5)	'tin'
lí-vééle	*lí-vééla	(cl. 5)	'breast'
lí-bóódo	*lí-bóóda	(cl. 5)	'post'
li-doôdo	*li-doôda	(cl. 5)	'leg'

I consider three reasons for why word-final vowel does not reduce. First, it may be that the final vowel does not reduce because of foot structure constructed for stress. In Shimakonde, the penultimate stress is due to a trochaic foot constructed at the right edge of the word. The final vowel would be within the same foot as the stressed penultimate syllable, therefore foot structure itself may prevent the final vowel from reducing: thus, Shimakonde may be similar to Alderete's treatment of Russian, where unstressed vowels in the main stress foot are treated differently from other unstressed vowels. The Shimakonde trochaic foot structure is shown in (5.19).



(5.20) Harmony vs. vowel reduction:

va-nda-tót-eéla	~ va-nda-tát-eéla	/va-ndá-tot-Íl-a/	'they will sew for'
va-nda-lól-eéla	~ va-nda-lál-eéla	/va-ndá-lol-Íl-a/	'they will look at'
va-nda-shém-eéla	~ va-nda-shám-eéla	/va-ndá-shem-Íl-a	'they will call for'

The next data in (5.21) show that harmony crucially creates a suffix mid vowel after a mid vowel, and that suffix vowel undergoes reduction only because it becomes a mid vowel first. The vowel [e] in non-initial syllables derives from harmony of *kútálák-*idyaanga** 'to cause cook repeatedly'

(5.21) Harmony vs. vowel reduction:

kú-tót-édy-aana	~ kú-tát-ády-aana	'to cause each other sew'
kú-télék-édy-aanga	~ kú-tálák-ády-aanga	'to cause cook repeatedly'
kú-shém-édy-aanga	~ kú-shám-ády-aanga	'to cause call repeatedly'

We see that reduction of mid vowels in (5.21) gives a surface form which does not leave any height trace on the harmonized vowels. Thus, */tot-idyaana/* becomes *tot-edyana*, and the newly derived vowel [e] undergoes reduction giving *tát-adyana*. It is only by first undergoing vowel harmony that the suffix vowel *i* can become [a].

The next examples in (5.22) show that if the verbal root has an underlying /a/, harmony does not apply, and there is no way of knowing whether the low vowel is subject to reduction.

(5.22) Lack of harmony with vowel /a/:

kú-lál-ífl-a	'to sleep for'
kú-láp-ífl-a	'to swear for'
kú-pát-ífl-a	'to get for'
kú-málál-ífl-a	'to silent for'
kú-pákánífla	'to have a conversation'

The data in (5.20) – (5.22) reveal that vowel harmony should apply before vowel reduction, since reduction neutralizes the distinction between mid and low vowels, a distinction which is crucial for proper application of harmony. Additionally, harmony generates mid vowels which then reduce to [a].

The crucial rule ordering between harmony and reduction is shown in (5.23).

(5.23) Crucial rule ordering between harmony and reduction:

/va-nda-lól-Íl-a/	Input
va-nda-lól-el-a	V-harmony
va-nda-lál-el-a	V-reduction
[va-nda-lál-eéla]	Output

The problem posed by interaction between harmony and reduction is that harmony feeds into reduction and reduction makes harmony be opaque. For example, the underlying form /*va-ndá-lol-íl-a*/ becomes [*va-nda-lól-eél-a*] by harmony and then, it becomes [*va-nda-lál-eél-a*] because of reduction of the unstressed root-initial vowel. However, there is no lowering of the penult vowel in *va-nda-lál-iíla* 'they will sleep for' since the root /*lal*/ does not have an underlying mid vowel.

#### 5.4 Contiguity of Reduction (CORE)

Polysyllabic roots show that vowel reduction may affect not only the vowel immediately before the stressed vowel, but also the leftmost vowel of the stem. It is a generalization that reduction must apply to a contiguous sequence of vowels starting at a given point from the left to the right. Shimakonde restricts the pattern so that reduction applies to a vowel from the left edge, but cannot skip a potential candidate and then apply to a subsequent vowel. I call this 'Contiguity of Reduction', also referred to as CORE phenomenon.

The following examples in (5.24) show that all of the unstressed leftmost mid vowels may reduce to a low vowel [a] and this process affects mid vowels of both verbs and nouns.

(5.24) Reduction in stems based on polysyllabic roots:

a. Reduction in verbs:

kú-tétékééla	~ kú-tátákééla	/kú-tetekéla/	'to give up'
kú-kóngóvééla	~ kú-kángávééla	/kú-kongovéla/	'to crow'
kú-kólómóláánga	~ kú-kálámáláánga	/kú-kolomolánga/	'to cough repeat.'

b. Reduction in nouns:

shi-tongoódi	~ shi-tangoódi	/shi-tangódi/	'speech'
shi-dongodoóngo	~ shi-dangadoóngo	/shi-dongodóngo/	'Adam's apple'
li-kolomóódi	~ li-kalamoódi	/li-kolomódi/	'cough'

What we see in (5.24) is that it is possible to tell what the underlying vowels are, since reduction is optional, and due to optionality the underlying vowels can actually be pronounced as such.

The next examples in (5.25) include verbs and nouns, and these data show reduction of mid vowels following the general pattern found in the language, but certain patterns of reduction which do not observe CORE are prevented.

(5.25) CORE phenomenon:

a. kú-pélévéléléela ~ kú-pálévéléléela /kú-pevelel-Íl-a/ 'to not reach a full size for'

~ kú-pálávéléléela

~ kú-páláváléléela

~ kú-páláváláléela

\*kú-péla~~v~~alaléela

\*kú-pélév~~a~~láléela

\*kú-pélévé~~l~~áléela

b. li-kolomoódi ~ li-kalomoódi /li-kolomódi/ 'cough'

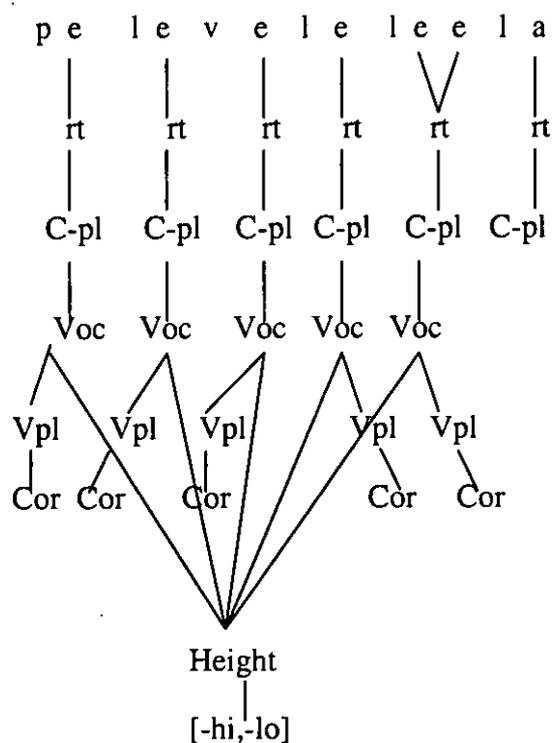
~ li-kalamoódi

\*li-kolamoódi

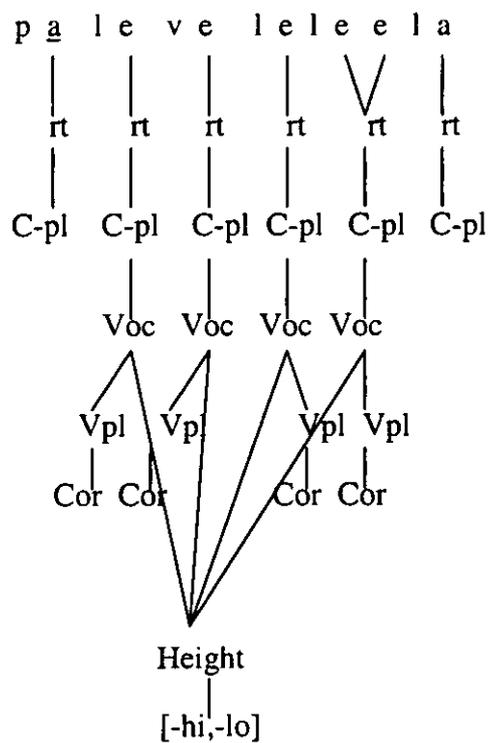
We see that reduction applies on a segment by segment basis, and the rule applies in an iterative fashion from left to right. Once the rule fails to apply to a given vowel, it cannot restart applying again after that point. Thus, we get the non-reduced surface form by not applying the rule at all, and the reduced surface forms derive from applying the rule once, twice, three times, and to all unstressed vowels.

To show the nature of the problem posed by the interaction between harmony and vowel reduction, I first provide the representation of height harmony without reduction in (5.26a), and then show vowel reduction applied to the first vowel alone in (5.26b).

(5.26) a. V-harmony

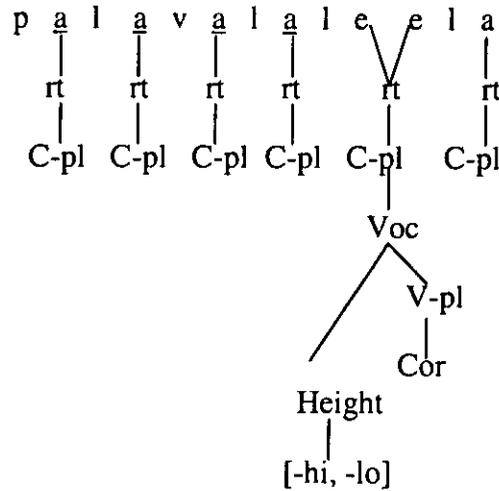


b. V-harmony plus V-reduction



The vowels in (5.26) share a single vowel height as a consequence of vowel harmony. Applying vowel reduction to just the leftmost unstressed vowel we get the representation in (5.26b) where the vocalic node of the unstressed vowel is deleted. Applying reduction to as many vowels as possible, we get the representation in (5.27).

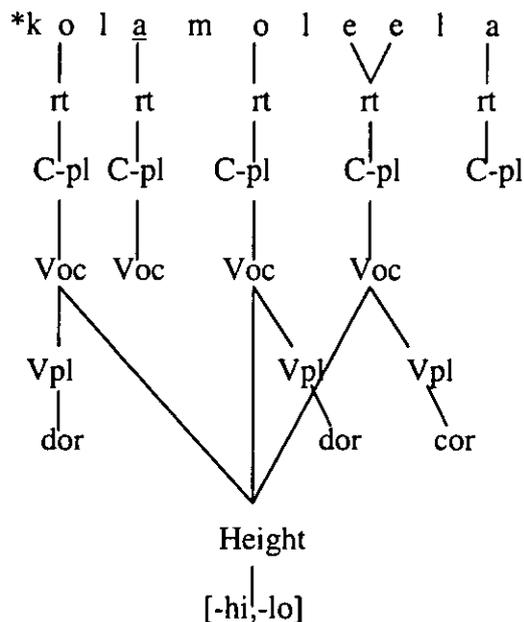
(5.27) CORE and vocalic node deletion:



The representation in (5.27) shows that by applying reduction to all unstressed vowels of the left edge of the stem, the vocalic node gets deleted, except that the penultimate stressed syllable keeps its underlying features.

In (5.28), I give the representation of one impossible outcome of reduction in Shimakonde, where reduction skips over the potentially reducible vowel at the left edge of the stem.

(5.28) Impossible pattern of reduction:



One possible explanation for the impossible pattern of reduction in (5.28) is to posit the No-Gapping constraint proposed in Archangeli and Pulleyblank (1994).

The No-Gapping constraint says that gapped configurations are universally ruled out where association of features to segments skips over an eligible feature-bearing unit (Archangeli and Pulleyblank, 1994: 38). The structure in (5.28) is thus blocked, because reduction does not apply to the root-initial syllable, but reduction applies to a vowel that follows it, but then also not to the penult. Such a pattern of reduction would force the root-initial vowel to share the height feature with vowels that follow the reduced syllable giving a gapped configuration.

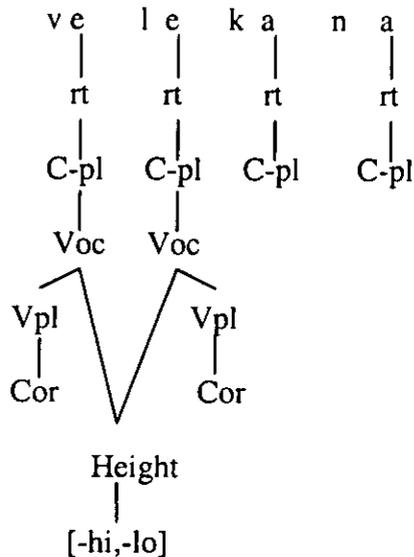
However, the No-Gapping approach does not cover all of the relevant cases of reduction patterns. No-Gapping would still allow reduction to begin at one point and applying to every vowel after it as seen in (5.29).

(5.29) No-Gapping inadequacy for CORE phenomenon:

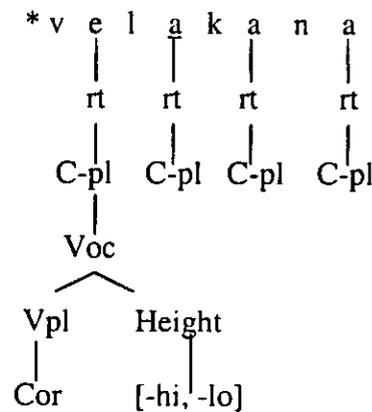
kú-vélékáána ~ kú-válékáána ~ \*kú-vélákáána 'to bring forth each other'  
 kú-tótédyaana ~ kú-tátédyaana ~ \*kú-tótádyana 'to cause each other sew'

The result of vowel harmony applied to (5.29) gives the representation in (5.30a). In (5.30b) we see that the vocalic node from the second vowel can be deleted, without giving a gapped configuration, yet (5.30b) is still ungrammatical.

(5.30) a. Harmony:



b. Impossible outcome of V-reduction:





## 5.5 Long Mid Vowel Reduction

In this section I motivated the claim that it is more abstract stress which determines whether a vowel reduces, and not surface length. In Shimakonde, there is no underlying contrast between long and short vowels. Long vowels that appear on the surface are derived from two independent phonological factors, namely stress-induced penult lengthening discussed previously, and the compensatory lengthening side-effect of repair strategies that relate to hiatus resolution discussed in chapter 4.

### 5.5.1 Correlation between Glide Formation and Vowel Reduction

We have seen that hiatus resolution word-internally derives a single surface long vowel. Crucial examples are repeated in (5.32).

(5.32) Hiatus resolution and CL:

a. kw-ééka	~ *kw- <u>á</u> áka	/kú-éka/	'to laugh'
kw-óóma	~ *kw- <u>á</u> áma	/kú-óma/	'to pierce'
kw-éékáána	~ kw- <u>á</u> ákáána	/kú-ek-ána/	'to laugh each other'
kw-óómána	~ kw- <u>á</u> ámáána	/kú-om-ána/	'to pierce each other'
kw-óóvélééla	~ kw- <u>á</u> áv <sup>á</sup> lééla	/kú-ovel-íla/	'to play with'

The data in (5.32) show that a derived long vowel does not reduce when it appears in the penult stressed syllable, since stress prevents a vowel from undergoing reduction.

However, a surface unstressed long vowel derived from glide formation is subject to vowel reduction the same way an unstressed short vowel is. One way of explaining the pattern of (5.32) is to assume that it is stress which determines whether a vowel undergoes reduction. One other possible analysis is that penultimate lengthening applies before hiatus resolution, and reduction applies after penultimate lengthening, but before hiatus resolution rules create new long vowels as shown in (5.33).

(5.33) Ordering penult length before V-fusion:

UR:	/kú-ovel-íl-a/	
Vowel Harmony:	kú-ovel-él-a	
Stress-Lengthening:	kú-ovel-éél-a	
Vowel Reduction:	kú- <u>a</u> val-éél-a	
Glide Formation:	kw- <u>á</u> va <u>l</u> -éél-a	
SF:	kw- <u>á</u> va <u>l</u> -éél-a	'to play with'

We see that the issue of stress and not length being the factor behind reduction depends on stating reduction only in terms of surface length. If reduction is stated in terms of a derivational model, which allows one to distinguish different sources of vowel length, one can state the conditions for reduction in terms of vowel length as well as stress.

## 5.5.2 Correlation between Vowel Fusion and Vowel Reduction

Similarly, vowel reduction also affects fused long vowels. However, reduction does not apply to a sequence of an initial low vowel plus high vowels as shown in (5.34).

(5.34) Reduction of fused long mid vowels:

/a+e/:	va-ndeékaána	~ va-ndaákaána	/vanda-ek-ána/	'they will laugh each other'
	va-ndeépeéla	~ va-ndaápeéla	/vanda-ep-íl-a/	'they will harvest for'
/a+o/:	va-ndoódaána	~ va-ndaádaána	/vanda-od-ána/	'they will follow each other'
	va-ndoónaána	~ va-ndaánaána	/vanda-on-ána/	'they will see each other'
/a+i/:	va-ndeémaána	~ *va-ndaámaána	/vanda-im-án-a/	'they will deny each other'
	va-ndeétiika	~ *va-ndaátiika	/vanda-itika/	'they will respond'
/a+u/:	va-ndoókaánga	~ *va-ndaákaánga	/vanda-ukánga/	'they will wash'
	va-ndoókuúla	~ *va-ndaákuúla	/vanda-ukúla/	'they will dig'

We see that long vowels derived from coalescence of an initial low vowel plus mid vowels reduce, but the fusion of an initial low plus high vowels derive a surface long vowel which does not reduce. The lack of reduction of mid vowels derived from /a+i/ and /a+u/ sequences relates to the restriction that high vowels do not reduce. Recall that the surface fused vowel has properties of both underlying vowels. Failure of vowel reduction here is not because of vowel length, but because of rule ordering, specifically reduction precedes fusion, and thus [ee] derived by fusion cannot reduce.

## 5.6 Phonetics

In this section I focus on three major issues. First, I examine duration as a correlate of stress in Shimakonde. Second, I deal with neutralizing reduction involving /e, o, a/ and finally I address the issue of duration-dependent phonetic reduction. The question to be addressed next is why vowels get reduced. I will show that in Shimakonde, vowel reduction can partially be explained following Lindblom (1990). According to Lindblom (1990) phonetic vowel reduction is governed by duration. However, it will be demonstrated that reduction of long vowels poses a problem for a duration-dependent undershoot approach, which states that the reason why unstressed vowels reduce is that there is not enough time to actually implement the full vowel gesture, Lindblom posits:

“The results of Nelson et al are compatible with the so called duration-dependent undershoot model proposed to explain vowel reduction (Lindblom, 1963): As vowel duration in a CVC syllable becomes shorter and shorter, the extent of the movement towards the vowel target is reduced: Hence both articulatory and acoustic undershoot (p. 414)”.

Lindblom's analysis presumably makes the correct prediction for phonetic reduction also found in Shimakonde involving unstressed short vowels, but not phonological reduction, since duration-dependent reduction cannot explain reduction of long vowels as we find in this language. Moreover, a duration-dependent account makes wrong predictions about the output of vowel reduction. Consider the following examples in (5.35).

(5.35)	tikaánga		'thresh repeatedly!'
	tekaánga	~ t̩kaánga	'fetch water repeatedly!'
	lipaánga		'pay repeatedly!'
	lepaánga	~ l̩paánga	'be long repeatedly!'

The duration-dependent reduction model predicts that the underlying unstressed high vowel /i/ and mid vowel /e/ in (5.35) would end up being indistinguishable, because there was not enough time to actually fully articulate the unstressed high front vowel /i/, so /e/ should become [i], not [a].

Reduction of mid vowels in Shimakonde leads to significant loss of vowel contrasts, since there is a three-way neutralization that converts underlying /a, e, o/ to become [a]. If on the other hand the vowels /i, e/ were to reduce to [i] and /u, o/ were to reduce to [u], as happens in Chamorro, there would be less neutralization. So, the duration-dependent vowel reduction model does not predict exactly whether there is lowering versus raising of the reduced vowel.

### 5.6.1 Duration as Correlate of Stress

The first question to be addressed phonetically is what is the phonetic correlate of stress in Shimakonde, and what evidence is there for postulating that the penultimate syllable gets stress in the language. There are two consequences of stress in Shimakonde. First, stressed long vowels have greater duration than unstressed long ones. Second, stress has an effect on reduction. Thus, duration and the potential for vowel reduction are the most clear phonetic correlates of stress in Shimakonde.

First, I examine the correlation between stress and vowel duration, and then discuss the correlation between stress and vowel quality. Measurements show that there is a difference in vowel duration associated with stress: stressed long vowels are longer than unstressed long ones. To test the phonetic correlate of stress, I constructed a list of words containing the long vowels [aa, ee, oo] in the penult and pre-penult positions as in CaCVVCVVCa. The corpus also included the short vowels [a, e, o] in the pre-penult position as in CaCVCVVCa. The vowels were distributed in 3 categories, namely, pre-penult long, pre-penult short and penult long, and grouped into 13 classes as seen in (5.36). There are 25 tokens for each vowel within the class, so there are 325 total tokens. Then, the duration of each vowel was determined. In addition,  $F_1$  and  $F_2$  values for all vowels were measured.

(5.36) Vowel categories:

Category	Classes
----------	---------

a. Prepenult long V:

pre-penult unstressed unreduced long [aa]:	/a+a/	→ [aa]:
pre-penult unstressed unreduced long [ee]:	/a+e/	→ [ee]:
pre-penult unstressed unreduced long [oo]:	/a+o/	→ [oo]:
pre-penult unstressed reduced long [ee]:	/a+e/	→ [ee] ~ [aa]:
pre-penult unstressed reduced long [oo]:	/a+o/	→ [oo] ~ [aa]

b. Prepenult short V:

pre-penult unstressed unreduced short [a]:	/a/	→ [a]
pre-penult unstressed unreduced short [e]:	/e/	→ [e]
pre-penult unstressed unreduced short [o]:	/o/	→ [o]
pre-penult unstressed reduced short [e]:	/e/	→ [e] ~ [a]
pre-penult unstressed reduced short [o]:	/o/	→ [o] ~ [a]

c. Penult long V:

penult stressed unreduced long [aa]:	/a/	→ [aa]
penult stressed unreduced long [ee]:	/e/	→ [ee]
penult stressed unreduced long [oo]:	/o/	→ [oo]

Comparison of duration between stressed long vowels and unstressed long vowels as in (5.37), shows that stressed long vowels are longer than unstressed long vowels.

(5.37) Stressed long vs. unstressed long vowel:

vá-ndáakaâta	'they take a bit'
va-ndaákaáta	'they will take a bit'
va-ndaálaála	'they will be beautiful'
vá-ndáamaâta	'they filter'

The table 5.1 shows the values of three categories of vowels. As seen, the penultimate stressed long vowel is longer than the pre-penult unstressed long vowel, and long vowels are much longer than short ones.

Phonetic variables:	DURATION/msc		
	[a]	[e]	[o]
[+stress; +long]	382	329	345
[- stress; +long]	303	302	306
[- stress; - long]	125	129	120

**Table 5.1:** *Influence of stress on duration for the surface [a]*

Since all stressed vowels are long and there is no short stressed vowel in the language, length and stress cannot be examined separately. The analysis of variance (ANOVA) shows that the factors that end up being significant in terms of determining duration of long vowels are stress and the surface vowel quality. The table 5.2 shows the significance of duration as a function of stress and surface vowel quality for the long vowels /a, e, o/.

Variables:	<i>P</i> -value: [F(y, y2) = F-ratio, ]
a. Stress	[F(1, 328) = 208, <i>P</i> < 0.001 ]
c. Surface vowel quality	[F(2, 328) = 29.89, <i>P</i> < 0.001 ]

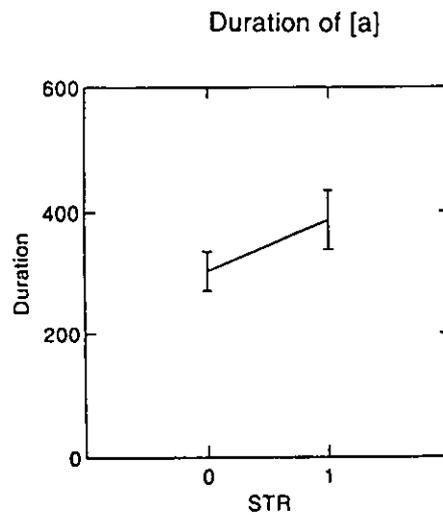
**Table 5.2:** *Factors that determine duration of long vowels /a, e, o/*

The difference in duration between stressed long vowels and unstressed long vowels has a *P*-value which is less than .01. The duration of the vowel is being strongly influenced by stress. The nature of the data does not allow one to test whether, pitch and amplitude are also phonetic correlates of stress in the language. The influence of stress on duration of the surface long vowels [e, o, a] shows that the mid vowels [e, o] exhibit less effect of stress on duration than the low vowel as seen in the table 5.3.

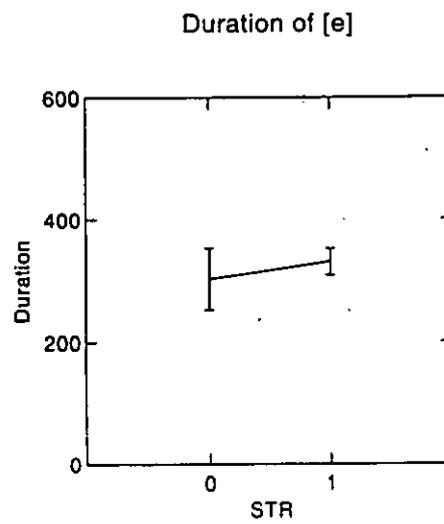
Variables	Vowel	<i>P</i> -values
Surface [ + long]	[a]	[F(1, 254) = 189, <i>P</i> < 0.001 ]
Surface [ + long]	[e]	[F(1, 35) = 3.29, <i>P</i> > 0.05 ]
Surface [ + long]	[o]	[F(1, 37) = 11.33, <i>P</i> < 0.05 ]

**Table 5.3:** *The influence of stress on duration of the surface long vowels [a, e, o]*

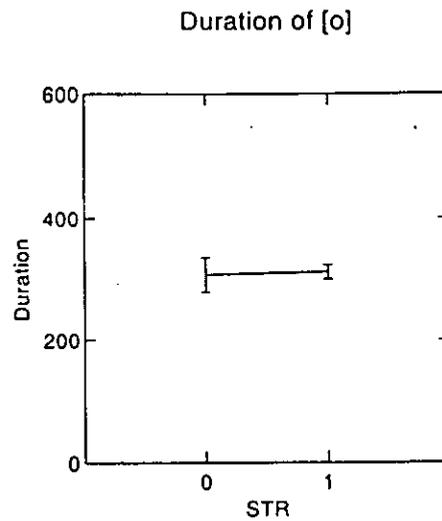
We see that the duration of the surface long vowel [a] may be strongly influenced by stress compared to the vowel [e] and [o]. The influence of duration on vowel [e] is greater than the influence of stress on duration of the surface vowel [o] which is statistically significant at a level of .05. The following graphs show that the surface long [a] has greater influence from stress on duration than surface long [e] or surface long [o].



**Figure 5.1:** *The influence of stress on duration for the surface long [a]*



**Figure 5.2:** *The influence of stress on duration for the surface long [e]*



**Figure 5.3:** *The influence of stress on duration for the surface long [o]*

The conclusion is that stressed long vowels have greater duration than unstressed long vowels.

### 5.6.2 Neutralizing Reduction

One question addressed in this section is whether vowel reduction truly neutralizes the distinction /e/, /o/ and /a/. Recall that in Shimakonde, given underlying minimal triples as in (5.38), they may optionally be pronounced in the same way as shown in the second column from left to right.

(5.38) Three-way minimal pairs:

/va-ndá-lamb-án-a/ [vandalámbaána]	'they will lick each other'
/va-ndá-lemb-án-a/ [vandalámbaána] ~ [vandalémbaána]	'they will draw each other'
/va-ndá-lomb-án-a [vandalámbaána] ~ [vandalómbaána]	'they will marry each other'
/va-ndá-pal-áng-a/ [vandapálaánga]	'they will scratch repeatedly'
/va-ndá-pél-áng-a/ [vandapálaánga] ~ [vandapélaánga]	'they will die repeatedly'
/va-nda-pol-áng-a/ [vandapálaánga] ~ [vandapólaánga]	'they will be cool repeatedly'

To test whether the surface [a] derived from reduction of mid vowels is identical to the underlying low vowel /a/, I constructed an appropriate list of words, preferably minimal pairs distributed in 3 groups. Each group contains a total of 25 words. Thus, there are 75 words for each underlying vowel /a, e, o/ giving a total of 225 tokens, distributed in three groups shown in (5.39).

(5.39) Groups of the underlying /a, e, o/:

- a. stressed long
- b. unstressed long
- c. unstressed short

In addition, the vowels /e/ and /o/ were distributed into five groups given in (5.40) and, there are 25 tokens for each vowel within the group, giving a total of 125 tokens.

(5.40) Groups for the underlying /e, o/:

- a. stressed unreduced long
- b. unstressed unreduced long
- c. unstressed reduced long
- d. unstressed unreduced short
- e. unstressed reduced short

The corpus includes CVCV as well as V-initial verb stems with all three underlying vowels /e, o, a/. Then, F1 and F2 values of all three underlying and reduced vowels were measured. In addition, the duration of each vowel was determined. In this section I shall show that reduction of mid vowels /e, o/ to [a] is a neutralizing reduction in Shimakonde, since /a, e, o/ are optionally pronounced [a].

#### **5.6.2.1 Previous Works on Vowel Reduction**

Several auditory-based phonetic studies (Port and Crawford 1989, Port and O'Dell 1985) have claimed that a phonological rule of neutralization like the German Devoicing Rule does not yield complete neutralization, since careful measurements reveal that neutralization is "incomplete". The basic idea behind the incomplete neutralization effect is stated in Port and Crawford (1989: 3):

“Evidence has been mounting that many textbook examples of phonological rules do not work as described in the linguistics literature. In many situations where auditory-based phonetics has supported a phonological rule of neutralization, careful acoustic measurements reveal that the neutralization is incomplete”.

I will not argue whether there is or is not neutralization in German. The data from Shimakonde will show that careful acoustic and perceptual measurements reveal that neutralization of both long and short vowels is complete, since both long and short mid vowels neutralize totally to [a].

#### 5.6.2.2 Acoustics

To test whether the surface low vowel derived from reduction of mid vowels is phonetically distinguishable from the underlying unreduced low vowel, I computed the mean formant values for the unstressed vowels which reduce to a low vowel, and computed the formant values of a vowel which is underlyingly low. There are 125 tokens of the underlying low vowel /a/, 125 tokens of the vowel /e/ which reduces to [a] and 115 tokens of the vowel /o/ which reduces to [a]. Three different techniques were used to determine formant values. One technique is the visual/manual, which consists in determining the midpoint of a given vowel and, also consists in visually (or manually) determining the middle of the formant. The second technique is *linear predictive coding* (LPC) analysis, which determines broad spectral peaks of a vowel. The third technique is an automated *Fast Fourier transform* (FFT) peak-reader.

At the beginning, the use of these three techniques was motivated by curiosity to see whether by using different techniques the results for formant values would still be the same. It turned out that the results for  $F_1$  and  $F_2$  depend somewhat on a specific technique, and different techniques might yield small numeric differences, and that caution should be used in accepting small numeric differences. Bearing these practical concerns in mind, I decided to use the average formant values derived from the above three techniques.

Consider the formant values for [a, e, o] as well as the average  $F_1$  and  $F_2$  in the following table, extracted from the above three techniques.

Technique	Visual	LPC	FFT	Avg $F_1$	Visual	LPC	FFT	Avg $F_2$
Vowels	$F_1$				$F_2$			
[a]	881	851	871	<b>867</b>	1590	1526	1497	<b>1538</b>
[e]	773	730	746	<b>749</b>	1764	1666	1680	<b>1703</b>
[o]	789	753	790	<b>777</b>	1424	1368	1349	<b>1380</b>

**Table 5.4:** Average formant values of the vowels [a, e, o]

The next table shows the mean formant values of the surface vowel [a] derived from unstressed underlying /a/ unstressed underlying /e/ which reduces to [a] and unstressed underlying /o/ which reduces to [a].

Source of the surface [a]			AvgF <sub>1</sub>	AvgF <sub>2</sub>
Underlying	V-Fusion	Surface		
a. /a+a/ →	[aa] →	[aa]	926	1528
b. /a+e/ →	[ee] →	[aa]	916	1538
c. /a+o/ →	[oo] →	[aa]	911	1552
-----				
d. /a/	→	[a]	741	1558
e. /e/	→	[a]	761	1542
f. /o/	→	[a]	814	1575

**Table 5.5:** Mean of the surface [a] derived from unstressed /a, e, o/

The analysis developed in this study predicts that neutralizing vowel reduction should remove the information whether the surface low vowel comes from the underlying /a/, or from /e/ or /o/.

The formant values of the surface long [aa] coming from [ee] and coming from [oo] are very close to the formant values of the unstressed long [aa]. Similarly, the formant values of the surface short low vowel derived from the underlying short vowels /e, o/ are also very close to the formant values of the underlying short low vowel /a/.

Considering the influence of underlying vowel quality in a one-factor ANOVA, the effect of the underlying vowel quality on  $F_1$  for all surface unstressed long [aa] and all surface unstressed short [a] is not even statistically significant at a level of .05 as shown in the following table 5.6.

Variables	P-values
Surface unstressed long [a]:	[F(2, 21) = 0.429 P > 0.05]
Surface unstressed short [a]:	[F(2, 45) = 0.236 P > 0.05]

**Table 5.6:** *The influence of the underlying vowel quality on AvgF<sub>1</sub> for [a]*

The influence of the underlying vowel quality on  $F_2$  for the surface low vowel is not even statistically significant at a level of .05 as shown in the table 5.7.

Variables	P-values
Surface unstressed long [a]	[F(2, 21) = 0.480 P > 0.05]
Surface unstressed short [a]	[F(2, 45) = 0.248 P > 0.05]

**Table 5.7:** *The influence of the underlying vowel quality on AvgF<sub>2</sub> for the surface [a]*

The data in the tables 5.4 – 5.7 establish that reduction of /e/ and /o/ to [a] is a neutralizing in Shimakonde, because the surface [a] derived from reduction of /e, o/ is indistinguishable from underlying unreduced low vowel.

### 5.6.2.3 Perception

To test whether native speakers can hear the difference between the surface [a] derived from the underlying vowels /e, o/, and the surface [a] from the underlying /a/, a perceptual test was conducted. I constructed a list with gloss in Portuguese containing three-way minimal pairs with the vowels /a, e, o/ such as in (5.41).

(5.41) Minimal triple pairs:

vanda-lámbaána	/vandá-lamb-án-a/	'they will lick each other'
vanda-lámbaána	/vandá-lemb-án-a/	'they will draw each other'
vanda-lámbaána	/vandá-lomb-án-a/	'they marry each other'

The corpus included 24 verb stems for each vowel and eight minimal triples. Two speakers of Shimakonde read the randomized list of 24 stems three times resulting in a total of 72 tokens. Two tokens from one speaker were not considered, which makes up a total of 142 valid tokens. The entire list of 142 tokens was recorded separately by each speaker in the laboratory of the Department of Linguistics. The entire list of 142 tokens was played back twice in random order and listened to by each speaker. Each speaker had the task of determining which of 3 meanings the word had, which correlates with underlying vowel quality. Then the answers from two speakers were computed and compared to the actual intended meaning of the words with the Portuguese gloss, which served as the guide to the speaker, and the results are given in the table 5.8.

a. Basic statistical analysis	Actual number	%
Total of responses:	568	100%
Incorrect responses:	387	68.13%
Correct responses:	181	31.86%
Expected correct answers guessing at random:		<b>33.3%</b>

b. Correlation between the underlying vowel vs. perceived vowel:

0	=	no correlation
1	=	perfect positive correlation
-1	=	perfect negative correlation
<b>Actual correlation</b>	=	<b>- 0.040942967</b>

**Table 5.8: Results of perceptual test**

As seen, native speakers cannot guess the correct underlying vowel from which the surface low vowel comes from.

Moreover, an ANOVA analysis shows no influence between who spoke the particular utterance, the listener who is guessing at the word or the underlying vowel. The effect of these variables was not significant at even the .05 level, and including the various interactions accounted for less than 2% of the data.

The conclusion is that native speakers cannot guess the underlying vowel from which the surface [a] comes from because neutralizing reduction removes the information whether the surface [a] comes from the underlying /a/ or /e/ or /o/.

### 5.6.3 Duration-dependent Phonetic Reduction

In this section I shall show that the vowel quality of short [a] is different for stressed vs. unstressed long [aa]. Thus, there is some phonetic reduction of the vowel /a/ that depends on duration. In order to test objectively whether this claim is true, an acoustic analysis was performed to verify the phonetic identity of the low vowel. Another goal for doing phonetic experimentation is determining whether there are any phonetic correlates of stress. Stress might have simply been an abstract phonological diacritic with no acoustic consequences, serving only to mark vowels as being reducible or unreducible. Acoustic measurements are thus provided here to show that apart from influencing vowel reduction, there is also a low level non-neutralizing reduction of the low vowel [a] in short syllables, which supports the prediction that duration determines the phonetic reduction of short vowels.

The next table provides the mean of the  $F_1$  value for the surface stressed and unstressed long and short [a]. What we see is that there is a difference in the value of the  $F_1$  as a function of stress, but there is little difference in the  $F_2$  value.

Vowel category	AvgF <sub>1</sub>	AvgF <sub>2</sub>
Surface long [a] [+stress]	931	1530
Surface long [a] [-stress]	904	1496
Surface short [a] [-stress]	758	1575

**Table 5.9:** Means of the surface vowel [a]

Furthermore, there is a difference in F<sub>1</sub> value between unstressed long and short [a]. A secondary question is why there is a difference in F<sub>1</sub> between long and short vowels. The analysis developed here predicts that neutralization should remove the differences of the surface low vowel regardless its underlying source. However, the surface long low vowel and the surface short low vowel do not have the same F<sub>1</sub> value. The F<sub>1</sub> mean of the surface long [a] is higher than the F<sub>1</sub> mean of the surface short [a]. An ANOVA analysis shows that the influence of stress on the F<sub>1</sub> value of the surface low vowel is statistically significant as seen in the table 5.10.

[F(1, 254) = 21.335, P < 0.001]
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**Table 5.10:** The influence of stress on the AvgF<sub>1</sub> for the surface long [a]

The question still is why the surface unstressed long low vowel differs from the surface unstressed short low vowel, provided that neutralizing reduction would give the same phonetic vowel identity.

To explain the difference in  $F_1$  between the surface unstressed long [a] and the surface unstressed short [a], I will follow the solution proposed by Nord (1986) in acoustic studies of vowel reduction in Swedish. According to Nord (1986: 34):

“Unstressed vowels coarticulate strongly with context: In non-final syllable position with surrounding phonemes and in final syllable position with a neutral position corresponding to a centralized (schwa) vowel. These tendencies were seen in varying degrees, probably depending on the relative locations of vowel targets”.

The conclusion is that in Shimakonde, apart from phonological reduction, mid vowels in unstressed positions are displaced towards a more central low position as reflected by the lower  $F_1$  value of unstressed [a]. Thus, there is a sub-phonemic neutralization affecting short vowels in unstressed syllables.

Although native speakers cannot hear the difference between the surface short low vowel and the surface long low vowel, there is a very clear phonetic reduction which lowers the  $F_1$  value. Thus, the surface short low vowel has lower  $F_1$  than the surface long low vowel, because in case the surface short low vowel, the movement towards the target vowel is reduced.

The figures 5.4 and 5.5 show that the  $F_1$  of the low vowel decreases from the syllable preceding immediately the stressed syllable. The only explanation for this is that there is a general phonetic reduction affecting a sequence of unstressed vowels.

The difference on  $F_1$  between the stressed and non-stressed vowels follows from the fact that non-stressed vowels have lower tongue position, while the stressed vowels have rising tongue position.



**Figure 5.4:** *Spectrogram for the vowel /a/ in CaCaCaCaCaaCa syllable structure*

vandaláválaáva

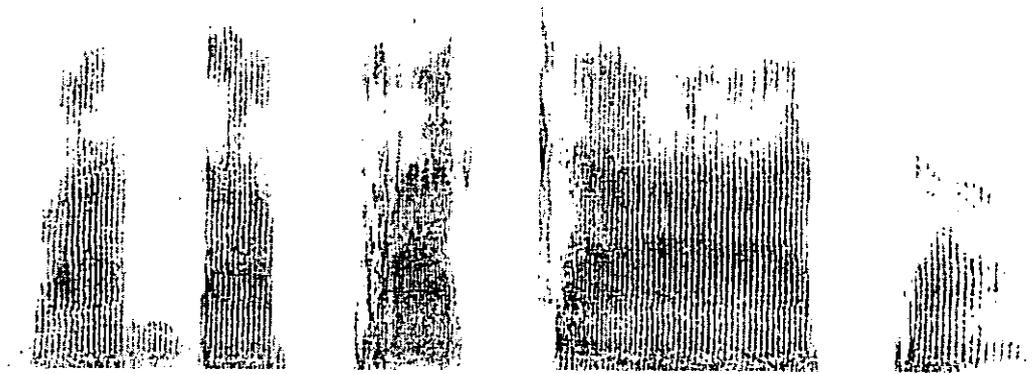


Figure 5.5: The spectrogram for the vowel /a/ in CaCaCaCaaCa syllable structure

### vandapákaáta

The data just considered argue that it is duration /length that determines phonetic reduction of the vowel. We have seen that long unstressed vowels are slightly shorter than long stressed vowels. Thus, there is a correlation between reduction and vowel length.

The conclusion is that in Shimakonde, irrespective of vowel length, mid vowels /e, o/ may optionally reduce to [a], except that there is no reduction in the penultimate stressed syllable. Duration and the potential for reduction are the clear phonetic correlates of stress in this language. There are two types of reduction: the neutralizing reduction which removes the distinction between /a, e, o/ and sub-phonemic reduction which affects the  $F_1$  value of the short vowel [a], and native speakers of Shimakonde actually do not perceive the phonetic reduction.

## CHAPTER 6

### VERBAL TONOLOGY

#### 6.0 Introduction

The interaction between the complex morphology of the verb and tonal rules, namely primary tone assignment rules and spreading processes, makes the description of the general tone properties in the verb stem be particularly difficult. The goal of this chapter is to describe the tense-determined tones in verb stems and provide an answer to three major questions that pertain to verbal tone in Shimakonde. First, there is the question of how many and which types of spreading processes apply within the verb stem. Second, are various prefixes that combine with the verb stem underlyingly H toned or L toned? Third, which tenses pattern together tonally and which ones do not? It will be shown that the tone of the subject prefixes (SP's) and object prefixes (OP's) is determined by the tense of the verb, not by the prefixes themselves. In contrast, tense prefixes (TP's) can be grouped into two classes in terms of tone pattern. There is one class of TP's with an underlying H tone and another category of TP's which have an underlying L tone.

This chapter is organized as follows. Section 6.1 examines the general tonal properties of Shimakonde, and then I turn to certain tone complications in terms of how the general tone principles apply. Section 6.2 examines the underlying tone of prefixes. Section 6.3 discusses the patterns of penult tone. Section 6.4 and 6.5 take a close look at the effects of the stem-final glides and the length of the stem on penult tone. Section 6.6 and 6.7 deal with special cases.

### **6.1 General Tone Principles**

On the surface, Shimakonde has H and L tones. Rising, falling, rise-fall and fall-rise contours occur in the language, but only on long vowels. Like in all other Bantu languages of zone P, Shimakonde lacks lexical tone contrasts in the verb stem. Instead, stem tone is determined by four major factors. First, the actual tone of a verb is the result of underlying tone of the prefixes. Second, there are tones assigned to the penult by tense-sensitive rules which may be specific to particular tenses or a variety of tenses. Third, there are rules that assign tone to prefixes as a function of tense and finally, the tone of a verb results from rules of tone spreading and shifting. Each tense has a characteristic tonal effect on the penult, giving rise LH as in *vandi-táleéka* 'they cooked', rise-fall LHL as in *vaka-taleéka* 'if they cook' and L as in *ava-taleeka* 'they will not cook'.

Furthermore, falling HL, level H and fall-rise HLH are also found in the penult, but these tones are not assigned by a specific tone rule which targets the penult. Instead, fall-rise only appears when V-V sequences with H-LH get fused and there is mora reduction as in *vandôóka* from */vandá-uúka/* 'they will go', Falling tone derives from spreading of the stem-initial H to the next mora as in *vá-láala* 'sleeping'. Finally, level H's are due to obligatory UUS discussed in section 6.1.4.

Shimakonde has certain rules which specifically affect prefixal tones: these rules are Doubling, Unconditioned Unbounded Spreading (UUS), Prefix-to-Stem H Shift and delinking rules. In almost all Bantu languages of zone P, a target vowel for primary H can be any vowel of the stem, including V1, V2, V3 and the final vowel of the stem (Odden, 1989). Unlike in other Bantu languages, the tense-determined tone contrast in Shimakonde is not in the location of the primary H tone, since generally H appears in the penult position. What makes Shimakonde be tonally different in terms of tense-determined tone is the occurrence of the contours, which allow a four-way phonological tone contrast in verbs, as a way of marking tense-aspect mostly realized on the penult syllable as seen in (6.1) except for (6.1e).

(6.1) Five-way tone contrasts:

- a. Level L:                   ava-guguvalaniila     'they will not kneel for each other.'
- b. Level H:                   vanku-guguvalaniífla 'they are kneeling for each other'
- c. Penult LH Rising:       guguvalaniífla       'kneel for each other'
- d. Penult LHL rise-fall:   vaka-guguvalaniífla 'if they kneel for each other'
- e. Initial H:                vá-gúgúválániila     'kneeling for each other'

The tone contrast in (6.1) involves three basic tones which specifically target the penult. There is a level L in (6.1a), because this tense fails totally to assign H to the stem. There is a level H in (6.1b), rising in (6.1c), and rise-fall in (6.1d). The pattern of (6.1e) involves one restricted tone which includes an initial H, which may be subject to rightward tone spreading giving a surface L tone in the penult. In Shimakonde, verb stems do not assign falling tone to the penult, but nouns do.

The following examples in (6.2) show that the contour tone which specifically targets the penult can be preceded by a stem initial H which is subject to spreading.

(6.2) Stem initial H and penult tone:

- a. vándí-gúgúválániífla   ~ vándí-guguvalaniífla     'they had kneeled for each other'
- b. vásíndá-gúgúválániífla ~ vásíndá-guguvalaniífla   'they were kneeling for each other'
- c. vanda-gúgúválániífla   ~ vanda-gúgúvalaniífla     'they will kneel for each other'
- d. ava-gúgúválánídífla    ~ ava-gúgúvalanidífla     'they did not kneel for each other'

We see that there are two options in (6.2) in terms of tone distribution. One option shows that all vowels preceding the penult tone have H and the second option shows that the vowel immediately before the penult contour tone is L toned. Later it will be shown that the surface forms in (6.2) derive from spreading H assigned to the left edge of the stem to the right. Thus, the tone of the recent past negative *ava-gúgúválánídíle* 'they did not kneel for each other' in (6.2d) derives from */ava-gúguvalanidíle/*, where the stem-initial H has undergone spreading. The underlying H assigned to the penult surfaces as rising or rising-fall due to interaction of various rules which specifically target the penult. The tone rules which target the penult and their surface effects on the segmental and prosodic levels are discussed in section 6.4.

One general process recurrent in Bantu tonology is spreading. This process says that an underlying H tone associated with a vowel will also associate with the following vowels. There are two basic patterns of tone spreading in Shimakonde, specifically Doubling and Unconditioned Unbounded Spreading (UUS). Doubling simply spreads any H from its initially associated mora to the immediately following mora giving a sequence of two H tones. Because of Doubling a singly-linked H tone is restricted to certain conditions to be discussed in the subsequent sections. There is evidence that in Shimakonde Doubling applies to the mora and not to the syllable, as we will see in section 6.1.2.

Another pattern of tone spreading is Unconditioned Unbounded Spreading which says that a H tone initially associated with a given mora undergoes rightward spreading as far as possible, but spreading does not apply to the penult and the final syllables which are excluded from any tone spreading rules.

Furthermore, Shimakonde has a rule of tone shift, which moves tone from a prefix to the vowel at the beginning of the morphological stem. There are differences in tone behavior with respect to shift. There is a general pattern of tone shift which shows that if there is H on the TP that H appears on the root-initial vowel as in *vandi-pímaána* from *vandí-pimaána* 'they measured each other'. The second pattern shows that if there is H on the TP before an OP, tone shift applies only from the TP to the OP, as in *vandi-tú-pimiíla* from *vandí-tu-pimiíla* 'they measured for us', but there is no tone shift from the OP to the verbal root. So, *\*vandi-tu-pímiíla* is not a possible outcome in the language. Finally, if there is H on the SP before an OP, that H is subject to shift from the SP to the root-initial following the general pattern as in *ava-tu-pímiíle* derived from *avá-tu-pimiíle* 'they did not measure us'. Thus, the actual outcome of tone shift is conditioned by whether the underlying H tone is located on the vowel of the SP or on the TP and whether there is an OP in the macrostem.

Although it is predictable that a verb stem will place H in the penult, it is impossible to predict whether the penult H will surface as rising, rise-fall or level H tone just appealing to phonetic criteria.

Vowels in the language have a surface tone contrast between H and L, and L tone may enter at an earlier stage of Shimakonde phonology, even if it is not underlyingly present.

### **6.1.1 Shimakonde Verbal Tonology**

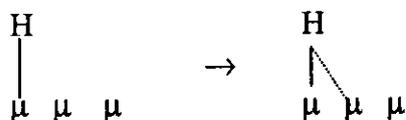
In Bantu tonology there is a general phenomenon referred to as H tone mobility. Given a H tone initially associated with a mora, that H will often be realized not just on that mora, but on one or more other moras to its right. Shimakonde has two types of spreading which apply word-internally and to the output of phrasal H insertion rules. This chapter focuses on tone spreading word-internally.

There are three major factors that affect surface tone distribution in Shimakonde verbs, namely, the length of the stem, whether the stem ends in a vowel and the location of the H at the left edge. Tone spreading is also sensitive to whether an object prefix is included within the macro-stem. The discussion of each of these factors is presented in the next sections, but I will include data of different types of stems in order to anticipate the vast majority of problems of tone complication covered in later sections of this chapter.

### 6.1.2 Tone Doubling

When there is a H tone at the beginning of the stem, that H always undergoes obligatory Doubling. Obligatory Doubling simply says that a H tone associated with a given mora will also obligatorily be associated with the immediately following vowel, giving a sequence of two surface H tones as formalized in (6.3).

(6.3) Tone Doubling:



The rule in (6.3) shows that in Shimakonde, a single H linking within the verb stem is avoided.

There are three conditioning factors which must be satisfied for Doubling to apply in the language. First, obligatory Doubling requires that there should be a H tone associated with a given vowel at the left edge of the stem. Second, Doubling does not spread H to the penult and finally, the process does not spread H from an OP.

In Shimakonde Doubling applies to the mora, not the syllable, and I will return to this issue in the next section. The following examples in (6.4) show the stem-initial H which undergoes Doubling. In Shimakonde, Doubling does not apply to the penult.

(6.4) Doubling:

**Stems without an OP**

a. Recent past positive (cf. B.1b):

vandi-gúgúvaadya 'they caused to kneel'

vandi-tálákeedya 'they caused to cook'

b. Subjunctive negative (cf. B.1dd):

avana-gúgúvaale 'let them not kneel'

avana-túmbíliike 'let them not persuade'

**Stems after an OP:**

d. Recent past positive (cf. B.1b)

vandi-tú-guguvaadya 'they caused us to kneel'

vandi-tú-talakeedya 'they caused us to cook'

e. Subjunctive negative (cf. B.1dd):

avana-tú-guguvaliile 'let them not kneel on us'

avana-tú-tumbiliike 'let them not persuade us'

The data in (6.4a) and (6.4b) have H on the stem-initial vowel and that H undergoes Doubling. The examples of (6.4c) and (6.4d) show that in case there is H on the OP, that H does not undergo Doubling from the OP to the stem vowel. Doubling is seen in the examples in (6.5), where the stem-initial H is followed by another H assigned to the penult.

(6.5) Doubling:

vandi-pímániíla	'they measured for each other'
vandi-tálákeéla	'they cooked for'
vandi-gúgúvaála	'they kneeled'
vanda-pímániíla	'they will measure for each other'
vanda-tálákeéla	'they will cook for'
vanda-gúgúvaála	'they will kneel'

We see that the stem-initial H undergoes Doubling giving two H's on the surface. In section 6.1.3 I shall show that the H which appears on the stem-initial vowel or on the OP derives from an independent rule which moves H from the preceding prefix to the next syllable.

If an OP is included within the macro-stem there is H on the OP as in *vandi-tú-guguvaliíla* derived from *va-ndí-tu-guguvalíla* 'they kneeled on us' and there is no Doubling from the OP to the stem vowel, so \**vandi-tú-gúgúvaliíla* is not a possible outcome. Blocking of Doubling from the OP to the stem vowel is seen in the following examples in (6.6).

(6.6) Blocking of Doubling by H-toned OP:

va-ndi-tú-pimiíla	'they measured for us'
vandi-tú-talakeéla	'they cooked for us'
vandi-tú-guguvalífla	'they kneeled on us'
vanda-tú-pimiíla	'they will measure for us'
vanda-tú-talakeéla	'they will cook for us'
vanda-tú-guguvalífla	'they will kneel on us'

The rule which blocks Doubling from the OP to the stem-initial vowel is given in (6.7).



The rule in (6.7) says that Doubling from the OP to the stem vowel is prohibited. We shall see that there are only two tenses in the language, namely the remote past positive (cf. 8.1d) and the participial positive (8.1aa), where Doubling seems to apply from the OP to the root-vowel.

Finally, CVCVCV stems ending in a glide show that it is a generalization that in Shimakonde Doubling does not apply to the penult as shown in (6.8), where H is lacking in the penult.

(6.8) Doubling and avoid penult condition:

vandi-pímiidya	'they caused to measure'
vandi-váleekwa	'they are born'
vandi-lí-piiya	'they hid themselves'
vanda-pímiidya	'they will cause to measure'
vanda-váleekwa	'they will be born'
vanda-lí-piiya	'they hide themselves'

The examples in (6.8) show that there is no H in the penult, and Doubling still fails to apply, because this process never spreads H to the penult. These data crucially show that the penult is the blocking property of tone Doubling in Shimakonde. Examples with a penult H like *vandi-pímiila* 'they measured for' also illustrate non-spread to the penult, but the penult H avoidance in this case can also be explained by appealing to the fact that the target syllable has a H tone. The data in (6.8) show that appeal to an existing penult H is insufficient. Compare the data in (6.8) with those in (6.9).

(6.9) Doubling and avoid penult:

vandi-gúgúvaadya	'they caused to kneel'
vandi-tálákeedya	'they caused to cook'
vanda-gúgúvaadya	'they will cause to kneel'
vanda-tálákeedya	'they will case to cook'

The examples in (6.9) show that spreading applies regularly from the stem-initial vowel to the next vowel in CVCVCVCV stems ending in a glide, since the glide does not inherently block Doubling.

Another major tone characteristic seen in (6.8) - (6.9) is that in Shimakonde the penult H systematically fails to appear in stems ending in a glide. The interaction between stem-final glides and penult tone is discussed in section 5.

The following examples in (6.10) show that Doubling does not apply to the penult even if this process spreads H from the prefix to another prefix.

(6.10) Doubling and avoid penult condition:

vánda-lya	'they eat'	cf. vánda-lyeêla	'they eat for'
vánda-pa	'they give'	cf. vánda-liíma	'they cultivate'
vándii-lya	'they had eaten'	cf. vándí-lyeêla	'they had eaten for'
vándii-ña	'they had defecated'	cf. vándí-ñeêla	'they had defecated for'

There are two conclusions that can be drawn about the data in (6.10). One is that the TP's are underlying L and they get H by Doubling as in the second column. The data in the left hand column simply show that Doubling fails to apply if the L toned prefix is in the penult. Another observation is that the TP's in (6.10) have L because the tense-sensitive rule which specifically assigns H to the penult fails to apply. The important fact for this section is that H fails to target the penult vowel even when the target is in a prefix.

In the subsequent pages I provide more data showing that Doubling applies in many tenses in the language following the same general principle. Just like in the previous examples, Doubling from the OP to the stem-initial vowel is blocked, but Doubling from stem vowel to stem vowel applies just in case the H shifts from the preceding tense-prefix to the stem vowel.

In Shimakonde, Doubling does not apply to CV and CVCV stems. In the examples that follow I will only consider longer verbs to show that Doubling applies in various other tenses in the language. I will first examine verbs without an OP and later consider cases where verbs have an OP.

Consider the following examples in (6.11).

(6.11) Doubling:

a. Recent past negative (cf. B.1c):

ava-pímídiŋle	'they did not measure for'
ava-túmblíŋke	'they did not persuade'
ava-gúgúveéle	'they did not kneel'
*ava-gúguveéle	
*ava-pímidifŋle	

b. Recent past positive (cf. B.1b):

vandi-túmbílíka	'they persuaded'
vandi-gúgúvalíla	'they kneed for'
vandi-tíndímbudyaanga	'they troubled water'
*vandi-túmbilíka	
*vandi-gúguvalíla	

We see that Doubling spreads the stem-initial H to the immediately following syllable giving a sequence of two H's. The starred examples of (6.11) show that a singly linked H is avoided, since Doubling is obligatory.

The derivations in (6.12) show Doubling from the stem-initial H.

(6.12.) Tone doubling: recent past:

	Positive form	Negative form:	
a.	$\begin{array}{c} \text{H} \\   \\ \text{va- ndi- gu } \text{gu va líf la} \end{array}$	$\begin{array}{c} \text{H} \\   \\ \text{a-va-gu } \text{gu veé le} \end{array}$	Input
b.	$\begin{array}{c} \text{H} \\ / \quad   \quad \backslash \\ \text{va-ndi- gu } \text{gu va líf la} \end{array}$	$\begin{array}{c} \text{H} \\ / \quad   \quad \backslash \\ \text{a-va-gu } \text{gu veé le} \end{array}$	Doubling

In Shimakonde, Doubling applies to a large number of tenses shown in (6.13), where any H assigned to the left edge of the verb stem gets into the root vowels by obligatory Doubling.

(6.13) Obligatory doubling:

a. Imperative negative (cf. B.1w):

avana-táleeke	'(they) do not cook'
amuna-tálákeele	'(you) do not cook for!'

b. Subjunctive negative (cf. B.1dd):

avana-púmuule	'let them not rest'
avana-púmúliile	'let them not rest for'

c. Suggestive negative (cf. B.1ff):

vákáná-piime	'they should not measure'
vákáná-gúgúvaale	'they should not kneel'

The data in (6.13) reinforce the claim that Doubling does not spread H to the penult. These examples also show that the penult blockage is independent of whether the stem ends in glide, since this set of data simply include those tenses where the penult H is lacking. Additional examples of Doubling can be seen in (6.14), where only a sequence of two H's appears on the surface.

(6.14) Additional cases of Doubling:

a. Future positive (cf. B.1s):

vanda-gúgúvaála	'they will kneel'
vanda-pímániíla	'they will measure for each other'
vanda-túmblíika	'they will persuade'

b. Present progressive positive (cf. B.1h):

vanku-gúgúvaadya	'they are causing to kneel'
vanku-títíkiidya	'they are causing to pass'
vanku-kámúliiya	'they are well holding'
vanku-kúlúmuuwa	'they are making grow'

The next data in (6.15) show another case of Doubling involving an optional tone alternation.

(6.15) Obligatory Doubling:

a. Imperfective progressive positive (cf. B.1k):

váshíndá-táleêka	~	váshíndá-taleêka	'they were cooking'
váshíndá-gúgúvaâla	~	váshíndá-guguvaâla	'they were kneeling'

b. Suggestive positive (cf. B.1ee):

vákándí-táleêka	~	vákándí-taleêka	'they should cook'
vákándí-gúgúvaâla	~	vákándí-guguvaâla	'they should kneel'

c. Present habitual positive (cf. B.1f):

vándá-táleêka ~ vándá-taleêka 'they cook'

vándá-gúgúvaâla ~ vándá-guguvaâla 'they kneel'

The examples in (6.15) show that there is an optional H on the first syllable, and when the option of actually having the stem-initial H is selected, that H must double if possible, since Doubling is subject to the avoid penult condition.

The following examples in (6.16) include CVCVCV stems which are analogous to the previous data in (6.15). These examples show that the pattern of spreading in (6.15) derives from Doubling just like the data in (6.16), but this process is subject to the avoid penult condition.

(6.16) Doubling and avoid penult condition:

váshíndá-páleeya ~ váshíndá-paleeya 'they were causing to pass through'

cf. váshíndá-páléyaanga ~ váshíndá-paleyaanga 'they were causing to pass through'

váshíndá-túmiidya ~ váshíndá-tumiidya 'they were causing to send'

cf. váshíndá-túmídyana ~ váshíndá-tumidyaana 'they were causing to send each other'

vandi-shúluusha 'they sold'

cf. vandi-shúlúshaana 'they sold each other'

What we see is that in CVCVCV stems, when the option of having the initial H is selected, it remains in the first vowel, because H avoidance in the penult prevents H from spreading to the next vowel.

I now turn to the verbs which have an OP and show that OP's have an effect on tone Doubling. We have seen in (6.4) that Doubling does not apply from the OP to the root-initial vowel. There are three major tonal consequences that relate to OP's. First, macro-stems with OP's differ tonally from stems without OP's. If there is H overtly expressed on the OP, Doubling does not apply from the OP to the root-initial vowel as seen in the following examples in (6.17).

(6.17) Blocking of Doubling in stems with H toned OP:

a. Present habitual (cf. B.1f):

vándá-tú-guguvaliîla 'they kneel on us'

vándá-tú-tindimbudyaanga 'they trouble us'

b. Present progressive (cf. B.1h):

vanku-tú-guguvadyaanga 'they're causing us to kneel'

vanku-tú-tindimbudyaanga 'they're troubling us'

c. Imperfective progressive positive (cf. B.1k):

váshíndá-tú-guguvaliîla 'they were kneeling on us'

váshíndá-tú-tumbilikiîla 'they were persuading for us'

d. Future positive (cf. B.1s):

vanda-tú-guguvaliíla 'they will kneel on us'

vanda-tú-tumbilikiíla 'they will persuade for us'

e. Imperative negative (cf. B.1w):

avana-tú-guguvaliile '(they) do not kneel on us!'

amuna-tú-tindimbudyaange '(you) do not trouble us'

f. Subjunctive negative (cf. B.1dd):

avana-tú-guguvaliile 'let them not kneel on us'

avana-tú-tumbilikiile 'let them not persuade for us'

g. Suggestive positive (cf. B.1ee):

vákándí-tú-guguvaliíla 'they should kneel on us'

vákándí-tú-tumbilikiíla 'they should persuade for us'

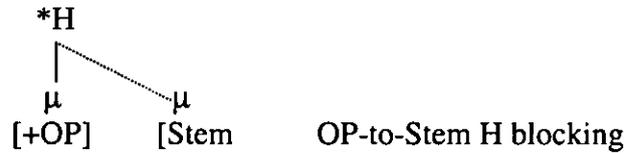
h. Suggestive negative (cf. B.1ff):

vákáná-tú-guguvaliile 'they should not kneel on us'

vákáná-tú-tumbilikiile 'they should not persuade for us'

The examples of (6.17) reflect the application of the rule given in (6.7) repeated in (6.18) below. This rule says that Doubling from the OP to the stem vowel is prohibited in Shimakonde.

(6.18) OP-to-Stem blocking of Doubling:



If the OP is L toned, because the initial H is at the beginning of the stem, Doubling applies following the same general pattern as shown in the following examples in (6.19).

(6.19) Doubling in stems with L toned OP:

a. Recent past negative (cf. B.1c):

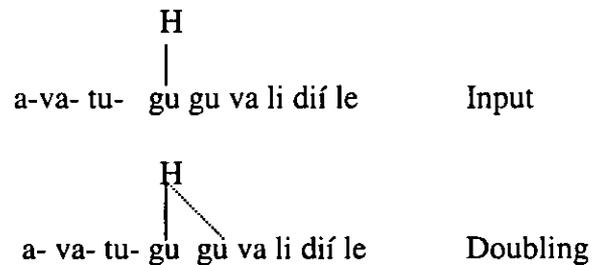
- |                       |  |
|-----------------------|--|
| ava-tu-gúgúvalidifile | 'they did not kneel on us'               |
| ava-tu-túmbfikidifile | 'they did not persuade for us'           |
| ava-tu-pímángidifile  | 'they did not measure for us repeatedly' |

b. Future negative (cf. B.1t):

- |                     |                              |
|---------------------|------------------------------|
| a-va-tu-gúgúvaliila | 'they will not kneel on us'  |
| a-va-tu-kólómoleela | 'they will not cough for us' |

What we see is that Doubling applies in (6.19) even if the OP is present, because the H is not on the OP syllable. These data show that the H spreads from the root-initial vowel to the next vowel by Doubling as shown in the derivations in (6.20).

(6.20) Doubling in stems with L toned OP:



We see that the tone pattern of the negative form like *a-va-gúgúvalidiíle* in (6.11) is analogous to the tone of *a-va-tu-gúgúvalidiíle* in (6.20), where H gets into the verbal root by Doubling. So these forms are underlyingly related in terms of having an underlying H on the SP *va-*. In section 6.1.3 I provide an explanation for why the underlying H of the SP does not show up on the vowel of the OP.

I conclude that Doubling actually applies to the verb stem, even if there is an object prefix, provided that the OP is L toned. So, it not the presence of the OP that blocks Doubling, but rather the fact that the H is located on the OP vowel. Any stem-initial H undergoes Doubling, but H does not spread to the penult due to avoid penult condition.

### 6.1.2.1 Interaction between Doubling and Vowel Fusion

This section deals with the interaction between Doubling and vowel fusion. The goal of this section is to show that in Shimakonde, Doubling targets the mora, not the syllable. Furthermore, we shall see that Doubling should apply after fusion.

Finally, it will be shown that Doubling is blocked just in case there is fusion with VCV stems. Consider the following examples in (6.21), where Doubling interacts with vowel fusion.

(6.21) Doubling vs. vowel fusion:

vá-ká-eenga	~ vá-keenga	'that they are not cutting up'
vá-ká-ekaana	~ vá-kéekaana	'that they are not laughing each other'
vá-ká-ekaniila	~ vá-kéekaniila	'that they are not laughing for each other'
vá-ndá-ekaâna	~ vá-ndéekaâna	'they laugh each other'
vá-ká-iida	~ vá-keeda	'that they are not coming'
vá-ká-itiika	~ vá-kéetiika	'that they are not responding'
vá-ndá-itiîka	~ vá-ndéetiîka	'they respond'
vá-ká-oona	~ vá-kooona	'that they are not seeing'
vá-ká-omaana	~ vá-kóomaana	'that they are not piercing each other'
vá-ndá-omaâna	~ vá-ndóomaâna	'they pierce each other'
vá-ká-uuka	~ vá-kooka	'that they are not going'
vá-ká-uluuka	~ vá-kóoluuka	'that they are not flying'
vá-ndá-ulukaniîla	~ vá-ndóolukaniîla	'they fly for each other'

The data in (6.21) reflect the interaction of tone and vocalic phonology. First, there is H assigned to the SP *va-*. The prefixal H spreads by Doubling to the TP when there is no fusion as seen in the left-hand column.

The data in the second column of (6.21) show that when the H toned vowel of the TP *-ka-* or *-nda-* fuses with the root-initial vowel, there are two possible outcomes in terms of surface tone distribution.

One option is seen in VCV stems where there is a single H on the SP *va-* and there is no Doubling. Doubling is blocked because fusion puts the target syllable in the penult. Thus, */vá-ka-oonal/* becomes *vá-koona* 'that they are not seeing' as a result of vowel fusion. Furthermore, VCVCV stems also have H on the SP *va-* and another H on the first mora of the prepenult long vowel when fusion applies. Because the target syllable is not the penult, Doubling applies. These data can be explained by assuming that fusion applies before Doubling. The surface form like *vá-kooka* from */vá-ka-uuka/* 'that they are not going' results from not applying Doubling from the SP to the penult, after fusion. The surface form like *vá-ndóolukaniïla* from */vá-nda-ulukaniïla/* 'they fly for each other' shows that Doubling applies only to the first mora of the root-initial vowel after fusion creates a single long vowel.

The interaction between Doubling and fusion can be seen in the derivations in (6.22).

(6.22) Interaction between Doubling and fusion:

H   v a - n d a - u l u û k a	Input
H   v a - n d o o l u û k a	V-Fusion

H  
 |     \  
 v a -nd o o l u û k a

Doubling

The representations in (6.22) show that in Shimakonde Doubling applies to the mora, and not the syllable. If Doubling targeted the syllable, we would expect to have \**vándóóluûka* instead of *vándóoluûka* from */vándá-uluûka/* ‘they fly’, and that is not a possible outcome in the language.

### 6.1.3 Prefixal H Shift

In this section I motivate the process referred to as Prefixal H Shift focusing on the tone of the TP and SP, though the process also applies to other prefixes. Prefixal H shift says that an underlying pre-stem H of the TP shifts from the prefix to the morphological stem-initial vowel if the preceding prefix is L. Shimakonde has two specific rules of prefixal H shift which have different tone consequences. One rule says that if there is an underlying H tone on the SP the H shifts from the SP to whatever follows as in *ava-tu-pímidíile* derived from *avá-tu-pimidiíle* ‘they did not measure for us’. The second rule says that an underlying H shifts from a prefix to the following syllable.

These two rules are basically the same rule, except that the first rule applies only to the subject prefix. Thus, the surface form like *ava-tu-pímidíile* derives from *avá-tu-pimidiíle* with H on the SP. That H shifts to the OP by the SP shift rule giving *ava-tú-pimidiílee*, and then applying the general rule we get *ava-tu-pímidíile*. Doubling explains the surface form *ava-tu-pímidíile* ‘they did not measure for us’.

The surface forms like *vandi-tú-pimiíla* ‘they are measured for us’ are found in the language where there is no Doubling or tone shift. I explain this pattern by assuming that there is H on the TP as in underlying *vandí-tu-pimiíla*, and the reason why there is no Doubling is because only one general rule applies which moves H from the TP to the following syllable, the OP.

There are three conditions that distinguish prefix H shift from Doubling. First, shift can put H onto the penult, while Doubling cannot. Second, prefix H shift requires a L toned prefix before the prefix which loses its tone, and the process does not apply if the preceding prefix of the target H also has a H tone. Third, the rule itself shift, not just spreads the H. I will first deal with general pattern of H shift and later turn to the specific SP H shift rule.

### 6.1.3.1 General Pattern of Prefix-to-Stem H Shift

The following examples in (6.23) show that the TP of the recent past (cf. B.1b) has an underlying H on the prefix *-ndi-* and that H appears on the prefix before CVCV stems, but the H of the prefix *-ndi-* shows up on the stem-initial vowel in CVCVCV stems.

(6.23) Prefix-to-stem H shift:

	<i>va-ndi-pátaána</i>	/va-ndí-patána/	‘they got each other’
cf.	<i>va-ndí-paáta</i>	/va-ndí-páta/	‘they got’
	<i>va-ndi-lékaána</i>	/va-ndí-lekána/	‘they left each other’

- |     |                 |                  |                                  |
|-----|-----------------|------------------|----------------------------------|
| cf. | va-ndí-leéka    | /va-ndí-léka/    | 'they left'                      |
|     | va-ndi-pímaána  | /va-ndí-pimána/  | 'they measured each other'       |
| cf. | va-ndí-pííma    | /va-ndí-píma/    | 'they measured'                  |
|     | va-ndi-júgwaána | /va-ndí-jugwána/ | 'they requested from each other' |
| cf. | va-ndí-juúgwa   | /va-ndí-júgwa/   | 'they requested'                 |

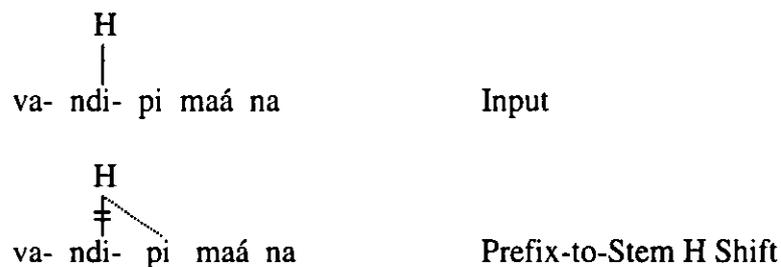
The data in (6.23) show that both CVCV and CVCVCV stems have H on the penult vowel, and that H follows another H assigned to the left edge of the stem as in *va-ndí-paáta* 'they got', where the TP *-ndi-* appears with a H tone. We can see that the H of the TP appears on the prefix before CVCV stems. However, the TP appears with a L tone before CVCVCV stems and there is a H tone realized on the stem-initial syllable. The H tone that appears on the stem-initial syllable in CVCVCV stems is due to a general rule of prefix H shift. The prefix H shift rule is formalized in (6.24).

(6.24) Prefix H shift:



The representation in (6.25) shows the correct output derived from prefix H shift, which moves an underlying H from the TP *-ndi-* to the root-initial vowel, which causes the prefix to appear with a L tone.

(6.25) Prefix shift:



Prefixal H shift never targets a vowel which already has H. The CVCV stems in (6.23) have H assigned to the penult by tense-sensitive rules, and tone shift generally does not target syllables which have H. Furthermore, prefix H shift is blocked from targeting the final vowel. Thus, the surface form *vandiĩ-lya* derived from */vandi-lyal/* 'they ate' has H on the TP and that H appears on the prefix realized as rise-fall. The surface form like *\*vandi-lyá* is ungrammatical, since shift cannot target the final vowel. The restriction of H shift to the final vowel follows a general principle which prevents any tone spreading or shifting from targeting the final syllable.

The next examples in (6.26) show that the presence of a L toned prefix before the trigger underlying H syllable is crucial for prefixal shift to apply. It is the lack of toneless prefix which is relevant to decide whether prefix-to-stem H shift applies.

(6.26) Blocking of shift by preceding H tone:

- |    |                  |   |                                   |                                    |
|----|------------------|---|-----------------------------------|------------------------------------|
| a. | vá-pímaana       |   | 'while measuring each other'      |                                    |
|    | vá-túkuuta       |   | 'while running'                   |                                    |
| b. | vá-ká-pimiila    |   | 'that they are not measuring for' |                                    |
|    | vá-ká-guguvaala  |   | 'that they are not kneeling'      |                                    |
|    | vá-ndí-pimaniíla | ~ | vá-ndí-pímániíla                  | 'they had measured for each other' |
|    | vá-ndí-guguvaála | ~ | vá-ndí-gúgúvaála                  | 'they had kneeled'                 |

The data in (6.26) show that the H of the prefix does not shift, because that H is not preceded by a L prefix. The examples in (6.26b) show that it is necessary that the target tone be preceded by a L toned prefix for H shift to apply. We see that the TP's *-ndi-* and *-ka-* show up with H because the preceding prefix is H.

If there is a SP before a toneless prefix and a toneless TP, then there is shift to the OP in case the stem is CVCV as seen in (6.27a). If stem is longer than CVCV, the H appears on the stem-initial vowel but not on the OP vowel as shown in (6.27b).

(6.27) H shift from the SP to stem:

- |    |                 |                    |                              |
|----|-----------------|--------------------|------------------------------|
| a. | avaká-gweéne    | /avá-ka-gweéne/    | 'while they did not see'     |
|    | avaka-tú-gweéne | /avá-ka-tu-gweéne/ | 'while they did not see us'  |
|    | avaka-tú-peéle  | /aváka-tu-peéle/   | 'while they did not give us' |

- b. avaká-líflé /avá-ka-líflé/ 'while they did not eat'  
 avaka-tu-pímiíflé /aváka-tu-pimiíflé/ 'while they did not measure us'  
 avaka-tu-límídiíflé /aváka-tu-limidiíflé/ 'while they did not cultivate for us'

The data in (6.27) show various steps of H shift. One step involves H shift from the SP *va-* to the TP *-ka-*. The second step includes H shift from the TP *-ka-* to the OP *-tu-*. Finally, there is H shift from the OP to the stem-initial vowel.

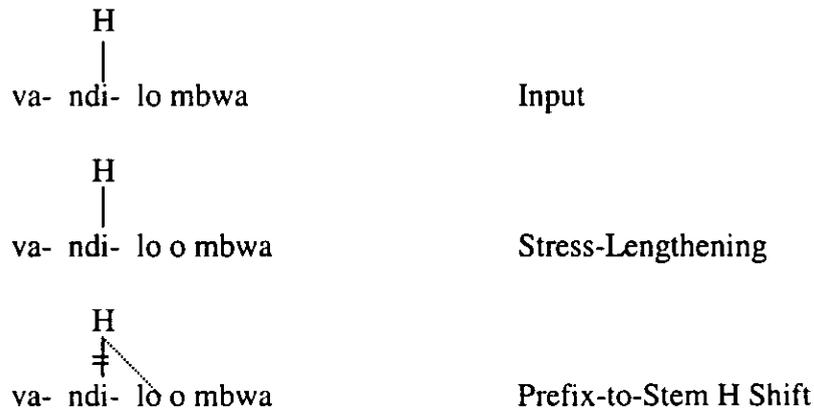
The next examples in (6.28) show that the H on the target syllable blocks shift, not the penult position. These examples also reinforce the claim that it is the H, not the position in the word, which is relevant to decide whether H shift applies. If the penult H is missing, H shift does move H from the TP to the stem-initial vowel of CVCV stems.

(6.28) Shift to a L-toned penult syllable:

va-ndi-lóombwa	/va-ndí-lombwa/	'they got married'
va-ndi-píishya	/va-ndí-pishya/	'they caused to pass'
va-ndi-púuwa	/va-ndí-puwa/	'they have been happy'
va-ndi-léegwa	/va-ndí-legwa/	'they are drunk'
va-ndi-túudya	/va-ndí-tudya/	'they have given a gift'
vandi-léeya	/va-ndí-leeya/	'they prohibited'

The data in (6.28) have an underlying H on the TP vowel *-ndi-* which shifts to the first mora of the stem-initial vowel, which happens to be the penult. These CVCV stems have no H assigned to the penult by the tense-sensitive rules, because that H is lacking in glide-final stems. Prefix H shift in (6.28) is illustrated in the derivations in (6.29).

(6.29) Prefix H shift:



We see that if the penult H is lacking, there is a regular application of H shift, making the H-toned TP become L. The derivations in (6.29) are analogous to the representations in (6.25) in terms of having an underlying H on the TP *-ndi-*, and that H is subject to tone shift.

The following examples in (6.30) include all tenses which have an underlying H on the TP, and that H undergoes prefixal H shift. These data include one example of a CVCV stem where shift is blocked, and another example with a CVCVCV stem, where H shifts.

(6.30) Prefix H shift:

a. Recent past positive (cf. B.1b):

vandí-paáta	'they got'
vandi-pímiífla	'they measured for'
vandi-pímániífla	'they measured for each other'
vandí-loómba	'they married'
vandi-lóombwa	'they got married'
vandi-lómbaána	'they married each other'
vandi-lómbániífla	'they married for each other'

b. Future positive (cf. B.1s):

vandá-pííma	'they will measure'
vanda-píímaána	'they will measure each other'
vanda-pímániífla	'they will measure for each other'
vandá-loómba	'they will marry'
vanda-lóombwa	'they will get married'
vanda-lómbaána	'they marry each other'
vanda-lómbániífla	'they will marry for each other'

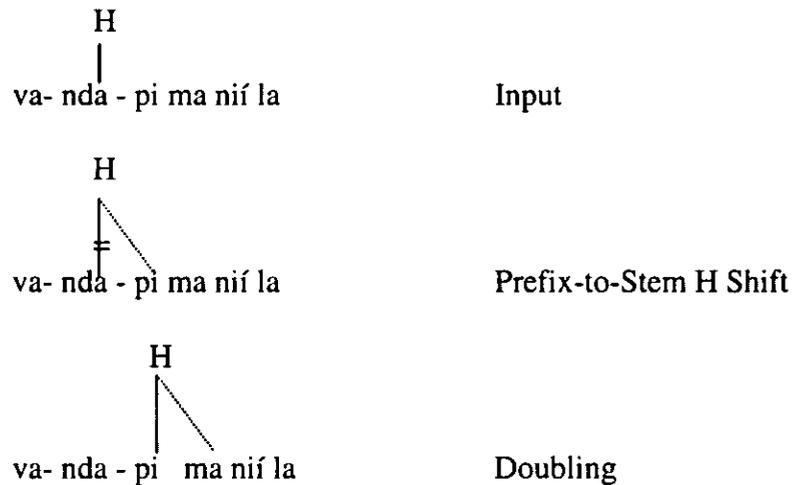
c. Recent past negative (cf. B.1c):

avá-liífla	'they did not eat'
ava-pííífla	'they did not pass'
ava-pímííífla	'they did not measure for'

We see that the prefix of the recent past *-ndi-* in (6.308a) is tonally similar to the prefix of the future tense *-nda-* in (6.30b) in term of having an underlying H tone and that H is subject to tone shift.

Longer stems of (6.30a) – (6.30c) show that the H tone gets to the stem-initial vowel by shift, and later that H is subject to Doubling as motivated previously. The interaction between prefixal H shift and Doubling is shown in the derivations in (6.31).

(6.31) Interaction between prefixal shift vs. Doubling:

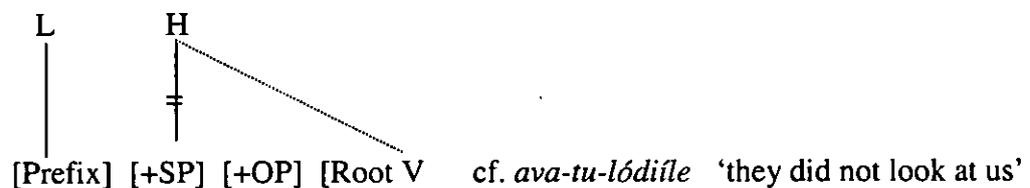


### 6.1.3.2 Subject Prefix H Shift

One other context where prefixal tone shifts involves specifically H's assigned to the SP. In Shimakonde, prefixal H shift also moves an underlying H tone from the SP to whatever follows as in *a-va-tú-peéle* derived from *la-vá-tu-pélele* 'they did not give us', where the H which appears on the OP has been moved from the 3 plural SP *-va-*. The H of the SP *va-* actually shows up on the prefix vowel when the OP is lacking as in *a-vá-liíle* 'they did not eat', where tone shift is blocked, because the target syllable has a H tone.

There are two generalizations about SP H shift. First, if there is a H tone on the TP before an OP, the H shifts only from the TP to the OP as in *vandi-tú-guguvaliíla* derived from *lvandí-tu-guguvaliílal* 'they kneeled on us'. Second, if there is H on the SP before an OP, H shifts from the SP past the OP, to the root as in *ava-tu-pímiíle* which comes from *lavá-tu-pimiílele* 'they did not measure us'. The rule which specifically shifts H from the SP moves H from the SP to the root-initial vowel skipping the prefixes that precede the root. If the root-initial vowel is H toned, shift puts the H tone on the syllable before the root-initial vowel. The SP H shift rule is formalized in (6.32).

(6.32) SP H shift:



I continue describing the pattern of H shift from the SP. The assumption is that if there is H on the SP, there is shift from the SP to the next syllable whatever it is. Later, H shift applies from the prefix to the stem. The following examples in (6.33) show H shift from the TP to the OP by the TP-to-OP shift rule. These data are similar to those of (6.17) where H never doubles from an OP.

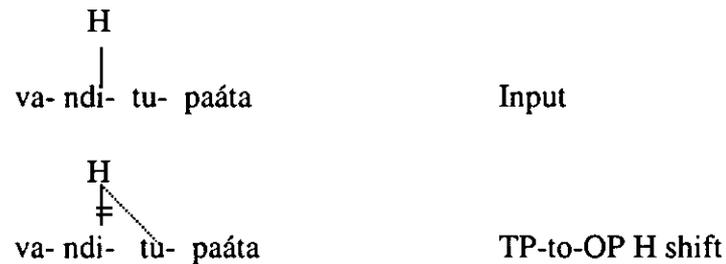
(6.33) TP-to-OP H shift:

	va-ndi-tú-paáta	'they got us'
cf.	va-ndí-paáta	'they got'
	va-ndi-tú-leéka	'they left us'
cf.	va-ndí-leéka	'they left'
	va-ndi-tú-piíma	'they measured us'
cf.	va-ndí-piíma	'they measured'
	vandi-tú-loómba	'they married us'
	vandí-loómba	'they married'

We see that shift is blocked in CVCV stems where the OP is lacking, and the actual H of the TP surfaces as such. In case there is an OP, the H of the TP appears on the OP due to prefixal shift.

Prefix-to-prefix H shift is shown in the derivations in (6.34), where the underlying H of the TP *-ndi-* appears on the OP *-tu-* 'us', casing the TP to surface with a L tone.

(6.34) TP-to-OP H shift:



The next examples in (6.35) show that prefixal H shift also applies from the 3 plural SP *va-* to the following OP prefix syllable, but tone shift does not target the syllable which has H tone.

(6.35) Recent past negative (cf. B.1c):

a-va-tú-lífle	'they did not eat us'
cf. a-vá-lífle	'they did not eat'
a-va-tú-ñífle	'they did not defecate us'
cf. a-vá-ñífle	'they did not defecate'
a-va-tú-tweéte	'they did not take us'
cf. a-vá-tweéte	'they did not take'

The next data in (6.36) include longer stems where there is H shift to the OP, but there is no spreading by Doubling from the OP to the root-initial vowel, because Doubling does not apply from the OP to the root-initial vowel.

(6.36) TP-to-OP H shift and blocking of Doubling:

va-nda-tú-pimiífla	*va-nda-tu-pímiífla	'they will measure for us'
va-nda-tú-guguvaliífla	*va-nda-tu-gúgúvaliífla	'they will kneel on us'
va-nda-tú-tumbilikiífla	*va-nda-tu-túmbilikiífla	'they will persuade for us'

The examples in (6.36) have an underlying H on TP's *-nda-* and that H appears on the prefix *-tu-* due to prefixal shift. The point that needs to be emphasized is that the H of (6.36) does not shift to the root-vowel. Furthermore, these examples show that the H tone associated with the OP does not undergo Doubling, because Doubling does not apply from the OP to the stem vowel. The relevance of the data in (6.36) is that this pattern of prefix-to-prefix shift differs from another pattern of tone shift about to be discussed. Contrast the examples in (6.36) with those in (6.37) below.

(6.37) SP-to-OP H shift vs. Doubling:

a.	a-vá-liíle	/a-vá-líle/	'they did not eat'
	a-va-tú-liíle	/a-vá-tu-líle/	'they did not eat us'
	a-vá-leéle	/a-vá-léle/	'they did not sleep'
	a-va-tú-peéle	/a-vá-tu-péle/	'they did not give us'
b.	a-va-tu-ládiídye	/a-vá-tu-ladídye/	'they did not cause us to sleep'
	a-va-tu-pímiíle	/a-vá-tu-pimíle/	'they did not measure us'
	a-va-tu-lékiíle	/a-vá-tu-lekíle/	'they did not leave us'
	a-va-tu-pímángidiíle	/a-vá-tu-pimangidíle/	'they did not measure for us repeatedly'
	a-va-tu-gúgúvalidiíle	/a-vá-tu-guguvalidíle/	'they did not kneel on us'

The SP *va-* has an underlying H and that H appears on the prefix in (6.37a) if an OP is lacking. If there is an OP, the H of the SP appears on the OP due to prefixal shift. The data in (6.37b) show that all of the prefixes have L and there is a H tone on the stem-initial vowel which undergoes Doubling seen in the last two examples of (6.37b). So the question is why there is no tone shift from the OP to the stem-initial vowel in *vanda-tú-pimiíla* 'they will measure for us' in (6.36b), but there is prefixal shift in *ava-tu-pímiíle* 'they did not measure us' in (6.37b).

I explain this tone difference by assuming that there is a major tonal difference between (6.36) and (6.37b) in terms of the actual location of the underlying H. Specifically, the surface H which appears on the OP *-tu-* like *vanda-tú-pimiila* in (6.36) is underlyingly associated with the TP *-nda-*. In (6.37b) the surface H which appears on the stem-initial vowel in *ava-tu-pímiile* comes from the SP *va-*, and that H shifts past the OP to the stem vowel.

The tone difference between (6.36) and (6.37b) can be seen in the derivations in (6.38a) and (6.38b), respectively.

(6.38) TP-to-OP shift and SP-to-stem H shift:

a. as (6.36):

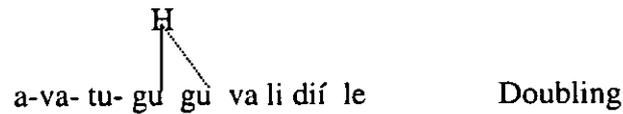
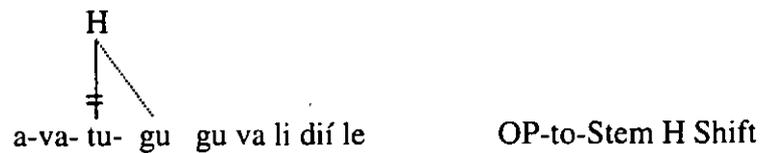
H  
|  
va-nda- tu- gu gu va líf la      Input

H  
| \  
va-nda- tu- gu gu va líf la      TP-to-OP H Shift

b. as (6.37b):

H  
|  
a- va- tu- gu gu va li díf le      Input

H  
| \  
a- va- tu- gu gu va li díf le      SP-to-OP-H shift



It is a factual observation that prefixal H shift has different tone consequences depending on the location of the actual H. In some tenses like the recent past (cf. 142b) and the future positive (cf. 142s), the H shifts only to the OP. In some tenses like the recent past negative (cf. 142c) H shifts from the SP, past the OP, to the stem-initial vowel. The relevant examples from (6.30) are repeated in (6.39).

(6.39) Prefix H shift:

a. TP-to-OP H shift:

	va-ndi-tú-pííma	‘they measured us
cf.	va-ndí-pííma	‘they measured’
	vandi-tú-loómba	‘they married us’
cf.	va-ndí-loómba	‘they married’
	vanda-tú-patííla	‘they will get for us’
cf.	va-ndá-paáta	‘they will get’

b. SP-to-stem H shift:

	ava-tú-peéle	'they did not give us'
cf.	avá-leéle	'they did not sleep'
	ava-tu-pímiíle	'they did not measure us'
cf.	avá-lifíle	'they did not eat'
cf.	ava-tu-gúgúvalidifíle	'they did not kneel on us'

Prefixal shift is complicated by a number of interacting factors such as the length of the stem and the primary tone assignment rules. For example, H shift does not apply to CV and CVC roots if the target syllable has H as seen previously. Consider the following examples in (6.40).

(6.40) Present habitual positive (cf. 8.10):

va-ndí-paáta	*va-ndi-pááta	'they got'
va-ndá-paáta	*va-nda-pááta	'they will get'
va-ndá-muúta	*va-nda-múúta	'they will push him'

The examples in (6.40) show that all prefixes have H before CVCV stems, and one cannot tell whether that H derives from SP to TP shift, just based on the actual surface H.

These data also show that tone shift is blocked from targeting a H toned penult syllable. Furthermore, the data in (6.40) also show that the H associated with the TP's *-ndi-*, *-nda-* cannot be deleted. Contrast the data in (6.40) with those in (6.41).

(6.41) Shift only if possible:

a.	vandiî-pa	*vandii-pá	'they gave'
	vandiî-ña	*vandii-ñá	'they defecated'
	vandiî-lya	*vandiilyá	'they ate'
	vandiî-twa	*vandii-twá	'they pounded'
b.	vandi-káasha		'they sliced'
	vandi-léeya		'they prohibited'
	vandi-lóombwa		'they got married'
	vandi-kóondya		'they found'

The examples in (6.41a) have an underlying H on the TP and that H appears on the prefix as rise-fall. The examples in (6.41b) have L on the prefix and the underlying H of the prefix appears on the next vowel due to tone shift.

There is a positional restriction on shift against moving H to the final syllable, and an unrelated restriction pertaining to not shift to a syllable that already has a H tone. Thus, unlike Doubling, shift can target the penult if there is no underlying H in the penult. The discussion of positional tone avoidance in Shimakonde is presented in section 6.1.2.

The second reason tone shift is restricted in CV and CVCV stems is because of the location of H: shift is blocked if the target syllable has H. Finally, delinking rules and tone mapping rules may derive surface forms which lack the actual H. For example, some tenses like the participial tense (cf. B.1bb) have two options and in one of the options all of the pre-stem prefixes have L and a single H appears in the penult as in (6.42).

(6.42) Participial negative (cf. B.1bb):

vakana-pimífla	~ vakana-pímífla	'not measuring for'
vakana-pimanífla	~ vakana-pímánífla	'not measuring for each other'
vakana-tu-pimífla	~ vakana-tu-pímífla	'not measuring for us'
vakana-tu-pimangífla	~ vakana-tu-pímangífla	'not measuring for us repeatedly'

The examples in (6.42) do not involve tone shift, but they are tone complications involving delinking rules to be discussed in section 6.4. At the moment, I should mention that the pattern in (6.42) can be interpreted in two ways. One way is to say that the pattern with a single penult H derives from delinking surface multiple H's after spreading. Another way is to assume that the option with a single penult H is due to a failure of application of an independent rule which assigns H to the stem-initial syllable, and because the stem-initial H is missing, there is no spreading.

### 6.1.3.3 Interaction between Tone Shift and Vowel Fusion

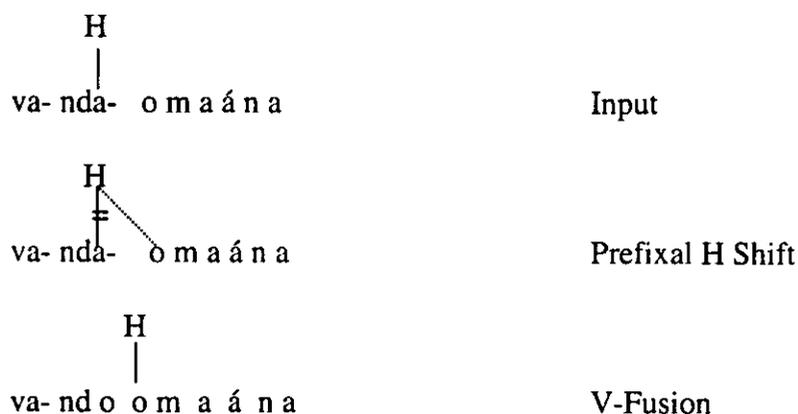
This section shows that in Shimakonde, the correct output can be derived by crucially applying shift before fusion. Unlike Doubling shift does not care about the penult position in the word. Recall that Doubling applies after fusion creates a single long vowel. In this respect prefixal shift differs from Doubling Consider the following examples in (6.43).

(6.43) Tone shift vs. V-fusion:

va-ndyoómaána	~ va-ndi-ómaána	'they pierced each other'
va-ndyeékaána	~ va-ndi-ékaána	'they laughed each other'
va-ndyaákaána	~ va-ndi-ákaána	'they chased each other'
va-ndeékaána	~ va-nda-ékaána	'they will laugh each other'
va-ndoómaána	~ va-nda-ómaána	'they will pierce each other'
va-ndoóluúka	~ va-nda-úluúka	'they will fly'

We know from previous sections that the H which appears on the root-initial vowel derives from prefixal shift, and this rule applies if the target tone follows a L toned syllable. The data in (6.43) show that if the vowel of the TP fuses with the root-initial vowel there is H on the second mora of the root-initial syllable. The interaction between shift and fusion is seen in (6.44).

(6.44) Shift and fusion:



As the representation in (6.44) shows, making an underlying antepenult become in the penult does not affect whether the rules apply, since shift is not restricted by position in the word.

#### 6.1.4 Positional Tone Avoidance

This section discusses one other principle recurrent in Bantu tonology and also observed in Shimakonde, which is the attempt to avoid having tone in certain positions. In this section I document two different principles of positional tone avoidance. Specifically, I describe the principle which avoids having a final H referred to as Non-finality. The second principle examined in this section is the attempt to avoid H in the penult position. Although there is a lot of evidence for Non-finality in previous linguistic analyses, there is not a lot of evidence for the principle of avoiding penult H tones.

#### 6.1.4.1 On Non-Finality

Non-finality simply says that final H's are avoided. The first non-finality effect in Shimakonde is that there are almost no H's on a final mora. In this section I document the effect of non-finality and I shall show that Shimakonde seems to be quite successful in avoiding H on the final vowel of the word in utterance-final position.

Certain tenses have penult H, which is singly linked, and that H does not spread to the final mora by Doubling due to non-finality as shown in (6.45).

(6.45) Non-finality:

vanku-guguvalaniífla	*vanku-guguvalaniíflá	'they are kneeling for each other'
vanku-tú-guguvaliífla	*vanku-tú-guguvaliíflá	'they are kneeling on us'
vandi-gúgúválániífla	*vandi-gúgúválániíflá	'they kneed for each other'
guguvalaniífla	*guguvalaniíflá	'kneel for each other!'
tu-guguvaliífla		'kneel on us!'

The effects of Non-finality can be seen in terms of such effects on spreading rules and H assignment rules. In terms of H assignment rules, verb stems in Shimakonde strongly avoid assigning H to the final vowel, so there are almost no final H tones at all. Thus, all tense-sensitive tone rules assign H to the penultimate syllable or to a vowel at the left edge of the stem, not to the final.

The examples in (6.46) are repeated from (6.1), except that the pattern with an initial H is excluded. These examples show that the maximum number of tone contrasts is found in the penult. The final vowel is never specifically targeted in any tense by any tone assignment rule.

(6.46) Non-finality effect on tone assignment rules:

- |               |                     |                                      |
|---------------|---------------------|--------------------------------------|
| a. Level H:   | vanku-guguvalaniíla | 'they are kneeling for each other'   |
| b. Level L:   | ava-guguvalaniila   | 'they will not kneel for each other' |
| c. Rising:    | guguvalaniíla       | 'kneel for each other'               |
| d. Rise-fall: | vaka-guguvalaniíla  | 'if they kneel for each other'       |

There is only one context where the principle of non-finality does not hold in the language. Specifically, stems in the subjunctive may associate the inflectional H to the final syllable under certain restricted conditions. CV roots of the subjunctive have final H as in *vaa-lyé* 'let them eat', but CVC or longer roots have rising tone in the penult like *va-piíme* 'let them measure'. The discussion of tense-sensitive tone rules is presented in section 6.4.

The effect of non-finality also is seen in prefix-to-stem H shift discussed previously. Recall from the previous section that the H of the prefix does not shift from the prefix to the stem-initial syllable of a CV stem, since that vowel happens to be final, which is virtually invisible for tone rules.

The relevant examples showing the non-finality principle are repeated in (6.47) where prefix-to-stem H shift is simply impossible in CV stems, because the target syllable happens to be the final which is virtually invisible for tone rules.

(6.47) Non-finality effect on prefixal H shift:

va-ndiî-lya	*va-ndii-lyá	'they ate'
va-ndiî-ña	*va-ndii-ñá	'they defecated'
va-ndaâ-lya	*va-ndaa-lyá	'they will eat'
va-ndaâ-gwa	*va-ndaa-gwá	'they will fall down'

Similarly, the non-finality effect also is seen in spreading rules. Verb stems in Shimakonde show that neither spreading processes, Doubling nor UUS, apply to the final syllable, because the final syllable is totally invisible for spreading rules. The following examples in (6.48) show that Doubling fails to apply to the final syllable.

(6.48) Non-finality effect on spreading:

guguvalaniíla	*guguvalaniílá	'kneel for each other!'
va-ndi-gúgúválániíla	*va-ndi-gúgúválániílá	'they kneed for each other'
a-va-gúgúválániídiíle	*a-va-gúgúválániídiílé	'they did not kneel on each other'

The tenses in (6.48) have a rising tone in the penult, entailing H on the pre-final mora. These tenses show that the H associated with the pre-final mora fails to spread to the final syllable, because non-finality prevents H from targeting the final syllable.

#### 6.1.4.2. Penult H Avoidance

The second principle of positional H avoidance is the attempt to avoid having H in the penult. In Shimakonde, spreading is blocked from targeting the penult, so the penultimate syllable also plays a key phonological role in Shimakonde tonology. We have seen that the penult presents the maximal tone contrasts in verb stems, so penult H avoidance is not absolute.

The following examples in (6.49) show that Doubling and UUS do not target the penult syllable due to positional H avoidance.

(6.49) H spreading and avoid penult:

a. vandi-pímiiya	*vandi-pímííya	'they well measured'
vanda-pímiigwa	*vanda-pímíígwa	'they will be measured'
vandi-shúluusha	*vandi-shúlúúsha	'they sold'
b. vandi-shúlúshiidya	*vandi-shúlúshíídya	'thy sold for'
vandi-tálákeeya	*va-ndi-tálákééya	'they caused to cook'
vandi-gúgúvadyaana	*vandi-gúgúvadyáána	'they caused each other to kneel'

vá-gúgúváliila	*vá-gúgúválííla	'kneeling for'
vá-gúgúválániila	*vágúgúválánííla	'kneeling for each other'
pává-gúgúválánídiile	*pává-gúgúválánídííle	'when they kneeled for'
pává-tú-gúgúválídiile	*pává-tú-gúgúválídííle	'when they kneeled on us'

We see that in (6.49a) Doubling does not apply to the penult due to avoidance of the penult. The examples in (6.49b) show that the attempt of avoiding H in the penult is also observed with UUS which spreads any initial H as far as possible to the right edge of the stem, except to the penult. UUS does not target the penult, even if the penult is L toned.

The conclusion is that in Shimakonde spreading does not apply to the penult, since Avoid Penult prevents spreading from targeting the penult syllable. However, penult H avoidance is much weaker than Non-Finality, especially given that there are various tense-sensitive rules that put H specifically on the penult. In addition, shift will move a H tone from a prefix to a penult as seen in the followings examples in (6.50).

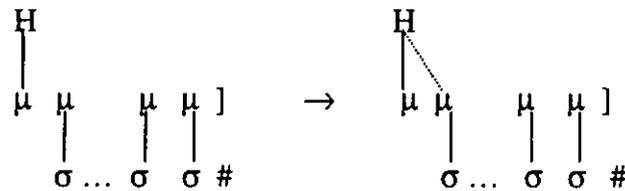
(6.50) Shift from a prefix to the penult:

vandi-lóombwa	/vandí-loombwa/	'they got married'
vandi-léeya	/vandí-leeya/	'they prohibited'
vanda-jóosha	/vandá-joosha/	'they will bake'
vanda-kóodya	/vandá-koodya/	'they will find'

### 6.1.5 Unconditioned Unbounded Spreading

One other general tone principle found in Shimakonde is Unconditioned Unbounded Spreading (UUS) which spreads any stem initial H as far as possible to the right, except that spreading does not apply to the penult and final syllables which are not subject to spreading rules. UUS is formalization in (6.51).

(6.51) UUS:



The rule in (6.50) keeps applying to its own output as long as there are at least two following syllables. Like Doubling, UUS also does not apply from the OP to the stem vowel if there is H on the OP. Based on its surface tone effects, UUS can be divided in two sub-categories: obligatory UUS, and in some contexts, optional UUS.

#### 6.1.5.1 Optional Unconditioned Unbounded Spreading

In Shimakonde, UUS is optional if the verb stem has a rise-fall, rising or a low tone in the penult and also has a stem-initial H. UUS is seen in the following examples in (6.52).

(6.52) Optional UUS:

a. Remote past positive (cf. B.1d):

vándí-gúgúvalaniífla	~ vándí-gúgúválnífla	'they had kneeled for each other'
	~ vándí-gúgúválníífla	=
	~ vándí-guguvalaniífla	=
vándí-guguvadiidya	~ vándí-gúgúvádiidya	'they had caused to kneel for'

b. Recent past positive (cf. B.1b):

vandi-gúgúvalaniífla	~ vandi-gúgúválnífla	'they kneeled for each other'
	~ vandi-gúgúválníífla	=
vandi-gúgúvadiidya	~ vandi-gúgúvádiidya	'they caused to kneel for'

c. Imperative negative (cf. B.1w):

avana-gúgúvalaniíle	~ avana-gúgúválníle	'(they) do not kneel for e. o.!'
	~ avana-gúgúválnííle	=
avana-gúgúvadiidye	~ avana-gúgúvádiidye	'(they) do not cause to kneel for!'

There are two patterns of spreading involving the data in (6.52). First, Doubling explains why at least the first two syllables of the stem must have H tone. Second, there is optional UUS. Spreading optionally applies rightward as far as possible, except to the last two syllables.

The actual number of surface H tones derived from UUS depends on the length of the stem. If the stem has six syllables, as many as four H tones appear on the surface, and a stem with seven syllables will have maximally five H tones on the surface, since the last two syllables are excluded from getting H derived from UUS.

Unconditioned Unbounded Spreading also applies in other tenses given in (6.53), where the H assigned to the left edge of the stem precedes a LH rising, LHL rise-fall or L tones in the penult. These tenses show that UUS applies to many tenses in the language.

(6.53) Optional UUS:

a. Recent past negative (cf. B.1c):

ava-gúgúvalanidífle	~ ava-gúgúválnidífle	'they did not kneel for e. o.'
	~ ava-gúgúválnidífle	=
	~ ava-gúgúválnidífle	=
ava-gúgúvadiídye	~ ava-gúgúvadiídye	'they did not cause to kneel for'

b. Future positive (cf. B.1s):

vanda-gúgúvalaniífla	~ vanda-gúgúválnífla	'they will kneel for each other'
	~ vanda-gúgúválnífla	=
vanda-gúgúvadiidya	~ vanda-gúgúvadiidya	'they will cause to kneel for'

c. Imperfective progressive positive (cf. B.1k):

vásíndá-gúgúvalaniîla	~ vásíndá-gúgúválníîla	'they were kneeling for e. o.'
	~ vásíndá-gúgúválníîla	=
	~ vásíndá-guguvalaniîla	=
vásíndá-gúgúvadiidya	~ vásíndá-gúgúvadiidya	'they were causing to kneel for'
	~ vásíndá-guguvadiidya	=

d. Suggestive positive (cf. B.1ee):

vákándí-gúgúvalaniîla	~ vákándí-gúgúválníîla	'they should kneel for e. o.'
	~ vákándí-gúgúválníîla	=
vákándí-gúgúvadiidya	~ vákándí-gúgúvadiidya	'they should cause to kneel for'
	~ vákándí-guguvadiidya	=

e. Present habitual (cf. B.1f):

vándá-gúgúvalaniîla	~ vándá-gúgúválníîla	'they kneel for each other'
	~ vándá-gúgúválníîla	=
	~ vándá-guguvalaniîla	=
vándá-gúgúvadiidya	~ vándá-gúgúvadiidya	'they cause to kneel for'
	~ vándá-guguvadiidya	=

f. Participial positive (cf. B.1aa):

vá-gúgúvalaniila	~ vá-gúgúválníila	'kneeling for each other'
	~ vá-gúgúválníila	=

vá-gúgúvadiidya	~ vá-gúgúvádiidya	'causing to kneeling for'
g. Suggestive negative (cf. B.1ff):		
vákáná-gúgúvalaniile	~ vákáná-gúgúválaniile	'they should not kneel for e. o.'
	~ vákáná-gúgúválániile	=
	~ vákáná-gugúvalaniile	=
vákáná-gúgúvadiidye	~ vákáná-gúgúvádiidye	'they should not cause to kneel for'
	~ vákáná-gugúvadiidye	=
h. Present progressive (cf. B.1h):		
vanku-gúgúvadiidya	~ vanku-gúgúvádiidya	'they are causing to kneel for'
i. Subjunctive negative (cf. B.1dd):		
avana-gúgúvalaniile	~ avana-gúgúválaniile	'let them not kneel for e. o.'
	~ avana-gúgúválániile	=
avana-gúgúvadiidye	~ avana-gúgúvádiidye	'let them not cause to kneel for'

The examples given in the first column of (6.53) show that obligatory Doubling spreads H from the stem-initial vowel to the second syllable. The second column shows that there may also be multiple H's within the stem due to UUS, which optionally expands any initial H towards the right edge of the stem.

The following examples seen in (6.54) show that the actual number of surface H's derived from optional application of UUS depends on the length of the stem.

(6.54) Number of syllables vs. surface tone distribution:

Number of syllables	Patterns of UUS	Gloss
5	ava-gúgúvaleéngé	'they did not kneel repeatedly'
	~ ava-gúgúvaleéngé	=
6	ava-gúgúvalidiíle	'they did not kneel for'
	~ ava-gúgúválidiíle	=
	~ ava-gúgúválídiíle	=
7	ava-gúgúvalangidiíla	'they did not kneel for repeatedly'
	~ ava-gúgúválangidiíle	=
	~ ava-gúgúválángidiíle	=
	~ ava-gúgúválángídiíle	=

One last point to be made is that though Doubling and UUS apply to the data in (6.54), the next examples in (6.55) show that any factor that blocks Doubling also blocks UUS.

(6.55) Blocking of Doubling and UUS:

a. Remote past positive:

vándí-tú-guguvaliíla	*vándí-tú-gúguvaliíla	'they had kneeled on us'
	*vándí-tú-gúgúváliíla	

vándí-tú-guguvadiidya \*vándí-tú-gúguvadiidya 'they had caused us to kneel for'

\*vándí-tú-gúgúvádiidya

b. Recent past positive:

vandi-tú-guguvaliífla \*vandi-tú-gúguvaliífla 'they kneeled on us'

\*vandi-tú-gúgúváliífla

vandi-tú-guguvadiidya \*vandi-tú-gúguvadiidya 'they caused us to kneel for'

\*vandi-tú-gúgúvádiidya

c. Imperative negative:

avana-tú-guguvaliile \*avana-tú-gúguvaliile '(they) do not kneel on us!'

\*avana-tú-gúgúváliile

avana-tú-guguvadiidye \*avana-tú-gúguvadiidye '(they) do not cause us to kneel for!'

\*avana-tú-gúgúvádiidye

d. Future positive:

vanda-tú-guguvaliífla \*vanda-tú-gúguvaliífla 'they will kneel on us'

\*vanda-tú-gúgúváliífla

vanda-tú-guguvadiidya \*vanda-tú-gúguvadiidya 'they will cause us to kneel for'

\*vanda-tú-gúgúvádiidya

e. Suggestive negative:

vákáná-tú-guguvaliile \*vákáná-tú-gúguvaliile 'they should not kneel on us'

\*vákáná-tú-gúgúváliile

vákáná-tú-guguvadiidye \*vákáná-tú-gúguvadiidye 'they should not cause us to kneel for'  
 \*vákáná-tú-gúgúvadiidye

f. Present progressive positive:

vanku-tú-guguvalífla \*vanku-tú-gúguvalífla 'they are kneeling on us'  
 \*vanku-tú-gúgúvalífla

avana-tú-guguvaliile \*avana-tú-gúguvaliile 'let them not kneel on us'  
 \*avana-tú-gúgúvaliile

We see that the H does not undergo Doubling or UUS into the stem from the OP. What we see is that the failure of Doubling and UUS in (6.55) is because the relevant H is not in the stem, instead, it is on an OP. As seen previously, there is no Doubling from OP to the stem. The next data in (6.56) show that Doubling and UUS apply to the stem vowels if the H is on the stem-initial vowel, and not on the vowel of the OP.

(6.56) Doubling and UUS:

ava-tu-gúgúvalidiíle ~ ava-tu-gúgúválidiíle 'they did not kneel on us'  
 ava-tu-gúgúvadiídye ~ ava-tu-gúgúvádiídye 'they did not cause us to kneel for'  
 avana-tu-guguvalífla ~ avana-tu-gúgúválífla 'they do not kneel on us'

The examples in (6.56) establish that it is the location of the H and not the presence of the OP which blocks Doubling and UUS. Since Doubling and UUS apply under the same conditions, the relation between the two processes is shown in the derivations in (6.57).

(6.57) Optional UUS:

a. vanku - gu gu va dya ngii dya                      Doubling

b. vanku - gu gu va dya ngii dya                      UUS

Now I turn to a few tenses which involve a tone complication, because these tenses might seem to undergo Doubling and/or UUS even if the H is on the vowel of the OP. These tenses include the participial positive, and four subordinate tenses shown in (6.58).

(6.58) Tone complication:

a. Participial or gerund positive (cf. B.1aa):

vá-tú-píima	'measuring us'
vá-tú-pímiila	'measuring for us'
vú-tú-líipa	'paying us'

vá-tú-límiila		'cultivating for us'
vá-tú-gúgúvaliila	~ vá-tú-gúgúváliila	'kneeling on us'
vá-tú-gúgúvadiidya	~ vá-tú-gúgúvádiidya	'causing us to kneel for'

b. Recent past perfective-when positive (cf. B.1hh):

pává-tú-péele		'when they gave us'
pává-tú-pímiile		'when they measured us'
pává-tú-gúgúvalidiile	~ pává-tú-gúgúváliidiile	'when they kneeled on us'
pává-tú-gúgúvadiidye	~ pává-tú-gúgúvádiidye	'when they caused us kneel for'

The tenses in (6.58) show that if the stem is CVCV there is H in the penult which is realized as a falling tone. We know that Doubling and UUS do not otherwise put H in the penult, so I conclude that penult H is assigned by tense sensitive rules. If the stem is CVCVCV a single H appears in the stem-initial vowel, and there is no Doubling, because the target syllable would be in the penult. In longer stems there is H at the beginning of the stem which is subject to Doubling and UUS.

To explain the tone pattern of (6.58) I assume that these tenses have H assigned to the stem-initial vowel. The surface form like *vá-tú-píima* 'measuring us' derives from assigning H to the stem-initial vowel, which happens to be the penult. There is also another H on the word-initial prefix and that H gets to the next prefix by Doubling. This pattern is analogous to *vá-tú-pímiila* 'measuring for us', where a H tone is assigned to the stem-initial vowel and there is no Doubling to the penult because of penult avoidance.

Longer stems in (6.58b) show that if there is H at the beginning of the stem, that H undergoes Doubling and UUS. One crucial point made with the data in (6.58) is that multiple H's that appear on the stem vowels derive from UUS which apply from the stem-initial vowel and not from the OP.

### 6.1.5.2 Obligatory Unconditioned Unbounded Spreading

Verbal stems so far considered to motivate optional UUS have either a low tone or a contour tone in the penult and they do not include a level H tone in the penult. The following examples in (6.59) show a tone complication due to the H assigned at the beginning of the stem which is seen in other tenses. Consider the examples below.

(6.59) Tone complication:

Imperfective-when positive (cf. B.1kk):

páváshí-tú-pííma	'when they were measuring us'
páváshí-tú-líípa	'when they were paying us'
páváshí-tú-pímííla	'when they were measuring for us'
páváshí-tú-gúgúválííla	'when they were kneeling on us'
páváshí-tú-túmbíílkííla	'when they were persuading for us'

d. Present habitual-when positive (cf. B.1oo):

páváná-tú-pííma	'when they measure us'
páváná-tú-pímííla	'when they measure for us'

páváná-tú-gúgúválííla 'when they kneel on us'

páváná-tú-túmbíílkííla 'when they persuade for us'

e. Present habitual-when negative:

pávákáná-tú-gúgúválííla 'when they do not kneel for'

pávákáná-tú-túmbíílkííla 'when they do not persuade for us'

The examples in (6.59) show that if the stem is CVCV there is H in the penult and also multiple H's on the preceding prefixes. We know that the penult H in CVCV stems cannot derive from Doubling, since the target syllable would be the penult. All vowels of the longer stems of (6.59) show up with a H tone. One observation is that these tenses have only one option of having multiple H's. One other observation is that CVCV stems in (6.59) have a level H in the penult, while the analogous data seen previously in (6.58) have a falling tone in the penult.

To explain the pattern of (6.59), I posit that these tenses have H assigned at the beginning of the stem just like the examples in (6.58). In addition, the tenses in (6.59) also have another H assigned to the penult. The stem-initial H undergoes UUS targeting all syllables between the two H's. The examples just considered above show that in Shimakonde, there is a general tone principle which says that if the stem-initial H precedes a level H in the penult, there is always obligatory application of UUS, giving multiple surface H tones. Additional data with obligatory UUS are seen in (6.60).

(6.60) Obligatory UUS:

a. Present progressive positive (cf. B.1h):

vanku-guguvalanífla ~ vanku-gúgúválnífla 'they are kneeling for each other'

\* vanku-gúgúvalanífla

\* vanku-gúgúválnífla

b. Imperfective progressive negative (cf. B.1l):

avasi-guguvalanífla ~ avasi-gúgúválnífla 'they were not kneeling for each other'

avasi-tu-guguvalífla ~ avasi-tu-gúgúválnífla 'they were not kneeling on us'

\* avasi-gúgúvalanífla

\* avasi-gúgúválnífla

c. Conditional negative (cf. B.1z):

vakana-guguvalanífla ~ vakana-gúgúválnífla 'if they do not kneel for each other'

vakana-tu-guguvalífla ~ vakana-tu-gúgúválnífla 'if they do not kneel on us'

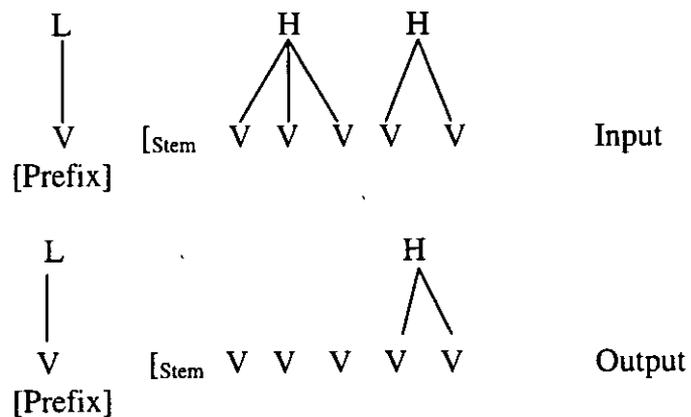
\* vakana-gúgúvalanífla

\* vakana-gúgúválnífla

The examples in (6.60) involve some tone complications which need to be explained before getting to obligatory UUS. First, we see that these examples presents only two options and the starred variants are not possible outputs. In this respect, the tenses in (6.60) differ tonally from (6.59) since there are only two options. Given the optional application of UUS discussed previously, we would expect many tone options in (6.60).

What we see is that there is one option which includes multiple level H's, because of UUS. The second option includes a single H in the penult. To explain the pattern with multiple level H's in (6.60) I posit that these tenses have a stem-initial H and also have a level H assigned to the penult syllable just like the data in (6.59). The stem-initial H undergoes UUS targeting all vowels between the two H's. To explain the surface form with a single H in the penult like *vanku-guguvalaníla* 'they are kneeling on each other' I posit that this pattern derives from an independent tone rule which delinks H's from the left edge of the stem, rule (6.61).

(6.61) H-Delinking:



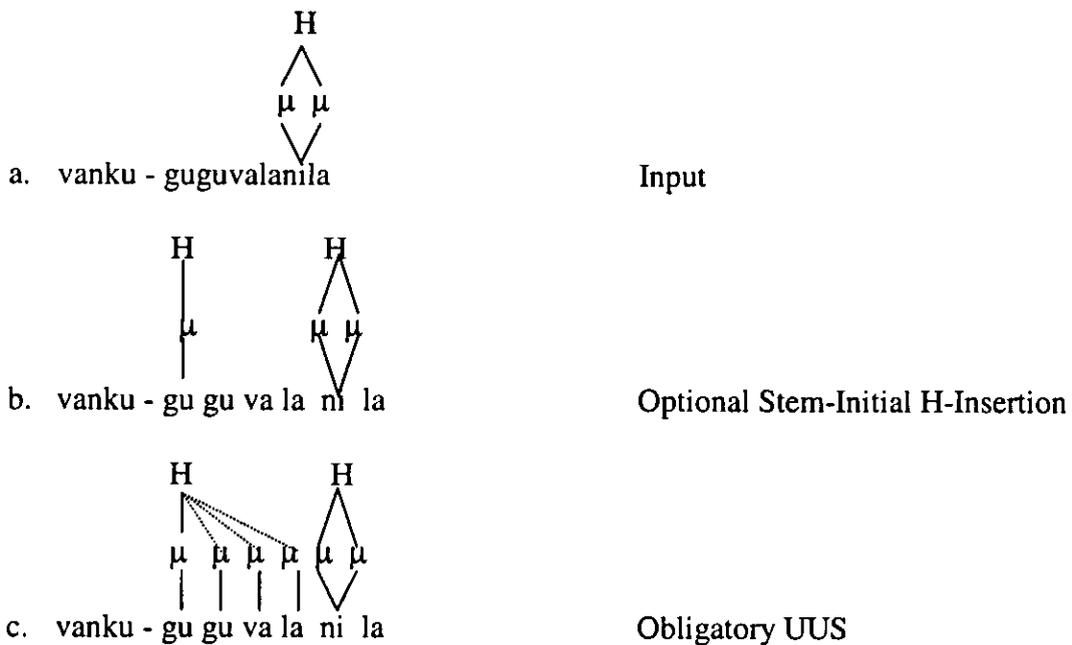
The rule in (6.61) only applies if the target tone is immediately adjacent to the trigger H and also if there is a L tone on the vowel before the target H. So, obligatory UUS applies because Shimakonde does not have the tone option given in (6.62).

(6.62) Impossible tone pattern:

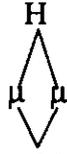


There are two competing theories to explain the data in (6.60). One way is to assume that there is H assigned to the penult and optionally another H is also inserted at the beginning of the stem. Once the stem-initial H is inserted at the beginning of the stem, it is subject to obligatory UUS giving multiple level H tones. If the option of not inserting the stem-initial H is selected, the surface pattern with a single H in the penult is derived as shown in the derivations in (6.63).

(6.63) Obligatory UUS:







d. vanku - gu gu va la ni la

Optional H-Delinking

The derivations in (6.64) show that it is because of optional H delinking, not the lack of the stem-initial H which derives the pattern of a single H in the penult.

The conclusion is that the representations in (6.63) - (6.64) show how the options in (6.59) and (6.60) are tonally related underlyingly, and they only differ in the surface tone realization due to optional tone rules.

### 6.1.5.3 Doubling in Prefixes and into Stem

Spreading of the stem initial H which is followed by another H in the penult shows tone complications in certain tenses. Specifically, we have seen that Doubling within the stem is obligatory, but I shall now show that Doubling can be optional in prefixes. There are a number of tone anomalies in certain tenses in terms of not following the general pattern of spreading. In the subsequent pages I describe some of the anomalies found in the language. Consider the following examples in (6.65), where there is Doubling in prefixes.

(6.65) Optional Doubling in prefixes:

- |    |               |                                   |
|----|---------------|-----------------------------------|
| a. | vá-kaa-gwa    | 'that they are not falling down'  |
|    | vá-kaa-lya    | 'that they are not eating'        |
|    | vá-kaa-ña     | 'that they are not defecating'    |
| b. | vá-ká-liima   | 'that they are not cultivating'   |
|    | vá-ká-piima   | 'that they are not measuring'     |
|    | vá-ká-pimiila | 'that they are not measuring for' |

The data in (6.65a) show that the SP *va-* has H which appears on the prefix, and avoidance of penult H prevents Doubling from targeting the next L toned prefix *ka-*. The prefix *ka-* gets H by Doubling in (6.65b). Tone complication can be seen by examining the sub-domains in which spreading rules apply. In Shimakonde, verbs show evidence that there are three sub-domains in which spreading rules apply. Specifically, spreading applies to a prefix domain, stem domain and a third domain, the word domain, which includes both the first two domains. To show spreading at the prefix domain, consider the telling examples in (6.66).

(6.66) Past progressive relative negative (cf. B.1n):

- |    |                           |   |
|----|---------------------------|---|
| a. | vákasi-guguvalanganífla   | 'that they were not kneeling for each other repeatedly' |
| b. | ~ vákási-guguvalanganífla | =   |
| c. | ~ vákásí-guguvalanganífla | =   |
| d. | ~ vákásí-gúgúvalanganífla | =   |

- e. ~ *vákási-gúgúválánganífla* =
- f. \* *vákási-gúguvalanganífla*
- g. \* *vákási-gúgúválanganífla*
- h. \* *vákási-gúgúválanganífla*

There are two interpretations for the data in (6.66). One is that these patterns derive from Doubling or UUS within prefixes. The first example of (6.66a) would derive from optional Doubling, since there is a single H on the subject prefix *va-*. The surface form (6.66b) can be interpreted as a result of Doubling in the prefix domain. Finally the option given in (6.66c) could derive from UUS applied to the prefixes.

One other way of explaining the patterns in (6.66) is simply to say that there is no way of telling which spreading process applies. The surface form like *vákási-gúguvalanífla* in (6.66b) can be explained by assuming that there is UUS applied once, since UUS is optional. The pattern seen in (6.66c) could derive from applying UUS twice. The conclusion is that the data in (6.66) do not support any particular method of spreading, because these results could derive either from Doubling or UUS.

One point I should make clear is that there is a tone anomaly in (6.66) in terms of the expected patterns of spreading. One anomaly is that there is no obligatory Doubling at the prefix level in this tense as we can see in (6.66a), but there is obligatory Doubling at the stem level as in (6.66d) vs. (6.65f).

Notice that (6.66f) is not a possible outcome because Doubling fails to apply. We see that these examples show unexpected optionality of Doubling and unexpected partial obligatoriness of Doubling in the stem.

The question is why there are many options in (6.66), but only two options in (6.60). The assumption has been that if there is a stem-initial H and a level penult H, there is obligatory UUS. The data just considered above show that this condition does not hold, because the condition for spreading in (6.66) is that if there is no spreading at all, it is correct, but if H spreads once, spreading should apply as much as possible. The similar tone complication is seen in other tenses given in (6.67).

(6.67) Unexpected pattern of spreading:

- |       |                         |                                   |
|-------|-------------------------|-----------------------------------|
| (67a) | pá-vá-gúgúválídiile     | 'when they kneeled for'           |
| (67b) | pá-vá-ká-guguvalidííle  | 'when they did not kneel for'     |
| (67c) | pá-vá-sí-gúgúválííla    | 'when they were kneeling for'     |
| (67d) | pá-vá-ká-sí-guguvalííla | 'when they were not kneeling for' |
| (67e) | pá-vá-ká-guguvaliila    | 'when they are not kneeling for'  |
| (67f) | pá-vá-gúgúváliila       | 'when they are kneeling for'      |
| (67g) | pá-vá-ná-gúgúválííla    | 'when they kneel for'             |
| (67h) | pá-vá-ká-ná-gúgúválííla | 'when they do not kneel for'      |
| (67i) | á-vá-ná-gúgúvaliile     | 'they should not kneel for'       |

At the moment I have no answer for the cause of this tone complication, but it seems that in certain tenses there is arbitrary application of UUS. However, there is a crucial tonal difference which needs to be noted in (6.66d). Specifically, there is one option of not applying UUS at all when the H tone gets into the stem by H insertion and later by Doubling. This can be explained by assuming that UUS is optional within prefixes and it is optional with respect to whether H spreads into the stem, but once H starts spreading into the stem by UUS, it must keep spreading, though H can still get into the stem by Doubling.

The conclusion is that there are three patterns for UUS. There is a totally optional UUS discussed in section 6.1.5.1, obligatory UUS examined in section 6.1.5.2 and mixed pattern of optional-obligatory UUS shown with the data in (6.66) – (6.67).

Shimakonde presents other tenses which have obligatory and mixed pattern of optional-obligatory UUS. These tenses include the imperfective-when negative seen in the following examples in (6.68).

(6.68) Imperfective-when negative (cf. B.111):

a. pávákasi-guguvalanífla		'when they were not kneeling for each other'
~ pávákási-guguvalanífla	=	
~ pávákásí-guguvalanífla	=	
~ pávákásí-gúgúvalanífla	=	
~ pávákásí-gúgúválánífla	=	

- b. pávákasi-tu-guguvalífla                    'when they were not kneeling on us'  
 ~ pávákási-tu-guguvalífla                    =  
 ~ pávákásí-tu-guguvalífla                    =  
 ~ pávákásí-tú-guguvalífla                    =  
 ~ pávákásí-tú-gúgúválífla                    =  
 \* pávákásí-gúguvalanífla  
 \* pávákásí-gúgúvalanífla

There are two observations about the data in (6.68). First, following the pattern seen in (6.66), we see that if there is H on the first vowel of the prefix that H undergoes Doubling and optional UUS within the prefix syllables. Optional UUS at the prefix level is seen in (6.69).

(6.69) Optional UUS in prefixes:

- a.                    H  
                       |  
 a.                    va ka si-                    Input
- b.                    H  
                       | \  
 b.                    va ka si-                    Doubling within prefixes
- c.                    H  
                       | \ /  
 c.                    va ka si-                    Prefixal UUS

Second, if there is stem-initial H there is spreading by Doubling and that H also undergoes UUS from the stem-initial syllable to the following vowels and the relevant examples are repeated in (6.70).

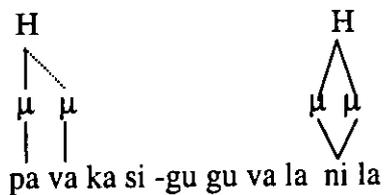
(6.70) Optional-obligatory UUS:

pávakasi-guguvalanífla		'when they were not kneeling for each other'
~ pávákasi-guguvalanífla	=	
~ pávákási-guguvalanífla	=	
~ pávákási-guguvalanífla	=	
~ pávákási-gúgúvalanífla	=	
~ pávákási-gúgúválánífla	=	
* pávákási-gúguvalanífla		
* pávákási-gúgúválánífla		

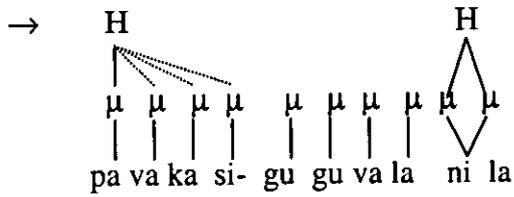
The assumption is that once the stem-initial H is inserted, UUS becomes obligatory in prefixes and this explains why the surface form like \*pávákasi-gúgúválánífla is disallowed, because a L toned prefix cannot precede a stem-initial H.

The examples in (6.70) show that the presence of stem-initial H triggers automatic Doubling and UUS applying to all vowels of the stem. The derivations in (6.71) show each possible tone variant in (6.70).

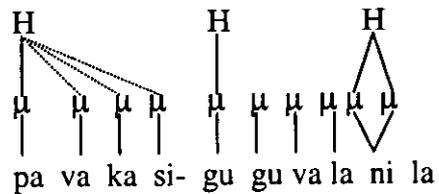
(6.71) Doubling in the prefixes



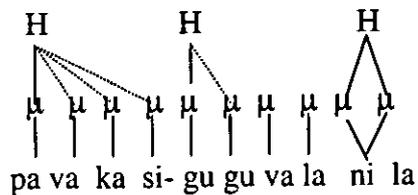
a. UUS in the prefix domain:



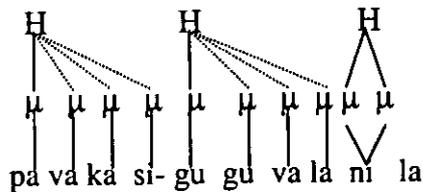
b. Optional Stem-Initial H Insertion:



c. Doubling:



d. Obligatory UUS:



The variant in (6.71a) shows the option where UUS applies in prefixes, but there is no UUS within the stem, because the stem-initial H is lacking. The option seen in (6.71b) is never realized on the surface, because the stem-initial H insertion is subject to obligatory Doubling, giving the variant in (6.71c). The variant seen in (6.71d) derives from UUS applied at the prefix domain and also to the stem syllables.

Additional data in (6.72) show the interaction of various tonal processes in several tenses. The verbs below have stem-initial H and they also assign H to the penult just like the previous examples. Unlike in the previous tenses where the stem-initial H insertion is optional, these tenses show that the H inserted at the beginning of the stem is obligatorily. Obligatory stem-initial H insertion results in obligatorily UUS in the stem domain.

(6.72) Obligatory UUS:

a. Present habitual relative:

váná-gúgúválnííla	* váná-guguvalanííla	'that they kneel for each other'
váná-tú-gúgúválííla	* váná-tú-guguvalííla	'that they kneel on us'
váná-túmbílikánííla	* váná-tumbilikanííla	'that they persuade for each other'
váná-tú-túmbílikííla	* váná-tú-tumbilikííla	'that they persuade for us'

b. Imperfective when positive:

pávásí-gúgúválnííla	* pávásí-guguvalanííla	'when they were kneeling for each other'
pávásí-tú-gúgúválííla	* pávásí-tú-guguvalííla	'when they were kneeling on us'
pávásí-túmbílikánííla	* pávásí-tumbilikanííla	'when they were persuading for each other'

c. Present habitual when:

páváná-gúgúválnííla	* páváná-guguvalanííla	'when they kneel for each other'
páváná-tú-gúgúválííla	* páváná-tú-guguvalííla	'when they kneel on us'
páváná-tú-mbílikánííla	* páváná-tumbilikanííla	'when they persuade for each other'

One crucial observation about the data in (6.72) is that these tenses have only one option of having multiple H's, so in this respect these examples differ tonally from those seen in (6.70), where there is one other option of having a single H in the penult, and the question is why. Recall that the crucial condition for proper application of obligatory UUS is the presence of a level H in the penult and also another H at the beginning of the stem. In this respect the data in (6.72) are tonally similar to the examples in (6.70), since any stem-initial H triggers obligatory UUS. The only difference is that there is a mixed pattern of UUS in (6.70), while in (6.72) there is totally obligatory UUS. Recall also that if the penult is L-initial and there is one option of a L toned prefix between the word-initial H and the stem-initial H then there is also optional UUS.

I assume that the tenses in (6.72) require a presence of H on all of the prefix vowels and the last prefix cannot have a L tone. Moreover, I posit that these tenses have stem-initial H which I assume to be obligatory. The major tonal difference between (6.72) and (6.70) is not in terms of application of obligatory UUS, but it is because there is obligatory stem-initial H insertion in (6.72), while the H inserted at the beginning of the stem in (6.70) is optional. The pattern with a single H in the penult is impossible in (6.72) because the H at the beginning of the stem will undergoes obligatory UUS. I assume that the surface multiple H tones like in *páváná-gúgúválníla* in (6.72c) derive from */páváná-gúguvalaníla/*, where all prefix syllables have H and there is also another H on the stem-initial vowel.

What we see is that there is a tone contrast between the tenses like *pávásí-gúgúválnííla* 'when they were kneeling for each other' in (6.72b) and *pávakasi-guguvalanííla* 'when they were not kneeling for each other' in (6.70). In former case there is no L in the last two prefixes and the stem-initial syllable gets H by a rule which is assumed to be obligatory. In the later case, there is one option of having a L tone in the last prefix, and the H that appears at the beginning of the stem is inserted by a rule which is assumed to be optional.

It is a generalization about Shimakonde that the optional pattern of UUS is found only within the set of tenses which have H before the stem and also have an underlying toneless prefix before the stem. Obligatory UUS applies only within the set of tenses which has H at the beginning of the stem and also there is another level H in the penult. I attribute the alternation between optional and obligatory UUS to underlying H vs. L on the prefix and to whether the penult is L-initial or level H. Consider the following examples in (6.73).

(6.73) Optional UUS vs. obligatory UUS:

a. Imperfective when negative (cf. 8.111):

<i>pávakasíí-lya</i>	/pá-va-ka-sí-lya/	'when they were not eating'
~ <i>pávakasíí-lya</i>		=
~ <i>pávákásíí-lya</i>		=

b. Present habitual when positive:

pávánáá-lya            /pá-vá-náá-lya/            'when they eat'

\*pávanáá-lya

\*pávánaa-lya

We know from the previous sections that in Shimakonde spreading does not target the penult and final syllables. So, the underlying distinction on the prefix tone which I claim is motivated by examples like those in (6.73).

We see that in (6.73a) there is Doubling within prefixes and UUS derives H in [páváká-] from /pávaka-/. Note that the TP *-si-* in (6.73a) gets H by tense-sensitive rules which assign H to the penult, since the stem vowel cannot get H due to Non-Finality. Surprisingly, in (6.73b) there is only one option of having multiple H's, because there is no option of L-toned prefix.

The following examples in (6.74) include longer stems of other tenses where there is tone alternation on the prefix. Due to tone alternation between H and L, the prefixes appear with a single H, two H's or multiple surface H's.

(6.74) H vs. L tone contrast on the prefix:

a. Imperfective-when negative:

pávákasi-guguvalanífla

~ pávákási-guguvalanífla

~ pávákásí-guguvalanífla

~ pávákási-gúgúválánífla

'when they were not kneeling for each other'

b. Past progressive relative negative:

vákasi-guguvalanífla

~ vákási-guguvalanífla

~ vákásí-guguvalanífla

~ vákási-gúgúválánífla

'that they were not kneeling for each other'

c. Imperfective-when positive:

cf. pávásí-gúgúválánífla

cf. \* pávásí-guguvalanífla

cf. \* pávásí-guguvalanífla

'when they were kneeling for each other'

d. Present habitual when positive:

cf. páváná-gúgúválánífla

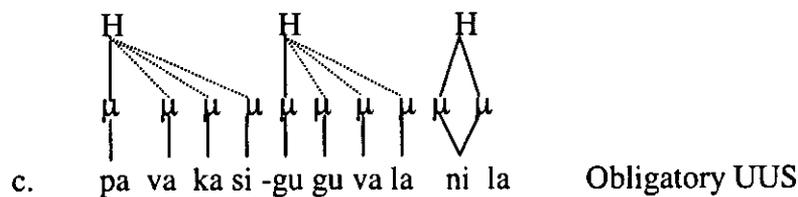
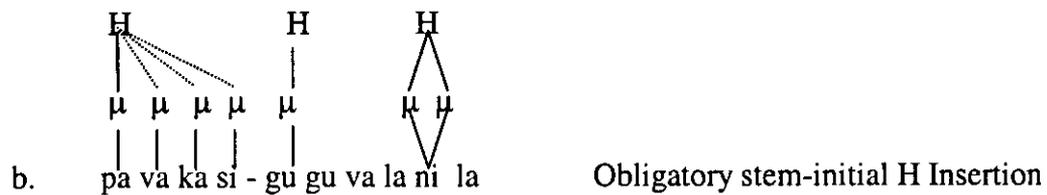
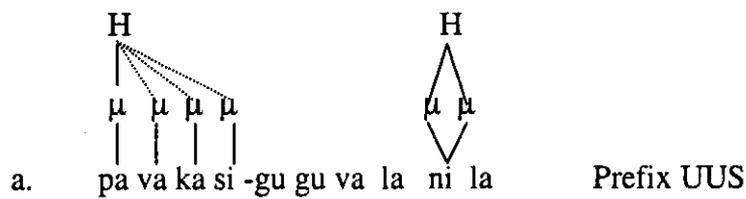
cf. \* pávána-guguvalanífla

cf. \* páváná-guguvalanífla

'that they kneel for each other'

We see that in (6.74a) there is the option of spreading H by Doubling or UUS in the prefixes, but if there is H at the beginning of the stem there is obligatory UUS. This same pattern is seen in (6.74b). The data in (6.74c) and (6.74d) show that there is only one option of having multiple H's, because these tenses do not have the option of having L in the last prefix syllable and there is H obligatorily inserted at the beginning of the stem. The relation between obligatory stem-initial H insertion and optional stem H insertion is seen in the relevant derivations in (6.75).

(6.75) Obligatory UUS:



## 6.2 The Underlying Tone of Prefixes

In the previous section, I have shown that in Shimakonde, spreading processes may apply at the prefix level, the stem domain and may cross over from one domain to another domain. I have also shown that the final and penult syllables play a special role in the language. This section describes the underlying tone of the prefixes. There are three observations about the prefixal tone in Shimakonde. First, subject prefixes (SP's) have no underlying tone, and the tone that appears on the SP is determined by the tense of the verb, not by the prefixes themselves.

Second, there is a class of tense-prefixes including the past-tense marker *-ndi-*, the future tense-prefix *-nda-* and the present progressive *-nku-* which have an underlying H. Third, there are tense-prefixes which are toneless and their tonal behavior depends on the preceding tone.

### 6.2.1 The Tone of Subject Prefixes

In Shimakonde, SP's are toneless and the tone that appears on the subject prefixes is determined by the tense-aspect of the verb stem. Before I progress, I provide a list of tenses where the subject prefix appears with H.

(6.76) H-toned SP in absolute word-initial position:

- |       |                       |                                   |
|-------|-----------------------|-----------------------------------|
| (76a) | vá-ndí-guguvaliîla    | 'they had kneeled for'            |
| (76b) | vá-sí-ndá-guguvaliîla | 'they were kneeling for'          |
| (76c) | vá-sí-gúgúválííla     | 'that they were kneeling for'     |
| (76d) | vá-ká-si-guguvalííla  | 'that they were not kneeling for' |
| (76e) | vá-ndá-guguvaliîla    | 'they kneel for'                  |
| (76f) | vá-ná-gúgúválííla     | 'that they kneel for'             |
| (76g) | vá-ká-ná-gúgúválííla  | 'that they do not kneel for'      |
| (76h) | vá-ká-guguvaliîla     | 'that they are not kneeling for'  |

- |       |                        |                             |
|-------|------------------------|-----------------------------|
| (76i) | vá-gúgúvaliila         | 'kneeling for'              |
| (76j) | vá-ká-ndí-guguvaliífla | 'they should kneel for'     |
| (76k) | vá-ká-ná-guguvaliile   | 'they should not kneel for' |

As seen, the 3 pl. subject prefix in (76) appears with a H tone. The next examples in (6.77) include 2 sg. and 2 pl., and these examples show that the tone of the SP does not change according to the specific grammatical person in Shimakonde.

(6.77) H toned SP:

- |                        |  |
|------------------------|--|
| ú-ndí-guguvaliífla     | 'you (2 sg.) had kneeled'                |
| mú-ndí-guguvaliífla    | 'you (2 pl.) had kneeled'                |
| ú-sí-ndá-guguvaliífla  | 'you (2 sg.) were kneeling for'          |
| mú-sí-ndá-guguvaliífla | 'you (2 pl.) were kneeling for'          |
| ú-sí-gúgúválíífla      | 'you (2 sg.) that you were kneeling for' |
| mú-sí-gúgúválíífla     | 'that you (2 pl.) were kneeling for'     |
| ú-gúgúvaliila          | 'you (2 sg.) kneeling'                   |
| mú-gúgúvaliila         | 'you (2 pl.) kneeling for'               |
| ú-ká-guguvaliila       | 'that you (2 sg.) are not kneeling for'  |
| mú-ká-guguvaliila      | 'that you (2 pl.) are not kneeling for'  |

We can see that the SP's in (6.77) are tonally the same as the 3 pl. SP in (6.76). Since the person is irrelevant for the tone of the SP, in the subsequent pages I will only consider examples involving the 3 pl. SP.

The data in (6.78) show a H-toned SP after a H-toned tense-prefix *pa-*.

(6.78) H-toned SP after prefixal H tone:

- |       |                                |                                   |
|-------|--------------------------------|-----------------------------------|
| (78a) | <i>pá-vá-gúgúválídiile</i>     | 'when they kneeled for'           |
| (78b) | <i>pá-vá-ká-guguvalidífle</i>  | 'when they did not kneel for'     |
| (78c) | <i>pá-vá-sí-gúgúválífla</i>    | 'when they were kneeling for'     |
| (78d) | <i>pá-vá-ká-sí-guguvalífla</i> | 'when they were not kneeling for' |
| (78e) | <i>pá-vá-ká-guguvaliila</i>    | 'when they are not kneeling for'  |
| (78f) | <i>pá-vá-gúgúváliila</i>       | 'when they are kneeling for'      |
| (78g) | <i>pá-vá-ná-gúgúválífla</i>    | 'when they kneel for'             |
| (78h) | <i>pá-vá-ká-ná-gúgúválífla</i> | 'when they do not kneel for'      |
| (78i) | <i>á-vá-ná-gúgúvaliile</i>     | 'they should not kneel for'       |

The example in (6.78f) is crucial for determining the underlying tone of the SP. If the stem is CV, the analogous tone for (6.78f) is a penult H which is realized as a falling tone like *pá-váa-lya* 'when they are eating'. Since H cannot get to the penult by Doubling, that H must be underlyingly present on the SP *va-*.

The examples in (6.77) and (6.78) show that there are various tenses including main clause, subjunctive and subordinate forms of both positive and negative forms which have H on the subject prefix syllable.

The following examples in (6.79) show that there is a class of tenses which select the pattern of a L tone associated with the subject prefix.

(6.79) L-toned SP in absolute word-initial position:

- |       |                    |                              |
|-------|--------------------|------------------------------|
| (79a) | va-ndi-gúgúválífla | 'they kneeled for'           |
| (79b) | va-nku-guguvalífla | 'they are kneeling for'      |
| (79c) | va-guguvalífla     | 'that they are kneeling for' |
| (79d) | va-nda-gúgúvalífla | 'they will kneel for'        |
| (79e) | va-guguvalíflé     | 'let them kneel for'         |
| (79f) | va-ka-guguvalífla  | 'if they kneel for'          |
| (79g) | va-ka-guguvalíiile | 'if they do not kneel for'   |
| (79h) | va-guguvalídiile   | 'when they have kneeled for' |

The next data in (6.80) show that the L-toned SP also appears after a L-toned prefix either the negative prefix *a-* or the temporal prefix *pa-* 'when', which are underlyingly L.

(6.80) L-toned SP after prefixal L tone:

- |       |                     |                              |
|-------|---------------------|------------------------------|
| (80a) | a-va-na-gúgúvaliile | 'do not kneel for! (they)    |
| (80b) | a-va-gúgúválídiíle  | 'they did not kneel for'     |
| (80c) | a-va-guguvalidiíle  | 'they had not kneeled for'   |
| (80d) | a-va-si-guguvalííla | 'they were not kneeling for' |
| (80e) | a-va-na-guguvalííla | 'they do not kneel for'      |
| (80f) | a-va-guguvaliila    | 'they will not kneel for'    |
| (80g) | a-va-na-gúgúvaliile | 'let them not kneel for'     |
| (80h) | pa-va-guguvalidiíle | 'when they had kneeled for'  |

The data in (6.79) and (6.80) show that certain tenses including positive and negative forms of the main clause, subjunctive and subordinate tenses select a tone pattern where H is associated with a stem vowel and the subject prefix appears with a L tone.

The crucial data for determining the underlying tone of the subject prefix are those presented in (6.76), (6.79) and (6.80), where the subject prefix is not preceded by a H-toned prefix. However, the previous examples do not show whether H that appears on the prefix is underlyingly present or derived by a rule, so in the following discussion I begin motivating the underlying tone of the subject prefixes.

Shimakonde has various noun-class prefixes, and a table of all noun-class prefixes is provided in the nominal morphology. For every noun class, except locative, there is a distinct subject prefix. In classes 5, 7, 8, 9, 10, 11, 12, 13 and 14 the noun-class prefix and the SP are phonologically identical, but in some cases including classes 1, 2, 3, 4 and 6, the noun-class prefix has a different shape from the SP. The data in (6.81) list all subject prefixes of Shimakonde.

(6.81) Subject prefixes of Shimakonde:

=====

SP:

ni-	1 <sup>st</sup> person (sg)	cf. ní-ndí-guguvaliîla	'I had kneeled for'
tu-	1 <sup>st</sup> person (pl)	cf. tú-ndí-guguvaliîla	'we had kneeled for'
u-	2 <sup>nd</sup> person (sg.)	cf. ú-ndí-guguvaliîla	'you had kneeled for'
mu-	2 <sup>nd</sup> person (pl.)	cf. mú-ndí-guguvaliîla	'you had kneeled for'
a-	3 <sup>rd</sup> person (sg.)	cf. á-ndí-guguvaliîla	'(s)he had kneeled for'
va-	3 <sup>rd</sup> person (pl.)	cf. vá-ndí-guguvaliîla	'they had kneeled for'

SP	Noun class prefix		
u- (cl. 3 sg.)	(mu-)	cf. muú-ti	ú-ndípindikuûka 'the head had turned over'
vi- (cl. 4 pl.)	(mi-)	cf. mí-láandi	ví-ndípindikuûka 'the trees had turned over'
li- (cl. 5 sg.)	(li-)	cf. li-doôdo	lí-ndípindikuûka 'the leg had turned over'
a- (cl. 6 pl.)	(ma-)	cf. ma-doôdo	á-ndípindikuûka 'the legs had turned over'
shi- (cl. 7 sg.)	(shi-)	cf. shi-puûla	shí-ndípindikuûka 'the knife had turned over'
vi- (cl. 8 pl.)	(vi-)	cf. vi-puûla	ví-ndípindikuûka 'the knives had turned over'
i- (cl. 9 sg.)	(i-)	cf. í-ndífla	í-ndípindikuûka 'the road had turned over'
di- (cl. 10 pl.)	(di-)	cf. dí-mbúúdi	dí-ndíguguvaliîla 'the goats had kneeled for'
lu- (cl. 11 sg.)	(lu-)	cf. lu-ngaájo	lú-ndípindikuûka 'the foot print had turned over'
(cl. 10 pl.)	(di-)	cf. di-ngaájo	díndípindikuûka 'the feet prints had turned over'
ka- (cl. 12 sg.)	(ka-)	cf. ká-búúdi	ká-ndíguguvaliîla 'the small goat had kneeled for'
tu- (cl. 13 pl.)	(tu-)	cf. tú-búúdi	tú-ndíguguvaliîla 'the small goats had kneeled for'
u- (cl. 14 sg.)	(u-)	cf. ú-tútúúli	ú-ndípindikuûka 'the brain had turned over'
a-	(ma-)	cf. má-tútúúli	á-ndí-pindikuûka 'the brains had turned over'
			*má-tútúúli má-ndí-pindikuûka

The following examples in (6.82) include the remote past, present habitual, participial and the progressive relative negative which have a H tone on the subject prefix.

(6.82) Surface H toned subject prefixes:

a. Remote past (as in (76a):

vá-ndí-guguvalaniîla	'they had kneeled for each other'
ní-ndí-guguvaliîla	'I had kneeled for'
tú-ndí-guguvalaniîla	'we had kneeled for each other'
mú-ndí-guguvalaniîla	'you had kneeled for each other'
lí-ndí-guguvaliîla	'it (cl.5) had kneeled for'
shí-ndí-guguvaliîla	'it (cl.7) had kneeled for'
dí-ndí-guguvaliîla	'they (cl.10) had kneed for'

b. Present habitual (as in 76e):

vá-ndá-guguvalaniîla	'they kneel for each other'
ní-ndá-guguvaliîla	'I kneel for'
tú-ndá-guguvalaniîla	'we kneel for each other'
mú-ndá-guguvalaniîla	'you kneel for each other'
lí-ndá-guguvaliîla	'it (cl.5) kneel for'
shí-ndá-guguvaliîla	'it (cl.7) kneel for'
dí-ndá-guguvaliîla	'they (cl.10) kneel for'

c. Participial (as in 76i):

vá-gúgúvalaniila	'kneeling for each other (they)'
ngú-gúgúvaliila	'kneeling for (I)'
tú-gúgúvalaniila	'kneeling for each other (we)'
mú-gúgúvalaniila	'kneeling for each other (you)'
lí-gúgúvaliila	'kneeling for (cl.5)'
shí-gúgúvalaniila	'kneeling for each other (cl.7)'
dí-gúgúvalaniila	'kneeling for each other (cl.10)'

d. Present progressive relative negative (as in 76h):

vá-ká-guguvalaniila	'that they are not kneeling for each other'
ní-ká-guguvaliila	'that I am not kneeling for'
tú-ká-guguvalaniila	'that we are not kneeling for each other'
mú-ká-guguvalaniila	'that you are not kneeling for each other'
lí-ká-guguvaliila	'that it (cl.5) is not kneeling for'
shí-ká-guguvaliila	'that it (cl.7) is not kneeling for'
dí-ká-guguvalaniila	'that they (cl.10) are not kneeling for each other'

The following examples in (6.83) show the same subject prefixes given in (6.82), but instead of having a H tone they appear with L tone, since these tenses require that the prefix be H toned.

(6.83) Surface L toned subject prefixes:

a. Recent Past (as in 79a):

va-ndi-gúgúvalanífla	'they kneed for each other'
ni-ndi-gúgúvalífla	'I kneed for'
tu-ndi-gúgúvalanífla	'we kneeled for each other'
mu-ndi-gúgúvalanífla	'you kneeled for each other'
li-ndi-gúgúvalífla	'it (cl.5) kneeled for'
shi-ndi-gúgúvalífla	'it (cl.7) kneeled for'
vi-ndi-gúgúvalanífla	'they (cl.8) kneeled for each other'
di-ndi-gúgúvalanífla	'they (cl.10) kneeled for each other'

b. Present progressive (as in 79b):

va-nku-guguvalanífla	'they are kneeling for each other'
ni-nku-guguvalífla	'I am kneeling for each other'
tu-nku-guguvalanífla	'we are kneeling for each other'
mu-nku-guguvalanífla	'you are kneeling for each other'
li-nku-guguvalífla	'it (cl.5) is kneeling for'
shi-nku-guguvalífla	'it (cl.7) is kneeling for'
vi-nku-guguvalanífla	'they (cl.8) are kneeling for each other'
di-nku-guguvalanífla	'they (cl.10) are kneeling for each other'

c. Conditional (as 79f-79g):

va-ka-guguvalaniîla	'if they kneel for each other'
ni-ka-guguvaliîla	'if I kneel for'
tu-ka-guguvalaniîla	'if we kneel for each other'
mu-ka-guguvalaniîla	'if you kneel for each other'
li-ka-guguvaliîla	'if it (cl.5) kneel for'
shi-ka-guguvaliîla	'if it (cl.7) kneel for'
vi-ka-guguvalaniîla	'if they (cl.8) kneel for each other'
di-ka-guguvalaniîla	'if they (cl.10) kneel for each other'

The data in (6.82) - (6.83) show that the tone of the SP is dictated by the verb tenses, not any property of the prefixes such as noun class, person or number.

There is only one tense-aspect prefix *pa-* 'when', which patterns tonally with the SP in terms of its surface tone being dictated by the inflectional category of the verb. Due to tone similarities between the tense-prefix *pa-* and the SP, I will treat this tense-aspect marker together with the subject prefixes.

The recent past-when, the recent progressive-when and other tenses in (6.84) have a H tone on the prefix *pa-*, but in the remote past-when shown in (6.84c), the tense prefix *pa-* appears with a L tone. Consider the following examples in (6.84) below.

(6.84) Stem determined tone prefixes:

a. Recent past-when:

pá-gúgúválídiile	/pá-a-guguvalidile/	'when he kneeled for'
pá-vá-gúgúválídiile	/pá-va-guguvalidile/	'when they kneeled for'
pá-dí-pátíkídiile	/pá-di-patikidile/	'when they (cl.10) got stuck'
pá-tú-pátíkídiile	/pá-tu-patikidile/	'when we got stuck'

b. Present progressive-when:

pá-gúgúvaliila	/pá-a-guguvalila/	'when he is kneeling for'
pá-vá-gúgúvaliila	/pá-va-guguvalila/	'when they are kneeling for'
pá-lí-pátíkíila	/pá-li-patikila/	'when it (cl.5) is stuck'
pá-tú-pátíkíila	/pá-tu-patikila/	'when we are getting stuck'

c. Remote past-when:

pa- guguvalidiîle	/pa-a-guguvalidîle/	'when he had kneeled for'
pa-va-guguvalidiîle	/pa-va-guguvalidîle/	'when they had kneeled for'
pa-di-patikidiîle	/pa-di-patikidîle/	'when they (cl.10) had stuck'
pa-tu-patikidiîle	/pa-tu-patikidîle/	'when we had stuck'

The first example in each set of (6.84) comes from underlying /pa-a-guguval-/ , where there is a sequence of identical vowels and one of the vowel in the sequence gets deleted.

The prefix *pa-* usually has H, except in one tense, the remote past shown in (6.84c), where the prefix *pa-* has a L tone, because this tense requires no H on the tense-aspect prefix *pa-*. SP's are also L-toned after the negative low-toned prefix *a-*, as illustrated previously in (6.80). What this means is that the tone of the subject prefix is not phonologically predictable. Instead, tone is determined by the inflectional property of the tense-aspect.

### 6.2.2 The Tone of Tense-Aspect Prefixes

In Shimakonde, the inflectional category of the verbs is marked by segmental tense-prefixes, tone, or both. Before I examine the tone of the tense-aspect prefixes, I provide a list of tense-prefixes in (6.85).

(6.85) Tense-prefixes of Shimakonde:

Prefix	Possible environment	Illustration	Gloss
ku-	Infinitive	kú-gúgúváála	'to kneel'
-nku-	Present progressive	va-nku-gúgúváála	'they are kneeling'
-ndi-	Past tense	va-ndi-gúgúváála	'they kneeled'
-si-	Subordinate tenses	vá-sí-gúgúváála	'that they were kneeling'
a-	Negative	a-va-si-guguváála	'they were not kneeling'

-nda-	Future	va-nda-gúgúvaála	'they will kneel'
-na-	Negative	a-va-na-guguváála	'they do not kneel'
-ka-	Conditional	va-ka-guguvaâla	'if they kneel'
pa-	When-tenses	pá-gúgúvaala	'when he is kneeling'

The relation between the actual segmental form of the tense-aspect prefix and its semantics is not always clear. The tense-prefixes *a-* and *-ka-* have the semantic value of "negation" and "conditional", respectively, but there are various tenses in the language where negativity is marked tonally, and the prefix *a-* is absent. Consider the additional data in (6.86).

(6.86) TP and its semantics:

va-ka-guguvaâla		'if they kneel'
va-ka-tu-guguvalííla		'if they kneel on us'
va-ka-na-gúgúváála	~ va-ka-na-guguváála	'while not kneeling'
vá-ká-guguvaala		'that they are not kneeling'
vá-ká-tú-guguvaliila		'that they are not kneeling on us'
vá-ká-ná-gúgúváála	~ vá-ká-ná-guguváála	'that they do not kneel'
vá-ká-ná-tú-gúgúválííla	~ vá-ká-ná-tu-guguvalííla	'that they do not kneel on us'

The examples in (6.85) - (6.86) show that *ka-* shows up in conditional and negative tenses. This prefix is not even consistent, since it appears in conditional and negatives, but not all negatives include the *ka-* prefix. The prefix *a-* which appears before SP shows up consistently only in negatives, but not all negatives have this prefix.

The following examples in (6.87) show that the prefix *-na-* may occur in the present habitual negative, subjunctive negative and in the present habitual relative.

(6.87) Lack of semantic transparency of the tense-prefix:

- |                               |                     |                          |
|-------------------------------|---------------------|--------------------------|
| a. Present habitual negative: | a-va-na-guguvalííla | 'they do not kneel for'  |
| b. Subjunctive negative:      | a-va-na-gúgúvaliile | 'let them not kneel for' |
| c. Present habitual relative: | vá-ná-gúgúválííla   | 'that they kneel for'    |

What we see is that the same prefix may occur in different tenses with different semantic values, so there is no transparent relation between the prefix and the tense-aspect in which the prefix appears.

Based on surface tone, Shimakonde has three classes of TP's. First, there is one class with an underlying H tone, and that H can be detected by comparing shorter and longer verb stems. Second, there is a class of tense prefixes which have an underlying L tone. Finally, some tense-prefixes can be described as having either an underlying H or L tones, because one cannot be certain what the underlying tone is based on the surface tone.

The uncertainty of determining the underlying tone is because the prefix has a surface H, but that H could be underlying, or could come from spreading of an underlying preceding H.

I begin motivating the underlying H tone of the TP's in a context where the prefix appears with a H tone and there is no other H preceding it. Then, I examine the tense prefixes which have an underlying L tone. Finally I discuss the more complicated case of tense prefixes which surface with H after another prefix with a H tone.

#### **6.2.2.1 Underlying H Tone of Tense-Aspect Prefixes**

In Shimakonde only the TP's *-ndi-*, *-nda-* and *-na-* have underlying H which shows up on the prefix in certain contexts about to be discussed. The TP *-ndi-* is used in the recent past and remote past tenses and *-nda-* and *-na-* appear in the future and present habitual tenses. All the other TP's have an underlyingly L tone. The examples in (6.88) include the recent past positive and the future tenses, which have an underlying H on the tense prefixes.

(6.88) Underlying H toned TP:

a. Recent past:

va-ndí-paáta	'they got'
va-ndí-leéka	'they left'
va-ndí-liíma	'they cultivated'
va-ndí-juúgwa	'they requested'
va-ndi-tú-juúgwa	'they requested us'
va-ndi-tú-leéka	'they left us'

d. Future tense:

va-ndá-paáta	'they will get'
va-ndá-leéka	'they will leave'
va-ndá-liíma	'they will cultivate'
va-nda-tú-juúgwa	'they will request us'
va-nda-tú-leéka	'they will leave ua'

The tenses in (6.88) are tonally similar in terms of having an underlying H on the pre-stem TP *-ndi-* and *-nda-*, and that H shows up on the prefix before a H toned syllable, where the prefix H cannot shift as it does if the target syllable is L.

We know from the previous sections that shift of the prefix H does not target a H toned syllable, and H does not target the penult by Doubling. So, the H that appears in the penult in (6.88) is assigned by an independent rule and the reason why H appears on the prefix vowel is because shift is blocked by the following H.

The next examples in (6.89) show that in stems where the penult H is lacking, the prefix H of the recent past and future tenses appears on the root-initial vowel, and the prefixes have a L tone.

(6.89) Prefixal H shift:

va-ndi-lóombwa	* va-ndí-loombwa	'they got married'
va-ndi-lóodya	* va-ndí-loodya	'they showed up'
va-nda-lóombwa	* va-ndá-loombwa	'they will marry'
va-nda-lóodya	* va-ndá-loodya	'they will show up'

We see that pre-stem prefixes are L and there is H on the stem-initial syllable, which happens to be the penult. The pattern seen in (6.89) derives from H shift, which moves H from the TP to the next syllable. These data also show that it is not a position in the word which blocks H shift from targeting the penult syllable. Instead, it is the actual location of H which blocks shift from targeting the following syllable.

The underlying H of the prefixes *-ndi-* and *-nda-* regularly shows up in the next syllable in CVCVCV stems due to tone shift. This tone mobility makes the H-toned prefixes appear with a L tone as seen in (6.90).

(6.90) Prefixal H shift in CVCVCV stems:

va-ndi-pímiíla	'they measured for'
cf. va-ndí-piíma	'they measured'
va-ndi-táleéka	'they cooked'
cf. va-ndí-paáta	'they got'
va-nda-pímiíla	'they will measure for'
cf. va-nda-paáta	'they will get'
va-nda-táleéka	'they will cook'

It is a factual observation that in Shimakonde all tenses involving *-ndi-* and *-nda-* prefixes have L-initial tone in the penult. To explain the data in (6.89) – (6.90) I assume that there is H on the TP's *-ndi-*, *-nda-* and that H appears on the prefix when shift is blocked. However, the prefix H moves from the prefix to the stem-initial syllable if shift is not blocked.

Additional data of prefixal H shift is seen in (6.91), where longer stems are considered. These examples show that it is tone shift which makes the underlying H of the TP not show up on the prefix.



(6.91) Prefix-to-stem shift:

va-ndi-lékániíla	'they left for each other'
va-ndi-pímániíla	'they measured for each other'
va-nda-lékániíla	'they will leave for each other'
va-nda-pímániíla	'they will measure for each other'
va-nda-gúgúvalaánga ~ va-nda-gúgúválaánga	'they will kneel repeatedly'
va-nda-gúgúvaliíla ~ va-nda-gúgúváliíla	'they will kneel for'

We can see that longer stems have the option of applying Doubling or UUS. For the moment I will only focus on the issue of prefixal tone and in turn to the problem of tone optionality in the next section.

The next data in (6.92) show that if the prefixes *-ndi-* and *-nda-* appear after a H toned SP prefix, the H remains on the prefix.

(6.92) H toned TP after H prefix:

vá-ndí-piíma	'they had measured'
vá-ndí-tú-piíma	'they had measured us'
vá-ndí-pimaniíla ~ vá-ndí-pímániíla	'they had measured for each other'
vá-ndá-leêka	'they leave'

vá-ndá-tú-leêka		'they leave us'
vá-ndá-lekaniîla	~ vá-ndá-lékániîla	'they leave for each other'
vá-ndá-pimaniîla	~ vá-ndá-pímániîla	'they measure for each other'

It is impossible to tell whether the TP's in (6.92) are underlyingly H or they get H from the preceding syllable. One other TP which has an underlying H is the prefix *na-* which shows up with H if the prefix is in the penult as in (6.93).

(6.93) H toned TP –na-:

ava-naâ-lye	'let them not eat'
ava-naâ-ñe	'let them not defecate'
ava-naâ-gwe	'let them not fall down'

The underlying H of the TP is realized as a rise-fall in the penult due to a later rule. The penult H in (6.93) cannot derive from spreading since the target syllable would be in the penult. Anyhow, spreading would imply that the H should still be associated to its underlying source.

The following examples in (6.94) show that if the stem is CVCV or longer, the underlying H of the TP appears on the following vowel due to prefixal shift. Recall that shift does not care about the penult, so there is no tone blocking from targeting the penult.

(6.94) H shift form *-na-* to the stem-initial vowel:

ava-na-páate	'let them not get'
ava-na-píite	'let them not pass'
ava-na-tóolye	'let them not care about'
ava-na-lóole	'let them not look at'
ava-na-límiile	'let them not cultivate for'
ava-na-límániile	'let them not cultivate for each other'
ava-na-gúgúválníile	'let them not kneel for each other'

The examples in (6.94) show that the prefix *-na-* has L due to tone shift. Following the same general pattern, if H gets to the stem vowel by spreading is subject to Doubling and UUS.

The following examples in (6.95) show that if an OP is included within the macro-stem, the prefix *-na-* still shows up with a L tone, because shift will put the prefix H on the OP. As seen previously, the H of the OP is blocked from undergoing Doubling from the prefix to the stem vowel.

(6.95) Underlying H of prefix –na- and shift:

ava-na-tú-pimiile	'let them not measure for us'
ava-na-tú-limiile	'let them not cultivate for us'
ava-na-vá-guguvaliile	'let them not kneel for them'

Furthermore, compare *ava-tu-pímiidiile* from *lavá-tu-pimidiilel* 'they did not measure for us' with *avana-tú-pimiile* from *lavaná-tu-pimiilel* 'let them not measure for us'. In the former case, the H shifts from the SP to the stem-initial syllable, as happens with H's that originate on the SP. In the latter case, H only shifts to the OP, since the H originates from the TP –ná- and not the SP. In certain tenses like the future tense, the prefix –nda- optionally alternates with the prefix -na- as in (6.96).

(6.96) -nda- ~ -na- alternation:

a.	va-ndaâ-gwa	~ va-naâ-gwa	'they will fall down'
	va-ndaâ-ña	~ va-naâ-ña	'they will defecate'
	va-ndaâ-lya	~ va-naâ-lya	'they will eat'
b.	ava-náá-twa	*ava-ndáá-twa	'they do not pound'
	ava-náá-ña	*ava-ndáá-ña	'they do not defecate'
	ava-náá-lya	*ava-ndáá-lya	'they do not eat'

The conclusion is that in Shimakonde, some TP's have an underlying H, and that H may or may not appear on the prefix due to an independent tone rules which move H from its original source.

### 6.2.2.2 Underlying L tone of Tense-Aspect Prefixes

In Shimakonde, there is one other class of TP's with underlying L. This class includes the prefixes *a-*, *-ka-*, *-si-* and *-nku-* which may attach to the verb stem individually or in combination with other prefixes. I begin describing the tone pattern of the TP *-nku-* and then focus on the remaining prefixes.

The following examples in (6.97) show that the prefixes *-nku-* appears with H before CV stems, but this same prefix has L before CVCV or longer stems.

(6.97) Prefixal H in CV stems:

- |    |                  |                    |                                   |
|----|------------------|--------------------|-----------------------------------|
| a. | va-nkúú-twa      |                    | 'they are pounding                |
|    | va-nkúú-lya      |                    | 'they are eating'                 |
|    | va-nkúú-pa       |                    | 'they are giving'                 |
| b. | va-nku-pííma     |                    | 'they are measuring'              |
|    | va-nku-pimííla   | ~ va-nku-pímííla   | 'they are measuring for'          |
|    | va-nkú-lekanííla | ~ va-nku-lékánííla | 'they are leaving for each other' |

What we see is that the TP's *-nku-* has H in (6.97a), but the same prefix shows up with a L tone in (6.97b). One major tonal characteristic of these tenses is the presence of a level penult H. In this respect this pattern differs tonally from the pattern seen in (6.90) – (6.94), where there is L-initial in the penult.

There are two ways of explaining the pattern of tone prefixes in (6.97). One way is to assume that this prefix has H and that H shifts to the next syllable, but prefixal H does not target the final syllable due to Non-Finality. This restriction explains why the examples in (6.97a) have H on the TP prefix. Under this assumption, the optional pattern with a single H in the penult in CVCVCVCV stems can be explained by an independent rule which delinks H, and that rule should apply after UUS.

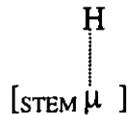
Another way of explaining the tone pattern of prefixes in (6.97) is to say that these prefixes are L toned. The reason why there is H on the prefix in (6.97) is because the prefix happens to be in the penult, where generally H goes. Under this assumption, the optional pattern with multiple level H's can be explained by saying that another independent rule optionally inserts H at the beginning of the stem, and that stem-initial H undergoes rightward spreading. The rule that inserts H to the stem is formalized in (6.98).

(6.98) Stem H Insertion:

$$\emptyset \rightarrow H / [ \text{STEM} \_ ]$$

The H inserted by the rule in (6.98) is mapped to the proper mora by tone mapping rule given in (6.99). In Shimakonde, the stem H is generally mapped onto the penult syllable.

(6.99) Stem Mapping:



In Shimakonde, there are some tenses like the present habitual negative (cf. 6.100a), present progressive (cf. (6.100b), imperfective progressive negative (cf. 6.100c), past progressive relative negative (cf. 6.100d) and present habitual relative negative (cf. 6.100e) which specifically require that a H be inserted at the beginning of the stem.

(6.100) Stem-initial H Insertion:

a. Present habitual negative:

avana-pimííla ~ avana-pímííla 'they do not measure for'

avana-pimanííla ~ avana-pímánííla 'they do not measure for each other'

b. Present progressive positive:

vanku-pimííla ~ vanku-pímííla 'they are measuring for'

va-ku-pimanííla ~ vanku-pímánííla 'they are measuring for each other'

c. Imperfective progressive negative:

ava-si-pimííla ~ avasi-pímííla 'they were not measuring for'

avasi-pimanííla ~ avasi-pímánííla 'they were not measuring for each other'

d. Past progressive relative negative:

vákási-pimíífla ~ vákasi-pímíífla 'that they were not measuring for'

vákási-pimaníífla ~ vákási-pímáníífla 'that they were not measuring for each other'

e. Present habitual relative negative:

vákána-pimíífla ~ vákána-pímíífla 'that they do not measure for'

vákána-pimaníífla ~ vákána-pímáníífla 'that they do not measure for each other'

One last point to be made is that the TP's *-ndi-* and *-nda-* seen previously differ tonally from the prefixes *-nku-* before CVC stems. Specifically, the prefixes *-ndi-* and *-nda-* always have H tone before H in CVC stems as in *va-ndí-paáka* 'they got' or *va-ndá-paáta* 'they will get', so *\*[va-ndi-paáka]* and *\*[va-nda-paáta]* are ungrammatical, because the underlying H prefix cannot be deleted and that H is not subject to tone shift, since shift does not target a H toned syllable. The examples of (6.97b) show that the prefixes *-nku-* appears with L before CVC as in *va-nku-pííma* 'they are measuring', so *\*va-nkú-pííma* and *\*va-nkú-piima* are not a possible outcomes in the language.

Recall from (6.63)-(6.64) that the pattern involving multiple H's and a single H in the penult can also be explained by assuming that all these tenses have stem-initial H and that H undergoes obligatory UUS. An independent tone rule delinks H at the left edge of the stem. In Shimakonde, there is no case of a single level H mapped to both moras of the penult without involving stem-initial H.

Although the discussion about the relation between surface tone distribution and the length of the stem is presented in the next section, I point out that the H which appears on TP *-nku-* before CV stems like *va-nkúú-pa* 'they are giving' is assigned to the stem by tense-sensitive rules, but that H is mapped on the prefix which happens to be the penult, because Non-Finality prevents the final vowel of the stem to get H. This fact explains why the underlyingly L toned TP *-nku-* surfaces with a H tone in CV stems.

The class of TP's with underlying L tone also includes the prefixes *a-*, *-ka-*, and *-si-*. The following examples in (6.101) show that the prefix *-ka-* in the conditional, the prefix *-si-* in the imperative progressive negative and the negative *a-* show up with a L tone, because they are underlyingly L.

(6.101) Underlying tone of prefixes *-ka-*, *-si-*, and *a-*.

a. Conditional:

<i>va-ka-guguvalaniíla</i>	'if they kneel for each other'
<i>ni-ka-guguvaliíla</i>	'if I kneel for'
<i>tu-ka-guguvalaniíla</i>	'if we kneel for each other'
<i>mu-ka-guguvalaniíla</i>	'if you kneel for each other'

b. Imperfective progressive negative:

a-va-si-guguvalanífla	~	a-va-si-gúgúválánífla	'they were not kneeling for e. o.'
a-tu-si-guguvalanífla	~	a-tu-si-gúgúválánífla	'we were not kneeling for e. o.'
a-mu-si-guguvalanífla	~	a-mu-si-gúgúválánífla	'you were not kneeling for e. o.'

The following examples in (6.102) show that if the L toned TP *-ka-* and *-si-* follow a prefix which has an underlying H tone, they also surface with H tone due to Doubling. The negative prefix *a-* never appears after another prefix word-internally, because it always appears in the absolute word-initial position.

(6.102) Underlying tone of prefixes *-ka-* and *-si-* after H:

a. Present progressive relative:

váká-guguvaliila	/váká-guguvaala/	'that they are not kneeling for'
váká-guguvalaniila	/váká-guguvalaniila/	'that they are not kneeling for e. o.'

b. Suggestive:

vákándí-guguvaliífla	/vákándí-guguvalífla/	'they should kneel for'
vákándí-guguvalanífla	/vákándí-guguvalanífla/	'they should kneel for each other'

c. Past progressive relative negative:

vá-ká-si-guguvalífla	/vá-ka-si-guguvalanífla/	'that they were not kneeling for'
vá-ká-sí-guguvalanífla	/vá-ka-si-guguvalanífla/	'that they were not kneeling for e. o.'
~ vá-ká-sí-gúgúválánífla	=	

vá-ká-sí-tu-guguvalífla /vá-ka-si-tu-guguvalífla/ 'that they were not kneeling on'  
 ~ vá-ká-sí-tú-gúgúválífla =

The examples in (6.102) show that the H of the first prefix syllable gets to the following prefix vowel by Doubling. In (6.102c) optionally the H of the prefix spreads to all prefix vowels by UUS applied to prefix domain. The L toned prefix *-ka-* never gets H from Doubling before CV stems due to avoidance of penult H as seen in (6.103).

(6.103) Avoid penult H in CV stems:

a. CV stems

vá-kaa-lya 'that they are not eating'

ví-kaa-pa 'that they are not giving'

vá-kaa-ña 'that they are not defecating'

b. CVCV stems:

cf. vá-ká-liima 'that they are not cultivating'

cf. vá-ká-puuta 'that they are not washing'

cf. vá-ká-teepa 'that they are not bending'

Thus even in tenses where the underlying L toned prefix is preceded by H, still there is evidence that the prefix *-ka-* is underlyingly L. Consider the data in (6.104), where Doubling seems to target the prefix *-si-* despite being in the penult.

(6.104) The tone of the prefix *-si-* in CV stems:

a. CV stems:

vá-síí-lyá 'that they were eating'

vá-síí-ñá 'that they were defecating'

vá-síí-gwá 'that they were falling down'

b. CVCV stems:

cf. vá-síí-lííma 'that they were cultivating'

cf. vá-síí-púúta 'that they were washing'

cf. vá-síí-téépa 'that they were bending'

The CV stems in (6.104a) have H on the subject prefix *va-* and there is also another H on the tense prefix *-si-* which happens to be the penult. The CVCV stems in (6.100b) show the same tone pattern where there is H on the penult and all syllables that precede the penult. The explanation for the tone pattern in (6.104) is that the subordinate tense has a sequence of underlying two H's, one being assigned to the penult and another H associated with the subject prefix, so *vá-síí-lííma* derives from */vá-si-líma/* 'that they were cultivating', a context where there is obligatory Doubling.

The CV stems thus do not provide an example of Doubling, where the prefix *-si-* happens to be the penult, where Doubling does not apply. The prefix *-si-* in *vá-síí-lyá* 'that they were eating' gets H from the stem tone mapping rule, because the final vowel of the stem is virtually invisible for tone rules.

The analysis developed here makes the correct prediction about the underlying tone of the prefixes in the language. Specifically, the TP's *-ka-* and *-si-* will only surface with a H tone if a H toned syllable precedes these morphemes and one never expect to find these prefixes with a H tone before low toned syllables.

### 6.3 Different Tone Patterns on the Penult as Determined by Tense

This section examines various tense-sensitive rules which specifically assign a H tone to the penult. The major question is how to account for the tone contrast in the penult, specifically rising and rise-fall tones. In Shimakonde, only LH rising and LHL rise-fall appear in the penult of a verb stem, and the contour tones may or may not be preceded by a H tone.

Falling HL tone also appears on the penult, but the penult fall derives from spreading H from the left edge to the right edge of the stem, so one never finds falling tone in verb stems without involving other tone processes. Finally, there is a fall-rise tone at the phonetic level when there is vowel fusion. Thus, it is predictable that verb stems assign H to the penult, but it is impossible to predict whether the penult H is going to be realized as rising or rise-fall, just based on phonetic criteria.

There are two major assumptions about the tone system of Shimakonde. First, verb stems do not have underlying tone contrast and a H tone that appears on the surface is assigned by a rule in (6.98) repeated in (6.105) below.

(6.105)             $\emptyset \rightarrow H / [_{STEM} \text{ — } ]$             H-Insertion:

Second, the penult contour tones found in verb stems are derived by interacting factors, specifically Stem Mapping rule and stress-induced lengthening. In the subsequent pages I provide a list of all tenses illustrating the penult tone contrast and develop an analysis accounting for the tone patterns on the penult.

I begin examining the class of verbs which have a surface LHL rise-fall in the penult. The penult rise-fall is seen in (6.106).

**(6.106) Penult LHL rise-fall**

**(106a) Remote past negative:**

ava-nĩĩle	'they had not defecated'
avi-peêle	'they had not give'
ava-pimiĩle	'they had not measured'
ava-pimidiĩle	'they had not measured for'
ava-guguvaleênge	'they had not kneeled repeatedly'

**(106b) Conditional positive:**

vakaâ-nã	'if they defecate'
vikaâ-pa	'if they give'
vaka-piĩma	'if they measure'
vaka-pimiĩla	'if they measure for'
vaka-guguvalaânga	'if they kneel repeatedly'

(106c) Remote past perfective-when positive:

pava-ñiîle		'when they had defecated'
pavi-peêle		'when they had given'
pava-pimiîle		'when they had measured'
pava-pimidiîle		'when they had measured for'
pava-guguvaleênge		'when they had kneeled repeatedly.'

(106d) Remote past positive:

vándíi-ña	~ vándii-ña	'they had defecated'
víndíi-pa	~ vándii-pa	'they had given'
vándí-piîma		'they had measured'
vándí-pimiîla	~ vándí-pímiîla	'they had measured for'
vándí-guguvalaânga	~ vándí-gúgúvalaânga	'they had kneeled repeatedly'

(106e) Present habitual positive:

vándáa-ña	~ vándaa-ña	'they defecate'
víndáa-pa	~ víndaa-pa	'they give'
vándá-piîma		'they measure'
vándá-pimiîla	~ vándá-pímiîla	'they measure for'
vándá-guguvalaânga	~ vándá-gúgúvalaânga	'hey kneel repeatedly'

(106f) Present progressive relative positive:

vaâ-ña		'that they are eating'
vaâ-pa		'that they are giving'
va-piîma		'that they are measuring'
va-pimiîla		'that they are measuring for'
va-guguvalaânga		'that they are kneeling repeatedly.'

(106g) Imperfective progressive positive:

vásíndáa-ña	~ vásíndaa-ña	'they were defecating'
vísíndáa-pa	~ vísíndaa-pa	'they were giving'
vásíndá-piîma		'they were measuring'
vásíndá-pimiîla	~ vásíndá-pímiîla	'they were measuring for'
vásíndá-guguvalaânga	~ vásíndá-gúgúvalaânga	'they were kneeling repeat.'

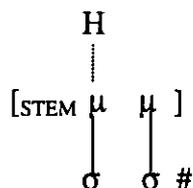
(106h) Suggestive positive:

vákándí-ña	~ vákándii-ña	'they should defecate'
vákándí-pa	~ vákándii-pa	'they should give'
vákándí-piîma		'they should measure'
vákándí-pimiîla	~ vákándí-pímiîla	'they should measure for'
vákándí-guguvalaânga	~ vákándí-gúgúvalaânga	'they should kneel repeatedly'

The examples in (6.106) include all tenses with a surface penult rise-fall in the language. One observation about these data is that CV and CVC stems are tonally problematic in terms of surface tone distribution, since they do not always pattern tonally the same with the analogous longer stems. One other observation about these data is that if there is a single rise-fall on the penult, and there is no H before the rise-fall at the left edge of the stem, the rise-fall appears as such.

If there is H at the left edge of the verb preceding the penult rise-fall, then both the penult rise-fall and the preceding H appear on the surface, and the H assigned to the left edge of the stem is subject to spreading. The assumption about the penult rise-fall that appears in the inflectional stems in (6.106) is that these tenses get H inserted into the stem by a Primary Stem H-Insertion rule. The H inserted into the stem is mapped onto the penult by a Stem Mapping Rule, which specifically puts the H tone on the penult syllable as seen in (6.107). The rule only maps the tone to the first mora of the penult in these specific tenses.

(6.107) Penult Stem Mapping:

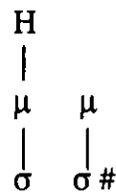




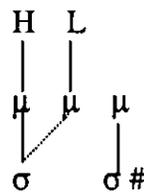
The mechanism of having LHL in a bimoraic syllable can be explained in a very simple way. First, there is H assignment to the penult like in *guguvalánga* 'kneel'. Then, by applying penult lengthening after H assignment we get a falling tone as in *guguvaláanga*. Finally, there is another rule which puts a L tone in any penult fall, giving a rise-fall. The derivation of the penult LHL is seen in the representation in (6.109).

(6.109) Penult H-to-LHL Change:

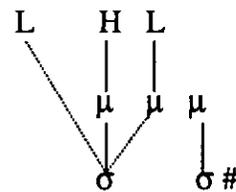
a. Input for LHL:



b. Lengthening:



c. Penult fall L Insertion:



As can see, the rule creating the penult LHL rise-fall in (6.109) adds a L at the beginning, since the second L would be already present, because this rule applies only to HL penults. It should be clarified that on the surface, LHL rise-fall is tonally contrastive with level H, HL falling and LH rising as seen in (6.110). Rise-fall can be preceded by both H and L tones.

(6.110) Penult tone contrast:

Penult rising LH:	pimiíla	'measure for!'
Penult rise-fall LHL after L:	vaka-pimiíla	'if they measure for'
Penult rise-fall LHL after H:	vándá-piíma	'they measure'
Penult falling HL:	vashíndá-pímya	'they were causing to measure'
Penult level H:	avana-pííma	'they do not measure'
Level L:	ava-pimiíla	'they will not measure for'

The basis for this tone contrast will become clear throughout this analysis when the discussion about penult tone contrast covers all the relevant data.

We shall see that further tense-sensitive tone rules also may assign H to the penult in a later phonological stage, but that H assigned to the penult in a later stage is never realized as rise-fall, instead it appears as a rising tone. Also H's which shift from a prefix to the penult surface as falling tone, not rise-fall.

The rule that creates the penult rise-fall affects a large number of verbs in Shimakonde as seen in (6.111).

(6.111) Verbs with penult rise-fall:

(111a) Remote past negative:

ava-lííle	'they had not eaten'
ava-pimidiíle	'they had not measure for'

ava-tu-guguvadiîdye		'they had not caused us to kneel for'
(111b) Remote past positive:		
vândí-piîma		'they had measured'
vândí-pimiîla	~ vândí-pímiîla	'they had measured for'
(111c) Conditional positive:		
vaka-piîma		'if they measure'
vaka-pimiîla		'if they measure for'
aka-tu-guguvadiîdya		'if they cause us to kneel for'
(111d) Present habitual:		
vándá-piîma		'they measure'
vándá-pimiîla	~ vándá-pímiîla	'they measure for'
(111e) Remote past perfective-when positive:		
pava-liîle		'when they had eaten'
pava-pimiîle		'when they had measured'
pava-tu-guguvadiîdye		'when they had caused us to kneel'
(111f) Imperfective progressive positive:		
vásíndá-piîma		'they were measuring'
vásíndá-pimiîla	~ vásíndá-pímiîla	'they were measuring for'
(111g) Present progressive relative:		
va-piîma		'that they are measuring'
va-pimiîla		'that they are measuring for'

va-tu-guguvadiîdya 'that they are causing us to kneel for'

(112h) Suggestive positive:

vákándí-piîma 'they should measure'

vákándí-pimiîla ~ vákándí-pímiîla 'they should measure for'

vákándí-tú-guguvadiidya 'they should cause us to kneel for'

The second class of inflectional stems found in Shimakonde includes six tenses which have a LH rising tone in the penult. Stems with penult LH tone are seen in (6.112).

(6.112) Penult LH rising tone:

(112a) Imperative positive:

ñaa 'defecate!'

paa 'give!'

piîma 'measure!'

pimiîla 'measure for!'

guguvalaánga 'kneel repeatedly!'

(112b) Recent past positive:

vandiî-ñaa 'they defecated'

vandiî-pa 'they gave'

vandí-piîma 'they measured'

vandi-pímiîla 'they measured for'

vandi-gúgúvalaánga ~ vandi-gúgúválaánga 'they kneeled for repeatedly.'

(112c) Future positive:

vandaâ-nã	'they will defecate'
vindaâ-pa	'they will give'
vandá-píma	'they will measure'
va-nda-pímiíla	'they will measure for'
vanda-gúgúvalaánga ~ vanda-gúgúválaánga	'they will kneel repeatedly'

(112d) Recent past negative:

avá-nííle	'they did not defecate'
aví-peéle	'they did give'
ava-pímiíle	'they did not measure'
ava-pímídiíle	'they did not measure for'
ava-gúgúvalidiíle ~ ava-gúgúválídiíle	'they did not kneel for'

(112e) Recent past perfective-when negative:

páváká-nííle	'when they did not defecate'
pávíká-peéle	'when they did give'
páváká-pimiíle	'when they did not measure'
páváká-pimidiíle	'when they did not measure for'
páváká-guguvaleéngé	'when they did not kneel repeatedly'

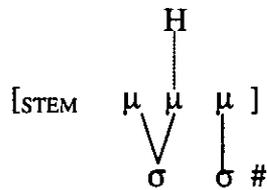
(112f) Subjunctive positive:

vaa-ñé	'let them defecate'
vii-pé	'let them give'
va-pííme	'let them measure'
va-pimifíle	'let them measure for'
va-guguvalangifíle	'let them kneel for repeatedly.'

We see that CV stems of (6.112) do not pattern tonally the same as the analogous longer stems, because the stem vowel also happens to be word-final, which has tone restrictions. There is only one exception in the language, namely the subjunctive (112f), where there is a stem-final H in a CV stem. The underlying H of the prefix is realized as rise-fall in CV stems, when the prefix is a penult syllable. Again, the only exception is when the CV stems include the subjunctive positive.

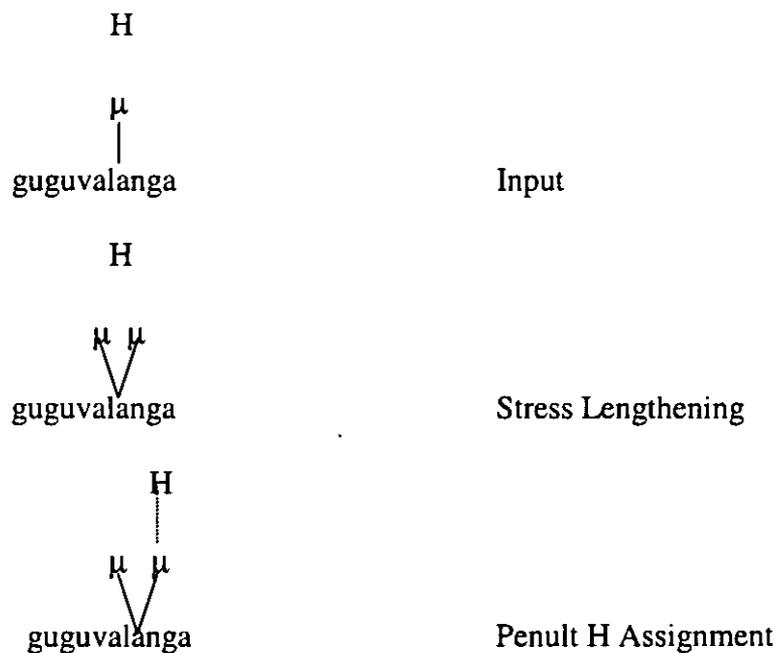
The tenses in (6.112) reflect two independent rules. First, the stress-lengthening rule creates a long vowel in the penult by inserting an additional mora and that rule precedes the stem tone mapping rule which targets the penult. In case of penult rise tone, the stem mapping rule which generally puts H on the penult will associate H with the right edge of the penult syllable by a specific rule referred to as Penult H Mapping rule formalized in (6.113).

(6.113) Penult H Assignment:



The derivations in (6.114) show the correct output in the imperative by mapping the H tone to the penult after stress-induced lengthening.

(6.114)



We can see that the penult rise derives from crucially ordering stress-lengthening before this penult H mapping rule.

The next examples in (6.115) include seven tenses which have a penult level H which optionally alternates with multiple level H tones. In Shimakonde, a single level H never appears on the penult without involving tone alternations with multiple H tones.

(6.115) Penult level H:

(115a) Present habitual negative:

avanáá-ña		'they do not defecate'
avináá-pa		'they do not give'
avana-pííma		'they do not measure'
avana-pímííla	~ avana-pímííla	'they do not measure for'
avana-guguvaláánga	~ avana-gúgúváláánga	'they do not kneel repeatedly'

(115b) Present progressive positive:

vankúú-lya		'they are eating'
vanku-pííma		'they are measuring'
va-nku-pímanííla	~ vanku-pímánííla	'they are measuring for'
vanku-guguvaláánga	~ vanku-gúgúváláánga	'they are kneeling repeatedly'

(115c) Participial/Gerund negative:

vakanáá-lya		'not eating'
vakana-pííma		'not measuring'
vakana-pímííla	~ vakana-pímííla	'not measuring for'
vakana-guguvaláánga	~ vakana-gúgúváláánga	'not kneeling repeatedly'

(115d) Imperfective progressive negative:

avasíí-lya		'they were not eating'
avasi-pííma		'they were not measuring'

avasi-pimííla ~ avasi-pímííla 'they were not measuring for'  
 avasi-guguvaláánga ~ avasi-gúgúváláánga 'they were not kneeling repeat.'

(115e) Past progressive relative negative:

vákásíí-lyá 'that they were not eating'  
 vákási-pííma ~ vákási-pííma 'that they were not measuring'  
 vákási-pimííla ~ vákási-pímííla 'that they were not measuring for'  
 vákási-guguvaláánga ~ vákási-gúgúváláánga 'that they were not kneeling repeatedly'

(115f) Present habitual-when negative:

pávákáná-pííma 'when they do not measure'  
 pávákáná-pimanííla ~ pávákáná-pímánííla 'when they do not measure for'  
 pávákáná-guguvaláánga ~ pávákáná-gúgúváláánga 'when they do not kneel repeat.'

(115g) Present habitual relative negative:

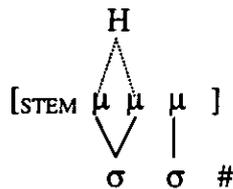
vákána-pííma ~ vákáná-pííma 'that they do not measure'  
 vákána-pimííla ~ vákáná-pímííla 'that they do not measure for'  
 vákáná-guguvaláánga ~ vákáná-gúgúváláánga 'that they do not kneel repeat.'

We see that CV stems have H on the prefix, because only one H can appear on the penult, since the stem-final vowel is excluded. In CVCV there is a H tone on the penult. In CVCVCV or longer stems there are two options.

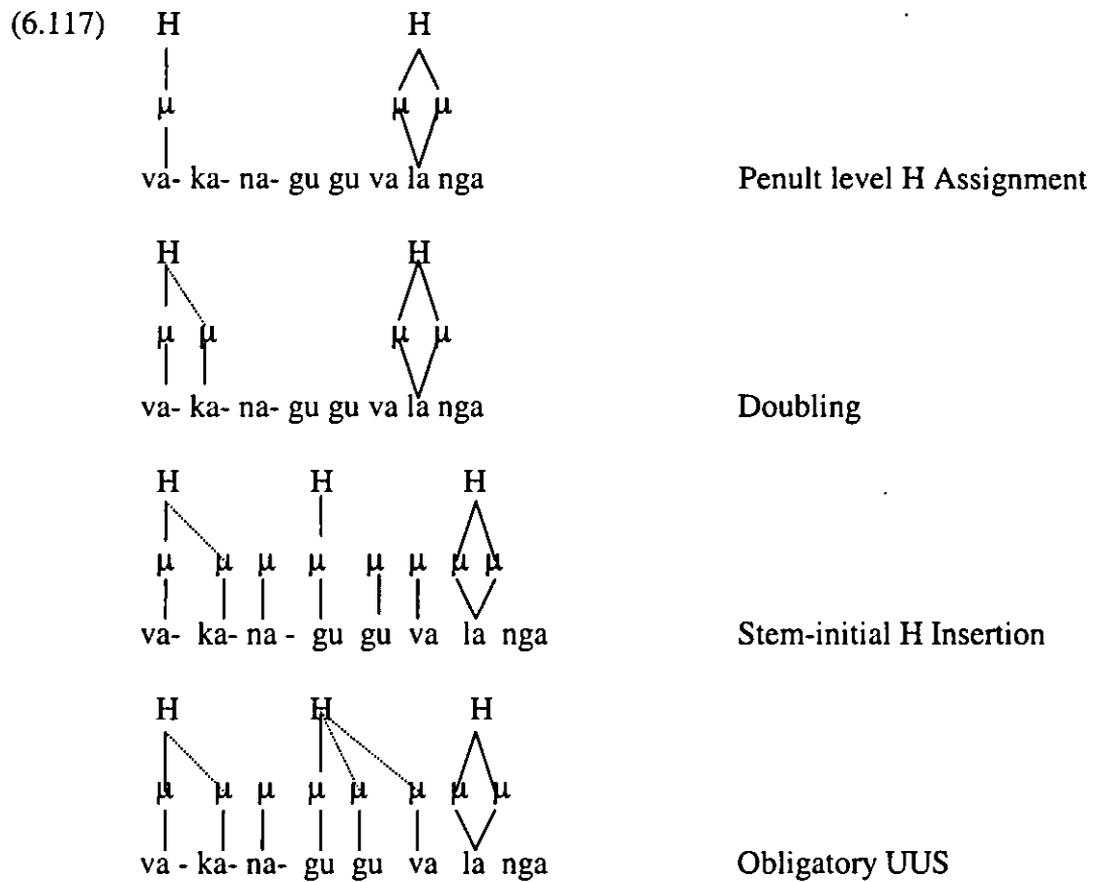
One option seen in the first column shows that all stem vowels have L except the penult, which has H. This pattern can be explained by assuming a rule which delinks H at the left edge of the stem and that rule should apply after spreading. Alternatively, it is possible also to assume that the pattern with a single H in the penult is due to lack of the stem-initial H which is optional.

The second column shows another option where all syllables of the stem have H, because there is H inserted at the beginning of the stem and that stem-initial H is subject to obligatory UUS. Since UUS does not target the penult syllable, the H that appears on the penult derives from an independent tone rule which inserts H into the stem and is later mapped to both moras of the penult syllable. This rule should apply after stress-induced lengthening. The rule which associates H to both moras of the penult is seen in (6.116).

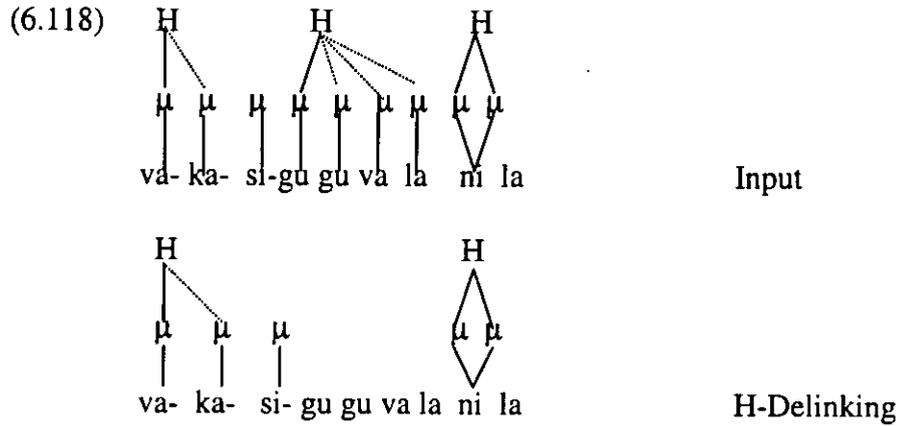
(6.116) Penult Level H Assignment:



Given the rule in (6.116), the surface form like *vá-ká-ná-gúgúváláánga* derives from */vá-ka-na-gúguvalánga/*, where the prefix *-ka-* gets H by Doubling. UUS explains why all prefixes show up with a level H. Furthermore, the stem-initial H undergoes obligatory UUS giving H on the stem vowels as shown in the relevant derivations in (6.117).



Note that I have also assumed the possibility that the pattern with multiple H's in the stem derive from obligatory UUS. Then an independent rule delinks the H's at the left edge of the stem giving *vákási-guguvaláánga* 'that they were not kneeling repeatedly'. Under this assumption a H-deletion rule would be optional and the rule targets any H at the left edge of the stem as shown in the relevant derivations in (6.118).



The representation in (6.118) shows that surface form derived from UUS feeds into H-delinking, so in order to get the correct surface form, H-delinking from the left edge of the stem should apply after UUS. This analysis predicts correctly that applying UUS only within the verb stem as in *va-ka-na-gúgúváláánga*, H-delinking will derive optional forms in which there is no H at the left edge of the stem, so the correct output for the participial *va-ka-na-guguvaláánga* 'not kneeling' is derived.

The following examples in (6.119) include five other tenses which have multiple H's. On the surface, these examples differ tonally from the previous examples in (6.115). Specifically, the tenses in (6.119) have multiple level H's just like the second option of (6.115), but H delinking from the left edge of the stem is totally prohibited, so there is no option with a single H on the penult. Contrast the data in (6.115) with (6.119) below.

(6.119) Multiple level H's:

(119a) Infinitive:

kú-pííma		'to measure'
kú-pímííla	* kú-pimííla	'to measure for'
kú-gúgúváláánga	* kú-guguvaláánga	'to kneel repeatedly'
kú-tú-guguvalííla		'to kneel on us'

(119b) Past progressive relative:

vásí-pííma		'that they were measuring'
vásí-pímííla	* vásí-pimííla	'that they were measuring for'
vásí-gúgúváláánga	* vásí-guguvaláánga	'that they were kneeling repeatedly'
vásí-tú-gúgúválííla		'that they were kneeling on us'

(119c) Present habitual relative positive:

váná-pííma		'that they measure'
váná-pímííla	* váná-pimííla	'that they measure for'
váná-gúgúváláánga	* váná-guguvaláánga	'that they kneel repeatedly'
váná-tú-gúgúválííla		'that they kneel on us'

(119d) Imperfective-when positive:

pávásí-pííma		'when they were measuring'
pávásí-pímííla	* pávásí-pimííla	'when they were measuring for'
pávásí-gúgúváláánga	* pávásí-guguvaláánga	'when they were kneeling repeatedly'
pá-vá-sí-tú-gúgúválííla		'when they were kneeling on us'

(119e) Present habitual-when positive:

páváná-pííma		'when they measure'
páváná-pímííla	* pá-vá-ná-pimííla	'when they measure for'
páváná-gúgúváláánga	* pá-vá-ná-guguvaláánga	'when they kneel repeat.'
páváná-tú-gúgúválííla		'when they kneel on us'

Excluding the last example involving the macro-stem of the infinitive in (6.119a), all stems of (6.119) have multiple H's, and there is no option of having a single H in the penult. The tone of the infinitive involves tone complication to be discussed later.

To explain the pattern of multiple H's of (6.119) I assume that these examples have an underlying H assigned to the penult syllable and also another H at the left edge of the stem and the initial H undergoes obligatory UUS. The question that needs to be addressed is why H deletion from the left edge of the stem does not apply. The reason why there is no H delinking from the left edge of the stem is because there is no option with a L tone on the last prefix vowel, since all pre-stem prefix syllables have a H tone in these examples. I will also assume that the assignment of the stem-initial H is obligatory for these tenses.

The next examples in (6.120) show that in certain tenses there is H assigned to the first prefix of the verb and that H gets into the stem by Doubling or by UUS. Optionally, the H that gets into the stem is also subject to Doubling or UUS. Consider the data in (6.120) below.

(6.120) Word-initial H assignment:

(120a) Recent past perfective-when positive:

pává-líile		'when they ate'
pává-pímiile		'when they measured'
pává-pímídiile		'when they measured for'
pává-gúgúvalaniidiile	~ pává-gúgúválánídiile	'when they kneeled for each other'

(120b) Participial positive:

vá-píima		'(they) measuring'
vá-pímiila		'(they) measuring for'
vá-gúgúvaliila	~ vá-gúgúváliila	'(they) kneeling for'
vá-tú-gúgúvaliila	~ vá-tú-gúgúváliila	'(they) kneeling on us'

(120c) Suggestive negative:

vákáná-piime	~ vákáná-píime	'they should not measure'
vákáná-pimiile	~ vákáná-pímiile	'they should not measure for'
vákáná-guguvalaange	~ vákáná-gúgúvalaange	'they should not kneel repeatedly'
	~ vákáná-gúgúválaange	=

(120d) Present positive-when positive:

pává-píima		'when they are measuring'
pává-pímiila		'when they are measuring for'
pává-gúgúvalaanga	~ pává-gúgúválaanga	'when they are kneeling repeatedly'

The crucial data is seen in *pává-liile* 'when they ate' (120a), where a CVCV stem has falling tone in the penult. This fact shows that the penult H is inserted by the Stem-Initial H Insertion and not derived from Doubling, because Doubling would not spread that H to the penult.

The last class of tenses found in Shimakonde includes three tenses which have multiple L/toneless vowels, because the rule that inserts H into the verb stem simply fails to apply in certain tenses shown in (6.121).

(6.121) Multiple level L's:

(121a) Future negative:

ava-piima	'they will not measure'
ava-pimiila	'they will not measure for'
ava-guguvalaanga	'they will not kneel repeatedly'

(121b) Conditional negative:

vaka-piime	'if they do not measure'
vaka-pimiile	'if they do not measure for'
va-ka-guguvalaange	'if they do not kneel repeatedly'

(121c) Perfective-when positive:

va-pimiile	'when they have measured'
va-pimidiile	'when they have measured for'
va-guguvaleenge	'when they have kneeled repeatedly'

The examples in (6.121) further motivate the claim that verb stems have no underlying tone contrast; instead the H that appears on verb stems is inserted by a rule. Given that only few tenses fail to undergo the Stem H-Insertion rule in Shimakonde, it is reasonable to state that Stem H-Insertion rule is very general in the language and the tenses in (6.121) should be treated as exceptions.

The conclusion of this section is that Shimakonde has a few general tone rules which specifically target the stem. There is a Stem H-Insertion rule which assigns H to the verb stem. There are stem mapping rules which put H on the appropriate mora within the stem. Certain tenses require that two H's be assigned to the stem, one H being assigned to the right edge of the stem and another H being assigned to the left edge of the stem. Finally, there are tenses which have H in the stem syllables and that H derives from application of tone rules which moves the prefix H to the stem syllables.

#### **6.4 The Effect of a Stem-final Glide on Tone**

In Shimakonde, certain tenses do not follow the general patterns of spreading and tone assignment discussed previously. In this section I describe the effect of penult or stem-final glides on tone distribution. We shall see that the surface make-up of the penult tone depends on whether the penult or stem-final consonant is a glide or a plain consonant.

Stems ending in a glide are irregular in terms of tone distribution not because of the glide, but because the glide derives from a vowel. So it is the vowel-final stem which triggers tone complications in verbs. In the following discussion I will use the generic term stem-final glide to refer to both penult and stem-final glides.

#### 6.4.1 The Effect of a Stem-final Glide on LH Rising Tone

There are two surface generalizations about the relation between C-final stems and glide-final stems in terms of tone. First, if in some tense the stem has a penult LH, that stem is L if it ends in a glide. Second, if the C-final stem has LH rise and also a H tone at the left edge of the stem, the penult rising tone changes to a L tone and only the stem-initial H appears with subsequent tone spreading. The following examples in (6.122) include all tenses of Shimakonde which present penult tone alternation as a result of C-stem final vs. stem-final glide.

(6.122) Penult LH rising tone:

##### C-stem final

##### Glide-stem final

(122a) Imperative positive:

paáta	'get!'	patiiya	'cause to get'
piíta	'pass!'	piishya	'cause to pass!'
piíma	'measure!'	pimiiya	'cause to measure directly!'

pimiíla	'measure for!'	pimiidya	'cause to measure indirectly!'
guguvalaánga	'kneel repeat!'	guguvaadya	'cause to kneel!'

(122b) Recent past positive:

vandí-pííta	'they passed'	vandi-píishya	'they caused to pass'
vandí-pííma	'they measured'	vandi-píímya	'they caused to measure'
vandi-píimiíla	'they measured for'	vandi-píimiidya	'they caused to measure'
vandi-gúgúváliíla	'they kneeled for'	vandi-gúgúvaadya	'they caused to kneel'

(122c) Future positive:

vandá-pííta	'they will pass'	vanda-píisha	'they will cause to pass'
vandá-pííma	'they will measure'	vanda-píímya	'they will sell'
vanda-píimiíla	'they will measure for'	vanda-píimiidya	'they will cause to measure'
vanda-gúgúváliíla	'they will kneel for'	vanda-gúgúvaadya	'they will cause to kneel'

(122d) Subjunctive:

va-pííte	'let them pass'	va-píishyé	'let them cause to pass'
va-píimiíle	'let them measure for'	va-píimiishyé	'let them cause to measure'
va-guguvalangiíle	'let them kneel for repeat.'	va-guguvaadyé	'let them cause to kneel'

The examples in (6.122a) show that if the plain consonant stem-final has a LH rising tone and there is no H preceding the penult tone, that stem is L/toneless if it ends in a glide.

The tenses in (6.122b) - (6.122c) show that if the C-final stem has a penult LH rising tone and there is also a H at the left edge of the stem, the penult rising tone becomes L if the stem ends in a glide, but the stem-initial H appears on the surface with subsequent spreading.

The subjunctive data in (6.122d) show another tone complication. This tense has a LH rise on the penult in a C-final stem and we would expect that rise to become a L tone in a glide final stem in the same fashion as in (6.122a), but that does not happen. Instead the penult rise becomes L and there is H on the final vowel if the stem ends in a glide. Note that the H that appears in the root-initial vowel in (6.122) derives from prefix-to-stem H shift a process motivated previously.

The following examples in (6.123) show a class of tenses with a penult rise and also another H at the left edge of the stem, but there is no interaction between tone and stem-final glides.

(6.123) Lack of effect of stem-final glides on tone:

(123a) Recent past negative:

**C-stem final:**

avá-ñiíle	'they did not defecate'
avá-piíle	'they did not burn'
ava-pítííle	'they did not pass'
ava-pímídííle	'they did not measure for'



What (6.123a) shows is that prefix-to-stem tone shift also applies from the subject prefix *-va-* to the stem-initial vowel. However, stems ending in a glide in (6.123a) differ tonally from those stems ending in a glide in (6.122b) -(6.122c). Specifically, the stem-initial H of (6.122) prevents the stem from having a rise tone in the penult in stems ending in a glide, but the stem-initial H in (6.123a) does not prevent the stem from having the penult rise tone and the question is why.

The relevant inflectional factor is whether the stem has the perfective suffix. Specifically, the loss of penult H due to glides does not happen in perfective stems.

#### **6.4.2 The Effect of a Stem-final Glide on LHL rise-fall Tone**

The effect of final glides is also observed on stems with penult LHL rise-fall. There are two major generalizations about LHL tone. First, C-final stem and stem final glides are tonally similar if there is a penult LHL and there is no H preceding it. In that case the penult rise-fall appears as such. Second, in case there is H preceding the penult LHL rise-fall, there are two patterns. In C-final stems both the rise-fall and the preceding H appear on the surface and the H assigned to the left edge is subject to spreading. If the stem ends in a glide, the rise-fall does not show up and only the preceding H appears on the surface.

The following examples in (6.124) show that there is tone difference between C-final stem and stem final glide in case the level H precedes the rise-fall.

(6.124) Penult LHL rise-fall:

(124a) Remote past positive:

**C-final stem**

vándí-piîta		'they had passed'
vándí-laâla		'they had slept'
vándí-pîmiîla	~ vándí-pimiîla	'they had measured for'
vándí-gúgúvaâla	~ vándí-guguvaâla	'they had kneed'
vándí-tú-guguvaliîla		'they had kneeled on us'

**Glide-stem final**

vándí-pîishya	~ vándí-piishya	'they had caused to pass'
vándí-láadya	~ vándí-laadya	'they had caused to sleep'
vándí-pîmiiya	~ vándí-pimiiya	'they had caused to measure'
vándí-gúgúvaadya	~ vándí-guguvaadya	'they had caused to kneel'
vándí-tú-guguvadiidya		'they had caused us to kneel for'

(124b) Present habitual positive:

**C-final stem**

vándá-piîta		'they pass'
vándá-pîmiîla	~ vándá-pimiîla	'they measure'
vándá-gúgúvaliîla	~ vándá-guguvaliîla	'they kneel for'
vándá-tú-guguvaliîla		'they kneel on us'

### **Glide-stem final**

vándá-píishya	~ vándá-piishya	'they cause to pass'
vándá-pímiiya	~ vándá-pimiiya	'they cause to measure'
vándá-gúguvaadya	~ vándá-guguvaadya	'they cause to kneel'
vándá-tú-guguvadiidya		'they cause us to kneel for'

(124c) Imperfective progressive positive:

### **C-final stem**

vásíndá-piîta		'they were passing'
vásíndá-pímiîla	~ vásíndá-pimiîla	'they were measuring for'
vásíndá-gúguvalaânga	~ vásíndá-guguvalaânga	'they were kneeling repeatedly.'
vásíndá-tú-guguvaliîla		'they were kneeling on us'

### **Glide-stem final**

vásíndá-píishya	~ vásíndá-piishya	'they were causing to pass'
vásíndá-pímiiya	~ vásíndá-pimiiya	'they were causing to measure'
vásíndá-gúguvaadya	~ vásíndá-guguvaadya	'they were causing to kneel'
vásíndá-tú-guguvadiidya		'they were causing us to kneel for'

(124d) Suggestive positive:

**C-final stem**

vákándí-piîta		'they should pass'
vákándí-pímiîla	~ vákándí-pimiîla	'they should measure for'
vákándí-gúgúvalaânga	~ vákándí-guguvalaânga	'they should kneel repeatedly'
vákándí-tú-gugualiîla		'they should kneel on us'

**Glide-stem final**

vákándí-píishya	~ vákándí-piishya	'they should cause to pass'
vákándí-pímíidiya	~ vákándí-pimidiya	'they should cause to measure for'
vákándí-gúgúvádyana	~ vákándí-guguvadyana	'they should cause to e. o. to kneel'
vákándí-tú-guguvadiiya		'they should cause us to kneel for'

The tenses in (6.124) show that if there is a H tone preceding the penult LHL rise-fall, both tones appear on the surface in stems ending in a plain consonant. If the stem ends in a glide, the penult rise-fall becomes L and only the preceding H appears on the surface, which spreads within the prefix and from the prefix into the stem vowels. The inclusion of an OP within the macro-stem prevents H from targeting the stem vowels.

The next examples in (6.125) include tenses which only have LHL on the penult, but there is no H preceding it. These examples show that C-final stems and glide-final stems are tonally similar, since the penult rise-fall appears as such in both C-final and glide-stem final.

(6.125) Penult LHL:

(125a) Present progressive relative positive:

**C-final stem**

va-piîta	'that they are passing'
va-pimiîla	'that they are measuring for'
va-guguvalaânga	'that they are kneeling repeat.'
va-tu-guguvaliîla	'that they are kneeling on us'

**Glide-stem final**

va-piîshya	'that they are causing to pass'
va-pimiîya	'that they are causing to measure'
va-guguvaâdya	'that they are causing to kneel'
va-tu-guguvadiîdya	'that they are causing us to kneel for'

(125b) Remote past negative:

**C-final stem**

ava-piîle	'they had not burned'
ava-pitiîle	'they had not passed'
ava-pimidiîle	'they had not measured for'
ava-guguvaleênge	'they had not kneeled repeatedly'
ava-tu-guguvalidiîle	'they had not kneeled on us'

**Glide-stem final**

ava-pishiîdye	'they had not caused to fall down'
ava-shulushiîdye	'they had not sold'
ava-guguvadiîdye	'they had not cause to kneel for'
ava-tu-guguvadiîdye	'they had not caused us to kneel for'

(125c) Conditional:

**C-final stem**

vakaâ-nâ	'if they defecate'
vakaâ-pa	'if they give'
vaka-pîta	'if they pass'
vaka-pimiîla	'if they measure for'
vaka-guguvalaânga	'if they kneel repeatedly'
vaka-tu-guguvaliîla	'if they kneel on us'

**Glide-stem final**

vakaâ-gwa	'if they fall down'
vakaâ-pya	'if they burn'
vaka-pîshya	'if they cause to pass'
vaka-pimiîya	'if they to measure'
vaka-guguvadiîdya	'if they cause to kneel for'
vaka-tu-guguvadiîdya	'if they cause us to kneel for'

(125d) Remote past perfective-when positive:

**C-final stem**

pava-ñiîle	'when they had defecated'
pava-piîle	'when they had burned'
pava-pitiîle	'when they had passed'
pava-pimidiîle	'when they had measured for'
pava-guguvaleênge	'when they had kneeled repeatedly.'
pava-tu-guguvalidiîle	'when they had kneeled on us'

**Glide-stem final**

pava-gwiîle	'when they had fallen down'
pava-pyeênge	'when they had burned'
pava-pishiîdye	'when they had caused to pass'
pava-guguvadiîdye	'when they had caused to kneel for'
pava-tu-guguvadiîdye	'when they had caused us to kneel for'

One crucial observation about the data in (6.125) is that all tenses have penult rise-fall and we see that there is no tone contrast between stems ending in a plain consonant and those stems ending in a glide. So, the question is why we do not get tone change in (6.126). These tenses do not alternate tonally because there is no H at the left edge of the stem and the lack of H prevents the penult rise-fall from disappearing.

The examples in (6.124) – (6.125) show that stems ending in a glide are tonally inconsistent in Shimakonde. To explain the tone inconsistency of stem-final glides, I first assume that glides are underlyingly vowels and they result from surface syllabification due to Glide Formation, which triggers tone adjustment. Second, I posit that the tonology of Shimakonde is not directly sensitive to a consonant-glide dichotomy, instead only prosodic properties are the relevant ones. However, treating glides as coming from vowels predicts that H would be associated with the penult mora, which ends up not being a tone-bearer on the surface.

Thus, glides have an inconsistent prosodic status in the language and this fact leads to the problematic tonal pattern of the stem-final glides. The complexity of tone patterns also derives from interacting tone rules and tone restrictions such as spreading and positional tone avoidance and tone restrictions dictated by the inflectional category of the verb. Liphola and Odden (2000) present an analysis which attempts to account for the tone pattern of stem-final glides, though now it becomes clear that the facts involving tone and stem-final glides are more complicated.

#### **6.4.3 The Effect of a Stem-final Glide on level H**

In Shimakonde, stem-final glides have no effect on the tone of stems in tenses with penult level H. The following examples in (6.126) show that the C-final stems and stem-final glides are tonally similar.

(6.126) Lack of effect of stem-final glide on level H:

(126a) Present habitual negative:

**C-final stem**

avana-pííta		'they do not pass'
avana-pímííla	~ avana-pimííla	'they do not measure for'
avana-gúgúváláánga	~ avana-guguvaláánga	'they do not kneel repeatedly'
avana-tu-gúgúválííla	~ avana-tu-guguvalííla	'they do not kneel on us'

**Glide-stem final**

avana-pííshya		'they do not cause to pass'
avana-pímííya	~ avana-pimííya	'they do not cause to measure'
avana-gúgúváádyá	~ avana-guguváádyá	'they do not cause to kneel'

(126b) Participial negative:

**C-final stem**

vakana-pííta		'if they do not pass'
vakana-pímííla	~ vakana-pimííla	'if they do not measure for'
vakana-tu-gúgúválííla	~ vakana-tu-guguvalííla	'if they do not kneel on us'

**Glide-stem final**

vakana-pííshya		'if they do not cause to pass'
vakana-pímííya	~ vakana-pimííya	'if they do not cause to measure'
vakana-gúgúvádyáána	~ vakana-guguvadyáána	'if they do not cause e. o. to kneel'

(126c) Imperfective progressive negative:

**C-final stem**

avasi-pííta		'they were not passing'
avasi-pímííla	~ avasi-pimííla	'they were not measuring for'
avasi-tu-gúgúváiíla	~ avasi-tu-guguvalííla	'they were not kneeling on us'

**Glide-stem final**

avasi-pííshya		'they were not causing to pass'
avasi-pímííya	~ avasi-pimííya	'they were not causing to measure'
avasi-gúgúváiídyá	~ avasi-guguvadíídyá	'they were not causing to kneel for'

(126d) Past progressive relative negative:

**C-final stem**

vákási-pííta	~ vákási-pííta	'that they were not passing'
vákási-pímííla	~ vákási-pimííla	'that they were not measuring for'

**Glide-stem final**

vákási-pííshya	~ vákási-pííshya	'that they were not causing to pass'
vákási-pímííya	~ vákási-pimííya	'that they were not causing to measure'
vákási-gúgúváiídyá	~ vákási-guguváiídyá	'that they were not causing to kneel'

(126e) Present habitual relative negative:

**C-final stem**

váná-pííma	'that they measure'
váná-pímííla	'that they measure for'
váná-tú-gúgúválííla	'that they kneel on us'

**Glide-stem final**

váná-pííshya	'that they cause to pass'
váná-pímííya	'that they cause to measure'
váná-gúgúvadyáána	'that they cause e. o. to kneel'
váná-tú-gúgúvadíídyá	'that they cause us to kneel for'

The tenses in (6.126) show the pattern where there is H on the penult and also another H at the beginning of the stem. Because a sequence of two H's triggers obligatory UUS, there is one option where UUS is obligatory as seen in the first column. There is another option in which H delinks from the left edge of the stem.

**6.5 The Effect of Length of the Stem on Tone**

One other conditioning factor for tone distribution is the length of the stem. I begin illustrating this fact in the recent past and future positive, where a H tone is generally assigned to the tense-prefix *-ndi-* and *-nda-*, respectively, and that H undergoes tone shift. Consider the following examples in (6.127).

(6.127 The effect of length of the stem on tone:

(127a) Recent past:

<b>CVCV stems</b>		<b>CV stems</b>	
vi-ndí-pííta	'they passed'	cf. vi-ndiî-pa	'they gave'
va-ndí-paáka	'they painted'	cf. va-ndiî-ña	'they defecated'
va-ndí-leéka	'they left'	cf. va-ndiî-gwa	'they felt'
va-ndí-laámba	'they licked'	cf. va-ndiî-lya	'they ate'

(127b) Future positive:

va-ndá-ñeéla	'they will defecate for'	cf. va-ndaâ-ña	'they will defecate'
vi-ndá-pííta	'they will pass'	cf. vi-ndaâ-pa	'they will give'
va-ndá-lyeéla	'they will eat for'	cf. va-ndaâ-lya	'they will eat'

We see that CV stems have LHL rise-fall in the penult, while CVCV stems have a rising tone in the penult. A similar tone alternation involving CV and CVCV stems is found in the conditional tense, which has a L toned prefix *-ka-* before CVCV stems, but the prefix appears with a LHL rise-fall before CV stems as shown in (6.128).

(6.128) Conditional:

**CVCV stems**

va-ka-ñeêla

'if they defecate for'

vi-ka-piîta

'if they pass'

va-ka-lyeêla

'if they eat for'

**CV stems**

cf. va-kaâ-ña 'if they defecate'

cf. vi-kaâ-pa 'if they give'

cf. va-kaâ-lya 'if they eat'

We know from the previous sections that the TP *-ka-* is underlyingly L, so the question is why these prefixes get LHL rise-fall before CV stems. There is a simple explanation for this tone difference between CVCV and CV stems. We have seen that Shimakonde has a general tone principle which says that every H assigned at the beginning of the penult changes to a rise-fall. Because Non-finality prevents the final vowel of the stem from getting H, that H appears on the prefix *-ka-* which happens to be in the penult.

The conclusion is that the surface tone distribution is also dictated by the length of the stem. Certain tone processes such as spreading may be blocked because there is no mora available to actually map a H tone.

## 6.6 The Tone of the Infinitive

One other tone complication found in Shimakonde relates to the pattern of the infinitive, which seems not to follow the tone patterns discussed so far. At the surface, verbs in the infinitive have multiple level H's as seen in (129).

(6.129) Infinitive:

kúú-lya		'to eat'
kúú-pa		'to give'
kú-pááta		'to get'
kú-gúgúváála	*kú-gúgúvaala	'to kneel'
kú-gúgúváláánga	*kú-gúgúváalaanga	'to kneel repeatedly.'
kú-kálámólángííla	*kú-kálámolangííla	'to cough for each other repeatedly'
kú-túmbílikánííla	*kú-túmbílikanííla	'to persuade for each other'

I posit that that multiple level H's in the infinitive derive from spreading of the prefixal H which is followed by another H assigned to the penult, since this is the context where obligatory UUS should apply. The CV and CVC stems do not provide evidence for the existence of a sequence of two underlying H's and they also do not show tone spreading, because the H tone appears on the prefix which happens to be in penult position.

The following examples in (6.130) show that if an object prefix is added to the macro-stem of the infinitive, there is a rising tone in the penult and a H appears on the infinitive prefix and another H on the object prefix. The H that appears on the object prefix can be explained by Doubling.

(6.130) Infinitive stem after an object prefix:

kú-tuu-lya		'to eat us'
kú-tuu-dya		'to ask us'
kú-tuu-pa	~ kú-tuú-pa	'to give us'
kú-tú-paáta		'to get us'
kú-tú-guguvalangiíla		'to kneel for us repeatedly'
kú-tú-kalamolangiíla		'to cough for us repeatedly'
kú-vá-tumbilikiíla		'to persuade for them'
kú-vá-guguvalangiíla		'to kneel for them repeatedly'
kú-vá-guguvadyaanga		'to cause them to kneel repeatedly'
kú-tú-guguvadyangiídyá		'to cause us to kneel for repeatedly'

The stem vowels do not get H by Doubling because Doubling from the OP to the stem vowel is blocked. There are two observations about the tone pattern in (6.130). First, CV stems show that Doubling does not target the penult L toned OP due to avoid penult H, so *\*kú-túú-lya* is not a possible outcome.

The second observation is that the infinitive is sensitive to a stem-final glide, since the penult rise tone does not appear in case the stem ends in a glide. The problem is that when an object prefix is added to the macro-stem of other tenses which otherwise pattern tonally the same with the regular infinitive, they do not behave tonally the same as the infinitive does. These tenses have no rising tone in the penultimate syllable, instead multiple H tones appear on the surface, patterning together with the stems which do not have an OP. Compare the following examples in (6.131), where stems have multiple level H's. In (6.131a) an OP is not included within the macro-stem, but the tenses of (6.131b) have an OP.

(6.131) The effect of an OP on tone:

a. Stem without an object prefix:

váná-gúgúválánífla	'that they kneel for each other'
pávásí-gúgúválánífla	'when they were kneeling for e. o.'
páváná-gúgúválánífla	'when they kneel for each other'
pávákáná-gúgúváláánga	'when they do not kneel repeatedly'

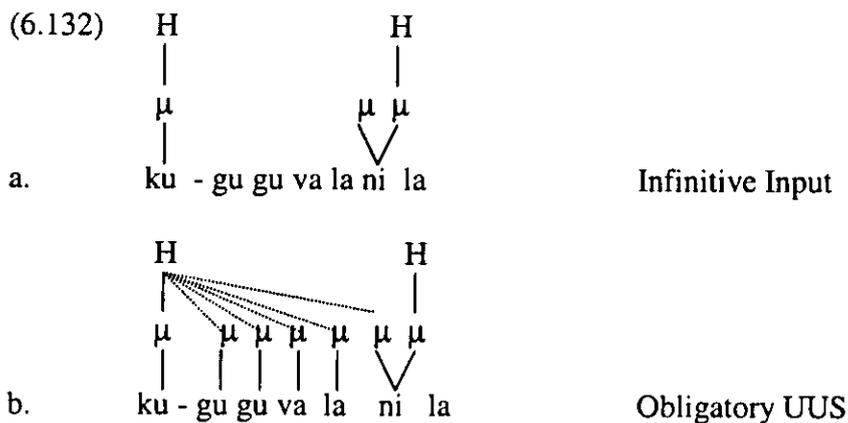
b. Stem after an OP:

váná-tú-gúgúválífla	'that they kneel for us'
pávásí-tú-gúgúválífla	'when they were kneeling for us'
páváná-tú-gúgúválífla	'when they kneel for us'
pávákáná-tú-gúgúválífla	'when they do not kneel for us'

While the tone of the verb stems in the infinitive is sensitive to the inclusion of an OP in the macro-stem, the presence of an OP does not affect the tone pattern in (6.131).

The assumption is that if the tenses in (6.131) were tonally similar to the infinitive, we would expect H to appear on the prefixes and a rise tone in the penult, and that never happens. The question is why the infinitive verb stems behave tonally different?

The answer is that the tone of the infinitive verb stems is more complicated, because it has an underlying rising tone in the penult, which does not show up unless an OP is included in the macro-stem. The infinitive verb stems lacking an OP apply obligatory UUS even though UUS should be optional in this phonological context, as seen in derivations in (6.132).



The derivation in (132b) shows that what makes the regular infinitive verb stem be more complicated tonally is the fact that UUS is obligatory even when the penult has a L-initial tone, a context where UUS is otherwise optional.

The expected optionality is overruled just when the infinitive prefix immediately precedes the stem, that is, when there is no object prefix. Another diagnostic for the underlying rising tone of the infinitive is the lack of H tone with the stem-final glides. The basic tonal facts about stem-final glides can be stated as follows. First, if the stem penult tone is rise, and there is no H preceding the penult tone. The corresponding glide-final stems have no tone at all as we can see (6.133).

(6.133) C-final stems:		Glide-final stems:	
loómba	'marry!'	cf. loombwa	'be married!'
guguvaála	'kneel!'	cf. guguvaadya	'make kneel!'
tumbilikiíla	'persuade for!'	cf. tumbilikiigwa	'be persuaded!'

If the stem has a rise-fall in the penult and it is preceded by a H tone on the prefix, there is no rise-fall in the corresponding glide-final stem. The preceding H tone of the prefix undergoes optional spreading as shown in the present habitual positive tense in (6.134).

(6.134) C-final stems:		Glide-final stems:	
vándá-liíma	'they cultivate'	cf. vándá-liimya	'they cause to cultivate'
vándá-taleêka	'they cook'	cf. vándá-talakeedyá	'they cause to cook'

~ vándá-táleêka	=	cf. ~ vándá-tálákeedya	=
vándá-guguvaâla	'they kneel'	cf. vándá-guguvaadya	'they cause to kneel'
~ vándá-gúgúvaâla	=	cf. ~ vándá-gúgúvaadya	=

Recall that the penult rise-fall delinking in glide-final stem only affects certain tenses, since that penult rise-fall shows up in the stem-final glide of the conditional as in (6.135).

(6.135) C-final stems

Glide-final stems:

va-ka-liîma	'if they cultivate'	cf. va-ka-liîmya	'if they cause to cultivate'
va-ka-taleêka	'if they cook'	cf. va-ka-talakeêdya	'if they cause to cook'
va-ka-guguvaâla	'if they kneel'	cf. va-ka-guguvaâdya	'if they cause to kneel'

Finally, the examples in (6.136) include CVCV stems in the infinitive ending in a plain consonant and in a stem-final glide, where we see changes in the tone pattern.

(6.136) CVCV-final stems:

CVCGV-final stems:

kú-lííma	'to cultivate'	cf. kú-líímya	'to cause to cultivate'
kú-jááma	'to open a mouth'	cf. kú-jáámya	'to make open a mouth'
kú-lóóla	'to look at'	cf. kú-lóodya	'to point out'
kú-tú-loóla	'to look at us'	cf. kú-tú-loodya	'to point out to us'
kú-tú-viíka	'to put us'	cf. kú-tú-viinya	'to make us dance'

The examples of (6.136) show that if the stem ends in a plain consonant and bears a penult level H, the corresponding infinitive glide-final stem have a falling tone. If there is a penult rise tone in stems ending in a plain consonant, it changes to L/toneless in stem-final glides.

The examples in (6.134) – (6.136) show that glide-final stems actually do behave tonally different from C-final stems. The tone irregularity of the stems in the infinitive is expected, because the infinitive belongs to a class of noun category (class 15), so I hypothesize that the tonal irregularity of the infinitive is due to the fact that nouns differ tonally with the verb stems. The irregularity can however, be reduced to the fact that the infinitive has a rising tone which exceptionally undergoes obligatory UUS when the prefix *kú-* precedes the stem.

One other tense which patterns tonally the same with the infinitive is the present progressive positive, which involves a level H and that H is affected by stem-final glide as seen in (6.137).

(6.137) Present progressive positive:

**C-stem final**

vanku-pííta		'they are passing'
vanku-pímííla	~ vanku-pimííla	'they are measuring for'
vanku-tú-guguvalííla		'they are kneeling on us'

### **Glide-stem final**

vanku-píshya	'they are causing to pass'
vanku-pímíiya	'they are causing to measure'
vanku-gúgúváyaaana	'they are causing each other to kneel'
vanku-tú-guguvadiidya	'they are causing us to kneel for'

The data in (6.137) pattern tonally the same with the stems ending in a glide. There is a historical explanation for the tone anomaly of the present progressive positive. Historically, this tense is derived from something like "I am to cultivate" or "they are to cause to cultivate". Thus the tone anomaly of this tense can be treated as the same type of tone anomaly of the infinitive. The conclusion is that the inflectional categories of the verbs are the conditioning factor for blocking of penult tone adjustment after the Glide Formation in certain tenses.

### **6.7 The Tone of the Subjunctive**

Verb stems of the subjunctive represent a special complication. This section shows that exceptionally stems in the subjunctive have H on a word-final vowel. Underlyingly, the H that appears in the final syllable of the subjunctive is assigned to the penult, but the penult H may appear on the final mora, due to interaction between tonal and syllabic phonology. Thus, the subjunctive is the only tense which violates the Non-finality principle.

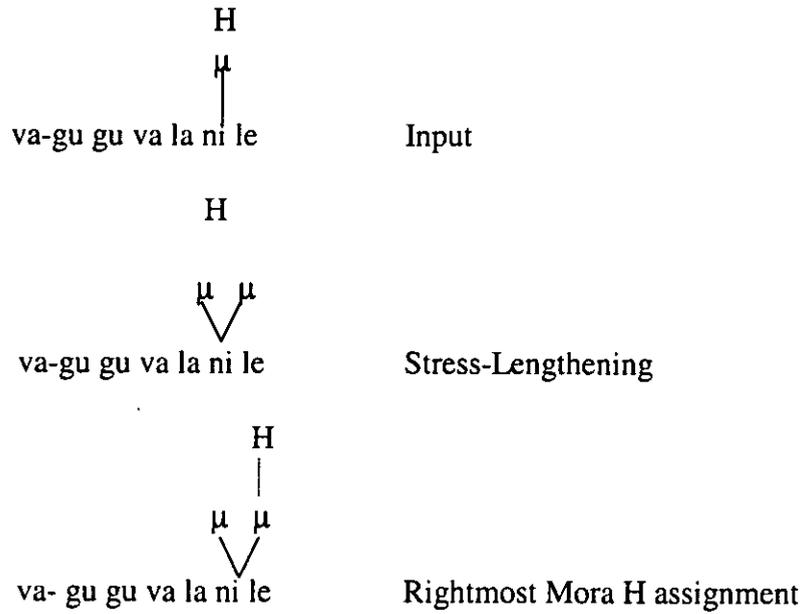
The following examples in (6.138) show that the tense-determined H of the subjunctive is assigned to the penult and that H stays on the penult in (C)VCV and longer stems.

(6.138) Penult H in the subjunctive:

va-pífte	'they should pass'
va-ííde	'they should come'
va-lííme	'they should cultivate'
va-uúke	'they should go'
va-leéke	'they should leave'
va-loómbe	'they should marry'
va-guguvalaánge	'they should kneel repeatedly.'
va-guguvalaniíle	'they should kneel for each other'

The penult H in (6.138) is realized as a rising tone, because the penult mapping rule applies after stress-induced lengthening. Since there is no H at the left edge of the verb, there is no either Doubling or UUS. The derivations in (6.139) show the tone of the subjunctive.

(6.139) Subjunctive:



The first anomaly of the subjunctive can be seen in stems with an OP, where the stem begins either with a plain consonant or with a vowel. In such cases, there is a H on the stem-initial vowel, and that H is subject to spreading, but there is no H on the penult as seen in (6.140), except when the stem-initial syllable is itself the penult.

(6.140) Stem-initial H in the subjunctive:

a. Subjunctive stem after an OP with no GF:

va-tu-páate	'they should get us'
va-ngu-léeke	'they should leave me'
va-t-uúluuwe	'they should make us fly'
va-t-uúkúliile	'they should dig for us'

va-ngu-válaange	'they should count me'
va-ngu-gúgúvaliile	'they should kneel for me'

b. Subjunctive stem after an OP with GF:

va-tw-íftiike	'they should respond us'
va-ngw-aáloote	'they should point me out'
va-tw-oódeele	'they should follow for us'
va-tw-ífgwíliile	'they should listen to us'
va-ngw-aápuule	'they should separate me'

The data in (6.140) show that if the derived stem is CVCVCV and begins in a consonant, the stem-initial H is realized as a level H, but if the stem begins in a vowel the stem-initial H is realized as a rising tone. If the stem is CVCV and begins in a consonant, there is a penult falling tone. The rising tone on the stem-initial long vowels results from applying H tone shift from the OP after hiatus resolution derives long vowels. One crucial observation is that the OP has a H only in the subjunctive. These surface tone differences between stems beginning in a consonant and stems beginning in a vowel are shown in the derivations in (6.141).

(6.141) C-stem initial

V-stem initial

H	H	
va-tu-valange	va-tu-apule	Stem H Insertion Rule
	H	
N/A	va- tw-aapule	Hiatus Resolution
H	H	
va-tu-valange	va- tw-aapule	H Shift

The crucial part of the derivation in (6.141) is the application of the Stem Mapping rule after Glide Formation in order to derive the rising tone of the root-initial vowel. So, the tone difference between *va-guguvaliile* 'they should kneel for' and *va-tu-gúgúváliile* 'they should kneel for us' can be explained as being triggered by the presence/absence of an object prefix within the subjunctive verb stem. The subjunctive macro-stem with an OP has a single stem-initial H which is subject to obligatory Doubling and that H also undergoes UUS, giving a penult falling.

The derivations in (6.142) show that applying prefix H shift before spreading, the correct surface form is derived.

(6.142) Tone of the subjunctive:

H	
va- tu- gu gu va liile	Input

H  
 †  
 va- tu- gu gu va lii le

Prefix-to-Stem Shift

H  
 va- tu- gu gu va lii le

Doubling

H  
 va-tu- gu gu va lii le

UUS

There are certain other conditions which make the subjunctive be complicated tonally. First, subjunctive verb stems select the pattern with a final H if the stem is monosyllabic and simultaneously does not include an object prefix within the stem. Compare the following examples in (6.143), where in one case the stems include an object prefix and in the other case the object prefix is excluded from the verb stem.

(6.143) Subjunctive tone:

a. Monosyllabic stems without an OP:

- vaa-lyé 'they should eat'
- vaa-twé 'they should pound'
- vii-pé 'they should give'
- vaa-ñé 'they should defecate'

b. Monosyllabic stems + OP:

- va-tuû-lye 'they should eat us'
- va-muû-twe 'they should pound you (pl.)'
- vi-tuû-pe 'they should give us'
- va-kuû-ñe 'they should defecate you (sg.)'

Monosyllabic stems which include object prefixes in (6.143b) have a rise-fall on the prefix, which happens to be in the penult position. The penult rise-fall derives from a single H underlyingly mapped onto the penult and that H is realized as rise-fall by the tone principle discussed previously. The examples in (6.143a) have a surface H on the stem-final vowel, and this pattern is due to surface tone adjustment.

There are two reasons why there is H on the final vowel in (6.143a). First, the penult vowel is also a word-initial syllable, which is L and that vowel cannot have a H tone. This fact explains the stem-final H in *vii-pé* and *vaa-ñé*, where H is assigned to the final vowel, since there is the only available mora within the stem. Second, in case the stem ends in a glide like *vaa-lyé* 'they should eat' there is tone adjustment due to surface syllabification as shown in the derivations in (6.144).

(6.144) Subjunctive tone adjustment:

/va-lie/      → va-líe      →      vaa-lyé

The assumption about tone adjustment in (6.144) is that glides are underlyingly vowels, so the underlying penultimate mora in /va-lie/ is a vowel which is desyllabified on the surface. The tense-determined tone is assigned to the penultimate syllable /va-líe/, not to the final. The underlying penult prevocalic high vowel desyllabifies and the penult tone adjusts in the expected fashion. A word-final H as in *vaalyé* is the best output. So, avoidance of initial H is one mechanism that can be invoked to account for these facts, but there is no evidence for the relevance of this principle in this language.

If the verb stem is disyllabic, there is a regular H on the penult and that H is realized as rising tone which derives from crucial rule ordering. Adding an object prefix to disyllabic stems, there is H assigned to the left edge of the stem as in (6.145).

(6.145) Subjunctive:

a. Stem without an OP:

va-paáte 'they should get'  
 va-tuúme 'they should order'  
 va-leéke 'they should leave'  
 va-loómbe 'they should marry'

b. Stem after an OP:

cf. va-ngu-páate 'they should get me'  
 cf. va-tu-máañe 'they should know us'  
 cf. va-tu-lééke 'they should leave us'  
 cf. va-tu-lóombe 'they should marry us'

The tone differences between (6.145a) and (6.145b) are due to the fact that H is assigned to the penult if the stem does not include an OP, and there is an underlying H on the OP if it is included within the subjunctive stem.

Contrast the data in (6.145b) with the following examples in (6.146), where the object prefix is L and the stem-initial vowel has H, but that H is realized as a rise-fall.

(6.146) Subjunctive VCV stems:

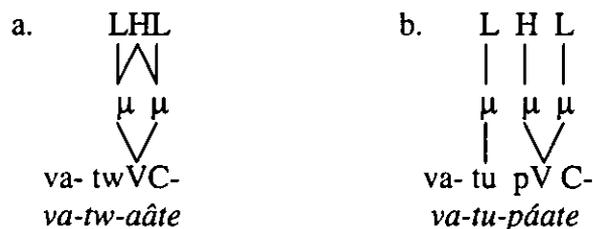
va-ngw-îte 'they should refuse me'  
 va-tw-aâte 'they should follow us'  
 va-tw-oône 'they should see us'

va-t-uûte	'they should push us'
va-t-uûnge	'they should tie us'

We see that these examples are similar tonally, specifically there is H on the stem-initial vowel after a L toned object prefix. The only difference is that the penult H of (6.145b) is realized as a falling tone, because that H is assigned by a later tone rule. The penult H of (6.146) is realized as rise-fall. One possibility is to assume that the rise-fall in (6.146) derives from H assignment to the penult at earlier stage of phonology, and that penult H changes to rise-fall. This analysis however, does not explain why such earlier tone assignment rule only affects vowel-initial subjunctive stems in (6.146), not C-initial subjunctive stems in (6.145b).

Another possibility is to assume that the penult rise-fall in (6.146) is because the OP has an underlying L tone and also because of Glide Formation. The alternative is that the OP is H but the tone shifts, so at the relevant stage it is L. The OP contributes with a L component of the rise-fall, since there is a H on the penult, which also happens to be the stem-initial vowel. Since there is no Glide Formation involving the data in (6.145b), the LHL rise-fall which maps to the sequence -tu-CVV- can be decomposed into expected three L-H-L components. The structural similarities between the rise-fall in (6.146) and the falling tone in (6.145b) can be seen in the representations given in (6.147).

(6.147) Tone similarities in the subjunctive:



As the representations above show, the falling tone in (6.145b) results from decomposing rise-fall into the actual three components of the contour. The decomposition of rise-fall into its tonal components is motivated, since this is the context where we expect some tone simplification to apply, because there is no mora available to map L-H-L tones. We do not find any phonological plausible principle of deriving a LHL rise-fall tone in the same fashion in stems like *vaka-guguvalaniíla* ‘if they kneel for each other’, where apparently there is no need for tone simplification.

The tone of the subjunctive also gets more complicated in longer stems ending in a glide. We have seen that when the prevocalic penult high vowel is subject to Glide Formation, the H assigned to the penult is adjusted due to surface syllabification. Observe the following examples in (6.148).

- |  |   |
|--|---|
| <p>(6.148) a. Subjunctive glide-stem final:</p> <p>va-loombwé ‘they should be married’</p> <p>va-uungwé ‘they should be imprisoned’</p> <p>va-tukuushyé ‘they should make run’</p> <p>va-guguvaadyé ‘they should cause to kneel’</p> | <p>b. Subjunctive plain C-stem final:</p> <p>cf. va-loómbe ‘they should marry’</p> <p>cf. va-uúnge ‘they should tie’</p> <p>cf. va-tukuúte ‘they should run’</p> <p>cf. va-guguvaáale ‘they should kneel’</p> |
|--|---|

Verb stems of the subjunctive ending in a glide have H on the final vowel. Liphola and Odden (2000) provide a very simple explanation for why stems ending in a glide have H on the final vowel. The assumption is that the verb stems of the subjunctive in (6.148) are tonally related underlyingly. There is a H tone mapped on the penult, but that penult H appears on the next mora in case the stem ends in a glide. In (6.148b) the penult tone assignment should apply after stress-induced lengthening in order to derive the rise tone. In Shimakonde, both Glide Formation and stress trigger vowel lengthening.

The surface tone differences between */va-lombue/* in (6.148a) and */va-lombe/* in (6.148b) can be represented as in (6.149).

(6.149) Subjunctive tone adjustment:

<i>/va-lombue/</i>	→	va-l o o mbu e	→	va- lombw e
H		⊥ H		⋖ H
-				
<i>/va-lombe/</i>	→	va- lo o mb e		
H		 H		

We see that the apparent no application of the non-finality principle in the subjunctive verb stems results from later rule complication, specifically the surface syllabification of underlying vowels due to Glide Formation and subsequent tone adjustment. The conclusion is that the subjunctive verb stems have H assigned to the penult like other tenses in the language do, avoiding H on the final vowel due to non-finality.

## CHAPTER 7

### NOMINAL PHRASE PHONOLOGY

#### 7.0 Introduction

Several studies have recognized that certain phonological rules that apply at the phrase level are governed by specific syntactic conditions. Relevant research in this area includes Kaisse (1985), Selkirk (1986) Nespor and Vogel (1986), Odden (1990), Jokweeni (1995), Cassimjee and Kisseberth (1998), Truckenbrodt (1999), just to mention a few examples.

This chapter investigates four patterns of phonological changes in the prosodic phonology of Shimakonde, focusing on Vowel Shortening and Tone alterations which take place at the phrase level. First, there is Shortening which shortens a penult long vowel of the noun before a possessive pronoun or before any modifier as shown in (7.1).

#### (7.1) Phrasal vowel shortening:

na-katataambwe		'spider'
na-katatambwé	waángu	'my spider'
ná-kátátámbwé	ngúlúguuma	'round spider'

If the penult long vowel has a lexical contour tone and the vowel is shortened phrasally, there is contour resolution, which changes a lexical contour tone to a level tone, because a short vowel can only have a single tone. Phrasal contour simplification is shown in (7.2).

(7.2) Phrasal contour simplification:

li-putipuúti		'sheep'
li-putiputí	lyaángu	'my sheep'
lí-pútípútí	língúlúguuma	'round sheep'

When the penult long vowel becomes a short vowel, and the contour tone changes to a level tone, the tone that is realized on the short syllable is the first component of the contour tone as shown in (7.3).

(7.3) Shortening and contour resolution:

a. Lexical falling tone:

li-jamáanda		'basket'
li-jamándá	lyaáke	'his basket'

b. Lexical level H tone:

lí-pángápáánga		'sp. cactus'
lí-pángápángá	lyaáke	'his cactus'

c. Lexical rising tone:

li-putipuúti		'sheep'
li-putiputí	lyaángu	'my sheep'

d. Lexical rise-fall:

na-ngatoômwa		'top'
na-ngatomwá	waáke	'his top'

e. Lexical low tone

li-ndandoosha		'ghost'
li-ndandoshá	lyeénu	'your ghost'

Second, Shimakonde has a general principle which inserts a H tone at the right edge of the word this in a phrasal context and that H is assigned to the final vowel of the noun before a modifier as seen in (7.4).

(7.4) H assignment to the final vowel of the noun phrase-medially:

li-ndandoosha		'ghost'
li-ndandoshá	lyaáke	'his ghost'
na-katataambwe		'spider'
na-katatambwé	waángu	'my spider'

The following examples in (7.5) show the pattern where optionally, the H tone inserted on the right edge of the noun is assigned to the penult vowel of the noun before a modifier.

(7.5) Optional H assignment to the phrasal penult vowel of the noun:

na-katataambwe		'spider'
li-ndandoosha		'ghost'
na-katatámbwé	wáangu	'my spider'
na-katatámbwé	ngúlúguuma	'round spider'
li-ndandóshá	línɡúlúguuma	'round ghost'

The data in (7.5) show that the H tone assigned to the penult vowel undergoes spreading from the penult vowel to the final vowel of the noun in phrase-medial position.

Third, there is an optional insertion of a H tone on the first vowel of the noun before a modifier and that initial H undergoes an independent rule of unconditioned unbounded spreading as seen in (7.6).

(7.6) Initial H insertion and UUS:

na-katataambwe		'spider'
ná-kátátámbwé	wáake	'his spider'
ná-kátátámbwé	ngúlúguuma	'round spider'

Finally, every H tone of the noun is deleted before the word *shaáni* 'which' as illustrated in (7.7). Tone deletion applies both to underlying H's or derived tone.

(7.7) Lexical H deletion before *shaáni*:

lí-pángápáánga		'cactus'
li-pangapangá	shaáni	'which cactus?'
lí-pákánúúndu		'wildcat'
li-pakanundú	shaáni	'which wildcat?'

It will be shown that in Shimakonde, phrasal shortening and tone changes apply between two words if they phrase together. The Shimakonde nominal phrase phonology shows that a phonological rule applies between two words if the trigger and the target are within the same noun phrase (NP).

The theoretical significance of this study is that the concept of '*belonging to the same NP*' is crucial for explaining Shimakonde nominal phrase phonology and this concept differs from the standard XP or  $X_{max}$  domain as proposed in previous analyses of syntax and phonology interaction.

The crucial data examined in this chapter include structures like those given in (7.8b), where a modifier from a higher clause always triggers phonological changes on a noun of a lower clause.

(7.8) Phrasal phonological changes in elements of different clauses:

li-ndandoosha				'ghost'	
n-kóongwe				'woman'	
kú-díimba				'be black'	
a. lí-ndándóshá	lyá	n-kóngwé	wá	kúdíimba	'ghost of a black woman'
	<i>ghost</i>	<i>of</i>	<i>woman</i>	<i>black (woman)</i>	
b. lí-ndándóshá	lyá	n-kóngwé	<b>lyá</b>	<b>kúdíimba</b>	'black ghost of a woman'
	<i>ghost</i>	<i>of</i>	<i>woman</i>	<i>black (ghost)</i>	

In (7.8b), the adjective *lyá kúdíimba* 'black' triggers shortening and tone change on the preceding noun 'woman'. The major problem posed by the data in (7.8b) is that the adjective 'black' is a modifier of the noun of the higher clause 'ghost', and that modifier triggers phonological changes on the head noun of the lower clause 'woman'.

This is the context where all existing theories of the syntax and phonology interaction predict that a modifier of a higher clause should not trigger phonological changes on a lower noun. The reason why the theories predict that 'black' should not affect 'woman' in (7.8b) is because the modifier is not in the phrase headed by 'woman'.

This chapter is organized as follows. In section 7.1 I briefly review some of the theories of syntax-phonology interface so that we can see whether they make different empirical predictions with respect to Shimakonde nominal phrase phonology.

In section 7.2 I present the basic tonal facts of Shimakonde nominal phrase phonology then in section 7.3 I examine word phrasing in the language. In 7.4 I take a close look at the exceptions to word phrasing. In section 7.5 I discuss the theoretical implications and show that the major theories of syntax-phonology interaction fail to account for word phrasing in Shimakonde. Finally, in section 7.6 I present conclusions.

## **7.1 Theories**

### **7.1.1 Direct Approach**

Kaisse (1985) proposes a theory of direct access of phonological rules to syntax. According to Kaisse, a phonological rule applies between two words if the condition in (7.9) is satisfied.

(7.9) Domain C-command (Kaisse, 1985: 159):

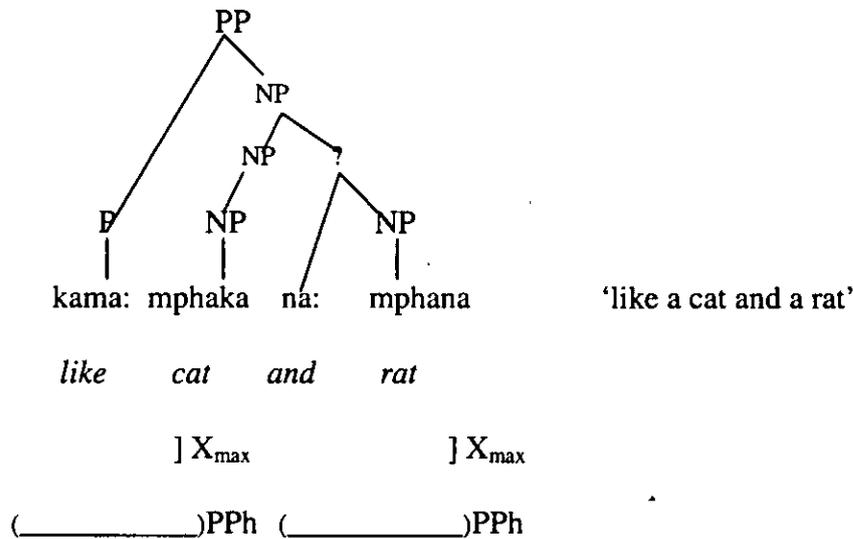
‘In the structure [X<sub>max</sub> . . . α . . .], X<sub>max</sub> is defined as the domain of α. Then α c-commands any β in its domain’.

This condition says that for the syntactic condition to be satisfied, one of the two words must be in the same XP phrase headed by the other word.

### 7.1.2 Indirect Approach

Contrary to the direct approach, Selkirk (1986) proposes a theory generally referred to as the end-based theory, which does not make direct reference to syntax in the phonological rule. According to Selkirk, prosodic constituents are constructed by grouping an utterance into units which are determined by the right or left end of some syntactic constituent as shown in (7.10).

(7.10) End-based theory: pre-antepenultimate shortening in Chimwi:ni (Selkirk, 1986: 392):



The basic claim made by the representation in (7.10) is that phonological phrases are created based on syntax. In the structure in (7.10), the first phonological phrase encompasses the preposition and the following NP, though these elements are not a single constituent of syntactic structure.

### 7.1.3 Constraint-based Approach

Truckenbrodt (1999) interprets phrasal phonological rules in Optimality-Constraint-based analysis and he posits the constraint WRAP-XP given in (7.11).

(7.11) Constraint-based account (Truckenbrodt, 1999:14):

‘WRAP-XP: Each XP is contained in a phonological phrase’.

The main contribution made by Truckenbrodt is simultaneously to allow, but penalize recursive phonological phrasing. Otherwise, the theory makes the same predictions as Selkirk’s (1986) in what syntactic conditions define phrasing.

### 7.2 Basic Facts of Shimakonde Nominal Phrasal Phonology

Before describing the basic facts of Shimakonde phrase phonology, I begin with a summary of lexical tone. Unlike verbal stems which have four tone contrasts, nouns present five phonologically contrastive tones in the penult as shown in (7.12):

(7.12) Penult tone contrast in nouns:

a. Rising LH:	li-putipuúti	‘sheep’
	shi-dangadoóngo	‘Adam’s apple’

b. Rise-fall LHL:	na-ngatoômwa	'top'
	li-doôdo	'leg'
c. Falling HL:	li-shandúuku	'suitcase'
	li-papáatu	'bark of a tree'
d. Level H:	lí-pángápáánga	'sp. cactus'
	lí-pákánúúndu	'wildcat'
e. Level L:	li-ndandoosha	'ghost'
	na-katataambwe	'spider'

The data in (7.12) show that unlike in verb stems where a surface falling HL tone is not purely assigned by a rule and thus nouns have a lexical falling tone HL in the penult.

I now turn to the basic facts of Shimakonde nominal phrase phonology. I will consider four tests for whether a noun and a single modifier phrase together. Three of these tests are tonal processes and one test relates to vowel length suppression on a word in the phrasal context.

### 7.2.1 Phrasal Shortening

In Shimakonde, when a noun and modifier phrase together, the predictable penultimate vowel lengthening of the noun is suppressed phrase medially. The suppression of the penultimate length can be analyzed as shortening, since only stressed penult long vowels have contours. I refer to this as *Phrasal Shortening* hereafter. Recall from chapter 5 that Shimakonde has no underlying contrast between long and short vowels, and any vowel in the penult position is lengthened because of stress.

The examples in (7.13) show that if a noun is followed by a possessive pronoun the penult vowel is short due to phrasal shortening.

(7.13) Phrasal shortening:

na-katataambwe		'spider'
na-katatambwé	waáke	'his spider'
li-kangañaanga		'sp. caterpillar'
li-kangañangá	waángu	'my sp. caterpillar.'
li-ndandoosha		'ghost'
li-ndandoshá	weétu	'our ghost'

The data in (7.13) reflect two independent rules. One rule shortens a long vowel before the possessive pronoun. The second rule discussed in the next section inserts a H tone on the final vowel of the noun in phrase-medial position.

The following examples in (7.14) show that when the penult long vowel has a contour tone and the vowel is shortened, there is automatic contour resolution. Due to shortening, the contour tone is realized as a level tone in a short syllable, because Shimakonde does not have any contours on a short vowel.

(7.14) Shortening and contour resolution:

a. Falling tone:	li-shandúuku		'suitcase'
	li-shandúkú	lyaáke	'his suitcase'
b. Level H:	útútúúli		'brain'
	útútúlí	waángu	'my brain'
c. Rising tone:	shi-dangadoóngo		'Adam's apple'
	shi-dangadongó	shaáke	'his Adam's apple'
d. Rise-fall tone:	na-ngatoômwa		'top'
	na-ngatomwá	weétu	'our top'
e. Level L tone:	li-kangañaanga		'sp. caterpillar'
	li-kangañangá	lyeénu	'your sp. caterpillar'

### 7.2.2 Phrasal Tone

This section deals with tonal processes which apply to the phrase level, namely Phrase-medial H-Insertion, Word-initial H-Insertion and Tone Deletion before the word *shaáni* 'which'.

### 7.2.2.1 Phrase-Medial H Insertion

One general rule of Shimakonde nominal phrase phonology is Phrase-Medial H Insertion. This rule inserts a H tone on the right edge of the word before another word. When the phrasal H is inserted at the right edge of the word, there are two choices of assigning that H tone either to the penult or to the final syllable. I will first consider examples of phrasal H assignment to the final vowel and later present data with H assigned to the penult.

The following examples in (7.15) show the option where the H inserted at the right edge of the noun is assigned to the final vowel of the noun phrase-medially.

(7.15) Final phrasal H assignment:

na-katataambwe		'spider'
na-katatambwé	waáke	'his spider'
li-kangañaanga		'sp. caterpillar'
li-kangañangá	weétu	'our sp. caterpillar'

We see that the underlyingly L-toned nouns in (7.15) get a single H on the final vowel in a phrase-medial position due to Phrase-Medial H Insertion. This process is shown in the derivations in (7.16).



	*li-ndandóshá	lyaáke	
	*li-ndandoshá	lyáake	
b. Rising:	li-putipuúti		'sheep'
	li-putipútí	lyéetu	'our sheep'
	li-putiputí.	lyeéetu	'our sheep'
	shi-dangadoóngo		'Adam's apple'
	shi-dangadóngó	sháake	'his Adam's apple'
	shi-dangadongó	shaáke	'his Adam's apple'
c. Rise-fall:	na-ngatoômwa		'top'
	na-ngatómwá	wáake	'his top'
	na-ngatomwá	waáke	'round top'

The examples in (7.17) also show that the phrasal H inserted to the right edge of the noun can go to the final syllable, or to the penult, in free variation.

Furthermore, data of (7.17) show that the possessive pronoun has two tone options of either having rising tone or falling, and the selection of tone pattern of the noun entails the selection of a particular tone pattern of the possessive pronoun. The phrasal penult H assignment is shown in the derivations in (7.18).

(7.18) Penult phrasal H assignment

- |    |                                |                           |
|----|--------------------------------|---------------------------|
| a. | n a-k a t a t a m b w e        | Toneless Input            |
|    | H                              |                           |
| b. | n a-k a t a t a m b w e w áake | Phrase Medial H Insertion |
|    | H                              |                           |
| c. | n a-k a t a t a m b w e w áake | Penult H Assignment       |
|    | H                              |                           |
| d. | n a-k a t a t a m b w e w áake | Doubling                  |

In (7.19) I provide some examples showing that if the penult is H-initial, only the HH option appears medially due to H being assigned to the penult vowel of the noun. So, the output like *\*li-shandukú lyáake* from *li-shandúuku lyáake* 'his suitcase' is ungrammatical, because the H assigned to the penult is missing.

(7.19) Penult H assignment:

- |             |              |              |                  |
|-------------|--------------|--------------|------------------|
| a. Falling: | li-shandúuku |              | 'suitcase'       |
|             | li-shandúkú  | lyáake       | 'his suitcase'   |
|             | li-shandúkú  | língúlúguuma | 'round suitcase' |
|             | *li-shandukú | lyaáke       |                  |
|             | *li-shandukú | lyáake       |                  |

b. Level H:	lí-pángápáánga		'sp. cactus'
	lí-pángápángá	lyáake	'his sp. cactus'
	lí-pángápángá	lyaáke	'his sp. cactus'
	lí-pángápángá	líkúmeêne	'big cactus'

The starred examples of (7.19a) are ungrammatical because this noun is penult H-initial and the ungrammaticality is due to deletion of the penult H.

The following examples in (7.20) show that if a noun is followed by an adjective, there is only one option of assigning the phrase-medial H tone to the penult syllable of the noun and H cannot be assigned to the final vowel.

(7.20) A single option of phrase penult H assignment:

a.	na-katatámbwé	ngúlúguuma	'round spider'
	li-ndandóshá	líkúmeêne	'big ghost'
	*na-katatambwé	ngúlúguuma	
	*li-ndandoshá	líkúmeêne	
b.	li-putipútí	língúlúguuma	'round sheep'
	shi-dangadóngó	shíkúmeêne	'big Adam's apple'
	na-ngatómwá	ngúlúguuma	'round top'
	*li-putiputí	líkúmeêne	

*shi-dangadongó	shíkúmeêne
*na-ngatomá	ngúlúguuma

We can see that a noun before an adjective gets H inserted at the right edge just like a noun before a possessive pronoun. Moreover, if the H is assigned to the penult there is a sequence of two surface H's due to Doubling.

### 7.2.2.2 Word-Initial H Insertion

One other rule that applies at the phrase level is Word-Initial H Insertion. This rule optionally inserts H on the first vowel of the noun before a modifier and that initial H tone is subject to UUS as shown in (7.21).

(7.21) Optional word-initial H insertion:

na-katataambwe		'spider'
ná-kátátámbwé	ngúlúguuma	'round spider'
ná-kátátámbwé	wáake	'his spider'
*ná-kátátámbwé	waáke	

The examples of (7.21) reflect four independent rules. One general rule inserts a phrase medial H tone towards the end of the noun before a modifier. Another rule assigns that H to the penult syllable, and this is the rule we saw motivated in (7.16).

The third rule optionally inserts a second H tone on the first vowel of the noun before a modifier. Finally, UUS spreads any initial H from the left to the following vowels. The last example of (7.21) shows that due to the optional application of the Word-Initial H Insertion which is subject to UUS, the H tone of the possessive pronoun does not shift from the first mora to the second mora of the first syllable.

The interaction of tone rules in (7.21) can be seen in the derivations in (7.22).

(7.22) Interaction of rules:

a.	na-katataambwe		Toneless Input
	H		
b.	na-katatambwe	ngúlúguuma	Phrase-medial H Insertion
	H		
c.	na-katataambwe	ngúlúguuma	Penult H Assignment
	H		
d.	na-katataambwe	ngúlúguuma	Doubling
	H            H		
e.	na-katataambwe	ngúlúguuma	Word-Initial H insertion
	H            H		
f.	na-katataambwe	ngúlúguuma	UUS

The data in (7.22) show that if the option of inserting initial H is selected, there is always application of UUS in this phonological context.

### 7.2.2.3 Shaáni H-Deletion

The last tone process of Shimakonde nominal phonology is H deletion which applies in constructions involving a noun before the word *shaáni* 'which'. This rule simply deletes every lexical H tone of a noun before *shaáni*. I refer to this as *Shaáni H-Deletion*.

Consider the following examples in (7.23).

(7.23) Shaáni H-deletion:

a.	lí-pángápáánga		'sp. cactus'
	li-pangapangá	shaáni	'which sp. cactus?'
	lí-pákánúúndu		'wildcat'
	li-pakanundú	shaáni	'which wildcat?'
b.	li-putipuúti		'sheep'
	li-putiputí	shaáni	'which sheep?'
	li-shandúuku		'suitcase'
	li-shandukú	shaáni	'which suitcase?'
	na-ngatoômwa		'top'
	na-ngatomwá	shaáni	'which top?'

We seen from (7.23) that every lexical H tone of the noun is deleted before *shaáni*, except that deletion does not apply to a H inserted phrase-medially before *shaáni*. Otherwise Phrase-Medial H Insertion is a very general and inviolable rule in the language. It is important to note that the deletion of H before *shaáni* is an arbitrary phenomenon, since there is no relation *a priori* between *shaáni* H-deletion and word phrasing and we see no phonological explanation for why *shaáni* should trigger tone deletion on the preceding noun. I posit that the pattern of H deletion before *shaáni* reflects the syntactic conditions of word phrasing in Shimakonde. Specifically, the rule applies to a sequence of words which includes the word immediately before *shaáni*, and optionally includes any contiguous sequence of preceding words in the phrase as shown in the following examples in (7.24), where the parentheses indicate phonological phrases.

(7.24) Shaáni H-Deletion:

	lí-pángápáánga		'cactus'
	lí-gúlúguuma		'black'
a.	(li-pangapangá	shaáni)	'which cactus?'
b.	(lí-pángápángá	língúlúguuma)	'round cactus'
c.	(lí-pángápángá	(lingulugumá shaáni))	'which round cactus?'
d.	(li-pangapanga	(lingulugumá shaáni))	'which round cactus?'
e.	* li-pangapanga	língúlúguuma shaáni	



As seen, the lexically H toned noun has a single H on the final vowel immediately before *shaáni* as in (7.24a), and all of the H tones of the noun delete before *shaáni*. If *shaáni* is placed after the adjective as in (7.24c), then the adjective surfaces with a single H tone on the final vowel, and optionally, the H toned noun may also surface with multiple low tones as shown in (7.24d). The last example of (7.24e) shows that deletion applies to a contiguous sequence of words from the left to the right.

*Shaáni* H-deletion is just an arbitrary property of *shaáni*, and nothing really explains why *shaáni* and *shaáni* alone, has this property. The second observation is that *shaáni* H-deletion also involves a variable size “phrasing”. The standard approach would be to posit that the word *shaáni* forms a phrase with a word which comes with it and then H deletes within that phrase. This approach suggests that we would have two different domains of phonological phrasing. One type of “phrasing” would include “small phrases” which has *shaáni* and the word before it like in [*li-pangapangá shaáni*] ‘which cactus?’ Optionally, any number of words before *shaáni* would have to be within a phrase as in [*li-pangapanga lingulugumá shaáni*] ‘which round cactus?’

The second type of “phrasing” would include ‘bigger phrases’, which include ‘*shaáni* phrases’ plus the elements inside the NP that are not part of the ‘*shaáni* phrases’, where a H tone does not delete and, instead a H tone is inserted and length is suppressed as in (7.25b).

(7.25) Variable size of phrasing:

a. 'Small phrases':

- |       |                                      |  |                        |
|-------|--------------------------------------|--|------------------------|
|       | lí-pákánúúndu                        |  | 'wildcat'              |
| (i)   | (li-pakanundú shaáni)                |  | 'which wildcat?'       |
| (ii)  | (lí-pákánúúndú (lingulugumá shaáni)) |  | 'which round wildcat?' |
| (iii) | (li-pakanundu lingulugumá shaáni)    |  | 'which round wildcat?' |

b. 'Larger phrases':

- |     |                            |  |                |
|-----|----------------------------|--|----------------|
|     | na-katataambwe             |  | 'spider'       |
| (i) | (ná-kátátámbwé ngúlúguuma) |  | 'round spider' |

We see that *shaáni* does not trigger H-deletion on the preceding noun in (7.25ai), but it does in (7.25aiii). These tone differences result from the fact that there is optional phrasing between *shaáni* and any number of words before it. I conclude that *shaáni* H-Deletion applies to words within the phrase and the process applies from right to left.

### 7.3 Syntax and Phonology Interface

I now turn to the syntax of Shimakonde nominal phrase phonology. I take shortening and tone alternation as diagnostics for phrasing in the language and investigate a range of structures involving a noun before a modifier to see what kind of syntactic relations holds between the noun and other types of complements.

The following examples in (7.26) show the application of various processes on a noun before an adjective.

(7.26) **Noun + adjective:**

a. Low tone:	na-katataambwe		'spider'
	na-katatámbwé	ngúlúguuma	'round spider'
	ná-kátátámbwé	ngúlúguuma	'round spider'
b. Falling tone:	li-shandúuku		'suitcase'
	li-shandúkú	lyá mboône	'beautiful suitcase'
	lí-shándúkú	lyá mboône	'beautiful suitcase'
c. Rising tone:	li-putipuúti		'sheep'
	li-putipútí	líkúmeêne	'big sheep'
	lí-pútípútí	líkúmeêne	'big sheep'

All the nouns in (7.26) undergo phrasal shortening and tone change before a modifier.

The L toned noun *na-katataambwe* 'spider' appears with a H tone at the phrase level.

Consider the following examples in (7.27) - (7.28) where other kinds of complements are considered. These examples show that various kinds of complements trigger the same phonological changes on the preceding noun.

(7.27) Possessive structures:

a. **Noun + possessive pronoun:**

Low tone:	na-katataambwe		'spider'
	na-katatambwé	waángu	'my spider'
	na-katatámbwé	waáke	'his spider'
Falling tone:	shi-tungúulu		'onion'
	shi-tungúlú	shaángu	'my onion'
Rising tone:	shi-dangadoóngo		'Adam's apple'
	shi-dangadongó	shaáke	'his Adam's apple'
	shi-dangadóngó	sháake	'his Adam's apple'

b. **NP-possessive structure:**

Low tone:	na-katataambwe		'spider'
	nkóongwe		'woman'
	nakatatámbwé	wá n-kóongwe	'spider of the woman'
Falling ton:	shi-tungúulu		'onion'
	n-kóongwe		'woman'
	shi-tungúlú	shyá n-kóongwe	'onion of the woman'

Rising tone:	li-putipuúti			'sheep'
	n-núúme			'man'
	li-putipúfí	lyá	n-núúme	'sheep of the man'
Rise-Falling tone:	na-ngatoômwa			'top'
	n-dyóóko			'child'
	na-ngatómwá	wá	n-dyóóko	'top of the child'

(7.28) Noun + different types of complements:

a. **Noun + demonstrative:**

Low tone:	li-ndandoosha			'ghost'
	li-ndandósh'	ááli		'this ghost'
Rising tone:	li-putipúty	ááli		'this sheep'
	ma-putipúty	áála		'these sheep'
Falling tone	li-shandúuku			'suitcase'
	li-shandúk'w	ááli		'this suitcase'
	ma-shandúk'w	áála		'these suitcases'

b. **Noun + an ordinal numeral:**

	na-katataambwe			'spider'
	na-katatámbwé	nántaáandi		'the first spider'

li-jamáanda			'basket'
li-jamánda'	lítaáandi		'the first basket'
li-putipuúti			'sheep'
li-putipútí	lyá	mbíili	'the second sheep'
na-ngatoômwa			'top'
na-ngat ómwá	wá	mwáanu	'the fifth top'

c. **Noun + Wh-word:**

li-ndandoosha			'ghost'
li-ndandóshá	wá	kwaáshi	'which spider?'
na-katataambwe			'spider'
na-katatámbwé	wá	namuná shaáni	'spider of what variety?'
li-putipuúti			'sheep'
li-putipútí	lyáake	ñááni	'the sheep of whom?'
li-shandúuku			'suitcase'
li-shandúkú	lyá	kwaáshi	'which suitcase?'
na-ngatoômwa			'top'
na-ngatómwá	wá	kwaáshi	'which top?'

The examples of (7.27) - (7.28) show that various kinds of complements phrase together with the preceding noun, triggering automatic phrasal shortening and tone change.

### 7.3.1 Relative Clause

One other context where phrasal changes are found in Shimakonde involves a noun before a relative clause. The examples in (7.29) show that constructions involving a noun plus relative clause are subject to the same phrasal processes of vowel shortening and tone change.

(7.29) Noun + relative clause:

a. L-toned noun before a relative clause:

na-katataambwe		'spider'
na-katatambwé	áshítúkúúta	'spider which was running'

b. HL-toned noun before a relative clause:

li-shandúuku		'suitcase'
li-shandúkú	lyá váshúuma	'the suitcase which they are buying'

c. LH-toned noun before a relative clause:

li-putipuúti		'sheep'
li-putipútí	lyá váshúmiile	'the sheep which they bought'

d. LHL-toned noun before a relative clause:

na-ngatoômwa		'top'
na-ngatómwá	ákánun'unuula	'the top that does not spin'

The conclusion is that a relative clause causes the same phonological changes, namely shortening and tone alternation on the preceding noun as any modifier does.

### 7.3.2 Shaáni H-Deletion

If a noun is followed by *shaáni*, all lexical H tones of the noun get deleted, and a single H appears on the final vowel of the noun, the one inserted by the Phrase-Medial H Insertion rule. The relevant examples are repeated in (7.30), where every lexical H tone of the noun deletes before *shaáni* 'which'.

(7.30) Noun + shaáni:

li-putipuúti		'ghost'
li-putiputí	shaáni	'which ghost?'
li-jamáanda		'basket'
li-jamandá	shaáni	'which basket?'
na-ngatoômwa		'top'
na-ngatomwá	shaáni	'which top?'
lí-pákánúúndu		'wildcat'
li-pakanundú	shaáni	'which wildcat?'

What we see is that *shaáni* H-deletion on the noun preceding it targets both H's which are underlyingly present and any H tone derived from an independent rule.

The following examples in (7.31a) show that *shaáni* also deletes every lexical H tone on the modifier preceding it, or in any number of contiguous words before it, but *shaáni* does not delete the lexical tone in a modifier after it as seen in (7.31b).

(7.31) The tonal effect of *shaáni* H-deletion:

- |    |              |              |                 |                             |
|----|--------------|--------------|-----------------|-----------------------------|
| a. | li-shandúuku |              |                 | 'suitcase'                  |
|    | li-shandúkú  | língúlúguuma |                 | 'round suitcase'            |
|    | li-shanduku  | lingulugumá  | shaáni          | 'which round suitcase?'     |
|    | li-shandúkú  | língúlúgumá  | líkúmeêne       | 'round big suitcase'        |
|    | li-shanduku  | linguluguma  | likumené shaáni | 'which round big suitcase?' |
| b. | li-shandukú  | shaáni       | língúlúguuma    | 'which round suitcase?'     |
|    | li-shandukú  | shaáni       | líkúmeêne       | 'which round big suitcase?' |

There are two observations about the data in (7.31). First, *shaáni* triggers shortening and H insertion on the final vowel of the preceding noun, as all modifiers do in the language. Second, a modifier in a phrase medial position also undergoes the same phonological changes as in a noun before a modifier. I simply posit that H insertion on the right edge of the noun is general to all phrasal contexts, and even overrides *shaáni-H-deletion*.

## 7.4 Exceptions to Phrasal Alternations

Shimakonde presents cases where noun plus modifier do not fall within the domain of application of phrasal phonological changes. This domain includes numbers, quantifiers and a combination of a noun before a verb.

### 7.4.1 The Treatment of Numbers and Quantifiers

In Shimakonde, numbers and quantifiers phrase separately from a preceding noun as shown in the following examples in (7.32).

(7.32) Separate phrasing:

a. Noun + cardinal numeral:

L tone:	li-ndandoosha		'ghost'
	li-ndandoosha	límo	'one ghost'
	ma-ndandoosha	mavífi	'two ghosts'
	ma-ndandoosha	mataátu	'three ghosts'
HL tone:	ma-shandúuku		'suitcases'
	ma-shandúuku	ncece	'four suitcases'
	ma-shandúuku	mwaánu	'five suitcases'

LH tone:	li-putipuúti		'sheep'
	li-putipuúti	límo	'one sheep'
	ma-putipuúti	mwaánu na límo	'six sheep'
	ma-putipuútimwaánu	na mataátu	'eight sheep'
LHL tone:	ma-doôdo		'legs'
	ma-doôdo	mwaánu na nceence	'nine legs'
	ma-doôdo	kuúmi	'ten legs'
H-tone:	má-túngúlúúngu		'blisters'
	má-túngúlúúngu	makuúmi maviíli	'twenty blisters'
	má-túngúlúúngu	makuúmi mwaánu	'fifty blisters'

b. Noun + quantifier:

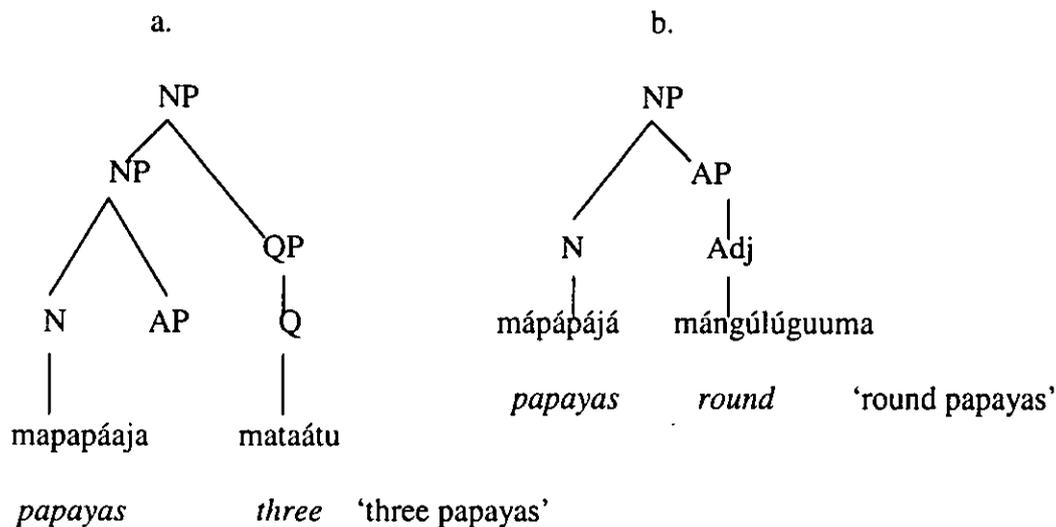
L tone:	ma-ndandoosha		'ghosts'
	ma-ndandoosha	uúti	'all ghosts'
	ma-ndandoosha	oóe	'a lot of ghosts'
	ma-ndandoosha	padyoóko	'few ghosts'
HL tone:	ma-shandúuku		'suitcases'
	ma-shandúuku	uúti	'all suitcases'
	ma-shandúuku	oóe	'a lot of suitcases'
	ma-shandúuku	padyoóko	'few suitcases'

LH tone:	li-putipuúti		'sheep'
	li-putipuúti	uúti	'all the sheep'
	ma-putipuúti	oóe	'a lot of sheep'
	ma-putipuúti	padyoóko	'few sheep'
LHL tone:	ma-doôdo		'legs'
	ma-doôdo	uúti	'all legs'
	ma-doôdo	oóe	'a lot of legs'
	ma-doôdo	padryoóko	'few legs'
H tone:	lí-pákánúúndu		'wildcat'
	má-pákánúúndu	uúti	'all wildcats'
	má-pákánúúndu	padyoóko	'few wildcats'

We can see that numerals and quantifiers are treated exceptionally in terms of phrasing with the preceding noun. The exceptional treatment of numerals and quantifiers in Bantu is not unprecedented. For example, Kisseberth and Abasheikh (1974) and Odden (1990) provide some phonological evidence for special treatment of quantifiers and numerals in terms of phrasing separately from a noun in the Bantu languages Chimwi:ni and Kikongo, respectively.

To explain the special treatment of quantifiers and numerals, some analyses claim that separate phrasing of numbers and quantifiers from the preceding noun reflects differences in syntactic structures. This possible structural difference between a noun before a quantifier or numeral and a noun before an adjective can be seen in (7.33a) and (7.33b), respectively.

(7.33) Different syntactic structures between quantifiers and adjectives:



I reject the approach in (7.33), because it predicts incorrectly that quantifiers and numerals could not come before an adjective. In Shimakonde, quantifiers and numbers can freely stand before an adjective as shown in (7.34).

(7.34) Numerals or quantifiers before an adjective:

- |    |            |          |              |                       |
|----|------------|----------|--------------|-----------------------|
| a. | ma-papáaja |          |              | 'papaya'              |
|    | ma-papáaja | mataátu  |              | 'three papayas'       |
|    | ma-papáaja | padyóoko |              | 'few papayas'         |
| b. | má-pápájá  | mátátú   | mángúlúguuma | 'three round papayas' |
|    | má-pápájá  | pádyókó  | mángúlúguuma | 'few round papayas'   |

What we seen in (7.34a) is that the quantifier and the number do not trigger phonological change on the preceding noun, but in (7.34b) both the numeral and quantifier undergo phonological changes in phrase-medial position. Apparently, they also trigger tone change and shortening on the preceding noun, suggesting that a flat structure is needed.

#### 7.4.2 Separate Phrasing

Though the phrasing of quantifiers and numbers poses a small problem for the theories of syntax-phonology interface, the data discussed so far, can be explained within the end-based or max-command approach, which predict syntactic effects on phonology. The end-based account (Selkirk, 1986) predicts that the right or left edge of an NP separates the noun from the next word, therefore NP should phrase separately from the next word.

### 7.4.2.1 Separate Phrasing of a Noun before a Verb

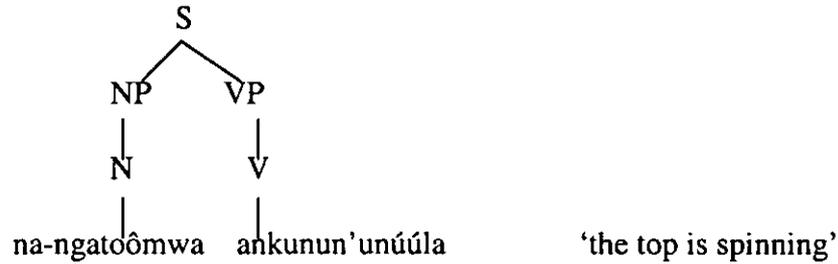
The next examples in (7.35) show that a noun before a verb phrases separately from the verb, because the right edge of the NP separates a noun from the next word.

(7.35) Noun before a verb:

li-ndandoosha		'ghost'
li-ndandoosha	lindípiíta	'the ghost passed'
li-putipuúti		'ghost'
li-putipuúti	linditúkuúta	'the ghost ran'
li-shandúuku		'suitcase'
li-shandúuku	lindiîgwa	'the suitcase fell'
na-ngatoômwa		'top'
na-ngatoômwa	ankunun'unúúla	'the top is spinning'

The data in (7.35) show that there is no phrasal shortening and tone change on the noun before the verb, since this is the context where we do not expect a noun to phrase with the following word. These data have the structure in (7.36).

(7.36) Noun before a verb:



#### 7.4.2.2 Separate Phrasing of a Noun in a Two-Object Structure

The following examples in (7.37) - (7.39) and (7.41) show another case where separate phrasing between a noun and the following word is found because the right edge of an NP separates a noun from the next word. Here, the VP contains two NP's.

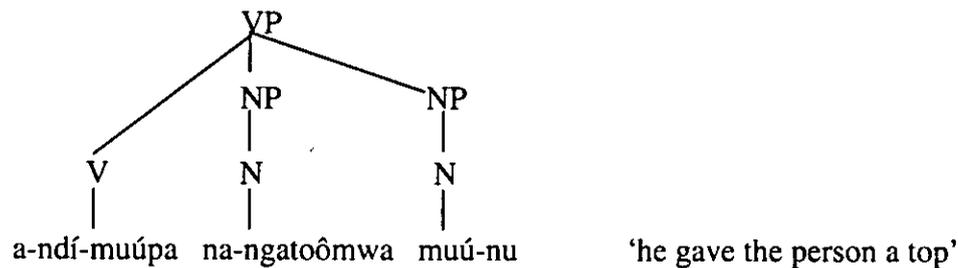
(7.37) Noun in two object constructions:

- |   |  |                                 |
|---|--|---------------------------------|
| a. muú-nu                               |  | ‘person’                        |
| li-putipuúti                            |  | ‘sheep’                         |
| na-ngatoômwa                            |  | ‘top’                           |
| a-ndí-muú-pa                            |  | ‘he gave to him’                |
| (a-ndí-muú-pa) (muú-nu) (li-putipuúti)  |  | ‘he gave the person a sheep’    |
| (a-ndí-muú-pa) (muú-nu) (lishandúuku)   |  | ‘he gave the person a suitcase’ |
| (a-ndí-muú-pa) (muú-nu) (na-ngatoômwa)  |  | ‘he gave the person a top’      |
| (a-ndí-muú-pa) (muú-nu) (lí-pákánúúndu) |  | ‘he gave the person a wildcat’  |

- b. (a-ndí-muú-pa) (li-putipuúti) (muú-nu) 'he gave the person a sheep'  
 (a-ndí-muú-pa) (li-shandúuku) (muú-nu) 'he gave the person a suitcase'  
 (a-ndí-muú-pa) (na-ngatoômwa) (muú-nu) 'he gave the person a top'  
 (a-ndí-muú-pa) (lí-pákánúúndu) (muú-nu) 'he gave the person a wildcat'

The examples of (7.37) have the structure in (7.38), where neither a noun is the head, and neither a noun c-commands the other, since the right edge of an NP separates the two nouns.

(7.38) Noun before two-object constructions:



#### 7.4.2.3 Separate Phrasing of a Noun before an Adverb

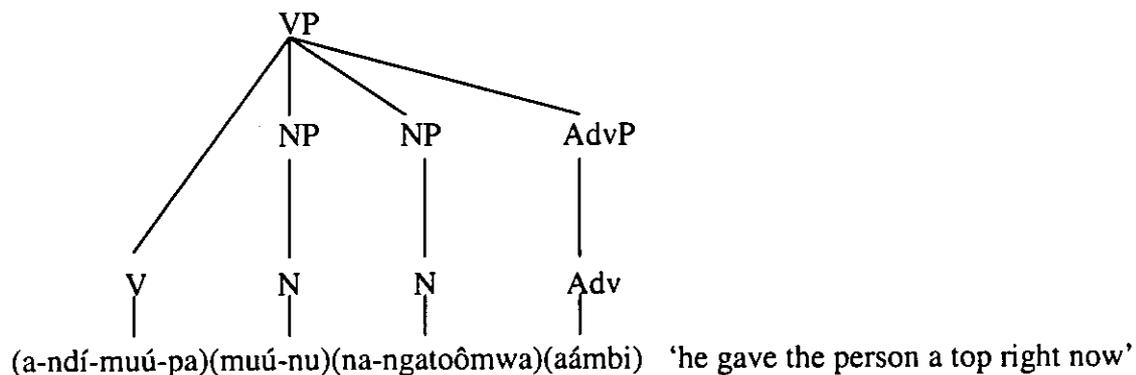
In Shimakonde, adverbs are outside of the NP, and should phrase separately from the preceding noun, which is within the NP. The following examples in (7.39) show that there is no shortening and tone change on the noun preceding the adverb.

(7.39) Noun before an adverb:

a-ndí-mw-oóna	'he saw him'
a-ndí-muú-pa	'he gave to him'
shipájeêlo	'quickly'
lído	'yesterday'
kákoova	'slowly'
aámbi	'right now'
(a-ndí-mw-oóna)(li-putipuúti)(shipájeêlo)	'he saw the sheep quickly'
(a-ndí-muú-pa)(muú-nu)(li-putipuúti)(lído)	'he gave the person a sheep yesterday'
(a-ndí-muú-pa)(muú-nu)(li-shandúuku)(ákákoova)	'he gave the person a suitcase slowly'
(a-ndí-muú-pa)(muú-nu)(na-ngatoômwa)(aámbi)	'he gave the person a top right now'

We can see that the presence of an adverb does not trigger phonological changes on the preceding word. For the data in (7.39) I assume the structure in (7.40).

(7.40) Noun before adverb:



#### 7.4.2.4 Conjoined Nouns

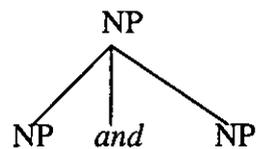
Different phrasing is also found when two or more nouns are conjoined, since each part of the conjunction preserves its underlying tone and the stressed-induced vowel lengthening. Different phrasing of conjoined nouns is shown in (7.41) below.

(7.41) Noun *and* Noun:

- |    |                                 |    |              |  |
|----|---------------------------------|----|--------------|--|
|    | n-dyóóko                        |    |              | 'child'                                  |
|    | li-putipuúti                    |    |              | 'sheep'                                  |
|    | na-ngatoômwa                    |    |              | 'top'                                    |
|    | li-shandúuku                    |    |              | 'suitcase'                               |
| a. | n-dyóóko                        | na | na-ngatoômwa | 'the child and the top'                  |
|    | n-dyóóko                        | na | li-shandúuku | 'the child and the suitcase'             |
|    | n-dyóóko                        | na | li-putipuúti | 'the child and the sheep'                |
| b. | (andímuúpa)(muúnu)(liputipuúti) | na | (andítwaála) | 'he gave the person a sheep and took'    |
|    | (andímuúpa)(muúnu)(lishandúuku) | na | (andyuúka)   | 'he gave the person a suitcase and went' |
|    | (andímuúpa)(muúnu)(nangatoômwa) | na | (andílaála)  | 'he gave the person a top and slept'     |

The question is why there is no phrasal alternations in (7.41)? The conjoined nouns in (7.41a) have the structure given in (7.42), where elements outside of the NP phrase separately from the preceding noun.

(7.42) Conjoined nouns:



The structure of conjoined nouns in (7.42) is crucial for understanding the syntactic conditions under which word phrasing applies in Shimakonde. There is an assumption according to which in this language words bounded within the same NP undergo phrasal changes. Under this assumption, the examples of conjoined nouns in (7.41a) should undergo phonological change. The reason why conjoined nouns do not undergo phrasal changes is because in Shimakonde, phrasal alternations apply to a noun before a modifier. So, a noun undergoes phonological changes before any modifier independent of whether the trigger word and the target are within the same clause. Since in a conjoined structure neither NP is a modifier of another NP, there are no phrasal phonological changes affecting the two nouns.

The conclusion is that in Shimakonde different phonological phrasing between a noun and the following word can be partially explained under the end-based approach of syntax-phonology interface. That is, the right and left edge of NP separates the noun from the next word. Furthermore, Shimakonde nominal phrase phonology requires that phrasal phonological changes apply only to a noun before modifiers bounded within the same NP.

## 7.5 Theoretical Account for Shimakonde Nominal Phrase Phonology

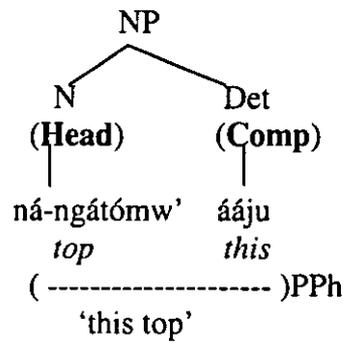
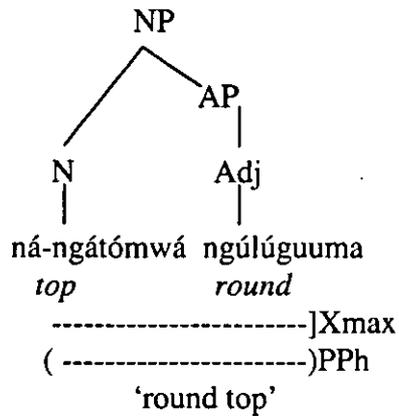
All theories of syntax-phonology interaction predict correctly that nouns and modifiers phrase together phonologically if they are within the same syntactic constituent (NP), but a noun followed by words outside NP phrase separately. The conditions under which certain phonological changes apply in a phrasal context have been proposed in the C-command theory or  $X_{\max}$  domain (Kaisse, 1985), where phonological rules have direct access to syntactic information. According to this analysis, a noun before a modifier, like in *ná-ngátómwá ngúlúguuma* 'round top', should phrase together, because the head of NP which is N, C-commands Determiners and everything else within the NP.

Nespor and Vogel (1986) on the other hand, claim that it is the head-to-complement relationship that determines phonological changes. Basically, the Head-to-complement approach makes the same empirical predictions as the c-command theory does, since the complement-Head relationship reflects Max-command as seen in the structure in (7.43).

(7.43) Max-command vs. Head-to-complement accounts for Shimakonde data:

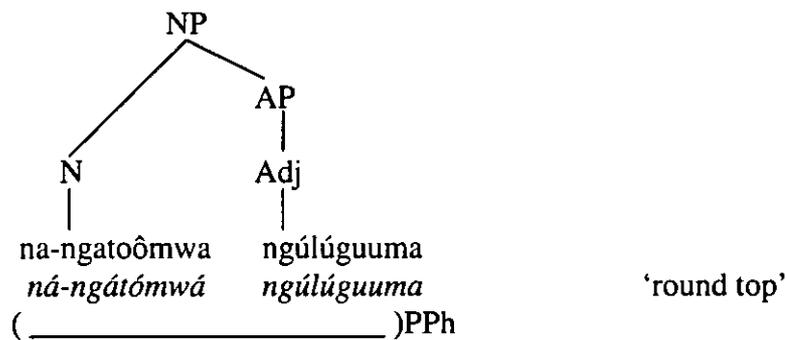
a. Max-command (Kaisse, 1985)

b. Head-to-complement (Nespor and Vogel, 1986)



Selkirk (1986) favors the end-based theory which posits that syntactic conditions on phonology are expressed indirectly. According to Selkirk, the domain of application of phonological rules is a prosodic constituent, which is derived by reference to the right or left edge of syntactic constituents. For example, since the adjective and the determiner in (7.43) are terminal strings at the right end of a syntactic constituent (NP), these modifiers should phrase together with the preceding noun as illustrated in the structure in (7.44).

(7.44) The end-based account (Selkirk, 1986) for Shimakonde data:



Truckenbrodt (1999) posits that phonological changes are determined by whether a constraint *Wrap-XP* which forces lexical projections to be contained in a phonological phrase ranks fairly higher. From a constraint-based viewpoint, the noun *na-ngatoômwa* 'top' and the following modifier *ngúlúguuma* 'round' in (7.44) are subject to the *Wrap-XP* constraint, forcing them to be within the same phonological phrase. I shall show that phrasing involving a noun before multiple modifiers and structures with certain verb tenses pose a problem to all theories of syntax-phonology interaction.

### 7.5.1 Noun before Multiple Modifiers

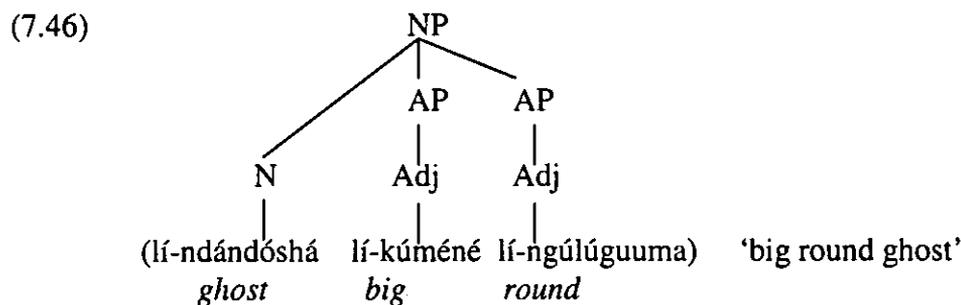
The following examples in (7.45) show that a noun before two or more modifiers undergoes shortening and tone change the same way as in a noun before a single modifier.

(7.45) Noun + modifier + modifier:

na-katataambwe	'spider'
li-ndandoosha	'ghost'
gúlúguuma	'round'
kúmeêne	'big'

(ná-kátátámbwé	ngúlúgúmá	nkúmeêne)	'round big spider'
(ná-kátátámbwé	nkúméné	ngúlúguuma)	'big round spider'
(lí-ndándóshá	língúlúgúmá	líkúmeêne)	'round big ghost'
(lí-ndándóshá	líkúméné	língúlúguuma)	'big round spider'

Surprisingly, in (7.45) a modifier before another modifier within the same NP undergoes these same phonological changes. These data have the structure in (7.46), where a noun and the following adjectives are within the same NP.



The fact that a modifier in a phrase medial position also undergoes phonological changes before another modifier in (7.46) cannot be explained by any existing theory of syntax-phonology interface. First, the Head-to-complement model (Nespor and Vogel, 1986) posits that a noun is subject to phonological changes if that noun and a modifier are in a head-to-complement relationship. This analysis cannot explain phonological changes in (7.46), since from a standard viewpoint, an adjective is not in head-to-complement relationship with another adjective.

The structure in (7.46) also poses a problem for the Max-command theory (Kaisse, 1985), because the first adjective does not c-command the following adjective, and this structure does not prevent the first adjective from undergoing phonological changes under the influence of the second adjective.

The end based theory (Selkirk, 1986) also incorrectly predicts that the right end of an adjective phrase (AP) in (7.46) should block phonological changes between the two adjectives and this is not the case.

Finally, the constraint-based account (Truckenbrodt, 1999) apparently seems to explain that WRAP-XP forces the noun and the following adjectives in (7.46) to be within the phonological phrase. However, we shall see that WRAP-XP also fails to explain the patterns of phrasing found in the language, when phonological changes are governed by the inflectional category of the verb or by the purely morphological agreement features. I posit that the elements in (7.46) phrase together, because they are within the same NP.

### **7.5.2 Noun in NP-possessive Structure + Modifier**

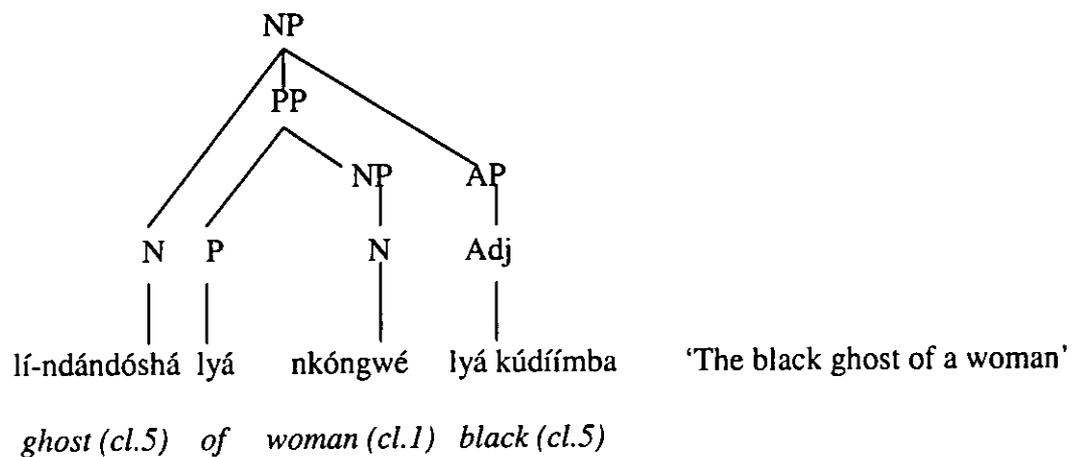
The following examples in (4.47) continue illustrating complications of phrasing in Shimakonde. In these constructions a modifier of the main clause also triggers phonological changes on words of the lower level, when the NP-possessive precedes a modifier.

(7.47) Noun + NP-possessive + modifier:

n-kóongwe				'woman'	
kúdíimba				'be black'	
li-ndandoosha				'ghost'	
a. (lí-ndándóshá	lyá	nkóongwe)		'the ghost of a woman'	
b. (lí-ndándóshá	lyá	nkóngwé	wá	kúdíimba)	'the ghost of a black woman'
c. (lí-ndándóshá	lyá	nkóngwé	lyá	<b>kúdíimba)</b>	'the black ghost of a woman'
<i>ghost</i>	<i>of</i>	<i>woman</i>		<i>black</i>	

The crucial data in (7.47c) show that the modifier 'black' is a modifier of the subject of the main clause 'ghost' with the syntactic structure give in (7.48).

(7.48) Noun before NP-possessive + adjective:



The structure in (7.48) presents some complications to all theories of syntax-phonology interface, since there is no explanation why the noun 'woman' should undergo phonological changes under the influence of the modifier 'black'.

### 7.5.3 Noun before Relative Clause + Object + Modifier

The next examples in (7.49) include other syntactic relations between a noun and the following modifier. I begin considering constructions involving a noun before a relative clause (RC) followed by other complements. These examples also pose a problem for all theories of syntax-phonology interaction, because a modifier of a higher clause triggers phonological changes on the noun of a lower clause.

(7.49) Noun + RC + object + modifier:

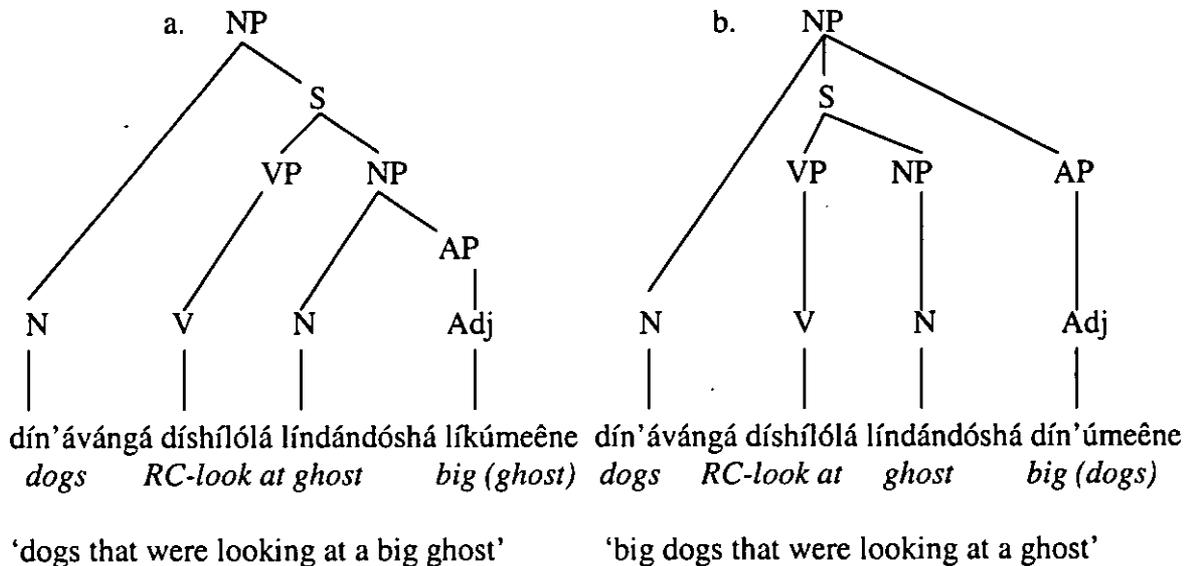
- a. dí-n'ávaanga 'dogs'  
 dí-n'ávángá díshílólá lindandoosha 'dogs that were looking at a ghost'  
 dí-n'ávángá díshílólá líndándóshá líkúmeêne 'dogs that were looking at a big ghost'  
     *dogs RC-look at ghost big(ghost)*
- b. dí-n'ávángá díshílólá líndándóshá **dín'úmeêne** 'big dogs that were looking at a ghost'  
     *dogs RC-look at ghost big(dogs)*

The crucial example is seen in (7.49b), where the last adjective 'big' is a modifier of the subject of the higher clause 'dogs', and this structure does not prevent the noun of the lower clause from undergoing phonological changes.

The examples in (7.49) show contrasting positions of attachment of the AP in the tree.

These contrasting positions of attachment are seen in the structures given in (7.50).

(7.50) Contrasting element attachment:



The structures in (7.50) further support the claim that in Shimakonde phonological interactions between two words within a phrase are determined by whether the trigger and the target words are within the same NP.

#### 7.5.4 Noun before an Adjective + Relative Clause

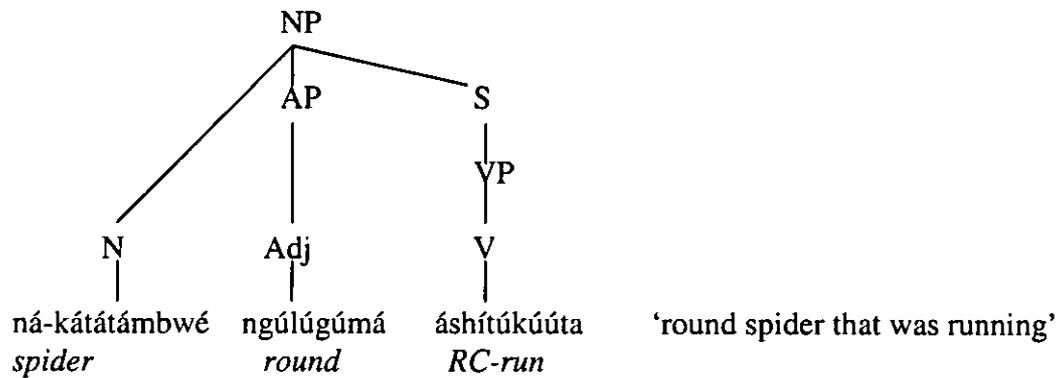
The examples in (7.51) include structures of a noun before a modifier which is followed by a relative clause. These data show that words bounded with the same NP are subject to phonological changes.

(7.51) Noun + adjective + RC:

na-katataambwe			'spider'
li-ndandoosha			'ghost'
gúlúguuma			'round'
díkídiîki			'small'
ná-kátátámbwé	ngúlúgúmá	áshítúkúúta	'round spider that was running'
<i>spider</i>	<i>round</i>	<i>RC-run</i>	
lí-ndándóshá	lídíki díki	líshítángóóla	'small ghost that was talking'
<i>ghost</i>	<i>small</i>	<i>RC-talk</i>	

As predicted, the adjective in a phrase-medial position triggers phonological changes on the preceding noun in (7.51) and the verb of the relative clause triggers alternations on the preceding modifier. Furthermore, following the pattern explained in (7.48), the relative clause of (7.51) triggers phonological changes on the preceding nominal modifier. The data in (7.51) have the structure in (7.52):

(7.52) Noun before adjective + RC:



The structure in (7.52) shows that elements bounded within the same NP phrase together phonologically.

### 7.5.5 Noun before RC + Adjective

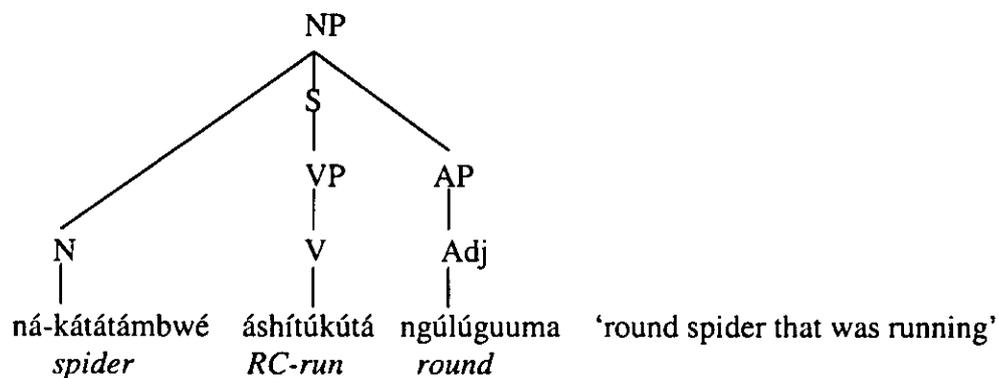
The next data in (7.53) reinforce the claim that phonological changes in (7.52) are not conditioned by word order, since changing order of the elements gives the same phonological phrasal patterns.

(7.53) Noun + RC + adjective:

ná-kátátámbwé	áshítúkútá	ngúlúguuma	‘round spider that was running’
<i>spider</i>	<i>RC-run</i>	<i>round</i>	
lí-ndándóshá	líshítángólá	lídíkídiîki	‘small ghost that was talking’
<i>ghost</i>	<i>RC-talk</i>	<i>small</i>	

The examples in (7.53) have the structure in (7.54) below. We can see that the structure in (7.54) is analogous to the structure given in (7.52), where elements bounded within the same NP undergo phrasal phonological changes.

(7.54) Noun before RC + adjective:



### 7.5.6 Noun *conj.* Noun + Modifier

The last structure I consider involves conjoined nouns before a modifier. The following examples in (7.55) show that elements within the same NP phrase together phonologically.

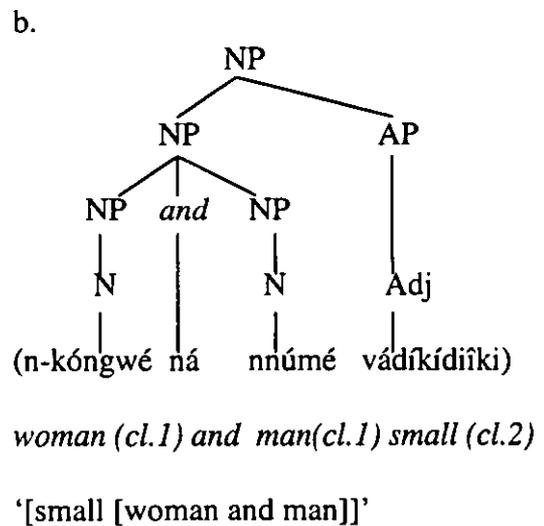
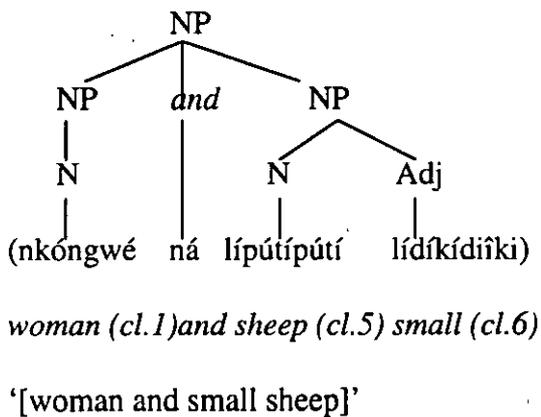
(7.55) Noun *and* noun + modifier:

n-nkóongwe	‘woman’
li-putipuúti	‘sheep’
díkídiíki	‘small’

- a. (n-kóngwé) na (lí-putipúúti) 'woman and sheep'
- b. (n-kóngwé ná lí-pútípútí lídfkídiíki) 'woman and small sheep'
- c. (n-kóngwé ná n-númé vádfkídiíki) 'small [woman and man]'
- d. (lí-pútípútí ná n-kóngwé ndífkídiíki vákújáánda) 'thin sheep and thin small woman'
- e. \*lí-pútípútí ná n-kóngwé vákújándá ndífkídiíki

The phrasal data in (7.55) show that in Shimakonde, all elements within the same NP phrase together. The sentences in (7.55b) and (7.55c) have the representation in (7.56a) and (7.56b), respectively.

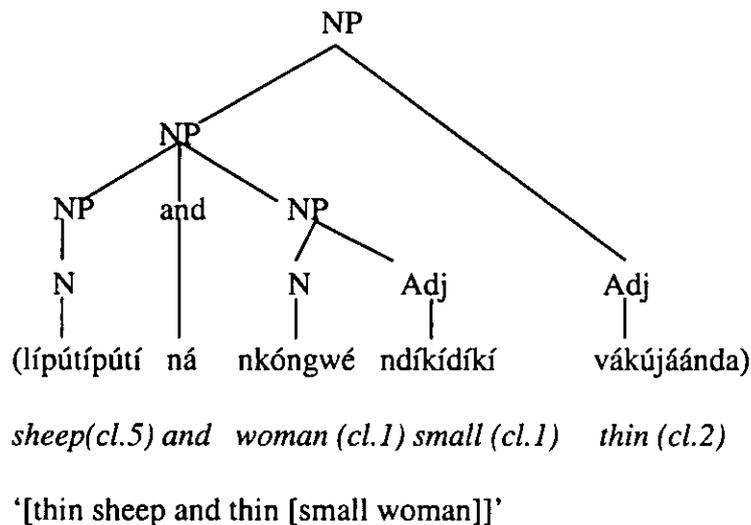
(7.56) Conjoined nouns before adjective



Notice that in (7.56a) the adjective ‘small’ is a modifier of the second component of the conjunction. In (7.56b), the adjective ‘small’ is a modifier of the conjoined nouns and that modifier triggers phonological changes on the preceding nouns in both structures, since the trigger and the target words are within the same NP.

The sentence in (7.55d) has the representation given in (7.57).

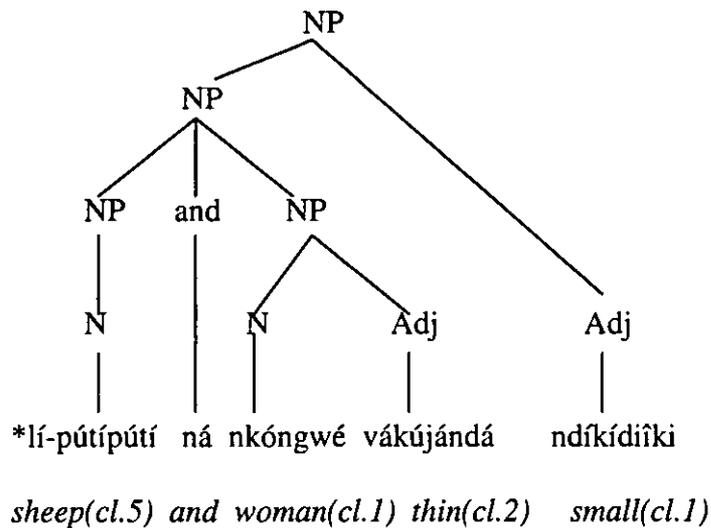
(7.57) Conjoined nouns before multiple modifiers:



The structure in (7.57) shows that the modifier ‘thin’ is a modifier of ‘sheep’ and the ‘small woman’, therefore is attached to the higher NP. This syntactic configuration does not prevent the adjective ‘thin’ from affecting the preceding modifier attached to a lower NP, which undergoes phonological changes, because both the trigger and target words are within the same NP.

Interestingly, the sentence (7.55e) is impossible, because the adjective 'thin' which is a class 2 modifier, is incorrectly being attached to the lower noun which is a class 1 noun, as shown in the representation in (7.58).

(7.58) Impossible outcome:



The syntactic configuration in (7.58) is analogous to the one in (7.57), so we see no explanation of why (7.58) is impossible output, if one attempts to explain the problem of phonological changes based only on syntactic structures. We see that it is the adjective 'thin' of the class 2 which cannot modify the noun 'woman' which is a class 1 noun, and not the syntactic structure which prohibits the sentence in (7.55e).

### 7.5.7 The Influence of the Verbal Tense on Phrasing

The following examples in (7.59) show that some tenses are responsible for blocking phrasal phonological changes, and phrasing involving a noun before a modifier needs specifically to refer to the inflectional category of the verb or to the features of morphological agreement.

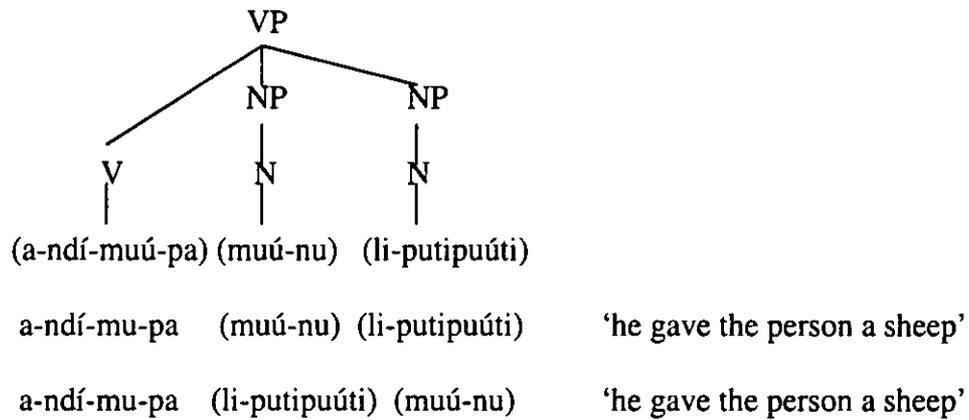
Consider the data in (7.59) involving a noun in a two-object construction.

(7.59) Noun in two-object construction:

- a. (a-ndí-muú-pa) (muú-nu) (na-ngatoômwa) 'he gave the person a top'  
(a-ndí-muú-pa) (na-ngatoômwa) (muú-nu) 'he gave the person a top'
- b. (a-ndí-mu-pa) (muú-nu) (li-putipuúti) 'he gave the person a sheep'  
(a-ndí-mu-pa) (li-putipuúti) (muú-nu) 'he gave the person a sheep'

These examples show that neither noun undergoes phrasal phonological changes, since neither noun is a head and neither noun c-commands another. The non-application of phonological changes on a noun before another noun in (7.59) can be explained as a reflex of the syntactic structure given in (7.60), where the right edge of the NP separates the two nouns.

(7.60) Verb before two objects:



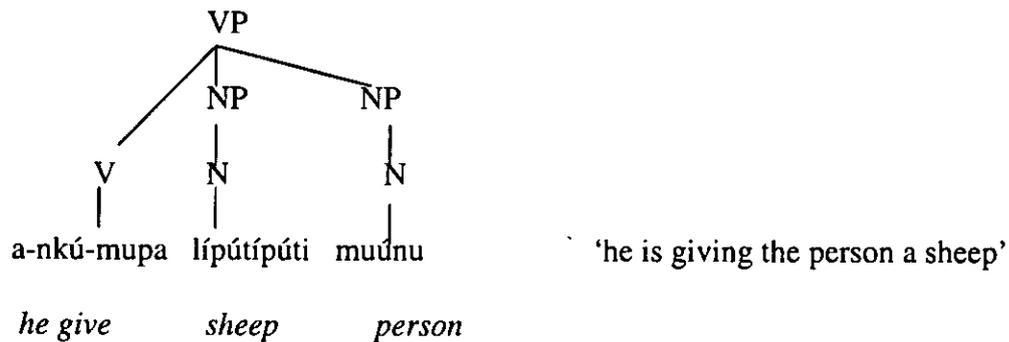
Contrast the constructions in (7.60) with the following examples in (7.61).

(7.61) Phrasal changes in two object constructions:

- a. (a-nkú-muú-pa) (muú-nu) (li-putipuúti)    'he is giving the person a sheep'
- (a-nkú-muú-pa) (muú-nu) (li-shandúuku)    'he is giving the person a suitcase'
- (a-nkú-muú-pa) (li-shandúuku) (muú-nu)    'he is giving the person a suitcase'
- b. a-nkú-mu-pa    mú-nu li-putipuúti    'he is giving the person a sheep'
- a-nkú-mu-pa    mú-nu li-shandúuku    'he is giving the person a suitcase'
- c. a-nkú-mu-pa    lí-pútípúti    muú-nu    'he is giving the person a sheep'
- a-nkú-mu-pa    lí-shándúuku    muú-nu    'he is giving the person a suitcase'

In (7.61a) there is an optional pattern where all words phrase separately. In (7.61b) and (7.61c) the noun in a phrase-medial position undergoes phonological changes before another noun. These data have the representation in (7.62).

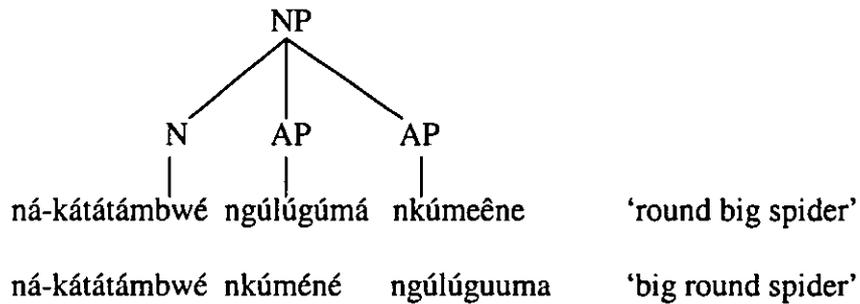
(7.62) Verb before two objects:



Surprisingly, phonological changes apply to a noun before another noun in (7.62), but there is no application of phrasal changes on the noun before another noun in (7.61), and both sentences have a parallel syntactic structure.

Even more surprising is the fact that phonological changes apply to a modifier in a phrase medial position if followed by another modifier as seen in the structure repeated in (7.63) below.

(7.63) Noun before two adjectives:



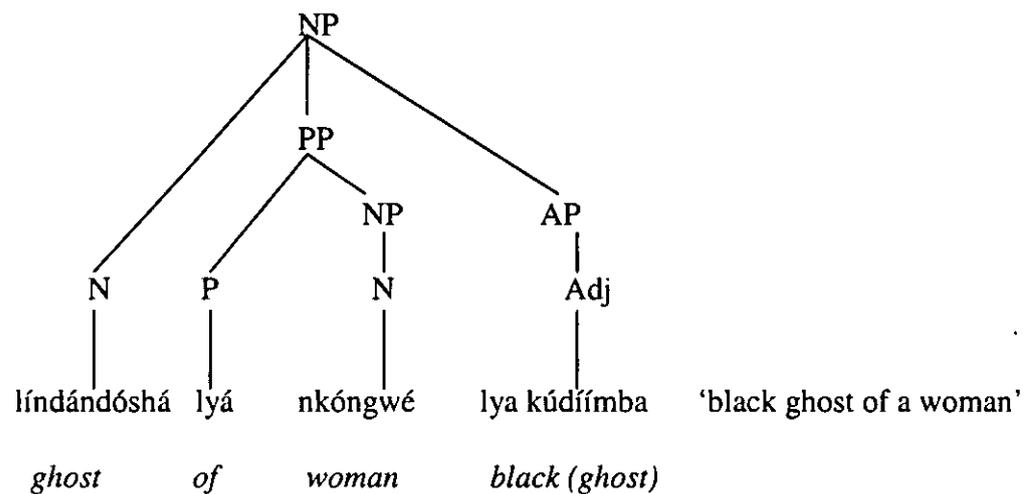
So the question is why phonological changes apply in one case and not in other case, even when there are parallel syntactic structures?

There is an assumption that the differences on the phonological behavior of the nouns in (7.60) and (7.61) is due to the differences in the inflectional category of the verb which may block phrasal changes, and not due to the syntactic configurations. The adjectives are subject to phonological change in (7.63) because they are within the same NP. In (7.61) it is the present progressive tense which allows phrasal phonological changes in a noun before another noun. The recent past tense in (7.59) and (7.60) prevents the noun from undergoing phonological alternations before another noun.

### 7.5.8 Discussion

Now I address in detail the problems posed by the syntactic structures such as (7.48) and (7.50b), where a modifier which triggers phrasal changes is not in the lower NP with the target word. For convenience the structure in (7.48) is repeated in (7.64) below.

(7.64) Noun before NP-possessive + adjective:



All the existing theories of the syntax-phonology interaction fail to explain phonological changes in Shimakonde if the processes under consideration affect the elements of a lower level under the influence of the modifier of the higher clause. The data considered above cannot be accounted for under the c-command hypothesis (Kaisse, 1985), since the c-command relation does not hold between the trigger modifier and the target word.

Notice that the XP node dominating *woman* does not dominate the modifier *black*, however, this structure does not prevent the preceding word from undergoing phonological changes under the influence of the modifier of the higher clause.

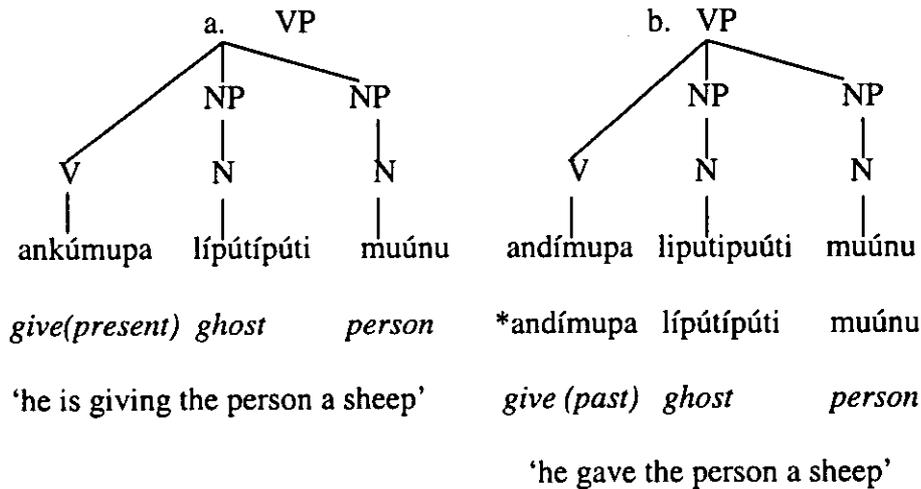
These phonological changes also cannot be explained under the hypothesis of the Head-to-complement relationship proposed in Nespor and Vogel (1986). The Head-to-complement approach posits that words on the non-recursive side of the head within its maximal projection are grouped into the same phrase. As the structure in (7.64) shows, the adjective triggering phonological changes on the preceding word of the lower level is not a complement of the preceding noun.

Structures like the one in (7.64) also pose a problem for the end-based theory advanced by Selkirk (1986), since then the modifier *black* should not cause phonological changes on the noun *woman*, because there is an NP-*end* after the lower NP. A simple explanation for these phonological changes is that in Shimakonde phrasal changes are determined by whether the trigger and the target words are inside the same NP, not because of the Head-comp relationship, c-command or XP-ends.

Truckenbrodt (1999) posits a constraint called WRAP-XP which forces each XP to be in a phonological phrase. According to Truckenbrodt Wrap predicts that each syntactic phrase is contained in a phonological phrase. Another constraint Align-XP predicts that the end of each syntactic phrase should correspond to the end of a phonological phrase.



(7.66) The influence of verbal tense on phrasing



What we see is that a noun before another noun undergoes tone change and vowel shortening in (7.66a), but the rule does not apply to (7.66b). The major problem is that Wrap needs to be restricted to certain syntactic structures, since we see no apparent explanation why Wrap does not force the elements in (7.66b) to be in a phonological phrase.

What is most problematic is that Wrap also predicts phrasing together conjoined nouns without a modifier, which does not occur in Shimakonde, although it does predict phrasing together conjoined nouns with modifiers. As seen previously, in Shimakonde, phrasing together conjoined nouns with modifiers is governed by morphological features and Wrap does not account for this. Instead, it predicts incorrectly that conjoined nouns in (7.58) should phrase together with the following modifiers.

## 7.6 Conclusions

The study of the phrasal tone of Shimakonde and the explanation of its operation provides further evidence that several algorithms for accounting the syntax-phonology interaction do not fully predict the phonological unit within which phrasal rules apply. Following previous studies in this area, I propose a parameter for an individual language to explain the phrasal changes in Shimakonde.

I have shown various cases where phrasing is determined by whether the trigger and the target words are inside the same NP and this parameter applies without making any particular reference to heads, complements and edges of some syntactic constituent. The analysis also provides evidence for certain categories that may prevent phonological changes between elements. These categories include certain tense-aspects and elements not bounded within the same NP.

## CHAPTER 8

### CONCLUSION

In this dissertation I have described a wide range of phonological phenomena. First, I have provided a brief description of major morphological properties. Second, in Chapters 3 and 4 I describe consonantal and vocalic phonology focusing on consonant plus nasal sequences and on V-V sequences. We have seen that N+C sequences do not provide a unified set of phonological alternations because the actual outcomes depend on the nature of the prefix which is involved. In the realm of V-V sequences, there are different surface patterns of V-V resolution. At the word level, there is vowel coalescence, fusion and Glide Formation. There is a complication pertaining to Glide Formation which is obligatory in the penult, but the process is optional before the penult. The issue of optionality of Glide Formation is complicated and requires further investigation. At the phrase level, V-V sequences undergo Glide Formation, vowel deletion, and homorganic glide deletion. In chapter 5 I have examined vowel harmony and reduction. We have seen that while harmony is well attested in many languages, phonological vowel reduction in a typically tone language has not been documented yet, and Shimakonde seems to be the only case where there is such a phonological vowel reduction in a tone language.

Reduction interacts with harmony, which should apply before reduction, since reduction removes the vocalic node of mid vowels which is crucial for proper application of harmony. Acoustic measurements and perceptual tests show that the surface vowel derived from reduction of underlying mid vowels is identical to the stressed surface low vowel [a]. Still in the realm of harmony and reduction, I examined the contiguity of reduction (CORE) phenomenon which dictates that reduction should apply at one point from the left to the right and once the rule stops being applied, it cannot restart applying again.

In chapters 6 and 7 I focused on tone at the word level and phrase level, respectively. The major tonal principles that apply at the word level, namely Doubling and Unconditioned Unbounded Spreading also apply at the phrase level. Apart from Doubling and UUS, there is tone shift which may apply from a prefix to another prefix or from the prefix to the stem-initial vowel. There are three tone domains at the word level, namely prefix domain, stem domain and the word domain.

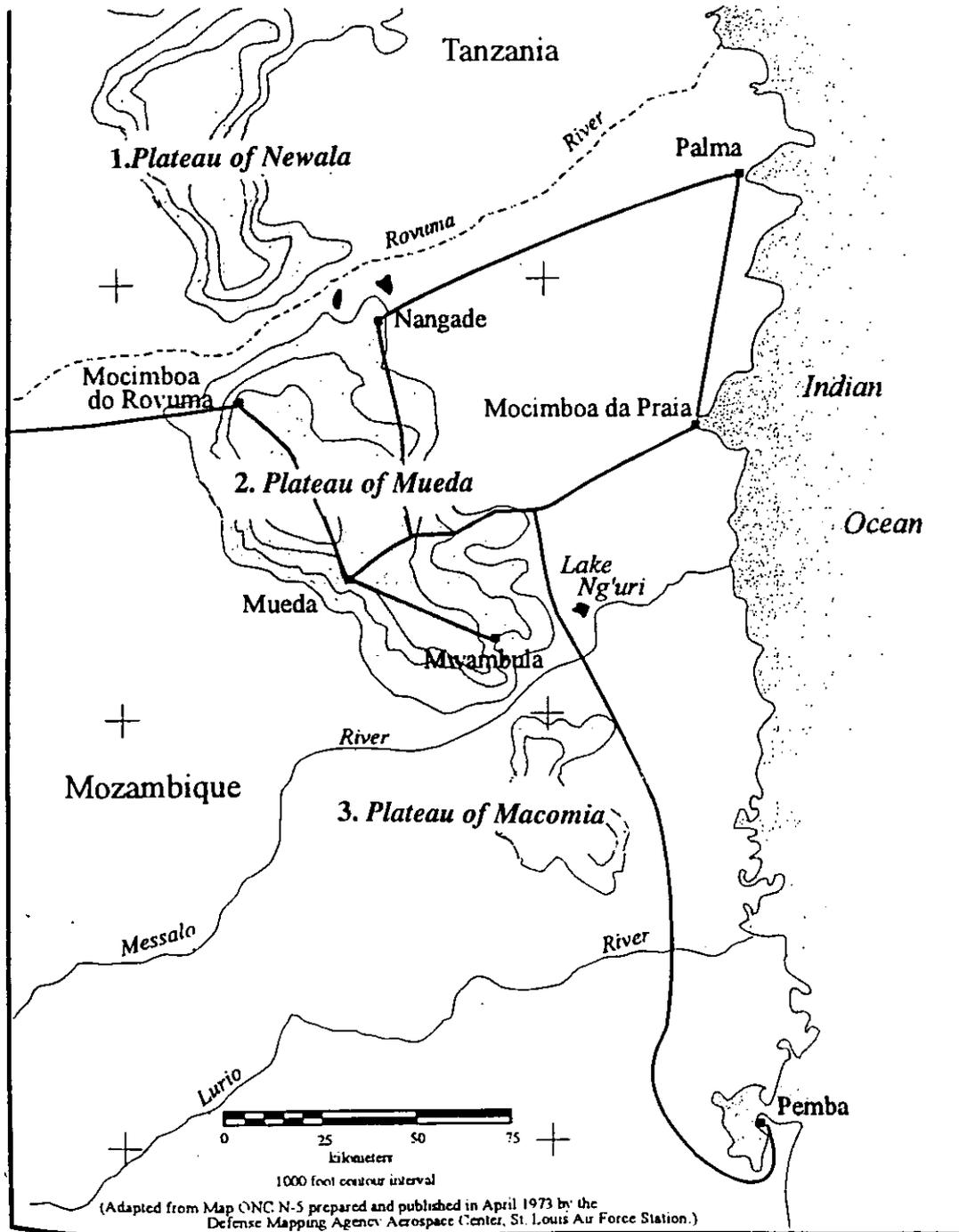
The findings from Shimakonde phrase phonology show that there are three tone rules which apply at this level. Specifically, there is obligatory phrase-medial H insertion, optional word-initial H insertion and *shaáni* H-deletion. Furthermore, apart from the phrasal tone processes, there is phrasal shortening of the penult stress-induced long vowel of the noun when the noun phrases together phonologically with the following word.

In this respect, the Shimakonde data support the claim made by all major theories of syntax-phonology interaction that two words phrase together phonologically if there are within the same maximal syntactic projection. Phrasal data from Shimakonde also show that all theories of syntax-phonology interaction fail to account for phonological changes involving a noun before multiple modifiers. The combination of a noun before multiple modifiers shows that the following word will always trigger phonological changes to the preceding word, even if the trigger and the target words are in separate clauses. I propose an account which claims that two elements phrase together if they are bounded within the same NP.

This dissertation is by no means an exhaustive account of all the grammatical structures of Shimakonde. There are a few areas which are not included in the present study, namely, reduplication, glide-tone interaction and verbal phrase phonology. Beyond examining just Shimakonde, a study of the phonological systems of other languages of Zone P, in particular Emakhuwa, Ciyao, Elomwe, Echuwabo, Cindonde and Cimakwe might help to understand some of the facts of Shimakonde. I hope this research experience could be applied to these languages in the future, and take into consideration of the phonological systems of other languages which are related to Shimakonde.

APPENDIX A

PLATEAU REGION OF NORTHERN MOZAMBIQUE



## APPENDIX B

### VERBAL TENSES

#### B.1. List of Verbal Tenses:

##### (B.1a) Infinitive positive:

kú-pííma	'to measure'
kú-tú-pííma	'to measure us'
kú-pímánííla	'to measure each other'
kú-tú-pimangiíla	'to measure for us repeatedly'

##### (B.1b) Recent past positive:

vandí-pííma	'they measured'
vandi-tú-pííma	'they measured us'
vandi-pímánííla	'they measured for'
vandi-tú-pimangiíla	'they measured for us repeatedly'

(B.1c) Recent past negative:

ava-pímiíle	'they did not measure'
ava-tu-pímiíle	'they did not measure us'
ava-pímángídiíle ~ ava-pímángidiíle	'they did not measure for repeatedly'
ava-tu-pímángídiíle ~ ava-tu-pímángidiíle	'they did not measure for us repeatedly'

(B.1d) Remote past positive:

vá-ndí-piíma	'they had measured'
vá-ndí-tú-piíma	'they had measured us'
vándí-pímániíla ~ vándí-pimaniíla	'they had measured for each other'
vándí-tú-pimangiíla	'they had measured for us repeatedly'

(B.1e) Remote past negative:

ava-pimiíle	'they had not measure'
ava-tu-pimiíle	'they had not measure us'
ava-pimanidiíle	'they had not measure for each other'
ava-tu-pimangidiíle	'they had not measure for us repeatedly'

(B.1f) Present habitual positive:

vándá-piíma	'they measure'
vándá-tú-piíma	'they measure us'
vándá-pímániíla ~ vándá-pimaniíla	'they measure for each other'
vándá-tú-pimangiíla	'they measure for us repeatedly'

(B.1g) Present habitual negative:

avana-pííma	'they do not measure'
avana-tu-pííma	'they do not measure us'
avana-pímánííla ~ avana-pimanííla	'they do not measure for each other'
avana-tu-pímángííla ~ avana-tu-pimangííla	'they do not measure for us repeatedly'

(B.1h) Present progressive positive:

vanku-pííma	'they are measuring'
vanku-tú-pííma	'they are measuring us'
vanku-pímánííla ~ vanku-pimanííla	'they are measuring for each other'
vanku-tú-pimangiíla	'they are measuring for us repeatedly'

(B.1i) Present progressive negative:

avana-pímá shiinu	'they are not measuring'
avana-tu-pímá shiinu	'they are not measuring us'
avana-pímánííla shiinu ~ avana-pimanííla shiinu	'they are not measuring for each other'
avana-tu-pímííla shiinu ~ avana-tu-pimííla shiinu	'they are not measuring for us'

(B.1j) Volitional present progressive positive:

va-lota kú-pííma ~ vá-lótá kú-pííma	'they are intending to measure'
va-lota kú-tú-pííma ~ vá-lótá kú-tú-pííma	'they intend to measure us'
va-lota kú-pímánííla ~ vá-lótá kú-pímánííla	'they intend to measure for each other'
va-lota kú-tú-pimangiíla ~ vá-lótá kú-tú-pimangiíla	'they intend to measure for us repeat.'

(B.1k) Imperfective progressive positive:

vásíndá-pííma	'they were measuring'
vásíndá-tú-pííma	'they were measuring us'
vásíndá-pímánííla ~ vásíndá-pimaniíla	'they were measuring for each other'
vásíndá-tú-pimangiíla	'they were measuring for us repeatedly'

(B.1l) Imperfective progressive negative:

avasi-pííma	'they were not measuring'
avasi-tu-pííma	'they were not measuring us'
avasi-pímánííla ~ avasi-pimanííla	'they were not measuring for each other'
avasi-tu-pímángííla ~ avasi-tu-pimangííla	'they were not measuring for us repeatedly'

(B.1m) Past progressive relative positive:

vásí-pííma	'that they were measuring'
vásí-tú-pííma	'that they were measuring us'
vásí-pímánííla	'that they were measuring for each other'
vásí-tú-pímángííla	'that they were measuring for us repeatedly'

(B.1n) Past progressive relative negative:

vákásí-pííma ~ vákasi-pííma	'that they were not measuring'
vákásí-tú-pííma ~ vákasi-tu-pííma	'that they were not measuring us'
vákásí-pímánííla ~ vákasi-pimanííla	'that they were not measuring each other'
vákásí-tú-pímángííla ~ vákasi-tu-pimangííla	'that they were not measuring for us repeat.'

(B.1o) Present habitual relative positive:

váná-pííma	'that they measure'
váná-tú-pííma	'that they measure us'
váná-pímánííla	'that they measure for each other'
váná-tú-pímángííla	'that they measure for us repeatedly'

(B.1p) Present habitual relative negative:

vákáná-pííma ~ vákana-pííma	'that they do measure'
vákáná-tú-pííma ~ vákána-tu-pííma	'that they do not measure us'
vákáná-pímánííla ~ vákáná-pimanííla	'that they do not measure for each other'
vákáná-tú-pímángííla ~ vákáná-tu-pimangííla	'that they do not measure for us repeatedly'

(B.1q) Present progressive relative positive:

va-piíma	'that they are measuring'
va-tu-piíma	'that they are measuring us'
va-pimaniíla	'that they are measuring for each other'
va-tu-pimangiíla	'that they are measuring for us repeatedly'

(B.1r) Present progressive relative negative:

váká-piima	'that they are not measuring'
váká-tú-piima	'that they are not measuring us'
váká-pimaniila	'that they are not measuring for each other'
váká-tú-pimangiila	'that they are not measuring for us repeatedly'

(B.1s) Future positive:

vandá-piíma	'they will measure'
vanda-tú-piíma	'they will measure us'
vanda-pímániíla	'they will measure for each other'
vanda-tú-pimangiíla	'they will measure for us repeatedly'

(B.1t) Future negative:

ava-piima	'they will not measure'
ava-tu-píima	'they will not measure us'
ava-pimaniila	'they will not measure for each other'
ava-tu-pímangiila	'they will not measure for us repeatedly'

(B.1u) Volitional future positive:

vá-lótá kú-pííma ~ va-lota kú-pííma	'they intend to measure'
vá-lótá kú-tú-piíma ~ va-lota kú-tú-piíma	'they intend to measure us'
vá-lótá kú-pímániíla ~ va-lota kú-pímániíla	'they intend to measure for each other'
vá-lótá kú-tú-pimangiíla ~ va-lota kú-túpimangiíla	'they intend to measure for us repeat.'

(B.1v) Imperative positive:

piíma	'measure!'
tu-piima	'measure us!'
pimaniíla	'measure for each other!'
tu-pimangiila	'measure for us repeatedly!'

(B.1w) Imperative negative:

avana-píime	'(they) do not measure!'
avana-tú-piime	'(they) do not measure us!'
avana-pímániile	'(they) do not measure for each other'
avana-tú-pimangiile	'(they) do not measure for us repeatedly!'

(B.1y) Conditional positive:

vaka-piíma	'if they measure'
vaka-tu-piíma	'if they measure us'
vaka-pimaniíla	'if they measure for each other'
vaka-tu-pimangiíla	'if they measure for us repeatedly'

(B.1z) Conditional negative:

vaka-piime ~ vakana-pííma	'if they do not measure'
vak-tu-piime ~ vakana-tu-pííma	'if they do not measure us'
vaka-pimaniile ~ vakana-pimanííla	'if they do not measure for each other'
vaka-tu-pimangiile ~ vakana-tu-pimangííla	'if they do not measure for us repeatedly'

(B.1aa) Participial/Gerund positive:

vá-pííma	'measuring'
vá-tú-pííma	'measuring us'
vá-pímániila	'measuring for each other'
vá-tú-pímángiila	'measuring for us repeatedly'

(B.1bb) Participial/Gerund negative:

vakana-pííma	'not measuring'
vakana-tu-pííma	'not measuring us'
vakana-pímánííla ~ vakana-pimanííla	'not measuring for each other'
vakana-tu-pímángííla ~ vakana-tu-pimangííla	'not measuring for us repeatedly'

(B.1cc) Subjunctive positive:

va-pííme	'let them measure'
va-tu-pííme	'let them measure us'
va-pimaniíle	'let them measure for each other'
va-tu-pímángiile	'let them measure for us repeatedly'

(B.1dd) Subjunctive negative:

avana-pííme	'let them not measure'
avana-tú-piime	'let them not measure us'
avana-pímániile	'let them not measure for each other'
avana-tú-pimangiile	'let them not measure for us repeatedly'

(B.1ee) Suggestive positive:

vákándí-pííma	'they should measure'
vákándí-tú-pííma	'they should measure us'
vákándí-pimaniíla	'they should measure for each other'
vákándí-tú-pimangiíla	'they should measure for us repeatedly'

(B.1ff) Suggestive negative:

vákáná-piime	'they should not measure'
vákáná-tú-piime	'they should not measure us'
vákáná-pímániile ~ vákáná-pimaniile	'they should not measure for each other'
vákáná-tú-pimangiile	'they should not measure for us repeatedly'

(B.1gg) Perfective temporal-when positive:

va-pimiile	'when they have measured'
va-tu-pimiile	'when they have measured us'
va-pimanidiile	'when they have measured for each other'
va-tu-pimangidiile	'when they have measured for us repeatedly'

(B.1hh) Recent past perfective temporal-when positive:

pává-pimiile	'when they measured'
pává-tú-pimiile	'when they measured us'
pává-pímánidiile	'when they measured for each other'
pává-tú-pímángídiile	'when they measured for us repeatedly'

(B.1ii) Recent past perfective temporal-when negative:

páváká-pimiíle	'when they did not measure'
páváká-tú-pimiíle	'when they did not measure us'
páváká-pimidiíle	'when they did not measure for each other'
páváká-tú-pimangidiíle	'when they did not measure for us repeatedly'

(B.1jj) Remote past perfective temporal-when positive:

pava-pimiife	'when they had measured'
pava-tu-pimiife	'when they had measured us'
pava-pimanidiife	'when they had measured for each other'
pava-tu-pimangidiife	'when they had measured for us repeatedly'

(B.1kk) Imperfective temporal-when positive:

pavasi-piima	'when they were measuring'
pavasi-tu-piima	'when they were measuring us'
pavasi-pimaniifa	'when they were measuring for each other'
pavasi-tu-pimangiifa	'when they were measuring for us repeatedly'

(B.1ll) Imperfective temporal-when negative:

pavakasi-piima ~ pavakasi-piima	'when they were not measuring'
pavakasi-tu-piima ~ pavakasi-tu-piima	'when they were not measuring us'
pavakasi-pimaniifa ~ pavakasi-pimaniifa	'when they were not measuring for each other'

(B.1mm) Present progressive temporal-when positive:

pava-piima	'when there are measuring'
pava-tu-piima	'when they are measuring us'
pava-pimaniila	'when they are measuring for each other'
pava-tu-pimangiila	'when they are measuring for us repeatedly'

(B.1nn) Present progressive temporal-when negative:

páváká-piima	'when they are not measuring'
páváká-tú-piima	'when they are not measuring us'
páváká-pimaniila	'when they are not measuring for each other'
páváká-tú-pimangiila	'when they are not measuring for us repeatedly'

(B.1oo) Present habitual temporal-when positive:

páváná-píima	'when they measure'
páváná-tú-píima	'when they measure us'
páváná-pímánííla	'when they measure for each other'
páváná-tú-pímángííla	'when they measure for us repeatedly'

(B.1pp) Present habitual temporal-when negative:

pávákáná-píima ~ pávákana-píima	'when they do not measure'
pávákáná-tú-píima ~ pávákana-tu-píima	'when they do not measure us'
pávákáná-pímánííla ~ pávákáná-pimaniíla	'when they do not measure for each other'
pávákáná-tú-pímángííla ~ pávákáná-tu-pimangííla	'when they do not measure for us repeat.'

## **B.2. Tenses which phrase together with the following noun:**

(B.2a) Infinitive positive:

kú-pímííla ínguúvo	'to measure cloth for'
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(B.2b) Present progressive positive:

vá-m-pímííla múnu inguúvo	'they are measuring cloth for a person'
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(B.2c) Volitional present progressive positive:

vá-lótá kú-m-pimila íngúúvo 'they are intending to measure cloth for him'

(B.2d) Past progressive relative positive:

vásí-pímílá íngúúvo 'that they were measuring cloth for'

(B.2e) Present habitual relative positive:

váná-pímílá íngúúvo 'that they measure cloth for'

(B.2f) Volitional future positive:

vá-lótá kú-pímílá íngúúvo 'they intend to measure cloth for'

(B.2g) Imperfective temporal-when positive:

pávásí-pímílá íngúúvo 'when they were measuring cloth for'

(B.2h) Present habitual temporal-when negative:

páváná-pímílá íngúúvo 'when they measure cloth for'



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