Tonal polarity and paradigm uniformity in the nominal paradigm of Xitsonga (S53) *

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Lee, Seunghun J. 2013. Tonal polarity and paradigm uniformity in the nominal paradigm of Xitsonga (S53). *Studies in Phonetics, Phonology and Morphology* 19.1. 107-123. Xitsonga nouns display two types of plural formation. Plural prefixes can be added to a singular root (*prefixation*), or plural prefixes can take the place of singular prefixes (*substitution*). Tonal realizations differ in these two types, as the prefixation plurals show tonal polarity whereas the substitution plurals show paradigm uniformity effects in the absence of tonal polarity. The Xitsonga data differ from previous studies of tonal polarity in that the presence or absence of tonal polarity can target the same class of nouns that differ only in terms of how plurals are formed. A constraint-based analysis shows that the paradigm uniformity constraint (IDENT-BO-T) outranks the OCP constraint, which in turn outranks the general tonal identity constraint (IDENT-T). **(Central Connecticut State University and Zentrum für Allgemeine Sprachwissenschaft)**

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1. Introduction

This paper has three tightly connected goals. The first goal is to present tonal patterns of singular vs. plural forms in the nominal paradigm of Xitsonga, a southern Bantu language, in which tonal polarity appears or fails to display. The second goal is to argue that the failure to undergo tonal polarity in some plural forms is due to the (tonal) paradigm uniformity effect. The last goal is to present a constraint-based analysis (Optimality Theory, OT, Prince and Smolensky 1993/2004). This analysis incorporates new observations (i.e. failure to display tonal polarity) in the number morphology, which have not

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been included, and are difficult to be added to, previous analyses of tonal polarity.

Xitsonga has two basic types of processes when a plural form is created from a singular form: prefixation and substitution. Xitsonga is a two-tone language with high (H) tone and low (L) tone.

(1) Plural formation in Xitsonga

a. Prefixation: A plural prefix is added to the singular base

	Class 3	Tone	Class 4	Tone	
i.	Ø-ɬátá	Ø-H	**mì**-ɬátá	L-H	'sweet potato'
ii.	Ø-nàwù	Ø-L	**mí**-làwù[1]	H-L	'law'

b. Substitution: A plural prefix replaces the singular prefix

	Class 3	Tone	Class 4	Tone	
i.	**mú**-gájó	H-H	**mí**-gájó	H-H	'mealie meal'
ii.	**mù**-gàŋgá	L-LH	**mì**-gàŋgá	L-LH	'village'

When plural prefixes (in particular, class 4, 6, and 10) are added to singular nouns (the *prefixation* type), tones of the prefixes display tonal polarity as shown in (1a); the prefix receives the tone that is different from the tone of the stem-initial syllable. Plural prefixes are realized as high tone (H) before L tone stem-initial syllable as in (1ai). They are realized as low tone (L) before H tone stem-initial syllable as in (1aii).

Tonal polarity, however, does not always occur as shown in (1b), which I dub as the *substitution* type. The prefixes in (1bi) and (1bii) have identical tones in both the singular prefix and the plural prefix, in contrast with examples in (1a). This faithful tonal realization in the substitution type (i.e. the non-application of tonal polarity) has not been observed, and thus has not been incorporated into previous analyses of tonal polarity.

The main proposal for the difference between (1a) and (1b) is that tonal polarity in plural prefixes in (1a) is due to Obligatory Contour Principle (OCP), and the violation of tonal polarity in (1b) is due to a paradigm uniformity effect.

The rest of the paper is organized as follows. In section 2, basic information about Xitsonga, focusing on nouns, will be presented. Tonal polarity will be discussed in section 3. Analyses of tonal polarity and the failure to show tonal polarity will be discussed in section 4. A discussion regarding the status of nasal prefixes is also presented in section 4, which is followed by section 5 which discusses cross-linguistic implications of patterns observed in Xitsonga.

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[1] The [n] ~ [l] alternation in (1aii) is common in Bantu languages. The alternation pattern will not be pursued further in this paper because it has no bearing to the tonal polarity analysis.

2. Xitsonga nouns: background and data collection

Xitsonga (S53, Bantu language classification à la Guthrie 1967-1971) is a language spoken mainly in South Africa, Mozambique and Zimbabwe. According to Baumbach (1987: 1) Xitsonga is also spoken in Swaziland. In South Africa, Xitsonga is one of the 11 official languages and it is spoken by more than 1.7 million people (4.4%, Statistics South Africa 2003). The majority of Xitsonga speakers are found in the Limpopo province, in which Xitsonga shares linguistic space with TshiVenda and Northern Sotho. Multilingualism is widespread in the area. Many Xitsonga speakers can communicate in TshiVenda and English. Some speakers also have knowledge of isiZulu and Northern Sotho (Sepedi).

Xitsonga has 15 Noun Classes that are marked with prefixes.[2] The forms of the singular prefixes vary between the forms shown in the left column of (2), to a homorganic nasal prefix or a null prefix. The plural prefixes, however, always take the forms in the right column of (2). Xitsonga Noun Classes are thus determined by considering the singular/plural prefix pair of a noun. As will be analyzed in sections 3 to 5, tones on the plural prefixes (the right two columns) are argued to be assigned through constraint interactions.

(2) Xitsonga noun class prefixes[3]

	Singular		*Plural*
Class 1	mu-	Class 2	βa-
Class 3	mu-	Class 4	mi-
Class 5	ri-	Class 6	ma-
Class 7	ʃi-	Class 8	ʂi-
Class 9	ji-	Class 10	ti-
Class 11	ri-	Class 10	ti-
Class 14	βu-	Class 6	ma-
Class 15	ku-		

Recordings of data for this paper have been collected with assistance from the M.E.R. Mathivha Centre at the University of Venda in Limpopo, South Africa. The data, extracted from a Xitsonga dictionary (Cuenod 1967), was recorded by a Zoom H4 digital recorder using a head-mount unidirectional microphone (Shure WH-30).

Target words were recorded in a carrier sentence with L tone words preceding and following the target. Plural forms were produced by a wug test,

[2] There is no consensus as to how nouns are divided into these noun classes. See Katamba (2003) for an overview of Bantu noun classes.

[3] The plural class markers are numbered based on the phonological forms. Thus, the plural of class 11 [ti-] is numbered as class 10, and the plural of class 14 [ma-] is numbered as class 6. Note that the singular class markers are not numbered based on the phonological forms. Thus, both class 1 and class 3 have the form [mu-].

in which consultants were asked to produce a plural form by recalling a form for 'two' items after a singular form is produced.

This paper is based on the analysis of 196 examples of speech by one female native speaker of Xitsonga, who completed one year of university-level Xitsonga classes. She also has limited knowledge of Tshivenda, another language commonly spoken in Limpopo.

3. Tonal polarity

Tonal polarity in Xitsonga has been noted as early as 1959 by Cole-Beuchat (1959: 133). Particularly, tonal polarity is observed in the cases when a noun has no overt singular prefix, and plurals are formed by adding a plural prefix to a singular stem (the *prefixation* type). Then, the plural prefix is assigned a tone opposite to the tone of the stem-initial syllable as shown in (3).

(3) Examples of tonal polarity in class 3/4

	Class 3	Tone	Class 4	Tone	
a.	Ø-ɬátá	Ø-H	**mì**-ɬátá	L-H	'sweet potato'
b.	Ø-nàwù	Ø-L	**mí**-làwù	H-L	'law'

In (3a), the singular stem [ɬátá] is an H-initial noun. The plural form of this noun is [mì-ɬátá] in which the prefix [mi-] is realized with an L tone. The same plural prefix [mi-] is realized with an H tone in (3b) when the singular stem is an L-initial noun.

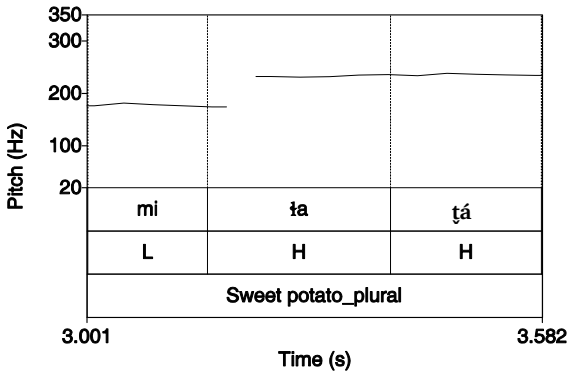

Figure 1. Pitch track of [mì-ɬáʈá] 'sweet potatoes'

Figure 1 shows the pitch track of the plural form in (3a). The pitch difference between the prefix [mi-] and the nominal root is about 50 Hz. Note that the influence from the vowel quality to this pitch difference must be minimal because the L toned prefix has a high vowel [i] and the H-initial

noun root has only the low vowel [a].

In previous studies, tonal polarity has mostly been analyzed as an effect of the Obligatory Contour Principle (OCP). In Kenstowicz et al. (1988), tonal polarity in Mooré has been argued to be a case of dissimilation, in which an underlying H tone of a suffix becomes an L tone on the surface if the stem has an H-initial tone, i.e. if there is an OCP violation. Their analysis has been applied to the associative construction in Mooré. The crucial assumption there is that Mooré has a three-way underlying tonal contrast: high, low and toneless stems. Examples such as [wám-dé] 'calabash-singular', which has two consecutive high tones, are analyzed as a case of high tone spreading from the high tone suffix /-dé/ '(singular)' to a toneless stem /wam/ 'calabash'. In Mooré, stems will vary in its tonal value in response to the suffixes. In Xitsonga, however, the prefix varies in its tonal value in response to the stem. This stem/affix difference makes a simple application of Kenstowicz et al. (1988) to Xitsonga untenable.

On the other hand, other studies argue that tonal polarity emerges from syllables with toneless input, contra to Kenstowicz et al. (1988). In languages with tonal polarity in toneless inputs, the OCP again determines surface tones (Dagaare in Anttila and Bodomo 2000). Cahill (2004) also analyzes Kɔnni in such a constraint-based framework, and argues that tonal polarity needs to be analyzed with a specific tonal polarity constraint. Cahill also argues against Kenstowicz et al.'s (1988) claim that tonal polarity is an epiphenomenon of dissimilation. The Kɔnni study proposes the POLAR constraint, similar to OCP, with a specific reference to the noun class 1 plural, the only locus where tonal polarity is observed. The tonal polarity constraint in Cahill (2004) specifically targets a single noun class. This specificity of the POLAR constraint cannot extend to an analysis of Xitsonga. In Xitsonga, all noun classes would undergo tonal polarity or fail to display tonal polarity depending on whether the tonal conditions for tonal polarity were met or not, rather than being morphologically tailored to do so.

Previous studies discussed so far analyze tonal polarity with representational restrictions (Kenstowicz et al. 1988) or with a morpheme specific constraint (Cahill 2004). While these theories partially account for Xitsonga tonal polarity, they cannot fully explain the Xitsonga data, in which plural prefixes show or fail to show tonal polarity based on the phonological environment with respect to the singular stem. The failure to tonal polarity in Xitsonga is argued to be the result of the drive for tonal identity between the base and the output in the grammar (see Section 4.2), and not as a case of tonal spreading to a toneless stem (Kenstowicz et al. 1988) or a case of failure to belong to a particular morphological class (Cahill 2004).

4. An optimality theoretic analysis

In OT terms, plural prefixes receive surface tones through constraint interactions that govern tonal polarity. Regardless of input specifications (H

tone, L tone, or toneless), the tonal constraints determine outcomes of surface tones. Plural prefixes that have corresponding singular prefixes in the paradigm are assigned to tone in the output based on paradigm uniformity constraints.

In OT, regardless of specifications given to a prefix in the input (a property known as Richness of the Base), the ranking of constraints should produce outputs that conform to observed patterns in a language. Thus, H tone inputs and L tone inputs have changes in tone depending on the tone of stem-initial syllables, and toneless inputs will surface with tonal polarity in the sense of Anttila and Bodomo (2000). In the following analysis, the following faithfulness constraints (4) and markedness constraints (5) will be considered.

(4) Faithfulness constraints (Yip 2002)
  a. IDENT-T
     Corresponding mora in the input and in the output have identical tonal value.
  b. DEP-T (No insertion)
     Assign a violation mark for any mora in the output which has a tone that does not have a tone on a corresponding mora in the input
  c. MAX-T (No deletion)
     Assign a violation mark for any mora in the input which has a tone that does not have a tone on a corresponding mora in the output

(5) Markedness constraints
  a. TBU→T (Lee 2008)
     Assign a violation mark for a tone bearing unit (TBU) that is not associated with a tone in the output (cf. *TONELESS constraint in Cahill 2004)
  b. OCP (Obligatory Contour Principle) (Leben 1973, Goldsmith 1976)
     Assign a violation mark when adjacent tone bearing units in the output are each associated with tones that have identical tonal values.
  c. NOFUSION (Yip 2002)
     Assign a violation mark to a tone in the output which has multiple correspondents in the input.

4.1 Tonal polarity (*the prefixation type*)

Let's consider first an input with a toneless plural prefix (cf. Anttila and Bodomo, 2000). The optimal candidate in (6a) is assigned to a polar tone, a tone opposite to the tone of the stem-initial TBU. The candidate with an H tone prefix in (6b) violates the higher ranked OCP constraint. In order to satisfy the OCP constraint, the H tone on the prefix fuses with the following H tone in (6c). This candidate, however, violates the NOFUSION constraint. (Candidates with tonal fusion are marked with underlines). In (6d), the candidate with a toneless prefix violates the TBU→T constraint.

(6) Mapping of /**mi-**ɬátá/ to [mì-ɬátá][4]

	/**mi-**ɬátá/ Ø-H	OCP	NOFUSION	TBU→T	DEP-T
a. ☞	[mì-ɬátá] L-H				*
b.	[mí-ɬátá] H-H	W *			*
c.	[mí-ɬátá] H		W *		*
d.	[mi-ɬátá] Ø-H			W *	L

(7) Mapping of /**mí-**ɬátá/ to [mì-ɬátá]

	/**mí-**ɬátá/ H-H	MAX -T	OCP	TBU →T	NO FUSION	IDENT -T	DEP -T
a. ☞	[mì-ɬátá] L-H					*	
b.	[mí-ɬátá] H-H		W *			L	
c.	[mi-ɬátá] Ø-H	W *		W *		L	
d.	[mí-ɬátá] H				W *	L	

In the tableau (7), an input with an underlying H tone (cf. dissimilation, Kenstowicz et al. 1988) is considered. The optimal candidate in (7a) is assigned to an L tone, a polar tone even though this tonal change violates the faithfulness constraint IDENT-T. The faithful candidate in (7b) violates the OCP constraint. The candidate deleting the H tone satisfies the OCP constraint in (7c), but it incurs violations of TBU→T and MAX-T (MAX-T is ranked based on arguments in (13)). The candidate in (7d) violates the NOFUSION constraint. Hereafter, the fusion candidate will not be included in future tableaux.

(8) Ranking so far (to be updated),

a. OCP, NOFUSION >> IDENT-T	Tonal polarity	(7b), (7d)
b. MAX-T, TBU→T >> DEP-T	No toneless syllable	(6d)

The tableau in (9) evaluates an input with an underlying L tone on the

[4] All the tableaux in this paper are presented as comparative tableaux, which represents ranking arguments in graphic ways. A cell with W means that a constraint favors the optimal candidate over the non-optimal candidate. A cell with L means that a constraint favors the non-optimal candidate over the optimal candidate. See Prince (2002) for details.

prefix [mi-]. The faithful candidate in (9a) is the optimal candidate because it does not violate any constraints in the grammar.

(9) Mapping of /**mì-**ɬátá/ to [mì-ɬátá]

	/**mì-**ɬátá/ L-H	MAX-T	OCP	TBU→T	NO FUSION	IDENT-T	DEP-T
a. ☞	[mì-ɬátá] L-H						
b.	[mí-ɬátá] H-H		W *			W *	
c.	[mi-ɬátá] Ø-H	W *		W *			

The ranking that has been established so far applies to the tonal polarity patterns that assign an H tone to a plural prefix when a stem-initial syllable has an L tone. Regardless of the tonal specification of plural prefixes, the OCP constraint determines tonal values assigned to these prefixes, following the analyses of Dagaare (Anttila and Bodomo 2000) and Mooré and Lama (Kenstowicz et al. 1988). Unlike the tonal polarity case in Kɔnni (Cahill 2004), Xitsonga tonal polarity does not provide evidence that CON needs a specific POLAR constraint.

So far, it has been shown that when there is no overt singular prefix, Xitsonga plural prefixes show tonal polarity effect, in which the prefix tone is opposite to the tone of the stem-initial syllable. This tonal polarity is argued to be the result of the OCP constraint dominating the IDENT-T constraint.

4.2 Failure to display tonal polarity (*the substitution type*)

A puzzle appears regarding tone assignment in Xitsonga plural prefixes. As shown in section 4.1, the plural class 4 prefix is subject to tonal polarity when it comes to tone assignment. However, in the following example, the same class 4 prefix does not show tonal polarity. The H tone prefix in (10a) is followed by an H tone syllable, and the L tone prefix in (10b) is followed by an L tone syllable; both examples fail to display tonal polarity.

(10) Exceptions to tonal polarity

	Class 3	Tone	Class 4	Tone	
a.	**mú**-gájó	H-H	**mí**-gájó	H-H	‘mealie meal’
b.	**mù**-gàŋgá	L-LH	**mì**-gàŋgá	L-LH	‘village’

The main part of the puzzle is that the same class prefixes (class 4) show tonal polarity in some cases (section 4.1), and no tonal polarity in other cases

(this section).[5]

The generalization regarding non-tonal polarity in Xitsonga is as follows. In the cases when a noun has an overt singular prefix, and the plural prefix replaces the singular prefix, the tone in both singular and plural forms remains constant.

(11) Comparison between cases with and without an overt singular prefix

	Class 3	Tone	Class 4	Tone	
a.	**mú**-gájó	H-H	**mí**-gájó	H-H	'mealie meal'
	Compare with				
b.	**Ø**-ɬátá	Ø-H	**mì**-ɬátá	L-H	'sweet potato'

The presence of an overt singular prefix and the failure to undergo tonal polarity as in (11a) is argued to be an effect of paradigm uniformity. Words that belong to the same paradigm must be phonologically uniform (cf. Benua 2000, Kenstowicz 2001). In this paper, discussion regarding paradigm uniformity will be limited to tonal paradigm uniformity.[6]

(12) Constraints regarding tonal paradigm uniformity

a. *Base-Output Correspondence* (BOC)
(from Ko 2006, which is adopted from Kager 1999)
Given two strings S1 and S2, related to one another as Base-Output, Base-Output correspondence is a relation ℜ from the elements of S1 to those of S2. Elements α∈S1 and β∈S2 are referred to as *correspondents* of one another when αℜβ.

b. IDENT-BO-T (BO = Base Output)
A tone in the Base and its correspondent in the Output have identical tonal value.

The proposed constraint in (12b) is added to the current analysis in order to explain the tonal paradigm uniformity effect. This constraint is violated if corresponding tones in the Base and the Output, regardless of whether they are associated with an affix or a root, have different tonal values. This constraint enforces tonal identity between singular forms (the Base) and plural forms (the Output).

The competition between tonal polarity and paradigm uniformity is such that paradigm uniformity only applies to the relationship between the base and its correspondent in the output. Plural prefixes that do not belong to the base (=singular form) are not subject to the base-output correspondence constraints.

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[5] The failure to exhibit tonal polarity cannot be due to the types of class prefixes as it has been reported in Gur languages because in Xitsonga these nouns belong to the same noun class as the nouns that show tonal polarity.

[6] For other proposals concerning paradigm uniformity see Kenstowicz (1996) and (Kager 1999).

Let's consider an input that has H tone on the singular prefix. The optimal candidate in (13a) violates the OCP constraint. However, this candidate satisfies the higher ranked constraint IDENT-BO-T, which requires tonal identity between the base [múgájó] and the output [mígájó]. The candidate in (13b) satisfies the OCP constraint, but violates the higher ranked IDENT-BO-T constraint. In (13c), the candidate deletes the underlying H tone on the plural prefix. The deletion of tone, however, violates the higher ranked Max-T constraint. The candidate (13d) that changes the tone of the stem from H tone to L tone violates both IDENT-BO-T and IDENT-T, and is harmonically bounded by the optimal candidate.

(13) A singular prefix with an input H tone

	/mí-gájó / H-H BASE: **[mú-gájó]** H-H	IDENT -BO-T	MAX-T	OCP	TBU→T	IDENT -T	DEP-T
a. ☞	[mí-gájó] H-H			*			
b.	[mì-gájó] L-H	W *		L		W *	
c.	[mi-gájó] Ø-H		W *	L	W *		
d.	[mí-gàjò] H-L	W *				W *	

The base-output correspondence constraint IDENT-BO-T in paradigm uniformity examples does not play a role in examples in which the plural prefix is added to the base because the base does not have a prefix to which the plural prefix can correspond. This is shown in (14). The summary ranking of tonal polarity cases and paradigm uniformity cases is shown in (15).

(14) A base without a prefix

	/mì-ɬátá/ L-H BASE: **[ɬátá]** Ø-H	IDENT -BO-T	MAX-T	NO FUSION	OCP	TBU →T	IDENT -T	DEP -T
a. ☞	[mì-ɬátá] L-H							
b.	[mí-ɬátá] H-H				W *		*	
c.	[mi-ɬátá] Ø-H		W *			W *		

(15) Ranking

a. IDENT-BO-T, MAX-T, NOFUSION >> OCP	Paradigm uniformity	(13)
b. Max-T, OCP >> IDENT-T	Tonal polarity	(7b)
c. TBU→T >> DEP-T	No toneless syllable	(6d)

The ranking in (15a) and (15b) also show a stringency relationship between two faithfulness constraints: IDENT-BO-T and IDENT-T. The markedness constraint OCP is placed between these two faithfulness constraints so that OCP can only be violated when there is a requirement for base-output tonal correspondence.

(16) Stringency Relationship

Specific Faithfulness		*Markedness*		*General Faithfulness*
IDENT-BO-T	>>	OCP	>>	IDENT-T

In sum, this section has shown that plural prefixes fail to exhibit tonal polarity when they have a corresponding singular prefix. The blockage of tonal polarity is a result of paradigm uniformity implemented via the IDENT-BO-T constraint, which requires tonal identity between the base (singular form) and the output (plural form). Moreover, the addition of the IDENT-BO-T constraint does not affect the tonal polarity analysis because plural prefixes that exhibit tonal polarity do not belong to the base.

4.3 The status of nasal prefixes /N-/

In Xitsonga, nominal prefixes belonging to the same class can be a full CV prefix, a null prefix or a single nasal. It turns out that these singular prefixes in the form of single nasals are always L tone and thus they follow the paradigm uniformity effect.

(17) Tonal patterns of nasal prefixes

a. No tonal polarity

	Class 3	Tone	Class 4	Tone	
i.	**ǹ**-tlàwá	L-LH	**mìn**-tlàwá	L-LH	‘group’
	Class 9	Tone	Class 10	Tone	
ii.	**ǹ**-ts^{h}àβà	L-L	**tìn**-ts^{h}àβà	L-L	‘mountain’

b. Apparent tonal polarity

	Class 3	Tone	Class 4	Tone	
i.	**ǹ**-kúkú	L-H	**mìn**-kúkú	L-H	‘rooster’
	Class 9	Tone	Class 10	Tone	
ii.	**m̀**-bútí	L-H	**tìm**-bútí	L-H	‘goat’

In (17a), the plural prefixes of class 4 and class 10 do not show tonal polarity. As a result the L tone prefix is followed by an L-initial root. In (17b), however, there is an apparent tonal polarity before H-initial roots. The tonal polarity in (17b) is an artifact of nasal prefixes being L tone.

The tonal patterns in (17) speak to the question of whether Xitsonga is a mora count language or a syllable count language, which is important for fully understanding tonal polarity. The tonal patterns of nasal prefixes show that nasal prefixes in the singular have the same tone as the tone of corresponding plural prefixes; the same as in paradigm uniformity cases.

This tonal pattern is significant because it shows that the TBU in Xitsonga must be the syllable rather than the mora. The basic syllable structure of Xitsonga is (C)V(N), and the syllable nucleus can be a nasal segment. If Xitsonga were a mora count language and the nasal prefix [n-] in [ǹ-tlàwá] (17ai) is simply a moraic segment, we expect that the plural prefix [mi-] would be realized with a H tone because the plural prefix would be outside of the base and it would then be subject to tonal polarity. However, this is not the case and the plural prefix is not subject to tonal polarity.

Thus, it is the case that TBU counting in Xitsonga must be based on syllables. Hence, the increase of moras in [mìn-] does not affect the tonal pattern, i.e. the plural prefix becomes part of the base count for evaluating IDENT-BO-T.

4.4 Summary of tonal processes in Xitsonga plural formation

In sum, there are two basic types of processes in creating plural forms from singular forms in Xitsonga, which affect the tonal realizations in the plural forms. A summary table of tonal processes in Xitsonga nouns in (18) is presented below. Examples for each noun class are reported in Appendix A.

(18) Summary table

Singular		Plural	Type	Tonal realization
Class 1	→	Class 2	Prefixation Substitution	tonal polarity paradigm uniformity
Class 3	→	Class 4	Prefixation Substitution	tonal polarity paradigm uniformity
Class 5	→	Class 6	Prefixation	tonal polarity
Class 7	→	Class 8	Substitution	paradigm uniformity
Class 9	→	Class 10	Prefixation Substitution	tonal polarity paradigm uniformity
Class 11	→	Class 10	Substitution	paradigm uniformity
Class 14	→	Class 6	Prefixation Substitution	tonal polarity paradigm uniformity

When a plural prefix is added to the singular base (the prefixation process), the tone of the plural prefix is sensitive to tonal polarity. When a plural

prefix replaces the singular prefix (the substitution process), the tone of the plural prefix observes paradigm uniformity and maintains the tone of the singular prefix.

5. Further implications and conclusion

5.1 Paradigm uniformity in other categories

As argued in section 4.2, constraints on paradigm uniformity outrank tonal polarity constraints in Xitsonga. This ranking suggests that any singular-plural pairs that display the same number of syllables in both forms should follow the paradigm uniformity pattern. This ranking has consequences for other categories in Xitsonga. Would verbs or adjectives, for example, also be subject to the paradigm uniformity constraints? If so, the verbal paradigm in Xitsonga would display tonal polarity whenever an affix is added to the verbal stem.

In (19a), an underlying H tone verb /vóna/ 'to see' is followed by an L tone noun /mùn̩ù/. The H tone of the verb spreads to the penultimate syllable of the sentence. The sentence in (19b) is made to be past tense by adding the past tense suffix /–il/ to the verb root, which is underlylingly toneless. If tonal polarity were at work for verbal suffixes, we would expect that the past tense suffix would realize with an L tone, which is not the case.

(19) Tone in the verbal paradigm

a. ni vónámún̩u
I see person 'I see a person'

b. ni vón-**íl**-é mún̩u
I see-past person 'I saw a person'

Paradigm uniformity is claimed not to apply to categories that do not have free standing base forms (Kager 1999, Benua 2000). In Xitsonga, categories such as verbs and adjectives do not have a free standing base form. Verbs are always preceded by a subject agreement prefix and followed by a final vowel (a common feature in Bantu languages). Adjectives are always preceded by an agreement marker depending on the noun class of the head noun. Thus, it is not unreasonable to assume that verbs and adjectives in Xitsonga do not follow paradigm uniformity.[7]

Since major categories such as verbs and adjectives do not have a free standing base, they would not be subject to the tonal grammar that regulates the paradigm uniformity. There are free standing categories such as adverbs, but adverbs do not have affixation processes where tonal polarity may apply. Thus, the current proposal, in which tonal polarity and paradigm uniformity

[7] For example, Ko (2006) also analyzes the noun-verb asymmetry in Korean with respect to paradigm uniformity and base identity.

intersect, is restricted to nominal categories in Xitsonga.

5.2 Status of L tone: underlying specification or toneless

The last issue I will discuss is the status of L tone in Bantu languages, which is often a complex issue with no simple answer. Is the tonal system of a given language H tone vs. L tone, or is it H tone vs. Ø tone? In a representation based theory, this distinction has consequences in describing the complexity of the grammar. In OT, however, this discussion is rather moot because constraint ranking determines optimal outputs, and the representation of the input does not.

In the case of Xitsonga, the ranking of tonal constraints selects an optimal candidate for each input tone type: H tone, L tone and toneless. Thus, the difference between underlying L tone syllables and underlying toneless syllables is in the tonal realization in the output, a consequence of the constraint ranking. Underlying L tone syllables can be realized faithfully on the surface or their tone may change due to the OCP constraint. Underlying toneless syllables, on the other hand, are mainly subject to tonal polarity when IDENT-BO-T is at work, where Base is involved, because the syllables have no corresponding tone in the input to be faithful to.

This shows that the current analysis extends beyond explaining the occurrence and non-occurrence of tonal polarity. If this analysis is correct, Xitsonga can be classified as a language with three types of tonal specifications: H tone, L tone and Ø tone, departing from a dichotomy-based representation in which phonological L tone and tonelessness are considered to be mutually exclusive.

6. Conclusion

I have presented two types of plural formation in Xitsonga: the prefixation type and the substituation type. The prefixation type shows tonal polarity when a plural prefix is added to a singular prefixless stem. The substitution type, on the other hand, shows that tones on a plural prefix should be preserved if there is tone on a corresponding singular prefix, which sometimes results in violation of tonal polarity.

In the future, a perception study on tonal polarity in Xitsonga could be conducted. Most previous studies on tonal polarity are based on production data. The basis of these previous studies can be further confirmed if speakers of tonal polarity languages exhibit sensitivity to a categorical grammaticality judgment for such polarity.

Tonal polarity is also found in other languages, outside of Africa. Reportedly, Southeastern Kyungsang Korean spoken in the Pusan area also displays tonal polarity in compounding. When two high tone nouns /k'ótʃ^{h}/ 'flower' and /pát^{h}/ 'field' form a compound [k'òtpát] 'flower bed', the tone of the first noun becomes lower (Gim 2005: 201). A future study on this

phenomenon in Southeastern Kyungsang Korean would be one of the first steps to understand tonal polarity in languages outside of Africa.

Appendix A

Examples with tonal polarity in plural prefixes (Prefixation type). Class 15 prefixes are not included in the data below because it does not have a plural form.

Class	Xitsonga	Tone	Class	Xitsonga	Tone	Gloss
1	kókwánà	HHL	2	βàkókwánà	L-HHL	'grandmother'
3	róɲó	HH	4	mìróɲó	L-HH	'vegetable'
5	búlóɲó	HHH	6	màbúlóɲó	L-HHH	'bridge'
7	*No data*		8	*No data*		
9	ɲálá	HH	10	tìɲálá	L-HH	'onion'
11	*No data*		10	*No data*		
14	ʤáɲí	HH	6	màʤáɲì	L-HL	'grass'

Examples that fail to show tonal polarity (Substitution type)

Class	Xitsonga	Tone	Class	Xitsonga	Tone	Gloss
1	mùnɲù	L-L	2	βànɲù	L-L	'person'
3	mùg|ìβélà	L-LHL	4	mìg|ìβélà	L-LHL	'Saturday'
5	rìfù	L-L	6	màfù	L-L	'death'
7	ʃìfánísó	L-HHH	8	ʂìfánísó	L-HHH	'picture'
9	ɲìndlù	L-L	10	tìndlù	L-L	'house'
11	rìrímí	L-HH	10	tìndzímí	L-HH	'language'
14	βùβáʤí	L-HH	6	màβáʤí	L-HH	'illness'

Examples with singular forms that have a nasal prefix (a subtype of substitution)

Class	Xitsonga	Tone	Class	Xitsonga	Tone	Gloss
1	ǹtúkúlù	L-HHL	2	βàtúkúlù	L-HHL	'grandchild'
3	ǹsísí	L-HH	4	mìnsísí	L-HH	'hair'
5	*No data*		6	*No data*		
7	*No data*		8	*No data*		
9	ǹsúná	L-HH	10	tìnsúná	L-HH	'mosquito'
11	*No data*		10	*No data*		
14	*No data*		6	*No data*		

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