

*Issues of locality and morphologically induced non-identity in the N. Karanga assertive and non-assertive patterns**

NINA TOPINTZI

Abstract

The main previous account of the N. Karanga verbal stem tonology, Hewitt and Prince 1989, relies on derivations and makes heavy use of extrametricality. I propose an output-based analysis in which tone triplication is the result of FtHd Locality interacting with the OCP. Construction-specific extrametricality is dispensed with in favour of a requirement for phonological non-identity among members of morphological paradigms.

1 Introduction

Tone shift or tone spreading within Optimality Theory have generally been treated as a result of constraints that require alignment of a tone with a specific edge of a prosodic or morphological unit (ALIGN-TONE) or as a requirement that tone bearing units (TBU's) are tonally specified (SPECIFY). These constraints may interact with others to regulate the exact position of the tone after displacement or the total amount of spreading. In tone shift¹, a tone may move to the final syllable as in Digo, or to the penultimate as in Chizigula. In the first case, high-ranked ALIGN-R ensures association of tone to the final syllable, while in the latter, ALIGN-R is dominated by NONFINALITY forcing the tone to appear on the penultimate syllable. Moreover, tone may shift from its original position by just one syllable, as in Kikuyu, where a constraint LOCAL demands that tone linking occurs to an adjacent TBU. Analogous patterns arise when tone spreads.

N. Karanga, the language under consideration, presents a more peculiar pattern where a tone *spreads* by two syllables on its right, thus being an intermediate case between local and unbounded spreading. A similar pattern arises in tone shift in Sukuma, where tone moves by two syllables to the right. Sietsema (1989) explains this pattern by proposing that binary feet are constructed and tone shifts from the

* This paper has benefited greatly from suggestions and discussion with Moira Yip. Of course, all errors are my own.

¹ For a more extensive presentation of these examples and illustration with data, see Yip 2002.

head of one foot to the head of the next. I propose that N. Karanga corroborates this hypothesis with tone spreading too. A constraint, FtHD LOCALITY is advanced that not only accounts for this spreading pattern, but also for patterns where tone duplication occurs instead of triplication.

Further, FtHD LOCALITY presents a viable alternative to the major analysis of the same data by Hewitt and Prince 1989 [henceforth H&P]. This account, being couched within a derivational framework, explains the trisyllabic tone span that normally arises as the result of two rules, where the first feeds the next one. Such an approach cannot be maintained in classic OT which disallows intermediate stages in the derivation. The current proposal suggests a way out of the conundrum.

N. Karanga also serves as an example for the second major claim of this paper, namely that there is pressure that members within a morphological paradigm should be distinctly phonologically realized. This is argued to be a case of morphologically-induced phonological non-identity. Various proposals have been put forward to account for this phenomenon including anti-faithfulness theory (Alderete 1999) and realizational morphology theory [RMT, (Kurisu 2001)]. The latter is discussed in more detail as it seems promising to account for the data at hand. However, it is shown that in fact N. Karanga poses some serious problems for this theory and a related but different solution is offered by means of a constraint BE DIFFERENT that ensures non-identity within the paradigm.

Among its major advantages is the fact that BE DIFFERENT is general enough in the sense that it does not impose any specific way in which non-identity is achieved. In N. Karanga, tone misalignment is chosen, but it is predicted that other languages may use other methods. Anti-faithfulness theory on the other hand, always involves the interaction of a specific anti-faithfulness constraint with its faithfulness counterpart, thus having to introduce a large number of anti-faithfulness constraints. Here though, other independently motivated constraints (not restricted to faithfulness only) regulate the manner that non-identity manifests itself. In addition, the outputs that exhibit non-identity are determined by the general ranking of the language, without any need to make direct reference to them, as RMT or anti-faithfulness do.

Finally and specifically to the Karanga problem, the current solution provides a deeper explanation for the surface representation of the toneless non-assertive pattern, i.e. satisfaction of non-identity, while it automatically discards the implausible solution of initial extrametricality previously suggested by H&P.

The paper is structured as follows. Section 2 presents background information concerning the N. Karanga verbal stem and the data under discussion, namely the H-toned assertive, the H-toned non-assertive and their toneless counterparts. Section 3 focuses on the assertive patterns. The topic of tone triplication is

addressed and is accounted for by way of the local constraint FtHd LOCALITY that allows a maximum of tone spreading by two syllables. Section 4 examines the H-toned non-assertive. This is the only pattern that includes two underlying H tones and naturally OCP effects arise. Additional discussion is devoted to the bisyllabic form HL which unexpectedly fails to show spreading of the first H. This is argued to be the result of a high-ranked constraint LINK that bans spreading if unassociated underlying tones remain in the output. Section 5 presents the argument of morphologically-induced phonological non-identity. Section 6 discusses some remaining issues regarding concerns on the indispensability of final extrametricality and briefly examines the basic pattern arising from the prefix-stem concatenation which constitutes the phonological word domain. It is argued that in this domain, some re-ranking of constraints occurs resulting in prohibition of spreading. Finally, section 7 presents some concluding remarks.

2 The verbal stem in N. Karanga and data

Northern Karanga, a dialect of Shona, contrasts H(igh) and L(ow) tones (a H will be marked with an acute accent, a L with no accent at all), while no contours arise. Adopting H&P's assumption this contrast is taken to be one between the presence and absence of tone [while Odden (1984) assumes that this is a genuine contrast between High and Low tones]. The verbal stem includes the root – which may be toneless or not – and a number of suffixes usually referred to as extensions that denote various categories e.g. *Vs* (causative), *Vr* (applicative), *w* (passive). Prefixes standing *outside* the stem mark inflectional categories, e.g. *ha* (negative), *ã* (tense), *ka* (remote) or are object markers like *mũ* (3rd person singular). Two major constructions will be discussed below, namely the assertive and the non-assertive. The former appears in affirmative declarative main clauses and in the infinitive. The latter is used in a number of subordinate and nondeclarative constructions, including the conditional, negative, relative clause and reflexive forms. Some examples are presented below (after H&P). Underneath the examples, glosses are given. Following standard practice, a verbal root appears underlined.

(1)

H-toned Root	
① Assertive	② Non-assertive
ku- <u>p</u> - <u>ǎ</u> “to give”	handäka- <u>p</u> - <u>ǎ</u> “I didn’t give”
ku- <u>tëng</u> - <u>ǎ</u> “to buy”	handäka- <u>tör</u> -a “I didn’t take”
ku- <u>tëng</u> - <u>ës</u> - <u>ǎ</u> “to sell”	handäka- <u>tör</u> -es- <u>ǎ</u> “I didn’t make take”
ku- <u>tëng</u> - <u>ës</u> - <u>ër</u> -a “to sell to”	handäka- <u>tör</u> - <u>ës</u> -er- <u>ǎ</u> “I didn’t make take for”
ku- <u>tëng</u> - <u>ës</u> - <u>ër</u> -an-a “to sell to each other”	handäka- <u>tör</u> - <u>ës</u> - <u>ër</u> -an- <u>ǎ</u> “I didn’t make take for each other”
ku- <u>tör</u> - <u>ës</u> - <u>ës</u> -er-an-a “to make take a lot for each other”	handäka- <u>tör</u> - <u>ës</u> - <u>ër</u> -es-an- <u>ǎ</u> “I didn’t make take for each other a lot”
-----	handäka- <u>tör</u> - <u>ës</u> - <u>ër</u> -es-es-an- <u>ǎ</u> ditto

Toneless Root	
③ Assertive	④ Non-assertive
ku- <u>bik</u> -a “to cook”	handäkä- <u>bik</u> - <u>ǎ</u> “I didn’t cook”
ku- <u>bik</u> -is-a “to make cook”	handäkä- <u>bik</u> - <u>ïs</u> -a “I didn’t make cook”
ku- <u>bik</u> -is-ir-a “to make cook for”	handäkä- <u>bik</u> - <u>ïs</u> - <u>ïr</u> -a “I didn’t make cook for”
ku- <u>bik</u> -is-ir-an-a “to make cook for a lot”	handäkä- <u>bik</u> - <u>ïs</u> - <u>ïs</u> -ir-a “I didn’t make cook for each other”
ku- <u>sung</u> -unur-is-ir-w-a “to be made to untie for”	handäkä- <u>bik</u> - <u>ïs</u> - <u>ïs</u> -ir-an-a “I didn’t make cook a lot for each other”
-----	handäkä- <u>bik</u> - <u>ïs</u> - <u>ïr</u> -is-is-an-a ditto
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Abstract sequences of H and L tones [after Odden (1984:259)] reveal the emerging patterns more clearly. Only the stem portions are depicted.

(2)

H-toned Root	
① Assertive	② Non-assertive
H	H
HH	HL
HHH	HLH
HHHL	HHLH
HHHLL	HHHLH
HHHLLL	HHHLLH
HHHLLLL	HHHLLLH

Toneless Root	
③ Assertive	④ Non-assertive
L	H
LL	LH
LLL	LHL
LLLL	LHHL
LLLLL	LHHLL
LLLLLL	LHHLLL
LLLLLLL	LHHLLLL

It is clearly evident that the form of the patterns depends on the number of syllables and the tonal specification of the root each time. Summarising the patterns above, the H-toned assertive (①) exhibits a single tone which can spread rightward up to the third syllable within the word, while the toneless assertive (③) has no tones throughout the string. Moving to the remaining two patterns, we can tell that the non-assertive is characterized by the presence of a floating tone. The relative evidence comes from the toneless non-assertive (④); here the word arises with a tone – contra the assertive toneless – whose only source can be the non-assertive, since the root is toneless. This finding is consistent with the forms of the H-toned non-assertive (②) where the polysyllabic forms clearly indicate the presence of two tones, while in smaller words OCP effects crop up. These will be fully discussed later on.

Moreover, we can conclude that the non-assertive tone tends to appear near the beginning of the word (as in ④) unless an underlying root tone is already present there (as in ②). When this occurs, the non-assertive H attaches to the final syllable.

3 The Assertive

3.1 Tone Spreading and the H-toned Assertive (❶)

The H-toned assertive emerges with a high tone which maximally spans across three syllables. This raises an interesting issue of ternarity. The H located on the first syllable spreads over its next syllable, but does not stop there. It continues up to the third syllable. We would normally anticipate spreading that occurs either locally to the next TBU or affects the whole string. Instead, a somehow intermediate non-local configuration arises.

H&P recognise the problem and avoid a straightforward, but highly implausible treatment that would be sensitive to syllable counting. What they come up with is the use of two rules; Root Tone Spread (RTS) spreads a root tone over the next syllable and General H-Spread (GHS) is a general rule that spreads any tone to the next syllable. RTS feeds GHS. The end result is that the application of both these rules will produce the desirable ‘tone tripling’. However, whenever there is no root-tone, only GHS applies and thus tone doubling arises instead. This accounts for the pattern in ❹ or for the case of a monosyllabic H-toned prefix being followed by a toneless root, e.g. *rim* where the tone spreads only by one syllable within the stem and not by two, e.g. *mũ-rĩmisa* ‘you should make plow’ and not *mũ-rĩmĩsa*.

Although the proposal mentioned is elegant and accounts for the patterns, it presents a number of problems. First, since the approach is derivational, it cannot be directly translated within an output-oriented framework that bans intermediate steps in the derivation. In addition, for the analysis to work properly, rules of extrametricality need to be employed whose application manifests certain weaknesses. A more general problem is that H&P’s treatment masks a deeper explanation for the difference among patterns which only arises once we consider them more broadly. We will examine this in detail in section 5.

As it has already been mentioned, it is unsatisfactory to permit phonology to count beyond two (McCarthy and Prince 1986:1) as the existence of binary feet versus the lack of ternary or quaternary feet as basic metrical constituents or the requirement in many languages that the minimal word is bimoraic rather than e.g. trimoraic suggest. Along this line of thinking, the current approach attempts to reduce the attested triplication to a licit binary constituent that is well-grounded cross-linguistically, namely the foot and more specifically by making use of the foot-head. Hewitt (1992) devotes considerable space in discussing Shona patterns with special reference to N. Karanga. There, he mentions that no particular evidence for the construction of feet (1992:181) exists. Thus, assuming footing is not problematic so long as it is consistent with the data. Assuming foot construction in N. Karanga in fact yields the attested patterns. Feet here should be

understood as abstract rhythmic units. They are formed in an iterative fashion from left to right constructing bisyllabic trochees. Footing begins at the first syllable².

(3) (σσ)(σσ)(σσ)

Under this schema, if a H is situated on the first syllable, then its spreading up to the third syllable can now be expressed in a local manner. A H spreads from the first foot-head up to the next foot-head, but no more.

(4) (σσ)(σσ)(σσ)


This requirement will be expressed in the constraint in (5).

(5) **FtHd LOCALITY**: Spread a tone only up to the adjacent foot head.

The fact that a tone spreads³ in the first place indicates that the requirement that TBUs are tonally specified, i.e. SPECIFY is fairly high ranked. However, spreading adheres to FtHd LOCALITY and thus a maximum of three-syllable-tone-span cannot be exceeded. For this reason FtHd LOCALITY must dominate SPECIFY. Finally, since the tonal specification of syllables is preferred over the insertion of *new* association lines, SPECIFY dominates the low-ranked *ASSOCIATE which militates against the insertion of new association lines.

The tableau below illustrates the interaction of the constraints. At the same time this exemplifies pattern ❶.

² Since the verbal stem patterns are explored here, the initiation of footing refers to the first stem syllable. It is possible however that if the discussion extends to the higher domains that Myers (1987) proposes, i.e. grammatical word, phonological word and phrase, a more elaborated examination of footing may be in need. For the purposes of this paper I set this matter aside.

³ For the consistently rightward spread I am assuming an undominated constraint ANCHOR-L proposed in Myers (1997), which demands the preservation of the left edge of a ‘tone span’ (1997:861). For details on the formulation of this constraint see Myers 1997:861,868.

(6) FtHd LOCALITY >> SPECIFY >> *ASSOCIATE

	FtHd LOCALITY	SPECIFY	*ASSOCIATE
$\begin{array}{c} \sigma \sigma \sigma \sigma \sigma \sigma \\ \\ H \end{array}$			
a. $\begin{array}{c} (\sigma \sigma)(\sigma \sigma)(\sigma \sigma) \\ \swarrow \downarrow \searrow \\ H \end{array}$	*!	**	***
b. $\begin{array}{c} (\sigma \sigma)(\sigma \sigma)(\sigma \sigma) \\ \swarrow \downarrow \\ H \end{array}$		****!	*
c. $\begin{array}{c} (\sigma \sigma)(\sigma \sigma)(\sigma \sigma) \\ \\ H \end{array}$		****!*	
d. $\begin{array}{c} (\sigma \sigma)(\sigma \sigma)(\sigma \sigma) \\ \swarrow \\ H \end{array}$		****!	*
e. $\begin{array}{c} (\sigma \sigma)(\sigma \sigma)(\sigma \sigma) \\ \swarrow \downarrow \searrow \\ H \end{array}$		***	**

Candidate (6a) violates FtHd LOCALITY as it spreads not only up to next foot-head, but continues further to the foot-tail. (6b)⁴ through (6d) all violate SPECIFY to a different extent, but in any case more severely than the winning candidate (6e). *ASSOCIATE is too low ranked to affect the outcome. It is important to mention that FtHd LOCALITY does not force spreading, so (6c) where there is no spreading whatsoever vacuously satisfies FtHd LOCALITY. Spreading is triggered by SPECIFY. However, in case spreading occurs, FtHd LOCALITY's requirement is that the H tone may reach up to the next foot-head that immediately follows the tone's original point. Therefore, FtHd LOCALITY places a maximum to spreading, which yields the trisyllabic span, but no minimum. Thus, (6d) for instance, which spreads only to the adjacent TBU satisfies FtHd LOCALITY. The burden falls on other constraints like SPECIFY to regulate the total amount of spreading.

⁴ (6b) also incurs a violation of NO GAP which states that multiply linked tones cannot skip TBUs.

3.2 The Toneless Assertive (③)

Before moving on, we can briefly mention the third pattern, that of the toneless assertive. As noted, the string here appears toneless throughout. This pattern is not particularly informative. Nonetheless, it establishes the ranking DEP-T >> SPECIFY, since no tones are inserted just for the sake of having TBUs tonally specified.

4 The H-toned Non-Assertive (②)

4.1 General Pattern

Recall that this form includes both the radical H as well as the non-assertive H underlyingly. The radical H appears on the first stem syllable, while the floating H links to the last syllable of the word. The constraints responsible for this result are ALIGN-L (H, Stem) and ALIGN-R (H, Stem). The first demands that if there is a high tone, then its left edge must align with the left edge of the stem, while the latter requires the same only this time for the right edge. When there is a single underlying H as in ①, this always emerges at the left edge indicating that ALIGN-L (H, Stem) must dominate ALIGN-R (H, Stem)⁵. The latter's effects are only evident when two underlying tones are present as is the case in ②.

If we combine this finding with the analysis presented before for spreading we would successfully account for the forms in ② that are larger than four syllables. But this would not suffice for the explanation of smaller words. To account for these, an additional ingredient is required; the effects of OCP. Take for instance the quadrisyllabic⁶ H₁H₁LH₂. As before, both underlying tones arise at the edges. The problem is that due to the relatively high-ranked SPECIFY we would also expect that the third syllable should be tonally specified, yielding H₁H₁H₁H₂. But it does not. This can easily be accounted for if the OCP is highly ranked.

(7) OCP: Adjacent identical tones are banned.

⁵ Nonetheless, as a consequence of a basic OT tenet, ALIGN-R, although dominated, could still have effects on a single underlying tone, e.g. in a hypothetical pattern ① form like HHHHH, a single H spreads along the whole string satisfying ALIGN-R perfectly, while the actual winner HHHLL doubly violates it. However, such an output is prohibited by limitations on spreading imposed by F_{THD} LOCALITY, since it is throughout the discussion assumed that F_{THD} LOCALITY dominates ALIGN-R.

⁶ For ease of exposition, I am using the indices 1 and 2 to refer to the two underlying H tones. When the index 1 appears more than once, it denotes a tone that has spread.

(9)

- (a) $\begin{array}{c} \sigma \ \sigma \\ | \\ H_1 \end{array}$ H₂ deletes
- (b) $\begin{array}{c} \sigma \ \sigma \\ | \\ H_1 \textcircled{H_2} \end{array}$ H₂ stays afloat
- (c) $\begin{array}{c} \sigma \ \sigma \\ | \\ H_{1,2} \end{array}$ H₁ fuses with H₂

It is thus better to fuse, delete or keep a tone unlinked than create an OCP violation. Either of the representations above will do, indicating that:

(10) OCP >> MAX-T, *FLOAT, *FUSION

But, the question that naturally arises is why do we not get (11) which is simultaneously consistent with OCP satisfaction and spreading limitations?

(11)

- (a) $\begin{array}{c} \sigma \ \sigma \\ \surd \\ H_1 \end{array}$ H₂ deletes
- (b) $\begin{array}{c} \sigma \ \sigma \\ \surd \\ H_1 \textcircled{H_2} \end{array}$ H₂ stays afloat
- (c) $\begin{array}{c} \sigma \ \sigma \\ \surd \\ H_{1,2} \end{array}$ H₁ fuses with H₂

The answer that H&P give is that a rule of final vowel extrametricality restricted to toneless final vowels in the non-assertive (and to subjunctive as well) is used. Crucially, extrametricality has to only refer to spreading and not to tone association, otherwise in e.g. the trisyllabic form HLH, the last syllable would be L instead of the actual H. However, in the bisyllabic word the association of the floating H₂ to the last syllable would incur an OCP violation. Since linking of this tone is impossible, another option is to spread H₁. It is exactly this environment where final extrametricality applies and marks the last vowel invisible to spreading.

As we will see later on, it may in fact be the case that final extrametricality is indispensable, since it is the only mechanism that can account for a single form (namely LHL of ④). However, it is desirable to dispense with final extrametricality, since its introduction does not seem well-grounded. It has to be defined for a very specific environment, i.e. banning spreading onto toneless vowels in the non-assertive, thus producing an ad hoc solution for the problem

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- (b) ADJACENT: $\begin{array}{cc} A & B \\ | & | \\ x & x \end{array}$
- (c) NONADJACENT: $\begin{array}{cc} A & B \\ | & | \\ x & x \ x \end{array}$

If the analysis that follows is on the right track, then N. Karanga presents an argument against (aii) – and apparently of (aiii) – being considered as structurally adjacent. In any case, in this paper I assume that an OCP violation only occurs in a configuration like (b).

described in the beginning of this section. For this reason, a different view will be taken here that makes no use of extrametricality.

(12) **LINK**: No tone spreading before all underlying tones are linked to a TBU.

LINK has to be understood as the local conjunction of *FLOAT & *ASSOCIATE. It is only violated, when a candidate at the same time emerges both with a floating tone and with association lines that did not exist originally in the input. Essentially, when the constraint is ranked highly-enough, it expresses the fact that priority should be given in linking all underlying tones before spreading any of them. Further, the way LINK is stated here, it only penalizes floating tones under the circumstances mentioned, but makes no claims when an underlying tone has deleted or fused with another. Given the well-established assumption that the non-assertive tone is floating, it is reasonable that among the possible outputs in (9), the one which is in fact chosen is that in (9b), which preserves the tone floating. For this reason, (9a) and (9c) as well as (11a) and (11c) can be excluded sooner by promoting the constraints they violate, namely MAX-T (for 9a and 11a) and *FUSION (for 9c and 11c). The new ranking is shown below:

(13) OCP, MAX-T, *FUSION >> *FLOAT

The real competition emerges between (9b) and (11b), where (9b) wins. This can be achieved if LINK ranks above *FLOAT, since both candidates violate *FLOAT, but only the latter incurs an additional violation of LINK. This yields the ranking:

(14) OCP, MAX-T, *FUSION, LINK >> *FLOAT >> SPECIFY

For concreteness, all candidates in (9) and (11) as well as the OCP-violating one are considered in the tableau below.

(15) OCP, MAX-T, *FUSION, LINK >> *FLOAT >> SPECIFY

	σ σ H (H)	OCP	MAX-T	*FUSION	LINK	*FLOAT	SPECIFY
a.	σ σ H H	*!					
b.	σ σ / H		*!				

c.	$\begin{array}{c} \sigma \quad \sigma \\ \diagdown \quad / \\ H_{1,2} \end{array}$			*!			
d.	$\begin{array}{c} \sigma \quad \sigma \\ \diagdown \quad / \\ H \textcircled{H} \end{array}$				*!	*	
e.	$\begin{array}{c} \sigma \quad \sigma \\ \quad \\ H \end{array}$		*!				*
f.	$\begin{array}{c} \sigma \quad \sigma \\ \quad \\ H_{1,2} \end{array}$			*!			*
g.	$\begin{array}{c} \sigma \quad \sigma \\ \quad \\ H \textcircled{H} \end{array}$					*	*

The discussion above shows that no introduction of final extrametricality is needed. It just suffices to observe that spreading may take place only after all underlying tones have linked to a TBU provided that no OCP violation arises.

5 Non-Identity and the toneless Non-Assertive (④)

The toneless non-assertive pattern ④ has - as already mentioned - only one underlying tone, which originates from the non-assertive. Contrary to the H-toned pattern discussed in the previous section, where the floating non-assertive tone is realized on the last syllable, here the tone appears near the beginning of the word, but does not quite reach the left edge. Instead it emerges on the second syllable from where it spreads to the next TBU.

The next section is engaged with the discussion of this peculiarity and attributes the misalignment to a condition ensuring the distinctiveness of the patterns that is activated in this pattern. Moreover, the spreading by only one syllable is related to the requirements of FtHd LOCALITY.

5.1 Morphologically-induced phonological non-identity

In this section we shall re-examine pattern ①, compare it with pattern ④ and see how the latter is produced. It will be argued that there is an overarching requirement in N. Karanga that members of a paradigm are phonologically different from one another. An analysis that makes similar claims will also be

considered (Kurusu 2001), namely Realizational Morphology Theory. Following that, some of its weaknesses will be discussed and it will be shown that the N. Karanga data present a number of difficulties for this theory. The current analysis addresses these issues and suggests an alternative treatment. Finally, H&P's proposal is examined and is argued against.

To start with, recall from section 3.1 that the H-toned assertive is underlyingly specified only in terms of a single root H. This tone associates to the first stem syllable and then spreads further on the following two syllables presenting a tone triplication effect. The toneless non-assertive presents a similar pattern, the only difference being that the first stem syllable appears toneless. Below, the two patterns are repeated for ease of exposition.

(16)

① H-Toned Assertive	④ Toneless Non-assertive
H	H
HH	LH
HHH	LHH
HHHL	LHHL
HHHLL	LHHLL
HHHLLL	LHHLLL
HHHLLLL	LHHLLLL

It has already been argued that the H-Toned assertive is the result of the ranking FtHd LOCALITY >> SPECIFY >> *ASSOCIATE. But how are we to account for the toneless non-assertive? The crucial observation is the fact that both patterns have identical inputs, that is, both include a single H tone (abstracting away from the fact that the one is a root tone and the other a floating tone). This means that given the same ranking and for the same inputs, it is anticipated that identical outputs would result. However, as the data indicate, this is not the case in N. Karanga. The toneless non-assertive minimally differs by misaligning the H tone. I argue that this is a case of morphologically induced phonological non-identity (cf. Alderete 1999, Kurusu 2001), i.e. morphologically distinct forms must also be phonologically different.

5.1.1 Realizational Morphology Theory (Kurusu 2001). Kurusu (2001) develops a theory that accounts for cases where phonological non-identity arises due to morphological pressures. Although he does not discuss the N. Karanga data, these are predicted to be explained under his theory. To express the fact that different

morphological forms need to have distinct phonological representations, Kurisu introduces⁸ the constraint below (Kurisu 2001:39):

(17) Realize Morpheme (RM):

Let α be a morphological form, β be a morphosyntactic category and $F(\alpha)$ be the phonological form from which $F(\alpha+\beta)$ is derived to express a morphosyntactic category β . Then RM is satisfied with respect to β iff $F(\alpha+\beta) \neq F(\alpha)$ phonologically.

RM requires the overt presence of a morpheme in the surface representation and is responsible for the preservation of morphological contrasts. RM is employed for cases of nonconcatenative morphology using the schema below (Kurisu 2001:59):

(18) The Emergence of Nonconcatenative Morphology Schema:

$\text{Faith}_\alpha \gg \text{RM} \gg \text{Faith}_\beta$

Kurisu argues for the subdivision of a faithfulness constraint into several indexed components, where relevant indices, i.e. **a**, **b** represent morphosyntactic categories, e.g. singular, plural, etc. For instance, Koasati plural formation involves deletion of the final coda or rime in the singular form. Omitting many details of Kurisu's analysis, the general schema proposed is $\text{Max}_{\text{Sing}} \gg \text{RM} \gg \text{Max}_{\text{Plural}}$. Assuming that both singular and plural forms are based on the stem, this ranking denotes that no stem material is deleted in the singular form, although this violates RM, due to the high-ranking of Max_{Sing} , but deletion occurs in the plural due to the pressure of RM that the morpheme 'plural' surfaces overtly. Since RM dominates $\text{Max}_{\text{Plural}}$, this difference appears in terms of subtractive morphology.

Although I find the use of RM useful and, due to its general definition, able to account for many cases of nonconcatenative morphology, I believe that the overall analysis presents serious drawbacks mainly because of the subdivision of faithfulness. A proliferation of faithfulness constraints is advanced that could over-generate unattested patterns. For instance, the opposite of Koasati ranking, namely $\text{Max}_{\text{Plural}} \gg \text{RM} \gg \text{Max}_{\text{Sing}}$ is in principle allowed predicting that a language may

⁸ In fact, to be more precise, as Kurisu himself notes (2001:28), RM had been already proposed and used by other researchers before him, e.g. Akinlabi 1996, Samek-Lodovici 1993 etc. What he has accomplished is to formalize the constraint and extend its application into other domains.

show subtractive morphology in the singular but not in the plural. Apparently no such cases occur⁹.

Moreover, Kurisu does not present the logical extension of his argument. It could be the case that RM and faithfulness relations act not only between two forms, e.g. Lardil Stem-Nominative, Icelandic Infinitive-Deverbal Noun, etc, but a richer network of correspondences could be available within morphological forms. RM's design though is such that it cannot handle the comparison of more than two forms. Additionally, it remains a mystery what would happen if more than one morphemes were considered at once, that is if a word included a series of morphemes, as is commonly the case in e.g. Bantu languages. Would multiple instances of RM be employed? This matter is not considered at all. Finally, it also seems that RM and faithfulness can in principle relate any morphological forms with one another. In this sense the arbitrary use of RM and faithfulness could again yield unattested patterns. For instance a ranking such as $\text{Max}_{\text{infinitive}} \gg \text{RM} \gg \text{Max}_{\text{Nominative}}$ could arise that - to my knowledge - does not. In other words, the pairing of the faithfulness constraints is unrestricted.

To make the aforementioned proposal more concrete, let us attempt to apply it to the case at hand. We need RM to distinguish pattern ④ from ①. The way that the language chooses to do that is by misalignment, that is, the tone of the toneless non-assertive does not align at the left edge of the stem, as expected; it rather links to the second stem syllable. Following the Emergence of Nonconcatenative Morphology Schema presented above the relevant tableaux¹⁰ would look roughly as those here:

⁹ Kurisu (2001:82, 117) presents a significant number of subtractive morphology cases reported in the literature; among these, no example is given of singular subtractive morphology. On the contrary, plural subtractive morphology is prevalent appearing in Koasati, Alabama, Choctaw, Chickshaw, Mikasuki and Hessian German. Horwood 1999 however mentions that the phenomenon of singularization is crosslinguistically unattested. In any case, this is not explained under Kurisu's theory since ranking permutation of the faithfulness constraints predicts that it should be attested.

¹⁰ I use ① and ④ to make clear each time which forms are considered. This is just for convenience. N/A within a cell of some constraint indicates that the constraint is not applicable for the output considered.

(19) ALIGN-L (H, Stem)_{Assert} >> RM >> ALIGN-L (H, Stem)_{Non-Assert}

/HHLL/Assertive	ALIGN-L (H, Stem) _{Assert}	RM	ALIGN-L (H, Stem) _{Non-Assert}
a. ❶ LHHLL	*!		N/A
☞ b. ❶ HHHLL		*	N/A

For this analysis to work as Kurisu suggests, we need to assume that the input is the form HHHLL, i.e. the triplicated H-toned assertive and that the non-assertive is derived through it. In his words (2001:46) “RM compares output candidates and the input when the input is already an output form which carries some morphosyntactic information”. The indexed morpheme each time denotes the form that will be expressed, here the assertive and the non-assertive. RM is satisfied if the output has a different phonological representation from the input HHHLL. In (19), the forms of the assertive are evaluated where the second candidate is preferred although it violates RM, because it satisfies the alignment considerations, contrary to (a) which fails to do so.

(20) ALIGN-L (H, Stem)_{Assert} >> RM >> ALIGN-L (H, Stem)_{Non-Assert}

/HHLL/Non-Assert	ALIGN-L (H, Stem) _{Assert}	RM	ALIGN-L (H, Stem) _{Non-Assert}
a. ❷ HHHLL	N/A	*!	
☞ b. ❷ LHHLL	N/A		*

(20) presents the state of affairs for the non-assertive. This time misalignment of the non-assertive is tolerated, because now it is more important to satisfy RM. Thus (20b) correctly emerges as the winner.

But this analysis comes with a number of problems. Most significantly, it demands the subdivision of alignment constraints too depending on the morpheme each time. As noted, it is arguable whether a subdivision of faithfulness constraints in the manner proposed by Kurisu (2001) is sufficiently motivated. The risk of over-generation of patterns and unrestrictiveness of the theory is readily visible. An additional subdivision of alignment constraints – as the Karanga data suggest – seems implausible¹¹. Further, it seems unclear to me what RM’s treatment of

¹¹ To avoid direct reference and subdivision of alignment constraints, it could be suggested that something like Faith-Align_{Assert} >> Faith-Align_{Non-Assert} is instead employed. To my knowledge, this type of faithfulness is unprecedented. Moreover it too presents serious problems and should be abandoned. Apart from stuffing too much within a constraint – since this is both a faithfulness

patterns ❷ and ❸ would be. Even if a more fully-fledged analysis could incorporate these in the analysis without apparently disturbing the other two patterns, it is questionable how this treatment would fit with the overall analysis that accounts for the generation of all four patterns. Nonetheless, what is even more difficult is to solve the problem that arises through the alignment constraints' subdivision, since the role of alignment seems indispensable for an analysis that makes reference to the morphology-phonology relationship of the N. Karanga verbal stem paradigm.

5.1.2 BE DIFFERENT and application to the verbal stem paradigm. Having shown some of RMT's weaknesses, I believe that RM should not be employed for the Karanga data and instead non-identity of morphologically (and semantically) related forms should be advocated by means of the constraint below:

- (21) **BE DIFFERENT:** For a morphological paradigm p with a set of members n_i, n_j, \dots, n_k , it is the case that each member must be phonologically different from every other member of the paradigm.

BE DIFFERENT is inherently restricted by making reference to members of morphological paradigms¹². Further – and like RM – it is general enough in not specifying the way that the language chooses to satisfy non-identity (contrary to e.g. Alderete's 1999 anti-faithfulness where every time a specific anti-faithfulness constraint is employed to induce avoidance of similarity). It is the job of other constraints to decide what strategy will be used to ensure non-identity.

Returning now to the specific problem in Karanga, the claim has been that BE DIFFERENT is the constraint responsible for the misalignment of tone by one syllable at the beginning of the word. More concretely, it must be the case that BE DIFFERENT >> ALIGN-L (H, Stem) forces the minimal misalignment that occurs. Naturally, a number of considerations arises.

First, as noted, BE DIFFERENT makes reference to the whole morphological paradigm, but implicit in the discussion has been the fact that in the case at hand, its effects only arise in patterns ❶ and ❹. The reason that this occurs is more evident in the diagram below:

and an alignment constraint – it also mixes a constraint that inherently compares the input-output configuration, i.e. faithfulness, with one that only looks at outputs, i.e. alignment.

¹² There is a large amount of work on relations between morphologically-related words and their phonology. See among others: Burzio (1998, 2000), Kenstowicz (1996), McCarthy (to appear), Steriade (1999, 2000).

(22) How many tones each time?

<p>❶ H-toned Assertive 1</p>	<p>❷ H-toned Non-Assertive 2</p>
<p>❸ Toneless Assertive 0</p>	<p>❹ Toneless Non-Assertive 1</p>

It is obvious that the patterns that are in potential conflict are ❶ and ❹. Both contain only one tone underlyingly and thus given the same ranking, identical outputs could be expected. Apparently this is not allowed. As for the other two patterns, i.e. ❷ and ❸, no similar concern comes up since the first includes two tones and the other none.

Some suggestive evidence for the ‘non-identity’ proposal comes when we consider that the bisyllabic forms of all the patterns exploit all four possible combinations between H and toneless. Furthermore, it is plausible to impose such a requirement especially if the forms under investigation happen to perform prominent semantic functions¹³. Being able to use distinct patterns will definitely result in the enhancement of effective and unambiguous communication.

This is exactly the situation we find here. Recall that among the forms under consideration, pattern ❶ expresses the assertive whose semantics relate to affirmative declarative main clauses and infinitive, while pattern ❹ expresses the non-assertive, used for a host of functions including: reflexive, conditional, negative, relative clause and other subordinate and nondeclarative environments (H&P citing Odden 1981).

The generation of the patterns occurs as illustrated in the forthcoming tableau. For concreteness, the unaffected patterns will be shown too. To save space, no linkage between tones and syllables will be indicated. Instead, a representation H will denote ‘a syllable with a H tone’ and L should be read as ‘a toneless syllable’.

¹³ Thanks to Moira Yip for bringing this point to my attention.

(23) OCP, MAX-T, DEP-T, *FUSION >> *FLOAT >> BE DIFFERENT >> ALIGN-L (H, Stem)

	OCP	MAX -T	DEP- T	*FUSION	*FLOAT	BE DIFFERENT	ALIGN-L (H, Stem)
a. ① HHHLL ② HHHLH ③ LLLLL ④ HHHLL						*!	
b. ① LHHLL ② HHHLH ③ LLLLL ④ LHHLL						*!	**
☞ c. ① HHHLL ② HHHLH ③ LLLLL ④ LHHLL							*
☛ d. ① LHHLL ② HHHLH ③ LLLLL ④ HHHLL							*

The ranking presented here is the one established by the other tonal patterns. Candidate (23a) violates BE DIFFERENT since patterns ① and ④ are identical. The same happens if misalignment affects both the patterns in question as in (b). In addition, violations of ALIGN-L (H, Stem) are incurred. Candidates (23c) and (23d) satisfy BE DIFFERENT and violate ALIGN-L (H, Stem) to the same extent. Their difference is that (23c) – the actual winner – shows misalignment in the toneless non-assertive, while maintaining proper alignment and tone triplication in the H-toned assertive. (23d) is the reverse; misalignment occurs in the assertive and proper alignment and tone triplication emerges in the non-assertive.

This brings us to the next consideration. We need to dispose of candidate (23d), but how? BE DIFFERENT gives no priority in any of the two competing candidates. So, how can we account for the fact that ① takes priority over ④ and resists change?

I believe that the answer lies on the more general and independently motivated distinction between root and affix faithfulness (cf. McCarthy and Prince 1995). In particular, a distinction between root and affix alignment is here evident. It is noticeable that the tone in ① is a root tone, while the one in ④ is introduced by the non-assertive affix (whose manifestation is a floating tone). This result is depicted

in (24), where the first candidate presents a slight misalignment of the affixal tone, but this is fine because the competitor incurs a more serious violation by misaligning the root-tone, while the affix-tone presents perfect alignment. This yields the desirable outcome.

(24) ROOT-T ALIGN >> AFFIX-T ALIGN

	ROOT-T ALIGN	AFFIX-T ALIGN
a. ① HHHLL ② HHHLH ③ LLLLL ④ LHHLL		*
b. ① LHHLL ② HHHLH ③ LLLLL ④ HHHLL	*!	

Without elaborating further on that, I assume that such a ranking is in effect and thus the preservation of the position of a root tone over the corresponding one of an affix tone is preferred. For this reason, candidate (23c) [repeated as (24a)] is the sole winner.

A very reasonable concern is also related to the resistance of patterns ② and ③ to change. We could imagine that these could also be affected by BE DIFFERENT, but they are not. Why should this be? Intuitively, the answer lies in the fact that these forms are already distinct both from one another as well as when compared to ① and ④. Therefore, no risk of identity occurs. On a more technical note, these forms are not expected to change, because such an alteration would be gratuitous. If they changed, then this would happen at the expense of other constraints in the language, without any additional gain in terms of BE DIFFERENT. To drive the point home, suppose that candidates with the paradigms below were considered:

- (25) a) ① HHHLL b) ① HHHLL
 ② HHHLH ② HHLLH
 ③ HLLLL ③ LLLLL
 ④ LHHLL ④ LHHLL

(25a) and (25b) are nearly identical with the winning candidate (23c). Their difference is shown in the underlined syllables. (25a) presents a high tone in the first syllable of the toneless assertive, while in (25b) the third syllable is occupied

by a toneless syllable in the H-toned non-assertive. Again, as with the winning candidate, BE DIFFERENT is perfectly satisfied, since no form is identical with any of the others within the paradigm. The problem though has to do with the fact that the syllables underlined incur violations that do not emerge in the winning candidate. Thus, (25a) violates DEP-T because it has inserted a tone, while (25b) violates SPECIFY to a greater extent than the winning candidate by merely duplicating the tone rather than triplicating it. These considerations also justify the dominance of constraints like OCP, MAX-T, DEP-T, *FUSION, *FLOAT over BE DIFFERENT. (23c) is therefore the candidate that best satisfies these high-ranking constraints while obeying the non-identity demanding BE DIFFERENT.

Related to the above, another question still remains unanswered. Why instead of LHHLL do we not get an output like LHHHL represented as:

$$(26) \quad (\underline{\sigma \sigma})(\underline{\sigma \sigma})(\sigma \sigma)$$

This would be consistent with the results of both (23) and (24), since it would satisfy BE DIFFERENT plus it would prioritize root-tone alignment. This candidate presents spreading on the next two syllables, instead of the attested LHHLL where spreading affects only the adjacent syllable. As a matter of fact, this candidate is very significant as it simultaneously exemplifies two important results. First, spreading is not sensitive to counting. It is not as if spreading consistently occurs upon two syllables producing a trisyllabic span. If the goal was to achieve such a span, then the candidate above would be optimal since it manages to satisfy SPECIFY more satisfactorily. The nature of spreading has to be sought in a different factor, which actually has already been extensively discussed, namely FtHD LOCALITY. LHHLL satisfies it, because it spreads up to the next foot-head, while LHHHL exceeds this maximum since it reaches the next foot-tail and for this reason it is excluded. Finally, LHLLL obeys FtHD LOCALITY by not spreading at all. The problem with this is that it violates SPECIFY more than the actual output. Again, FtHD LOCALITY successfully generates the correct spreading without using any rules to produce it.

A final consideration to be discussed at this point is what happens in the monosyllabic forms of the patterns. A brief look will reveal that three out of the four patterns emerge with a H tone. This indicates that BE DIFFERENT is a significant constraint in the language, but it is superseded by other more important ones. In the case at hand, no tones are deleted or stay afloat for the sake of the aforementioned constraint. If there is no space or any other alternative for the tone

to emerge without violating BE DIFFERENT, then so be it. MAX-T, *FLOAT, etc impose more important imperatives.

As it has been presented, this is a fairly complex analysis so an obvious question arises; why should we not assume that what is going on instead is just that a form of NONINITIALITY is employed which bans the attachment of tone at the initial syllable? This is the solution that H&P (1989) suggest. The major drawback of this is that as various researchers have noted ‘extrametricality on the left side of the word is virtually unattested in the languages of the world’ (Goedemans 1996:37), while Hyde 2001 states that there is no constraint such as ‘NonInitiality’ and thus an analysis that crucially uses it should be abandoned. Moreover, initial extrametricality misses the insight that identity avoidance is a fairly common phenomenon (cf. Alderete 1999, Kurisu 2001 and in a different context Yip 1998).

The current approach addresses this issue and provides a tentative analysis by suggesting that a constraint BE DIFFERENT is active and demands that all members within the verbal paradigm, i.e. the assertive and non-assertive forms should each time differ at least to a minimal extent. Thus, where two forms would otherwise be identical - as in ❶ and ❷ where each includes a single underlying tone - BE DIFFERENT forces one of them to minimally change. The reason that the H-toned assertive remains unchanged, while the toneless non-assertive is submitted to a slight misalignment is attributed to the ranking ROOT-T ALIGN >> AFFIX-T ALIGN.

An additional indication that this analysis is on the right track and that NONINITIALITY is not a viable solution is the fact that to postulate such a constraint faces further complications even if we ignore its inherent problems. If we consider again both patterns of the non-assertive, namely the H-toned and the toneless, we can observe that only the latter shows alleged non-initiality. The former follows the general pattern of the language where proper alignment of the tone at the left is preferred. Thus, if we had assumed that the general pattern in the language in terms of alignment is something like ALIGN-L (H, Stem) >> NONINITIALITY, we would be forced to say that the re-ranking NONINITIALITY >> ALIGN-L (H, Stem) is not a property of the non-assertive, but a property of the *toneless non-assertive*. Evidently, this is not a plausible analysis. On the contrary, under the current proposal, the discrepancy in the alignment behaviour of the non-assertive comes naturally. Misalignment only occurs due to a requirement of non-identity.

6 Remaining Issues

6.1 Is non-finality still needed?

In contrast to the robust arguments against initial extrametricality, final syllable extrametricality cannot be as easily disposed of. The reason is that evidence exists suggesting that final extrametricality is active in other constructions. For instance, in the subjunctive, spreading fails to reach the final syllable irrespectively of the tonal specification of the root (examples from Myers 1987:165).

- | | | |
|------|--------------------------|------------------------|
| (27) | i) H-toned root | ii) Toneless root |
| | ũ-těng-e (cf. ku-těng-ǎ) | ũ-gǎr-e (cf. ku-ga-ra) |
| | “that you might buy” | “that you might stay” |

It is also the case that other Shona dialects, make consistent use of final extrametricality. For example, in the Southeastern dialects of Southern Manyika and Ndaou, at the levels of the grammatical word, phonological word and phrase, a high tone spreads up to the penultimate syllable in the domain (Myers 1987:159). Final extrametricality is thus well-attested in Shona.

Recall that in the data discussed, H&P employ final extrametricality to account for the subjunctive and the lack of tone spreading on the final vowels of the non-assertive. As far as the latter issue is concerned, an alternative treatment has been argued in section 4.2 based on the problematic definition of extrametricality in those cases. However, the approach just presented does not manage to provide a neat account for a single form, namely LHL of ④ (while H&P’s final vowel extrametricality does). The problem is that according to all that has been said till now, the expected form would be LHH, i.e. spreading would have occurred. The current approach makes no use of extrametricality, therefore this option is not available. It may well be a case of lexical exception and as such I will treat it here. A future more satisfactory account is of course in demand.

Setting this detail aside, my claim is not that final extrametricality is not significant in N. Karanga, but rather that it is not the proper treatment for the facts in section 4.2. That is, the extrametricality that appears in the subjunctive and generally in Shona is ‘real’ extrametricality, in the sense that it is consistent and makes no restrictions of the type ‘ban spreading onto toneless vowels in the non-assertive, but allow linking’. For this ‘superficial’ final extrametricality, I believe that a solution like the one proposed by the constraint LINK should be preferred. It remains to see whether such a constraint may gain empirical confirmation from other languages too.

6.2 Prefix + Stem

Only a brief and sketchy examination will be taken up here. Exploring the interactions between prefixes and stems in detail would presently take us too far afield. In particular the basic pattern of prefixation will be considered. In the domains of the phonological word and the phrase, a high tone spreads rightward by only a syllable (Myers 1987: 177). This is the relevant pattern with some prefixes (for more examples and details, see Myers 1987: 178-9) like the object markers. For instance, H&P discuss the case of the H-toned 3rd person singular object marker *mũ* being prefixed to a toneless root like *rim* ‘plow’. Given the usual triplication pattern, the anticipated output would be **mũ-rĩmĩsa*, instead of the actual *mũ-rĩmisa*. Their explanation is that since there is no root tone available, RTS is inapplicable. Only GHS applies causing spreading by only one syllable.

Of course such an explanation cannot be maintained in an OT framework. However, edges of domains can be taken into consideration. Recall that a prefix is external to the stem, i.e. root plus suffixes. That means that a prefix followed by the stem constitute a phonological word. At this level then, what is important is that both the prefix and the initial stem syllable are tonally specified. This can be expressed by high ranking ALIGN constraints¹⁴. More specifically, by using ALIGN-L (H, Stem) and ALIGN-L (H, PrWd). Moreover, SPECIFY and *ASSOCIATE must re-rank as no further spreading will be allowed¹⁵.

¹⁴ I am here using the phonological word as equivalent to the prosodic word. {...} marks a prosodic word, while [...] marks a stem. At this stage there is no ranking argument established between the alignment constraints, and *ASSOCIATE. They all just need to dominate SPECIFY.

¹⁵ Of course the two analyses make quite different predictions. For instance, H&P’s analysis predicts that e.g. given an input: *H-toned monosyllabic prefix+toneless monosyllabic prefix+toneless stem*, both prefixes should appear with a H tone without further spreading within the stem, while according to the current analysis both prefixes and the first stem syllable will be tonally specified. Unfortunately, at this stage, I have no data that would answer this question. Moreover, modifications in the current analysis may be in need if for inputs with a string of two monosyllabic prefixes where the second is H-toned, the actual output does not appear with a tone at the leftmost prefix, i.e. satisfy ALIGN-L (H, PrWd), but instead the tone is preserved on the position of the second prefix. This is to show that this analysis here only shows the bare essentials of the prefix-stem relation and needs further research.

(28) ALIGN-L (H, Stem), ALIGN-L (H, PrWd), *ASSOCIATE >> SPECIFY

	{mu-[rimisa]} H	ALIGN-L (H, Stem)	ALIGN-L (H, PrWd)	*ASSOCIATE	SPECIFY
☞ a.	{mu-[rimisa]} H			*	**
b.	{mu-[rimisa]} H			**!	*
c.	{mu-[rimisa]} H	*			***!
d.	{mu-[rimisa]} H		*		***!

(28b) satisfies both alignment constraints, but it also spreads too much incurring fatal violations of *ASSOCIATE. (28c) and (28d) present no spreading whatsoever. Each incurs a violation of an alignment constraint, but more severe is the fact that too many tones are left tonally unspecified. (28a) is proclaimed winner because it minimally violates *ASSOCIATE and SPECIFY while satisfying the alignment constraints perfectly.

7 Conclusion

The preceding analysis examined the patterns of the assertive and non-assertive as they emerge in N. Karanga. It suggested that it is possible to replace the spreading rules of M&P with a general constraint FTHD LOCALITY, whose interaction with SPECIFY leads to the maximal trisyllabic span.

It has also been pointed out that extrametricality is not suitable to explain the attested patterns and that it can be at least to an extent re-analysed as only the side effect of two more significant requirements that the language poses; final extrametricality in fact expresses a preference to link all underlying tones before the beginning of spreading and when this is impossible to do, e.g. due to OCP, then ban spreading altogether. Initial extrametricality on the other hand is an epiphenomenal result of the requirement that members of morphological paradigms are distinctly realized.

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