Phonology **17** (2000) 65–115. Printed in the United Kingdom
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*Nasal reduplication in Mbe affixation**

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1 Introduction

It is well known that though reduplicative morphemes generally fill their content through copy from a base stem, some also display a portion of fixed material. Understanding the source of such fixed segmentism in reduplication has been a matter of controversy and the subject of ongoing research in phonological theory. A long-standing theoretical approach has attributed any fixed content to prespecified material (Marantz 1982, Yip 1982 and subsequent developments; see Alderete *et al.* 1999 for an overview). However, more recent work has presented an alternative. A fruitful line of inquiry has stemmed from the notion that fixed content in reduplicative affixation can be explained without prespecification, through the activity of phonological constraints that are well integrated into the phonotactics and segmental-featural system of the language (McCarthy & Prince 1994b, 1995, Urbanczyk 1996a, b, Spaelti 1997, Alderete *et al.* 1999). Alongside the issue of fixed segmentism stands the question whether templatic structures are required to determine the size and shape of reduplicative affixes or whether such properties can be made to follow from general constraints on prosodic structure (see work cited above; also McCarthy & Prince 1994a, Prince 1997, Gafos 1998a, b, Urbanczyk 1998; with foundation from McCarthy & Prince 1986, 1990).

This paper brings a study of Mbe affixation to bear on these issues. Mbe presents a nasal agreement phenomenon in which a nasal in the base of affixation triggers the occurrence of a nasal coda in a CV prefix with its place features linked to the following onset (Bamgboṣe 1971). When the

* This paper has benefited significantly from the comments and suggestions of Jaye Padgett, John Alderete, Diamandis Gafos, Junko Itô, John McCarthy, Armin Mester, Sharon Rose, Philip Spaelti, Suzanne Urbanczyk and three anonymous *Phonology* reviewers, as well as audience members at *WCCFL* 17 at the University of British Columbia and members of phonology groups at the University of Southern California, University of California, Santa Cruz and University of Massachusetts, Amherst. Special thanks to John McCarthy for first bringing the Mbe data to my attention and to Akin Akinlabi for help in tracking down source material. Any errors in this work are my own. This research was supported in part by fellowship 752-93-2397 from the Social Sciences and Humanities Research Council of Canada and grant SBR-9510868 from the National Science Foundation.

https://doi.org/10.1017/S0952675700003833 Published online by Cambridge University Press

stem contains only oral content the prefix does not display a coda nasal. Representative examples from diminutive prefixation are given in (1).

(1) a. kɛ̌n-tɔ̀ní 'little earthworm' b. kɛ̌-bɛ̂l 'little breast'
kɛ́ŋ-kùɔm 'little snake skin' kɛ̀-fúfú 'little sweat'

Interestingly, the nasal agreement occurs only in specific affixations. A structure like the diminutive above is found also in verbal inchoative prefixation, where the nasal coda occurs in conjunction with fixed segmentism [re]. The agreeing nasal is also seen in a reduplicative series of imperative verbs. In this structure the nasal occurs alongside a reduplicated CV:

(2) a. jûŋ-jûen 'learn' b. pû-pûabrì 'stray'
pûm-pûɔnì 'mix' ʃî-ʃîarì 'scatter'

The reduplicative imperative affixation suggests that the source of the agreeing nasal is reduplication. However, an intriguing property of the phenomenon is the occurrence of the nasal with fixed rather than reduplicated segmentism in the diminutive/inchoative affixation.

The focus of this paper is twofold. First, I argue that the agreeing nasal is reduplicative. I present a study of the morphophonology of Mbe to support this conclusion and also to demonstrate that an alternative approach positing nasality spreading as the basis of nasal agreement must be rejected. The second point concerns the related issue of prespecification: I argue that analysing the nasal agreement as reduplication does not require prespecified material in reduplicative affixes, for example, an empty C slot, coda nasal, fixed CV segments, etc. Indeed, this study reveals that not only is prespecification unwarranted, but assuming it would fail to capture key generalisations about Mbe grammar. The fixed segmentism is shown to have an independent morphological basis in the diminutive and inchoative constructions and the place-linked nasal nature of the copied consonant is demonstrated to follow from general phonotactics of the language. In addition, the limitation of reduplication to a single segment in the case of diminutive/inchoative affixation need not be stipulated in the underlying structure but rather is an instance of The Emergence of the Unmarked (TETU; McCarthy & Prince 1994b), obtained through an a-templatic constraint penalising syllable structure (Spaelti 1997). These discoveries about reduplicative affixation in Mbe support the claim that fixed segmentism in reduplication is not prespecified but is either PHONOLOGICALLY DETERMINED, as mentioned above, or MORPHOLOGICALLY DETERMINED (McCarthy & Prince 1986, Alderete *et al.* 1999). Connected to this research is the idea that phonologically determined fixed material serves in some manner to reduce the phonological markedness of the structure, and this markedness may show context-sensitivity. Within the formal framework of Optimality Theory (OT; Prince & Smolensky 1993), I introduce a general proposal to eliminate the emergence of prespecified material in reduplicative morphemes stemming from a statement of head *vs.* dependent markedness.

https://doi.org/10.1017/S0952675700003833 Published online by Cambridge University Press

The organisation of this paper is as follows. First, in §2 I outline the nasal agreement phenomenon in three kinds of affixation and I present evidence that the fixed prefixal segmentism seen in conjunction with the nasal actually belongs to a separate affix. §3 focuses on the nature of the affixation and identifies the prefix as reduplicative. An alternative nasal-spreading account is determined to be inadequate on various grounds, a principal factor being the action-at-a-distance, which is not consistent with other nasal-spreading phenomena. Evidence for a reduplication approach is adduced and properties of the affixation that do not correspond to cross-linguistically canonical reduplicative structures are shown to be attested in reduplication elsewhere. In §4 I spell out the key theoretical assumptions concerning correspondence, morpheme realisation and the exclusion of prespecified material in reduplication. The optimality-theoretic analysis is developed in §5, focusing first on the syllable-size reduplicative imperative affixation and rankings characterising the nasal phonotactics of the language from which the nasal coda copy follows. This account is then extended to the minimised copy of the diminutive/inchoative constructions. These latter affixations are shown to necessitate an a-templatic approach to size restriction. §6 goes on to examine the role of the a-templatic size restrictor in other affixation in Mbe, and finally §7 presents the conclusion and implications for further research.

2 Nasal agreement in Mbe affixation

Mbe is a Benue-Congo language spoken in the Ogoja Province of Nigeria. As mentioned above, certain prefixes in Mbe display a nasal agreement effect, whereby a nasal occurs in the coda only when the stem contains a nasal. The phenomenon and other aspects of Mbe morphology and phonology are described in a series of papers by Bamgboṣe (1966, 1967a, b, c, 1971). In this section I outline the nasal agreement pattern in three affixations. I begin with a series of imperative verbs, where the agreeing nasal occurs as part of a syllable-size reduplicative prefix. I then go on to present the nasal agreement in diminutive and inchoative prefixation, where the agreeing nasal occurs alongside fixed prefixal segmentism rather than reduplicative material. Further data is supplied to diagnose the morphological status of these fixed elements. To focus on the nasal agreement, this section concentrates on segmental qualities of the affixation; the tonal dimension of the constructions is discussed in §3.

2.1 Imperative verbs

Nasal agreement occurs in the formation of a series of imperative verbs in Mbe. Verbs in Mbe are categorised as Class 1 or Class 2, corresponding to the particular form of affixation that takes place in verbal inflection. Affixes may be fixed in their phonological content or reduplicative. Imperative verbs occur in two series: a reduplicative series and a simple

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(non-reduplicated) one. The pattern of reduplication for Class 2 imperative singular verbs produces a prefix that takes the form of either an open or closed syllable, depending on the segmental content of the base stem. First, the data in (3) present examples where the reduplicative prefix is an open syllable. The prefix vowel is an identical copy for a high stem vowel and [ə] for any non-high stem vowel. Only the first vowel of a diphthong (high vowel followed by low) is copied.

(3) *Class 2 : reduplicative imperative singular*

rû-rû	'pull'	ʃî-ʃîe	'sell'
ʧî-ʧî	'help put on head'	jû-júbò	'go out'
gê-gê	'belch'	pû-pûabrì	'stray'
lə̂-lə̂	'burn'	kû-kúɛlò	'nibble at'
kpə̂-kpâ	'hang'	ʃî-ʃîarì	'scatter'
mə̂-mâl	'finish'	sə̂-sórò	'descend'
fû-fûel	'blow'	tə̂-tárò	'throw'
ʧû-ʧûe	'bore (hole)'		

The above exemplify the formation of the reduplicative series when the stem contains no segment eligible to be copied as the prefix coda – this privilege is restricted to nasals. As seen in (4), if the stem contains a non-initial nasal, the prefix is closed with a nasal stop homorganic with the following onset. Observe that the nasal occurs in the prefix even if non-contiguous to other copied segments in the base stem, that is, it appears that reduplication can 'skip' the second diphthongal element in order to copy the nasal. These data illustrate the phenomenon that I refer to as nasal agreement.

(4) *Class 2 : reduplicative imperative singular*

tə̂n-tâŋ	'teach'	bə̂m-bámò	'hide'
bîm-bîem	'believe'	pûm-pûɔnì	'mix'
jûŋ-jûen	'learn'	jîŋ-jîɔnì	'forget'
dzûn-dzûɔŋ	'be higher'	lûn-lûonì	'repair'
gbə̂ŋm-gbénò	'collide'	kpûŋm-kpômnì	'congeal'[1]

2.2 Diminutive nouns

The next example of nasal agreement in Mbe is found in the formation of diminutive nominals. In contrast to the imperative reduplication, the agreeing nasal segment in affixation does not co-occur with other reduplicated segmentism; instead it forms the coda to fixed CV prefixal segmentism. As illustrated in (5a), nouns containing a nasal form the diminutive singular with [kɛ-] closed by a homorganic nasal stop (vowel harmony produces a [ka-] variant before syllables containing [a]). If the noun root does not contain a nasal, then the prefixation consists of [kɛ-] only (5b).

[1] After labial-velar stops, [u] appears as the correspondent of [o] in the reduplicant.

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(5) *Diminutive singular*

a.			b.		
	kàm-bàm	'little bag'		kɛ̌-ʧî	'little head'
	kɛ̀m-mù	'little story'		kɛ̌-bɛ̂l	'little breast'
	kàŋ-fàŋ	'little path'		kɛ̌-lîe	'little food'
	kɛ̌n-tɛ́m	'little heart'		kɛ̀-fúfú	'little sweat'
	kɛ̌n-tɔ̀ní	'little earthworm'		kɛ̀-kpíʧù	'little crocodile'
	kɛ̌n-rén	'little fruit'		kɛ̀-kìkɛ̀l	'little fingernail'
	kɛ̌n-lêm	'little tongue'		kà-bàrò	'little liver'
	kɛ̌n-nên	'little bird'		kɛ̀-gògòrò	'little wall'
	kɛ̀n-sûnì	'little soldier ant'			
	kán-ʃíaní	'little work'[2]			
	kɛ̌ŋ-ɲíen	'little thing'			
	kɛ́ŋ-kùɔm	'little snake skin'			
	káŋ-kùamô	'little squirrel'			
	kɛ́ŋm-gbénó	'little upper arm'			

Plural diminutives are formed as above but with fixed segmentism [ke-]:

(6) *Diminutive plural*

a.			b.		
	kɛ̌n-tɛ́m	'little axes'		kɛ̌-bɛ́l	'little wives'
	kɛ̌n-rén	'little fruits'[3]		kɛ̌-fúɔrɔ́	'little brains'

An intriguing property of the diminutive prefixation is the co-occurrence of the agreeing nasal segment with the fixed segmentism. The reduplicative imperative prefix displays an agreeing coda nasal that is straightforwardly connected with reduplication, but in the present case, the agreeing nasal does not occur alongside copied material. Yet the conditions that trigger the presence of an agreeing nasal are otherwise the same: the base must contain a nasal (one not copied elsewhere in the prefix). Given this parallel, the diminutive prefixation would seem to be a candidate for a reduplicative morpheme structure that contains prespecified segments, as represented in (7) for the singular form:

(7) RED + *noun stem*
|
kɛ

This kind of representation raises a theoretical issue. Several analysts have noted that admitting prespecified segmentism predicts a much broader range of fixed segments than is actually attested – fixed segmentism in reduplication is typically default in character, suggesting that it is not underlyingly specified (McCarthy & Prince 1986, 1990, Urbanczyk 1996a, b, Spaelti 1997, Alderete *et al.* 1999). However, the fixed segments in the

[2] Bamgboṣe (1971: 10) notes that nasals are realised as [n] before [ʃ ʧ ʤ] and [ɲ] before [j ɲ].

[3] The examples of prefixation in (6a) are constructed on the basis of Bamgboṣe's description (1966: 48).

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diminutive prefix structure are not default and thus appear to undermine this generalisation.

An alternative structure posits that [kɛ-] and the agreeing nasal segment belong to separate morphemes, as tentatively represented in (8).

(8) kɛ + (N) + *noun stem*

The issue here is whether there is an independent basis for separating [kɛ/ke] and the nasal into distinct morphemes. If such a basis exists, a further matter is determining what causes the occurrence of the coda nasal only when a nasal appears in the root. At this point I turn to evidence bearing on the question of the diminutive nominal structure. I argue that when considered within the broader scope of Mbe morphology, it is the two-part prefixing structure in (8) that is appropriate, and a prespecification approach as in (7) must be rejected. The representation in (8) leaves open the question whether the agreeing nasal is a product of reduplication or the result of nasality spreading of some kind; this matter is taken up in §3.

Mbe displays a rich system of nominal prefixes. A careful examination of this nominal morphology will reveal that the bimorphemic prefixation structure is correct. First, we find that nouns never occur as bare roots, but must always occur with a prefix marking number category (singular/plural). The prefixed non-diminutive counterparts of a selection of the diminutive nouns in (5) are as follows:

(9) *Non-diminutive singular*

è-bàm	'bag'	ŋ́-kùamô	'squirrel'
bù-tɔ̀ní	'earthworm'	bù-ʧí	'head'
kɛ̀-nén	'bird'	bɛ̀-líe	'food'
ǹ̩-sûnì	'soldier ant'	è-kpíʧù	'crocodile'
lé-ʃíaní	'work'	lè-bàrò	'liver'
ó-kùɔm	'snake skin'		

Observe that a variety of prefixes is seen here. Mbe is a class language with seven primary nominal classes, four of which contain two secondary classes. The class to which a noun belongs determines which number category prefix it will take, as well as the form of syntactic agreement markers in verbs and concord markers. The phenomenon of syntactic agreement is illustrated in (10), where thematic concord markers agree with the class of the thematic noun.

(10) a. è-ʧí jí ǹ̩ kílé 'It was a tree that I saw'
CL.2 SG-tree CL.2 SG-THEME 1SG saw

b. kɛ̀-tɔ́r kúkù̀e ǹ̩ kílé 'It was a duiker that I saw'
CL.4 SG-duiker CL.4 SG-THEME 1SG saw

The noun-class morphology provides a diagnostic for determining the structure of diminutive prefixation. Bamgboṣe (1966: 48) notes that dim-

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inutive nominals are all members of Class 4, regardless of the nominal class for the root in the non-diminutive form. Syntactic agreement markers for diminutives thus match those for Class 4. The Class 4 membership of diminutives is significant when considered in relation to the form of prefixes marking number category: the Class 4 nominal prefixes, [kɛ-] (SG) and [ke-] (PL), precisely match the fixed segmentism in the singular and plural diminutive formation. However, non-diminutive Class 4 nouns do not exhibit nasal copy, as shown in (11a, b). As a consequence, Class 4 non-diminutive nouns are segmentally identical to their diminutive counterparts when they do not contain a nasal, although they are often distinguished by tones (11c).

(11) *Class 4*

	Non-diminutive		*Diminutive*	
a.	kɛ̀-tɛ̀m	*kɛ̌n-tɛ̀m	kɛ̌n-tɛ́m	'axe'
b.	kɛ̀-tɛ̀m	*kɛ̌n-tɛ̀m	kɛ̌n-tɛ́m	'axes'
c.	kɛ̀-ʧì		kɛ̌-ʧí	'stick'

Given that diminutives are Class 4 and have prefixal material identical to the usual Class 4 prefixes, the most reasonable inference is that the [kɛ/ke] portion of diminutive formation *is* a Class 4 prefix, not part of the diminutive morpheme itself (*pace* Bamgbọṣe 1971: 102). Hence the agreeing nasal is the only segmental material introduced by the diminutive morpheme. The derived diminutive nominal in Mbe belongs to Class 4, and it thereby takes the [kɛ-/ke-] prefixes. This structural analysis is necessary to explain the uniformity of affixes and agreement markers in diminutives and Class 4 non-diminutive nouns: if the [kɛ/ke] material were a prespecified part of a reduplicative diminutive prefix, the homophony would be accidental.

2.3 Inchoative verbs

The third instance of nasal agreement is found in the formation of inchoative verbs in Mbe. The inchoative construction is similar to the diminutive in combining fixed CV prefixal segmentism with an agreeing nasal. The data in (12a) present examples where a nasal in the stem triggers a nasal coda to the affixal material [re-]. The stems in (12b) contain no nasal segmental material – these form the inchoative verb with [re-] alone.

(12) *Inchoative*

a.	rên-túɔm	'has started to send'
	rêŋ-jíɔnì	'has started to forget'
	rêŋ-kɛ́n	'has started to walk'
b.	rê-tá	'has started to touch'
	rê-kɛ́l	'has started to look'
	rê-káb	'has started to dig'

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In the diminutive prefixation, where fixed segmentism combined with an agreeing nasal, evidence from Mbe nominal class morphology was adduced to argue that the fixed segments and the nasal belonged to separate morphemes. A similar argument can be made for the inchoative construction. The evidence stems from the occurrence of [re-] in the formation of four other verbal tense/aspect forms, either as the sole prefixal material or in combination with [ke] (I hypothesise that [reke] has the complex structure [re+ke]). These other instances of [re-] affixation are shown below (with different tonal patterns accompanying different tense/aspect forms). Observe that nasal agreement does not occur in these structures.

(13) a. *Remote past* (SG)
rè-tá 'had touched'
rè-jíɛm 'had sung'

b. *Past continuous* (SG)
rèké-ta 'was touching'[4]
rèké-jìɛmó 'was singing'

c. *Future* (SG)
rèké-tà 'will touch'
rèké-jíɛm 'will sing'

d. *Future continuous* (SG)
rèké-tá 'will be touching'
rèké-jíɛmó 'will be singing'

Since the [re] segmentism occurs in the formation of a variety of verbal tense/aspect forms, I conclude that it is not segmental material specific to the inchoative morpheme, but rather it has some more general function across these verbal forms (though the precise nature of its function requires further research). Like the diminutive, this yields an inchoative prefix consisting of just the agreeing nasal in its segmentism. Hence, prefixation in both the diminutive and inchoative constructions has been identified as bimorphemic, with the segmental content of the second morpheme taking the form of an agreeing nasal, i.e. one that occurs only when a nasal also appears in the stem. The analysis of the agreeing nasal must thereby take into account two issues: (i) the morphological structure of the prefixation, consistent with the function of the nasal in the construction, and (ii) the phonological structure; specifically, it must address whether this prefix is fixed or reduplicative in nature.

2.4 Summary

To summarise, this section has outlined the phenomenon of nasal agreement in three kinds of affixation. In the imperative structure, the nasal coda segment occurs as part of a syllable-size reduplicative prefix. In the diminutive and inchoative structures, the agreeing nasal instead occurs in conjunction with fixed prefixal segmentism. In both of these cases it has been established that the fixed segments belong to a morpheme distinct from that of the nasal, circumventing any motivation for treating these as reduplicative affixes with prespecified segmentism. The question now arises whether the agreeing nasal in the latter constructions should be viewed as an isolated reduplicated segment or whether it would be better

[4] For this form, the tone on [ta] is not marked in the source (Bamgboṣe 1967b).

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conceived as resulting from nasality spreading. In the next section I argue that it must be the former.

3 The nature of the affixation

The occurrence of nasal agreement in the reduplicative imperative construction suggests that segment copying is its source. However, in the other instances of nasal agreement this does not look like a typical case of reduplication. Reduplicative affixation most commonly copies at least a syllable (or an onset plus default vowel); yet in the diminutive and inchoative structures, the matching material constitutes a coda or fails to appear at all. In addition, from a cross-linguistic standpoint, examples of canonical reduplicative prefixation copy a contiguous string of segments from left to right in the base. This does not occur in any of the nasal-agreement structures. In imperative forms, the first CV of the base is copied, but the agreeing nasal can be triggered after skipping intervening segments in the base. The diminutive and inchoative do not even necessarily display identity with the leftmost segment in the base, rather they simply agree with the first nasal, which can be at a distance from the left edge. If this were reduplication, it also seems unusual that these latter cases copy only nasal segments. Aspects of these non-canonical properties have previously been taken as evidence against a reduplication analysis of these data (Bamgbọse 1971). However, more recent developments in phonological theory, particularly the advent of OT, give reason to re-examine this conclusion. The lack of strict conformity to canonical reduplicative patterns might be explained as arising from the interaction of demands in the grammar that are competing and violable. This approach is pursued below. But first, I evaluate the viability of an alternative that proceeds from a more rigid adherence to canonical reduplication structures.

3.1 Feature spreading

Noting the lack of a canonical reduplicative basis for nasal agreement and its co-occurrence with fixed segmentism, Bamgbọse rejects the possibility that it stems from reduplication. He proposes to instead treat the agreeing nasal as what he terms a phonetic element introduced by a morphologically specific 'nasal harmony' rule for specific prefixes: CV-CVN(V) → CVN-CVN(V) (1971: 105). In this rule, Bamgbọse identifies the CV-context as one of the following prefixes: the prefix [re-] that he labels the inchoative marker, the prefix [kɛ-/ke-] that he labels the diminutive prefix, or a reduplicated verbal prefix. However, the source of the fixed prefixal segmentism determined above reveals this rule to be inadequate. Bamgbọse assumes that the fixed [kɛ/ke] and [re] segments *are* the diminutive and inchoative prefixes, respectively; but we have seen evidence to the contrary: these segments belong to prefixes that play a

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separate role in the structure. Moreover, when these prefixes occur in other constructions, they do not trigger a harmonising nasal.[5] In other words, a key property of the nasal agreement is that it occurs in specific morphological constructions; however, this environment cannot be reduced simply to the occurrence of the independent prefixes [kɛ-/ke-] and [re-]. Nevertheless, setting aside the drawbacks of this specific approach, the nasal harmony notion could conceivably be remodelled in light of the new understanding of the fixed prefixal segmentism.

Let us suppose that the nasal agreement results from [+nasal] spreading from a segment in the base. The first question to consider is what serves as the target of nasal spreading. If this were feature spreading, it is unusual that there is no alternating target segment, rather there is an alternation between the occurrence of a nasal segment and zero. We might speculate that the nasal agreement actually represents a featural alternation in the onset consonant in the form of prenasalisation, that is, the feature spreads to form a nasal contour within a pre-existing segment.[6] However, this possibility can be swiftly ruled out. First, if this were feature spreading within the noun stem, it would fail to explain why the nasal agreement occurs only in specific morphological constructions, rather than occurring as a general process in the language (note examples (11) and (13) above). A survey of nasal harmony by Walker (1998) reveals that [+nasal] spreading is not triggered by affixation. While there are cases in which an affix itself consists of a nasal feature that spreads within the root (e.g. Tereno; Bendor-Samuel 1960); these affixations *add* the feature [+nasal] to the structure – the nasality does not have a source in the base of affixation nor does the affixation itself impose any condition of nasal agreement between segments in separate morphemes. By way of contrast, it should be noted that the reduplication analysis of the nasal that will be developed below makes a different prediction: under a reduplication account, the distribution of the agreeing nasal is expected to be morphologically conditioned.

A second problem for a prenasalisation alternation is raised by evidence that the agreeing nasal stop has its own root node independent of the onset consonant. Bamgboṣe (1967c: 8) observes that [e] regularly reduces to [ə] in the context of a closed syllable in Mbe, e.g. /fér/ → [fə́r] 'fold' (cf. /èfé/ → [èfé] 'lung'). (Note that transcription of /e/ in data given earlier follows Bamgboṣe's phonemic transcription and does not reflect this reduction.) Interestingly, the agreeing nasal also activates this reduction: /rê-n-túɔm/

[5] The rule-based approach is also problematic because the formalism itself is too powerful. Since the formalism places no restriction on the character of potential inserted elements, the inserted segment could in principle be any consonant. Hence its agreement with a nasal in the stem is purely accidental. Further, the formalism makes available any location in the string as a possible site for insertion – it thus reduces the occurrence of the harmonising nasal at a morpheme boundary to a coincidence.

[6] The resulting structure could be represented as a contour within a complex segment (Sagey 1986) or in the two aperture node representation of Steriade (1993) – the choice does not figure to the point here.

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→ [rântúɔm] 'has started to send', /rê-ɲ-jíɔnì/ → [râɲjíɔnì] 'has started to forget' (Bamgbọṣe 1971: 104). This triggering role supports its status as a segment in its own right occupying the coda of the first syllable – a representation in which the nasality was part of a nasal contour in the onset segment fails to predict the alternation. An additional point is that prenasalised consonants do not occur generally in the language (Bamgbọṣe 1967c). As a consequence, nasals that occur before a stop at the beginning of a word are always syllabic and tone-bearing. It is thus clear that an account positing the nasality as part of a contour within the onset consonant is inadequate. Questions about the locality of feature spreading will also confront this approach – these issues are raised in relation to another alternative below.

All the evidence points to a structure in which the agreeing nasal is dominated by its own root node. Let us consider an alternative spreading structure in which the inchoative or diminutive prefix is the source of this root node, that is, these affixes consist of a (partially) underspecified consonant with a root node. This consonant could then serve as the target of [+nasal] spreading from a segment in the stem.[7] Since the consonantal prefix is realised only when there is a nasal in the stem, we must assume that it is deleted if it does not become nasal through spreading. This could perhaps be made to follow from restrictions on the content of medial codas (such restrictions are detailed in §5). The hypothesised representation is shown in (14):

(14) kɛ + C + kuɔm

[+nas]

A key issue here is the locality of spreading. This structure must allow [+nasal] to spread at any distance between the trigger and target segment, while the intervening vowels and consonants remain oral. However, such action-at-a-distance in feature spreading would be highly exceptional. A body of recent work has argued that apparent long-distance feature spreading between consonants does not actually skip intervening segments. Typological studies by Ní Chiosáin & Padgett (1993, 1997), Flemming (1995) and Gafos (1996, 1997) reveal that the coronal consonantal features which appear to spread at a distance are precisely those that do not affect the perceived acoustic quality of the intervening segments. In the case of nasal-feature spreading, it is significant that the property of nasalisation audibly affects both consonants and vowels. A cross-linguistic study by Walker (1998) finds that nasal harmony produces strictly continuous spans of nasalisation – with one exception: oral obstruents can occur within a nasality-spreading span. Walker identifies these transparent segments in nasal harmony as ones that fall near the extreme of incompatibility with nasalisation; a lowered velum gesture

[7] Note that the nasal agreement could not be viewed as an instance of spreading of *all* the features of a nasal segment in the stem, since the two nasals can have different place specifications.

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uncontroversially conflicts with obstruency (Cohn 1993, Ohala & Ohala 1993). This study also discovers that obstruents display transparent behaviour in nasal harmony only when all other segments undergo nasal spreading. Viewed together with the previous point, this means that the propagation of nasal spreading through segments that are least compatible with nasalisation – obstruents – implies that all segments more compatible with nasalisation participate in nasal spreading. Observing that the participation of a segment in nasal harmony consistently correlates with the participation of all more compatible segments, Walker develops a typological argument that 'transparent' obstruents must also be regarded as participants in nasal spreading. If these segments were simply skipped over in nasal spreading, the generalisation that obstruent transparency implies that all other segments undergo harmony would stand unexplained. The oral realisation of obstruents is argued to be an instance of derivational opacity obscuring the local nature of spreading in the case of phonetically incompatible segments.

Taken as a whole, this body of research on 'long-distance' spreading thus finds that features actually spread between strictly adjacent segments and apparent transparency arises in segments that are not affected perceptually by the spreading property or whose basic properties conflict with the spreading feature. However, the nasalisation in Mbe presents a different pattern. The nasal agreement applies across any string of intervening segments and does not produce nasalisation in any of them. This stands in glaring contrast to the generalisation that vowels and other sonorants, which are scaled high in compatibility with nasalisation, never exhibit transparent behaviour in nasal harmony: within a nasal-spreading span they are consistently produced with audible nasalisation. Hence, analysing the nasal agreement as spreading would require that it be allowed as an exception among all other nasal harmony and within feature spreading more generally.[8]

[8] It should be noted that some analysts have proposed that a nasal agreement occurring in certain Bantu languages (e.g. Kikongo) is an example of [+nasal] spreading between consonants without affecting intervening vowels (Ao 1991, Odden 1994, Hyman 1995, Piggott 1996). In this phenomenon a nasal stop induces nasalisation of a liquid or voiced stop occurring anywhere to its right in the stem. However, Walker (1998) argues that this is actually an instance of a co-occurrence restriction which disallows similar segments differing in nasality, but permits segments with identical nasality specifications – a restriction identified in other languages, such as Ngbaka (Mester 1986, Sagey 1986). Walker points out that co-occurrence restrictions do not exhibit the same strict segment-adjacency effects that feature spreading presents: many are sensitive to segments located anywhere in the word, and this is consistent with the action-at-a-distance seen in the Bantu cases. These examples of agreement are analysed by Walker (2000) as arising via correspondence between similar segments in the output of a word rather than through feature spreading. Moreover, even if it were granted that the Bantu phenomenon was indeed feature spreading, a long-distance spreading analysis of Mbe nasal agreement would still be problematic. A pervasive generalisation in the Bantu languages is that nasality agreement may not overlook an intervening voiced stop or liquid, i.e. in a spreading approach, [+nasal] cannot skip these segments. However, Mbe nasal agreement never affects an intervening consonant of this kind: [kămb̲ám] 'little bag'; [kěnl̲êm] 'little tongue'.

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We have determined that Mbe nasal agreement does not conform with the locality seen in any other case of nasal spreading. A spreading-based account would thus predict a range of long-distance feature-spreading effects that are elsewhere wholly unattested. Hence, this approach entails introducing an undesirable lack of restrictiveness into the theory. Gafos (1998a) makes a related point concerning consonantal spreading at the root level. He argues that when full consonant identity is enforced at a distance in certain morphological constructions of a language, it cannot be segment spreading, because the non-local interaction would be highly exceptional. The same reasoning applies here for spreading at the [+nasal] feature level. Gafos proposes that instances of putative long-distance consonant spreading are actually the product of reduplication. In what follows, I argue that reduplication is also the source of nasal agreement in Mbe.

3.2 Nasal agreement as reduplication

As mentioned above, the reduplicative imperative construction suggests the possibility that the agreeing nasal is copied. Though it has been noted that some aspects of the nasal agreement do not conform strictly to canonical patterns of reduplication from a cross-linguistic viewpoint, this in itself is not a reason for rejecting a reduplication approach without further evaluation. It is well known that not all reduplication follows strict canonical patterns – divergences may occur as a result of other requirements in the grammar (see, for example, McCarthy & Prince 1995, Gafos 1996, 1998a, Urbanczyk 1996b, Spaelti 1997, Alderete *et al.* 1999, among others). Let us recall the relevant details. A canonical reduplicative prefixation would copy a contiguous string of segments from left to right in the base, but this is not rigidly obeyed in the Mbe nasal-agreement structures. In the imperative prefixation, the coda nasal may be non-contiguous with other material copied from the base (the first CV). In the case of diminutive and inchoative prefixation, the prefixing nasal can be triggered by a nasal segment that is at a distance from the left edge of the base, and no other material is copied. Furthermore, in the latter affixations, no agreeing/copied material occurs at all when the base does not contain a nasal. In preview, the formal proposal developed in §5 is that the nasal agreement is an instance where maximising segment copy and copying a contiguous left-anchored string are outweighed by restrictions limiting word size and coda material. At this point I turn to arguments in favour of a reduplication analysis and demonstrate that the non-canonical reduplicative properties displayed here are attested elsewhere.

First, since the prefix in the imperative series is already known to be reduplicative, the agreeing nasal in this structure can follow directly from the same mechanism. To call on some other device would add needless complexity and miss an obvious generalisation. Such a complication would only be motivated if copy after skipping intervening material were unattested, since the triggering nasal can be at a distance in the stem from other reduplicated segments. However, copy of strings of segments that

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are non-contiguous in the base have been documented in numerous other languages. Gafos (1998a) discusses a prefixing reduplication in Temiar biconsonantals that copies the first and second consonant of a CVC stem to produce a structure C_1C_2-'C_1VC_2. In this configuration, the vowel cannot be copied because of a constraint banning unstressed (non-final) vowels, but it is skipped in order to copy the second consonant. Nakanai presents a prefixing reduplication where a co-occurrence restriction on obstruents causes a consonant to be skipped, producing the structure $C_1V_2V_4$-$C_1V_2C_3V_4$ (Carlson 1997, Spaelti 1997). Non-contiguous segments copied at a greater distance are also found. A striking case is seen in Semai. Hendricks (1998) discusses a reduplicative prefix that copies the first and last consonants of the root:

(15) ct-cʔɛ:t 'sweet'
cl-cfa:l 'appearance of flickering red object'
pŋ-pajaŋ 'appearance of being dishevelled'
cw-cruha:w 'sound of waterfall, monsoon rain'

A similar pattern is seen in Ulu Muar Malay, which prefixes a copy of the first CV of the root closed with a copy of the root-final consonant, e.g. [dan-dajaŋ] 'friend' (Nelson 1998). Analysts of the latter two languages have argued that the discontinuity is produced by a requirement that segments at each edge of the base be copied. Other cases in the literature where non-contiguous segment copy is discussed or implicit include the analysis by Alderete *et al.* (1999) of Tagalog, Urbanczyk's account of Lushootseed (1996b: 243) and the analysis by Ussishkin (1999) of 'total reduplication' in Hebrew. This range of examples demonstrates that non-contiguous segment copy is a true phenomenon in reduplication, taking place when compelled by conditions that restrict the content of the reduplicative form. In the case of imperative reduplication in Mbe, coda material is restricted to a homorganic nasal – a cross-linguistically common restriction on codas (Itô 1986). Hence, the imperative nasal agreement is a clear-cut instance of non-contiguous reduplication; to treat it otherwise would overlook its similarity to the other patterns.

If the agreeing nasal in the imperative construction is reduplicative, then the obvious source for the agreeing nasal in other affixation is also segment copy. Treating this nasal as uniformly reduplicative generalises the properties common to these affixations. Further, a reduplication approach explains the limitation of nasal agreement to specific morphemes. The agreeing nasal is the realisation of a reduplicative prefix and hence is expected to occur only in reduplicative affixation, namely, the imperative, inchoative and diminutive constructions.

Though there are compelling reasons for analysing the agreeing nasal as consistently reduplicative, to complete the argument we must address the non-canonical properties that it presents in the diminutive and inchoative structures. Perhaps most striking is the limitation of the reduplicant to nasal material. This might seem to indicate that a reduplication approach requires prespecifying the prefix as [+nasal], but the above discussion

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suggests an alternative. Like the imperative construction, the diminutive and inchoative affixations produce a syllable obeying a familiar condition: codas may consist only of homorganic nasals. The strict application of this condition in reduplication explains the nasal-specific nature of the single-segment copy in Mbe. In fact, the phonotactic restriction in question turns out to be one that holds more widely in the language (though exempted in root-final position). This point will be examined in some detail in §5. The phonotactic explanation for the nasal content achieved under reduplication may be contrasted with the [+nasal]-spreading approach, where it must be stipulated that nasality spreads. Nasal spreading is unconnected to the limitation of codas to homorganic nasals, though this restriction is still necessary to explain the lack of a coda prefix consonant when the stem contains only oral segmentism, as well as to account for the wider restriction on coda content in the language.[9]

Another property of the diminutive and inchoative affixation that does not conform to canonical reduplication is that it may copy a segment at a distance from the left boundary of the base, that is, the reduplicated prefix material is not left-anchored. However, this lack of anchoring is not an isolated occurrence: several other examples are noted in the literature. Spaelti (1997) points out that an infixing prefix in Rebi West Tarangan can copy the second consonant of the base as a coda to an open syllable preceding the stressed syllable, as in (16) (data from Nivens 1993: 369).

(16)

Base		*Reduplicated*	
bitɛma-na	'small (3SG)'	bim'tɛmna	
tapuran	'middle'	tar'puran	
ga, let	'relative', 'male'	gat'let	'bachelor'

According to Spaelti, copy of the first consonant in the base is blocked because it would produce a geminate, which is banned in the language. Another prefixation that fails to copy the leftmost segment occurs in Temiar triconsonantals. Like Rebi, the copied segment appears immediately before the stressed syllable, and rather than copying the onset consonant of the base, this prefixation consistently copies the coda, producing the structure: $C_1C_3.'C_2VC_3$ (Gafos 1998a). Observing that the reduplicant itself forms a coda, Gafos argues that the copied segment and its corresponding segment in the base must have the same syllabic roles, a requirement overriding left-anchoring. Some very similar properties are seen in a prefixing single-consonant copy in Kammu, a related language discussed by Takeda (1998). Anchoring violations have also been identified in reduplication copying more than one segment. McCarthy & Prince

[9] Note that the nasal agreement cannot be viewed as [+nasal] *feature copy* (rather than segment copy), since reduplication targets the root of the segment and not its individual features (as noted by Gafos 1998a: 230). On a related point, if this were analysed as reduplication of just [+nasal], some other mechanism would be needed in the account to produce insertion of a root node. Further, like the feature-spreading alternative, a feature-copy approach would make specific to the account what is suggested to be predictable in the language: (medial) coda segments are nasal.

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(1995: 276, n. 17) note that a reduplicative prefix in Madurese replicates only the final syllable of the base (e.g. [wɤ-kʰuwɤ] 'caves'), a reduction that is also seen in compounds and truncated words in the language. Another example is found in Tübatulabal, discussed by Alderete *et al.* (1999).

The above cases indicate that left-anchoring in reduplicative prefixes can be violated in order to produce a reduplicant that satisfies other structural well-formedness requirements in the grammar. Returning to the diminutive and inchoative affixation in Mbe, we can now establish that the nasal agreement has the potential to fall in line with other non-anchored prefixes. The occurrence of single-segment copy in such prefixes is not unusual, and in this case a general restriction applying to coda content is hypothesised as the relevant well-formedness requirement. Since this requirement limits codas to a nasal and the reduplication of this language does not change the nasal quality of a copied segment, the reduplicative morpheme must seek for the first nasal in the stem – other consonants are ineligible for copy, even if they fare better on anchoring.[10] Analysing the diminutive and inchoative affixation as reduplication is thus plausible and it is motivated by the evidence for segment copy from the imperative affixation as well as the non-local nature of the nasal agreement.

A further issue remains. If the diminutive and inchoative structures are indeed reduplicative, we must take note that when there is no nasal in the base to copy as a coda, segmental reduplication fails altogether. Though we have seen that other languages present reduplication structures that copy only a single consonant, canonical reduplicative affixations do not produce structures in which no segment copy takes place, that is, when structural constraints prevent copy of just one segment, an alternative reduplication structure appears. Rebi presents an example. The data in (16) showed that reduplication in this language copies a single consonant into the coda of the syllable immediately preceding the stress. However, when the preceding syllable is closed, a single copied segment cannot be incorporated into pre-existing syllable structure. In this instance, the first CVC of the base is copied:

(17)	*Base*	*Reduplicated*
	pajlawa-na 'friendly (3SG)'	pajlaw'lawana
	garkɔw-na 'orphaned (3SG)'	garkɔw'kɔwna

The CVC copy in these structures has an obvious functional motivation: it is necessary to produce a phonological realisation for the reduplicative morpheme (Spaelti 1997, Walker 1998).

Though Rebi presents an instance where copy of some segmentism must always take place, this is not invariably the case. A study of

[10] It is interesting to note that reduplicative prefixes that violate left-anchoring generally copy material within the first foot. In the case of Mbe nasal agreement, all of the forms that Bamgbose provides obey this generalisation. Though noun stems larger than a foot do exist in the language, no examples of diminutives are given that contain a nasal at a greater distance. It remains to be seen whether anchoring violations are subject to any upper limits on distance from the edge.

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Halq'eméylem by Urbanczyk (1998) reveals that a reduplicative prefix marking the continuative is prevented from copying any material under circumstances where it would produce certain marked structures. For example, while reduplication occurs in [wí-wəqəs] 'yawn (CONT)', it does not in the form [t^{θ}áχ^{w}əsəm] 'wash one's face (CONT)' (see Urbanczyk 1998 for details of the markedness conditions involved in blocking reduplication). It is interesting to note that this kind of non-realisation phenomenon is not limited to reduplicative affixation. Non-reduplicative segmental affixation can also result in structures that fail to realise any affiliated phonological content in order to respect certain well-formedness requirements. Padgett (1995a) discusses the example of Zoque, where a nasal pronominal prefix /N/ is realised with place assimilation before a stop-initial noun, but it is deleted before a continuant because assimilation is blocked: /N-gaju/ → [ŋgaju] 'my horse', /N-sɨk/ → [sɨk] 'my beans'. The latter form presents an instance where the pronominal morpheme has no corresponding phonological material in the output.

These examples signal that the occurrence of reduplicative or phonologically specified morphemes without any affiliated phonological content in an output form is attested cross-linguistically. Thus far, it seems that this state of affairs also holds in the case of the diminutive/inchoative morphemes; however, in order to establish this point with certainty, we must consider the tonal portion of these constructions. This is pursued in the next section, which both completes the picture of these affixations and confirms that the morphemes in question have no phonological realisation when nasal copy fails.

3.3 Tone patterns

3.3.1 *Diminutive prefixation.* The prefix material in diminutive nouns displays an interesting variation in tonal character. It is generally realised with one of two tone patterns: either it has a rising tone or it displays the same tone as the nominal prefix on its non-diminutive counterpart. This is exemplified below with nouns that are low-toned on the first syllable in their non-diminutive polysyllabic prefixed form. In the diminutive structure, some nouns regularly take the rising prefix (18a), while others consistently retain the non-diminutive low prefix tone (18b).[11] In a few cases, the noun has both patterns as an alternative (18c).

(18)	*Non-diminutive*	*Diminutive*	
a.	lè-kè	kɛ̌-ké	'load'
	kè-tɛ̀m	kɛ̌n-tém	'axe'
	bè-fúɔrɔ́	kɛ̌-fúɔrɔ́	'brains'

[11] A rising tone in the prefix induces certain regular changes in the stem tones that are peripheral to the present inquiry (see Bamgbose 1966: 49–50 for discussion). Note that noun stem tones are distinctive in Mbe, though Class 2 verb tones are not. A similar asymmetry is seen in various of the Bantu languages, where the nouns exhibit a richer system of tonal contrasts than verbs (Myers & Carleton 1996: 56).

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b.	bù-mù	kɛ̀m-mù	'story'
	lè-bàrò	kà-bàrò	'liver'
c.	è-rèn	kɛ̀n-rèn/kɛ̌n-rén	'fruit'
	è-bàm	kàm-bàm/kǎm-bám	'bag'

Though a few regularities are observed, Bamgbọṣe (1966: 49–50) notes that for the most part the choice of pattern cannot be predicted on the basis of phonological or morphological factors.

The occurrence of the rising prefix tone as an alternative to one matching the non-diminutive prefix suggests that the rising tone has a source in the diminutive prefixation. A rising tone consists of the autosegments Low–High (LH). I suggest that the L element derives from the Class 4 prefix, which is regularly low-toned in non-diminutive forms (Bamgbọṣe 1966: 44), and the H element derives from the presence of the diminutive prefix. We have already seen evidence that the diminutive prefix is not prespecified for segmental material, and I assume that it is also not prespecified for tonal content. I propose that the high tone is introduced by means of an alignment constraint (McCarthy & Prince 1993b) that aligns an H element to the diminutive morpheme, a constraint that will be characterised formally in §5. The presence of the resulting rising tone conflicts with a paradigmatic tonal identity effect which requires that the diminutive prefix tones match those of the non-diminutive prefix syllable.[12] As expected, the rising tone regularly emerges in diminutive nominals that are monosyllabic in their non-diminutive structure, since there is no competing prefix tone pattern, as in (19). Here the non-diminutive nouns each have a vowel-initial root and a prefix consisting of a single consonant. (Note that this prefixal consonant is retained in the diminutive form, a phenomenon discussed in §6.)

(19)

Non-diminutive	*Diminutive*	
l-í	kɛ̌-lî	'eye'
l-úob	kɛ̌-lûob	'navel'
ɲ-ìen	kɛ̌ɲ-ɲíen	'thing'

I conclude that the phonological material corresponding to the diminutive morpheme in output forms consists maximally of a reduplicative nasal segmental element. This phonological content is realised upon reduplication of a nasal in the base or not at all. The rising tone pattern that is characteristic of diminutive nominals is not a phonological correspondent of the diminutive morpheme – it is not reduplicated. These tones derive jointly from the Class 4 prefixation and a tonal alignment constraint, and they give way in some forms to a tone pattern matching that of the non-diminutive prefix.

3.3.2 *Verbal prefixes.* In verbs, the tone melodies over the root and its affixes are predictable on the basis of inflection and verb class membership.

[12] Note that the non-diminutive prefix tone does not necessarily match the first root tone, e.g. [ŋ̀-kùamô] 'squirrel', [kɛ̀-nén] 'bird', and thus cannot be attributed to spread (or copy) from the root-initial syllable.

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Verbal tone patterns are independent of segmental affixation: the examples of the inchoative and remote past forms are given in (20), where the same segmental affixation occurs with different tonal melodies in different tense/aspects. On the other hand, in some cases the same tone pattern is seen in forms with different segmental prefixes. This is seen in (20) for the inchoative and perfective verb forms:

(20)	*Inchoative*	*Perfective*	*Remote past*	
	'have started to X'	'have X-ed'	'had X-ed'	
	rê-tá	mê-tá	rè-tá	'touch'
	rê-lɔ̂	mê-lɔ̂	rè-lɔ́	'burn'
	rê-bɔ́rɔ̀	mê-bɔ́rɔ̀	rè-bɔ́ró	'help the friend'

Since the tone pattern in inchoative verb forms is not unique to this construction, I assume that these melodies do not derive from the prefix composed of the reduplicative nasal element, but rather stem from another aspect of the verbal inflection shared with the perfective structure.[13] Like the diminutive, the reduplicative inchoative morpheme thus has no phonological correspondent in forms where a nasal is not copied.

Since the reduplicative imperative construction always copies at least the first CV of the base, it consistently has an overt phonological realisation. The tonal melodies in this structure are predictable. A reduplicative Class 2 prefix regularly displays a falling tone, matching the tone of a monosyllabic base stem. Disyllabic stems are produced by derivational suffixation, and their resulting tone pattern is sensitive to the suffix form. Stems ending in suffixal [-o] have the sequence high–low, and stems ending in suffixal [-i, -ni, -ri, -li] present a falling–low sequence:

(21)		
	rû-rû	'pull'
	jû-júbò	'go out'
	pûm-pûɔnì	'mix'

In each case, the autosegments producing these patterns in the stem and the reduplicant are HL, as illustrated in (22).[14]

(22) a. rû b. júbò c. pûɔnì



[13] As previously mentioned, the semantic function of each individual element of verbal inflection is not fully understood and requires further study (for more details on the perfective structure in Mbe see Walker 1998). For the present purposes, what is important is that the tonal melodies of inchoative verbs are not specific to the inchoative affixation.

[14] I assume that the occurrence of a contour tone on the first syllable in forms like (22c) is due to a constraint requiring that the left edge of the set of stems derived by suffixing [-i, -ni, -ri, -li] be aligned with the left edge of an L element. Assuming that the HL ordering is maintained and that every syllable must be assigned a tone, the falling–low pattern is the most harmonic outcome with respect to this alignment constraint.

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The same HL sequence also appears in the simple series of imperative verbs (e.g. [kpô] 'be wicked'). Hence the predictable HL elements derive from imperative inflection – they are not introduced by the morpheme forming the reduplicative series. It is interesting that the tones of the prefix match those of a monosyllabic stem, though they are not always identical to the first syllable of the base. I propose that this is because the prefix itself has the morphological status of a root, in particular, a bound root or 'root prefix' (following terminology of Urbanczyk 1996b: 81). Evidence comes from the size of the reduplicative prefix, which can be as large as CVC. In this it is exceptional: other prefixes in the language are no bigger than CV. However, verb roots in Mbe display the same size range as the reduplicative prefix: they are CV(C) in structure (Bamgbọse 1967a: 174–175). If the imperative prefix were of the same affixal status as other prefixes in the language, the size discrepancy would be unexplained, but as a root prefix it is expected.[15] The imperative reduplication is thus posited as a kind of compounding structure, within which the reduplicant and the stem each form their own tone domain displaying the imperative HL sequence.[16]

3.4 Summary

This section has reviewed arguments in favour of analysing the nasal agreement as reduplication and against an alternative feature-spreading account. The non-local nature of the phenomenon provides a strong motivation for rejecting the possibility of nasal spreading. On the other hand, the action-at-a-distance and the morpheme-specific nature of nasal agreement are consistent with reduplication. In addition, the restriction of copy to nasals is suggested to have a source in a general condition that limits coda material in the language, a matter that will be addressed in some depth in §5. This, in tandem with an a-templatic size restriction on reduplication, will achieve a nasal target for segment copy without stipulation, that is, the size and content of the reduplication follow from independent considerations. Hence, for each of the affixes, we have determined that the underlying representation is simply RED, and their corresponding phonological material in the output consists solely of reduplicated segmentism.

An anonymous reviewer notes that it might seem that the occurrence of single-segment nasal agreement in the inchoative and diminutive suggests a possible objection: if nasal agreement is morpheme-specific, why does it occur in more than one prefixation? In light of the discussion in this section,

[15] See Urbanczyk (1996b: 78–83) for use of a similar diagnostic to identify root prefixes in Lushootseed, including the reduplicative distributive morpheme. A reduplicative root affixation structure is also posited for Axininca Campa by McCarthy & Prince (1993a: 86).

[16] An alternative would be to assume that the falling tone in the prefix results from transfer of all base tones in reduplication, even though only the first syllable of segmentism is copied. However, the lack of any tonal transfer in the other reduplicative affixation patterns suggests otherwise.

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this question can be answered straightforwardly. First, there is no reason to expect that reduplication should be restricted to just one affixation; many languages use reduplication in more than one morphological construction. Second, the nasal agreement does not occur in all prefixations, clearly signalling that it is not a more general process in the language. And third, the nasal content of the copied segmentism follows from a more general restriction governing the content of codas in the language. Where the inchoative and diminutive prefixes differ from the imperative reduplication is in their limitation of copy to a single segment or zero. I propose below that this is a result of the dominated status of the realisation constraints for these morphemes.

In what follows, I develop an analysis of nasal agreement as reduplication in Mbe. The next section lays out the basic analytical tools needed for the account and then I go on to work out the formal account set within a wider view of the morphophonology of the language.

4 Theoretical assumptions

I begin by outlining key theoretical assumptions. The account is formalised in the constraint-based framework of OT (Prince & Smolensky 1993). I assume a basic familiarity with the underpinnings of OT and its formalisms.

4.1 Correspondence in reduplication

I assume the correspondence model of faithfulness, as elaborated in McCarthy & Prince (1995). The basic model proposed by McCarthy & Prince is given in (23). (This model will be revised below in §4.3.)

(23) *Basic model* (McCarthy & Prince 1995: 273)

input	/Af_{RED} + Stem/	
	↑↓	*Stem-IO faithfulness*
output	R(ED) ↔ B(ase)	
	B-R identity	

Input–output faithfulness (Faith-IO) evaluates correspondence (i.e. identity of structure and content) between input and output, and base-RED faithfulness (Faith-BR) evaluates correspondence between a base and reduplicant. Three core families of correspondence constraints on segments are given in (24), where S1 refers to a structure such as an input or base and S2 refers to the output or reduplicant (McCarthy & Prince 1995: 264).

(24) a. MAX
Every segment of S1 has a correspondent in S2. (No deletion.)

b. DEP
Every segment of S2 has a correspondent in S1. (No insertion.)

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c. IDENT[F]
Let α be a segment in S1 and β be any correspondent of α in S2. If α is [γF], then β is [γF]. (Correspondent segments are identical in feature F.)

In the analysis of Mbe reduplication, an important function will be performed by rankings producing The Emergence of the Unmarked (McCarthy & Prince 1994b). The ranking schema for TETU effects is as follows:

(25) *Ranking schema for The Emergence of the Unmarked*
Faith-IO ≫ Phono-Constraint ≫ Faith-BR

Because Faith-IO dominates the Phono-Constraint (penalising some 'marked' structure), the effect of the Phono-Constraint is not apparent in general, i.e. it will not affect correspondence between an input and output. However, with the Phono-Constraint dominating Faith-BR, it will be respected in Base-to-RED copying and can induce BR correspondence violations. This produces an Emergence of the Unmarked in reduplication. Recent work has argued that size restrictions on reduplicants can be derived without prespecified templates by viewing reduplicant size as a property emerging from a TETU ranking (McCarthy & Prince 1994a, Prince 1997, Spaelti 1997). This approach interleaves a size-restricting constraint that minimises structure between IO and BR Faith: Faith-IO ≫ Size-Restrictor ≫ Faith-BR. Spaelti (1997) utilises this ranking in conjunction with a constraint minimising syllable structure to produce reduplication that either does not add a syllable to the word or adds no more than a syllable. I assume this a-templatic approach; indeed it will prove to be critical in achieving a unified approach to the variable shapes of the reduplicative affixation in Mbe.

4.2 Morpheme realisation

In addition to correspondence relations between related phonological structures, I assume the existence of mappings between morphology and phonology. Numerous analysts have noted the necessity for some form of a constraint requiring that a morpheme be realised in the phonological content of the output. A constraint of this type was first proposed by Samek-Lodovici (1993), and subsequent developments appear in the work of Akinlabi (1996), Gnanadesikan (1997), Rose (1997, to appear) and Walker (1998) (for related proposals see Lin 1993, Urbanczyk 1998).[17] Walker characterises the constraint essentially as in (26):

(26) REALISE-μ
A morpheme must have some phonological exponent in the output.

[17] Additional applications of this general kind of constraint are found in work by Buckley (1998), Gafos (1998b), Hendricks (1998) and Nelson (1998), among others. Urbanczyk (1998) frames a constraint that enforces distinctness in the paradigm (cf. Rose 1997). Issues connected with this approach are considered in §5.

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Following the terminology of McCarthy & Prince (1993a), the phonological 'exponence' of a morpheme is the phonological material affiliated with it. The notion of phonological exponence implicitly assumes an indexing or correspondence between phonological material and morphemes; indeed, McCarthy & Prince suggest that the phonological exponence of a morpheme is assigned in input and output forms (1993a: §§2, 5). Since morphological and phonological structures exist as related grammatical structures in an output, I propose that the morphological realisation constraint be formalised as a correspondence constraint between the morphological and phonological levels. Intuitively the requirement is that every element of the morphological structure in the output have some corresponding element in the phonological structure. Consider the morphology–phonology mapping illustrated for the diminutive nouns below. Each of these output forms contain three morphological elements: a noun root, the diminutive morpheme and a Class 4 nominal prefix. The structure in (27a) exhibits nasal copy, giving a phonological correspondent for the diminutive morpheme. On the other hand, the diminutive morpheme in (27b) has no phonological exponence.

(27) a. kàmbàm 'little bag'

P structure	$k_{m1}\grave{a}_{m1}$ -	m_{m2} -	$b_{m3}\grave{a}_{m3}m_{m3}$
M structure	Morph1	Morph2	Morph3
	CL.4	DIM	'bag'

b. kèfúfú 'little sweat'

P structure	$k_{m1}\grave{\varepsilon}_{m1}$ -	$\emptyset$ -	$f_{m3}\acute{u}_{m3}f_{m3}\acute{u}_{m3}$
M structure	Morph1	Morph2	Morph3
	CL.4	DIM	'sweat'

It is important to note that although it is silent, the diminutive is truly present in the output morphological structure in (27b), as evidenced by the meaning of the word. The presence of the diminutive morphological information is also apparent from the change it induces in nominal class affixation: the form here displays a Class 4 prefix because the base of class prefixation is diminutive – the noun is Class 2 in its non-diminutive form: [è-fúfú]. Hence, this structure violates morpheme realisation strictly in a phonological sense: it contains a morpheme with no corresponding phonological element.[18] The relevant constraint is of the MAX family: it

[18] There also are cases in which a lack of corresponding phonological material causes a morpheme to be eliminated from the output. An example from Chaha is discussed by Rose (to appear), where phonological constraints prevent a reduplicative frequentative morpheme from achieving phonological exponence. The result in the relevant constructions is a categorical failure to form a verb with frequentative meaning. That is, the input frequentative morpheme fails to map to the output, a relation that may be mediated through morphological correspondence. The relevant ranking is REALISE-$\mu \gg$ MAX-μ-IO (cf. M-PARSE; Prince & Smolensky 1993). Lin (1993: 674) identifies a related case in Turkish echo-formation. The reverse ranking

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requires that every morpheme in the output morphological structure have a correspondent in the output phonological structure. In principle, this correspondent could be any potential corresponding phonological element, including, for example, segments, tones and features. Moras might also be numbered among this set (see McCarthy & Prince 1995 for a general discussion of phonological elements that potentially stand in correspondence). This kind of structural dependency relation is formalised in (28) (building on the logical expression of MAX proposed by Alderete 1999: 132):

(28) MAX-MP (henceforth REALISE-μ)

Let m be a variable ranging over morphemes, p be a variable ranging over phonological elements, and M and P be the related morphological and phonological structures of a given output. Let m$\Re$p mean that m is in a correspondence relation with p. Then $\forall m \in M$ $\exists p \in P$ [m$\Re$p].

The notation here expresses that for all elements in the morphological structure of an output, there is some element in the phonological structure of that output with which it is in correspondence, in other words, MAX-MP (REALISE-μ) requires that a morpheme have some phonological exponence.

REALISE-μ predicts that each morpheme in the output will be affiliated with some phonological content. This content will be drawn from the phonological specification of the morpheme in the input or from copying material in the case of a reduplicative morpheme. This follows from the principle of Consistency of Exponence, which underlies the theory of Gen (McCarthy & Prince 1993a: 20). Consistency of Exponence requires that no changes take place in the phonological exponence of a morpheme, except for reduplicative morphemes, which may gain phonological specification through correspondence with the base.[19]

In the case of reduplicative affixation, REALISE-μ can compel the copy of some material. Rebi serves as an example. Recall first that Rebi copies a consonant as the coda to an open syllable immediately preceding the stressed syllable. This reduplication does not add a syllable, which is analysed by Spaelti (1997) as a TETU effect arising from ranking a constraint that minimises syllable structure between MAX-IO and MAX-BR. Following Urbanczyk (1998), I assume here that the intermediate

holds in Mbe, where the diminutive morpheme remains part of the morphological structure of the output even when it has no phonological exponence.

[19] Note that by Consistency of Exponence, a non-reduplicative morpheme that is phonologically null in the input cannot satisfy REALISE-μ through epenthetic segmentism. A more general consideration is whether Consistency of Exponence is necessary to assume as a principle. It is conceivable that it could perhaps be obviated through correspondence relations between morphology and phonology, but this is a question left for further research.

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constraint is *STRUC-σ, a syllable-specific version of *STRUC (Prince & Smolensky 1993: 25, n. 13, citing Zoll, personal communication).[20]

(29) *Single-segment reduplication in Rebi West Tarangan*

RED-tapuran	MAX-IO	*STRUC-σ	MAX-BR
☞ a. tar'puran		***	****
b. tapur'puran		****!	**

When the pretonic syllable is closed, a single consonant cannot be copied into the coda of a pre-existing syllable. Thus far, we expect *STRUC-σ to prevail, preventing the copy of any segmental material. However, the reduplicative morpheme would then lack a phonological correspondent. The alternative is to copy a syllable, satisfying REALISE-μ:

(30) *Syllable-size reduplication in Rebi West Tarangan*

RED-garkɔwna	REALISE-μ	MAX-IO	*STRUC-σ	MAX-BR
☞ a. garkɔw'kɔwna			****	**
b. gar'kɔwna	*!		***	********

4.3 Prespecification in reduplication

Turning to the matter of fixed segmentism in reduplication, I assume that prespecified content does not occur in reduplicative morphemes. I have argued above that reduplicative affixes in Mbe contain no prespecified material. As previously mentioned, cross-linguistic evidence that fixed segments in reduplication are usually default in character suggests that prespecification in reduplicative morphemes should be more generally excluded. If it were prohibited, this generalisation would be explained: fixed material would be limited to that derived through TETU rankings. A distinct kind of fixed segmentism characterised as Melodic Overwriting has been argued to have a morphological basis – not prespecification in the reduplicant (McCarthy & Prince 1986, Alderete *et al.* 1999).

How prespecified material is to be ruled out has not been often addressed in previous work, although it might be taken to follow from the standard definition of RED:

(31) *Definition of* RED (McCarthy & Prince 1994a (Part 1): 2)

RED$_k$ is a morpheme *lexically unspecified* for segmentism, but requiring a correspondence relation with its base, the phonological structure to which it attaches.

[20] I depart from Spaelti in assuming that the size restrictor is a structural markedness constraint rather than an alignment constraint. In Spaelti's account, the size limit is achieved by ALL-σ-R (Align (σ-R, PrWd-R)), which requires that the right edge of every syllable be aligned with the right edge of some prosodic word. This constraint acts as a minimiser by penalising each syllable that is not aligned at the right edge. The choice of minimiser is not crucial here, however – either approach is sufficient to handle the present data.

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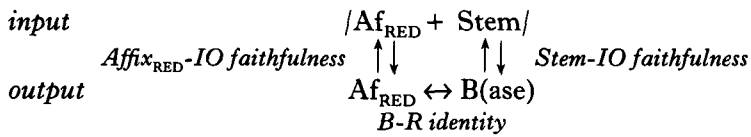
This definition states that reduplicative morphemes are unspecified for segmentism in the input. However, this approach is at odds with the principle of Richness of the Base (Prince & Smolensky 1993: 191), which hypothesises that all inputs are possible. A claim connected to this principle is that optimality-theoretic constraints do not apply to inputs, but evaluate outputs only. Hence the role of the constraint ranking is to select only those outputs which are well-formed (i.e. grammatical) in the language. Given these assumptions, the null hypothesis is that prespecification could actually occur in the inputs of reduplicative forms – the alternative amounts to stipulating a restriction on inputs. Accordingly, I suggest that the definition of RED be simplified, as in (32):

(32) *Revised definition of* RED

RED_k is a morpheme requiring a correspondence relation with its base, the phonological structure to which it attaches.

I propose to achieve the lack of fixed segmentism deriving from prespecification in reduplicative morphemes through constraint rankings holding over output candidates. Let us review the correspondence relations holding in reduplication. In the basic model, the reduplicative affix is in correspondence only with the base. If it were assumed that the reduplicative affix came with no prespecified material, there would be nothing in the input form of the affix to which the output could correspond. However, with this assumption eliminated, an elaborated model is required, with correspondence between the input and output forms of the affix:

(33) *Elaborated basic model*



If a reduplicative affix came with prespecified input material, i.e. some input segmentism as well as a requirement of reduplication of the base, then it would have correspondence relations to satisfy both between input and output and between output and base. In this situation, $Affix_{RED}$-IO faithfulness has the potential to conflict with BR identity. Since the affix is a RED morpheme, there is a demand that its output be fully expressed by correspondence with the base, but IO-Faith requires output correspondents for input segmentism. Constraint ranking gives the two general configurations in (34): one or more BR-faith constraints win over IO-Faith or the reverse.

(34) a. Faith-BR $\gg$ $Affix_{RED}$-Faith-IO
b. $Affix_{RED}$-Faith-IO $\gg$ Faith-BR

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A ranking placing all of BR-Faith over $\text{Affix}_{\text{RED}}$-Faith-IO yields a pattern in which maximal reduplication takes place (within the limits of any size restriction) and wins over prespecified material. This outcome corresponds to one in which there is no apparent prespecification, a result which is clearly well attested. A second ranking structure placing some or all of $\text{Affix}_{\text{RED}}$-Faith-IO at the top presents difficulties. With this hierarchy for $\text{Affix}_{\text{RED}}$-Max-IO, any prespecified material will appear in the output at the cost of maximising copied material from the base. This is illustrated in (35) for a hypothetical language with a RED containing prespecified segmentism [so]. Here the prespecified material is preserved and reduplication takes place to fill up the remainder of the size restriction. This outcome is the sort that can yield prespecified material as the source of fixed segmentism in reduplication, a pattern we have seen reason to believe is unattested.

(35) *Ranking yielding combination of prespecified material and reduplication*

RED-bam | so	Af_{RED}-Max-IO	*Struc-σ	Max-BR	Dep-BR
☞ a. sob-bam		**	am	so
b. bam-bam	s!o	**		

Another problematic pattern arises when there is no size restriction in force. The tableau in (36) shows how high-ranking $\text{Affix}_{\text{RED}}$-Max-IO can produce full copy of the base in combination with fixed material. The unattested aspect of this kind of outcome is that fixed [so] occurs only with reduplicative forms, not otherwise.[21]

(36) *Prespecified material plus full copy*

RED-bam | so	Af_{RED}-Max-IO	Dep-BR
☞ a. sobam-bam		so
b. bam-bam	s!o	

[21] Note that there is precedent in other work positing input segmentism in a reduplicative affix for interpreting Affix-Max-IO ≫ Faith-BR as producing an output combining prespecified and reduplicated material (Gafos 1996, 1998b). It is worth considering whether the ranking of $\text{Affix}_{\text{RED}}$-Dep-IO is relevant to reduplication in these structures. A standard assumption is that copied material is the phonological expression of the RED input element, and it is not interpreted as violating Dep-IO. Rankings like those in (35)–(36) would thus produce an undesirable outcome no matter what the ranking of Dep. If reduplicated material were instead interpreted as violating Dep-IO, and this constraint outranked Max-BR, then the output of the reduplicative affix would simply be its prespecified segmentism without any copy (i.e. [so-bam]). The unattested pattern would still arise, however, under the reverse ranking of Dep-IO and Max-BR.

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Observe that if rankings like that in (34b) could be eliminated, prespecified material would be prevented from ever appearing in the output of a reduplicative affix at the cost of BR-Faith. I suggest this ranking can be ruled out through a markedness statement concerning head *vs.* dependent morphemes. Let us consider the correspondence relations in (34) in terms of root and affix faith. $\text{Affix}_{\text{RED}}$-Faith-IO is an affix-to-affix correspondence relation, and Faith-BR is a correspondence relation between a root or root-containing stem and an affix. The undesirable ranking structure in (34b) thus ranks a faith relation between affixes over a faith relation between a root-based form and an affix, that is, it places a correspondence constraint between dependent morphemes over one between a head and dependent. The same head *vs.* dependent correspondence configuration holds in the case of reduplicative root prefixes, since these may also plausibly be considered dependents in relation to a base root head. The generalisation is clear: it is more harmonic for the segmentism of a reduplicative affix to be dependent on a root-based head than on a dependent morpheme. I propose the metaconstraint in (37), which states that a base–reduplicant correspondence relation universally outranks a correspondence relation mapping from input affixal material. This markedness statement rules out the ranking in (34b), and consequently the possibility of emergence of prespecified material in a reduplicative affix. Metaconstraints of this kind in OT, stemming from the relative markedness of affixal/dependent material in relation to root/head content, have wide cross-linguistic motivation (e.g. McCarthy & Prince 1994a, 1995, Alderete 1995, 1999, Selkirk 1995, Urbanczyk 1996b, Beckman 1997, 1998, Revithiadou 1999).[22]

(37) *Reduplication correspondence metaconstraint*
Faith-BR $\gg$ $\text{Affix}_{\text{RED}}$-Faith-IO

5 Analysis of reduplicative affixation

I turn now to developing the details of the formal analysis of Mbe nasal agreement as reduplication. In what follows I argue that the size of affixation, nasal specificity and distance of copy arise from the interaction

[22] An anonymous reviewer points out that REALISE-μ can interact with a size restriction to produce the effect of affix material overriding a portion of root material. An example comes from the Beijing dialect of Mandarin Chinese, where *-er* suffixation replaces the final C of the root /pan-r/ → [par] 'board' (Lin 1993). Together with a condition that the output must not exceed a syllable, Lin argues that a requirement that an affix be manifested produces the replacement of the root coda. The apparent 'win' of affix over root content can be attributed to the following grammar:

(i)

pan-r	REALISE-μ	*STRUC-σ	RT-MAX-IO	AF-MAX-IO
☞ a. par		*	*	
b. pan	*!	*		*
c. panər		**!		

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of competing demands in the grammar. I focus first on the reduplicative imperative structure, which copies a full syllable closed with a nasal when one is available in the base. I then incorporate the single-segment/null copy of the diminutive and inchoative affixations.

5.1 Reduplicative imperative affixation

5.1.1 *Syllable-size restriction.* I begin with the analysis of the general size restriction seen in the reduplicative imperative affixation. Some representative examples are repeated below. Recall that when the base contains no nasal material, as in (38a), the reduplicated affix copies the first CV of the stem. [ə] appears in place of any non-high stem vowel, and if the first syllable of the base contains a diphthong, only the first member of the diphthong is copied. When the stem contains a non-initial nasal, the prefix is formed as in (38a) but closed with a nasal stop homorganic with the following onset consonant (38b).

(38)	a.	lə̂-lə̂	'burn'	b. bîm-bîem	'believe'
		jû-júbò	'go out'	pûm-pûɔnì	'mix'
		kû-kúɛlò	'nibble at'	jîŋ-jîɔnì	'forget'

The reduplicative imperative prefix regularly consists of a syllable of copied material, which can be obtained through the TETU ranking: MAX-IO ≫ *STRUC-σ ≫ MAX-BR, as noted in §4. The outcome is illustrated in (39), restricting attention to reduplicants forming an open syllable – conditions on coda content are discussed in the next section. Assuming that the optimal output is fully syllabified, *STRUC-σ acts as a size minimiser by favouring words containing fewer syllables. As a result, a general effect of the *STRUC-σ markedness constraint is to prefer parsing of the input segments into syllables of maximal size, achieving the result of prosodic principles made in earlier proposals by Selkirk (1981) and Itô (1989). In minimising the number of syllables, *STRUC-σ also has the potential to limit the amount of segmental material in an output. Since *STRUC-σ is dominated by MAX-IO, it does not place a restriction on root material (39c). However, the placement of *STRUC-σ over MAX-BR produces a size minimisation that emerges in reduplication. By penalising each occurrence of a syllable, *STRUC-σ prevents reduplicative affixation from adding more than one syllable (compare (39a, b)). This is a prime example of a TETU phenomenon: *STRUC-σ becomes visibly active in limiting the amount of segment material under circumstances of reduplication (McCarthy & Prince 1994b). Note that to best satisfy *STRUC-σ, reduplication would in fact add no syllable to the word, but alternatives that copy less than a syllable are ruled out by undominated constraints in the present circumstance, as illustrated by (39d, e). Candidate (39d) copies just the first consonant, forming a geminate. Non-nasal geminates are

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prohibited in Mbe through the force of a constraint that I label GEM$_{oral}$.[23] Candidate (39e) copies no material: it fares best on markedness, but it contains no phonological correspondent for the reduplicative morpheme. This form is ruled out through a morpheme-realisation constraint for the reduplicative imperative series, which compels some segment copy, parallel to Rebi in (30).

It was established in §3 that the reduplicative imperative affix is consistently realised, but the diminutive and inchoative morphemes do not always have phonological exponence. To reflect this distinction, I assume that REALISE-μ constraints may be specific to particular morphemes (extending the differentiation of constraints by lexical group or category which is familiar in the arena of faith constraints; see e.g. McCarthy & Prince 1994a, 1995, Itô & Mester 1995, Pater 1995, Beckman 1997, 1998, Smith 1998). The subscript in the REALISE-μ constraint below refers to the reduplicative morpheme marking the second series of imperative verbs. Note that I do not mark the imperative inflection tones in the input here; I assume that these are introduced through a combination of alignment constraints, the details of which are peripheral to the present investigation. This particular assumption is not a crucial one.

(39) *Syllable-size reduplicants*

RED-jubo	REALISE-μ_{impS2}	*GEM$_{oral}$	MAX-IO	*STRUC-σ	MAX-BR
☞ a. jû-júbò				***	bo
b. júbò-júbò				****!	
c. jû-jû			b!o	**	
d. j-júbò		*!		**	ubo
e. júbò	*!			**	jubo

The markedness basis underlying the TETU treatment of this size restriction deserves further consideration. In general, an optimal output with respect to *STRUC-σ will be one containing the fewest number of syllables. Taking into account the familiar requirement that a PrWd be properly headed by a foot and a syllable in turn, the approach predicts that cross-linguistically a monosyllable could characterise a kind of minimal PrWd size (I assume that universal principles of prosodic structure encoded in Gen filter any PrWd that falls below a single syllable). This falls in line with the definition of the minimal PrWd framed by McCarthy & Prince (1986: 8). They discuss evidence for two kinds of minimal word sizes: one which is limited to any licit foot of the language and another which consists of a minimal foot that can yet be a word, i.e. a single syllable. McCarthy & Prince argue that the latter size restriction is seen in English truncations (1986: §2.4). Itô & Mester (1997) also argue that a

[23] Given transcriptions like the following by Bamgbọṣe: [kěn-nên] 'little bird', [kěn-ɲíen] 'little thing', I assume that nasal geminates are possible in Mbe, though this point is subject to verification.

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syllable size restriction functions in German truncated words. It is interesting to note that within Mbe, verb roots are canonically monosyllabic, and a restriction of root size to a single syllable is seen in other languages as well (e.g. Kammu). In addition, a study of affixation in Chinese dialects by Lin (1993) reveals the activity of word-size constraints that limit output material to a syllable. Hence, the treatment of this kind of size restriction as a markedness effect has independent motivation.

5.1.2 *Phonotactics and nasal copy.* The previous section established the basis for the restriction of the imperative reduplication to a syllable in size. In the next part of the analysis I turn to the limitation of coda material to nasals and its relation to the phonotactics of Mbe, matters that will be crucial to understanding the nasal agreement.

While the restriction of reduplicants to one syllable in imperative affixation is a reduplicative TETU effect, the restriction of reduplicant codas to a nasal with place features linked to the following onset is part of a distribution holding of Mbe phonological structure in general, as previewed in §3. Bamgboṣe (1967c: 11) notes that across the Mbe language, coda nasals must be place-linked except root-finally (word-final or before a C-initial suffix). Interestingly, this requirement holds of syllabic nasals as well, revealing that the condition is one holding of preconsonantal nasals rather than strictly in coda position. Examples of homorganic nasals outside of reduplication are as follows:

(40) [n-ɔ́ntɔ̀r] 'lizard'
[é-kùrántsáŋ] 'millet'
[m̀-bór] 'palm trees'
[ǹ-sûnì] 'soldier ant'
[ŋ̀-kúel] 'tortoise'

From Bamgboṣe's data it also appears that within the domain of [prefix + root], a nasal is the only consonant that can occur in coda position (except root-final) or as a syllabic consonant.[24] The relevant distributional condition in Mbe thus consists of three parts:

(41) *Consonantal distribution condition*
a. Place features of a coda/syllabic consonant must be linked to a following onset.
b. Coda/syllabic consonants are limited to nasals.
c. The restrictions of (a) and (b) are exempt in root-final position.

This general condition is what limits the content of reduplicant coda segments to nasals. I elaborate below the constraint rankings that produce

[24] Examples of root-final and word-final consonants other than place-linked nasals are: [káb] 'dig', [wél] 'drive away', [ʃíɔr] 'sneeze', [túɔm] 'send'. Root-final examples before a C-initial suffix are: [jùab-kî] 'be washing', [fùel-kî] 'be blowing', [tsɔ̌r-kì] 'be carrying', [jĭɛm-kì] 'be singing'.

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this condition and its interaction with reduplication. The account of the distribution builds on a study of nasal place assimilation by Padgett (1995b) along with work by other analysts on coda conditions, as detailed in what follows.

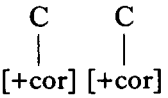
First, after Padgett, I generalise the segments that are targeted by place assimilation in the above condition as consonants that are unreleased. Though it might at first be conjectured that all coda consonants (and syllabic nasals) are uniformly unreleased, Padgett observes that in some languages word-final position stands as a position of release (see also Steriade 1999). The patterning of root-final consonants in Mbe suggests that these segments also belong to the released set, contributing to the exemption in (41c).[25] Phonetic factors are proposed to underlie the following constraints and rankings that limit unreleased consonants to homorganic ones; for details of the phonetic grounding, the reader is referred to Padgett (1995b).

The restriction in (41a) may now be restated: place features of an unreleased consonant must be linked to a following onset. Alderete *et al.* (1999) suggest that this outcome is driven by the interaction of markedness and faith constraints. The constraints driving multiple linking are place-feature markedness constraints, which I refer to here as *C-PL/X (collapsing *PL/DORS, *PL/LAB ≫ *PL/COR, and others; Prince & Smolensky 1993). Following Alderete *et al.*, violations of *C-PL/X are reckoned on an autosegmental basis rather than a segmental one, so that one occurrence of a place feature linked to two segments incurs one violation for the single place feature, as illustrated in (42) (for additional foundation and applications, see Itô & Mester 1994, McCarthy & Prince 1994b, Beckman 1997, 1998).

(42) a. *One* *C-PL/X *violation*



b. *Two* *C-PL/X *violations*



If *C-PL/X outranks consonantal place-feature identity constraints (IO and BR), then place-linked structures for consonant clusters in roots and reduplicants will be selected over structures with two separate places. MAX constraints must also outrank place identity constraints to prevent segments from not copying or deleting rather than undergoing place assimilation, as shown in (43). Only consonants with a place feature are considered in the candidates here. Following Lombardi (1995), I assume that there are no truly placeless consonants, i.e. the requirement that every consonant have some place specification is Gen-enforced (cf. Padgett 1995b). The present tableau focuses on candidates preserving onset place

[25] Note that the proposed release status is limited to final position in primary roots; bound root prefixes do not display an exemption on coda content.

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features. (I assume that high-ranked ONSET prevents deletion of onset segments.)

(43) *Copied codas are place-linked*

RED-jiɔni	*C-PL/X	MAX-IO MAX-BR	ID-IO[Pl] ID-BR[Pl]
☞ a. jîn͡-jîɔnì	j,n͡j,n	ɔi(BR)	*(BR)
b. jîn-jîɔnì	j,n,j,n!	ɔi(BR)	
c. jî-jîɔnì	j,j,n	ɔni!(BR)	

Observe that since reduplication can skip the second member of a diphthong to copy a nasal, MAX-BR must outrank BASECONTIGUITY, which requires that correspondent elements in the base form a contiguous string (McCarthy & Prince 1995: 371).

(44) *Non-contiguous segment copy*

RED-jiɔni	MAX-BR	ID-BR[Pl]	BASECONTIG
☞ a. jîn͡-jîɔnì	ɔi	*	*
b. jî-jîɔnì	ɔni!		

In instances of place assimilation, a key property is that unreleased consonants take on the place features of a neighbouring onset but not the reverse. Padgett handles this by calling on a faith constraint sensitive to the perceptually salient release position.

(45) $\text{IDENT}_{\text{rel}}$-IO[Place]
Let S be a [+release] segment in the output. Then the input correspondent of S is identical in place-feature specifications.

The ranking needed for Mbe places release-sensitive IO-faith for place features over the place-markedness constraint, which in turn outranks non-positional faith for place features: $\text{IDENT}_{\text{rel}}$-IO[Place] ⪢ *C-PL/X ⪢ IDENT-IO/BR[Place]. As illustrated in (46), this ranking produces spreading of place features from onsets to codas in consonant clusters. This tableau shows that $\text{IDENT}_{\text{rel}}$-IO[Place] and *C-PL/X must each outrank IDENT-BR[Place]. The need for a ranking between the two dominating constraints will be exemplified presently.

(46) *Place features spread from released to unreleased position*

RED-puɔni	ID_{rel}-IO[Pl]	*C-PL/X	ID-IO[Pl] ID-BR[Pl]
☞ a. pûm͡-pûɔnì		p,m͡p,n	*(BR)
b. pûn͡-tûɔnì	*!	p,n͡t,n	*(IO)
c. pûn-pûɔnì		p,n,p,n!	

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IDENT$_{rel}$-BR[Place], given in (47), must outrank *C-PL/X together with IDENT$_{rel}$-IO[Place] to ensure place identity of segments in release position.

(47) IDENT$_{rel}$-BR[Place]

Let S be a [+release] segment in the reduplicant. Then the base correspondent of S is identical in place-feature specifications.

Recall that *C-PL/X collapses a hierarchy of place-markedness constraints. It is the dominating status of BR and IO IDENT$_{rel}$-[Place] that prevents place features in released positions from changing to the least marked consonantal place (e.g. coronal), as shown in (48). Only violations of C-place identity are marked below.

(48) *Released consonant place identity is preserved*

RED-ge	ID$_{rel}$-IO[Pl] ID$_{rel}$-BR[Pl]	*PL/DORS *PL/LAB	*PL/COR	ID-IO[Pl] ID-BR[Pl]
☞ a. gə̂-gê		**		
b. də̂-gê	*!(BR)	*	*	*(BR)
c. də̂-dê	*!(IO)		**	*(IO)

Next we must account for the restriction of coda/syllabic consonants to nasals (41b). A number of languages display phonotactic constraints that disallow approximants and/or obstruents at the end of a syllable. These two classes of segments might reasonably be excluded on separate bases. For example, Blevins (to appear) points out that in the Yecuatla dialect of Misantla Totonac approximants are not possible codas, though nasals and obstruents are. Following Blevins, the relevant phonotactic constraint is one that bans approximants in codas (or, alternatively, it licenses approximants only in prevocalic position). In contrast to this case, other languages have been shown to instantiate a general constraint preferring codas of high sonority over ones of low sonority (Hooper 1976, Murray & Vennemann 1983, Clements 1990; cf. Blevins, to appear). The preference for high-sonority codas can serve to exclude obstruents from this context. Finally, the restriction of syllabic consonants to nasals may be attributed to a syllable-structure constraint that requires only vowels or nasals bear the head mora (and tones). In Mbe, each of these phonotactic constraints are active. For the present purposes, I will refer to this set of constraints as *C$_{oral}]_{\sigma}$.

In order to satisfy *C$_{oral}]_{\sigma}$, oral consonants will not be copied into coda position, violating MAX-BR. In IO mappings, I assume that the MAX violation strategy is similarly used to eliminate segments in this context, though no alternations are observed.[26] This means that *C$_{oral}]_{\sigma}$ must outrank MAX-IO/BR, as illustrated with the reduplicative structure in (49). Also shown here are undominated IDENT-IO/BR[nasal] constraints

[26] A ranking must nevertheless be assumed, given Richness of the Base (see §4.3).

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that rule out alternatives changing oral consonants to nasals. For completeness, *C-PL/X is displayed in the tableau, though it does not in fact crucially dominate MAX-IO/BR. Violations of MAX may be attributed to $*C_{oral}]_{\sigma}$.

(49) *Non-nasal codas are prohibited*

RED-kuɛlo	ID-IO[nas] ID-BR[nas]	$*C_{oral}]_{\sigma}$	*C-PL/X	MAX-IO MAX-BR
☞ a. kû-kúɛlò			k,k,l	ɛlɔ(BR)
b. kûl-kúɛlò		*(!)	k,l,k,l(!)	ɛɔ(BR)
c. kûL͡-kúɛlò		*!	k,L͡k,l	ɛɔ(BR)
d. kûŋ͡-kúɛlò	*!(BR)		k,ŋ͡k,l	ɛɔ(BR)
e. kûŋ͡-kúɛnò	*!(IO)		k,ŋ͡k,n	ɛɔ(BR)

The retention of consonants in root-final position is attributed to an edge-anchoring constraint. The relevant anchoring constraint, which demands a correspondent for peripheral segments, is given in (50). This constraint is formulated as edge-specific, after McCarthy & Prince (1995: 371); however, it could alternatively be stated in edge-neutral terms applying to both the left and right root periphery (Nelson 1998).

(50) RIGHT-ANCHOR-IO_{ROOT} (R-ANCHOR-IO_{RT})
Any segment at the right edge of the root in the input has a correspondent at the right edge of the root in the output.

Since R-ANCHOR-IO_{RT} prevents consonants from deleting root-finally, it must outrank *C-PL/X and $*C_{oral}]_{\sigma}$, as shown in (51) with the form [ʃíɛb] 'cut (TRANS)'.

(51) *Codas that are oral and not place-linked can occur in root-final position*

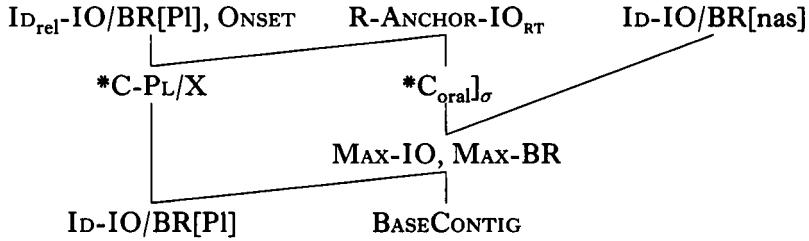
ʃiɛb	R-ANCHOR-IO_{RT}	*C-PL/X	$*C_{oral}]_{\sigma}$	MAX-IO
☞ a. ʃíɛb		ʃ,b	*	
b. ʃíɛ	*!	ʃ		b

Recall that an alternative candidate which retains the final consonant but changes to the least marked place (e.g. [ʃíɛd]) is ruled out by $IDENT_{rel}$-IO[Place] ≫ *C-PL/X (see (48)) together with the proposed status of root-final position as released. This ranking also prevents assimilation from taking place between a root-final consonant and a following suffix onset.

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This completes the rankings which obtain the general phonotactic condition and nasal copy in Mbe. They are summarised in (52).

(52) *Rankings for consonantal distribution restriction and nasal reduplication*



Within this hierarchy, the ranking of MAX-BR forces copy of a (non-contiguous) place-assimilated nasal as prefix coda. The activity of other constraints yields the more general restriction of unreleased consonants to place-assimilated nasals. In what follows I will be concerned only with the restriction that these combined constraints impose on consonants in prefixal coda position. For expository convenience, I will henceforth refer to this set of rankings as CODACOND.

5.1.3 *Vocalic TETU effects.* Before leaving the imperative affixation, I briefly examine two other effects in the reduplication which can be explained through TETU rankings. The first of these is the absence of diphthongs in the reduplicative prefix. It is widely recognised that diphthongs qualify as marked structure. Rosenthall (1997) proposes the constraint in (53) to prohibit them.

(53) NODIPH

Two tautosyllabic moras linked to distinct vowels are prohibited.

The TETU ranking which permits diphthongs in stems but not reduplicants is given in (54).

(54) *No diphthongs in reduplication*

RED-biem	MAX-IO	NODIPH	MAX-BR
☞ a. bîm͡-bîem		*	e
b. bîem͡-bîem		**!	
c. bîm͡-bîm	e!		

Note that an alternative candidate [bêm-bîem] ties with (54a) on CONTIGUITY – each incurs one violation (McCarthy & Prince 1995). The preference for the first vowel, which is always high, can be attributed to the markedness ranking favouring high vowels over non-high ones, *[−high] ⩾ *[+high]. This ranking is supported more broadly by cross-linguistic markedness considerations, as discussed by Beckman (1995).

In the case of diphthong avoidance in reduplication, there are two vowels available in the base to copy, and the height-markedness ranking

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selects copy of the high vowel. When the base contains a monophthong consisting of a non-high vowel, a second vocalic TETU effect is observed: the non-high vowel is copied, but it is reduced to [ə] in the reduplicant. This can be seen as a result of the relative markedness of non-high full vowels in relation to [ə]. I will refer here to the combination of constraints producing the dispreference for non-high vowels that are not reduced as *NonHiFullV (see Walker 1998 for the details of a ranking that yields this outcome). The force of *NonHiFullV causes a violation of BR identity for vowel colour ([round] and [back] features). Hence, the relevant TETU ranking places the markedness constraint between IO and BR faith for [colour].

(55) *No non-high full vowels in reduplication*

RED-lɔ	Id-IO[col]	*NonHiFullV	ID-BR[col]
☞ a. lə-lɔ		*	*
b. lɔ-lɔ		**!	
c. lə-lə	*!		

This concludes the account of the imperative reduplication in Mbe. The three main properties of this affixation have been addressed: (i) the syllable-size restriction, (ii) the nasal agreement in the prefixation and its connection to the general condition that limits codas to place-linked nasals and (iii) the vocalic TETU effects.

5.2 Diminutive and inchoative affixation

Having established the analysis of the reduplicative imperative prefixation, I now turn to extending the account to include the diminutive and inchoative affixation, elaborating the few additional rankings that are needed to explain their phonological form. First let us note that the affixations share many properties in common. In each case, the underlying form of the affix consists of RED, and any reduplicated material occupying a coda is a place-assimilated nasal, obeying the general phonotactic restriction in Mbe. Since the diminutive and inchoative affixes only fill syllable codas, their nasal content will follow from the established rankings that determine the consonantal distribution in (41), which I will refer to as CodaCond. Like the imperative reduplication, they also display a size restriction stemming from the avoidance of adding syllables to the word. Where the patterns differ is in the precise size of reduplication: the imperative reduplication adds one syllable to the word while the diminutive/inchoative affixation is restricted to forming a syllable coda or failing to be realised at all. The relevant generalisation in the latter case is that reduplication occurs only if it does not add a syllable to the word.

5.2.1 *Single-segment copy.* I begin by focusing on the occurrence of single-segment copy in the diminutive and inchoative affixation. The size restriction presented by this pattern is achieved through the same TETU

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ranking as that already established in §5.1.1 for the imperative reduplication, which limits the addition of syllables in reduplication. The outcome for the present affixation is illustrated in (56). Only candidates obeying CODACOND are considered here. Examples in this section are drawn from diminutive nominals, though the same generalisations apply to the inchoative structure as well.

(56) *Single-segment copy in a diminutive nominal*

kɛ̀-RED-tèm	MAX-IO	*STRUC-σ	MAX-BR
☞ a. kɛ́-n͡-tém		**	tɛ
b. kɛ́-tém		**	tɛm!
c. kɛ́-tén͡-tém		***!	
d. tèm	k!ɛ	*	tɛm

In the above form, reduplication of some material is achieved without adding a new syllable, by filling the coda position supplied by the preceding affix. The availability of single-consonant copy in the diminutive and inchoative affixations is thus connected to their co-occurrence with an independent CV prefix (note also Gafos 1996, Spaelti 1997). In the case of the imperative reduplication, there is no separate preceding morpheme, and as a result prefixation of a single copied consonant is ruled out by phonological well-formedness constraints (see (39)).

A second point introduced by the single-segment affixation is the possibility of anchoring violations. Since a nasal can be copied anywhere in the stem, a constraint compelling segment copy must outrank L-ANCHOR-BR, which requires that the leftmost base segment have a correspondent at the left edge of the reduplicant (McCarthy & Prince 1995: 371):

(57) *Left-anchoring violation in nasal copy*

kɛ̀-RED-tèm	MAX-BR	L-ANCHOR-BR
☞ a. kɛ́n͡-tém	tɛ	*
b. kɛ́-tém	tɛm!	

Note that the losing candidate in (57) is non-optimal not only because of its extra violation of MAX-BR, but also because it fails to realise any phonological correspondent for the diminutive morpheme. Hence an alternative would be to rank the relevant REALISE-μ constraint over L-ANCHOR-BR – each of these rankings is consistent with the data.

5.2.2 *Violability of morpheme realisation.* Though morpheme realisation is satisfied when single-segment copy takes place, it is violated in the diminutive and inchoative affixation in structures where there is no nasal to reduplicate. This signals that REALISE-μ for the diminutive and inchoative affixes is outranked by markedness constraints, in particular,

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the size restrictor *STRUC-σ and the set of rankings referred to as CODACOND, as shown in (58). (For completeness, the MAX constraints that flank *STRUC-σ are included here.) The outcome is size minimisation at an extreme.

(58) *Copy fails, violating morpheme realisation*

kɛ̀-RED-kìkɛ̀l	CODACOND	MAX-IO	*STRUC-σ	MAX-BR	REALISE-μ_{dim} REALISE-μ_{inc}
☞ a. kɛ̀-kìkɛ̀l			***	kikɛl	*
b. kɛ̀-kì-kìkɛ̀l			****!	kɛl	
c. kɛ̀-k-kìkɛ̀l	*!		***	ikɛl	

It is important to observe that if the morpheme-realisation constraint for the diminutive morpheme were ranked above *STRUC-σ, as in the case of the imperative reduplication (39), the optimal output would be (58b), which adds a syllable of copied material, rather than (58a), which copies nothing at all. Such a ranking would produce a pattern like that seen in Rebi, where full-syllable copy takes place when copy into the coda of a pre-existing syllable is prevented. On the other hand, note that if the morpheme realisation for the imperative were ranked along with the diminutive and inchoative realisation constraints below *STRUC-σ, no copy in the reduplicative imperative series would ever take place. The diminutive and inchoative affixation thus contrasts with the imperative reduplication (and Rebi) in presenting an instance where morpheme realisation is sacrificed to markedness. Since the reduplicative imperative prefix is posited as a root prefix, this asymmetry within the morphology of Mbe could conceivably be generalised as another instance of head *vs.* dependent markedness in correspondence: REALISE-μ Root $\gg$ REALISE-μ Affix.

To verify the dominated status of the morpheme-realisation constraints in question, let us once again consider the tones in this affixation. It was established in §3.3 that the tone patterns found in these constructions do not represent phonological correspondents of the reduplicative morphemes in question. Focusing on the diminutive structure, recall that prefixation in a diminutive nominal is generally marked by a rising tone that comes about through the combined contribution of L from the Class 4 prefix and H from a constraint that aligns a high tone to the diminutive morpheme. I propose to formalise the alignment constraint as ALIGN (Dim-L, High-R). This formulation follows Bamgbose in assuming that non-syllabic nasals are not tone-bearing; hence the right edge of the rising tone falls at the left edge of the diminutive nasal segment. When no segment copy takes place, the high tone is introduced because the diminutive morpheme still occurs in the morphological structure of the output even though it is not phonologically realised. This is illustrated by the following morphological structure, $[_{Cl.4}$kɛ̌$[_{dim}[_{rt}$ʧɪ́$]]]$, where the root is first derived into a diminutive stem followed by the appropriate noun-

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class prefixation. Here the alignment constraint locates the high tone at the diminutive morphological boundary.

As previously noted, an alternate pattern to the rising prefix tone is seen in some diminutive forms where the tone instead matches the melody occurring on the class prefix in the non-diminutive counterpart. Such a requirement could be achieved through an output–output correspondence relation demanding identity of affix tone patterns in morphologically related words (output–output correspondence is familiar from the work of McCarthy 1995, Kenstowicz 1996, Benua 1997 and Burzio 1997, among others); however, the particulars of analysis will not concern us here, since they are outside of the main line of inquiry. What is important for the present purposes is simply that this alternate tone pattern presents an unambiguous example where the diminutive morpheme has no phonological correspondent when nasal copy does not take place. I assume that the variable tone pattern in the diminutive affixation arises from variable ranking of the tone-alignment and IDENT-OO[Tone] constraints. For many words, this ranking is lexically specific.

A broader issue raised by these affixations is whether the violability of the morpheme-realisation constraints for the inchoative and diminutive prefixes is related to their co-occurrence with other prefixation and the potential for indirect recoverability that affixation has taken place. In the case of violable morpheme realisation in Halq'eméylem reduplication, Urbanczyk (1998) observes that when the reduplicative affix marking the continuative has no phonological exponence, other phonological changes take place in the stem, such as default segment epenthesis or stress shift, which distinguish the output from its non-continuative counterpart. This provokes the question whether a similar correlation is found in Mbe, that is, whether the violability of morpheme realisation is connected with the occurrence of other changes in the stem that independently signal the phonologically null affixation. The CV affixation that occurs along with these reduplicative affixes makes a contribution in this direction. Note that if realisation of the reduplicative imperative affixation were violable and outranked by *STRUC-σ, the occurrence of affixation would be wholly unrecoverable from the output. Further research is needed in the case of the diminutive and inchoative affixation of Mbe to determine whether the independent CV affixation always produces a stem distinct from other related outputs. If this is identified to indeed be an active phenomenon, questions then arise about how to formally implement such a requirement within the constraints of the theory. For instance, would it warrant a global comparison within the paradigm? How precisely is distinctness to be evaluated? Are certain types of changes to produce distinctness preferred over others (e.g. adding rather than subtracting phonological material)? As Urbanczyk points out, a connection might be explored with work on anti-faithfulness constraints by Alderete (1999). These issues are beyond the scope of the present paper but hold a promising avenue towards a firmer understanding of the conditions under which morpheme realisation is violated in some languages.

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5.2.3 *Summary*. The above completes the constraint rankings needed for the set of three reduplicative affixes in Mbe. Three properties of this affixation are of particular interest: (i) the occurrence of variable single-segment or null copy in diminutive/inchoative prefixation, (ii) the nasal specificity and (iii) the difference in size of affixation seen in the imperative syllable-size copy *vs*. the diminutive/inchoative coda/null copy.

At the core of the account is the set of rankings that compose CODACOND as well as the TETU size-restrictor configuration: MAX-IO ≫ *STRUC-σ ≫ MAX-BR, which limit reduplicative content and size across affixes and together achieve the nasal agreement phenomenon. CODACOND imposes a general restriction confining material in unreleased positions to homorganic nasals. The size-restrictor ranking is responsible for limiting reduplication to the patterns of coda/null copy or syllable-size copy. As a result, the coda realisation of the diminutive/inchoative prefixes can only be a nasal, and similarly, the coda of the imperative is also limited to nasals. Since reduplication cannot change a nasal specification in the stem, copied coda material arises only when there is a nasal available in the base to copy.

The imperative and diminutive/inchoative prefixations display two principal differences. The first is the occurrence of single-segment copy in the diminutive and inchoative affixation that arises from the availability of a coda slot from preceding prefixes. A second distinction is that when single-segment copy is blocked by phonological well-formedness requirements of the language, no copy takes place, rather than copy of a full syllable, as in the imperative. This latter difference arises from the dominated ranking of the morpheme-realisation constraints for the diminutive and inchoative affixes in contrast to the undominated ranking of the realisation constraint for the reduplicative imperative affix. The core ranking structure is summarised in (59):

(59) *Reduplicative affixation ranking summary*

CODACOND, REALISE-μ_{impS2}, MAX-IO ≫ *STRUC-σ ≫ *MAX-BR, REALISE-μ_{dim}, REALISE-μ_{inc}

5.3 The inadequacy of templatic or prespecified alternatives

Building on Spaelti's (1997) study of reduplication in Rebi and other Aru languages, the present account assumes an a-templatic approach to reduplicant size restriction, that is, it does not call on a fixed templatic structure or constraint to limit reduplicant size or content (see also McCarthy & Prince 1994a, Prince 1997, Gafos 1998a, b, Urbanczyk 1998). Interestingly, the a-templatic approach proves to be crucial. In what follows I demonstrate that a templatic alternative is not simply unnecessary, but it is in fact insufficient to handle the range of size restrictions in Mbe.

The alternative that I focus on is a version of 'Generalised Template Theory', which achieves size restrictions through TETU rankings with

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templatic constraints on the maximal phonological structure of a general morphological category, such as 'Affix' (McCarthy & Prince 1994a, b, Urbanczyk 1996a, b; with foundation from McCarthy & Prince 1986, 1990, 1993a). An example of a generalised templatic constraint is AF$\leq\sigma$: 'the phonological exponent of an affix is no larger than a syllable'. AF$\leq\sigma$ readily captures the imperative syllable-size reduplication. Ranking this constraint between MAX-IO and MAX-BR limits reduplicant size to one syllable. MAX-BR drives copy of the largest possible syllable, and the independently required CODACOND restricts coda material to that allowed in the language. The ranking is exemplified in (60) for a base containing only oral segments. In instances where the base contains a nasal, a nasal coda is admitted in the prefix by CODACOND.

(60) AF$\leq\sigma$ *in syllable-size copy*

RED-jubo	CODACOND	MAX-IO	AF$\leq\sigma$	MAX-BR
☞ a. jû-júbò				bo
b. júbò-júbò			*!	
c. jûb-júbò	*!			o
d. jû-jû		b!o		

Although generalised templates account for the majority of reduplication phenomena, they are insufficient for the more unusual cases of diminutive and inchoative coda/null reduplication. The problem is that the templatic size restrictor is specific to the size of the affix and does not make reference to the overall syllabic structure of the word. Ranked between Faith-IO and Faith-BR, AF$\leq\sigma$ predicts that copied material will form a full syllable, driven by the maximising function of MAX-BR, as in (61). The incorrect outcome for a diminutive form is signalled by the left-pointing hand in (61b). The actual output (61a) is not selected here.

(61) AF$\leq\sigma$ *gives wrong outcome for diminutive*

kɛ̀-RED-tɛ̀m	CODACOND	MAX-IO	AF$\leq\sigma$	MAX-BR
☞ a. kɛ̌-n͡-tém				t!ɛ
☜ b. kɛ̌-tén͡-tém				

The fact that reduplication for the diminutive/inchoative morphemes occurs only when it will not add a syllable to the word requires independent explanation. *STRUC-σ is what achieves this explanation; yet it is also capable of capturing the size restriction on its own. It thus obviates the need for a generalised templatic constraint. In addition, utilised in an a-templatic approach, *STRUC-σ makes the important advance of producing a unified account of the size limits across reduplicative affixation in Mbe. The a-templatic approach to size restriction can be understood as a progression of Generalised Template Theory. It retains the insights that size restrictions in reduplication are correlated to

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prosodic structure and are derived with TETU rankings. Where it advances is in eliminating the need for templates. Mbe adds to the growing set of languages that provide an empirical motivation for this move.

A related point concerns the question of prespecification. As mentioned in §3, the single-segment nasal copy of diminutive/inchoative affixation might at first seem to suggest a need to prespecify these prefixes with the feature [+nasal] and/or a C-slot. The above analysis has shown that neither kind of prespecification is necessary, and they are thus not motivated in the account. But the argument can be taken yet further. If either of these elements were assumed to be prespecified, the analysis would actually fail to capture important generalisations about the phonology of Mbe. Prespecifying the diminutive/inchoative affixes as [+nasal] fails to make a connection with the fact that coda consonants are limited to nasals; it renders this source of explanation a coincidence. In addition, a prespecification approach would require that each of the diminutive and inchoative affixes be individually marked [+nasal]; their phonological similarity thus emerges as an accident rather than a product of the grammar. Prespecifying these affixes with a vacant C-slot is subject to the same objections. It further misses the generalisation that these affixations minimise the addition of syllables and thereby target consonants in order to remain within the bounds of the syllable structure needed to accommodate input material.

To conclude, alternatives prespecifying material or making use of templatic frames are insufficient to obtain the patterns of reduplicative affixation in Mbe and they are also not required. Interestingly, the best explanation for these data follows from an analysis where the structure of affixation consists simply of RED.

6 Extending explanation to cumulative affixation in Mbe

The analysis in §5 addresses the size and content of reduplicative affixation in Mbe. In the foregoing account, the a-templatic size-restricting constraint *STRUC-σ performs an important function across the reduplicative prefixes. In this section I extend this general analysis beyond the reduplicative morphology, arguing that it offers explanation for a size restriction exhibited in a non-reduplicative prefixation in the nominal morphology of Mbe. This stands as a final piece of support for the approach.

We have seen previously that nouns take class prefixes marking number category ((5)–(6), (9)). In the general case this affixation attaches a nominal class marker to a bare noun root, or in the formation of diminutives a Class 4 prefix marker is added to a derived diminutive nominal. However, in some forms, the base of class prefixation is more complex. To understand this, we must first consider the three forms of nominal prefixes. These are

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(i) CV or V, which occur before consonant-initial stems, (ii) C, which occurs before vowel-initial stems, and (iii) N, which occurs before vowel-initial or consonant-initial stems. Bamgbọṣe (1966: 36) notes that plural prefixation exhibits what I will call a 'cumulative affixation' property such that when the singular form of a noun is formed with one of the latter two types of prefix (C or N), then the plural nominal class prefix is added to the whole of the singular noun form. Yet if the singular is formed with a CV or V prefix, the plural prefix replaces the singular prefix in the plural noun. This is illustrated in (62); examples in (a) show cumulative affixation and in (b) show replacement.

(62)

	Singular	*Plural*	
a.	l-én	bè-lén	'name'[27]
	l-úob	bè-lúob	'navel'
	m-ɔ̀m	bè-mɔ̀m	'wine'
	m̩-pîe	bè-mpîe	'dog'
b.	kè-tɔ́r	kè-tɔ́r	'duiker'
	ò-sùe	è-sùe	'house'
	lè-lém	bè-lém	'tongue'
	lè-kwór	ŋ̀-kwór	'heap'

A similar cumulative affixation effect appears in diminutives. Nouns which take C or N prefixes in their non-diminutive form construct their diminutive counterpart by prefixing [kɛ-] and [ke-] to singular and plural non-diminutive noun forms, respectively (63a). Nouns with a V or CV prefix in their non-diminutive form replace this with [kɛ-/ke-] in their diminutive counterpart (63b).

(63)

	Non-diminutive	*Diminutive*	
a.	l-í	kɛ̌-lî	'eye'
	ŋ̀-kúel	kɛ̌ŋ-kûel	'tortoise'
b.	bù-ʧí	kɛ̌-ʧî	'head'
	ò-bé	kɛ̌-bê	'hand'

Why are purely consonantal prefixes included in the base of affixation but V or CV replaced? A phonological generalisation underlies this phenomenon: cumulative affixation takes place only when the combined prefixal material adds no more than a syllable to the word. This is particularly clear when we consider the variable syllabification of nasal prefixes. In word-initial position before a consonant, nasal prefixes are syllabic and tone-bearing; however, when a V or CV prefix appears before them, nasal prefixes are syllabified into a coda and do not bear a tone. The

[27] Note that monosyllabic singular forms are truly composed of a prefix and a vowel-initial root rather than being monomorphemic. Bamgbọṣe (1966: 34) observes that evidence stems from the generalisation that monosyllabic nouns consistently have a consonant drawn from the set [b l j ɲ m n], which is precisely the set of N and C prefixes. If these nouns were not prefixed, the limitation to this set of initial consonants would be wholly unexpected, as noun roots in general can have a much broader range of initial consonants.

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restriction of nominal prefix material to adding no more than a syllable can be explained by a familiar constraint in our analysis of Mbe: *STRUC-σ. This size restrictor conflicts with the constraint driving cumulative affixation. I propose that the cumulative affixation arises from the activity of an output–output correspondence relation (see §5.2) that enforces similarity between morphologically related outputs, in particular between a morphologically marked output form (plural, diminutive) and its related unmarked base (singular, non-diminutive).[28] The relevant constraint is spelled out in (64):

(64) AFFIX$_{nom}$-MAX-OO

Every nominal affix segment in S1 has a correspondent in S2, where S1 is a singular or non-diminutive output form and S2 is a morphologically related plural or diminutive output form, respectively.

In nominal prefixation, *STRUC-σ prevents the OO-correspondence from adding any additional syllables to the word beyond that required to accommodate input material. This is achieved by the following ranking: MAX-IO ≫ *STRUC-σ ≫ AFFIX$_{nom}$-MAX-OO. The outcome is illustrated in (65) and (66). In these tableaux, I display the base of output–output correspondence as well as the input.

(65) *Cumulative prefixation when OO-correspondence does not add a syllable*

input: bè-pîe *base:* m̩-pîe	MAX-IO	*STRUC-σ	AF$_{nom}$-MAX-OO
☞ a. .bèm.pîe.		**	
b. .bè.m̩.pîe.		***!	
c. .bè.pîe.		**	m!
d. .m̩.pîe.	b!ɛ	**	
e. .pîe.	b!ɛ	*	m

(66) *No cumulative prefixation when OO-correspondence would add a syllable*

input: bè-lém *base:* lè-lém	MAX-IO	*STRUC-σ	AF$_{nom}$-MAX-OO
☞ a. .bè.lém.		**	le
b. .bè.lè.lém.		***!	
c. .lè.lém.	b!ɛ	**	

[28] See Alderete (1999: 120–121) for a formal means of encoding the relative markedness of morphemes in the constraint hierarchy and using morphological markedness to select the base of output–output correspondence.

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The role of *STRUC-σ is pivotal. Note that since the affixal material is not necessarily coextensive with a syllable, as in [.bɛ̀.-l-ɛ́n.] 'names', [.kɛ̌.-l-î.] 'little eye', the restriction cannot be reduced to a condition that prefixal content be aligned with a syllable. The cumulative affixation phenomenon thus provides independent evidence within the morphophonology of Mbe for the role of *STRUC-σ as a size restrictor. Interestingly, the a-templatic approach is again crucial. Here it is not the case that individual prefixes must be no more than a syllable in size (as posited in the generalised template approach), rather non-input material introduced by output–output correspondence may not add a syllable. This requires invoking *STRUC-σ to limit size over the entire word, producing an OO TETU effect.[29]

7 Conclusion

In this paper I have argued that analysing nasal agreement in Mbe as reduplication provides an insightful account of this phenomenon dovetailing with other aspects of Mbe morphophonology. The evidence supporting a reduplicative treatment of this affixation stems from a variety of sources, including the occurrence of this effect in the unambiguously reduplicative imperative affixation, the morpheme-specificity of the phenomenon and the action-at-a-distance of the triggering nasal. A second key point of the analysis developed here is that although the diminutive and inchoative affixes may at first appear to be instances of reduplicative affixes with prespecified segmentism, the fixed segmentism does not derive from prespecification but rather from independent non-reduplicative morphemes. Further, I have demonstrated that the nasal nature of the reduplicated coda material is a direct consequence of a general condition restricting coda content in the language – prespecification of the nasal quality is not required and it would fail to capture the phonotactic generalisations holding across reduplicative and non-reduplicative structures. Another quality of the diminutive and inchoative affixation that might seem to warrant prespecification is the limitation of segment copy to no more than a single consonant. However, I have argued that this restriction does not arise from any stipulation on the reduplicant itself, such as a prespecified C-slot, rather the single-consonant copy follows from activity of an a-templatic size restrictor that minimises

[29] It should also be noted that though the cumulative affixation and reduplication show evidence of the minimisation of syllable structure, the condition cannot be generalised to one under which all affixation in Mbe adds no more than a syllable. This is apparent from the verbal forms. Non-reduplicative prefixation can add two syllables, e.g. [rè-ké-tá] 'will be touching', and together with suffixation, verbs may contain three syllables of affixal material: [rè-ké-bɔ́r-kí] 'will be helping'. Even in the case of reduplicative imperative verbs, combined affixal material deriving from reduplicative and non-reduplicative affixes can add two syllables: [jû-júb-ò] 'go out'.

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syllable structure over the word. I have also demonstrated that this size restrictor functions elsewhere in Mbe, achieving the syllable-size limit on imperative reduplication and size minimisation in non-reduplicative cumulative prefixation. This approach analyses size limitation as a TETU effect, a kind of explanation widely motivated by reduplication phenomena. Further, the a-templatic analysis proves to be necessary in Mbe affixation and obviates templatic alternatives.

The core result is that Mbe nasal agreement is best analysed as reduplication without prespecification. This finding has wider implications for the understanding of fixed segmentism in the theory of reduplication. The present study has identified the coaffixation of a separate non-reduplicative prefix along with a reduplicative morpheme as a source of putative fixed segmentism in reduplication. Two other sources of fixed segmentism are discussed by Alderete *et al.* (1999): default segmentism arising through TETU rankings, and Melodic Overwriting, which has a morphological basis – not prespecification. This research converges on a discovery that prespecified material is not necessary in reduplication, indeed admitting prespecification would predict a much wider range of fixed content than is actually attested. In answer to this problem, I have proposed that the emergence of lexically specified segmentism can be ruled out through an independently motivated statement of head *vs.* dependent markedness. Yet there are still questions to be explored in further research about the nature of reduplicative morphemes. I have adopted a modified version of the standard definition of RED; however, a possible alternative might be to re-examine the assumption of an input RED affix for reduplication and/or the structure of the correspondence relations involved (see e.g. Spaelti 1997, Struijke 1998), in which case the problem of prespecification could conceivably be obviated by the model itself. These and other considerations may provide reason for re-evaluating the standard assumptions about RED. A second area to be investigated concerns the residue of cases of fixed material in reduplication which do not appear to be phonologically or morphologically determined. The results of the present work and precursors cited above are suggestive that further research on these cases be directed towards explaining fixed material independent of a lexical specification in a reduplicative morpheme.

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