Chapter Six

Augmentation in the Prosodic Morphology of the Diminutive

1. INTRODUCTION

In chapter 5, we have shown the need to distinguish between two types of PP's: those that appeal to the epenthesis of /u/ to achieve an iambic foot and those that do not. We have shown that the non-epenthesis or epenthesis of /u/ follows from the interaction of prosodic constraints requiring that the output be an iamb and faithfulness constraints requiring identity of the input and the output. In this chapter we present further evidence for foot ianbicity based on another aspect of the prosodic morphology of CMA which is the diminutive.

Like the PP, the output of the diminutive is also governed by a prosodic constraint demanding that the output be an iambic foot. Also, the output of the PP and the diminutive must be an iambic foot of the type LL or in the ideal case LH but never a minor LH iamb, i.e. an iamb whose light syllable consists solely of a consonant. Both classes resort to augmentation to achieve this iambic requirement. However, they differ in the way this augmentation is achieved as well as in the result it leads to. The PP appeals to the language default segment /u/ to form an iambic foot of the type LH, whereas the diminutive may add a whole default syllable or the feminine suffix [-a], depending on whether the base is masculine or feminine and this in order to achieve an iambic foot of the type LL. It will be shown that achieving this kind of iambicity is the result of satisfying a constraint referred to as INITIAL-CC which requires that the PWd start with a cluster of two consonants, thus forcing the diminutive morpheme [-i] to be placed after this cluster and resulting in the required prosodic shape.

The chapter is divided into 5 major sections. Section 2 lists the possible diminutive forms of the language. Section 3 shows how a derivational approach such as circumscriptive morphology fails to adequately account for diminutive formation. Section 4 argues for the necessity of incorporating in the analysis of the diminutive a constraint referred to as INITIAL-CC which has the effect of forcing the diminutive morpheme to be placed after two consonants.

Support for this constraint comes from cases involving labialization and gemination of labial consonants. Here, it will be pointed out that the gemination of labial consonants in the diminutive follows from the constraint INITIAL-CC and the interaction of markedness constraints on labialized consonants. Sections 5, 6 and 7 offer an OT account of augmented and unaugmented diminutive forms. In particular, it will be argued that a fair analysis of the diminutive is derived from the interaction of prosodic constraints on foot types with markedness and faithfulness constraints as well as their respective ranking.

2. THE DATA

The diminutive is formed by the affixation of the morpheme [-i-] after the second segment of the base. This process is often accompanied by the labialization of the first segment of the base if it happens to be one of the dorsal consonants [k, g, x, γ, q] or labial consonants [b, f, m]. The body of relevant data is listed in 1 below:

-1-

	Base	*Diminutive*	*Gloss*
a.	wəld	wliyyəd	boy
	ʒməl	ʒmiyyəl	camel
	sbəʕ	sbiyyəʕ	lion
	nmər	nmiyyər	tiger
	sdər	sdiyyər	chest
b.	fərx	friyyəx	bird
	bərd	briyyəd	wind
	fərħ	friyyəħ	feast of rejoicing
	bγəl	bγiyyəl	mule
c.	kəlb	k^wliyyəb	dog
	ktəf	k^wtiyyəf	shoulder
	qərd	q^wriyyəd	monkey
	qəlb	q^wliyyəb	heart
	qfəz	q^wfiyyəz	cage
	gdəm	g^wdiyyəm	heel
	x^wəbz	x^wbiyyəz	bread
	$γ^w$rab	$γ^w$riyyəb	crow

d.	bit	bb^{w}iyyət	room
	bir	bb^{w}iyyər	well
	mus	mm^{w}iyyəs	knife
	buq	bb^{w}iyyəq	loud sppeaker
	BuT	BB^{w}iyyəT	rubber boots
	f^{w}əmm	ff^{w}iyyəm	mouth
e.	far	ff^{w}iyyər	mouse
	kas	kwiyyəs	A (drinking) glass
	ʒib	ʒwiyyəb	pocket
	BaR	BB^{w}iyyəR	pub
	RaS	RwiyyəS	head
	bab	bb^{w}iyyəb	door
	γaR	γwiyyər	cave
f.	ʃəmʃ	ʃmiʃa	sun
	zit	zwita	oil
	bənt	bnita	girl
	Dar	dwira	house
	kəréʃ	k^{w}riéʃa	belly
	ʕin	ʕwina	eye
	wdən	wdina	ear
g.	ʕʃa	ʕʃiwa	dinner
	γda	γdiwa	lunch
	mRa	mRiyya / mRiwa	woman
	ʕSa	ʕSiyya / ʕSiwa	a stick
	bRa	bRiyya / bRiwa	letter
	ʃta	ʃtiwa	rain
h.	bəlγa	bliγa	(oriental) slippers
	dəmʕa	dmiʕa	a tear
	kura	kwira	ball
	g^{w}əRSa	g^{w}RiSa	a (small, circular) loaf of bread
	wəRDa	wRiDa	flower
	xuxa	xwixa	peach
i.	TəbSil	TbiSil	plate
	sərwal	sriwil	pants
	ʃərbil	ʃribil	women’s (oriental) slippers
	dəbliʒ	dbiliʒ	bracelet
	sarut	swirit	key
	ħanut	ħwinit	shop

j.	SəBBaT	SBiBiT	shoes
	g^wəffa	g^wfifa	basket
	g^wəlla	g^wlila	earthware jar
	kəBBuT	k^wBiBiT	jacket
	səllum	slilim	ladder
	bərrad	bririd	tea pot
k.	limuna	lwimina	orange
	banana	bb^winina	banana
	SənDala	SniDila	sandals
	gənDuRa	g^wniDiRa	a Moroccan gown
	baliza	bb^wiliza	suitcase
	hiDuRa	hwiDiRa	sheepskin
l.	ʒəllaba	ʒliliba	jellaba (a gown with a hood)
	bərraka	bririka	a slum hut
	ʃəkk^{w}ara	ʃk^wikira	satchel
	nəffaxa	nfifixa	baloon
	nəwwara	nwiwira	flower
	ZəmmaRa	ZmimiRa	horn

The generalization that could be made about the items in 1 is that disyllabic 1h-j as well as trisyllabic 1k and 1l bases surface with the same number of syllables in the diminutive. The more interesting cases are those diminutive items in 1a-g which surface as disyllabic in spite of the fact that their bases consist of only one major syllable. The data above also show that there are two ways a base can be augmented: first by the building of what Al Ghadi (1990) refers to as the default syllable of the language, i.e. a syllable whose nucleus is the schwa and whose coda is the final consonant of the base as in 1a-e. Second, the base can be augmented by the suffixation of the feminine morpheme [-a] as is in 1f.

The questions we should ask here are the following: why is it the case that the diminutive forms in 1a-g are augmented by one syllable while the disyllabic and trisyllabic ones are not? Why is it the case that only very specific consonants are labialized in the diminutive?

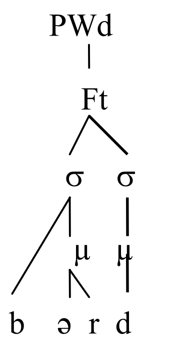
In what follows, we will attempt to provide answers for these two questions within the theoretical framework adopted. First, we will show how a non-constraint based framework such as operational circumscriptive theory is incapable of accounting for the diminutive forms in CMA.

3. AGAINST A CIRCUMSCRIPTIVE ACCOUNT OF THE DIMINUTIVE

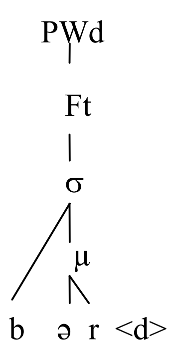
McCarthy and Prince (1990a) assume that templates in Prosodic Morphology are defined in terms of prosodic categories such as the mora, the syllable, the foot and the prosodic word. They further assume that the domain to which a morphological operation applies is circumscribed by prosodic as well as morphological criteria. In particular, a base, which corresponds to the minimal word, is selected as the locus of the morphological operation. In MA, the base has been found to correspond to a minimal syllable of the type CV or CəC (Al Ghadi 1990, Bennis 1992). In what follows, we show how the diminutive in CMA could be derived within the theory of prosodic circumscription. Thus, an item having the shape CəCC, such as [bərd] “wind”, could be derived as in 9 below:

-2-

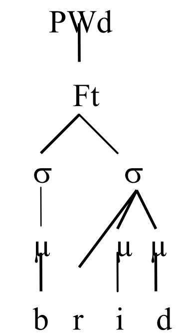
a. Input



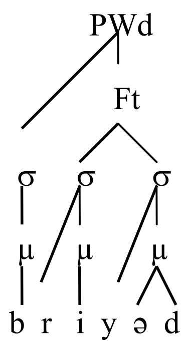
b. Circumscription of a CəC and final C extrametricality



c. Suffixation of the diminutive to the circumscribed CəC and restoration of <b>



d. Augmentation to satisfy an LL iambic foot



In this representation, we ignore the gemination of the glide that serves as an onset to the schwa syllable. We take this problem down in section 6.

Leaving aside the critique that might be leveled at such an approach, we turn now to see whether the circumscriptive analysis could adequately account for all the diminutive cases. In fact any analysis based on circumscription of a prosodic unit will fail given an input of the shape CCəC. Given that the diminutive is suffixed to a minimal syllable, words like [ktəf] "shoulder" and [Smək] "deaf" would be derived as in 3 below:

-3-

a. Input k.təf S.mək

b. Circumscription of a CəC and Initial C extrametricality

<k> təf <S> mək

c. Suffixation of the diminutive to the circumscribed CəC.

təf-i mək-i

d. Restoration of extrametrical consonant

ktəf-i Smək-i

e. Syllabification

kət.fi Səm.ki

f. Augmentation to satisfy an LL iambic foot

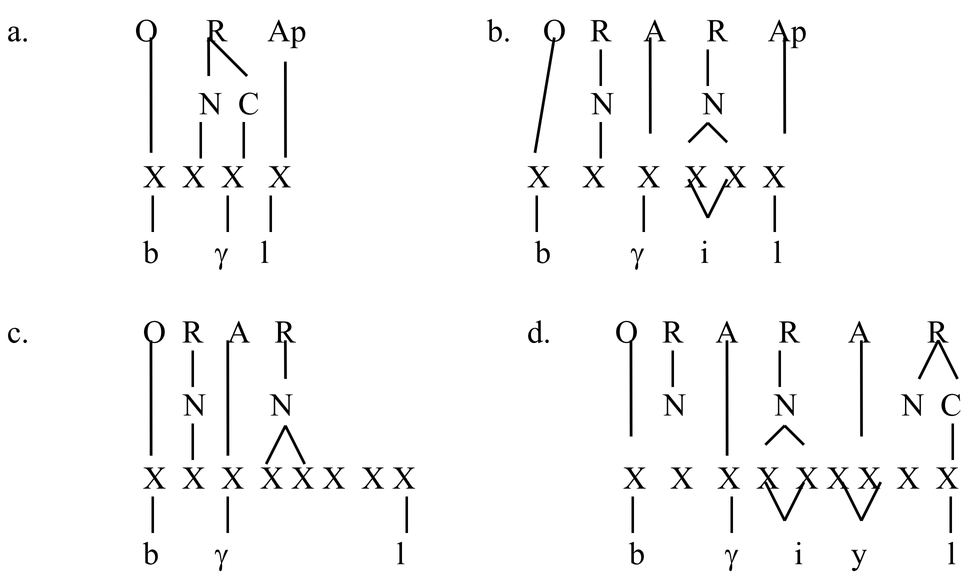
"satisfied" "satisfied"

g. Output *[kətfi] *[Səmki]

As shown above the operational circumscriptive analysis does not work and therefore should be abandoned because it is incapable of giving the correct output.

In an attempt to come up with a unified analysis for the diminutive in MA, Lasri (1989), who assumes that the diminutive morpheme is placed after the first syllable of the base, maintains that forms on the pattern CCəC should be treated like the rest of the items of the language. He assumes that items such as [ktəf], i.e. items on the pattern CCəC, have the template CəCC underlyingly and as such the diminutive would be placed in the right location. Within the theoretical framework he adopted, a form like [bγiyyəl] "mule" would be derived as in 4 below:

-4-



For Lasri (1989) representations such as the ones above reflect the steps below. The first step is to place the diminutive morpheme after the first syllable of the base and the syllabification of the coda of this syllable as an onset of the following syllable. The second step is to add two positions after the diminutive morpheme. At the final step, resyllabification applies, this time inserting another X-position which is assumed to be the nucleus of a syllable whose onset is the glide [y], resulting from the spreading of the diminutive vowel [-i-].

The analysis in 4 could be refuted on both theoretical and empirical grounds. On the theoretical level, the framework adopted by Lasri appeals to the syllable to make generalizations about the placement of the diminutive morpheme but at the same time makes recourse to skeleta that consist of timing units, something that goes against McCarthy and Prince's (1986) Prosodic Morphology Hypothesis. Templates are defined in terms of the authentic units of prosody and not the CV or the timing (X) units. Moreover, Lasri's analysis and the analysis that appeals to prosodic circumscription are operational in the sense that they have to scan an input form to look for a minimal syllable, then place the diminutive morpheme and make the necessary adjustment to get the output. In OT, this operational analysis is not needed since constraints apply on output forms in a non-serialist way. On the empirical level, Lasri assumes, without proving it, that the language has long vowels. In addition, saying that the diminutive is placed after the first syllable of the base gives the wrong output form as all bases on the pattern CCəC will surface as [CəCCi], unless recourse is made to some ad hoc mechanism to avoid that, a fact which is conspicuous from Lasri's analysis.

In the rest of this chapter, we offer an alternative analysis couched within the OT framework and show to what extent it is far better than the approaches undertaken in 3 and 4 above. But before doing that, let us consider the issue related to the cluster of consonants that diminutive forms start with as well as the process of labialization because of their key role in the understanding of how the diminutive formation works in CMA.

4. ON THE NEED FOR THE CONSTRAINT INITIAL-CC

The assumption underlying the present work is that the diminutive morpheme consists of the vowel [-i-] and the feature [+round]. The vowel is affixed after the second segment of the base while the feature [+round] hooks up to a word-initial dorsal consonant or a geminate labial. The legitimate question one could ask is why the diminutive affix is placed after the second segment of the base. To answer this question, recall that the regular cases of schwa epenthesis is for the schwa to be placed after the second segment of a CCC sequence in order to align the right edge of the stem with the right edge of a prominent syllable (see chapter two for details). The exception comes from nouns where the schwa, in some cases, shows up before the second consonant if its sonority value is greater than that of the third consonant.

Given the fact that the diminutive morpheme is a full vowel, it can be placed only after the second consonant to yield the correct output. Consider the possible candidates of an input such as /blγ-a, i/. The /i/ stands for the diminutive affix which comprises also the feature [+rd], which is not germane to the argument here. The diminutive morpheme is introduced by an alignment constraint requiring coincidence of the left edge of this morpheme and the left edge of the PWd:

-5-

/blγ–a, {i, [+rd]}/	*COMPLEX	ALIGN (Dim, L, PWd, L)	DEP-IO	*Min-σ
a. b.li.γa		**!		*
b. bli.γa	*!	**		
☞c. bil.γa		*		

The alignment constraint can never be satisfied because if we place the diminutive /i/ in initial position, we will fatally violate the constraint ONSET. Placing the morpheme after the initial segment of the base seems to be the closest location possible to the left edge of the PWd. This is exactly the case with candidate 5c which is wrongly predicted to be the optimal candidate. The real optimal candidate is 5a and is ruled out in 5 because it incurs a fatal violation of ALIGN (Dim, L, PWd, L).

Assuming that the diminutive morpheme must be aligned with the right of the PWd would give the correct output candidate:

-6-

/blγ-a, {i, [+rd]/	*COMPLEX	ALIGN (Dim, R, PWd, R)	DEP-IO	*Min-σ
☞a. b.li.γa		**		*
b. bli.γa	*!	**		
c. bil.γa		***!		

The candidates that best satisfy ALIGN (Dim, R, PWd, R) are 6a and 6b. But only 6a is retained; 6b is excluded on the ground that it violates *COMPLEX. Note also that the only candidate whereby ALIGN (Dim, R, PWd, R) is satisfied is one that suffixes the diminutive morpheme, giving rise to a form such as *[bəlγay] which is excluded because it violates IDENT-IO [cons] (i.e. the input vowel morpheme loses its moraic status and is realized as a glide).

With a quadrisegmental root, the alignment constraint in 6 would decide in favor of the form that suffixes the diminutive morpheme and epenthesizes a schwa between the second and third consonants of the base. Consider some output candidates from an input such as /mħbq, i/:

-7-

/mħbq, {i, [+rd}/	*COMPLEX	ALIGN (Dim, R, PWd, R)	DEP-IO	*Min-σ
a. m.ħi.bəq		***!	*	*
b. miħ.bəq		****!	*	
c. məħ.biq		*!	*	
d. mħi.bəq	*!	***	*	
☛e. m.ħəb.qi			*	*

Given the constraints in this tableau, the optimal output is candidate 7e, a form that does not correspond to the actual output [m.ħi.bəq]. This form incurs two violation marks of ALIGN (Dim, L, PWd, L) and three of ALIGN (Dim, R, PWd, R). This points to the fact that other constraints, which play a major role in deciding among the output candidates, are missing. Nevertheless, we will assume ALIGN (Dim, L, PWd, L) to be the right constraint since it allows for a better analysis for both trisegmental and quadrisegmental bases.

To account for diminutive formation in CMA, we propose a constraint dubbed INITIAL-CC which has the effect of forcing the diminutive affix in 7 (as well as other affixes as will be seen below) to be placed after the initial CC sequence of the base. This constraint is given in 8 below:

-8-

INITIAL-CC

Words must begin with two consonants.

This constraint predicts that words must begin with complex onsets, a fact which points out that this constraint must be ranked below *COMPLEX. The constraint INITIAL-CC is operative in a number of morphological categories in CMA other than the diminutive as could be seen in the examples below:

-9-

a. The plural

Singular	*Plural*	*Gloss*
kəlb	klab	dog
ktəf	ktaf	shoulder
STəl	STula	bucket
qərd	qruda	monkey
ktab	ktuba	book

b. Adjective formation

Noun	*Adjective*	*Adj. Gloss*
k^wbəR	kbir	old
Sγ^wəR	Sγir	young
DRafa	DRiyyəf	nice
smuniyya	smin	fat
lTafa	lTif	nice

c. Verb derived from adjective

Adjective	*Verb*	*Vb Gloss*
kħəl	kħal	darken
byəD	byaD	whiten
smin	sman	become fat

zRəq	zRaq	become blue
Smək	Smak	become deaf

d. Deverbal nouns

Verb	*Noun*	*Vb Gloss*
DRəb	DRib	hit
qtəl	qtil	murder
nʕəs	nʕas	sleep
fiq	fyaq	wake up
nuD	nwad	get up

The vowel in the items in the middle column is morphemic since it marks the morphological category. It is placed after the second segment of the base, exactly as is the case with the vowel of the diminutive. The items in 9 as well as all the diminutive forms without exception start with a cluster of consonants and therefore satisfy the constraint INITIAL-CC.

One could possibly argue that the constraint INITIAL-CC could be dispensed with for the typological consequences it has and that its effects follow from the interaction of other universal constraints. Thus, one could say that trisegmental forms such as the ones in 9 are governed by a prosodic constraint requiring the output to consist of an iambic foot of the type LH (where L is a minor syllable) and that it is this requirement that determines the location of the morphemic vowel. Given the constraint LH, there is only one place for the plural morpheme [a] to be placed in the nominal input /klb/; it is after the second segment of the base to get the correct output [klab]. If on the other hand, the plural morpheme is placed after the first segment of the base, the output obtained is the ungrammatical *[kaləb], a form that violates LH. Finally another alternative position would be for the plural morpheme to be suffixed to the base; the result that would be obtained is the ungrammatical plural *[kəlba][1], a form that also violates both LH and INITIAL-CC.

Assuming a constraint of the type LH does not solve the problem of the morpheme location in other morphological categories such as the diminutive which is the main focus in this chapter. As shown in the data in 1 above, bases with one major syllable always surface with two major syllables. Thus, for example, the input /klb, i/ never surfaces as *[k^wlib], that is a minor LH

[1] The ungrammatical plural form *[kəlba] should be kept different from the output [kəlba] 'bitch', where the final vowel stands for the feminine suffix.

foot. Such a form, as it will be shown in the sections to come, does not conform to the required foot of the diminutive which is either a true iambic foot of the type LH as in [TbiSil] and [bririd], or an iambic foot of the type LL as in [k^{w}liyyəb] and [kwira]. Since LL is a possible foot type in bases with one major syllable, one could wonder why a form such as *[k^{w}iləb] is ruled out despite the fact that it is a foot of the type LL. The answer comes from the constraint INITIAL-CC. The form *[k^{w}iləb] is ruled out not because of the prosodic requirement on foot type but because the diminutive morpheme is not placed after an initial CC sequence.

Quadrisegmental bases show the same behavior as trisegmental bases such as [kəlb]. If it were only a question of foot structure, we would expect an input such as /mħbq, i/ to surface as [məħbiq], a form that corresponds to a true iambic foot of the type LH. But since this output form does not place the diminutive morpheme after an initial CC sequence, it fails exactly because of the constraint INITIAL-CC.

Assuming that the output of the diminutive forms is governed by a prosodic constraint requiring that they conform to an iambic foot of the type LH or LL forces the placement of the diminutive morpheme to be after two consonants and hence satisfaction of INITIAL-CC. Take for example the nouns [bəlɣa] and [məħbəq]. If the diminutive morpheme is placed after the initial consonant of the base, the results obtained are the forms *[bilɣa] and *[miħbəq] which are ruled out because they correspond neither to LH nor to LL. Given the fact that the diminutive morpheme is a full vowel, placing it after the initial consonant of quadrisegmental and suffixed trisegmental bases such as [bəlɣa] and [məħbəq] would result in an anti-iambic foot of the form HL. However, placing this morpheme after an initial cluster and therefore satisfying INITIAL-CC ensures that medial CC clusters would never arise and that the output obtained would always conform to a foot of the type LH or LL.

With the constraint INITIAL-CC in hand, we show how the diminutive output candidate [mħibəq] is selected among other candidates. As already mentioned, we assume that the diminutive morpheme must be left aligned with the PWd. This constraint must be outranked by INITIAL-CC, which in turn must be outranked by *COMPLEX. The target word must conform to a foot of the type LH in the ideal cases or else to a foot of the type LL as shown in 10:

-10-

/mħbq, i/	INITIAL-CC	ALIGN (Dim, L, PWd, L)	LH	LL
☞a. m.(ħi.bəq)		**	*	
b. (miħ.bəq)	*!	*	*	*
c. (məħ.biq)		****!		*
d. m.(ħəb.qi)		*****!	*	

Candidates 10b is excluded because it violates the constraint INITIAL-CC. Candidates 18c and 18d are also eliminated because the first places the diminutive morpheme before the final segment of the base while the second suffixes the same morpheme to the base and in so doing they incur a fatal violation of ALIGN (Dim, L, PWd, L).

To sum up, this section has tried to show the need for a constraint of the type INITIAL-CC which has the effect of forcing the diminutive morpheme (as well as other morphemes that show a similar behavior) to be placed after an initial CC sequence in order for the output to conform to an iamb of the type LH or LL. We have shown that neither the alignment constraint alone nor the constraints on foot types allow us to come up with the correct output. It is only these constraints in combination with INITIAL-CC and other constraints, which we will consider as we proceed further, that could account for the diminutive in CMA. The need for INITIAL-CC finds its justification in diminutive cases where an initial labial consonant is geminated. To these cases we shift in the next section.

5. EVIDENCE FOR INITIAL-CC

Further support for the constraint INITIAL-CC comes from cases involving labialization and gemination of the consonants [f, b, m] before [w]. In order to fully understand the process of labial gemination, prior knowledge of how labialization works in CMA is required.

5.1 <u>Labialization</u>

CMA is characterized by a set of labialized consonants which include the labials [b, f, m] and the dorsals [k, g, x, γ, q]. These consonants are subject to three types of labialization. The first type is lexical labialization and is called so because it accompanies the word in its various realizations. The second type is morphological labialization. It serves to contrast different morphological classes. The third type of labialization is referred to as phonological labialization. It is the result of the contiguity of a labial consonant and the velar [w].

If both morphological and phonological labialization are to a large extent predictable, lexical labialization is not as could be shown in the examples below:

-11-

Base	*Plural*	*Diminutive*	*Gloss*
k^wəmm	k^wmayəm	k^wmiyyəm	sleeve
k^wərsi	k^wrisi	k^wrasa	chairs
g^wəRSa	g^wRaSi	g^wRiSa	small (circular) loaf of bread
g^wəffa	g^wfaf	g^wfifa	basket
x^wzana	x^wzayən	x^wzina	tent
γ^wTa	γ^wTawat	γ^wTiwa	cover
q^wənt	q^wnat	q^wniyyət	corner

Boudlal (1998) assumes that this kind of labialization is attributed to the influence of Tashlhit Berber, and as such the phoneme inventory of CMA should incorporate both the labialized dorsals as well as their non-labialized counterparts. (For more details, see section 5.1 in chapter 1 above)

Morphological labialization, on the other hand, is associated only with the dorsal consonants and serves to mark certain morphological classes such as the diminutive and the imperative as shown in the examples below:

-12-

a.	*Base*	*Diminutive*	*Gloss*
	kəlb	k^wliyyəb	dog
	qərd	q^wriyyəd	monkey
	xruf	x^wriyyəf	a lamb
	gəmla	g^wmila	louse
	γliD	γ^wliyyəD	fat

b.	*3 sg. Perfective*	*2 sg. Imperative*	*Gloss*
	dxəl	dx^{w}əl	come in
	xrəʒ	x^{w}rəʒ	go out
	gʕəd	g^{w}ʕəd	sit down
	qtəl	q^{w}təl	kill
	tqəb	tq^{w}əb	pierce

The labialization in 12b serves to contrast the perfective and the imperative forms; the labialization in 12a indicates that the word is in the diminutive form. Both types of labialization differ from each other in that the one associated with the diminutive is unbounded and as such applies to any dorsal consonants whereas the one associated with the imperative applies only to some words with dorsal consonants. In other words, there are some words whose dorsal consonants are not labialized in the imperative. We will not pursue the argument here but for a detailed account of this kind of labialization, the reader is referred to Boudlal (1998). What is of relevance to us here is that the labialization associated with the diminutive is no more than the full realization of the diminutive morpheme which is assumed to be the vowel [-i-] and the feature [+round] (Al Ghadi 1990, Boudlal 1993). It will be seen below that labialization in the diminutive case is the result of an alignment constraint requiring that the feature [+round] be left aligned with the prosodic word, thus ensuring that any dorsal consonant occurring in word initial position gets labialized.

Also of relevance to us in this chapter is what we refer to as phonological labialization:

-13-

Singular	*Plural*	*Gloss*
baliza	*bwaləz < bb^{w}aləz	suitcases
fuTa	*fwaTi < ff^{w}aTi	towels
manTa	*mwanəT < mm^{w}anəT	blanket
musəm	*mwasəm < mm^{w}asəm	annual festival
musiqa	*mwasəq < mm^{w}asəq	music
fuqiyya	*fwaqi < ff^{w}aqi	a Moroccan gown
bulisi	*bwaləs < bb^{w}aləs	policeman

The examples in 13 show that the sequences fw, bw, mw are not allowed in CMA. Whenever such sequences arise, labialization applies to give a labialized consonant. Previous approaches to phonological labialization (see Al Ghadi 1990, El Himer 1991, Boudlal 1993, 1998) assume that words such as those in 13 are derived in two stages. After the affixation of the plural morpheme [a], the [u] of the singular forms changes into [w] to serve as an onset to the plural morpheme. The initial labial consonant then gets geminated and the [w] is realized as a secondary labial on the geminate.

It should be noted here that not all cases of a labial and [w] result in labialization. Consider the following examples where the prefix [m-] in 14a, denoting the passive participle and the preposition consonants in 14b, are attached to a verb beginning with the glide [w] without there being a labialization process:

-14-

a.	*Vb base*	*PP*	*Vb Gloss*
	wəlləf	m-wəlləf	get accustomed to
	wəlləd	m-wəlləd	assist in childbirth
	wəkkəl	m-wəkkəl	feed
	wəSSəl	m-wəSSəl	walk (someone)
	wəDDəR	m-wəDDəR	lose (something)
	wənnəs	m-wənnəs	accompany (someone)
b.	*Noun*	*Prep + Noun*	*Gloss*
	waħəd	b-waħəd	by one
	walu	b-walu	with nothing
	wad	f-wad	in a river

Within a Lexical-Phonology framework, Boudlal (1993) has shown that the domain of labialization is the first stratum. This shows why labialization fails to apply to the passive forms in stratum 2 and to the words in 14b in the postlexical stratum.

Within the OT framework, the mismatch between the data in 13 and the data in 14 could be explained by reference to domain-specific instantiations of OCP (lab) much in the spirit undertaken by Selkirk (1995b) for the analysis of Berber. Thus it could be argued that the OCP (lab) applies at the stem level only, and that at the word or phrase level, this constraint is blind to any sequence of a labial consonant and [w]. This shows that OCP_{stem} (lab) must dominate OCP_{word} (lab). The morphological composition of representative items from 13 and 14 is given in 15 below:

-15-

a. [[bwaləz]$_{stem}$]$_{word}$

b. [m[wəlləf]$_{stem}$]$_{word}$

c. b[[waħəd]$_{stem}$]$_{word}$

Since [b] and [w] are juxtaposed within the stem in 15a, the form [bwaləz] is ruled out because it violates OCP$_{stem}$ (lab). In 15b, the sequence mw occurs at the word level and as such avoids violation of higher-ranked OCP$_{stem}$ (lab). Finally the sequence bw violates none of the OCP constraints since the preposition [b-] is introduced at the phrase level.

The case of OCP constraint dealt with in the present work is the one that applies at the stem level, i.e. OCP$_{stem}$ (lab). It should be noted that this labialization does not apply in cases where a labial consonant is followed by the vowel [u], something that points out to the necessity of distinguishing [u] and [w]. Like Hammari (1996), we assume that [u] and [w] have the structure in 10 below:

-16-

a. u
|
Dors
|
Lab

b. w
|
Lab
|
Dors

The labial consonants themselves have the structures in 17:

-17-

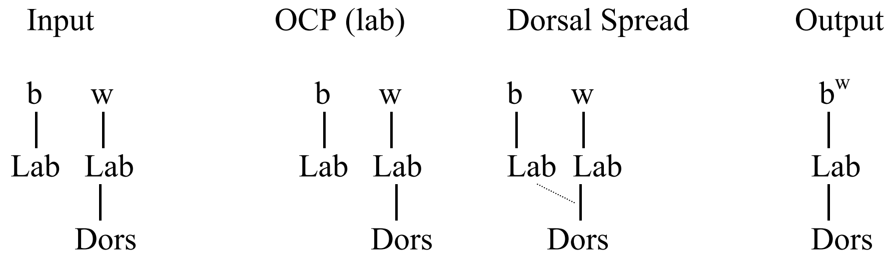
a. b
|
Lab

b. f
|
Lab

c. m
|
Lab

The representations in 16 and 17 allow us to explain why the sequence of a labial consonant and [w] are not allowed. Clearly such a sequence violates the OCP and that explains why the consonant is labialized, i.e. getting the secondary dorsal articulation. The whole picture is represented below:

-18-



The representations in 18 fairly explain how a sequence of labial consonant and [w] leads to a labialized consonant but does not explain how the resulting geminate in 13 above is obtained. In fact feature geometry cannot explain that. Suffice it to raise the problem here. It will be shown in the following subsection that gemination is the result of the constraint requiring the diminutive forms to start with two consonants.

To sum up, This subsection has raised questions that relate directly to the diminutive in CMA. It has shown that labialization in the diminutive is a consequence of realizing the feature [round], which is part of the diminutive morpheme, on an initial dorsal consonant. As to the labialization of the labial consonants, we have shown that it is the result of an OCP constraint, dubbed OCP (lab), which prohibits a sequence of a labial consonant and [w].

In the next subsection, we will consider how the labialization and gemination of the consonants [b, f, m] are achieved to satisfy the constraint INITIAL-CC.

5.2 <u>Labial Consonant Gemination</u>

As it has already been mentioned above, the labial consonants [b, f, m] are labialized and geminated before [w] in some morphological categories such as the plural and the diminutive. Consider some examples from both classes for illustration:

-19-

a.	*Singluar*	*Unattested Pl. in CMA*	*Actual Pl. in CMA*	*Gloss*
	fuTa	*fwaTi	ff^{w}aTi	towel
	fasi	*fwasa	ff^{w}asa	native to Fes
	muTuR	*mwaTəR	mm^{w}aTəR	motorcycle
	baliza	*bwaləz	bb^{w}aləz	suitcase
	manTa	*mwanəT	mm^{w}anəT	blanket

b.

Base	*Unattested Dim. in CMA*	*Actual Dim in CMA*
fuTa	*fwiTa	ff^{w}iTa
fasi	*fwisi	ff^{w}isi
muTuR	*mwiTiR	mm^{w}iTiR
baliza	*bwiliza	bb^{w}iliza
manTa	*mwiTa	mm^{w}inTa

In derivational terms, the data above show that after the affixation of the plural morpheme in 19a and the diminutive in 19b, the labial segment and the dorsal [w] are juxtaposed, giving rise to intermediate forms (the asterisked items) which are not attested in what Boudlal (1998) refers to as Southern Varieties of MA. In CMA, these forms are not attested because they violate the constraint OCP (lab) by juxtaposing two labials of the same rank (see section 5.1 above).

In the Northern Varieties of MA (cf. the variety of MA spoken in Fès, for example), labialization is almost absent, giving rise to forms such as the following:

-20-

Base	*Diminutive*	*Gloss*
faR	fwir	mouse
bab	bwiba	door
mus	mwis	knife
fanida	fwinida	candy
ma	mwiha	water

The data in 20 reveal two things. First, the constraint INITIAL-CC is not particular to a specific variety; it is observed in all the varieties of MA. Second, in varieties such as the ones in 20 the feature [+round], which is held responsible for the labialization of geminate labial consonants and dorsal consonants, does not show up; it shows up only in what is referred to as Southern Varieties of MA. (See Boudlal 1998, for details about labialization in Southern Varieties of MA)

In the present work, we assume that the diminutive morpheme consists of the vowel [-i-] and the feature [+round]. The vowel [-i-] is placed after the initial CC sequence of the base, whereas the feature [round] attaches to the initial consonant of the base if it is dorsal or labial. We assume that the feature [+round] is not realized on the labial consonants [b, f, m] when they are not geminated. That this is true is shown by cases such as [mriwa], [bniyya] and [friyyəx] whose labial consonants have not undergone labialization. The diminutive cases that show the labialization of these consonants (cf. [mm^{w}iyyəs] “knife”, [bb^{w}iyyət] “room” and [ff^{w}iyyər] “mouse”) are cases that result from the juxtaposition of the labial consonants and [w]. The gemination of the labial consonant is the result of the constraint INITIAL-CC.

The labialization of consonants to mark certain morphological classes is reminiscent of a similar phenomena in Chaha treated in McCarthy (1983) and Gafos (1998). In this language, certain morphological categories in verbs are marked by assigning the feature round to the rightmost labializable velar or labial consonant as shown in the examples below taken from McCarthy (1983:3):

-21-

Perfective 3 mas.sg.

Without object	*With 3 mas.sg. Object*	*Gloss*
dænæg	dænæg^{w}	hit
nædæf	nædæf^{w}	sting
nækæb	nækæb^{w}	find
nækæs	næk^{w}æs	bite
kæfæt	kæf^{w}æt	open
mæsær	m^{w}æsær	seem
qætær	q^{w}ætær	kill

Labialization in this language applies regardless of the distance that separates the labializable consonant from the end of the root. The scanning starts from right to left and the rightmost consonant is labialized even if it is initial. In case the word has more than one potential labializable consonants, it is the rightmost one that undergoes the process (cf. [nækæb^{w}], for example).

Within an OT framework, Gafos (1998) assumes that labialization in Chaha could be accounted for by assuming an alignment constraint which requires that the [round] feature-morpheme be aligned with the right edge of the output. For the diminutive cases in CMA, we also assume that the same constraint holds except that it applies at the left edge of the output. This constraint is stated in 22 below:

-22-

LABIALIZE (C, L, PWd, L)

The left edge of the prosodic word must be aligned with a labialized consonant.

This constraint must dominate the IDENT-IO [rd] faithfulness constraint which prohibits changing the [round] feature that exists in the input.

Having said this, an explanation of the phenomenon of labialization of dorsals and geminnate labials in the diminutives is in order. Given a base form such as [kəlba] “bitch”, Gen could produce the following output candidates:

-23-

/klb-a, {i, [+rd]}^{Af}/	LABIALIZE	IDENT-IO [rd]
☞ a. k^{w}liba		*
b. kliba	*!	

The tableau above rules out candidate 23b because it fails to realize the feature [round] which is part of the diminutive, thus incurring a fatal violation of LABIALIZE. Since [round] is part of the diminutive affix, it could also be claimed that the non-realization of this feature constitutes a violation of another constraint we state below:

-24-
MAX-IO [rd]

The feature [round] must be preserved in the input/output mapping.

Thus a form such as *[kliba] is suboptimal not only because it incurs a violation of the constraint LABIALIZE but also because it violates MAX-IO [rd], a fact which suggests that this constraint must dominate IDENT-IO [rd] as shown below:

-25-

/klb-a, {i, [+rd]}^{Af}/	MAX-IO [rd]	IDENT-IO [rd]
☞ a. k^{w}liba		*
b. kliba	*!	

However, such constraints are incapable of explaining why labialization affects only dorsal and geminate labial consonants. What would happen in a form that does not consist of a dorsal consonant? The data in 1 show that all the consonants, except the dorsal and geminate labial ones, do not labialize and as such their failure to labialize would constitute a clear violation of LABIALIZE and MAX-IO [rd]. Given an input form such as /dmʕ-a/ “tear” how do we get to the correct output [dmiʕa] without ever labializing the consonant [d]? To account for the non-labialization of [d] or [m], we assume the following markedness constraints on complex feature combination formulated à la Selkirk (1993):

-26-

$*T^w, *H^w, *B^w >> *K^w$

Each of these capital symbols in 26 stands for a whole class. Thus T^w stands for the class of coronals, H^w for pharyngeals, B^w for labials and finally K^w for dorsals. Since we do not have evidence for ranking the first three constraints in 26, we assume that the three of these dominate $*K^w$. In order to ensure that only dorsal consonants are labialized in the diminutive, we need to assume that both LABIALIZE and MAX-IO [rd] must be ranked on top of $*K^w$ and below the rest of the constraints. In the tableau below we show how the ranking $*T^w$, $*H^w$ and $*B^w$ above the constraint LABIALIZE and MAX-IO [rd] yields the correct output. Since the effect of LABIALIZE could be achieved by MAX-IO [rd], only the latter constraint will appear in the rest of the tableaux presented in this chapter:

-27-

/dmʕ-a, {i, [+rd]}^{Af}/	$*T^w$	$*H^w$	$*B^w$	MAX-IO [rd]	$*K^w$	IDENT-IO [rd]
a. d^wmiʕa	*!					*
b. dm^wiʕa			*!			*
☞c. dmiʕa				*		

This tableau shows that it is more optimal not to realize the [round] feature than to violate the higher-ranked markedness constraints. Thus, a candidate labializing any consonant other than dorsal is doomed to be ruled out

Going back to the data in 19 above, the asterisked forms are ruled out because they allow the juxtaposition of two labial consonants. We have shown that this is an instance of the OCP violation and that it is resolved by realizing the [w] on the labial consonant, thus giving rise to a labialized consonant. If this is the case, how can the gemination be explained? Clearly it can only be attributed to the constraint INITIAL-CC which demands that the diminutive morpheme (as well as other morphemes such as the plural morpheme) be placed after two initial consonants. If no consonant is available, recourse is made to the lexical default segment of the language noted as /u/.

Consider a diminutive form such as [ff^{w}iTa] from the input /fuT-a/. Within a derivational framework, the input/output mapping would possibly look something like 28:

-28-

Input:	/fuT-a/
Dim. Af.:	fuiTa
INITIAL-CC:	fwiTa
OCP (lab):	f^{w}iTa
INITIAL-CC:	f^{w}wita
OCP (lab):	f^{w}wiTa
Gemination:	ff^{w}iTa
Output:	[ff^{w}iTa]

The affixation of the plural morpheme [a] gives rise to intermediate [fuiTa] in which the base [u] loses its moraic status to serve as an onset to the diminutive vowel. The form [fwiTa], in turn, changes into [f^{w}iTa] to satisfy the constraint OCP (lab). Given the fact that the constraint INITIAL-CC is not satisfied in [f^{w}iTa], the default segment of the language (i.e. /u/) is introduced to provide a second consonant, thus resulting in a form that violates OCP (lab) (cf. *[f^{w}wiTa]). Because of the constraint OCP (lab), the language does not epenthesize /u/ to satisfy INITIAL-CC; rather it geminates the initial consonant to give the correct output form [ff^{w}iTa].

However, the analysis proposed in 28 cannot be accepted because it is operational and is therefore incompatible with the principles laid down by the OT framework. It further recognizes intermediate forms that are impossible to predict from either the input or the output.

The behavior of diminutive forms with initial geminates indicates two things: first, the constraint INITIAL-CC is essential if we are to get the optimal output. It is the constraint INITIAL-CC that forces the gemination of the base initial consonant and not the OCP (lab), a fact which indicates that the two constraints are not ranked with respect to each other. Second, examples such as the ungrammatical form *[f^wiTa] present further evidence to the ranking established in 26 which predicts that only simple dorsal consonants (i.e. K^w) are labialized. The grammatical form [ff^wiTa], on the other hand, shows that labialization of geminates does in fact occur but is restricted only to labial consonants. If we assume that the ranking concerning labialization is the same whether segments are geminates or not, then there is no way to account for initial labial geminates. For illustration, consider the competing candidates for the diminutive form of the word [fuTa]:

-29-

/fuT-a, {i, [+rd]}^{Af}/	*T^w	*H^w	*B^w	MAX-IO [rd]	*K^w	IDENT-IO [rd]
a.ff^wiTa			*!			*
☞b. ffiTa				*		

It is clear that the constraints in 29 alone cannot derive the correct output. Instead they wrongly predict that the optimal candidate is [ffiTa]. The question that needs to be addressed at this stage is the following: why is labialization allowed when the labial consonant is a geminate and disallowed when the labial consonant precedes another consonant?

To answer this question, let us assume that the morphological labialization of the diminutive is in principle available to all forms regardless of their beginning consonants and that the labialization or non-labialization of initial dorsal and labial consonants follows from the interaction of the markedness constraints in 26 above and other faithfulness constraints of the MAX family. Let us further assume that labialization is permitted with the geminate labial when this labial happens to be in onset position as it is the case with BB^w, and disallowed when the labial consonant is followed by another consonant, i.e. when it is not in onset position**.** Thinking about labialization this way, it is reminiscent of the Beckman (1998) positional faithfulness whereby certain positions are more privileged than others. In the case considered here, syllable onset positions are more privileged than other positions. This privilege can be made conspicuous by ranking MAX-Onset [rd] above MAX-IO [rd]. The whole scenario is given in 30 below:

-30-

Constraints on labialized consonants (to be revised)

$*T^w$, $*H^w$, OCP (lab) >> MAX-Onset [rd] >> $*B^w$ >> MAX-IO [rd] >> $*K^w$

Realizing the feature [round] in a surface onset must dominate the constraint against rounded labials which, in turn, must dominate the general MAX-IO [rd] constraint. With the ranking in 30 above, a labial geminate could be obtained in a straightforward manner. Thus the competing candidates for diminutive of [fuTa] are given in the following tableau:

-31-

/fuT-a, {i, [+rd]}^{Af}/	OCP (lab)	MAX-Onset [rd]	$*B^w$	MAX-IO [rd]
☞a. ff^{w}iTa			*	
b. fwiTa	*!	*		*
c. ffiTa		*!		*

Notice that a form such as [f^{w}iTa] is ruled out because it does not satisfy the constraint INITIAL-CC, something that argues for ranking this constraint above MAX-Onset [rd]. The pair *[f^{w}iTa]/[ff^{w}iTa] presents the first piece of evidence that INITIAL-CC must be undominated. It also shows that the labialization of labial consonants in the diminutive is of course driven by the constraint OCP (lab) forcing any sequence Bw to be realized as B^w.

The ranking in 30 can also account for the non-labialization of a labial consonant when it is not in onset position. Thus a word such as [bəSla] is realized in the diminutive as [bSila] and not *[b^{w}Sila]. Both candidates violate MAX-Onset [rd] and MAX-IO [rd] but *[b^{w}Sila] is ruled out because the labialization of the labial consonant incurs a fatal violation of $*B^w$. Trying to keep [round] in a surface onset would incur the undominated constraint $*T^w$. So the optimal candidate is the one that does not realize the [round] feature on any of the initial consonants.

Next, let us see if the ranking in 30 could account for the non-labialization of a simple labial consonant in onset position. Thus, in the diminutive form of a word such as [dəmʕa], the consonant [m], which serves as an onset to the diminutive vowel [-i-], must be labialized and as such should surface as *[dm^{w}iʕa] given the constraints already stated:

-32-

/dmʕ-a, {i, [+rd]}^{Af}/	*T^w	*H^w	OCP (lab)	MAX-Onset [rd]	*B^w	MAX-IO [rd]
a. dmiʕa				*!		*
☛b. dm^wiʕa					*	
c. d^wmiʕa	*!			*		

It is evident that these constraints, and consequently their ranking, cannot generate the correct output. By virtue of higher-ranking MAX-Onset [rd], they predict that any labial consonant, whether it is simple or geminate, should be labialized. The example in 32 shows that in order to account for the non-labialization of a labial consonant and its labialization when it is a geminate, we need in addition to the constraints in 26 other markedness constraints that apply to labialized geminates. These constraints are given in 33 below:

-33-

*TT^w, *HH^w, *KK^w >> *BB^w

We do not have evidence as to the ranking of the first three constraints and as such we assume that they must not be ranked with respect to each other and that the three of them must dominate the constraint *BB^w, given the fact that a labial geminate occurs in CMA. Incorporating markedness constraints on labialized geminates obviates the need to make recourse to the MAX-Onset [rd] constraint. All we need to account for the (non)labialization of dorsal and labial consonants (geminates and non-geminates) are the markedness constraints in 26 and 33 along with the OCP and the MAX-IO [rd] faithfulness constraint. Since both B^w and KK^w never surface in the diminutive while BB^w and K^w do, it follows that the constraint *B^w and KK^w must dominate MAX-IO [rd] which in turn must dominate *BB^w and K^w as shown in 34:

-34-

Constraints on the labialized consonants in CMA

*T^w , *H^w , OCP (lab) >> KK^w, *B^w >> MAX-IO [rd] >> BB^w, *K^w >> IDENT-IO [rd]

With this ranking, let us see how the diminutive form of [dəmʕa] is obtained:

-35-

/dmʕ-a, {i, [+rd]}^{Af}/	OCP (lab)	*B^{w}	MAX-IO [rd]	BB^{w}	IDENT-IO [rd]
☞a. dmiʕa			*		
b. dm^{w}iʕa		*!			*

The ranking shows that a non-geminate labial consonant never surfaces even if it is in onset position as wrongly predicted in 30 above. When this labial consonant is a geminate, the [round] feature reemerges as a result of lower-ranking BB^{w}. Consider the different candidates of the diminutive form of [fuTa] for illustration:

-36-

/fuT-a, {i, [+rd]}^{Af}/	OCP (lab)	*B^{w}	MAX-IO [rd]	BB^{w}	IDENT-IO [rd]
☞a. ff^{w}iTa				*	*
b. f^{w}iTa		*!			*
c. fwiTa	*!		*		
d. ffiTa			*!		

The realization of the [round] feature on simple labial consonants in 36b leads to the violation of *B^{w} (and INITIAL-CC). This violation eliminates candidate 36b from the race to optimality. 36c is excluded because it violates OCP (lab) by juxtaposing a labial consonant and the glide [w]. Finally 36d is excluded because the feature [+rd] of the input fails to surface. Note that the optimal candidate violates another constraint against having geminates, a fact which shows that *BB^{w} must dominate *GEM.

A question that raises itself when dealing with cases presenting initial geminates is why for example dorsal consonants are not geminated in the diminutive while labial consonants are. In other words, why is [k^{w}liba] optimal, whereas *[kkilba] and *[kk^{w}ilba] are not?

The answer to this question comes from ranking KK^{w} above MAX-IO [rd] and K^{w} as the tableau below shows:

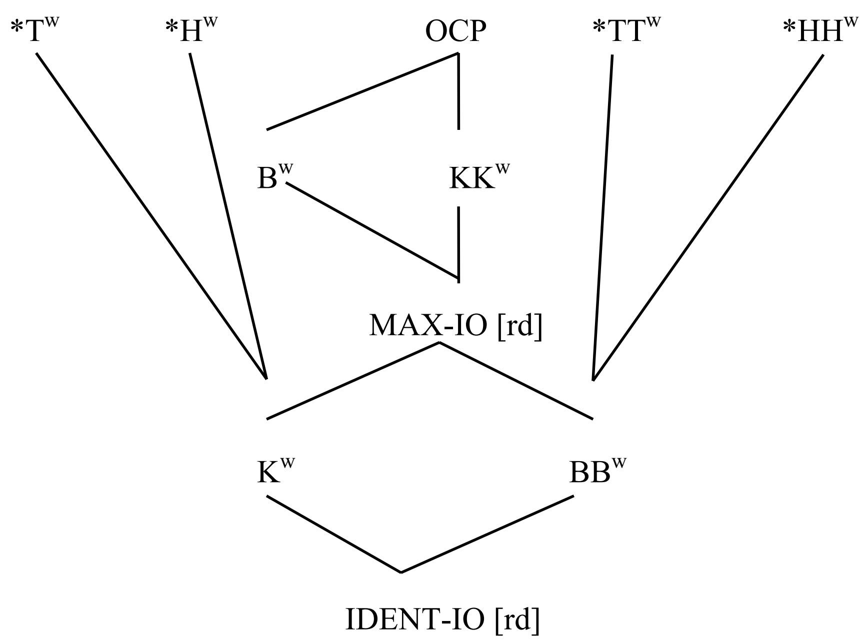
-37-

/klb-a, {i, [+rd]}^{Af}/	OCP (lab)	*KK^w	MAX-IO [rd]	K^w	IDENT-IO [rd]
☞a. k^wliba				*	*
b. kkilba			*!		
c. kk^wilba		*!			*

This tableau shows that it is more optimal to realize rounding on a simple dorsal consonant than geminate this consonant and/or labialize it as is the case with 37b and 37c. Note also that the suboptimal candidates in 31b and 37c could also be excluded because they don't conform to an iambic foot of the type LH or LL.

The final ranking responsible for the labialization or the non-labialization of dorsal and labial consonants is given in 38 below:

-38-



To sum up, this section has shown that the gemination exhibited by bases whose initial segment is labial provides support for the constraint INITIAL-CC. It has shown that words beginning with a CV, where the C stands for a labial consonant, make recourse to the default segment of the language [w] to satisfy the constraint INITIAL-CC. The juxtaposition of the labial consonant and [w] leads to the violation of OCP (lab). This violation is avoided not by the deletion of [w] but by the gemination of the labial consonant, hence the satisfaction of INITIAL-CC. It has been further shown that INITIAL-CC needs to be supplemented by markedness constraints on both simple and geminated labialized consonants as well as faithfulness constraints militating against any change that occurs in the input-output matching.

Having justified the need for the constraint INITIAL-CC, we turn in the next sections to consider diminutive formation in CMA and show how it could best be accounted for by a set of markedness constraints and their interaction or non-interaction with prosodic and faithfulness constraints. First, we consider how certain diminutive forms which do not fulfill prosodic requirements on the output are augmented to achieve this ideal shape.

6. AUGMENTED DIMINUTIVE FORMS

In this section we show how the OT framework, in general and CT in particular could account for the diminutive in CMA. It is divided into two major subsections. The first deals with the diminutive cases that are augmented by the addition of a whole syllable whose nucleus is the schwa, i.e. what is referred to as the default syllable in the language (Al Ghadi 1990). The second subsection deals with the diminutive forms that are augmented by the suffixation of the feminine morpheme [-a].

Throughout this section, it will be shown that the diminutive forms in CMA abide by a prosodic constraint which requires that the output consist of an iamb of the type LH or LL. In particular, It will be shown that bases containing one major syllable never achieve the true LH iamb; instead they proceed to augmentation to avoid what we refer to as a minor LH iamb, that is an iamb whose light syllable dominates a consonant.

6.1 Augmentation as the Addition of the Default Syllable

Having shown the utility of the constraint INITIAL-CC for an adequate account of the diminutive, let us now return to the data in 1a-e to see how the diminutive forms can be derived given the theoretical framework adopted in the present work. Representative items are given in 39 below:

-39-

Base	*Diminutive*	*Gloss*
fərx	*frix / friyyəx	bird
kəlb	*k^{w}lib / k^{w}liyyəb	dog
kas	*kwis / kwiyyəs	a (drinking) glass
wəld	*wlid / wliyyəd	boy
bit	*bb^{w}it / bb^{w}iyyət	room
sdər	*sdir / sdiyyər	chest

Recall that all the cases with one major syllable we are considering surface with two major syllables and this by building a syllable whose nucleus is the schwa. In this subsection, we will try to answer the following question: what is it that forces this augmentation? And why is augmentation located word-internally?

The answer to the above questions comes from prosody and its interaction with other constraints in the grammar. We have seen in the previous chapter that the passive participle makes recourse to u-epenthesis to achieve an iambic target of the type LH. In the case of the diminutive, augmentation targets a foot of the type LL. If this is the case, why isn't the diminutive of the bases in 39 simply [C.CVCu] with simple addition of the lexical default segment /u/. Forms having this pattern could be ruled out on the ground that they violate ALIGN-R since the right edge of the root does not correspond to the right edge of the syllable. u-epenthesis cannot apply at the left edge of the root because of ALIGN-L requiring that the left edge of the root correspond to the left edge of the PWd. Therefore, the only location for augmentation to apply is word-internally. The diminutive, like the PP, makes recourse to augmentation for prosodic purposes. While the target in the PP is achieving the ideal LH iamb, the target in the diminutive is an iamb of the type LL. This does not mean that LH iambs do not occur in the diminutive; they do but only in disyllabic and trisyllabic bases. As a matter of fact, it might be argued that the default iamb of the language is of the type LL as could be shown in the following examples. (AP stands for active participle and N. Ins for noun of instance):

-40-

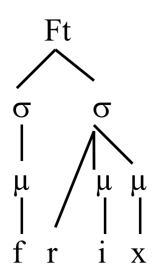
Verb	*A.P*	*N. Ins*	*Vb Gloss*
ktəb	katəb	kətba	write
DRəb	DaRəb	DəRba	hit
lbs	labəs	ləbsa	dress up
dxəl	daxəl	dəxla	come in
nʕəs	naʕəs	nəʕsa	sleep
lʕb	laʕəb	ləʕba	play
qtl	qatəl	qətla	kill
gls	galəs	gəlsa	sit down

In chapter five, we have shown that an input form such as /m-biʕ/ could give rise to the forms [məbyuʕ] and [mbiʕ],both of which correspond to an LH iamb. However, only [məbyuʕ] is a correct output. To exclude [mbiʕ], we have argued that CMA should incorporate a constraint which distinguishes between a true LH iamb and a minor LH iamb, in the same way as we have distinguished major from minor syllables.

Similarly, augmentation in the diminutive forms is achieved to avoid a minor LH iamb of the type given in 41:

-41-

Minor LH iamb



Before we show how a form such as [friyyəx] is chosen as the optimal candidate, it should be noted that the diminutive forms in 39 (and the rest of the diminutives in 1a-e above) do conform to an LL iamb in spite of the fact that the first major syllable is closed. Al Ghadi (1990), for example, assumes that the diminutive of the base [fərx] is derived as follows:

-42-

Input	frx
Dim. Affix	frix
Core syllabification	f.ri.x
Dim Prosodic Constraint	f.ri.əx
Onset filling	f.ri.yəx
Output	[friyəx]

After the affixation of the diminutive morpheme [-i-], syllabification applies to give the monosyllabic output [frix] (not counting the minor syllable of course), a form that does not satisfy the diminutive prosodic constraint which requires that the output be minimally constituted of two syllables. So another syllable has to be built to derive the correct output. For Al Ghadi (1990) the building of this syllable proceeds as follows: first a schwa is epenthesized to serve as the nucleus. Second, since onsetless syllables are not allowed in CMA, a glide is added to serve as the onset to this syllable whose nucleus is the epenthesized schwa and whose coda is the final consonant of the base.

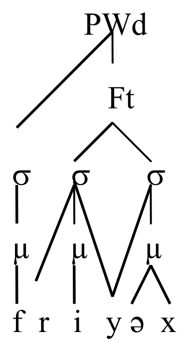
Boudlal (1993) has adopted the same analysis and assumes that [friyəx] is the form obtained at the lexical level and that the gemination of [y] to give [friyyəx] is a matter that takes place at the postlexical level in the module of phonetic implementation. The same process takes place in some cases where a glide is epenthesized for onset purposes as could be seen from 43 below:

-43-

	Singular	*Plural*	*Gloss*
a.	biru	biruwwat	office
	kilu	kiluwwat	kilo
	trikku	trikkuwwat	sweater
	ʒili	ʒiliyyat	vest
b.	Siniyya	Siniyyat	tray
	fuqiyya	fuqiyyat	a traditional gown
	ħəwliyya	ħəwliyyat	a ewe

The data above show that the glide is epenthesized to serve as an onset to the vowel-initial plural suffix [-at] or the feminine suffix [-a] in the singular form. The gemination of the epenthetic glide in 43 does not have a morphological status; it is there to regularize the pronunciation. One could wonder whether gemination is a case of off-gliding that is realized on the vowel and as such could be represented as [i^y] and [u^w]. This off-gliding is phonetically justified since it anticipates the next sound which is a glide itself. For this reason, we assume that the diminutive forms in 1a-e have the shape of an LL iamb. This could be made possible if we assume that the coda part of the geminate is not moraic and that the glide is ambisyllabic as the representation of the diminutive word [f^wriyyəx] "bird" below shows:

-44-



Having shown the need to distinguish between a minor iamb and a true iamb of the type LH as well as the need to consider the first syllable in 44 as light, let us now see how the diminutive forms in 1 could be obtained within a constraint-based framework. The analysis will proceed in such a way that only a representative item will be dealt with from each set of the items in 1 above. First, let's consider the possible candidates for an input such as /frx, i [+rd]/:

-45-

/frx, {i, [+rd]}^{Af}/	INITIAL-CC	*Min-LH	LH	LL	DEP-IO
a. (fi.rəx)	*!		*		*
b. (f.rix)		*!			
☞c. f.(riy.yəx)			*		***

Note that in 45 details about labialization have not been included. The first candidate is eliminated on the ground that it violates higher-ranked INITIAL-CC. It has made recourse to schwa epenthesis to satisfy the LL iamb. Candidate 45b is also eliminated because it violates *Min-LH. The third candidate is the optimal one in spite of the fact that it has proceeded to augmentation to satisfy LL, thus incurring three violations of DEP-IO. Note further that in all the diminutive forms, the initial syllabic consonant, which forms a minor syllable, is allowed outside the iamb. Incorporating it into foot structure would constitute a fatal violation of FT-BIN. Stating that it is not syllabic at all and that it should be included in the iamb would satisfy FT-BIN and solve the problem in words such as (f.riy$^{\mu}$.yəx$^{\mu}$) but would raise it in all non-derived trisegmental items such as (k.təb$^{\mu}$) and (kəl$^{\mu}$.b). In this work, we will continue to assume that the initial consonant in the diminutive is moraic and is associated with a minor syllable which is adjoined directly to the PWd.

Two other potential optimal candidates which are not included in 45 would be *[friyyux] and *[frixəx]. Take first the candidate *[friyyux]. Given that LH dominates LL, *[friyyux] should be chosen as optimal since it conforms to the most harmonic iamb, i.e. LH. In order to eliminate this candidate, we make recourse to the constraint DEP-u (see chapter 5) which has the effect of penalizing any cases of u-epenthesis. This constraint has to out-rank LH to avoid epenthesis in cases such as [friyyəx].

-46-

/frx, {i, [+rd]}^{Af}/	INITIAL-CC	DEP-u	LH	LL	DEP-IO
☞a. f.(riy.yəx)			*		***
b. f.(riy.yux)		*!		*	***

Notice that the ranking in 46 makes clear that INITIAL-CC must dominate DEP-u, a fact which will become clear as we proceed in the analysis.

The second candidate that competes with the actual output is *[frixəx]. It satisfies both INITIAL-CC and LL and would therefore be preferred to [friyyəx] on the ground that it incurs only one violation of DEP-IO. How is it possible to block a form such as [frixəx] from being the optimal output?

To answer this question, it should be noted that *[frixəx] has made recourse to both epenthesis and consonant spreading to satisfy the constraint LL. One way to block spreading in cases like [frixəx] is to invoke the NO-SPREAD constraint proposed by McCarthy (1997:9) and stated as follows:

-47-

NO-SPREAD $_{S1\text{-}S2}$ $(\tau,\varsigma)\tau\varsigma\tau\Re$

Let τ_i and ς_j stand for elements on distinct autosegmental tiers in two related phonological representations S_1 and S_2, where

τ_1 and $\varsigma_1 \in S_1$,
τ_2 and $\varsigma_2 \in S_2$,
$\tau_1 \Re \tau_2$, and
$\varsigma_1 \Re \varsigma_2$

if τ_2 is associated with ς_2,
then τ_1 is associated with ς_1.

The version of the NO-SPREAD constraint we will be using for CMA diminutives is one that relates a mora and a consonant. Thus NO-SPREAD (μ, C) prohibits the spreading of a consonant, resulting in the gain of new association lines. This constraint was originally proposed by McCarthy (1997) to account for the non-spreading of the consonant [t] in the singular/plural mapping [xaatam]/[xawaatim] instead of the unattested form *[xataatim], which violates NO-SPREAD (μ, C). What the classical Arabic example shows is that the epenthesis of [w] is better than the spreading of [t]. Likewise in the CMA diminutive cases, adding a whole syllable is more highly valued than spreading the final consonant and then epenthesizing a schwa to satisfy LL. In the tableau below we show how [friyyəx] wins over *[frixəx]. Since spreading a mora leads to the satisfaction of LL and LH (cf. *[frixux], for example), it follows that NO-SPREAD (μ, C) has to dominate both LH and LL in order to derive the correct output as shown in 48:

-48-

/frx, {i, [+rd]}^{Af}/	DEP-u	NO-SPREAD (μ, C)	LH	LL	DEP-IO
☞a. f.(riy.yəx)			*		***
b. f.(ri.xəx)		*!	*		*
c. f.(riy.yux)	*!			*	***

Notice that the [+rd] feature has not been realized in the above form because the first consonant is not dorsal or geminate labial. We have shown that labial consonants are labialized under special circumstances, i.e. when they are geminated. Note also that forms such as *[friyyix] and *[frixix] are also excluded although they conform to an iambic foot of the type LH. The reason is that they epenthesize another root vowel node which is filled out with a copy of the diminutive vowel. This epenthesis incurs a violation of DEP-V, which bans epenthesis of full vowels. (On the need to separate DEP-V and DEP-ə, see chapter five, section 4.2)

Now, consider another example whose first consonant is dorsal. The tableau below exposes the different candidates for the input
/klb, {i, [+rd]}^{Af}.

-49-

/klb, {i, [+rd]}^{Af}/	NO-SPREAD (μ, C)	INITIAL-CC	DEP-u	LH	LL	DEP-IO
☞a. k^w.(liy.yəb)				*		***
b. k^w.(li.bəb)	*!			*		*
c. (k^wi.ləb)		*!		*		*
d. k^w.(liy.yub)			*!		*	***

Candidate 49b has achieved the LL iamb by geminating the final consonant of the base, thus causing a fatal violation of NO-SPREAD (μ, C). Candidate 49c does not conform to an LH iamb and is still an iamb of the type LL exactly like the optimal candidate. But it is excluded for violating the constraint INITIAL-CC. Finally, 49d is eliminated for having made recourse to u-epenthesis to achieve an LH foot type.

Next, consider inputs whose second segment is a vowel. These include all the forms in 1d and 1e above. They all show augmentation by the addition of a whole syllable whose nucleus is the schwa. Two remarks need to be made about these diminutives. First, if the base first segment is a labial consonant, the diminutive form surfaces with a labialized geminate. The labialization is the result of the juxtaposition of [w] and the labial consonant of the base and this to avoid gratuitous violation of the constraint OCP (lab). As to the gemination it is dictated by the requirement that the diminutive start with two consonants in respecting the constraint INITIAL-CC. But where does the [w] that causes labialization come from? Is it the realization of the [+rd] feature-morpheme or is it some other segment that is epenthesized there whenever the language needs one? Second, if the base second segment is a vowel, it is consistently replaced by the diminutive [-i-], a case of melodic overwriting (McCarthy and Prince 1990b).

On the basis of items such as [bit], [mus] and [RaS] (cf. the examples in 1d and 1e in section 2 above) the glide [w] could be argued to be the language default segment that is epenthesized to satisfy the constraint INITIAL-CC. Given that the base second segment is a vowel, no form would obey this constraint were the base vowel to be realized. It has been shown in chapter 5 that the passive participle makes recourse to u-epenthesis to satisfy iambicity. As to the diminutives, we believe that the /u/ that shows up in the passive participle is the same as the one that consistently appears in the second position of diminutive forms whose second segment of the base is a vowel. The only difference is that the default segment /u/ in the PP retains its moraic status, whereas in the diminutive it loses this moraic status and gets realized as a glide to serve as an onset to the diminutive vowel if needed. The diminutive forms whose second segment of the base is a vowel show that ranking INITIAL-CC above DEP-u is justified in that it is this epenthesis that leads to the satisfaction of INITIAL-CC.

Consider the possible candidates obtained from an input such as /RaS, {i, [+rd]}^{Af}/:

-50-

/RaS, {i, [+rd]}^{Af}/	NO-SPREAD (μ, C)	INITIAL-CC	DEP-u	LH	LL	DEP-IO
☞a. R.(wiy.yəS)			*	*		****
b. R.(wi.SəS)	*!		*	*		**
c. (Ri.wəS)		*!	*			**
d. R.(wi.yuS)			**!			***

The base vowel in all the candidates is filled with the diminutive morpheme [-i-]. Candidate 50b is ruled out for reasons that have become clear now. The candidate in 50c has resorted to u-epenthesis. However the epenthesized /u/ is placed after the diminutive vowel to serve as on onset to the schwa syllable, thus causing a fatal violation of INITIAL-CC. Finally the candidate in 50d is ruled out because it incurs two violations of DEP-u: the first /u/ serves as the onset of the first syllable of the foot; the second as a nucleus to the heavy syllable of the same foot.

It should be noted that cases like [RwiyyəS], [kwiyyəs] and [γwiyyər], which are derived from the nouns [RaS] “head”, [kas] “a glass” and [γar] “cave”, respectively, should be treated differently from the rest of the items. As it has been shown above, the second segment of the base does not show up; it is systematically replaced by the diminutive vowel. Were the input vowel to surface, we would end up with forms such as *[Ra.iS] or *[RawiS] which violate INITIAL-CC, or *[RwawiS] which incurs two violations of DEP-u.

Other diminutives forms that deserve special treatment are output forms such as [kwiyyəs] and [γwiyyər] which are special in the sense that they present an apparent challenge to the constraint requiring the labialization of simple dorsal consonants as the tableau in 51 shows:

-51-

	MAX-IO [rd]	$*K^w$	IDENT-IO [rd]
☞a. k^w.wiy.yəs		*	*
b. k.wiy.yəs	*!		

Our constraints wrongly predict that the output is 51a rather than 51b. Clearly another constraint is at play, and it is a constraint that must outrank MAX-IO [rd].

Recall that in chapter 5, we assume that there is an OCP constraint on labials and more particularly on rounded labials dubbed *RdRd that militates against having output forms such as *[məʃwuf] instead of [məʃyuf]. It seems that it is this constraint that forces the non-labialization of [k] in the diminutive [kwiyyəs]. Further support for this assumption comes from items that have two diminutive forms: one with the labialization of the initial dorsal consonant and a syllable whose onset is the glide [y]; the other with a non-labialized dorsal consonant and a second syllable whose onset is the glide [w].

-52-

Base	*Diminutive*	*Unattested Dim.*	*Gloss*
Sγir	$S\gamma^{w}$iyyər / Sγiwwər	*$S\gamma^{w}$iwwər	small
rqiq	rq^{w}iyyəq / rqiwwəq	*rq^{w}iwwəq	thin
qSir	q^{w}Siyyər / qSiwwər	*q^{w}Siwwər	short
γ^{w}zal	γ^{w}ziyyəl / γziwwəl	*γ^{w}ziwwəl	nice
glil	g^{w}liyyəl / gliwwəl	*g^{w}liwwəl	short

When the initial consonant is labialized, the epenthesized segment is the glide [y]. The facts in 52 are reminiscent of Tashlhit Berber where two labials of the same rank are not allowed in the same word (Selkirk 1993). This is exemplified by the data below taken from Bensoukas (1999: 15):

-53-

a.	*Imperative*	*Perfective*	*Gloss*
	knu	k^{w}ni	bend
	gnu	g^{w}ni	sew
	xlu	x^{w}li	become crazy
	qlu	q^{w}li	fry

b.	*Singular*	*Plural*	*Gloss*
	taglut	tig^{w}la	oar
	taγrrust	$ti\gamma^{w}$rras	a piece (of fish)
	agru	ig^{w}ra	frog
	aγyyul	$i\gamma^{w}$yyal	donkey

These examples show that whenever the glide [w] occurs with the vowel [u], the labialized consonant loses its secondary articulation as a result of the OCP. The same phenomenon takes place in the CMA data in 52 above.

What is relevant to us here is that the non-labialization of the dorsal consonant in [kwiyyəs] is the result of a dissimilatory process that bans the occurrence of two round segments of the same rank, an instance of the OCP. The constraint *RdRd should be allowed to dominate MAX-IO [rd] to produce the correct output:

	*RdRd	MAX-IO [rd]	*K^w	IDENT-IO [rd]
☞a. k.wiy.yəs		*		
b. k^w.wiy.yəs	*!		*	*

This example shows that satisfying the OCP constraint *RdRd is more important than satisfying MAX-IO [rd] by labializing the dorsal consonant.

Before we close this subsection, it is reasonable to ask why in the case of trisegmental CCC roots, augmentation applies but u-epenthesis does not whereas in CVC roots both augmentation and u-epenthesis apply? In other words, why isn't the diminutive of [sdər] realized as *[swidər] instead of [sdiyyər]? The answer comes from ranking DEP-u above the general DEP-IO. Since [sdiyyər] does not violate DEP-u while [swidər] does, it follows that the optimal candidate is the one that satisfies INITIAL-CC with its own consonantal material without ever having to resort to epenthesis to fill in the second position.

To recapitulate, it has been shown that the diminutive forms in 1a-e proceed to augmentation by the addition of a whole syllable to avoid the minor iamb. It has also been shown that augmentation never leads to achieving an ideal iambic foot of the type LH. Instead it tries to avoid feet that would otherwise surface as minor iambs. Because of higher-ranking DEP-u and NO-SPREAD (μ, C), the only iambic foot that the diminutive form could achieve is of the type LL. Further support for our analysis comes from the diminutive forms that achieve the LL iamb through the suffixation of the feminine morpheme [-a].

6.2 Augmentation as the Feminine Morpheme Suffixation

This subsection will consider items that are totally different from the ones considered above. Up to this point we have shown that the diminutive form of nouns consisting of a single major syllable struggles to avoid a minor iambic foot and this by the addition of a whole syllable to satisfy an LL iamb. There is yet another category of nouns which proceeds to a different kind of augmentation to satisfy the iamb. These include nouns that are inherently marked for the feature [feminine] (cf. The items in 1f above):

-55-

Base	*Diminutive*	*Gloss*
wdn	wdina	ear
ʃəmʃ	ʃəmʃ	sun
zit	zwita	oil
DaR	dwira[2]	house
bənt	bnita / bniyya	girl

A look at these items shows that the diminutive has an additional final vowel, marking the feminine, which is not part of the input. Where did that vowel come from? Given the constraint system available to us so far, a noun such as [wdən] may have the following candidates in the diminutive:

-56-

	NO-SPREAD (μ, C)	INITIAL-CC	*Min-LH	LH	LL	DEP-IO
a. (w.din)			*!		*	
☞b. w.(diy.yən)				*		***
c. w.(di.nən)	*!			*!		*
d. (wi.dən)	*!	*!		*		*

The constraints we have so far seem to make the wrong prediction as to the optimal form. So, how is it possible to derive the form [wdina] instead of *[wdiyyən]?

Boudlal (1993) has shown that the lexical entries of the items in 1f (i.e. items like those in 55) are different from those in 1a-e in the sense that the former have an inherent specification for the feminine feature while the latter do not. In other words, the lexical entry of words such as [wdən] includes among other things, the phonological representation of the word, its syntactic category, diacritic features such as [feminine] and any idiosyncratic behavior. Words that are not specified for the feature feminine are simply unmarked (i.e. [ufeminine]) and acquire the [-feminine] specification by default.

[2] Notice here the deemphatization of the the consonants [D] and [R] which is triggered by the diminutive morpheme [-i-].

Therefore and in order to account for the diminutive of forms such as [wdən], we propose that the input should also include the feature [+feminine]. It is this feature that calls for the affixation of the morpheme [-a] to the base to satisfy foot requirements. In order for the feature [+feminine] to be materialized, we need a constraint that forces the suffix
[-a] to surface in words such as those in 55 (and 1f) above. This constraint could be stated as follows:

-57-

FEMININE = [-a] (henceforth FEM = [-a])

The feminine morpheme must be realized as [-a] in the output.

Satisfaction of this constraint simply means the realization of the [+feminine] feature as the vowel [-a]. Note here that this constraint is blind to all the masculine forms since the feature [+feminine] is not included in their input and that explains why they augment their bases by the addition of the default syllable. The constraint FEM = [-a] is undominated and as such should be ranked high in the hierarchy.

In the tableau below we reexamine the two competing candidates [wdina] and [wdiyyən]:

-58-

/wdn, {i, [+rd], [+fem]} ^{Af}/	FEM = [-a]	*Min-LH	LH	LL	DEP-IO
a. w.(diy.yən)	*!		*		***
☞b. w.(di.na)			*		*

Candidate 58a loses to candidate 58b because it fails to realize the [+feminine] feature which is normally associated with words that are inherently feminine.

It should be noted here that the word [bənt] listed among the items in 1f above presents a special case in the sense that it has two diminutive forms: a regular form obtained by the affixation of the feminine suffix [-a], giving the output [bnita], and another form which deletes the final [t] of the base and proceeds to the suffixation of [-a] thus giving the output [bniyya]. The glide is epenthesized to serve as an onset to a syllable whose head is the feminine suffix. Within a derivational framework, [bniyya] could be obtained as follows:

-59-

Input:	/bnt/
Dim morpheme:	bnit
Final C deletion	bni
Fem. a-suffix	bnia
Glide epenthesis	bniyya
Output	[bniyya]

Leaving aside the deletion of [t] which is really unpredictable, the example above shows that nouns which are inherently feminine take a final [-a] in order to avoid surfacing with a minor iamb. This example also shows that the constraint ONSET is observed in the language and thus never violated.

Closely related to ONSET satisfaction is a class of diminutives whose base ends up in a vowel (cf. 1g above). In 50 we repeat these examples:

-60-

a.	ʕʃa	ʕʃiwa
	γda	γdiwa
b.	mRa	mRiyya / mRiwa
	bRa	bRiyya / bRiwa
	ʃta	ʃtiwa
	ʕSa	ʕSiyya/ʕSiwa

The common characteristic among all these bases is that they all end up with the vowel [a], which is part of the base and therefore shouldn't be confounded with the feminine suffix [-a]. However, the respective diminutive of these bases is feminine (Compare this with diminutive forms in Tashlhit which are all feminine). The difference between these items is that the items in 60a are masculine (i.e. [-feminine]) whereas those in 60b are inherently specified as [+feminine]. The final [a] in 60b does not add any feature specification for gender.

The items in 60 are different from the ones considered so far in that the diminutive surfaces as disyllabic in spite of the fact that the base consists of one major syllable, and this without having to make recourse to augmentation (be it schwa syllable addition or a-suffixation).

Given a base form such as /ʕSa/, one should expect the diminutive morpheme [-i-] to be placed after the second segment of the base in conformity with the constraint INITIAL-CC. This placement causes the morpheme to be contiguous to the base final vowel, thus creating a hiatus that the language resolves by epenthesizing a glide or turning a high vowel into a glide to serve as the onset of the base final vowel.

In the tableau below, we show how [ʕSiyya] wins over two other candidates:

-61-

/ʕSa, {i, [+rd]}^{Af}/	INITIAL-CC	*Min-LH	LH	LL	DEP-IO
☞a. ʕ.(Siy.ya)			*		**
b. (ʕəS.ya)	*!		*		*
c. (ʕi.Sa)	*!		*		

The items in 60 above also present a special case in as far as ONSET satisfaction is concerned. It is known that in the case where a glide needs to be epenthesized, this glide needs to share the features of rounding with the immediately preceding vowel. If the preceding vowel is [i], the epenthesized glide is [y]; otherwise it's [w]. Such is not always the case as the items in 41 show in spite of the fact that the diminutive form of some items such as [ʕSa] shows an option between [y] and [w].

To sum up, we have shown that CMA diminutive proceeds to augmentation to avoid a minor iambic foot by suffixing the feminine morpheme [-a] to bases that are inherently specified as [+feminine]. We have also shown that this augmentation is not necessary in bases whose final vowel is [a] which should be distinguished from the feminine suffix [-a]. For these cases we have argued that iambicity follows from the interaction of constraints, namely the need to satisfy ONSET, an undominated constraint in the language.

7. UNAUGMENTED DIMINUTIVE FORMS

These include the diminutive forms of disyllabic bases (1h-j) and trisyllabic ones (1k,l). Consider representative examples given in 62 below:

-62-

	Base	*Diminutive*	*Gloss*
a.	bəlγa	bliγa	oriental (women's) slippers
	TəbSil	TbiSil	plate
	sarut	swirit	key
	SəBBaT	SBiBiT	a pair of shoes
b.	limuna	lwimina	an orange
	hiDuRa	hwiDiRa	sheepskin
	nəwwaRa	nwiwiRa	flower

The diminutive forms in 62 do not undergo any augmentation because they already satisfy the constraint on iambicity and as it has been shown, augmentation is achieved for the sole purpose of avoiding a minor iamb.

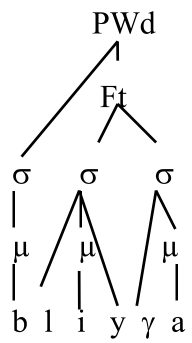
In the constraint tableau 63, we present some of the diminutive forms obtained from the base [bəlγa]:

-63-

/blγ-a, {i, [+rd]}^{Af}/	INITIAL-CC	*Min-LH	LH	LL	DEP-IO
☞a. b.(li.γa)			*		
b. (bil.γa)	*!		*	*	
c. b.(liy.γa)			*		*!

Although candidate 63a cannot achieve the true LH iamb, it is optimal because it conforms to a LL iamb, something the other candidates could not achieve. In placing the diminutive vowel after the first segment of the base, candidate 63b has violated the constraint INITIAL-CC as well as iambicity. Finally candidate 63c has proceeded to glide epenthesis causing a fatal violation of DEP-IO. However, it should be noted that a form such as [bliyγa] is a possible alternative output and it does conform to an LL iamb given the fact that the glide here is not moraic as shown in 64:

-64-

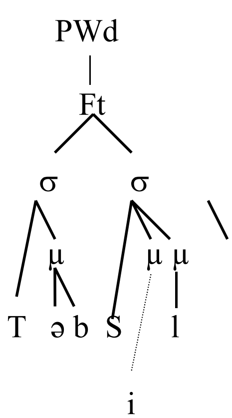


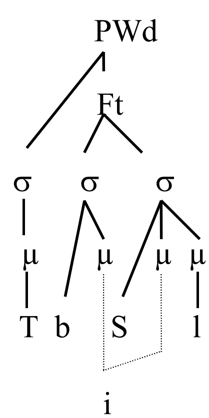
The structure above reflects a phenomenon that relates to regional variation. Generally, rural varieties epenthesize a glide whereas in the rest of MA varieties, the diminutive form obtained is identical to the output form in 63 above.

The next class of disyllabic bases we will consider is that of cases whose prefinal segment is the vowel [i] or [u], i.e. cases that contain what Al Ghadi (1990) calls Class I derivational affixes. These affixes are systematically replaced by the diminutive vowel [-i-] as a result of melodic overwriting.

The base/diminutive mapping is shown below for [TəbSi]/[TbiSil]:

-65-





The output of the diminutive here is a true LH iamb; the initial minor syllable is adjoined to the prosodic word since it cannot form a foot on its own as this would constitute a violation of the constraint FT-BIN. The tableau in 66 presents some candidates obtained from the input /TbSil/:

-66-

/TbSil, {i, [+rd]}^{Af}/	INITIAL-CC	*Min-LH	LH	LL	DEP-IO
☞a. T.(bi.Sil)				*	
b. (Tib)(Sil)	*!		*	*	
c. T.(bi.Səl)			*!		*

The candidate in 66b is ruled out for violating INITIAL-CC. The placement of the diminutive morpheme after the first segment of the base has created a situation where we have two contiguous heavy syllables, thus incurring a violation of both LH and LL. The candidate in 66c is ruled out because it does not conform to an LH iamb as the optimal candidate does. 66c can also be ruled out because the diminutive morpheme fails to spread to the final V-position that is occupied by the [i] in [TəbSil], thus violating MAX-V. Notice further that a potential candidate such as [TwibSil] is ruled out on the ground that it has resorted to u-epenthesis to satisfy INITIAL-CC. In the following tableau, we show how [TbiSəl] and [TwibSil] are ruled out in favor of [TbiSil]. We Assume that MAX-V and DEP-u are not ranked with respect to each other.

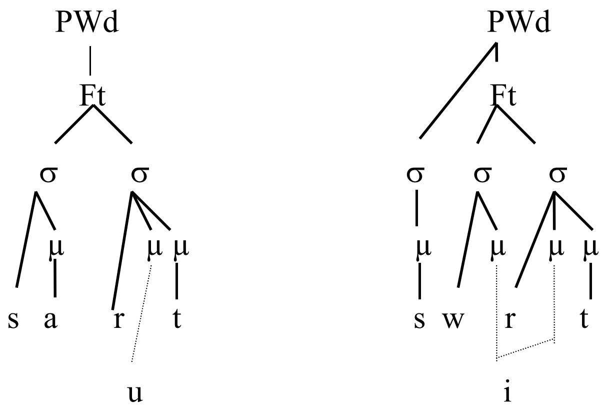
-67-

/TbSil, {i, [+rd]}^{Af}/	MAX-V	DEP-u	LH	LL	DEP-IO
☞a. T.(bi.Sil)				*	
b. T.(wib)(Sil)		*!	*	*	
c. T.(bi.Səl)	*!		*		*

Both candidates 67b and 67c are ruled out for different reasons: 67b is ruled out because it has resorted to the epenthesis of /u/ (realized as a glide in onset position), thus violating DEP-u; 67b is ruled out because it has deleted a vowel of the input, causing a fatal violation of MAX-V. In addition to these two constraints, both candidates can be eliminated on the ground that their prosodic shape does not conform to an LH iamb.

Similarly disyllabic bases whose prefinal segment is the vowel [u] behave in the same way as words like [TəbSil]. For illustration, consider the structures of the pair [sarut] / [swirit] given in 68 below:

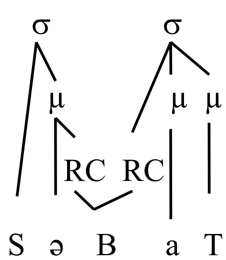
-68-



In the diminutive, the base vowel [a] is not realized because of the constraint INITIAL-CC. It has already been shown that whenever the base second segment is a vowel, it fails to show up in the output form but its position is filled in with the diminutive vowel. Given that these bases do not start with a cluster of consonants, recourse is made to the default segment /u/ (realized as the glide [w]) to satisfy INITIAL-CC.

The final cases of disyllabic diminutives we will consider are those in 1j above where the diminutive morpheme [-i-] splits up the geminate. Adopting the Two-Root Theory of geminates (Selkirk 1990, 1991), a word such as [SəBBaT] has the representation in 69 below:

-69-



In the following tableau, we consider some possible candidates from the input /SBBaT/. To rule out any candidate deleting a root consonant, we need the constraint MAX-RC which ensures that all root consonants of the input appear in the output. This constraint along with MAX-V need to be undominated:

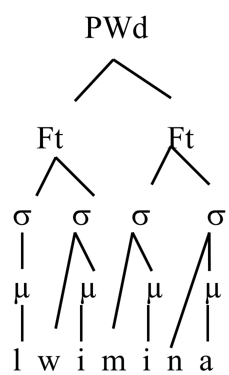
-70-

/SBBaT, {i, [+rd]}^{Af}/	MAX-V	MAX-RC	LH	LL	DEP-IO
☞a. S.(Bi.BiT)				*	
b. S.(Biy.yiT)		*!		*	**
c. S.(Bi.BəT)	*!		*		*

The candidate in 70b has resorted to glide epenthesis at the expense of a root segment, causing fatal violation of MAX-RC. The candidate in 70c is also ruled out because the base prefinal vowel-position, which is supposed to be filled out by the diminutive [-i-], is deleted, thus causing violation of MAX-V.

Trisyllabic bases do not need any other constraints; their diminutive forms can be obtained much in the same way as those of disyllabic ones. The only difference is that the output of the diminutive of trisyllabic bases consists of a minor LL iamb followed by an LL iamb as could be seen in 71 below:

-71-



The output in 71 differs from any other output considered so far. We have shown that all the augmented forms correspond to an iamb of the type LL preceded by a minor syllable which cannot form a foot on its own given the constraint FT-BIN. In disyllabic bases, the diminutive may consist of an LL iamb preceded by a minor syllable or an LH iamb preceded by a minor syllable depending on whether or not the input contains one of the affixes [-i-] and [-u-] found in [TəbSil] and [sarut], respectively. The diminutive of trisyllabic bases is consistently an LL iamb preceded by a minor LL iamb where the first light syllable is minor. Trying to decrease the number of syllables in a word such as [limuna] would result in the diminutive form [lmina] which incurs a fatal violation of MAX-V. This prohibition against deletion constitutes strong evidence for the undominated nature of MAX-V.

The tableau below gives some candidates obtained from the base [limuna]:

-72-

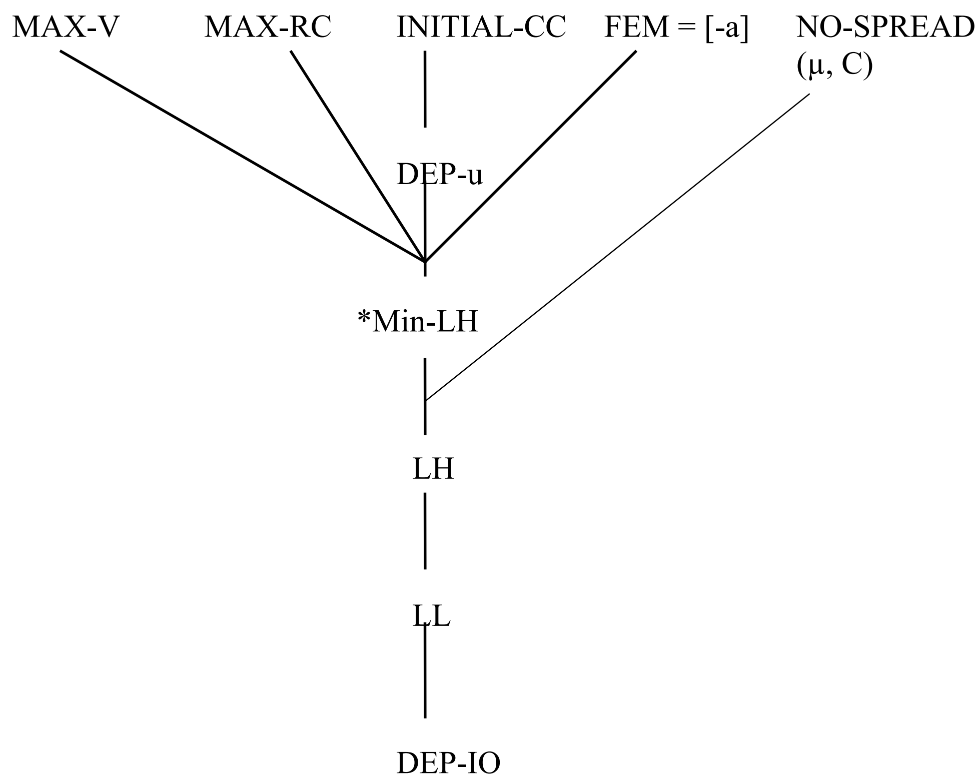
/limun-a, {i, [+rd]}^{Af}/	MAX-V	INITIAL-CC	DEP-u	LH	LL	DEP-IO
☞a. (l.wi)(mi.na)			*	*		
b. li.(mi.na)		*!		*		
c. l.(wim.na)	*!		*	*	*	
d. l.(mi.na)	*!					

Candidate 72b is ruled out because it violates INITIAL-CC. The one in 72c is also ruled out because the spreading of the diminutive affix, which is supposed to fill the position that used to be occupied by the base vowel [u], fails to apply, thus leading to the violation of MAX-V and LH and LL iambs. Finally, even if candidate 72d conforms to an iamb of the type LL, it is eliminated because it incurs a fatal violation of MAX-V.

Trisyllabic bases consisting of a geminate behave like disyllabic ones with regard to diminutive formation. Given the Two-Root Theory of geminates mentioned above, the diminutive vowel is expected to be placed between the first and the second part of the geminate and spread to any other position to its right.

To recapitulate, the constraints needed to account for the diminutive in CMA are ranked in 73 below:

-73-



Note that these constraints need to be complemented by the markedness and faithfulness constraints presented in 38 above and which are responsible for the labialization or non-labialization of initial consonants in the diminutive form.

To sum up, disyllabic and trisyllabic bases present further evidence for the interaction of prosodic and faithfulness constraints. Disyllabic cases have been found to conform to a foot of the type LH or LL with the initial syllabic consonant lying outside the iamb. As to trisyllabic cases, they all consist of a sequence of two LL iamb with the first syllable being minor. In both disyllabic and trisyllabic cases, it has been shown that the diminutive forms do not resort to augmentation because they already meet the required shape.

8. CONCLUSION

In this chapter, we have provided an OT account of diminutives in CMA. We have shown that in order to provide an adequate account of this morphological class, reference has to be made to prosody and its interaction with other constraints in the grammar. In particular, we have shown that the diminutive abides by a prosodic constraint which requires that the output conform to an iambic foot of the type LL or in the ideal cases LH. In order to achieve this prosodic requirement, certain forms augment their bases. The augmented cases considered are of two types: those that proceed by the addition of the language default syllable for masculine nouns, and those that suffix the feminine morpheme [-a] to nouns which are inherently specified as [+feminine]. In both cases, we have argued that augmentation never leads to the most harmonic LH iamb; instead, it is undertaken in order to avoid a minor LH.

We have also considered the process of labialization in its relation with the diminutive. We have shown that only dorsal consonants and labial geminates occurring in initial position are labialized and that their labialization follows from the constraint requiring the alignment of a labialized consonant with the left edge of the prosodic word and the need to satisfy MAX-IO [rd]. We have argued that the underapplication of labialization to the rest of the consonants (including simple labial consonants) results from the interaction of markedness constraints on simple labialized consonants and faithfulness constraints such as MAX-IO [rd] and IDENT-IO [rd]. We have shown that the failure of these consonants to labialize follows from ranking the constraints prohibiting labialized coronals, pharyngeals and simple labials above MAX-IO [rd] and below the constraint prohibiting labialized dorsals and geminate labials. Also, we have shown that the gemination of the labial consonants follows from the combination of INITIAL-CC, the OCP (lab) and markedness constraints on geminated labials.

Conclusion

Throughout this dissertation, we have tried to show that the framework of OT and CT is the most appropriate for the treatment of syllable structure and stress as cases related to CMA prosodic phonology, and the treatment of the nisba adjective, the causative, the passive participle and the diminutive as cases related to CMA prosodic morphology. It has been argued that this framework allows for a better understanding of these cases in terms of the interaction of constraints pertaining to Universal Grammar and ranked on a language-specific basis. Constraint interaction takes the form of conflict. It has been shown that lower-ranked constraints are allowed to be violated for the sole purpose of securing higher order constraints which determine the optimal shape of the output.

In dealing with CMA syllable structure, we have established a distinction between a minor syllable, which consists of a moraic consonant, and a major syllable, whose nucleus is the schwa or one of the full vowels of the language. Minor syllables arise to avoid fatal violations of the constraint *COMPLEX, prohibiting branching onsets and codas. Granting a syllabic status to minor syllables allows for the satisfaction of FT-BIN, particularly in nonderived trisegmental lexical words having the pattern CCV, CCəC and CəCC, and where the first consonant of the initial cluster in CCV, CCəC and the second consonant of the final cluster in CəCC are associated to a minor syllable. Furthermore, the analysis offered in this work has enabled us to come up with an explanation to the problematic cases of schwa epenthesis while still maintaining our predecessors' claim that the schwa in nouns, but not verbs or adjective, is dependent on the sonority of the surrounding consonants. In particular, it has been shown that the placement of the schwa before the final consonant in nonderived trisegmental verbs and adjectives derives from the constraint ALIGN-R (Vb/Adj, σ′), requiring stem-prominent syllable right-alignment, thus giving rise to an iambic foot type. This verb- and adjective-specific alignment constraint must rank higher than the general stem-prominent syllable right-alignment constraint ALIGN-R-σ′, needed to account for iambicity in nouns, verbs and adjectives. In both cases, a minor syllable can never appear in a prominent position because of the undominated constraint *Min-σ′. In order to account for nominal schwa syllabification, we have had recourse to a set of markedness constraints favoring schwa syllables with a higher sonority coda. Because these markedness constraints are noun-specific, they must rank higher than the general stem-prominent syllable right-alignment constraint in order to account for nominal cases on the pattern CəCC, where the schwa is epenthesized before the second consonant, thus leading to a noun whose right syllable is minor.

Another issue related to syllable structure concerns cyclic syllabification, which necessitates recourse to a type of faithfulness involving two output forms. It has been shown that cyclic syllabification is not warranted on both theoretical and empirical grounds. Theoretically, a cyclic account is operational in that an input form has to pass through different intermediate stages before reaching the final stage of phonetic realization. Empirically, a cyclic account of syllabification makes the wrong predictions in certain cases involving affixation of an object clitic to the verb stem. The analysis that has been proposed in this work is more powerful in that it derives the effect of cyclic syllabification without having to refer to intermediate stages, and this by a set of O-O constraints much in the spirit proposed in Basri et al. (1998) and Selkirk (1999). In order to account for the asymmetry between cases of affixation to the stem and affixation to the word exhibited in forms such as [DRəbt] and [DəRbək], we have proposed two different types of O-O faithfulness to prosodic edges: $O\text{-}O_{stem}$ ANCHOR (σ, σ, Initial) and $O\text{-}O_{word}$ ANCHOR (σ, σ, Initial). We have shown that $O\text{-}O_{stem}$ ANCHOR (σ, σ, Initial) must dominate $O\text{-}O_{word}$ ANCHOR (σ, σ, Initial) in order to account for faithfulness to the base stem [D.Rəb] in the derived output [D.Rəb.t], which does not epenthesize a schwa before the subject suffix, and lack of faithfulness to the stem exhibited by the output form [DəR.bək], which epenthesizes a schwa before the object suffix. Finally, we have further shown that the constraint $O\text{-}O_{stem}$ ANCHOR (σ, σ, Initial) is never violated except when the higher order markedness constraints ONSET and *COMPLEX are at stake.

The model of O-O correspondence adopted in this work has been tested to see if it can account for the formation of the causative and a class of nisba adjectives whose bases undergo truncation. We have argued that the truncation witnessed in nisba adjectives derived from compound nouns and nouns with the affixes [(ʔ)a-] and [ta-...-t] is not prosodically motivated and therefore does not require recourse to an O-O constraint relating a base and the truncated form or any other constraint limiting the prosodic size of its output. We have instead argued that in order to explain the truncation seen with these nisba adjectives, we need both markedness constraints and affixational ones. In particular, we have shown that truncation follows from ranking *[N + Adj]$_{PWd}$ along with the affixation constraint AFFIX-TO-N$_{stem}$ and the alignment constraint ALIGN-Nisba-R above the constraint MORPH-REAL, thus forcing deletion of the leftmost stem in compounds and the nominal affixes [ta-...-t] and [ʔa-] in nouns designating localities. As to the causative form, we have shown that the analysis appealing to prosodic faithfulness to some designated syllable edge is inadequate in that it fails to account for bases on the pattern /CVC/ and also to block long distance consonantal spreading, whereby it is the third and not the second segment of trisegmental bases which is geminated. We have instead proposed, following Imouzaz (forthcoming), to analyze the causative in terms of O-O correspondence constraints relating a base and its reduplicant. We have also argued for the prosodic nature of the causative by showing that the output always conforms to an iambic foot consisting of a sequence of two light syllables, a fact which blocks total reduplication.

In order to provide a thorough understanding of the stress system of CMA, we have judged it necessary to undertake two experiments: one quantitative; the other instrumental. The quantitative experiment has allowed us to quantify the results of native speakers' intuitions about the placement of stress. The instrumental experiment, in which we have considered both words in isolation and words in context, has allowed us to see to what extent the results obtained from the quantitative experiment are reliable. The results obtained from the instrumental test about words in isolation confirm to a large degree those obtained from the quantitative test, namely that the language is quantity-sensitive with stress on the final syllable if it is heavy or else on the penultimate. The instrumental test has also revealed that in context words, stress is consistently on the final syllable. Having discovered that the stress system of CMA is both iambic and trochaic, we have been faced with the intricate question of finding an appropriate way to solve this puzzle. The OT framework provides the appropriate tools for solving this puzzle. We have offered a unitary OT account based on the idea that iambic feet take priority over trochaic ones, and this by ranking the constraint IAMB above TROCHEE. We have shown that the location of stress and consequently the foot types depend on the organization of prosodic words into phonological phrases. In a phrase with a single prosodic word (i.e. a word in isolation), the foot type that surfaces as optimal is trochaic with stress on the final or penultimate syllable. Penultimate stress is derived by positing the constraint NON-FINALTY (σ′, PPh), requiring that the prominent syllable be non-final within a phonological phrase. In a phrase with more than one member, one word will be final and the others non-final surfacing with an iambic foot. In both isolation and context cases, it has been shown that restricting stress to the last two syllables of a word results from the undominated constraint ALIGN-R (Ft′, PWd), demanding right-alignment of the PWd and the prominent foot. Because this constraint is undominated, we have been led to recognize a trochaic foot of the type HL which violates RH-HARM and an iambic foot of the type L which violates FT-BIN. Both types occur word-finally.

The fact that the stress system of CMA is basically iambic is justified in the prosodic morphology of the PP and the diminutive. The idea defended in chapters five and six is that these two morphological categories are governed by prosodic constraints requiring that the output conform to an iambic foot of the type LH or LL. Assuming that the PP marker is the prefix [m-] and not the discontinuous morpheme [m-...-u-...], we have shown that the PP forms fall into two classes, based on whether or not they undergo the epenthesis of the lexical default segment /u/. In particular, we have argued that augmentation by u-epenthesis is a side effect of the requirement that the output conform to an LH iamb. The forms that resort to augmentation include the class of non-derived trisegmental verbs with the exception of verbs whose final segment is a vocoid. The foot structure of these forms still conforms to an iambic foot but of the type LL. We have argued that augmentation to achieve an LH iamb in these exceptional forms results in fatal violations of the higher-ranked constraints DEP-C or NO-LONG-V or else IDENT-IO [cons]. Other classes that do not show augmentation include the PP of quadrisegmental and derived trisegmental verbs. We have shown that if augmentation were to apply in these forms, the resulting output would violate the O-O constraints O-O_{stem} ANCHOR (Ft, Ft, Initial), requiring positional faithfulness of the initial segment of the base foot in the derived output, and O-O_{stem} IDENT-σ, demanding conservation of weight identity between two output stems.

The diminutive provides further support for the iamb-based analysis proposed for the PP. In dealing with this morphological category, we have provided arguments calling for the need to incorporate in the grammar of CMA the constraint INITIAL-CC which requires a PWd to start with a cluster of two consonants. This constraint, which interacts with the constraints calling for an iambic output, has allowed us to explain not only the necessity for placing the diminutive morpheme after the second segment of the base, but also to explain the gemination of the initial labial consonant of some bases. It has been shown that bases which consist of one major syllable proceed to augmentation in the diminutive to achieve an iambic foot consisting of a sequence of two syllables, preceded by a minor syllable which is directly adjoined to the PWd. The augmented cases we have considered are of two types: those that proceed to the addition of a schwa syllable if the base is masculine, and those that suffix the feminine morpheme [-a] to bases that are inherently specified as feminine. In both cases, we have shown that augmentation takes place in order to avoid diminutive cases that surface with a minor LH iamb, where the light syllable is a minor syllable. The analysis has also considered diminutive cases derived from disyllabic and trisyllabic bases. These forms do not resort to augmentation because they already meet the required prosodic shape. The diminutive forms derived from trisyllabic bases surface with a PWd consisting of a sequence of two iambs. For these we have argued that decreasing the number of syllables by deleting a vocalic element from the base would lead to a fatal violation of undominated MAX-V.

Closely related to the formation of the diminutive is the process of labialization which affects any dorsal or geminate labial consonants occurring word-initially. It has been shown the round-feature morpheme, responsible for labialization, is part of the diminutive morpheme and that its realization depends on the interaction of markedness constraints on labialized consonants and the faithfulness constraints MAX-IO [rd], calling for the realization of this morpheme along with IDENT-IO [rd] demanding the preservation of featural identity of the input segments in the input-output mapping. It has also been shown that the failure of consonants other than dorsals and geminate labials to labialize is the result of ranking the markedness constraints prohibiting labialized coronal, pharyngeal and simple labial consonants above MAX-IO [rd] and below the constraints on labialized dorsal and geminate labial consonants. The gemination of a word-initial labial followed by [w] has been shown to be derived from the combination of markedness constraints on labialized geminates, the OCP (lab) and INITIAL-CC.