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Morphological Causatives in Moroccan Arabic

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In Moroccan Arabic, morphologically-derived causatives are uniformly formed through the affixation of a consonantal mora in an infixed position. Two accounts have been proposed: the templatic-based account whereby consonant gemination results from a fixed-shape template and the analysis contending that causative gemination succumbs to positional faithfulness effects. In this paper, we diverge from this trend, claiming that the two approaches suffer from a lack of empirical adequacy. As an alternative, we propose an analysis within the framework of Optimality Theory, with the basic assumption being that the linearization of the causative morpheme is instead the result of phonological well-formedness interacting with the morphological process of causativization. An important empirical prediction of our analysis is that the causative affix can neither move to word-initial positions nor word-final positions under the pressure of phonological well-formedness constraints. This is shown to be an example of the Emergence of the Unmarked, wherein the otherwise inactive markedness constraint *COMPLEX$_{ONSET}$ in the language bears the burden of the explanation. The strength of the analysis suggested herein resides in the treatment of the infixal process as resulting from simple and universal constraints, primarily achieved through well-motivated demands on prosodic well-formedness without reference to language-particular templatic constraints.

1. Introduction

In Moroccan Arabic[1] (MA henceforth), morphologically-derived causatives are realized via the

[1] The data is taken from the urban variety spoken in Rabat-Sale (Coastal East, Central), a variety of which I am a native speaker. As far as I know, all MA varieties display the same morphological process for deriving morphological causatives.

infixation of a featureless consonantal mora to the verbal root (McCarthy, 1993; Bennis, 1992; Boudlal, 2001). What is puzzling is the reason why the process of geminiation invariably targets the second consonant, excluding ill-formed words such as *lləʕb and *lʕəbb, among others. Some examples are given in (1) to illustrate this process[2]:

(1)

Perfective	*Causative Forms*	
ktəb	kə**tt**əb	'to write'
ɦiRəb	ɦə**RR**əb	'to run away'
ʃRəb	ʃə**RR**eb	'to drink'
xrəʒ	xə**rr**əʒ	'to go out'
lʕəb	lə**ʕʕ**əb	'to play'

As demonstrated in (1), the phonological materials are based on the root, a base-dependence effect (Kager, 1999). Moreover, the shape of the causative morpheme appears to be consistently invariant throughout the paradigm. In all the cases, it consists solely of a consonantal mora whose phonological make-up varies as the second radical consonant of the root varies. Finally, the position of the causative morpheme with respect to the root is always the same in that it always skips over the first consonant of the root.

While the process of morphological causative has been described by different scholars (see Harrell, 1962 for example), the reason why this morpheme targets the second radical consonant of the root is either stipulated in an unsatisfactory way (McCarthy, 1993; Bennis, 1992; Boudlal, 2001) or the analysis is not empirically well-supported, hence questionable (Noamane, 2013). Two views have been proposed. The first account makes reference to the template as a morphological unit (McCarthy, 1979, 1981, 1993; Bennis, 1992). The second account advances the view that the morphological process is triggered by the fact that the first radical consonant of the root is a privileged position, shunning not only phonological processes, but also morphological ones (Noamane, 2013).

In this paper, we present empirical evidence showing that the two approaches lack adequate empirical adequacy. As far as the first approach is concerned, there are verbs whose template patterns with that of causatives, but do not semantically and syntactically behave like them.

[2] We use standard IPA transcription, except for emphatics transcribed with a capital letter.

Equally importantly, templatic analysis overlooks the fact that what triggers the infixal process is phonological well-formedness. As for the second approach, there are at least two attested phonological processes in the language that affect this ostensibly privileged position. These processes are long distance consonant harmony (Harris, 1942; Zellou, 2010) and secondary labial assimilation in the context of imperative verbs.

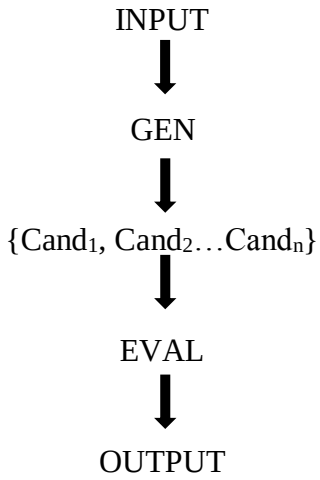
For this reason, an alternative treatment of the phenomenon at hand is needed, the treatment of which, we argue, is be better conceptualized within parallel Optimality Theory (OT) (Prince and Smolensky, 1993; McCarthy and Prince, 1993 and related works). We will show that the causative morpheme does not tolerate to appear in positions where *COMPLEX$_{ONSET}$ is violated. This accounts for why the causative morpheme appears infixed with respect to the root. Crucial to our analysis is the fact that the markedness constraint *COMPLEX$_{ONSET}$ is crucially dominated, as MA allows complex onsets. In OT, cases wherein morphological requirements are violated under the pressure of dominating prosodic ones are referred to as the Emergence of the Unmarked (TETU) (McCarthy and Prince, 1994a; Alderete *et al.* 1999, amongst others).

The remainder of this paper is constructed as follows. In section 1, we briefly sketch some of the basic principles and concepts of OT. Section 2 presents the basic accounts attempting to explain geminated causatives along with the arguments against them. The analysis defended herein is presented in section 3. This section also reviews the aspects of MA syllable structure relevant to our analysis. The last section concludes the paper, with putting forward the main findings and suggesting possible future research avenues.

1. Optimality Theory

As has been pointed earlier, the analysis in this paper is couched within the theory of parallel OT (Prince and Smolensky, 1993; McCarthy and Prince, 1993 and related works). In OT, the mapping between the input and the output is mediated through the interaction of universal and violable constraints. These constraints are in conflicts as to the well-formedness of a given output. The conflict is resolved via the ranking of the constraints on a language-particular basis. The OT grammar we assume here consists of three basic components, represented in (2) below:

(2)



As shown in (2), GEN takes an input and generates an infinite number of candidates. Endowed with *Freedom of Analysis* (McCarthy and Prince, 1993a), GEN has the ability to posit for any input any amount of structure. Central to OT is EVAL. It is the component that evaluates and assesses the well-formedness of the candidates generated by GEN. These candidates are assessed against a hierarchy of constraints ranked on a language-particular basis. On the basis of this, EVAL assigns violation marks whenever a given candidate incurs one, locating at the same time the most harmonic candidate, the one that incurs the least number of violations to the higher-ranked constraints.

The constraints in OT are universal with a general formulation. Different constraints have been proposed in the literature of OT. Examples of these constraints are Markedness and Faithfulness constraints. The former demand unmarked configuration such as the banning against onsetless syllables. The general universal capturing this demand is ONSET. Faithfulness constraints require a complete correspondence between the input and the output. As such, any structural change is a violation of Faithfulness constraints. In OT, to visualize the interaction of constraints along with their ranking, the constraint tableau method shown in (3) is used:

(3) **Constraint Tableau**, Constraint A >> Constraint B[3]

INPUT	Constraint A	Constraint B
Candidate 1	*!	
☞ Candidate 2		*

In this tableau, the set of candidates generated by GEN appear underneath the input, with the constraint hierarchy represented in the top row. There is a dominance relationship between the two constraints. Since Candidate 1 is ruled out, as it incurs a violation to Constraints A, but no such a violation is incurred by Candidate 2, we say that Constraint A dominates constraint B. This ranking is more apparent if we change the order of the constraints. In this case, Candidate 1 wins out.

2. Previous Accounts to Morphological Causatives in MA

2.1. Templatic Approach

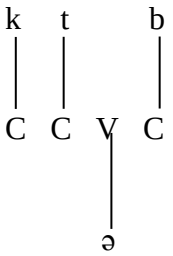
Earlier treatments of morphologically-derived causatives have relied on ideas suggested in McCarthy (1979, 1981), according to which the different forms of verbs are obtained through the association of a consonantal root and vocalic melodies to prosodic templates. Extending the formalism of Autosegmental Phonology (Goldsmith, 1976), McCarthy (1979, 1981) argued that verbs in Arabic have elements arranged on three independent tiers at the underlying level of representation in the lexicon. The first tier is the root tier which contains the verbal lexeme, the consonantal root. The second one is the skeletal tier, also called the prosodic template; it provides the canonical shape that is associated with a particular meaning and grammatical function. In the case at hand, the template CVCCVC is associated with the meaning of causativity. The third tier is the vocalic melody tier which encodes grammatical information such as voice, aspect, and mood. On this view, the derivation of causatives involves the identification of the prosodic template and the association conventions that would ensure that all the vacant slots are correctly mapped by

[3] Interestingly, if we switch the ranking Constraint A >> Constraint B, i.e. Constraint B >> Constraint A, a different grammar emerges, in which case candidate 1 wins out. This is a defining characteristic that the OT grammar predicts. In the OT literature, this property is referred to as *Factorial Typology*.

means of consonant and vowel spreading. Under such an approach, the derivation of causatives is as follows:

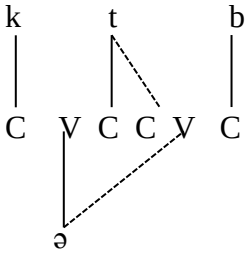
(4)

a. Perfective Form



[ktəb]

b. Causative Form



[kəttəb]

In both forms in (4), the consonantal root *ktb* and the vocalic melody are associated with their slots. In particular, the three tiers are linked together by association lines in one to one fashion, in compliance with the *Well-Formedness Constraint*, a constraint stating that association lines must not cross and at the end of a derivation all melody elements must be associated; thus unassociated materials are erased. The direction of the association mechanism proceeds from left to right. Assuming that the consonantal root and vocalic melodies are represented at different tiers in the derivation ensures that the two would never overlap.

As shown in (4), the difference between the form in (4-a) and (4-b) is the addition of the medial consonant slot. Indeed, medial gemination herein is obtained through the automatic spreading of the medial consonant /t/ to the empty slot C. The phonological content of the causative morpheme affix is thus achieved by copying the phoneme melody of the root. On this view, the morphological process, in this case infixation, is driven by the satisfaction of the prosodic template. This approach

also views infixation as a language-particular property dictated by the template. This is the claim adopted in Bennis (1992) and Bennis and Iazzi (1995).

However, there are two problems associated with this approach. First, the idea that each template is associated with a particular meaning is not borne out, as there are verbs whose template patterns with that of causatives, but they do not exhibit the properties that causatives do. Consider the examples in (5):

(5)

fə**ll**əħ	'agriculture'
sə**ll**əf	'lend'
wə**ll**əf	'get used to'
Tə**ll**əq	'divorce'
Sə**RR**əf	'exchange'

Similar to morphological causatives, the class of verbs in (5) involves the process of medial gemination. It also displays the same templatic shape of causatives sketched in (4) above. This is evident when we look at the nominal counterpart of these verbs. As shown in (6), their nominal counterparts are realized with a singleton in much the same way as causatives are.

(6)

Nouns	***Verbs***	
flaħa	fəlləħ	'agriculture'
səlf	səlləf	'lend'
wəlf	wəlləf	'get used to'
Tlaq	Təlləq	'divorce'
SəRf	Sərrəf	'exchange'

Moreover, as discussed in Benmamoun (1991) and Loutfi (2015, to appear), one property of the causative morpheme in MA is that it functions as a valency-increasing morpheme adding an agent argument to the clause. By way of illustration, consider the following examples:

(7)

a. Ayoub xrəʒ
   Ayoub went out-3sg
   'Ayoub went out'

b. Ayoub xə**rr**əʒ ddrari.
Ayoub CAUSE-went-out-3sg the-children
'Ayoub made the children go out'

c. d-dərri lʕəb l-kura
the-boy played-3sg the-ball
'The boy played football'

d. ʒamal lə**ʕʕ**əb d-dərri l-kura
Jamal CAUSE-Played-3sg the-boy the-boy
'Jamal made the boy play football'

However, this is not the case for the class of verbs in (6), as these verbs do not alternate, as is evidenced by the ungrammatically of the sentences in (8):

(8)

a. Hicham Səlləf (*Ayoub)
Hicham lent-3ms
'Hicham lent Ayoub money'

b. Abdullah sərrəf *(l-flus)
Abdullah gave-change-3ms the-money
'Abdullah gave change'

The second problem associated with the templatic approach concerns the element that is linked with the V-slots. The original approach argues that the V-slots encode grammatical categories such as tense, aspect and mood (see Bahloul, 2008 for example). MA, however, has undergone a loss of stem vowels. This is evident when we compare the same class of verbs in both Standard Arabic (SA) and MA.

(9)

SA	*MA*	
katab	ktəb	'write'
xaraʒ	xrəʒ	'go out'
Raħal	Rħəl	'move out'
ɦarab	ɦrəb	'run away'
ʃarib	ʃRəb	'drink'

In all the MA verbs, the vowels encoding the active voice, namely /a…a/, are lost[4]. Associating schwas with V slots, as in (4), would treat them on a par with full vowels. This move is problematic as the restricted nature of the insertion of schwa in MA renders its status as purely epenthetic, breaking up clusters of consonants the language does not tolerate (Benhallam, 1990; Al Ghadi, 1994; Boudlal, 2001)[5]. All things considered, the existence of forms whose derivation resembles that of morphologically-derived causatives and the loss of stem vowels suggests that the prosodic template does not suffice to identify morphologically-derived causatives.

Theoretically, the templatic account overlooks the fact that phonology and morphology interact to derive the process of morphological gemination (see Bennis, 1992 and Bennis and Iazzi, 1995 for example). We will show, however, that the process is derived via the joint consideration of both phonological constraints active in the language, i.e. its syllable structure, and the morphological process *per se*. Construing the process of morphological causatives as an instance of TETU, we will show that this process derives essentially from universal constraints, highlighting the fact that phonological well-formedness affects morphological processes. Before we flesh out our basic analysis, we will review and argue against another account couched within the theory of OT.

2.2. Positional Faithfulness

The theory of positional faithfulness rests on three fundamental assumptions. First, privileged positions permit a wide range of marked segments, contrary to unprivileged ones. This state of affairs is apparent in languages with a rich consonantal system, in which only a limited, ostensibly unmarked, subset of segments/features are allowed in the featural content of affixes[6]. Second, privileged positions trigger phonological processes and, third, they resist the otherwise regular ones in the language (see Yip, 1991; McCarthy & Prince, 1999; Beckman, 1998, 2004; Alderete, 2001b; Lombardi, 2004, among others). In fact, in MA, there are a number of contexts in which positional faithfulness is observed. For instance, the definite article affix /l/ regressively

[4] See Bahloul (2008) for a discussion of the morphological and the semantic meaning of vocalic melodies in Arabic.
[5] See also section 3.1. for more details on the status of schwa in MA.
[6] Arabic roots may contain pharyngeal consonants, whereas affixes cannot (See McCarthy & Prince, 1999 for examples like these and other root-induced harmony processes). In a similar vein, in Amazigh (Berber), Bensoukas (2004) argues that there is an asymmetry between root consonants and affix consonants, feature-wise. In OT, this is explained on the basis of a general process of positional faithfulness (Beckman, 1998, 2004).

assimilates to the immediately adjacent coronal sound of the first radical consonant of the root (10-a). Otherwise, the /l/ morpheme is realized. The data below illustrate this general process:

(10)

	UR		
a.	/l-Dar/	DDar	'the house'
	/l-Suq/	SSuq	'the market'
	/l-tuma/	ttuma	'the garlic'
	/l-ʒlbana/	ʒʒəlbana	'the green peas'
	/l-ʃms/	ʃʃəms	'the sun'
	/l-ng^{w}ir/	nng^{w}ir	'the nagging'
	/l-Rajb/	RRajəb	'the churned milk'
b.	/l-bab/	lbab	'the door'
	/l-flfla/	lfəlfla	'the peppers'
	/l-qəRfa/	lqəRfa	'the cinnamon'
	/l-klma/	lkəlma	'the word'
	/l-ʕRaDa/	ləʕRaDa	'the invitation'
	/l-ɦmm/	lɦəmm	'the worry'

As the data above suggest, elements in the root, in this case the initial consonants, seem to both trigger and resist the assimilatory process. These privileged behaviors derive from the following ranking schema for positional phonological asymmetries:

(11) IDENT-Position (F) >> C >> IDENT (F)

(Beckman, 1998: 9)

The C represents the intervening markedness constraints. Since it dominates the non-privileged position faithfulness IDENT (F), neutralization of contrast is expected in this context. Assimilation in OT is generally said to be an instance of the markedness constrain AGREE (Lombardi, 2004). In the case at hand, the intervening markedness constraint is AGREE-Coronal which is in competition with the two positional constraints IDENT-ROOT (F) and IDENT-IO (F).

(12)

(i) The constraints

AGREE-CORONAL: coronal clusters should agree in place.

IDENT-IO (F): underlying featural specifications should remain the same.

IDENT-ROOT (F): the underlying feature specifications of the root must be the same.

(ii) Ranking

IDENT-ROOT (F) >> AGREE-CORONAL >> IDENT-IO (F)

The positional constraint predicts that when undominated the root materials are immune to the process of assimilation. In this case, it is the trigger of the assimilatory process and the affix is the target. The ranking that account for the data at hand is as follows:

(13)

a. IDENT-ROOT (F), AGREE-CORONAL >> IDENT-IO (F)

b.

Input: //l-Dar/	IDENT-ROOT (F)	AGREE-CORONAL	IDENT-IO (F)
a. l-Dar		*!	
b. llar	*!		
☞ c. DDar			*

Since the coronal cluster does not agree in place, candidate (a) is ruled out, as it violates the constraint AGREE-CORONAL. Candidate (b) agree in place but it is ruled out by the higher-ranked positional constraint. Candidate (c) is the optimal by virtue of its satisfaction of the dominating constraints. This analysis seems to capture the asymmetry of the difference between privileged and non-privileged positions in a systematic way.

Another process that lends further support to positional faithfulness is gild formation in MA. The third person in the perfective aspect in MA is realized as the suffix {-u}, as demonstrated in (14):

(14)

xərʒ-u ‘they left’

ʃəTħ-u ‘they danced’

baʕ-u ‘they sold’

ʃəfr-u ‘the stole’

ləʕb-u ‘they played’

When The root ends in a vowel, however, the suffix turns into the glide /w/. To resolve hiatus, MA resorts to glide formation to repair the offending structure, the aim being to improve its syllable structure and to satisfy ONSET, a markedness constraint militating against onsetless syllables (V). As predicted by positional faithfulness, it is the affix, not the root vowel, that is affected by the process.

(15)

ʒa-w	*ʒa-u	‘they came’
mʃa-w	*mʃa-u	‘they went’
bka-w	*bka-u	‘they cried’
ʕta-w	* ʕta-u	‘they gave’
ʃka-w	* ʃka-u	‘the complained’

In view of these facts, Noamane (2013) extends this analysis to account for morphological causatives in MA. For him, what triggers the infixal process is the fact that in MA, the first radical consonant of the root is a privileged position, shunning not only phonological processes, but also morphological ones. To account for this, he posited a positional constraint IDENT-RtC_1 (Weight)– where Rt and C_1 stand for root and root-initial consonant, respectively[7]. The proposed constraints along with their ranking are as follows:

(16)

a. *Constraints:*

RM: Some phonological exponent must appear in the output form. **IDENT-IO (Weight):** Output segments and Input segments must be featurally identical for weight.

[7] We believe that this constraint is a misnomer, especially if one assumes that OT constraints are universal. There are languages, of which English is one, where word formation is not centered around the root, at least the root as it is conceived of in Semitic languages. Beckman’s (2004) constraint IDENT-σ_1 seems to capture the same generalization with a universal flavor. Mindful of these facts, we will use Noamane’s constraint for expository reasons only.

ALIGN-(μ_C, Left, Root, Left): The left edge of the causative morpheme must coincide with the left edge of the root.

IDENT-RtC_1 (Weight): The featural specification for the weight of the root's first radical element must be preserved in the input/output mapping.

b. *Ranking:*

RM >> IDENT-IO (Weight) and IDENT-RtC_1 (Weight) >>ALIGN-L (μ_C, Rt)

There are basically two problems that characterize Noamane's (2013) analysis. The first one is theoretical and concerns the issue of the general Root-Affix Metaconstraint. The schema the drives morphological causatives does not correspond to Beckman's (1998) ranking schema for positional asymmetries. As has been pointed out earlier, to derive the asymmetry a markedness constraint is expected to intervene between the privileged position and the non-privileged one, with the former being undominated. This is clearly not the case in the ranking schema in (16) above[8]. The second problem is empirical. In MA, there are two phonological processes that question the validity that morphological causatives succumb to positional faithfulness effects. These processes are secondary labial assimilation and long distance consonant harmony (Harris, 1942; Zellou, 2010).

2.3. Against Positional Faithfulness

In MA, there are two phonological processes in which the first radical consonant of the root proves unprivileged. These processes are secondary labial assimilation[9] and long distance consonant harmony. The data in (17) and (18) below are a case in point:

(17) *Labial Assimilation*

a. UR

/xrʒ/	$x^wruʒ$	'to go out'
/ʃrb/	$ʃ^wrurb$	'to drink'
/ɦrb/	$ɦ^wrub$	'to run away'
/qtl/	q^wtul	'to kill'

[8] As is obvious, there are a number of technical problems with this ranking, which for this reason we will neither discuss nor evaluate it here. Note that our primary purpose is to argue against the thesis that infixation is triggered by positional constraints.

[9] I should like to thank Abdellatif Al Ghadi for pointing out this to me.

/ʃf/ ʃʷuf ‘to see’

b.

/DRb/ DRəb ‘to hit’

/ʃTħ/ ʃTəħ ‘to dance’

/ħyyd/ ħəyyəd ‘to remove’

/ʒwb/ ʒawəb ‘to answer’

/ktb/ ktəb ‘to write’

(18) *Long Distance Consonant Harmony*

a. UR

/zwaʒ/ ʒwaʒ ‘marriage’

/zlʒlan/ ʒəlʒlan ‘sesame seeds’

/zuʒ/ ʒuʒ ‘two’

/srʒam/ ʃərʒam ‘window’

/sfnʒ/ ʃfənʒ ‘doughnut’

/zliʒ/ ʒəliʒ ‘tiles’

As far as labial assimilation is concerned, the initial consonant takes the roundness of the adjacent high round vowel whenever the root contains one. As for consonant harmony in (18), it is an instance of regressive assimilation of palatal consonant, in which the place of the initial consonant changes to post-alveolar (see Zellou (2010) for a detailed discussion). Of interest to our purposes is the fact that in both cases it is the initial consonant that is the target of the two processes, contrary to what is predicted by positional faithfulness. These facts support the idea that the first radical consonant of the root is not a privileged position.

To summarize thus far, we have presented the previous analyses accounting for geminated causatives in MA, namely the templatic analysis and the analysis undertaken under the purview of positional faithfulness. We have shown that the the template alone does not suffice to identify morphological causatives. The positional faithfulness analysis is not supported empirically either, as there are two phonological processes that question its validity. With this background in mind, the remainder of this paper will be devoted to presenting the analysis adopted herein. We will

present some facts about the syllable structure in MA that we argue are the driving force for the infixal process, yielding the effect of TETU.

3. Proposed Analysis

3.1. MA Syllable Structure

As generally assumed in the literature of MA (Benhallam, 1990; Al Ghadi, 1994; Boudlal, 2001; Bensoukas and Boudlal, 2012), the vowel inventory of the language is made up of three basic vowels [i, u, a] and an epenthetic schwa [ə]. The epenthetic status of schwa is attributed to the fact that its contexts are highly restricted. For instance, schwa never appears in open syllables. This accounts for the data in (19):

(19)

a.	ktəb	b.	kətb-u	'write'
	DRəb		DəRb-u	'hit'
	gləs		gəls-u	'sit'
	ʒbəd		ʒəbd-u	'pull'
	ħRət		ħəRt-u	'plough'
	qtəl		qətl-u	'kill'

Herein, when the third person plural affix is suffixed to the verbal root, we see that schwa appears in two position. The first position in (19-a) schwa appears located between the last two consonants. The second position in (19-b) is motivated by the requirement that schwas should not occur in open syllables.

Furthermore, there are two types of syllables: CV and CVC, other forms being derived (Benhallam, 1990). Crucial to our analysis is the fact that MA tolerates the existence of complex onsets. The contexts where complex onsets are allowed are as varied as verbs, adjectives and nouns. The following examples are a case in point:

(20)

Verbs		*Adjectives*		*Nouns*	
ktəb	'write'	ʕrəʒ	'lame'	rʒəl	'leg'
ʃtəħ	'dance	ħwəl	'cross-eyed'	qfəz	'cage'
DRəb	'hit'	kħəl	'black"	ʕsəl	'honey'

gləs ‘sit’ byəD ‘white’ nməl ‘ants’

In OT, allowing complex onsets amounts to say that the constraint militating against complex onsets, namely *COMLEX$_{ONSET}$, is crucially dominated to the effect that complex onsets surface in the language. This apparent when the constraint interacts with the phonological constraint active in the language[10].

(21)

a. Constraints:

***Min-σ:** Minor syllables are prohibited

MAX$_{IO}$: Every segment of the input has a correspondent in the output
(*No phonological deletion*)

DEP$_{IO}$: Every segment of the input has a correspondent in the output
(No epenthesis)

***COMPLEX$_{ONSET}$:** More than one consonant in the coda position is prohibited.

b. Ranking

Input : /bka/ ‘cry’	MAX$_{IO}$	*Min-σ	DEP$_{IO}$	*COMPLEX$_{ONS}$
a. bə.ka			*	
☞ b. bka				*
c. bk	*!			
d. b.ka		*!		

Candidate (a) and candidates (c-d) and are ruled out as they violate the higher-ranked constraints DEP$_{IO}$ and MAX$_{IO}$, respectively. Faithful to the input and incurring no violation to none of the undominated constraints, candidate (b) is selected as the optimal, the surface form. Interestingly, *COMPLEX$_{ONSET}$ has no say as to the well-formedness of the selected or the ruled out candidates. As has been noted earlier, this constraint is inactive, as the language allows complex onsets. In

[10] In this study, we do not attempt to provide an adequate study of syllable structure in MA. Issues likes these will take us too far afield. For this reason, only the phonological aspects pertaining to the present discussion are included. For instance, the constraint that bans onsetless syllables that is undominated will not be included. As far as we know, nothing crucial hinges on this. The interested reader may consult Benhallam (1990), Al Ghadi (1994), Boudlal (2001) and the references cited therein.

what follow, however, we will show that this constraint emerges as decisive in cases where faithfulness constraints do not prove crucial. In OT, cases like these are shown to be an example of the TETU (McCarthy and Prince, 1994a-b; Alderete *et al.* 1996, amongst others), a point further discussed in the next section.

3.2.Causatives as the TETU

TETU is one of the key characteristics in OT (McCarthy and Prince, 1994a; Alderete *et al.* 1996, 1997). It emerges in cases where a constraint C that is generally inactive in a language, because it is generally dominated, becomes active in contexts where the higher-ranked constraints fail to select the optimal candidate. This phenomenon is generally found in the context of reduplication[11], in which reduplicants tend to prefer unmarked structures, even if the structure means violating the phonotactics of the language in question. The ranking schema capturing this fact is in (22):

(22) ***Ranking schema for reduplicative TETU*** (Alderete *et al.* (1996: 330):
$\text{Faith}_{IO} >> M >> \text{Faith}_{BR}$

The fact that the markedness constraint M dominates the constraint that ensures that the relationship between the Base and the Reduplicant captures the fact that the reduplicant emerges as unmarked. In much the same way, we will show that the causative morpheme, referred to hereafter as $\text{Affix}_{CAUSE}\mu$, appears as an infix under the pressure of the otherwise inactive $*\text{COMPLEX}_{ONSET}$. Assuming that the causative morpheme is a consonantal mora captures the cross-linguistic fact that geminates are underlyingly moraic (Davis, 1999a; Davis and Torretta, 1998). The constraints proposed that derive causatives along with their ranking are as follows:

(23)

a. Constraints:

REALIZE-MORPHEME$_{Causative}$ (RM): An input causative morpheme has a correspondent in the output.

ALING (Affix$_{CAUSE}$, L, Root, L): Align the left edge of the Affix_{CAUSE} with the left edge of the root = every Affix_{CAUSE} is a prefix in the Root.
***Min-σ:** Minor syllables are prohibited
MAX$_{IO}$: Every segment of the input has a correspondent in the output.

[11] See also Bensoukas (2005) for showing that round velar dissimilation in Amazigh (Tashlhit) is an instance of TETU.

(No phonological deletion)

DEP$_{IO}$: Every segment of the input has a correspondent in the output.

(No epenthesis)

***COMPLEX$_{CODA}$:** More than one consonant in the coda position is prohibited.

***COMPLEX$_{ONSET}$:** More than one consonant in the onset position is prohibited.

b. Ranking:

REALIZE-MORPH, MAX$_{IO}$, *COMPLEX$_{CODA}$, *Min-σ >> DEP$_{IO}$ >> *COMPLEX$_{ONS}$ >> ALING- Affix$_{CAUSE}$μ-L.

An example of how these constraints interact is given in (23), where candidate (c) incurs the least violation, hence it is selected as optimal:

(24)

Input : / Affix$_{CAUSE}$μ-ktb/	RM	MAX$_{IO}$	*COMP$_{CODA}$	*Min-σ	DEP$_{IO}$	*COMP$_{ONS}$	ALING
a. ktb	*!			*			
b. kkətəb					*!*	*	
☞ c. kəttəb					*!*		**
d. ktəb.b				*	*		***
e. ktət.b				*	*		*
f. ktəbb			*		*	*	***
g. ktətb			*		*	*	*

Incurring a violation to higher-ranked constraint, candidate (a) is ruled out, as the Affix$_{CAUSE}$μ is not realized. Candidates (d) and (e) are out of the competition as the violate *Min-σ. Likewise, candidates (f) and (g) are ruled out for violating the top-ranked constraint *COMPLEX$_{CODA}$. The remaining two candidates demonstrate an interesting case, wherein the two tie as to their violation of the now active constraints. More interestingly is their tie with respect to the faithfulness

constraint DEP_{IO}, as they incur the same number of violations. Excluding the unviolated constraints, this gives us the following picture:

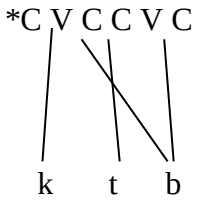
(25)

Input : / $Affix_{CAUSE}$μ-ktb/	DEP_{IO}	*$COMP_{ONS}$	ALING
b. kkətəb	**	*	
☞ c. kət.təb	**		**

The important question that remains is how this tie is to be resolved. We will adopt Prince and Smolensky's (1993) *Method of Mark Cancellation*, according to which the same number of violations two candidates share are cancelled. In the case at hand, this means cancelling the violation marks candidates (d) and (c) incur to DEP_{IO}. In this case, it is *$COMPLEX_{ONSET}$ that rules out candidate (b). As has been shown, this constraint is totally irrelevant in the language. Therefore, the derivation of morphologically-derived causatives in MA is an instance of TETU. This also provides a principled account as to why the $Affix_{CAUSE}$μ is an infix. This is captured by the fact that *$COMPLEX_{ONSET}$ dominates the alignment constraint. This state of affairs supports the cross-linguistic observation that morphological requirements maybe violated under the pressure of dominating prosodic demands (Kager and Zonneveld, 1999), a predication that is borne out as the data of causative formation amply demonstrate.

There are two remaining potential candidates that would emerge as optimal if this ranking above is maintained. These candidates are *kəbtəb and *kəktəb. These two candidates seem to obey the phonotactics of the language, namely the prohibition against minor syllables. To account for these two candidates, we follow Boudlal (2001) in assuming that they are ruled out by the constraint NO-CROSSING. As its name indicates, this constraint militates against the spreading of long distance consonant. This fact is illustrated as follows, adopted from Boudlal (2001: 191):

(26)



Since these two candidates do not surface, this constraint must be higher-ranked as the tableau below shows:

(27)

Input: /RED-ktb/	RED=μ	RM	NO-CROSSING	MAX_{IO}	$*COMP_{CODA}$	*Min-σ	DEP_{IO}	$*COMP_{ONS}$	ALING
a. ktb		* !				*			
b. kkətəb							* !*		
☞ c. kəttəb							* !*		*
d. ktəb.b						*	*		
e. ktət.b						*	*		*
f. ktəbb					*		*	*	*
g. ktətb					*		*	*	*
h. kəbtəb			* !						
i. kəktəb			* !						

4. Concluding Remarks and Implications

This paper has been an attempt to provide a new OT analysis of geminated morphologically-derived causatives in MA. We have proposed that the affixal process is the result of the interaction

of the phonological well-formedness with the morphological process, with the end result being infixation. In particular, we have shown that infixation is the result of cross-linguistically motivated constraints active in Moroccan Arabic. As such, we contribute to the line of research that purports to investigate the observation that morphological requirements are violated under the pressure of phonological ones. In OT, this suggests that phonology outranks morphology, a state of affairs that it is hard to formulate in serialist theories. In causatives, this has been shown to be an instance of the Emergence of the Unmarked. The strength of our analysis resides in treating the issue without reference to fixed-shape templatic constraints. We have also argued against suggesting that the process is triggered by special properties associated with the first radical consonant of the root.

There are a number of the issues that we have not discussed in this paper. The first issue addresses the question of the nature of the input. There is currently a controversy regarding the question of what serves as the input to word formation. This debate ranges from those who argue that word formation in Arabic is root-based (Davis, 2001) to those that advance a word-based approach (Bat-El, 1994; Benmamoun, 1999). If we assume a strictly root-based approach, we will be faced with the problem of the grammatical categorization of the root. As the OT mechanism adopted herein stands, there is no way that would tell us whether the optimal form is a verb, noun or adjective. Another problem associated with this approach is that although they encode causativity, there are verbs in which the causative morphology renders them ungrammatical, as indicated in examples (28):

(28)

a. Jamal qtəl Khalid
   Jamal killed-3ms Khalid
   'Jamal killed Khalid'

b. *Jamal qəttəl Khalid
   Jama CAUS-killed-3ms Khalid

c. Fatima Dərb-at l-ħiT
   Fatima hit-3fs the-wall
   'Fatima hit the wall'

d. *Fatima Dərrəb-at l-ħiT
   Fatima hit-3fs the-wall
   'Fatima hit the wall'

As argued in detail in Loutfi (2015, in preparation), the class of verbs that do not causativize in MA are lexical causatives, wherein the causative meaning is inherently encoded in these verbs[12]. Assuming that these verbs are associated with a feature that prevent them from appearing with causative morphology violates the basic assumption of the root-based approach (see Acquaviva, 2008 for example)

The word-based approach is far from being without glaring shortcomings either. The first issue facing this approach is the variability associated with the bulk of words in MA. As discussed in Noamane (2013), certain outputs either lose their vowels or acquire new ones, in an unpredictable way. Consider the following examples:

(29)

Nouns		*Causative Forms*	
Sʕib	'difficult'	Səʕʕəb	'complicate
Syir	'small'	Səɣɣər	'to minimize'
wasəʕ	'wide'	wəssəʕ	'to widen'
kuṛa	'ball'	kəwwəṛ	'to ball'
rwina	'mess'	rəwwən	'to cause a mess'

The second problem is consistency and addresses the issue of the base of the derivation. That is, there are different possible inputs, from varying grammatical categories, that may serve as the base of the derivation. For instance, it is not clear whether the formation of deadjectival change of state predicates, exemplified in (30) below, should be derived from nouns, verbs, or possibly roots.

(30)

a. Deadjectival Change of State Predicates

ħə**mm**ər 'to redden'

Sə**ff**ər 'to make something yellow'

kə**bb**ər 'to make something big'

[12] This fact is not a peculiarity of MA. See Loutfi (2015, to appear) for other similar examples from Standard Arabic and Amazigh.

Səɣɣər ‘to make something small’

Tə**ww**əl ‘to make something tall’

Investigating issues like these would shed more light on the nature of word formation in Arabic in general and Moroccan Arabic in particular. Given the complexity of these issues, we leave them to future research.

REFERENCES

Acquaviva, P. 2008. “Roots and Lexicality in Distributed Morphology”. Ms, University College Dublin.

Alderete, J. 2001b. ‘Root-controlled accent in Cupeño’, *Natural Language and Linguistic Theory* 19: 455-502.

Alderete, J. *et al.* 1999. “Reduplication with Fixed Segmentism”. *Linguistic Inquiry* 30: 327-64.

Al Ghadi, A. 1994. “An OT Account of Moroccan Arabic Prosody”. Ms. Delaware University, and Mohammed V University, Faculty of Letters and Humanities, Rabat.

Bahloul, M. 2008. *Structure and Function of the Arabic Verb*. London: Routledge.

Beckman, J. 1997. *Positional Faithfulness*. Doctoral Dissertation, University of Massachusetts, Amherst.

Beckman, J. 2004. Positional Faithfulness. In *Optimality Theory: A Reader*, J. J. McCarthy (Ed), 310-342. Oxford: Blackwell.

Benhallam, A. 1990. “Moroccan Arabic Syllable Structure”. In *Langues et littératures VIII*, 177-191. Faculté des Lettres, Rabat.

Benmamoun, A. 1991. “Causatives in Moroccan Arabic”. In Perspectives on Arabic Linguistics III, B. Comrie, & M, Eid (Eds), 173-195. Amsterdam: John Benjamins.

Benmamoun, A. 2003. “The Role of the Imperfective Template in Arabic Morphology”. In *Language Processing and Acquisition in Languages of Semitic, Root-based, Morphology*, I. Shimron (Ed), 99-114. Amsterdam: John Benjamins.

Bennis, S. 1992. *La Formation des Causatif en Arabe Marocain*. D.E.S. Thesis, Mohammed V University, Faculty of Letters, Rabat.

Bennis, S. and Iazzi, E. 1995. "Morphology des Verbe Causatif en Arabe Marocain". *Langues et littératures XIII*, 79-96. Faculté des Lettres, Rabat.

Bensoukas, K. 2004a. "Markedness, Faithfulness and Consonant Place in Tashlhit Roots and Affixes". *Langues et Literatures* 18: 115-153.

Bensoukas, K. 2006. "The Emergence of the Unmarked in Tashlhit Round Velar Consonant Dissimilation". In *La Linguistique Amazighe: Les Nouveaux Horizons*, A. Allati (Ed.), 76-118.

Bensoukas, K. and Boudlal, A. 2012. "An Amazigh Substratum in Moroccan Arabic: The Prosody of Schwa". *Langues et Littèratur*es 22: 179-221.

Boudlal, A. 2001. *Constraint Interaction in the Phonology and Morphology of Casablanca Moroccan Aarbic*. Doctorat d'Etat Dissertation, Mohammed V University, Faculty of Letters, Rabat.

Davis, S. 1999a. "On the Moraic Representation of Underlying Geminates: Evidence from Prosodic Morphology". In *The Prosody Morphology Interface*, R. Kager, H. van der Hulst, & W. Zonneveld (Eds), 39-61. Cambridge: Cambridge University Press.

Davis, S. 2001. "Arabic Hypocoristics and the Status of the Consonantal Root". *Linguistic Inquiry* 32: 512-520.

Davis, S. and Torretta, G. 1998. "An Optimality-theoretic Account of Compensatory Lengthening and Geminate Throwback in Trukese". *Papers from the Annual Meeting of the North East Linguistic Society* 28. 111–125.

El Himer, M. 1991. *Morphologie verbale de l'Arabe Marocain: Verbes Simples*. D.E.S. Thesis, Mohammed V University, Faculty of Letters, Rabat.

Kager, R. 1999. *Optimality Theory*. Cambridge: Cambridge University Press.

Kager, R. and Zonneveld, W. 1999. "Introduction". In *The Prosody Morphology Interface*, R. Kager, H. van der Hulst, & W. Zonneveld (Eds), 1-38. Cambridge: Cambridge University Press.

Kurisu, K. 2001. *The Phonology of Morpheme Realization*. Ph.D. Dissertation, University of California, Santa Cruz.

Goldsmith, I. 1979. *Autosegmental Phonology*. New York: Garland.

Harris, Z. 1942. "The Phonemes of Moroccan Arabic". *Journal of the American Oriental Society* 62:4 309−318.

Lombardi, L. 2004. "Positional Faithfulness and Voicing Assimilation in Optimality Theory". In *Optimality Theory: A Reader*, J. J. McCarthy (Ed), 343-364. Oxford: Blackwell.

Loutfi, A. 2013. *The Morphosyntax of Verbs and Argument Selection in Arabic*. MA Thesis, Mohammed V University, Faculty of Letters, Rabat.

Loutfi, A. 2015. "The VP Structure and the Syntax-lexicon Interface in Arabic". Paper Presented at the *3rd International Conference on Comparative Linguistics*, Faculty of Letters and human Sciences, Kenitra, May 14-15, 2015.

Loutfi, A. 2016. "Causatives in Moroccan Arabic: Towards a Unified Syntax-Prosody Interface". To appear in the *Proceedings of the First Purdue Languages and cultures Conference*.

Loutfi, A. In Preparation. *Aspects of the Clause Structure and Word Formation in Arabic*. Ph.D. Dissertation, University of Mohammed V, Rabat.

McCarthy, J. 1979. *Formal Issues in Semitic Phonology and Morphology*. Ph.D. Dissertation, MIT.

McCarthy, J. 1981. "A Prosodic Theory of Nonconcatenative Morphology". *Linguistic Inquiry* 12: 373-418.

McCarthy, J. 1993. "Templatic Form in Prosodic Morphology". *Proceedings of FLSM III*.

McCarthy, J. 2002. *A Thematic Guide to Optimality Theory*. Cambridge: Cambridge University Press.

McCarthy, J. and Prince, A. 1994a. "The Emergence of the Unmarked: Optimality in Prosodic Morphology". *North East Linguistic Society* 24: 333-379.

McCarthy, J. & Prince, A. 1999. "Faithfulness and Identity in Prosodic Morphology". In *The Prosody Morphology Interface*, R. Kager, H. van der Hulst, & W. Zonneveld (Eds), 218-309. Cambridge: Cambridge University Press.

McCarthy, J. and Prince, A. 2004. "Generalized Alignment: The Prosody-Morphology Interface". In *Optimality Theory in Phonology: A Reader*, J. McCarthy (Ed.), 451-463. Oxford: Blackwell.

Noamane, A. 2013. *Aspects of the Morpho-phonology of Causative Verbs in Moroccan Arabic: An Optimality-theoretic Approach*. MA Thesis, Mohammed V University, Faculty of Letters, Rabat.

Prince, A. and Smolensky, P. 1993/2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA, & Oxford: Blackwell. [Revision of 1993 technical report, Rutgers University Center for Cognitive Science. Available on Rutgers Optimality Archive, ROA-537.]

Zellou, G. 2010. "Moroccan Arabic Consonant Harmony: A Multiple Causation Hypothesis". *Toronto Working Papers in Linguistics*, Volume 33.

Urbanczyk, S. 2007. "Reduplication". In *The Cambridge Handbook of Phonology*, P. De Lacy (Ed.), 473-493. Cambridge: Cambridge University Press.

Ussishkin, A. 2000. "*The Inadequacy of the Consonantal Root: Modern Hebrew Denominal Verbs and Output-Output Correspondence*". Phonology 16: 401-442.

Ussishkin, A. 2007. "*Morpheme Position*". In The Cambridge Handbook of Phonology, P. De Lacy (Ed.), 457-472. Cambridge: Cambridge University Press.

Yip, M. 1991. "Coronals, Coronal Clusters and the Coda Condition". In *Phonetics and Phonology 2: The Special Status of Coronals*, C. Paradis and J.-F. Prunet (Eds), 61-78. New York: Academic Press.