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Underapplication of vowel reduction to schwa in Majorcan Catalan productive derivation and verbal inflection*

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In Majorcan Catalan, the process of vowel reduction of the mid front vowels to schwa in unstressed position underapplies under certain circumstances: (a) in productive derived forms with an unstressed vowel located in the initial syllable of the stem which alternates with a stressed mid front vowel in the stem of the underived form (p[é]ix 'fish' ~ p[e]ixet 'fish dim.'); (b) in verbal forms with an unstressed vowel located in the initial syllable of the stem which alternates with a stressed close mid front vowel in another verbal form of the same inflectional paradigm (p[é]ga '(s/he) hits' ~ p[e]gam '(we) hit'); (c) in learned and loan words with an unstressed e located in the initial syllable of the stem (p[e]culiar 'peculiar'). In this paper I propose a novel explanation of these patterns framed within a relativized version of the Transderivational Correspondence Theory (TCT) (Benua 1997/2000), the Optimal Paradigms model (OP) (McCarthy 2005), the Positional Faithfulness Theory (Beckman 1998/1999) and the prominence driven approach to vowel reduction (Crosswhite 1999/2001, 2004).

1. Introduction

The purpose of this paper is to provide a formal interpretation for a set of phonological anomalies in the unstressed vowel system of Majorcan Catalan (MC). This set

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is made up of cases where vowels exhibit atypical behavior, in that where we would expect to find a schwa (ə) due to a general process of vowel reduction (VR) of the mid front vowels [e] and [ε] and the open central vowel [a] in unstressed position, we find, against all expectations, the close mid front vowel [e]. In (1a) I show some alternations that are a consequence of the general process of VR in Majorcan Catalan. In (1b) I show some forms which escape from this generalization, because, instead of schwa, we systematically find the close mid front vowel [e] in unstressed position. Similarly, learned and loan words with an unstressed *e* are also unexpectedly realized with [e], especially when the vowel is located in the initial edge of the stem and preceded by a labial consonant (*i.e.* $esp[e]ci[\acute{a}]l$ 'special'; $f[e]l[i]\varsigma$ 'happy'; $imp[e]c[\acute{a}]ble$ 'impeccable'; $v[e]rm[\acute{u}]t$ 'vermouth', etc.). In contrast, inherited words with an unstressed *e* in the same position show the regular process of VR (*i.e.* $p[ə]d[\acute{a}]\varsigma$ 'dishtowel'; $f[ə]ix[\acute{u}]c$ 'heavy'; $v[ə][\acute{i}]$ 'neighbor', etc.).

(1) a. Normal application of VR to [a] in MC

Stressed pos	sition	Unstressed posit	tion
c[á]sa	'house'	c[ə]s[ə]ta	'house dim.'
caf[έ]	'coffee'	caf[ə]t[ə]t	'coffee dim'.
carr[é]r	'street'	carr[ə]r[ó]	'street dim'.
cont[é]st	'(I) answer'	cont[ə]st[á]m	'(we) answer
$x[\epsilon]rr$	'(I) chat'	x[a]r[a]m	'(we) answer'

b. Underapplication of VR to [ə] in MC

Stressed position		Unstressed po	Unstressed position			
p[ə]ix	'fish'	$p[e]ix[\dot{a}]t$	ʻfish <i>dim</i> .'			
f[é]sta	'party'	f[e]st[á]ssa	'party <i>augm</i> '			
c[έ]l	'sky'	c[e]l[ɔ]t	'sky <i>dim</i> '			
p[é]ga	'(s/he) hits'	p[e]g[á]m	'(we) hit'			
esp[é]ra	'(s/he) waits'	esp[e]r[á]u	ʻ(you) wait'			

According to my view, there are two main factors which conspire to bring about this situation: (a) as detected in previous studies, both descriptive (Veny 1962; Bibiloni 1998; Mascaró 2002) and theoretical (Mascaró 2005; Wheeler 2005),¹ the inclination of these vowels to become similar to the corresponding vowels which appear in the same inflectional or derivational paradigm, especially when the derivative process is productive; (b) the privileged status of the initial syllable of the stem, which both confers to the vowels located in this position a finer tendency to be faithful to their correspondents and disallows the occurrence of vowels with low sonority, such as the schwa. In order to account for the first factor, I propose a novel explanation framed within the Transderivational Correspondence Theory (TCT) (Benua 1997/2000) and

^{1.} For a critical review of previous approaches to these data, see Pons (in press).

the Optimal Paradigms model (OP) (McCarthy 2005). In order to account for the second factor, which has passed unnoticed in previous examinations of the same data, I assume the Positional Faithfulness Theory (Beckman 1998/1999) and the prominence driven approach to VR (Crosswhite 1999/2001, 2004).

I show how the analysis of these data leads to three interesting theoretical implications. First is the need to relativize the TCT according to the type of derivation, along the lines of Ohannesian & Pons (2009). Second is the corroboration this analysis provides that the initial syllable of the stem is, indeed, a prominent structural position that entails finer faithfulness requirements than other structural positions. Third is the incidence that these finer faithfulness requirements, expressed in terms of positional faithfulness constraints, can have, throughout time, on the vowel system of a linguistic variety, leading to the promotion of specific positional markedness constraints in the phonology of learned and loan words. A collateral implication of the analysis of these data is the confirmation that the surface schwa that appears before s+C word-initial clusters in this dialect is undeniably an epenthetic vowel which does not belong to the stem.

The paper is organized as follows. In §2 the data under analysis are presented; §2.1 is devoted to the data relative to VR in MC and §2.2 examines the data relative to underapplication of VR. In §3 I spell out my analytical proposal, and in §4 I summarize the main findings of the paper.

2. Data

2.1 Normal application of VR in MC

Most MC varieties have a vowel system of eight vowels in stressed position (2a) and four vowels in unstressed position (2b). This specific picture is the result of a general process of VR, according to which the mid front vowels [\acute{e}] and [\acute{e}] and the open central vowel [\acute{a}] are reduced to [\eth] in unstressed position, while the open mid back vowel [\acute{b}] is reduced to the close mid back vowel [o], also in unstressed position (2) (see, among others, Mascaró 2002).

(2) Process of VR in Majorcan Catalan



b. Unstressed vowel system



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Within Optimality Theory, the reduction of a vowel system in unstressed position is generally interpreted, along the lines of Crosswhite (1999/2001, 2004), as an effect of the harmony scale for margins, that is, for vowels in unstressed position (3a). This harmony scale and the subsequent margin constraint hierarchy (3b) express the universal preference for segments of low sonority in the margins (*i.e.* in unstressed syllables) or, in other words, the universal dispreference for segments of high sonority in the margins (see the assumed sonority scale for vowels in 3c). (For an application of the margin constraint hierarchy to the unstressed vowel system of Catalan in general, see Wheeler 2005, and for an application of it to the unstressed vowel system of Algherese and Western Catalan, see Lloret & Jiménez 2008.)

- Universal harmonic scale and constraint hierarchy for margins (After Crosswhite 1999/2001; Prince & Smolensky 1993/2004)
 - a. Universal harmonic scale for margins $M/a \succ M/i, u \succ M/e, o \succ M/\epsilon, o \succ M/a$
 - b. Universal constraint hierarchy for margins *M/a >> *M/ɛ,ɔ >> *M/e,o >> *M/i,u >> *M/ə
 - c. Sonority scale for vowels (from more to less sonority) $a > \varepsilon, \mathfrak{r} > e, \mathfrak{o} > i, \mathfrak{u} > \mathfrak{d}$

The application of VR to the vowels of the front series and the low vowel in MC is, therefore, due to the ranking of the positional markedness constraints $^*M/a$, $^*M/\epsilon$ and $^*M/e$, which penalize elements of high sonority in the margins, that is, in unstressed syllables, above the faithfulness constraint which penalizes featural changes, and, of course, above $^*M/a$. Thus, in the tableau in (4), candidates with [a], [ϵ] or [e] in unstressed position are discarded; candidates with [a], by contrast, are selected as optimal.

a. /pas+ət/ [pəsət] 'step dim'.	*M/a	*M/ε	*M/e	*M/ə	Ident(f)
☞ i. [pəsə́t]				*	*
ii. [pasə́t]	*W			L	L
b. /kəfɛt+ət/ [kəfətə́t] 'coffee dim.'	*M/a	*M/ε	*M/e	*M/ə	Ident(f)
☞ i. [kəfətə́t]				**	*
ii. [kəfɛtə́t]		*W		L	L
c. /karr+er+on/ [kərəró] 'street <i>dim</i> .'	*M/a	*M/ε	*M/e	*M/ə	Ident(f)
🖙 i. [kərəcó]				**	*
ii. [kərecó]			*W	L	L

(4) Prominence-driven VR in MC (after Crosswhite 1999)

2.2 Underapplication of VR in MC

2.2.1 Underapplication of VR in productive derivation

These are the regular facts. As shown in (5b), however, productive derived forms with an unstressed vowel located in the initial syllable of the stem which alternates with a stressed [é] or [$\dot{\epsilon}$] vowel at the base-stem of the primitive are not realized with [ϑ], but with [e]. In these cases, therefore, there is underapplication of the general process of VR to [ϑ]. As illustrated in (5c), non-productive derived forms with an unstressed vowel located in the initial syllable of the stem which alternates with a stressed [é] or [$\dot{\epsilon}$] vowel at the base-stem of the primitive undergo regular VR to [ϑ]. As shown in (5e) and (5f), productive and non-productive derived forms with an unstressed vowel located in the initial syllable of the stem with an alternating stressed [é] or [$\dot{\epsilon}$] vowel at the base-stem of the primitive, also undergo regular VR to [ϑ]. (Due to space limitations, we illustrate productive derivation with diminutives. The same patterns are found, however, with all other productive suffixes. See, in this respect, Bibiloni 1998 and §4. Along with Bibiloni's description, paradigmatic pressure induced by [$\dot{\epsilon}$] is circumscribed in those cases in which the vowel is preceded by a labial consonant; see, however, §4. The data in (5) are from Bibiloni 1998 and Mascaró 2005)

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Base		PRODUCTIVE DERIVATION		Non-productive derivation		
a. Stressed stem with [é] or [έ]		b. Unstressed stem with the vowel in the initial syllable of the stem. → unexpected [e]		<i>c.</i> Unstressed stem with the vowel in the initial syllable of the stem \rightarrow expected [ə]		
p[é]ix	ʻfish'	$p[e]ix[\dot{a}]t$	ʻfish <i>dim</i> .'	p[ə]ixat[é]r	'fisherman'	
p[é]dra	'stone'	p[e]dr[ˈə]ta	'stone dim'.	p[ə]dr[é]ra	'quarry'	
Est[é]ve	'Stephen'	$Est[e]v[\dot{a}]t^2$	'Stephen dim.'			
t[έ]rra	'earth'	t[e]rr[ɔ]ta	'earth <i>dim</i> .'	t[ə]rr[é]stre	'terrestrial'	
c[έ]l	'sky'	c[e] <i>l</i> [á] <i>t</i>	ʻsky <i>dim</i> .'	c[ə]lesti[á]l	'celestial'	
d. Stressed stem with [é] or [é]		e. Unstressed stem with the vowel not in the initial syllable of the stem. → expected [ə]		f. Unstressed stem with the vowel not in the initial syllable of the stem \rightarrow		
pap[é]r	'paper'	pap[ə]r[ə]t	'paper <i>dim</i> '	pap[ə]rera	ʻpaper basket'	
cast[é]ll	'castle'	cast[ə]ll[ə]]t	'castle dim.'	cast[ə]ll[é]r	'casteller'	
fid[ἑ]u	'noodle'	fid[ə]u[ə]t	'noodle <i>dim</i> .'	fid[ə]u[á]da	'noodle dish'	
<i>caf</i> [έ]	'coffee'	caf[ə]t[ʻə]t	'coffee dim'.	caf[ə]ter[í]a	'coffee shop'	

(5) Normal application vs. underapplication of VR in derivation

^{2.} The first vowel in *Esteve* ~ *Estevet* is epenthetic. See §3.1.1.

2.2.2 Underapplication of VR in verbal inflection

As shown in (6), the very same patterns under similar conditions hold for inflectional verbal paradigms. In (6b), we find underapplication of VR when an unstressed vowel located in the initial syllable of the stem alternates with a stressed close mid front vowel [\acute{e}] in another verbal form of the same inflectional paradigm. In (6f), by contrast, we find regular application of VR when the alternating unstressed vowel is not located in the initial syllable of the stem. In inflection, however, underapplication of VR is not found when the alternating stressed vowel is the open mid front vowel [\acute{e}]. This can be seen in (6d). As inflection is intrinsically productive, this factor is not at play here. (The data in 6 is from Bibiloni 1998 and Mascaró 2005.)

Stressed-stem verbal form	Unstressed-stem verbal form
a. Stressed stem with [é] or [é]	b. Unstressed stem with the vowel in the initial syllable of the stem \rightarrow unexpected [e]
p[é]ga, p[é]gues, p[é]gui, p[é]guis, p[é]guen 'to hit' verbal forms	p[e]g[á] <i>m</i> , p[e]g[á] <i>u</i> , p[e]gar[é], p[e]gar[í]es 'to hit' verbal forms
esp[é]r, esp[é]res, esp[é]ra, esp[é]ri, esp[é]rin 'to wait' verbal forms	esp[e]r[á]m, esp[e]r[á]u, esp[e]r[á]ssis ³ 'to wait' verbal forms
c. Stressed stem with [ɛ́]	<i>d.</i> Unstressed stem with the vowel in the initial syllable of the stem \rightarrow expected [ə]
x[ɛɛ]rr, x[ɛɛ]rra, x[ɛɛ]rren, x[ɛɛ]rris, x[ɛɛ]rren 'to chat' verbal forms	x[ə]rr[á]m, x[ə]rr[á]u, x[ə]rrar[í]es 'to chat' verbal forms
at[ɛɛˈ]rra, at[ɛɛ]rren, at[ɛɛ]rri, at[ɛɛ]rrin 'to land' verbal forms	<i>at</i> [ə] <i>rr</i> [á] <i>m</i> , <i>at</i> [ə] <i>rr</i> [á] <i>u</i> , <i>at</i> [ə] <i>rrar</i> [í] <i>es</i> 'to land' verbal forms
e. Stressed stem with [é]	<i>f.</i> Unstressed stem with the vowel not in the initial syllable of the stem \rightarrow expected [ə]
<i>cont</i> [é] <i>st, cont</i> [é] <i>stes, cont</i> [é] <i>sta</i> 'to answer' verbal forms	<pre>cont[ə]st[á]m, cont[ə]st[á]u, cont[ə]star[í]a 'to answer' verbal forms</pre>
acc[é]pt, acc[é]ptes, acc[é]pta 'to accept' verbal forms	acc[ə]pt[á]m, acc[ə]pt[á]u, acc[ə]ptar[í]a 'to accept' verbal forms

(6)	Normal application vs.	underapplication	of VR in	inflection
	**	**	~	~

^{3.} The first vowel in *esper*, *esperes*, etc. is epenthetic. See §3.2.1.

2.2.3 Underapplication of VR in learned and loan words

Learned and loan words with an unstressed e are also unexpectedly realized with [e], especially when located in the initial edge of the stem (7a).⁴ Inherited words with an unstressed e, in contrast, show the regular process of VR (7b). (The data in 7 is from Bibiloni 1998.).

a. Learned and loan words		b. Inherited words		
esp[e]ci[á]l	'special'	p[a]d[a]c	'dishtowel'	
imp[e]c[á]ble	'impeccable'	p[ə]ned[í]r-se	'to regret'	
p[e]culi[á]r	'peculiar'	p[ə]ssig[á]r	'to pinch'	
p[e]d[a]l	'pedal'	b[ə]s[á] <i>da</i>	'kiss'	
p[e]l·l[í]cula	ʻfilm'	b[ə]ss[ó]	'twin'	
comm[e]mor[á]r	'to commemorate'	m[ə]nt[í]da	'lie'	
llargm[e]tr[á]tge	'feature film'	<i>m</i> [ə] <i>l</i> [ó]	'melon'	
m[e]dic[í]na	'medicine'	m[ə]norqu[í]	'Minorcan'	
<i>f</i> [e] <i>l</i> [í] <i>ç</i>	'happy'	<i>f</i> [ə] <i>ix</i> [ú] <i>c</i>	'heavy'	
f[e]titx[í]sme	'fetishism'	f[a]r[e]r	'to hurt'	
v[e]rm[ú]t	'vermouth'	v[a]ll[i]t	'velvet'	
v[e]rb[é]na	'party'	v[ə][í]	'neighbor'	

(7) Normal application vs. underapplication of VR in learned words

3. Analysis

3.1 Underapplication of VR in productive derivation

3.1.1 Generalizations and Optimality Theory analysis

Within derivation, there are four crucial conditions for the underapplication of VR, none of which is sufficient on its own.

a. The unstressed affected vowel must have a corresponding stressed vowel in the stem of the primitive word. The first vowel of the word *petit* 'small', which does not alternate with any stressed vowel, undergoes regular VR to $[\bar{a}](p[\bar{a}]t[i]t)$, whereas

^{4.} It appears that the unstressed vowel not undergoing reduction is systematically flanked by a labial consonant on its left, but up to this point I can not provide a satisfactory explanation of this fact. An anonymous reviewer awares me of a similar case of underapplication of vowel reduction motivated by a preceding labial or velar consonant in Coratino (see Bucci 2009).

the first vowel of the word *peixet* 'fish *dim*', which alternates with a stressed vowel $(p[\acute{e}]ix$ 'wind'), does not undergo regular VR to [ə] $(p[e]ix[\acute{e}]t$ 'wind *dim*'). This condition can be interpreted as a standard output-to-output faithfulness constraint effect (Benua 1997/2000). The activity of a constraint such as OO-IDENT(post), which states that within the derivational paradigm correspondent surface segments must have the same featural specification for [post], would explain the lack of VR. BASE-PRIORITY, on the other hand, ensures that the direction of the pressure is from the base to the derived form and not the other way around.

- b. The vowels in the alternating stressed stem must be front and mid (*i.e.* [é] and [έ]), given that the pressure does not work when the primitive has the low vowel [á] (*i.e.* c[á]sa 'house' ~ c[ə]s[á]ta 'house dim'; *c[a]s[á]ta). This condition can be understood as the result of the activity of the positional markedness hierarchy for margins (see §2.1 and 8a). The high ranking of *M/a inhibits the possible effects of the constraint demanding homogeneity in the stem —in this case, OO-IDENT(low)— when the alternating vowel is [á] (*i.e.* c[á]sa vs. c[ə]s[á]ta, *c[a] s[á]ta).⁵ The high ranking of *M/ε, on the other hand, answers for the fact that the selected vowel in cases of paradigmatic pressure from a stem with [έ] is [e] and not [ε] (c[έ]l vs. c[e]l[á]t, *c[ε]l[á]t). The idea is that [ε] is too sonorous to appear in unstressed position in these dialects.
- с. The derived form must be productive (cf. $p[\acute{e}]ix$ 'fish' ~ $p[e]ix[\flat']t$ 'fish dim', p[e]ix[5]t fish augm, with underapplication of VR, vs. p[ə]ixat[e]r fisherman, p[a]ixater[i]a 'fish shop', with normal application of VR). This requirement is a very important one in that it makes necessary a refinement of the submodel designed to account for surface resemblances between the members of a derivational paradigm. Since different behavior is found depending on the kind of derivation (*i.e.* productive derivatives are more faithful to the base than nonproductive derivatives), and given the fact that this is a very common pattern across languages, generated derivational paradigms are likely to have an uneven and irregular structure. In fact, a hierarchical structure is already predicted in Benua's TCT, in that the base has priority over the derived forms. But I propose an even more hierarchical structure. I suggest that, instead of flat paradigms, structured paradigms which contain subparadigms are generated, and therefore the OO-faithfulness constraints are relativized according to these subparadigms. In this way, the superior proximity of the productive derivative to the primitive form with respect to the non-productive derivative is explicitly formalized (See Pons & Ohannesian 2009, for a more detailed formalization of subparadigms within derivation based on the formal and semantic distances established between the

^{5.} An anonymous reviewer points out to me the notorious resistance of [a] to reduction in Romance languages such as French or Italian dialects.

base and the derivative forms). Thus, the constraint proposed in *a* to account for the paradigmatic pressure within the derivational paradigm, OO-IDENT(post), needs to be split into two different constraints: OO-SUBPARIDENT(post), which requires that, within the subparadigm, correspondent surface segments must have the same featural specification for [post], and OO-PARIDENT(post), which requires that, within the paradigm, correspondent surface segments must have the same featural specification for [post].

d. The position of the vowels under surface correspondence must be within the initial syllable of the stem (cf. $p[e]ix[\dot{a}]t$ 'fish dim', $Est[e]v[\dot{a}]t$ 'Stephen dim'. — in which the first vowel is epenthetic — $vs. pap[\dot{e}]r$ 'paper' ~ $pap[\bar{a}]r[\dot{a}]t$ 'paper dim'). This requirement can be understood, along the lines of Beckman (Beckman 1998/1999), as a positional faithfulness effect, in that in a prominent position, such as the initial syllable of the stem, vowels exhibit a stronger tendency to be faithful to the correspondent segment than in other structural positions. Thus, the constraints proposed above to account for the paradigmatic pressure within the (sub)paradigm need to be relativized even further, with an explicit reference to faithfulness in vowels located in the initial syllable of the stem (see 8b).

In (8) I present these four conditions expressed in terms of constraints. And in the tableaux (9) and (10), it can be seen how they interact and bring about the desired results. (Although not illustrated in these tableaux, we assume, of course, the activity in the constraint hierarchy of the non-relativized OO-IDENT constraints.)

- (8) Relevant constraints
 - a. *Positional prominence constraints* (Crosswhite 2001, 2004; McCarthy 2008)

*M/a: Assign one violation mark for every [a] in the margin.

*M/ ϵ : Assign one violation mark for every [ϵ] in the margin.

*M/e: Assign one violation mark for every [e] in the margin.

b. (Relativized) Transderivational correspondence constraints

OO-PARIDENTINITIALSYLLSTEM(post):

Within the derivational paradigm, assign one violation mark for every output segment located in the initial syllable of the stem whose output correspondent has different values for the feature [post].

(adapted from Benua 1997/2000; Ohannesian & Pons 2009; Beckman 1998/1999; see also McCarthy 2008)

OO-SUBPARIDENTINITIALSYLLSTEM(post):

Within the derivational subparadigm, assign one violation mark for every output segment located in the initial syllable of the stem whose output correspondent has different values for the feature [post].

(adapted from Benua 1997/2000, Ohannesian & Pons 2009; Beckman 1998/1999; see also McCarthy 2008). BASE-PRIORITY: Assign one violation mark for every output segment of the base which has a different featural specification than its input correspondent. (adapted from Benua 1997/2000)

The tableau in (9) illustrates underapplication of VR in productive derivational forms with a vowel located in the initial syllable of the stem and alternating with a stressed [é]. It can be seen that the selected paradigm candidate (9a) is the one in which underapplication of VR to schwa only applies in the subparadigm. This is because the ranking of *M/e above OO-PARIDENTINITIALSYLLSTEM(post) blocks the selection of paradigm candidate (9b), in which underapplication of VR applies across the entire paradigm. The ranking of OO-SUBPARIDENTINITIAL SYLLSTEM(post) above *M/e, moreover, blocks the selection of the candidate with regular application of VR (9c). BASE-PRIORITY, finally, blocks the selection of the candidate with paradigmatic pressure to the base (9d).

⟨p/e/dra, p/e/dreta, p/e/drera⟩	Base -Prior	OO- Subpar IdentInitial SyllStem (post)	*M/e	OO-Par IdentInitial SyllStem (post)	Ident (F)
$rightarrow$ a. $\langle\langle p[\acute{e}]dra, p[e]dr[\acute{ə}]ta \rangle$ $p[\eth]drera \rangle$			*	****	*
b. (〈p[é]dra, p[e]dr[ə]ta〉 p[e] drera〉			**W	L	L
c. $\langle \langle p[\acute{e}] dra, p[\eth] dr[\acute{ə}] ta \rangle p[\eth] drera \rangle$		**W	L	****	**W
d. $\langle p[\dot{a}] dra, p[\dot{a}] dr[\dot{a}] ta \rangle p[\dot{a}] drera \rangle$	*W		L	L	***W

(9) Underapplication of VR in MC derivation⁶

The very same ranking explains the selection of the paradigm candidate with underapplication of VR to schwa circumscribed to the subparadigm in productive derivational forms with a vowel located in the initial syllable of the stem and alternating with a stressed [$\dot{\epsilon}$] (e.g. $\langle t[\dot{\epsilon}]rra, t[e]rreta \rangle t[\exists]rrestre \rangle$). In this case, however, absolute uniformity within the paradigm is not possible because of the high ranking of *M/ ϵ (ranked at the same level as BASE-PRIORITY).

^{6.} To illustrate the analysis, we use comparative tableaux. The 'W' stands for winner, and it appears below the constraint that favors the winner, and the 'L' stands for loser, and it appears below the constraint which favors the loser. Then, every L must be dominated by at least one W.

The tableau in (10) illustrates normal application of VR in productive and nonproductive derivational forms with a vowel *not* located in the initial syllable of the stem and alternating with a stressed [é]. In this case, OO-SUBPARIDENTINITIALSYLLSTEM (post) is vacuously satisfied by all the paradigm candidates because the affected vowel is not located in the initial syllable of the stem. The ranking of *M/e above IDENT(F) explains the selection of the candidate with normal application of VR (10a). (Here it is where the non-relativized OO-IDENT constraint, without reference to the position of the segments within the stem, could play a role with respect to the competition between paradigm candidates with underapplication and paradigm candidates with normal application of VR: the simple ranking of this constraint below *M/e would block the selection of the former.).

<pre><pre>(pap/e/r, pap/e/ret, pap/e/rera)</pre></pre>	Base -Prior	OO-Subpar IdentinItial SyllStem (post)	*M/e	OO-par idinitial syllstem (post)	ident. (f)
					**
b. ({pap[é]r, pap[e]r[á]t} pap[ə]rera>			*W		L
c. < <pap[é]r, pap[e]r[á]t=""> pap[e]rera></pap[é]r,>			**W		L
d. < <pap[i]r, pap[i]r[i]t=""> pap[i]rera></pap[i]r,>	*W				***W

(10) Normal application of VR in MC derivation

3.2 Underapplication of VR in verbal inflection

3.2.1 Generalizations and Optimality Theory analysis

Within verbal inflection, there are three crucial conditions for the underapplication of VR, none of which, again, is sufficient on its own.

a. The unstressed affected vowel must have a correspondent stressed [é] vowel in the stem of another verbal form. This condition can be interpreted as the result of the activity of two OP-IDENT(F) constraints (McCarthy 2005) that demand that correspondent surface segments in the *inflectional paradigm* must have the same featural specification for the features [post] and [ATR], respectively: OP-IDENT(post) and OP-IDENT(ATR). The former ensures underapplication of VR when the alternating stressed vowel is [é], and the latter blocks underapplication of VR (driven by the constraint OP-IDENT(post)) when the alternating stressed vowel is [é], since the mapping [e] \leftrightarrow [E] implies a modification of the [ATR] featural val-

ues. According to this proposal, overapplication of VR in stressed position, which would be expected given the ranking of these OP-IDENT constraints above the markedness constraint *M/e (see, for instance, the tableau in 12), is blocked by the high ranked markedness constraint *Peak/a (see 12c in the same tableau), which penalizes a segment of low sonority, such as the schwa, as a syllable peak. It is important to mention here two relevant predictions of the OP model: on the one hand, the fact that the direction of the pressure cannot be motivated, *a priori*, by any particular member of the paradigm: rather, markedness is the factor that governs the direction of the pressure, in our particular case *Peak/ə; on the other hand, the fact that only overapplication of a process is predicted by this submodel, unless a specific markedness constraint blocks it, in our particular case *Peak/ə. In the vowel system of Majorcan Catalan, we find [ə] in stressed position (e.g. cad[a']na 'chain', c[a']ba 'onion', etc.). And this may appear to be in contradiction with the invoked constraint *Peak/ə, but, in fact, it is not. In Majorcan Catalan, the schwa is no longer a productive phoneme. In fact, in this dialect, most loanwords with a graphic *e* in stressed position are now adapted with the close-mid vowel [e], not with [ə] (e.g. Intern[é]t 'Internet', cass[é]t 'cassette', ved[é]t 'cabaret star', etc.) as was the case in the past. This is to say that [a] is permitted when it is underlying but not when derived.

- b. The vowel in the stressed stem must be front and mid-high (*i.e.*[é]), given that the pressure does not work when the alternating stressed form has [á] (cf. *p*[á]*ssa* 'it happens' *vs. p*[ə]*ssarà* 'it will happen', **p*[a]*ssarà*) or [ɛ] (see 6d). This requirement can be explained by the high ranking of the positional markedness constraints *M/a and *M/ɛ, which penalize these vowels in unstressed position and inhibit the possible effects of the constraint that demands uniformity in the stem.
- c. The position of the vowels under surface correspondence must be within the initial syllable of the stem (cf. p[e]gam 'we hit'; esp[e]ram 'we wait' in which the first vowel is epenthetic– *vs. cont*[ə]*stam* 'we answer' or $acc[ə]pt[\acute{a}]m$ 'we accept'). This condition, finally, can be interpreted again as a positional faithfulness effect, in that in a prominent position (such as the initial syllable of the stem), there is a greater tendency to faithfulness than in a non-prominent position (such as the right syllable of the stem). Thus, the constraints proposed in *a* should be relativized with an explicit reference to the initial syllable of the stem (see 11b). (As seen, the second vowel of words such as $Est[e]v[\acute{a}]t$ (see § 3.1.1) and $esp[e]r[\acute{a}]r$ is affected by the (structurally relativized) paradigmatic pressure, and this can be taken as a strong proof that the initial vowel, realized as schwa, is indeed epenthetic. If it was not, this vowel would not be affected by the paradigmatic pressure, because it would occupy a different position than the initial syllable of the stem. This is an issue that I leave for future research. I am grateful to John J. McCarthy

and Donca Steriade for valuable discussion on this aspect.) As inflectional paradigms are productive *per se*, productivity is not a factor at play within the inflectional verbal paradigm.

In (11), I present these three conditions expressed in terms of constraints. And in tableaux (12) to (14), it can be seen how they interact and lead to the desired results.

- (11) (New) Relevant constraints
 - a. Positional prominence constraints
 *Peak/ə: Assign one violation mark for every [ə] in the peak (Prince & Smolensky 1993).
 - b. (Relativized) Optimal Paradigm constraints

OP-IdentInitialSyllStem(post):

Within the inflectional paradigm, assign one violation mark for every output segment located in the initial syllable of the stem whose output correspondent has different values for the feature [post] (adapted from McCarthy 2005 and Beckman 1998/1999).

OP-IdentInitialSyllStem(ATR):

Within the inflectional paradigm, assign one violation mark for every output segment located in the initial syllable of the stem whose output correspondent has different values for the feature [ATR] (adapted from McCarthy 2005 and Beckman 1998/1999).

The tableau in (12) illustrates underapplication of VR to schwa in inflected forms with a vowel located in the initial syllable of the stem and alternating with a stressed [é]. The paradigm candidate with normal application of VR (12b) is discarded because of the ranking of both OP-IDENTINITIALSYLL(ATR) and OP-IDENTINITIALSYLL(post) above the markedness constraint *M/e (see 13 for the explicit ranking argument between these two constraints). The paradigm candidate with overapplication of VR in a stressed syllable (12c), which would be expected given the ranking noted above, is discarded because of the activity of the high ranked constraint *P/ə.

esp/e/r, esp/e/res, esp/e/ra, esp/e/ram, esp/e/rau, esp/e/ren	*P/ə	op- identinitial syllstem (ATR)	OP- IDENTINITIAL SYLLSTEM (post)	*M/e	IDENT (F)
<pre>☞a. (⟨esp[é]r, esp[é]res, esp[é]ra, esp[e]r[á]m, esp[∂]r[á]u, esp[é]ren⟩⟩</pre>				**	

|--|

(Continued)

	0	ï	й	-	r
<pre>b. <<esp[é]r, esp[é]<br="" esp[é]res,="">ra, esp[ə]r[á]m, esp[ə] r[á]u, esp[é]ren>></esp[é]r,></pre>		(x16) W	(x16) W	L	**W
c. < <esp[ə]r, esp<br="" esp[ə]res,="">[ə]ra, esp[ə]r[a]m, esp[ə] r[a]u, esp[ə]ren>></esp[ə]r,>	****W			L	****W

The tableau in (13) illustrates normal application of VR in inflectional forms with a vowel located in the initial syllable of the stem and alternating with a stressed [\dot{e}]. The paradigm candidate which shows underapplication of VR to schwa and partial reduction to [e] (13b) is discarded because it incurs several violations of the constraint OP-IDENTINITIALSYLLSTEM(ATR). The paradigm candidate with absolute uniformity (13c) is also ruled out, in this case because it incurs two violations of the constraint *M/E. The selected paradigm candidate is thus that which shows normal application of VR (13a).

x/ɛ/rr, x/ɛ/rres, x/ɛ/rra, x/ɛ/rram, x/ɛ/rrau, x/ɛ/ rren	*M/ε	*P/ə	OP IdentInitial SyllStem (ATR)	OP IdentInitial SyllStem (post)	*M/e	Ident (f)
$ \ \ \ \ \ \ \ \ \ \ \ \ \$				W(x16)		**
b. $\langle \langle x[\dot{\varepsilon}]rr, x[\dot{\varepsilon}]rres, [\dot{\varepsilon}]$ rra, $x[e]rr[\dot{a}]m, x[e]$ $rr[\dot{a}]u, x[\dot{\varepsilon}]rren \rangle \rangle$			W(x16)	L	**W	**
c. $\langle\langle x[\dot{\varepsilon}]rr, x[\dot{\varepsilon}]rres, x[\dot{\varepsilon}]$ rra, $x[E]rr[\dot{a}]m, x[E]$ $rr[\dot{a}]u, x[\dot{\varepsilon}]rren \rangle\rangle$	**W			L		L
d. $\langle\langle x[\dot{a}]rr, x[\dot{a}]rres, x[\dot{a}]$ $rra, x[\bar{a}]rr[\dot{a}]m, x[\bar{a}]$ $rr[\dot{a}]u, x[\dot{a}]rren \rangle\rangle$		****W		L		*****W

(13) Normal application of VR in MC inflection

The tableau in (14) illustrates normal application of VR in inflectional forms with a vowel *not* located in the initial syllable of the stem and alternating with a stressed [é]. In these particular cases, as the vowel is not situated in the initial syllable of the stem, it is not targeted by the OP constraints. This is why the selected candidate is the one displaying normal application of VR.

cont/e/st, cont/e/stes, cont/e/	*P/ə	OP-	OP	*M/e	Ident
sta, cont/e/stam, cont/e/stau,		IdentInitial	IdentInitial		(F)
cont/e/sten		SyllStem	SyllStem		
		(ATR)	(post)		
☞ a. ⟨⟨cont[é]st, cont[é]stes,					**
cont[é]sta, cont[ə]st[á]m,					
cont[ə]st[á]u,cont[é]sten} >					
b. ((cont[é]st, cont[é]stes, cont[é]				**W	L
sta, cont[e]st[á]m, cont[e]st[á]u,					
$cont[é]sten\rangle\rangle$					
c. ((cont[\$]st, cont[\$]stes, cont[\$]	****W				**
sta, cont[ə]st[á]m,cont[ə]st[á]u,					
$cont[\dot{a}]sten \rangle\rangle$					
$cont[\dot{a}]sten \rangle$					

(14) Normal application of VR in MC inflection

3.3 Underapplication of VR in learned words and loan words

Underapplication of VR to schwa in learned and loan words is also circumscribed to those cases in which the unstressed vowel is located in the initial syllable of the stem (see the examples in 7).7 In these cases, however, the unstressed vowel does not alternate with a stressed one, so that paradigmatic pressure is not a relevant factor here. A possible interpretation for the lack of vowel reduction would be to resort to a positional faithfulness constraint requiring the preservation of the featural specification of those segments located in the initial syllable of the stem, only active in the loanword phonology of MC. In this case, we should assume for these forms a single underlying represention with /e/. Another plausible explanation would be to consider that the activity of the output to output faithfulness constraints relativized according to the position of the vowel within the stem, responsible for underapplication of VR to schwa in productive derivation and inflection, that is, in the productive phonology of the dialect, and which have provoked a drastic reduction of the occurrences of the schwa in stem-initial position, have lead, throughout time, to a reinterpretation of the unstressed vowel system by Majorcan Catalan listeners. That is to say, the effects of the positional faithfulness constraints enhancing the appearance of [e], instead of [ə], in the initial syllable of the stem would have been reinterpreted by the listeners as a consequence of a positional markedness constraint of the type *ə/Initial-Syll-Stem, banning a schwa in the initial syllable of the stem (see Crosswhite 1999/2001, 2004;

^{7.} I leave for future research the possible influence of the phonetic context in these cases, which is not obvious.

and for Catalan, Lloret & Jiménez 2008); this constraint, again, would only be active in the loanword phonology of Majorcan Catalan.

4. Concluding remarks

In this paper I have argued that underapplication of VR to schwa in MC derivational and inflectional forms is a direct consequence of the interaction of the prominence constraint hierarchy for vowels in unstressed position and a set of output to output faithfulness constraints relativized according to two factors: the productivity of the derivational process and the position of the affected vowel within the stem. The asymmetry, with respect to VR, between productive and non-productive derived forms demands an uneven structure for the generated paradigm candidates as well as the invocation of specific OO–faithfulness constraints with an explicit reference to the subparadigm. The asymmetry between forms with the affected vowel in the initial syllable of the stem and forms with the vowel in other positions supports an even further relativized version of the very same constraints with an overt reference to this specific structural position, the initial or the initial syllable of the stem. I have also outlined a tentative proposal for cases of underapplication of VR in learned and loan words. This is an issue which I leave for future research.

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