

## Templatic morphology in the Portuguese verb

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### Abstract

It is argued here that the unmarked forms of the Portuguese verb can be accounted for by assuming a templatic constraint on inflectional morphology. The argument is built on root mid vowel umlaut (e.g., *firo* / *feres*, *durmo* / *dormes*), and independently supported by stress placement and suffixal morphology.

Neither rules nor morphological specifications are required in the present approach, which is shown to be preferable to previous rule-based accounts of the facts in terms of empirical adequacy, formal simplicity and naturalness, and explanatory power. Thus, this paper is intended to provide theoretical and empirical evidence for replacing opaque and idiosyncratic 'lexical' rules with structural / phonological and universal explanations. Specifically, Portuguese umlaut implies association of three vocalic melodies with a dissyllabic template, and the templatic basis of lexical umlaut is assumed to be universal.

A second point at issue here is that a basic part of Portuguese verbal morphology can be naturally accounted for thanks to a rather unusual concept in Romance linguistics, which is however familiar to Semitists. Comparatively to languages such as Arabic or Hebrew, it is clear that the verbal template has specific characteristics in Portuguese morphology for at least two reasons. Firstly, EP verb system remains concatenative insofar as there are here no consonant-based roots opposed to vowel-based morphemes. Thus, a 'templatic' language is not necessarily 'non-concatenative'. Secondly, while Semitic *binyanim* form rich paradigms, there is only one template in EP verb system. Thereby, it is both semantically 'poor' and morphologically widespread: if there is only one template in EP, then it shows the unmarked CVCV-pattern dictated by stress placement rules; hence, this unique *binyan* affects the unmarked and most frequent forms of the verb.

# **Templatic morphology in the Portuguese verb**

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## **1. Introduction**

It is argued here that the unmarked forms of the Portuguese verb can be accounted for by assuming a templatic constraint on inflectional morphology. The argument is built on root mid vowel alternations, and independently supported by other aspects of Portuguese morphology. Neither rules nor morphological specifications are required in the present approach, which is shown to be preferable to the standard rule-based account of the facts in terms of empirical adequacy, formal simplicity and naturalness, and explanatory power. This paper has two main theoretical issues. Firstly, I claim that some putative lexical rules actually hide purely phonological, i.e. post-lexical, phenomena, and should be replaced with configurational explanations. Secondly, I wish to show how Portuguese verbal alternations reveal templatic aspects within concatenative morphologies.

The article is organized as follows. Section 2.1 presents a brief outline of European Portuguese (henceforth EP) phonology, which is necessary to understand the facts at issue; these are exposed in § 2.2. Section 3.1 summarizes Wetzels' (1995) rule-based account of Portuguese verbal alternations, which can be viewed as the 'state of the art' in the line of autosegmental phonology for this topic; a critical review of Wetzels' theory is presented in § 3.2.<sup>1</sup> In § 4, the 'templatic hypothesis' is developed and evaluated with respect to the points addressed in § 3.2. Finally, § 5 is devoted to a brief exposition of two assumptions suggested by this study: on the universal conditioning of umlaut by purely phonological and configurational constraints, and on the place of templatic constraints in concatenative morphologies.

## 2. The facts

### 2.1 An outline of EP vowel and stress systems

2.1.1 The set of EP vowel phonemes occurring in stressed syllables is presented in (1):

(1) *Stressed vowel system:*

i		u
e	(ɐ)	o
ɛ	a	ɔ

/a/ is realized as [ɐ] before heterosyllabic nasals: *mat[a]r* ‘to kill’ vs. *mat[ɐ]mos* ‘we kill’, *c[ɐ]ma* ‘bed’, etc..<sup>2</sup>

The main case of vowel neutralisation in stressed contexts occurs within nasal rhymes, where /ɛ a ɔ/ are ruled out: hence the set of nasal vowels shown in (2):

(2) *Nasal vowels:*

ĩ		ũ
ẽ	ẽ̃	õ

EP nasal vowels, which all yield homorganic nasal consonants before stops, are to be analyzed as diphthongs (cf. Parkinson 1983, Carvalho 1988). These also exist in EP, and are listed in (3):<sup>3</sup>

(3) a. *Oral diphthongs:*

	iw		uj
(ej)	ew	ɐj	oj o(w)
	ɛj	ɛw	aj aw ɔj

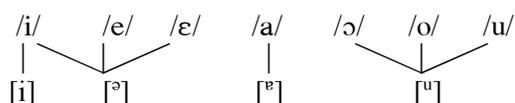
b. *Nasal diphthongs:*

(ẽK)	ẽ̃K	õK
)	ẽw̃	

2.1.2 An important feature of EP (contrary to Brazilian Portuguese) is vowel reduction in unstressed syllables (cf. Carvalho 1994). This is

presented and illustrated in (4). Note that: (a) [i] is disallowed in open final unstressed syllables, where [° ɐ u] are the only possible monophthongs; (b) [°] is commonly deleted in current speech.

(4) a. *EP vowel reduction:*



b. *Tonic / pretonic alternations:*

[i] ↔ [i]	<i>tiro</i> / <i>tirar</i>	‘I / to take off’
[e] ↔ [°]	<i>meto</i> / <i>meter</i>	‘I / to put’
[ɛ] ↔ [°]	<i>levo</i> / <i>levar</i>	‘I / to take away’
[a] ↔ [ɐ]	<i>bato</i> / <i>bater</i>	‘I / to strike’
[ɔ] ↔ [u]	<i>voto</i> / <i>votar</i>	‘I / to vote’
[o] ↔ [u]	<i>cozo</i> / <i>cozer</i>	‘I / to cook’
[u] ↔ [u]	<i>furo</i> / <i>furar</i>	‘I / to form a hole’

c. *Tonic / post-tonic internal alternations:*

[i] ↔ [i]	<i>suplica</i> / <i>súplica</i>	‘he implores’ / ‘request’
[ɛ] ↔ [°]	<i>hospede</i> / <i>hóspede</i>	‘he house’ (subj.) / ‘host’
[a] ↔ [ɐ]	<i>naufrago</i> / <i>náufrago</i>	‘I wreck’ / ‘shipwrecked’
[ɔ] ↔ [u]	<i>ancora</i> / <i>âncora</i>	‘he anchors’ / ‘anchor’
[u] ↔ [u]	<i>macula</i> / <i>mácula</i>	‘he maculates’ / ‘spot’

d. *Tonic / post-tonic final alternations:*

[a] ↔ [ɐ]	<i>matar</i> / <i>matá</i>	‘to kill’ / ‘he kills’, ‘kill!’
[ɛ] ↔ [°]	<i>comer</i> / <i>comê</i>	‘to eat’ / ‘he eats’, ‘eat!’
[i] ↔ [°]	<i>ferir</i> / <i>ferê</i>	‘to wound’ / ‘he wounds’

**2.1.3** EP stress is quantity-sensitive (cf. Carvalho 1989). Light syllables are either open or closed by /s/ and (word-internally) /r/; they undergo vowel reduction when unstressed. Heavy syllables have diphthongs or contain /VN/-, /Vɹ/- and (word-finally) /Vr/-clusters; they escape vowel

reduction.<sup>4</sup> In the unmarked case, stress falls on the penultimate syllable if the final syllable is light (*mata* ‘he kills’, ‘kill!’); otherwise, the final syllable is stressed (*matar*, *matei* ‘to kill’, ‘I killed (perfect)’). In the marked case, it falls on the antepenultimate syllable if the final syllable is light (*matávamos* ‘we killed (imperfect)’); otherwise, the penultimate syllable is stressed (*matáveis* ‘you killed (pl. imperfect)’).

EP stress placement is thus relatively free since quantity effects on the word accentual pattern depend on markedness conditions. Now, while such conditions often appear as lexical idiosyncrasies in nouns, where many proparoxytones and marked paroxytones remain unpredictable, this is not the case with verbs. In particular, stress never falls *after the stem* (cf. § 2.2), even if the verb has two suffixes, though this may violate the unmarked stress patterns of EP, as in *matávamos*, *matássemos*, *matáveis*, *matásseis*, etc..<sup>5</sup>

## 2.2 Mid-vowel alternations in the EP verb

2.2.1 The morphological structure of the finite verb is given in (5):

(5) a. [Root+Theme]<sub>Stem</sub> + Tense/Mood/Aspect + Person/Number

b. *Examples:*

[lav+á] + ra + mos	‘we had washed’
[com+ê] + ra + mos	‘we had eaten’
[dorm+í] + ra + mos	‘we had slept’

The three major regular conjugations are defined on the basis of the ‘thematic vowel’: the first conjugation has an *a*-theme, the second has an *e*-theme, and the third an *i*-theme; this is currently expressed by means of the infinitive endings (*ar-*, *er-* and *ir-*verbs).

The object of this study is the actual relationship between two alternations outlined in (6): those affecting the root vowel, and those occurring in the following syllable:

(6)

<i>1<sup>st</sup> conjugation</i>	<i>2<sup>nd</sup> conjugation</i>	<i>3<sup>rd</sup> conjugation</i>
a. <i>levar</i> ‘take away’	<i>meter</i> ‘put’	<i>ferir</i> ‘wound’

*Present indicative*

l[é]v[u]	m[é]t[u]	f[i]r[u]
l[é]v[ <sup>ɐ</sup> s]	m[é]t[ <sup>ɐ</sup> s]	f[é]r[ <sup>ɐ</sup> s]
l[é]v[ <sup>ɐ</sup> ]	m[é]t[ <sup>ɐ</sup> ]	f[é]r[ <sup>ɐ</sup> ]
l[ <sup>ɐ</sup> ]v[é]mos	m[ <sup>ɐ</sup> ]t[é]mos	f[ <sup>ɐ</sup> ]r[i]mos
l[ <sup>ɐ</sup> ]v[á]is	m[ <sup>ɐ</sup> ]t[é]is	f[ <sup>ɐ</sup> ]r[í]s
l[é]v[ẽw̃]	m[é]t[ẽ]	f[é]r[ẽ]

*Present subjunctive*

l[é]v[ <sup>ɐ</sup> ]	m[é]t[ <sup>ɐ</sup> ]	f[i]r[ <sup>ɐ</sup> ]
l[é]v[ <sup>ɐ</sup> ]s	m[é]t[ <sup>ɐ</sup> ]s	f[i]r[ <sup>ɐ</sup> ]s
l[é]v[ <sup>ɐ</sup> ]	m[é]t[ <sup>ɐ</sup> ]	f[i]r[ <sup>ɐ</sup> ]
l[ <sup>ɐ</sup> ]v[é]mos	m[ <sup>ɐ</sup> ]t[é]mos	f[i]r[é]mos
l[ <sup>ɐ</sup> ]v[á]is	m[ <sup>ɐ</sup> ]t[á]is	f[i]r[á]is
l[é]v[ẽ]	m[é]t[ẽw̃]	f[i]r[ẽw̃]

- b. *morar* ‘reside’ *comer* ‘eat’ *tossir* ‘cough’

*Present indicative*

m[ó]r[u]	c[ó]m[u]	t[ú]ss[u]
m[ó]r[ <sup>ɐ</sup> s]	c[ó]m[ <sup>ɐ</sup> ]s	t[ó]ss[ <sup>ɐ</sup> ]s
m[ó]r[ <sup>ɐ</sup> ]	c[ó]m[ <sup>ɐ</sup> ]	t[ó]ss[ <sup>ɐ</sup> ]
m[ <sup>u</sup> ]r[é]mos	c[ <sup>u</sup> ]m[é]mos	t[ <sup>u</sup> ]ss[i]mos
m[ <sup>u</sup> ]r[á]is	c[ <sup>u</sup> ]m[á]is	t[ <sup>u</sup> ]ss[í]s
m[ó]r[ẽw̃]	c[ó]m[ẽ]	t[ó]ss[ẽ]

*Present subjunctive*

m[ó]r[ <sup>ɐ</sup> ]	c[ó]m[ <sup>ɐ</sup> ]	t[ú]ss[ <sup>ɐ</sup> ]
m[ó]r[ <sup>ɐ</sup> ]s	c[ó]m[ <sup>ɐ</sup> ]s	t[ú]ss[ <sup>ɐ</sup> ]s
m[ó]r[ <sup>ɐ</sup> ]	c[ó]m[ <sup>ɐ</sup> ]	t[ú]ss[ <sup>ɐ</sup> ]
m[ <sup>u</sup> ]r[é]mos	c[ <sup>u</sup> ]m[é]mos	t[ <sup>u</sup> ]ss[é]mos
m[ <sup>u</sup> ]r[á]is	c[ <sup>u</sup> ]m[á]is	t[ <sup>u</sup> ]ss[á]is
m[ó]r[ẽ]	c[ó]m[ẽw̃]	t[ú]ss[ẽw̃]

**2.2.2** Most phonologists working on Portuguese (e.g., Harris 1974, López 1979, Redenbarger 1981, Quicoli 1990, Wetzels 1995) agree to three points. Firstly, to quote Wetzels (1995: 287), «the opposition between upper and lower mid vowels remains systematically unexploited

in verbs». Indeed, nearly all verbs having mid vowels in their root show [e ə] in all cases where these vowels occur in (6), that is, for the 1<sup>st</sup> conjugation, wherever the root vowel is stressed, and for the 2<sup>nd</sup> and 3<sup>rd</sup> conjugations, wherever the root vowel is stressed, except: (a) in the first person singular, and (b) in all the rhizotonic forms (i.e. stressed on the root) of the present subjunctive.

The only exception I know of is *chegar* ‘arrive’, which has systematically [e] in stressed syllables. No verb from the second and the third conjugations contains a high mid vowel in its root. Concerning *ir*-verbs, *ferir* and *tossir* in (6) undoubtedly represent the regular pattern since some of the verbs whose root vowel was high, and which should thus escape *i/ε*- and *u/ə*-alternations, were analogically attracted to the above model. Such is the case of verbs like *frigir*, *fugir*, *cuspir*, *entupir* as opposed to *permitir*, *insistir*, *unir*, which preserved their high root vowel: compare *fujo*, *foges...* and *uno*, *unes...*<sup>6</sup>

The reason for the generalization of [e ə] among verbs is irrelevant for the present purpose. Suffice it to say that the upper / lower mid vowel opposition is actually exploited by derivational morphology: verbs show [e ə] while the corresponding nouns have either [e o] or [e ə]. In what follows, /e ə/ will be viewed as the underlying vowels in verbal roots. Whether they are to be seen as resulting from a ‘lowering rule’, as is claimed by Wetzels and others (cf., e.g., Quicoli 1990), depends on one’s theoretical assumptions on the existence of rules in phonology. In any case, if EP has a lowering rule, it must be stressed that such a rule is strictly lexical and belongs to morphology proper, since (a) it occurs in verbs only, and (b) its hypothetical trigger never surfaces: clearly, lowering lacks here phonological naturalness, unlike the other two facts attested in (6).

The second point, indeed, that meets general agreement among phonologists concerns the reason why [e o] and [i u] appear on the surface in the first-person present indicative, and in the subjunctive forms, of the 2<sup>nd</sup> and 3<sup>rd</sup> conjugations respectively: the mid vowel is assimilated to the underlying theme vowel, if the latter is in prevocalic position, as in /kəme+o/, /kəme+a/, /fəri+o/, /fəri+a/, etc., which become /komo/, /koma/, /firo/, /fira/. A tempting generalization is that the 1<sup>st</sup> conjugation also has an *a*-harmony, whose results, however, are trivial since the root has already a low mid vowel. Hence the following cases of

assimilation underlying the facts in (6):

(7)	a.	$\varepsilon + a \rightarrow \varepsilon$	$/\text{leva}/ + o \rightarrow [\text{lev}]o$
		$\text{ɔ} + a \rightarrow \text{ɔ}$	$/\text{mɔra}/ + o \rightarrow [\text{mɔr}]o$
	b.	$\varepsilon + e \rightarrow e$	$/\text{mete}/ + o \rightarrow [\text{met}]o$
		$\text{ɔ} + e \rightarrow o$	$/\text{kɔme}/ + o \rightarrow [\text{kom}]o$
	c.	$\varepsilon + i \rightarrow i$	$/\text{feri}/ + o \rightarrow [\text{fir}]o$
		$\text{ɔ} + i \rightarrow u$	$/\text{tɔsi}/ + o \rightarrow [\text{tus}]o$

Whether the processes in (7) ought to be explained as the effect of a rule of (theme vowel) truncation, however, needs further discussion (cf. § 3).

Finally, as was described in § 2.1.2, the root vowels occurring in unstressed syllables follow from a later independent process of vowel reduction. Regarding pretonic vowels, we can deduce from the alternation  $f[i]r[\acute{e}]mos / f[i]r[ɐ]$  in the subjunctive that the [ɐ] in  $l[ɐ]v[\acute{e}]mos (/ l[\acute{e}]v[ɐ])$  results from the reduction of [ɛ], and that the one in  $m[ɐ]t[\acute{e}]mos (/ m[\acute{e}]t[ɐ])$  comes from the harmonised reflex [e] of /ɛ/, while the [ɐ]'s of the indicative directly procede from /ɛ/ in the three conjugations. This means that the root vowel is harmonised throughout the subjunctive paradigm; only the indicative forms exhibit root vowel alternations. As to post-tonic vowels, the final vowel of *mata(s)* enables us to postulate that the final [ɐ] of *mete(s)*, *come(s)*, and the one of *ferē(s)*, *tosse(s)* are underlyingly /e/ and /i/ respectively, which never surface by virtue of word-final vowel reduction.

While vowel lowering in verb forms is to be viewed as occurring at a lexical stage, vowel reduction is a post-lexical process. Between these two poles, the status of root vowel assimilation is dubious, and thereby appears as the most interesting. On the one hand, and contrary to vowel lowering in verb forms, height harmony has solid phonetic support insofar as its trigger (the theme vowel) shows up in the great majority of forms. On the other hand, however, and contrary to vowel reduction, the harmony processes in (7) cannot apparently be illustrated by other aspects of EP morphology: like vowel lowering, they occur only in verbs, where they seem to affect the  $/V_{\text{root}} + V_{\text{theme}}/$  sequences exclusively. I will be concerned here with the status of such 'intermediate' facts.

### 3. The state of the art

#### 3.1 Wetzels' account of Portuguese height harmony

Not surprisingly, the three mentioned phenomena are viewed by Wetzels (1995) as resulting from ordered rules. The first follows from Vowel Lowering (VL), which is a 'deep' lexical rule. The third is the effect of neutralisation rules, which are the Brazilian counterpart to EP vowel reduction, and which are ranked at a «post-lexical or post-cyclic» stratum of Portuguese morphophonology (1995: 299). The process affecting the sequence /V<sub>root</sub>+V<sub>theme</sub>/ is assigned an intermediate level between VL and neutralisation rules. Like VL, however, it is seen as lexical, since its domain is restricted to the verb, and its description requires morphological specifications.

According to Wetzels, Portuguese verbal height harmony results from two intrinsically ordered lexical rules: firstly, a Truncation rule, which affects the theme vowel when the latter is in prevocalic position, and, secondly, Vowel Harmony proper (VH). Both rules are presented in (8), where *aperture* and *aperture'* stand for aperture nodes in the line of feature geometry models:

- (8) a. *Truncation rule:*                      b. *Vowel harmony rule:*
- |   |   |
|---|---|
| $\begin{array}{c} V ]_{\text{Stem}} \quad V \quad \dots ]_{\text{Verb}} \\ \vdash \\ \text{aperture} \end{array}$ | $\begin{array}{c} V \quad \dots ]_{\text{Verb}} \\ \vdash \quad \text{aperture}' \\   \\ [+ \text{open}_3] \end{array}$ |
|---|---|

Truncation is defined as «vowel deletion with aperture stability» according to the well-known case where one of two tone-bearing vowels is deleted, while its tone is preserved and spreads to a contiguous vowel: «the deletion of a timing slot involves the deletion of all the nodes attached to it, as well as the erasure of association lines which connect V (...) to shared nodes. Since the aperture node is simultaneously dissociated, it escapes deletion at this point of the derivation. The

‘floating’ aperture node can be associated to another vowel in order to be phonetically realised» (Wetzels 1995: 291-292).

### 3.2 Is really there a Truncation rule ?

One main objection can be raised against Wetzels’ account of Portuguese verbal height harmony. It could be outlined that any lexical rule, involving morphological specifications like ‘stem’ and ‘verb’ in (8a), is necessarily poor in terms of generality. Suffice it to say that it is simply not true that the theme vowel falls when it is in prevocalic position within the right boundary of the morphological class VERB, as is required by (8a). As can be seen in (6), the endings of the 2<sup>nd</sup> person plurals *levais / morais, meteis / comeis* and *feris / tossis* contain the theme vowels *a, e* and *i* plus a vowel-initial suffix. The same can be found in the perfect forms of the verb shown in (9), where the theme vowel is attested before the suffix *-u* of the 3<sup>rd</sup> person singular in *er-* and *ir-*verbs: *meteu / comeu, feriu / tossiu*. Likewise, as will be seen in § 4.3.3, in *lev[ó(w)] / mor[ó(w)], lev[éj] / mor[éj]*, and in *met[í] / com[í], fer[í] / toss[í]*, at least some features of theme vowels are preserved before a vowel-initial suffix:<sup>7</sup>

(9) a.	<i>levar</i> ‘take away’	<i>meter</i> ‘put’	<i>ferir</i> ‘wound’
	l <sup>[°]</sup> v[éj]	m <sup>[°]</sup> t[í]	f <sup>[°]</sup> r[í]
	l <sup>[°]</sup> v[á]ste	m <sup>[°]</sup> t[é]ste	f <sup>[°]</sup> r[í]ste
	l <sup>[°]</sup> v[ó(w)]	m <sup>[°]</sup> t[é]u	f <sup>[°]</sup> r[í]u
	l <sup>[°]</sup> v[á]mos	m <sup>[°]</sup> t[é]mos	f <sup>[°]</sup> r[í]mos
	l <sup>[°]</sup> v[á]stes	m <sup>[°]</sup> t[é]stes	f <sup>[°]</sup> r[í]stes
	l <sup>[°]</sup> v[á]ram	m <sup>[°]</sup> t[é]ram	f <sup>[°]</sup> r[í]ram
b.	<i>morar</i> ‘reside’	<i>comer</i> ‘eat’	<i>tossir</i> ‘cough’
	m <sup>[u]</sup> r[éj]	k <sup>[u]</sup> m[í]	t <sup>[u]</sup> ss[í]
	m <sup>[u]</sup> r[á]ste	k <sup>[u]</sup> m[é]ste	t <sup>[u]</sup> ss[í]ste
	m <sup>[u]</sup> r[ó(w)]	k <sup>[u]</sup> m[é]u	t <sup>[u]</sup> ss[í]u
	m <sup>[u]</sup> r[á]mos	k <sup>[u]</sup> m[é]mos	t <sup>[u]</sup> ss[í]mos
	m <sup>[u]</sup> r[á]stes	k <sup>[u]</sup> m[é]stes	t <sup>[u]</sup> ss[í]stes
	m <sup>[u]</sup> r[á]ram	k <sup>[u]</sup> m[é]ram	t <sup>[u]</sup> ss[í]ram

Of course, the preservation of the thematic vowel in these cases might be said to follow from its being stressed; further specification should thus be required in order to restrict (8a) to unstressed theme vowels. However, nothing in this theory would then tell us why this vowel is precisely unstressed in /léva/+o, /léva/+e, etc., where the theme vowel ‘falls’, but not in /kɔmɛ́/+u, /levá/+is, etc., where it is maintained. Thereby, a Truncation rule appears as basically descriptive. Wetzels’ theory should therefore be abandoned if one could explain *both* vowel alternations and the different requirements such alternations have to meet, one of which seems to be stress placement.

#### 4. A ‘no-rule’ alternative

##### 4.1 Two basic assumptions

There are two implicit postulates in Wetzels’ (1995) account of Portuguese verb. My point is that they are not necessary within autosegmental representations of inflectional morphology.

The first postulate, in the line of *SPE* tradition, is that most empirical regularities are to be viewed as resulting from rules, like VL, Truncation and VH in the present case, that is from derivational processes. This may have been necessary within the strictly unilinear model of classic generative theory; however, autosegmental approaches provide much richer representations where a number of regular facts can be given configurational and non serial accounts. Thus, it will be assumed here that there is no Truncation rule.

The second implicit postulate of Wetzels’ theory is that each morpheme is lexically associated with (at least) one timing slot:

$$(10) \text{ Root + Theme}]_{\text{Stem}} + \text{ Tense/Mood/Aspect} + \text{ Person/Number}]_{\text{Verb}}$$

$$\begin{array}{cccc} \dots & \text{V} & \text{V} & \text{V} & \text{V} \\ & | & | & | & | \end{array}$$

Truncation is a necessary consequence of such a view: the theme vowel ‘falls’ if, and only if, its timing slot is deleted. Now, there is no need in

autosegmental phonology for assuming that morphological structure has a strict skeletal correlate. In what follows, I shall exploit all the possibilities provided by plurilinear representations: there can be empty slots as well as floating melodies, i.e. lacking any timing slot of their own, in both lexical and post-lexical representations.

#### 4.2 One place for two

Since truncation is ruled out, the thematic vowels, the 1<sup>st</sup> person singular *-o* and the subjunctive vowel affixes will be seen as floating melodies. The basic idea is that floating material is associated to the skeleton whenever, and only whenever, it can. Now, since it is the presence of either of two additional morphemes (the 1<sup>st</sup> p. singular *-o* or the subjunctive affixes) that prevents the realization of the theme vowel, it will be assumed that there is *only one* slot available for these additional morphemes *and* the theme vowel, so that there is ‘not enough place’ for two vowels to be linked and thus to be phonetically realized. In this case, and only in this case, the height feature of the floating theme vowels /a e i/ spreads to the root vowel, yielding the observed alternations.

The limitation imposed to the number of slots available to the verb suggests that at least a basic part of EP verbal morphology belongs to a ‘templatic’ type which resembles what can be found in many Afroasiatic languages, and was first formulated in autosegmental terms by McCarthy (1979, 1981). A morphology is templatic if it recurs to one or several syllabic patterns or templates that constrain the volume of words and the association of melodic units. Just as the perfective forms of the Arabic verb obey a CVCVC pattern regardless of the number of radical consonants involved (e.g., √ktb ‘write, writing’ → *katab* ‘he wrote’ and √md ‘stretch, stretching’ → *madad* ‘he stretched’), so do the verbal forms in (6) match the dissyllabic template broadly represented in (11) regardless of the number of vowels:

$$(11) \quad EP \text{ verbal template:} \quad ] \quad \sigma_1 \quad \sigma_2 \quad ] \\ \quad \quad \quad \Delta \quad \quad |$$

The leftmost bracket means that (11) constrains what might be called the ‘verbal rhyme’, i.e. the final part of the verb beginning by the last radical syllable. In other words, the number of syllables preceding the final syllable of the root is irrelevant. The bottom symbols mean that, while  $\sigma_1$  is either light or heavy, the last syllable is necessarily light.

Clearly dictated by the unmarked accentual pattern of EP (cf. § 2.1.3), this template underlies the morphologically unmarked forms of the verb, i.e., *ceteris paribus*:

- |      |                              |   |
|------|------------------------------|---|
| (12) | Unmarked vs. marked:         | Examples:   |
|      | a. Singular vs. plural:      | <i>levo / levamos, leve / levemos,</i><br><i>levas / levais, leves / leveis.</i>  |
|      | b. Present vs. other tenses: | <i>levo / levava, leve / levasse,</i><br><i>levas / levaste, levam / levaram.</i> |

Assuming that the suffixes in (13) lack any skeletal basis of their own, and that roots are lexically associated to the verbal template in (11), there is only one syllable left for the two vowel sets in (13), which are, thus, in complementary distribution:

- (13) a. The thematic vowels *a, e, i*.  
 b. The 1<sup>st</sup> person suffix *o*, and the subjunctive affixes *e, a*.

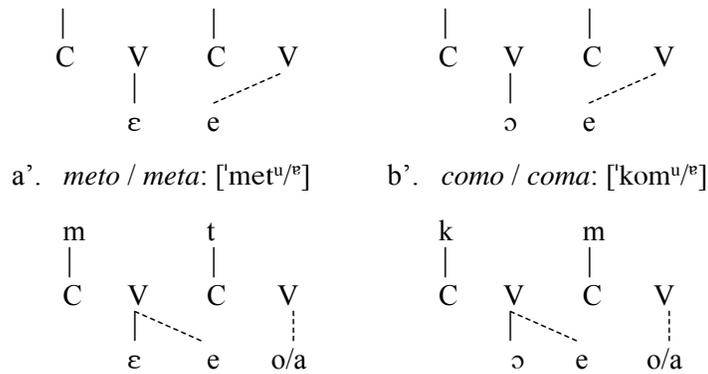
Vowel alternations become entirely predictable by means of a single parameter which can be formulated as follows:

- (14) *Linking directionality parameter:*

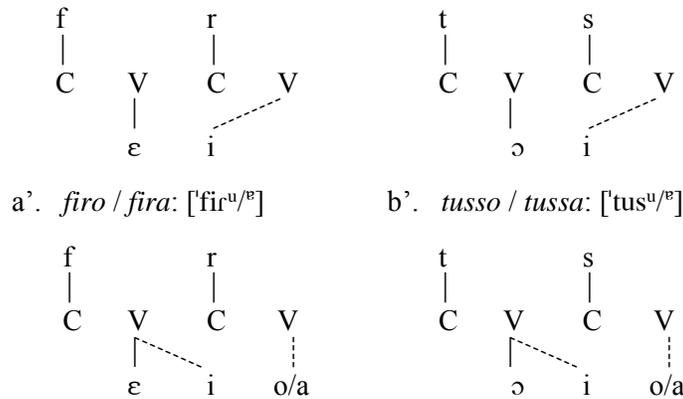
Floating melodies associate from right to left.

As illustrated in (15, 16), the theme vowel is associated to the final syllable of the verbal template if, and only if, there is no (13b)-type morpheme in the verb; otherwise, the theme vowel’s height feature spreads onto the root vowel:

- |      |                         |                         |
|------|-------------------------|-------------------------|
| (15) | a. <i>mete</i> : [mɛtʰ] | b. <i>come</i> : [kɔmʰ] |
|      | m            t          | k            m          |



- (16) a. *fere*: [fɛr<sup>ɔ</sup>]                      b. *tosse*: [tɔs<sup>ɔ</sup>]



The CV notation of the verbal template in (15, 16) is a shorthand for a sequence of timing slots linked to onset/nuclei components. Likewise, the melodies /e/ and /i/ represent either whole segments, as in (15a,b) and (16a,b), or only their height features, as in (15a',b') and (16a',b').<sup>8</sup> Why this is so results from the constraints on segmental structure in EP: since there are no front rounded vowels in EP, \*[kɔm<sup>u</sup>] and \*[tys<sup>u</sup>] are disallowed, and only the theme vowel's height feature is compatible with both root vowels.

### 4.3 Independent evidence for the templatic theory

**4.3.1** At this stage, two objections could be raised against the theory presented in § 4.2. Firstly, it might be said that the reason for the template in (11) exclusively lies on EP vowel alternations. It should thus be necessary to give independent evidence for (11).

Secondly, contrary to Wetzels' rules, the mechanism presented here has a purely phonological basis: no morphological specifications such as 'stem', 'theme', etc. are needed. Now, this might be viewed as a trivial claim if such vowel assimilations occurred only within  $/V_{\text{root}} + V_{\text{theme}}/$ -sequences. We should thus look for similar assimilations elsewhere in EP morphology.

**4.3.2** Let us first consider the validity of (11). A crucial issue of the putative dissyllabic template underlying the morphologically unmarked forms defined in (12) is that the affixes listed in (13) are pure melodies, lacking timing slots of their own, since the template provides only one slot for two classes of affixes. Therefore, independent evidence for the existence of these CV-less affixes would be indirect support for the templatic hypothesis. Now, stress placement in the verb brings independent evidence for CV-less affixes.

It is remarkable that all unmarked forms defined in (12) are both paroxytonic and rhizotonic. Indeed, given the dissyllabic template in (11), whose last syllable is open and hence light, this is exactly what we expect according to EP stress placement rules (cf. § 2.1.3). Crucially, the adjunction of (13b)-type suffixes *does not affect stress placement*: *levo*, *leve*, *meto*, *meta*, etc., with two underlying suffixes, remain paroxytonic and rhizotonic just like *leva*, *mete*, etc., with only one suffix. Clearly, assuming that stress is CV- and not melody-sensitive, the claim that the suffixes in (13) lack any skeletal basis provides the simplest way to explain such a fact.

Of course, it could be objected that a Truncation rule would be as useful as the present hypothesis. However, as was seen in § 3.2, truncation-based theories do not precisely explain why the root vowel is stressed in  $/l\acute{e}va/+o$ ,  $/k\acute{o}me/+o$  (1<sup>st</sup> p. present), but not in  $/lev\acute{a}/+u$ ,  $/k\omicron me\acute{}/+u$  (3<sup>rd</sup> p. perfect). On the contrary, in the present approach, this raises no difficulty if *two classes* of affixes are assumed in EP: those, listed in (17a), which do not affect stress placement in the verb, either lack timing slots of their own, or, like  $/-s/$ , do not involve a following

nucleus;<sup>9</sup> those, listed in (17b), which affect stress placement, will be viewed as lexically associated with nucleic positions.

(17) a. *CV-less affixes:*

<i>o</i>	‘1 <sup>st</sup> person singular’	
<i>s</i>	‘2 <sup>nd</sup> person singular’	
<i>N</i>	‘3 <sup>rd</sup> person plural’	
<i>e</i>	‘subjunctive’ (1 <sup>st</sup> conj.)	(+ <i>s, N, mos, es</i> )
<i>a</i>	‘subjunctive’ (2 <sup>nd</sup> & 3 <sup>rd</sup> conj.)	(+ <i>s, N, mos, es</i> )
<i>a</i>	thematic vowel (1 <sup>st</sup> conj.)	(+ <i>s, N, all CV affixes</i> )
<i>e</i>	thematic vowel (2 <sup>nd</sup> conj.)	(+ <i>s, N, all CV affixes</i> )
<i>i</i>	thematic vowel (3 <sup>rd</sup> conj.)	(+ <i>s, N, all CV affixes</i> )

b. *CV affixes:*

<i>mos</i>	‘1 <sup>st</sup> person plural’	
<i>(d)e(s)</i>	‘2 <sup>nd</sup> person plural’	
<i>i</i>	‘1 <sup>st</sup> person singular’ + ‘perfect’	
<i>s]te(s)</i>	‘2 <sup>nd</sup> person singular/plural’ + ‘perfect’	
<i>u</i>	‘3 <sup>rd</sup> person singular’ + ‘perfect’	
<i>ram</i>	‘3 <sup>rd</sup> person plural’ + ‘perfect’	
<i>va</i>	‘imperfect’ (1 <sup>st</sup> conj.)	(+ <i>s, N, mos, es</i> )
<i>ia</i>	‘imperfect’ (2 <sup>nd</sup> & 3 <sup>rd</sup> conj.)	(+ <i>s, N, mos, es</i> )
<i>sse</i>	‘imperfect subjunctive’	(+ <i>s, N, mos, es</i> )
<i>ra</i>	‘pluperfect’	(+ <i>s, N, mos, es</i> )
<i>r</i>	‘infinitive’	(+ <i>s, N, mos, es</i> )
<i>r</i>	‘future subjunctive’	(+ <i>s, N, mos, es</i> )
<i>n]do</i>	‘gerund’	

Since the affixes in (17b) have their own skeletal basis, stress falls immediately after the root syllable, according to the paroxytonic unmarked pattern, whenever they are added to the stem. For the same reason, this stressed syllable is left available for the theme vowel. Hence the imperfect subjunctive forms in (18, 19) (where the underlined CV stands for the stressed syllable), but also the imperfect indicative of the 1<sup>st</sup> conjugation (*-va*), the pluperfect indicative (*-ra*), the gerund (*-ndo*),

the future subjunctive and the infinitive (both with an *-r* followed by a final empty nucleus).

- (18) a. *metesse:* [m<sup>ə</sup>tes<sup>ə</sup>]
- |   |   |          |          |   |   |   |
|---|---|----------|----------|---|---|---|
| m |   | t        |          |   | s |   |
|   |   |          |          |   |   |   |
| C | V | <u>C</u> | <u>V</u> | + | C | V |
|   |   |          |          |   |   |   |
|   | ε |          | e        |   |   |   |
- b. *comesse:* [k<sup>u</sup>mes<sup>ə</sup>]
- |   |   |          |          |   |   |   |
|---|---|----------|----------|---|---|---|
| k |   | m        |          |   | s |   |
|   |   |          |          |   |   |   |
| C | V | <u>C</u> | <u>V</u> | + | C | V |
|   |   |          |          |   |   |   |
|   | ɔ |          | e        |   |   |   |
- (19) a. *ferisse:* [f<sup>ə</sup>ris<sup>ə</sup>]
- |   |   |          |          |   |   |   |
|---|---|----------|----------|---|---|---|
| f |   | r        |          |   | s |   |
|   |   |          |          |   |   |   |
| C | V | <u>C</u> | <u>V</u> | + | C | V |
|   |   |          |          |   |   |   |
|   | ε |          | i        |   |   |   |
- b. *tossisse:* [t<sup>u</sup>sis<sup>ə</sup>]
- |   |   |          |          |   |   |   |
|---|---|----------|----------|---|---|---|
| t |   | s        |          |   | s |   |
|   |   |          |          |   |   |   |
| C | V | <u>C</u> | <u>V</u> | + | C | V |
|   |   |          |          |   |   |   |
|   | ɔ |          | i        |   |   |   |

Crucially, as can be seen, the affixes that are involved in vowel alternations are the same as those that have no effect on stress placement. The hypothesis of CV-less affixes is thus supported by both vowel alternations and stress placement. Since such affixes are part of the

templatic theory presented in § 4.2, stress placement brings indirect evidence for the verbal template in (11).

**4.3.3** As was observed in § 2.2.2, height harmony has natural conditions, but seems to occur only within /V<sub>root</sub>+V<sub>theme</sub>/-sequences; hence, VH was assigned a lexical status by Wetzels, though it applies after VL, which is in all points morphologically conditioned. Here, vowel alternations are supposed to follow from a purely phonological process of assimilation. Accordingly, if such assimilations exist elsewhere in EP, they are expected to yield similar results, providing, thus, independent evidence for their phonological conditioning.

Let us consider the verbal forms in (20), in particular the 1<sup>st</sup> and 3<sup>rd</sup> persons singular in (20a), and the imperfect indicative forms of the 2<sup>nd</sup> conjugation in (20b):

(20) a. *Perfect indicative*

l <sup>[°]</sup> v[éj]	m <sup>[°]</sup> t[í]	f <sup>[°]</sup> r[í]
l <sup>[°]</sup> v[á]ste	m <sup>[°]</sup> t[é]ste	f <sup>[°]</sup> r[í]ste
l <sup>[°]</sup> v[ó(w)]	m <sup>[°]</sup> t[é]u	f <sup>[°]</sup> r[í]u
l <sup>[°]</sup> v[á]mos	m <sup>[°]</sup> t[é]mos	f <sup>[°]</sup> r[í]mos
l <sup>[°]</sup> v[á]stes	m <sup>[°]</sup> t[é]stes	f <sup>[°]</sup> r[í]stes
l <sup>[°]</sup> v[á]ram	m <sup>[°]</sup> t[é]ram	f <sup>[°]</sup> r[í]ram

b. *Imperfect indicative*

m <sup>[°]</sup> t[í]a	f <sup>[°]</sup> r[í]a
m <sup>[°]</sup> t[í]as	f <sup>[°]</sup> r[í]as
m <sup>[°]</sup> t[í]a	f <sup>[°]</sup> r[í]a
m <sup>[°]</sup> t[í]amos	f <sup>[°]</sup> r[í]amos
m <sup>[°]</sup> t[í]eis	f <sup>[°]</sup> r[í]eis
m <sup>[°]</sup> t[í]am	f <sup>[°]</sup> r[í]am

The point is the difference between those forms, especially the ones in (20a), which are listed in (21a), and the forms shown in (21b):

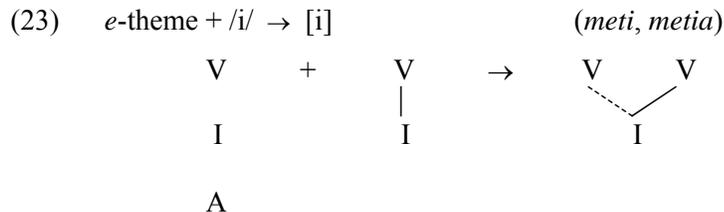
(21) a. lev[éj]                      b. lev[áj]                      ‘take away! (pl.)’

met[í]	met[éj]	‘put! (pl.)’
lev[ó(w)]	m[áw]	‘bad’
met[éw]	ch[é <sup>u</sup> ]	‘full’
fer[íw]	r[í <sup>u</sup> ]	‘river’

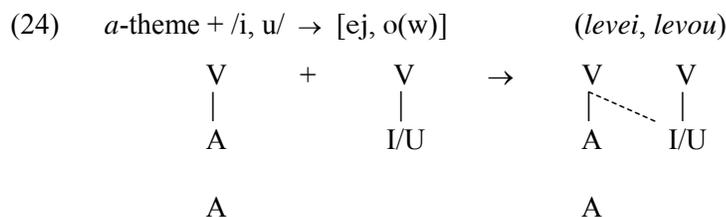
In both (21a) and (21b), stress falls after the root vowel. Hence, according to what was seen in § 4.3.2, both (21a)- and (21b)-type forms have CV-suffixes. Why, then, do they show different endings? We can notice a higher degree of contraction in (21a) than in (21b): *cheio* and *rio* are dissyllabic contrary to (*en*)*cheu* ‘he filled’ and *riu* ‘he laughed’; in the remaining forms, the thematic vowel is assimilated by the suffixal vowel in (21a) while it is preserved in (21b). I shall deduce from such differences that the underlying suffixal vowels in (21a) are higher than the ones in (21b); hence, they are more likely to trigger both diphthongization and assimilation.<sup>10</sup>

(22)	a.	/á + i/ → lev[éj]	b.	/á + e/ → lev[áj]
		/é + i/ → met[í]		/é + e/ → met[éj]
		/á + u/ → lev[ó(w)]		/á + o/ → m[áw]
		/é + u/ → met[éw]		/é + o/ → ch[é <sup>u</sup> ]
		/í + u/ → r[íw]		/í + o/ → r[í <sup>u</sup> ]

Now, if the suffixal vowels in (22a) are high, then the /i/ of *meti*, *metia* (= /mete+i(a)/) and the one of *firo* (= /fer+i/o) are due to the same reason: just as the root mid vowel was assimilated in (16a’) to the height of the thematic vowel, so is the thematic mid vowel assimilated here to the height of the suffixal vowel, as is represented in (23) (where the floating elements of the theme vowel allow for [e] ~ [ə] alternation: cf. § 2.1.2 and Carvalho 1994):



The same process applied to *a*-themes yields diphthongization, as is shown in (24) (where the floating A-element allows for [a] ~ [ɐ] alternation: cf. § 2.1.2 and Carvalho 1994):



The main difference between (15, 16) and (23, 24) is that, in the second case, there are enough positions for a diphthong to occur; hence, low vowels are also the target of assimilation, as in /a+i/ → [ej] (*levei, morei*), while, e.g., /lat+i/+o (from *latir* ‘bark’) gives [lat]o, not \*[lejt]o, because there is only one nucleic slot available in the stem.

Thus, the mechanism of EP vowel alternations is not based on idiosyncratic properties of morphemes: according to the phonological structure of the verbal form, assimilation affects either /V<sub>root</sub>+V<sub>theme</sub>/- or /V<sub>theme</sub>+V<sub>suffix</sub>/-sequences.

## 5. Conclusion

Comparatively to rule-based accounts of Portuguese vowel alternations, the present one has much greater explanatory power, since it links together, and thus explains, the three facts listed in (25):

- (25) a. Vowel alternations in the verb (cf. § 4.2);  
 b. Stress alternations in the verb (cf. § 4.3.2);  
 c. Perfect and imperfect endings (cf. § 4.3.3).

This paper has two main theoretical issues. Firstly, it proposes a universal definition of umlaut not as a rule-based and morphologically-grounded process but as a configurational and phonological phenomenon: it implies association of *n* segmental melodies with *n*-1

timing slots of a syllabic template, which is the *signifiant* of a given morpheme (here, the unmarked form of the verb).

The second point at issue here is that a basic part of Portuguese verbal morphology is naturally accounted for thanks to a rather unusual concept in Romance linguistics, which is however familiar to Semitists, and can be illustrated by the following perfective forms of the Arabic verb meaning ‘to write’ (3<sup>rd</sup> p.):

(26)		<i>Active</i>	<i>Passive</i>	
	a.	katab	kutib	unmarked mood
	b.	kattab	kuttib	"causative"
	c.	kaatab	kuutib	"participative"

As can be seen, there are three morphemes in these forms (cf. McCarthy 1979, 1981), (27c) being the syllabic template:

(27)	a.	the root:	/ktb/ ;
	b.	the voice:	/a/ ~ /ui/ ;
	c.	the mood:	CVCVC ~ CVCCVC ~ CVVCVC.

Portuguese morphology differs from the Semitic prototypical case in two ways. Firstly, it remains ‘concatenative’ insofar as it has no consonantal roots such as √ktb mixed with vowel-based morphemes like (27b); actually, the thematic vowel *follows* the verbal root and *precedes* personal and modal suffixes. Thereby, Portuguese verbal inflection shows that ‘concatenative morphologies’ are not necessarily non-templatic. It should be noted that ‘templatic morphologies’ are not always non-concatenative either: a large part of the Arabic verbal system also involves affixation. Hence, the following typology of two basic morphological features can be proposed:

(28)		<i>Templatic</i>	<i>Concatenative</i>
	a.	+	-

b.	+	+
c.	-	+
?d.	-	-

Whether (28d)-type morphologies exist remains an open question.

Secondly, while Semitic templates form rich paradigms with highly specific morphological content, as can be seen in (26), there is only one template in EP verbal morphology. However, this uniqueness may be supposed to be the cause of its relative importance: if there is only one template in EP, then it shows both the unmarked CVCV-pattern in (11) dictated by stress placement rules (cf. § 2.1.3), and an underspecified meaning (verbal unmarkedness); thereby, this unique template affects the most frequent and productive forms of the verb.

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## Notes

<sup>1</sup> Wetzels (1995) deals with Brazilian Portuguese. However, evidence for both Wetzels' views and the present claims is basically identical in Brazilian and European Portuguese; regarding the facts described in both studies, the two dialects differ but by the vowel neutralization processes in unstressed syllables, which are irrelevant for Wetzels' analysis and mine.

<sup>2</sup> I shall leave aside the /e/ ~ /a/ opposition that exists only before heterosyllabic nasals in central EP for a particular morphological purpose: *matamos* 'we kill' / *matámos* 'we killed'.

<sup>3</sup> The diphthongs [ej], [ẽK] and [ow] are currently realized as [ej], [ẽK] and [o] respectively in standard pronunciation. Nasal diphthongs are almost exclusively word-final, [ẽK)/ẽK)#] occurring instead of \*[ẽ#].

<sup>4</sup> Hence, /o(w)/ in (3), which is not reduced in unstressed syllables (cf. *louva* / *lowar*), is to be analyzed as a diphthong though it surfaces nowadays as a monophthong in southern EP.

<sup>5</sup> I shall not take into account in this paper the future and conditional forms (*matarei*, *matará*, *mataria*, etc.), which are exceptional in many ways. In particular, they allow pronominal insertion (*matá-lo-á*, *matá-lo-ia* 'he will/would kill him', *dir-se-ia* 'one would say'), which clearly reveals the autonomy of the verbal endings (< lat. *habere*).

<sup>6</sup> Some other verbs which once had root mid vowels (cf. *agredir*, *prevenir*, *polir*, etc.) underwent the same harmony process as *ferir* and *tossir* (cf. *agrido*, *pulo*), and generalized the harmonised high vowel to all rhizotonic forms (*agrides*, *agride*, *pules*, *pule*, instead of *\*agr[ɛ]des*, *\*p[ɔ]les*). Actually, such verbs are to be viewed as containing /i/ and /u/ in their roots in modern EP: the pronunciation in pretonic contexts *agr[ɨ]dir* and *p[ʉ]lir* is due to vowel reduction, the former involving a normal height dissimilation process (cf. *ministro*, *piscina*, etc. = [m<sup>3</sup>niʃtr<sup>u</sup>], [p<sup>3</sup>ʃsin<sup>ɐ</sup>]). Note that Brazilian Portuguese has height assimilation here: [m<sup>1</sup>niʃtr<sup>u</sup>], *agr[ɨ]dir*, *p[ʉ]lir*. In both dialects, thus, the radical underlying vowels can be shown to be /i/ and /u/.

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<sup>7</sup> Note that this is confirmed by clitic adjunction, where two contiguous vowels cause glide formation, not truncation:

/a/ + o → [ɐw]    *leva-o* ‘take it away!’, *coma-o* ‘eat it!’  
/e/ + o → [j<sup>u</sup>]    *leve-o* ‘take it away!’, *come-o* ‘eat it!’  
/e/ + a → [j<sup>e</sup>]    *leve-a* ‘take it away!’ (fem.), *come-a* ‘eat it!’ (fem.)  
/i/ + o → [j<sup>u</sup>]    *fere-o* ‘wound him!’  
/i/ + a → [j<sup>e</sup>]    *fere-a* ‘wound her!’

<sup>8</sup> EP vowel reduction (cf. Carvalho 1994) is not represented in (15, 16).

<sup>9</sup> The representation assigned here to word-final /-s/ results from the fact that EP /Vs/-syllables are light, contrary to final /Vr/-syllables (cf. Carvalho 1989), hence the absence of a following empty nucleic slot. On the other hand, like most CV-less affixes, /-N/ is a floating element; it associates with the preceding nucleic slot, yielding the light (and hence unstressed) final nasal diphthongs *-am* and *-em*.

<sup>10</sup> Note that *mau* and *cheio* come from lat. *malu* and *plenu* through the medieval loss of intervocalic *-l-* and *-n-*. Likewise, *levai* and *metei* derive from old Port. *leva(d)e* and *mete(d)e*. The forms in (22a), however, date back to vocalic clusters which already existed in vulgar Latin. The difference between the underlying final vowels of (22a) and (22b) is, thus, supported by diachronic evidence.