

## **Bihotz ahots**

M. L. Oñederra irakaslearen omenez



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# Complex Segments in Portuguese: The Unbearable Heaviness of Being Palatal

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## 1. Introduction

The most current phonological descriptions of Portuguese usually assume the existence of what will be called here «complex segments» (CSs): segments that correspond to phonetic singletons but are conceived of, at the phonological level, as the combination of two segmental and/or autosegmental units.

Nasal vowels and the uvular / alveolar trill are among the examples of such cases. The main arguments on which the proposal of «segment complexity» is grounded include diachronic and synchronic evidence.

In this paper, it is our aim to show that the palatal consonants of Portuguese —/ɲ ʎ ʒ/— can also be lexically represented as highly complex segments, with palatality {I} as a special autosegmental property that makes these consonants *inherently heavy*.

In section 2, we shall look at the special cases of nasal vowels and the uvular trill of Portuguese to review some of the main arguments that lead the current phonological descriptions of this language to accept them as «complex» (or «biphonemic») segments, in Structuralist (see, a.o., Barbosa 1983, 1994).

On the basis of the data collected in section 2, we shall develop, in section 3, our central proposal, suggesting that the same arguments can support the view of palatal consonants as complex consonants in Portuguese, too.

## 2. Complex segments in Portuguese: the cases of nasal vowels and trills

In this study, «complex segment» is a label that applies to whichever phonetic segment (either a vowel or a consonant) that, even though occurring phonetically as a singleton, is interpreted, at the lexical level, as the combination of at least two co-occurring segments or one segment plus an autosegment.

In this sense, «segment complexity» is unrelated to the notion of complexity that is found in Brandão de Carvalho *et al.* (2010) – who give complexity basically as a function of the number of «positive features» found within the internal structure of segments (mainly consonants) and relate it to typological frequency and markedness. By the other hand, complexity, as assumed in this paper, has nothing to do, to a certain extent at least, with the «secondary articulation» that usually describes, in many languages of the world, affricates and labiovelars (Chomsky and Halle 1968; Ladefoged and Maddieson 1996). Thirdly, we should mention that Segment Complexity, as assumed here, is unrelated, too, with the internal organization of segments in terms of features or elements, since what will be proposed later is that CSs are, indeed, lexically independent segments that phonetically merge into phonetic singletons, regardless of the elemental particles or sub-units that contribute to build up a *phonological* singleton.

In the narrowest sense that is assumed here, segment complexity can thus be formalised as in table (1).

**Table 1**

Phonetic complex segments and their phonological counterpart

Phonetic level

Lexical representation

[X]



A
B
...

X=Phonetic single segment    A, B, ... = *Phonological* (segmental / autosegmental)  
co-occurring segments / autosegments

In the following section, we shall try to exemplify this assumption of complexity with two subclasses of segments of European Portuguese (EP): nasal vowels and trills.

### 2.1. *Nasal vowels in Portuguese*

The phonetic inventory of Portuguese vowels includes a set of the so-called «nasal vowels». In the standard variety of European Portuguese (EP), only mid-high and high vowels can be realised as nasals, as shown in (2) in table 2. Phonetically, as it is shown in (3) in the table below, they can be distinctive.

**Table 2**  
Phonetic nasal vowels in EP

<p>(2). Phonetic nasal vowels in European Portuguese (standard variety)</p> <p>[ĩ] <i>fim</i> [fi] ‘end’, <i>quinta</i> [ˈkĩtɔ] ‘farm’                  [ẽ] <i>tempo</i> [ˈtẽpu] ‘time’                  [ẽ] <i>campo</i> [ˈkẽpu] ‘field’                  [õ] <i>fonte</i> [ˈfõti] ‘source’                  [ũ] <i>mundo</i> [ˈmũdu] ‘world’</p>	<p>(3). Nasal vowels’ distinctiveness at the surface level in European Portuguese</p> <p>a. [ũ] <i>mundo</i> [ˈmũdu] ‘world’ / [u] <i>mudo</i> [ˈmudu] ‘mute’                  b. [ẽ] <i>vende</i> [ˈvẽdĩ] ‘[he/she] sells’ / [e] <i>vede</i> [ˈvedĩ] ‘[you] see [imperat.]’</p>
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In spite of being phonetically surfaced as single segments (see phonetic transcriptions in 2), and regardless of being distinctive at the surface level (see 3), the nasal vowels of EP are generally assumed as the phonetic counterparts of the combination of two distinct, abstract phonological units: the vowel itself and nasality, conceived of as a theoretical segment «deleted at the phonetic level» (Mateus and Andrade 2000: 23), as a «floating segment» (Mateus and Andrade 2000: 130, 131), as an «autosegment» (Andrade 1994: 134, 138; Mateus and Andrade 2000: 131-132) or an «archiphoneme» (Barbosa 1983: 96 ff.; 1994: 195-196; Barroso 1999: 143). It is assumed that nasality, at the lexical level, keeps its autonomy from the vowel itself, maintaining therefore the historical independence between both. This is particularly true for the very frequent cases when nasal vowels descend from Latin linear sequences {Vowel + NasalConsonant} (Touratier 2005: 126-128), kept as such in some Romance languages, as it is shown in Table 3 (as for this particular, French behaves like Portuguese, since complete phonetic nasalisation of the vowel also occurs in both languages).

**Table 3**

The historical results of Latin Vowel + Nasal in Portuguese, Spanish and Italian

Latin 2 successive segments	Spanish / Italian 2 successive segments	Portuguese (= French) 1 single segment ([Ṽ]) (=COMPLETE NASALISATION)
Lat. <i>campum</i> [ˈkam.pum] Lat. <i>mundum</i> [ˈmun.dum]	Sp./It. <i>campo</i> [ˈkam.po] Sp./It. <i>mundo</i> [ˈmun.do]	EP <i>campo</i> [ˈkẽ.pu] EP <i>mundo</i> [ˈmũdu]

The «superimposition», at the phonetic level, of vowelness and nasality would be an instance of «phonetic nucleation», according to Morales-Front and Holt (1997: 402-403). That is to say, even if, in the history of the language, the vowel and a following etymological nasal have *merged* into a sin-

gle segment, their phonological representation still keeps them apart, as it happened in the past, as it still happens in other Romance languages and as it is still represented by the official orthography of the language, that goes on marking the vowel and the nasality with two different, successive symbols (one for the vowel, another one for nasality – see examples above).

Nonetheless, as previously said, phonologists generally coincide in interpreting phonetic Nasal Vowels of EP as purely phonetic, obtained through derivation from complex structures like the one found in (1). Rephrasing Barbosa (1983; 1994), they are «biphonemic» still in the contemporary stage of the language.

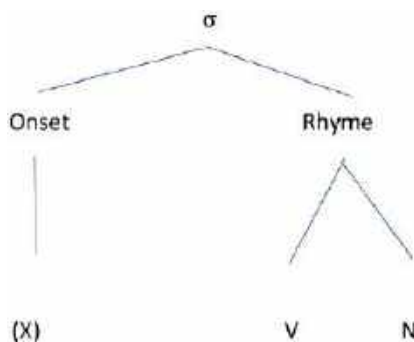
The main arguments that support this view are the following (see, e.g., Barbosa 1983; 1994; Mateus and Andrade 2000; Mateus *et al.* 2003):

- historically, such vowels do descend from a sequence of {Vowel + Nasal Consonant}; the merge of these two segments into a single one is relatively recent and purely phonetic;
- according to Portuguese phonotactics, syllable codas can be maximally filled by just one consonant (/l/, /r/ and, under particular circumstances, /S/); when a phonetically nasal vowel is found in a syllable, /l/ or /r/ cannot be found at syllable coda (there are no words such as \**munl.do* or \**quenr.te*, for instance (although *mun.do* ‘world’ [‘mũdu] and *quen.te* ‘hot’ [‘kêti] are admitted; this is explained by the presence of a theoretical /N/, inherited from Latin, as a nasal coda, even if not segmentally produced);
- when, in EP, a syllable with a medial consonantal coda is followed by a syllable with a rhotic as its onset, the only admitted rhotic is a trill (e.g., *guel.ra* ‘gill’ [‘gɛʃ.rɐ], vs. unadmitted \*[‘gɛʃ.rɐ]). This also happens with nasal vowels: contrasting with *ma.ta* ‘[s/he] kills’ [‘matɐ] / *mar.ta* ‘marten’ [‘martɐ] / *mal.ta* ‘people’ [‘maʎtɐ], \**mār.ta* \*[‘mārtɐ] is phonotactically impossible in EP. This is an additional argument to accept the presence of a theoretical, autosegmental —and lexically autonomous— /N/ in the coda of the first syllable;
- as a result of certain morphological operations, nasality can detach completely itself from the vowel with which it phonetically overlaps. Examples are found in morphologically related pairs such as *som* ‘sound’ [sõ] / *sonoro* ‘noisy’ [su'nõru] or *fim* ‘end’ [fi] / *final* ‘final’ [fi'naʎ]. In these examples, the second word of each pair projects nasality as a segmental consonant, at the onset of a second syllable, which is seen as evidence of the inherent autonomy between the vowel and the nasality which appears to be masked in surface realisations such as the phonetic nasal vowels;
- finally, it is accepted that nasal vowels, as any heavy VC sequence in Portuguese, confers weight to a syllable. When a .(X)VC. sequence

occurs in penultimate position in a Portuguese word, it mandatorily attracts word primary stress (*a.mar.go* ‘bitter’ [ɐ'margu]; *as.fal.to* ‘pitch’ [ɐʃ'faʎtu]). No proparoxytonic words with a heavy VC combination in penultimate position are allowed in Portuguese (\*[a'margu], \*[aʃ'faʎtu]), whereas all proparoxytons in Portuguese show a light .(X)V. structure in penultimate syllable (e.g., *es.tô.ma.go* ‘stomach’ [(i)ʃ'tomɐgu], *rá.pi.do* ‘fast’ [ʀ'rapidu], *flá.ci.do* ‘flaccid’ [ʃ'fladidu]). In this respect, VN structures behave exactly as any other VC sequence: no proparoxytons are found with a nasal vowel in the penultimate position and, when VN is found in such syllable, it always attracts word primary stress (e.g., *assunto* ‘subject’ [ɐ'sũtu], \*[ʃ'ɐsũtu]; *amante* ‘lover’ [ɐ'mẽti], \*[ʃ'ɐmẽti]).

Taken together, all these arguments lead to the conclusion that nasal vowels, although being monosegmental at the surface (phonetic) level, correspond, lexically, to more complex structures, with a prosodic structure like the one that is presented in table 4: they correspond to phonologically heavy syllables with a coda which is autosegmentally filled by a theoretical /N/.

**Table 4**  
Prosodic representation of phonetic nasal vowels of Portuguese



## 2.2. Trills

Rhotics in EP can be surfaced either as flaps ([r]) or trills (alveolar [r] or uvular [ʀ], depending on the dialects).<sup>1</sup> In intervocalic position, they behave as distinctive segments, as shown in table 5.

<sup>1</sup> Phonetically, trills are being replaced by dorsal fricatives in EP, as shown by Amorim (2014) and Veloso (2015). As it is not a relevant issue for the current study, we shall not focus on this on-going variation.

**Table 5**

Rhotics in Portuguese: surface-level distinctiveness  
(intervocalic position)

<i>muro</i> ‘wall’ [ˈmuru]	<i>murro</i> ‘punch’ [ˈmuru]
<i>caro</i> ‘expensive’ [ˈkaru]	<i>carro</i> ‘car’ [ˈkaru]
<i>era</i> ‘[s/he] was’ [ˈɛrɐ]	<i>erra</i> ‘[s/he] makes faults’ [ˈɛrɐ]

In spite of their contrastiveness, in pairs such the ones in (6), for many phonologists of Portuguese these rhotics correspond to one single lexical rhotic (/r/), [R] being the surface result of a gemination process (see Mateus and Andrade 2000; Mateus *et al.* 2003). No consensus about this issue exists, though, since other phonological interpretations are also available (Bonet and Mascaró 1997, Amorim 2014, a.o., accept the contrast flap / trill at the lexical level).

For those who defend that, lexically, one single rhotic exists in EP, two main arguments are generally given:

1. it offers us a more economic description of the consonantal system of the language;
2. in words with three or more syllables, if the last syllable has a trill as its phonetic onset, stress is found mandatorily on the ultimate or penultimate syllable: *catarro* ‘severe cough’ [kɐˈtaru] (\*[ˈkɐtaru]), *casmurro* ‘stubborn’ [kɐʒˈmuru] (\*[ˈkɐʒmuru]), *aforro* ‘savings’ [ɐˈforu] (\*[ˈɐforu]). This regularity is interpreted as a strong evidence that the coda of the penultimate syllable is filled by an underlying /r/, making it a heavy — thus, stressed — syllable, exactly in the same way as an underlying, autosegmental /N/ is accepted in the penultimate coda, inhibiting proparoxytonic stress, in words like those found in section (2.1). That is to say, words like the ones that have been just exemplified are phonologically interpreted as in table 6.

**Table 6**

Phonetic realisations and phonological representations of words with [R]-onset  
in the last syllable (Mateus and Andrade 2000; Mateus *et al.* 2003)

Word representation	Phonetic form	Lexical representation
<i>catarro</i> ‘severe cough’	[kɐˈtaru] (*[ˈkɐtaru])	/kɐˈtar.ru/
<i>casmurro</i> ‘stubborn’	[kɐʒˈmuru] (*[ˈkɐʒmuru])	/kɐʒˈmur.ru/
<i>aforro</i> ‘savings’	[ɐˈforu] (*[ˈɐforu])	/ɐˈfor.ru/

### 2.3. *Summary*

Mainstream phonological descriptions of Portuguese accept that some phonetically single segments can correspond to more than one segment or to a combination of at least one segment and one autosegment –that merge postlexically into one phonetic singleton. We have seen two of such cases–nasal vowels and trills. Most of the arguments that support this view have to do with the phonological behaviour of such sounds in the language: regardless of their distinctiveness, the fact that they behave like heavy VC (in the case of nasal vowels) or  $C_{\text{HeavySyllable}}.C$  (in the case of rhotics) sequences has been generally accepted as sufficient evidence of the view that, underlyingly, they correspond to two autonomous phonological units. The main evidence, as far as this argument is concerned, is the behaviour of nasal vowels and rhotics regarding primary stress assignment:

- a phonetically nasal vowel in the penultimate attracts stress and inhibits proparoxytonic stress;
- a phonetic trill in the onset of the last syllable also inhibits proparoxytonic stress.

In addition, historical data are also considered important: both nasal vowels and trills were, diachronically, two distinct, sequential segments, and the modern phonological structure of the language would somehow preserve such past status.

Altogether, these facts have been interpreted as evidence that, in both cases, the coda of the penultimate syllable is filled by a phonological unit without an autonomous, discrete phonetic realisation, even if lexically represented at the theoretical representation of the words as such. According to the definition of Complex Segment that was assumed at the beginning of the chapter, this phonological interpretation is sufficient to accept both nasal vowels and trills as CSs in EP.

## 3. **Palatal consonants**

In this section, the central issue of this paper will be dealt with: on the basis of some of the main arguments that can lead to the acceptance of phonetic nasal vowels and trills as complex segments (in the sense of «complex segment» that was made explicit in section 1), we shall suggest that palatal consonants could also correspond to complex segments.

### 3.1. *Palatal consonants as the merge of ancient sequences of two segments*

As we have seen in section 2, part of the arguments to defend nasal vowels as CSs are diachronical: CSs, which are, in the present stage of the lan-

guage, phonetically indivisible, correspond to ancient structures containing contiguous segments.

This is also true for palatal consonants, that are quite often, the result of old sequences {Consonant-PalatalGlide} in Latin, as shown by the examples in table 7.

**Table 7**  
Historical origins of Portuguese palatal consonants

Latin origin of /k/	Latin origin of /ɲ/	Latin origin of /ʃ/	Latin origin of /ʒ/
Lat. <i>fil</i> iu <filiu> > Port. <i>filho</i> ['fiʎu] 'son'	Lat. <i>vin</i> [j]la <vinea> > Port. <i>vinha</i> ['viɲɐ] 'vineyard'	Lat. <i>rus</i> [j]lu <roseu> > Port. <i>roxo</i> ['roʃu] 'purple'	Lat. <i>cas</i> [j]lu <caseu> > Port. <i>queijo</i> ['kajʒu] 'cheese'

Therefore, as it happened with nasal vowels, many cases of contemporary palatals of EP seem to be the historical result of an assimilatory process that merged two different segments into a single one.

Regarding this specific question, we should highlight that this assimilatory process remains active in certain dialects of contemporary European Portuguese. This is the special case of the Madeiran dialects and some Northern Continental dialects (mainly concentrated in the Aveiro district – see Segura 2013; P. Silva 2017; C. Silva forthcoming). In these dialects, many words that, for different reasons, did not undergo the general merging process (see table 7), are, nonetheless, subject to the assimilatory phenomenon, as in table 8.

**Table 8**  
Words with etymological {Consonant ∅ PalatalGlide}  
sequence without merging in most Continental dialects but WITH merging  
in the Madeiran and Aveiro dialects

LATIN OR MODERN {Consonant-PalatalGlide}	STANDARD EUROPEAN PORTUGUESE — NO MERGE INTO A SINGLE CONSONANT	MADEIRAN AND AVEIRO DISTRICT PORTUGUESE — MERGE INTO A SINGLE CONSONANT
<i>família</i> (<Lat. <i>familia</i> ) 'family' <i>fila</i> (<Lat. <i>filu</i> ) 'queue'	<i>família</i> [fɐ'miljɐ] <i>fila</i> ['filjɐ]	<i>família</i> [fɐ'miʎ(j)ɐ] <i>fila</i> ['fiʎ(j)ɐ]



### 3.2. Palatal consonants and weight / stress-assignment

In 3.1, it has been demonstrated that, quite often, palatal consonants are the modern result of a merging process that motivates the overlapping of two successive consonants into one single consonant, as it is the case for phonetic nasal vowels in EP.

Per se, this argument could not be sufficiently strong to accept these consonants as CSs: nasal vowels, as well as trills, need synchronic evidence — in addition to diachronic facts — to suggest that, in the actual stage of the language, they continue to correspond to more than one phonological unit. Such evidence, as seen in section 2, was found in weight- and stress-assignment rules. In sum, we have seen that nasal vowels and trills behave, as for weight- and stress-assignment, like any sequence of 2 phonological units: VC, for nasal vowels, and C.C, for trills. The fact that its occurrence in the final syllables of the word attracts almost invariably word primary stress and proparoxytonic stress is disallowed when these sounds and structures are found in penultimate position are generally accepted to postulate their complexity.

The following examples show that, as far as this same issue is concerned, palatal consonants behave exactly as nasal vowels and, mainly, as trills: in a word with three or more syllables, if the last syllable has a palatal consonant at its onset, stress is mandatorily found in the last or penultimate syllable, and proparoxytonic stress is forbidden, as shown by the examples in table 9.

**Table 9**

Palatal consonants as the onset of the last syllable and weigh- / stress-assignment in EP

/ɲ/	/ʎ/	/ʃ/	/ʒ/
<i>rebanho</i> 'herd' [rɨ'bɛɲu] (*[ʀibɛɲu])	<i>espelho</i> 'mirror' [iʃ'pɛʎu] (*[iʃpɛʎu])	<i>fogacho</i> 'flush' [fu'gafu] (*[ʃugafu])	<i>lampejo</i> 'flash' [lɛ'pɛʒu] (*[lɛpɛʒu])

If we accept that /r/ contains in its structure a sequence of two heterosyllabic flaps (/r.r/ – see section 2) and that the first flap, as the coda of the first syllable, renders it a heavy syllable mandatorily stressed, the same can be said for palatal consonants: they must include in their lexical representation some phonological entity that occupies the coda of the preceding syllable, making it obligatorily stressed and inhibiting proparoxytonic stress when a palatal consonant is found as the onset of the last syllable (table 9).

Apart from the historical data that show that these consonants quite often descend from 2-segment sequences (a non-palatal consonant + a pala-

tal glide), we should notice that, in many Northern dialects a palatal glide is always found, at the phonetic level, in the stressed syllable before the palatal consonant as well. The Northern realisations of the words of table 9 show this very clearly (see table 10).

**Table 10**

Standard vs Northern realisations of words with a palatal consonant as the onset of the last syllable

/ɲ/		/ʎ/		/ʃ/		/ʒ/	
<i>rebanho</i> 'herd'		<i>espelho</i> 'mirror'		<i>fogacho</i> 'flush'		lampejo 'flash'	
STANDARD EP	NORTHERN EP	STANDARD EP	NORTHERN EP	STANDARD EP	NORTHERN EP	STANDARD EP	NORTHERN EP
[ʀibɐ̃ɲu]	[ʀi'baɲɲu]	[iʃ'pɛ.ʎu]	[iʃ'pɛj.ʎu]	[fu'gaʃu]	[fu'gaʃʃu]	[lɛ'pɛʒu]	[lã'pɛjʒu]

The dialectal data shown in table 9 seem to reinforce the view that these consonants carry palatality as an autosegmental-like property that can be detached from the consonant itself. Its dialectal occurrence in the Northern dialects seem to be a good example of this special behaviour.

Taking all the information regarding these consonants into consideration, we could accept palatal consonants:

- as the result of the historical merge of a consonant and a palatal glide (as it happened with vowels and nasality in the formation of nasal vowels of modern EP);<sup>2</sup>
- as segments that contain, in addition to place, manner, voicing and nasality specifications, an extra specification — palatality — which functions quite autonomously and confers weight to the preceding syllable.

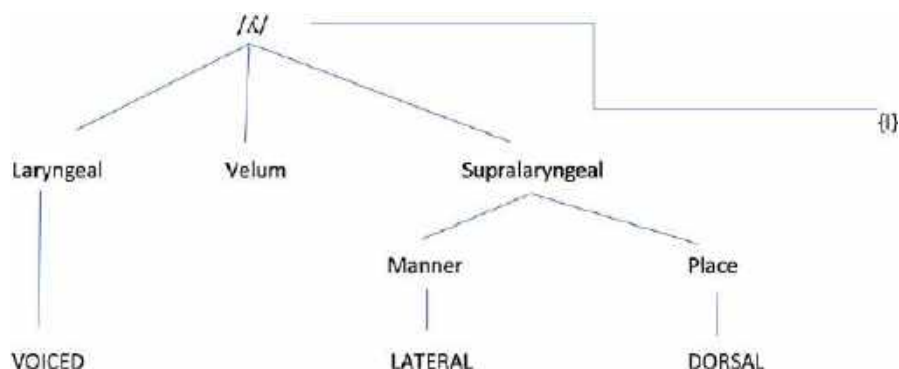
Thus, these consonants have the necessary requirements to be considered as CSs.

Assuming autosegmental combination as a way of building up segments occurring in the linear order and adopting palatality as a primitive element of speech that can be represented by {1}, we propose for each palatal consonant of EP the representations postulated in table 11. Features and elements are not necessarily ordered or ranked, in this proposal, and palatality is not cat-

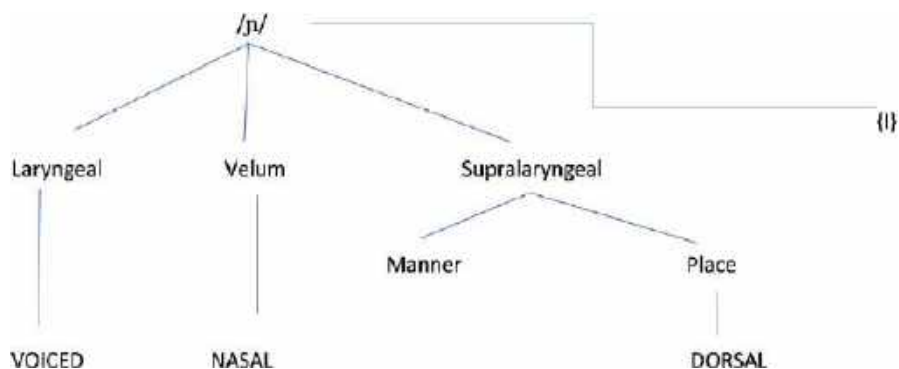
<sup>2</sup> A fact that remains to be explained is the metathesis of the consonant and the glide: most of them result from Latin sequences {Consonant-PalatalGlide}, as seen in table 7 and table 8, whereas in Northern EP they are generally surfaced as {PalatalGlide-Consonant} (see table 10).

egorised under special «geometrical» node, i.e., it is not strictly governed by «manner» or «place»; instead, it plays a role of its own, due to the fact that, in its nature, it is the remnant of another holistic segment that was merged into a single one in the course of the development of the language. This gives these consonants a very special status in EP, as they can be accepted as inherently «extra-heavy» consonants, as «complex consonants» both in the sense that was assumed in table 1 and in the sense this term is also used elsewhere, namely by Brandão de Carvalho *et al.* (2010) to refer to segments that are very marked typologically (these consonants are, indeed, relatively rare cross-linguistically and acquired very late) and structurally (due to the great amount of active features they include within their internal structure).

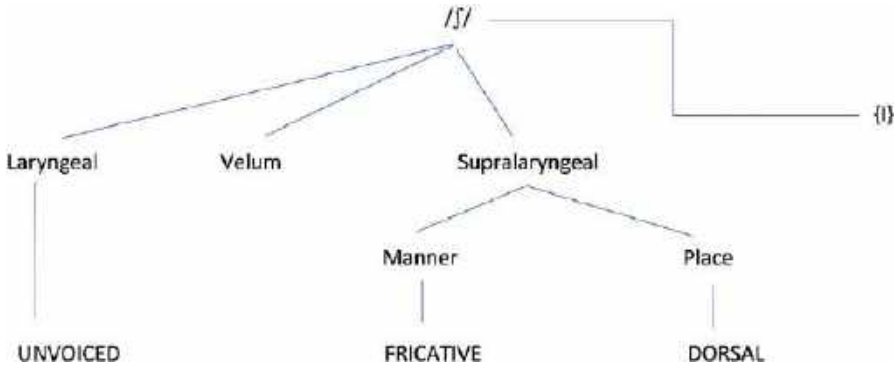
**Table 11a**  
Lexical representations of palatal consonants in EP



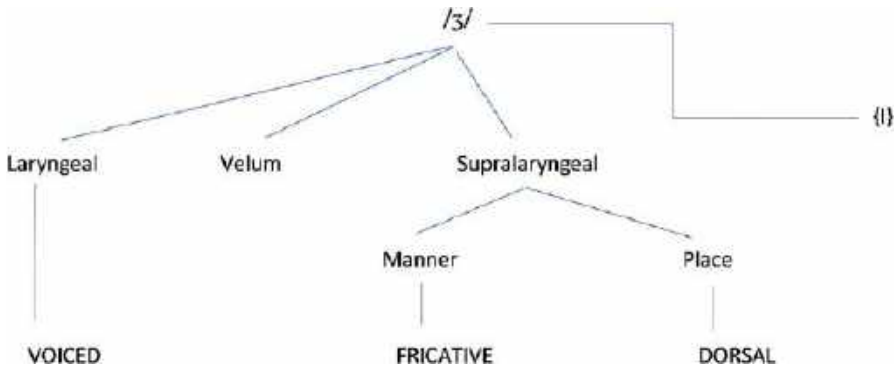
**Table 11b**  
Lexical representations of palatal consonants in EP



**Table 11c**  
Lexical representations of palatal consonants in EP



**Table 11d**  
Lexical representations of palatal consonants in EP



#### 4. Final Remarks

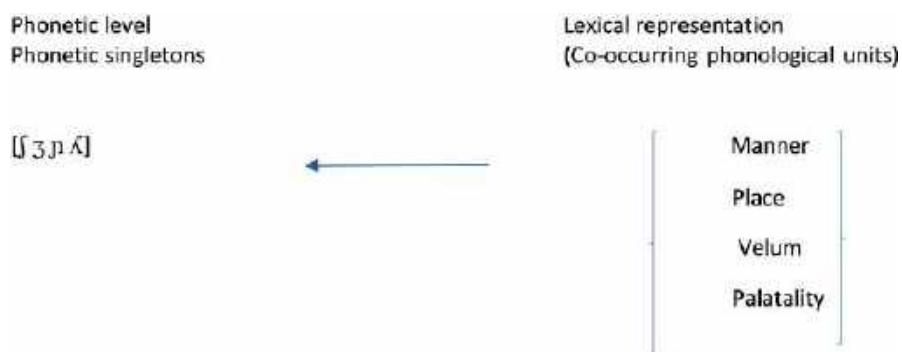
In this paper, we tried to show that, if we apply to the palatal consonants of EP, the same arguments that have allowed nasal vowels and, especially, trills, as complex segments —segments that phonetically are realised as singletons, though corresponding to successive, discrete segments at the lexical level—, palatals can also be interpreted as complex segments in Portuguese.

Applying to these consonants the theoretical representation that was adopted earlier to assume any consonant as Complex (see 1), we could postulate, for these special cases, a representation such as (table 12), which,

among other consequences, leads us to accept palatality {1} as an autosegment in this language.

**Table 12**

The phonological representation of palatal consonants in Portuguese



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