What's the matter with |I| |U|? On element asymmetry in Portuguese

Heglyn Pimenta
Université de Tours, UMR Inserm 1253 - iBrain

Overview. In Element-Theory and similar approaches to internal segmental structure, it is often assumed that the aperture element |A| is more sonorous and different in kind from the colouring elements |I| and |U| (Schane 1984, Pöchtrager 2006, Van der Hulst 2015), while the latter are usually considered to be equally sonorous and display symmetrical behaviour. As it has been previously noted, though, this formulation misses a recurrent crosslinguistic asymmetry: the fact that |I| and |U| do not behave the same way (Carvalho & Klein 1996, Nevins 2012, Veloso 2013, Pimenta 2019), let alone the fact that typologically, while rounding can be absent from a language inventory, "no language has been found that lacks both a front vowel and palatal glide" (Hyman 2008: 100, n. 11). This asymmetry is the source of several phenomena in Portuguese phonology, both synchronically and diachronically, from which I select one that is poorly studied: offglide colouring in the diphthongization of lexical nasal vowels. As will be shown, variation can contribute to linguistic formalization by revealing the preference for the front offglide [ɪ̯] over the back offglide [ʊ̯] in nasal vowel diphthongization in non-standard varieties of European Portuguese (henceforth EP).

Data. Portuguese is a language known for its nasal vowels /ĩ, ẽ, ɐ̃, õ, ũ/, present in all positions of the word, and its nasal diphthongs /ɐ̃ɪ̯, ɐ̃ʊ̯, õɪ̯, ũɪ̯/, found exclusively in final position, left alone a handful amount of words that all contain a front offglide [ɪ̯] (e.g. *muito* [ˈmũɪ̯to]'a lot', *cãibra* [ˈkɐ̃ɪ̯bɾɐ] 'cramp' and *zãibo* [ˈzɐ̃ɪ̯bu] 'lazy-eyed'). Regarded as exceptions, those non-final nasal diphthongs are usually left unexplained in phonological analysis (cf. Bisol 2013: 120), although a unified formalization of the structure of both nasal vowels and (final and non-final) nasal diphthongs as complex nuclei is possible (Pimenta 2019).

The data analysed in this paper, as exemplified in (1), concerns the diphthongization of the word-internal lexical vowels /ɐ̃, ẽ, õ/ in non-standard varieties of EP, a phenomenon that is at the very source of the few EP words containing a non-final lexical nasal diphthong (e.g. *cãibra* 'cramp'). But what are the constraints at work in the choice of the offglide?

(1) Forms attested in the ALEPG database[1]

a.	/ɐ̃/	*camba*	[ˈkɐ̃bɐ] ~ [ˈkɐ̃ʊ̯bɐ] ~ [ˈkɐ̃ɪ̯bɐ]	'rim'
		tangerina	[tɐ̃ʒiˈɾinɐ] ~ [tɐ̃ɪ̯ʒiˈɾinɐ]	'tangerine'
b.	/ẽ/	*tempo*	[ˈtẽpu] ~ [ˈtẽʊ̯pu] ~ [ˈtẽɪ̯pu] ~ [ˈtẽɪ̯pu]	'time'
		penso	[ˈpẽsu] ~ [ˈpẽʊ̯su] ~ [ˈpẽɪ̯su]	'hay'
c.	/õ/	*lontra*	[ˈlõtɾɐ] ~ [ˈlõʊ̯tɾɐ]	'otter'
		lombo	[ˈlõbu] ~ [ˈlõɪ̯bu]	'loin'

To answer this question, I will analyse 532 instances of diphthongized forms of EP lexical nasal vowels /ɐ̃, ẽ, õ/ in non-final position found in the ALEPG database. For each offglide (e.g. [ɪ̯] and [ʊ̯]), phonetic factors such as (i) the quality of the vowel that diphthongizes[2]; (ii) the place of articulation of the consonant to the right; and (iii) the colour of the final vowel (metaphony) will be considered.

[1] Dialectological data analysed in this paper belongs to the ALEPG project - *Atlas Linguístico-Etnográfico de Portugal e da Galiza* (cf. Saramago 2006).

[2] To analyse the influence of the colour of the vowel one can focus on its phonetic realisation or on its underlying form, which is particularly important in the diphthongization of the front nasal vowel /ẽ/, whose outputs are mostly [ẽɪ̯] or [ɐ̃ɪ̯]. The analysis that follows will take into account the underlying form, since this option showed itself more fit to explain the present data.

Analysis. The first thing that can be noticed is that front offglides are more frequent than back offglides in this corpus, [i̯] being found in 75,6% of the attested forms, while [u̯] is present in 24,4% of them. This can be partly explained by the fact that more than half of the vowels that diphthongise are phonological /ẽ/ (285/532)[3]. The second thing is that the rate of homorganicity with the following consonant is much higher before palatals than before labials or velars, as can be seen in (2). And finally, as can be seen in (3), back offglides that are neither homorganic with the nasal vowel or the following consonant can only rise through metaphony (e.g. *tempo* [ˈtẽ̯pu] 'time'), while a front offglide is possible with no homorganicity and no metaphony, and even in contexts where a back offglide should be expected (e.g. *lombo* [ˈlõĩ̯bu] 'loin').

(2) Number of front and back offglides according to the P.A. of the consonant to the right

		[i̯]	%	[u̯]	%
a.	Palatals	71/73	**97,26**	2/73	2,74
b.	Labials	56/90	62,22	34/90	**37,78**
c.	Velars	53/97	54,64	44/97	**45,36**
d.	Coronals	222/271	81,92	49/271	18,08

(3) Possibility of metaphony in non-homorganic glides

[i̯]	%	[u̯]	%
27/77	35,07	21/21	100

On the one hand, this shows that |I| is more powerful in causing homorganicity than |U|. On the other, it shows that in lack of any possibility of assimilation, the |I| element will be preferred over |U| as an offglide, possibly due to |I| being more extreme than |U| (Nevins 2012). I propose that this follows from the fact that |I| is less sonorous than |U|, which is corroborated by diachronic data on the formation of Portuguese nasal diphthongs (Pimenta 2019).

Conclusions. Results obtained in this study on the choice of the offglide in nasal vowel diphthongization in non-standard EP provide new arguments for considering that colouring elements |I| and |U| are not symmetric, which should lead to an amendment of both the Sonority Hierarchy, where front and back/round vowels are equally sonorous, and the Element Theory. It also shows how variation data can contribute to linguistic formalization.

References.

Carvalho, J. B. de, & Klein, M. (1996). A subsymbolic approach to phonological primitives. In J. Durand & B. Laks (Eds.), *Current Trends in Phonology: Models and Methods* (pp. 97–121). ESRI.

Hyman, L. M. (2008). Universals in phonology. *The Linguistic Review*, *25*(1-2), 83-137.

Hulst, H. V. der. (2015). The Opponent Principle in RcvP. Binarity in a Unary System. In E. Raimy & C. E. Cairns (Eds.), *The Segment in Phonetics and Phonology* (pp. 149–179). Wiley-Blackwell.

Nevins, A. (2012). Vowel lenition and fortition in Brazilian Portuguese. *Letras de Hoje*, *47*(3), 228-233.

Pimenta, H. (2019). *Nasalité et syllabe: Une étude synchronique, diachronique et dialectologique du portugais européen* [PhD]. Université Paris 8.

Pöchtrager, M. A. (2006). *The structure of length* [PhD]. Universität Wien.

Schane, S. A. (1984). The Fundamentals of Particle Phonology. In *Phonology Yearbook* (Vol. 1, p. 129-155). Cambridge University Press.

Saramago, J. (2006). O atlas linguístico-etnográfico de Portugal e da Galiza (ALEPG). *Estudis Romànics*, *XXVIII*, 281–298.

Veloso, J. (2013). Redução do vocalismo átono do português europeu contemporâneo: Assimetria dos elementos de tonalidade e interação entre diversos tipos de redução vocálica. *Textos Selecionados*, 655-672.

[3] Most of them are followed by a coronal consonant (218/532).