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Syllabically-driven stricture effects in Majorcan Catalan high vocoids

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Abstract: This paper analyzes the variation found in Majorcan Catalan regarding the realizations of /i/ and /u/ in contact with other vowels, which depend on the nature of the vocoids themselves, the syllabic position in which they occur, their surrounding segmental context, and the geographic origin of the speakers. Leaving aside faithful hiatic solutions, their realizations range from different degrees of strengthening to fusion and deletion, and further coexist with some instances of /v/-weakening. To account for these patterns, we provide a unified analysis within the split margin approach to syllable organization (Baertsch 1998, 2002), with phonetic grounding supporting the distinction between [+high] and [–high] for palatal glides (but not for their labial counterparts) and the approximant character of /v/ in intervocalic position. We also show that, in order to explain the whole variation, markedness constraints referring to the harmony of segments in intervocalic position (Kirchner 1998; Uffmann 2007), and their specific interaction with faithfulness constraints, are needed.

Keywords: glides, high vowels, sonority, strengthening, syllable structure, weakening, Catalan

1 Introduction and goals

Majorcan Catalan (MajC from now on) is a variety of Eastern Catalan spoken on the island of Majorca, in the Balearic Islands. It is characterized by a vast array of singular phonological processes and a large amount of variation across its territory. This rich internal variation makes MajC an ideal field for theoretical and micro-typological exploration. In this paper we focus on patterns involving high vocoids.

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As preliminarily illustrated in (1), high vocoids exhibit considerable variation in MajC when they appear in contact with other vowels. Leaving aside exceptional faithful hiatic solutions, their distinct realizations depend on the nature of the vocoids themselves, the margin syllabic position in which they occur, their surrounding segmental context, and the geographic origin of the speakers. Modifications related to high vowels range from regular gliding (1a-b, d) to mid-gliding (1c) and vowel loss (1c-d).[1] In the labial series, there are also morphemes that display [w] in codas alternating with [ʋ] intervocalically (see, e.g., *no*[w] ~ *no*[ʋ]*et* in (1a,d)), which, rather than being instances of a synchronic strengthening process (from /u/ to [ʋ] ~ [w]), are interpreted as cases of /v/-weakening (from /v/ to [ʋ] ~ [w]).[2]

(1) Summary of /i/, /u/, and /v/ outcomes under study in MajC

Position	Outcome	
a. Singleton coda		*All varieties*. Regular gliding & /v/-weakening
	mai 'never'	/mai/ [má**j**]
	babau 'silly'	/babau/ [bə.β̞á**w**]
	nou 'new'	/nɔv/ [nɔ́**w**]
b. Word-initial singleton onset		*All varieties*. Regular gliding
	hiena 'hyena'	/ienə/ [**j**é.nə]
	whisky 'whisky'	/uiski/ [**w**ís.ki]

1 In Section 4, we will discuss whether the interpretation of vowel loss is an instance of fusion or deletion. For simplicity, we stick to the label 'vowel loss' in the descriptive sections.

2 The following abbreviations are used throughout the paper: 1SG = 1st person singular; 2SG = 2nd person singular; 2PL = 2nd person plural; DIM = diminutive; FEM = feminine; MASC = masculine; OCat. = Old Catalan; PI = Present indicative; PL = Plural; SD = Standard deviation; SUBJ = subjunctive; SUPERL = superlative; UR = underlying representation.

c. Intervocalic singleton onset		*Varieties A*. Mid-gliding & vowel loss	*Varieties B*. Vowel loss
	talla '(s)he cuts'	/taiə/ [tá.e̯ə]	/taiə/ [tá.ə]
	filla 'daughter'	/fiiə/ [fí.ə]	/fiiə/ [fí.ə]
d. Intervocalic singleton onset		*Varieties I*. Regular gliding, vowel loss & /v/-weakening	*Varieties II*. Regular gliding & /v/-weakening
	creuen 'they cross'	/krəuən/ [krə́.**w**ən]	/krəuən/ [krə́.**w**ən]
	viuen 'they live'	/viuən/ [ví.**w**ən]	/vivən/ [ví.**ʋ**ən]
	bouet 'ox-DIM'	/bɔuət/ [bo.ə́t][3]	/bɔvət/ [bo.**ʋ**ə́t]
	novet 'new-DIM'	/nɔvət/ [no.**ʋ**ə́t]	/nɔvət/ [no.**ʋ**ə́t]

The paper pursues three main goals: first, to outline a descriptive typological comparison of the phonological patterns affecting high vocoids across MajC varieties; second, to provide a formal account of these patterns, framed within optimality theory (OT), and more specifically within the split margin approach to syllable organization (Baertsch 1998, 2002); and third, to show that in order to account for the variation found in MajC both markedness constraints referring to intrasyllabic organization and markedness constraints concerning the harmony of segments in intervocalic position are necessary, along the lines of Kirchner (1998) and Uffmann (2007). The paper continues the work started in Jiménez et al. (in press), which provides a general comparative account of the patterns involving high vocoids in Catalan and Spanish.

The discussion proceeds as follows: in Section 2 we present the theoretical and phonetic background of our analysis; in Section 3 we illustrate the strengthening and weakening patterns found in MajC; in Section 4 we offer a unified analysis for

3 The first vowel in *bouet* and *novet*, underlyingly open (/ɔ/), surfaces as [o] due to a general process of vowel reduction in unstressed position; /e/, /ɛ/, and /a/ typically also reduce to [ə] in unstressed position (see, for instance, Wheeler 2005: 60–61).

these patterns, and, finally, in Section 5 we close by highlighting the main contributions of our study.

2 Theoretical and phonetic background

2.1 Underlying assumptions, sonority scale, and featural specifications

The underlying representation of the glides under study ([j], [w], and also [e̯]) is not straightforward, since they never alternate with their vocalic counterparts ([i] and [u]). According to the richness of the base hypothesis (Prince and Smolensky 2004: 205, 225), in cases of no contrast such as these, it is of no consequence whether a vowel or a glide is chosen as the input, as long as the constraint hierarchy leads to the actual outcomes. Since in Catalan most glide realizations are predictable from /i/ and /u/ through default syllabification, with many instances of surface alternations ([i]*mmens* 'huge' vs. *carr*[o j]*mmmens* 'huge cart'; example from MajC in Dols 2000: 225), in this paper, we illustrate the patterns and the analysis assuming a vocalic underlying representation (/i/, /u/)[4]; the proposed constraint hierarchy, though, also leads to the expected outcomes assuming the alternative underlying representations (/j/, /w/). Departing from a vocalic representation, gliding is understood as a strengthening process that competes with full preservation and vowel loss when accommodating the input vowels to syllabic requirements. As said before, outputs displaying the alternation between [ʋ] in intervocalic onsets and [w] in codas are instead derived from /v/ and hence are the result of a weakening process.

Among the realizations of high vowels, a salient feature of MajC is that /i/ may undergo strengthening to [e̯] in intervocalic position (1c). To address the uniqueness of the palatal series, and following on from the acoustic results in Mascaró and Rafel (1981), Recasens and Espinosa (2005), and our own acoustic analysis (see Section 2.3), we resort to the distinction between high glides (Glide$_{[+high]}$: [j], [w], to which we also refer as regular glides), and non-high glides (Glide$_{[-high]}$: [e̯], [o̯], to which we also refer as mid-glides), with the fixed order 'Glide$_{[-high]}$ > Glide$_{[+high]}$' on the sonority scale. An additional novelty that we introduce in our description and analysis is the interpretation of the

4 All authors acknowledge that, besides default syllabification, there are additional prosodic and analogical conditions that also govern their realization. Moreover, there still remain lexically marked exceptions for which underlying glides (i.e., /j/ and /w/) or the syllabic nuclear status of the vocoids must be marked (see, e.g., Jiménez 1999; Cabré and Prieto 2004; Wheeler 2005: 88–123).

intervocalic labiodental segment that appears either in morphemes displaying [ʋ] ~ [w] alternation (i.e., [ʋ] in *no*[ʋ]*et* ~ *no*[w]) or in non-alternating morphemes (i.e., *co*[ʋ]*a* 'cave') as a more sonorous segment than the fricative [v], specifically as an approximant sonorant [ʋ]. On the sonority scale, [ʋ] occupies a higher position than [v] but a lower position than [w]: 'Glide$_{[+high]}$ ([w]) > ʋ [...] > Fricative ([v])' (see (2)). This proposal, inspired by Padgett's (2002) work on Russian, is grounded on the phonetic properties of labiodentals (see Section 2.3) and differs from previous formal analyses of MajC, which all presumed an intervocalic labiodental fricative [v] (see, e.g., Wheeler 2005: 339; Dols 2000: 256). The sonority distinctions relevant for the MajC data under discussion are detailed in (2).

(2) Sonority scale

Glide$_{[-high]}$ ([e̯], [o̯]) > Glide$_{[+high]}$ ([j], [w]) > [ʋ], Liquid > Nasal > Fricative > Stop

higher sonority ⟶ lower sonority

In (3) we specify the feature characterization of vocoids assumed to explain the micro-variation attested in MajC, roughly consistent with the one proposed in Wheeler (2005: 56). We also indicate the feature specification of the vowels that act as a crucial surrounding context. We take the common position, to which OT adheres, that glides and corresponding vowels are positional variants of a single underlying segment, and hence are analyzed as featurally identical.[5]

(3) Feature specification for vocoids

	Glides (non-syllabic vocoids) [–consonantal], [+sonorant]	Vowels (syllabic vocoids) [–consonantal], [+sonorant]
[Palatal]	[j], [e̯]	[i], [e], [ɛ]
[Labial]	[w], [o̯]	[u], [o], [ɔ]
[+high]	[j], [w]	[i], [u]
[–high]	[e̯], [o̯][6]	[e], [o] (and also [ɛ], [ɔ], [ə], [a])

5 As in Baertsch and Davis (2003: 4), we assume that the issue of sonority, which draws segments to certain syllabic positions, is independent of the issue of coda moraicity.

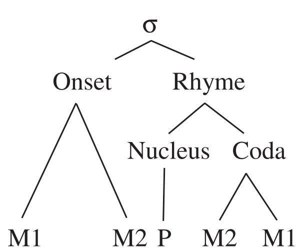
6 Glide realizations of more open vowels (i.e., [a̯]), although possible, would be even more marked than [e̯] and [o̯] and are not included in (3).

The approximant sonorant [ʋ] differs from glides (which are [−consonantal]) in being consonantal ([+consonantal]) and from the fricative [v] (which is [−sonorant]) in being sonorant ([+sonorant]).

2.2 Formal assumptions

Our analysis builds on two theoretical constructs. The first one concerns the organization of segments within the syllable according to their degree of sonority, and the second relates to the segmental preferences in intervocalic position, i.e., across syllables. Regarding the former, we follow Baertsch's (1998, 2002) and subsequent work, which develops the split margin approach to syllable organization. This approach refines Prince and Smolensky's hierarchy (2004 [1993]) by establishing a straightforward correlation between the constituents of the syllable. This hierarchy identifies two types of non-nuclear positions according to their behavior (see (4)), coherently targeted by two distinct universal hierarchies (see (5)): M1 (Margin 1), which stands for a singleton onset, for the first element of a complex onset and for the second element of a complex coda, and M2 (Margin 2), which stands for a singleton coda, for the second element of a complex onset and for the first element of a complex coda. As illustrated in (5), the constraint hierarchy governing M1 gives preference to low sonority segments (5a), while the constraint hierarchy governing M2 favors high sonority segments (5b). The two rankings in (5), thus, impose intrasyllabic conditions on segment distribution.

(4) Associated syllabic constituents (Baertsch 1998, 2002)



(5) Constraint hierarchies affecting the margins (M1 & M2)

a. Constraint hierarchy for M1 ($*M1_{\lambda}$); $*M1_{\text{GLIDE}[-\text{HI}]} \gg *M1_{\text{GLIDE}[+\text{HI}]} \gg *M1_{\upsilon,\text{LIQUID}} \gg *M1_{\text{NAS}} \gg *M1_{\text{FRIC}} \gg *M1_{\text{STOP}}$

b. Constraint hierarchy for M2 ($*M2_{\lambda}$): $*M2_{\text{STOP}} \gg *M2_{\text{FRIC}} \gg *M2_{\text{NAS}} \gg *M2_{\upsilon,\text{LIQUID}} \gg *M2_{\text{GLIDE}[+\text{HI}]} \gg *M2_{\text{GLIDE}[-\text{HI}]}$

As for intersyllabic preferences, several authors (see, e.g., Kirchner 1998, 2004; Uffmann 2007; Staroverov 2016) have detected a clear preference for more sonorous segments in intervocalic position, a tendency with an articulatory basis which guarantees a smooth vowel-consonant-vowel transition. Within OT, this preference is embedded in a universal ranking in which the constraints penalizing intervocalic segments with low sonority are higher-ranked than those penalizing segments with higher sonority (6). Note that, like the constraint hierarchy referring to M2 (see (5b)), the ranking governing intervocalic M1 (6) favors higher sonority segments.

(6) Constraint hierarchy for intervocalic M1 (*VM1$_{\lambda}$V): *VM1$_{\text{STOP}}$V ≫ *VM1$_{\text{FRIC}}$V ≫ *VM1$_{\text{NAS}}$V ≫ *VM1$_{\text{ʋ,LIQUID}}$V ≫ *VM1$_{\text{GLIDE[+HI]}}$V ≫ *VM1$_{\text{GLIDE[−HI]}}$V

The constraint hierarchy in (6), in which the target segment occupies an intervocalic M1 position, crucially interacts with the ranking governing all M1 in (5a). This interaction may have significant implications for glides: whereas the subhierarchy '*M1$_{\text{GLIDE[−HI]}}$ ≫ *M1$_{\text{GLIDE[+HI]}}$' generally favors [j] and [w], the subhierarchy '*VM1$_{\text{GLIDE[+HI]}}$V ≫ *VM1$_{\text{GLIDE[−HI]}}$V' locally favors [e̯] and [o̯], so that the language-particular ordering of the two subhierarchies may generate different outcomes.

As is usual in OT, these markedness constraints are in conflict with the faithfulness constraints regulating the typology of changes that inputs may undergo (i.e., featural changes, segmental deletion, fusion, etc.). The set of faithfulness constraints connected to our analysis is presented in Section 4. Finally, the activity of the general markedness constraints ONSET and, especially, the constraint conjunction ONSET&ONSET]$_{\text{ADJSYLL}}$ (also used in Cabré and Prieto 2004: 136) explain the regular avoidance of faithful hiatic resolutions of high vocoids in contact with other vowels.

2.3 Phonetic grounding

Though our data are mainly drawn from Bibiloni (1983, 2016) and Dols (2000), we have also conducted some empirical research in order to gain insights into the acoustic properties of the non-syllabic realizations of /i/ and /u/, and the approximant [ʋ]. The main goal of our survey is to prove that, while /i/ presents a non-high glide allophone [e̯] in word-internal intervocalic position, /u/ is never realized as [o̯], an issue that has not previously been addressed in the literature. The second goal is to investigate, for the first time, whether there are acoustic differences between [j], [w], and [ʋ] in MajC that might substantiate a distinction in their degree of sonority as our analysis demands.

2.3.1 Method

Five native speakers of MajC, aged between 20 and 25, were asked to read 52 sentences including the target segments /i/, /u/, and /v/ in the relevant syllabic margins (word-initial position, word-final position, and intervocalic position, within words and across words). Each carrier sentence was repeated seven times. The subjects were recorded in an anechoic chamber at the Phonetics Laboratory of the University of Barcelona, with a SHURE SM58 microphone connected to a Marantz PDM60 digital recorder. The audio was recorded with a 44.1 kHz sampling rate and 16-bit resolution.

The recordings of one subject (a female speaker from Artà, in the north-east of the island) were excluded from the general analysis because of the poor quality of the signal. The four remaining subjects fell into two categories according to the extension of the alternation between [ʋ] in intervocalic onsets and [w] in codas: two speakers (a male and a female from Llucmajor, in the south-east of the island)[7] displayed [ʋ] ~ [w] alternation just in the cases (common to all Catalan varieties) in which this pronunciation is reflected in the spelling: e.g. *novet* [no.ʋə́t] ~ *nou* [nɔ́w]. The other two participants (two females from Palma and Capdepera, in the south-west and north-east of the island respectively) showed a tendency to generalize the pattern of [ʋ] ~ [w] alternation beyond the cases reflected in the spelling and hence pronounced with [ʋ] words such as *vi*[ʋ]*en* (cf. *vi*[w] 's(he) lives').[8] Accordingly, the few examples of intervocalic contrast between [ʋ] (*ca*[ʋ]*en* 'they dig', *ri*[ʋ]*et* 'trim') and [w] (*ca*[w]*en* 'they fall', *ri*[w]*et* 'river-DIM') found in the variety of the first two subjects may be neutralized as [ʋ] in the speech of the latter group, as in the Capdepera informant.

The acoustic analysis of the data was carried out using the Praat software (Boersma and Weenink 2016). Target items were segmented and labeled manually based on spectrogram, waveform, and intensity contour. A Praat script was used to automatically extract the first two formants (F1 and F2, in Hz), as measured at the center of the segments. An accurate identification of word-internal intervocalic palatal glides proved to be particularly difficult, since their realizations are extremely short and tend to have the same intensity as the surrounding vowels; this is why, following Recasens and Espinosa's (2005: 14) procedure, "data for intervocalic [j] were not computed at consonant midpoint

7 The male subject, with a behavior almost identical to the female, was also excluded from the analysis in order to obtain a more homogeneous sample containing only female speakers.
8 With respect to the [ʋ] ~ [w] alternation, the speaker from Artà followed the same trend.

but at the temporal frame showing a maximal F2 within the overall VCV period". As is usual in acoustic analysis, we used F1 as an index of constriction, with higher values indicating more sonority; we expected [e̯] to have a higher value than [j], which translates into the sonority ranking [e̯] > [j]. F2, on the other hand, was used to define place differences between [j], [w], and [ʋ].

A second parameter considered in order to establish differences in constriction between [j], [w], and [ʋ] was their intensity, with more intensity indicating more sonority (Parker 2002). For each token, we first measured the lowest energy value of the approximant and the highest energy value of the next vowel. In both cases, following Recasens (2016: 158), "energy measures were taken after filtering the acoustic signal with a pass Hann band filter between 250 Hz and 10 kHz with the programme Praat". Then, in order to obtain a normalized index, comparable across speakers, we computed a ratio by dividing the intensity minimum of the approximant by the intensity maximum of the following vowel (from now on, Intensity ratio; see Hualde et al. 2011, and references therein). A percentage close to 1 indicates that the approximant and the following vowel are very similar in intensity, whereas lower values point to a greater difference between the two segments, with the vowel displaying the highest value. With respect to this parameter, we expected [ʋ] to have a lower Intensity Ratio than [w], giving support to the sonority ranking [w] > [ʋ].

To explore differences in F1, F2, and intensity among target segments, independent-samples t-tests and ANOVA tests were conducted using SPSS (IBM Corp 2013).

2.3.2 Results

2.3.2.1 Realizations of /i/

Our results across vowel contexts confirm the difference between the realization of /i/ in intervocalic position inside the word (i.e., *ta*[e̯]*a*) and in other positions, even when /i/ occurs between vowels across words.[9] As previously demonstrated in the literature (i.e., Mascaró and Rafel 1981; Recasens and Espinosa 2005), the glide realization of /i/ in intervocalic position inside the word presents an F1 value which is notably higher than in the other contexts ($F_{(3,\ 279)}$ =

9 Even though we were aware that the neighboring vowels affect the formant values of the glides, in the analysis we pooled cases with different surrounding vowels together; this decision did not affect the main goal of the study.

59.584, $p < 0.001$) and has a lower F2 value as well ($F_{(3,\ 279)} = 85.046$, $p < 0.001$); that is, the realization of word-internal intervocalic /i/ is more open and slightly more centralized. In codas and in intervocalic position across words, where less constricted variants should also be expected, the results reveal that the glide realization of /i/ is only slightly more open than word-initially. Differences in F2 between word-initial position and intervocalic position across words are hardly noticeable; the word-final position, though, shows a lower value. All in all, whereas the magnitude of the change in F1 and F2 in word-internal intervocalic position points to the existence of a different phonological target (namely, a non-high glide [e̯]), differences between the other contexts could be attributable to purely phonetic effects, with the final position and the intervocalic position across words favoring slightly more open variants of [j] (see Table 1).[10]

Table 1: F1 and F2 values (in Hz) of /i/ by context (the standard deviation of each variable is shown in parentheses beneath the variable means).

FEMALE SUBJECTS				CONTEXT
	##_V	V_##	V_V	V_##V
Cases	62	63	84	74
F1	371.1	400.24	552.32	420.41
	(50)	(102.4)	(129.63)	(38.44)
F2	2768.52	2557.21	2124.43	2690.62
	(304.53)	(347.55)	(186.15)	(260.62)

2.3.2.2 Realizations of /u/

As for the labial vowel, the first outcome that strikes us is the total absence of a mid-glide [o̯] — equivalent to [e̯] — between vowels inside the word (see Table 2). In this position, as well as word-finally and intervocalically across words, [w] is realized slightly more open than word-initially, a pattern comparable to the minimal opening that [j] displays word-finally and intervocalically across words ($F_{(3,315)} = 4.003$, $p = 0.008$). In contrast, the word-internal intervocalic

10 In our sample, the [e̯] realization in word-internal intervocalic position also appears in recently incorporated loanwords such as *Estàs on* [fá.e̯əɾ] 'You are on fire'. Sequences with clitics (i.e. *No* ***hi*** *ha ningú* [no.**e̯**a.niŋ.gú] 'There is no one') may also present mid-gliding realizations of /i/. According to the literature (Bibiloni 1983, 2016; Dols 2000), the mid-glide [e̯] also occurs intervocalically across words, but our data from younger speakers do not support this claim. Nevertheless, the presence of non-high glides across words in less formal styles should by no means be ruled out.

Table 2: F1 and F2 values (in Hz) of /u/ by context (the standard deviation of each variable is shown in parentheses beneath the variable means).

Female subjects				**Context**
	##_V	**V_##**	**V_V**	**V_##V**
Cases	63	61	86	109
F1	424.41	444.67	467.59	445.18
	(71.23)	(95.82)	(74.97)	(66.31)
F2	980.08	1119.62	888.19	970.99
	(181.97)	(242.36)	(160.69)	(158.51)

position does not present any pattern of centralization; in fact, it has the lowest F2 value. As for the other positions, the only noticeable issue is the fact that the word-final position is slightly more centralized ($F_{(3,\ 315)} = 19.252$, $p < 0.001$).

The contrast between the existence of the palatal [e̯] and the non-existence of the labial [o̯] is in line with the observation that, in Catalan, the palatal vowel is more prone to glide formation in rising sequences than its labial counterpart (e.g., [fə.sjál] 'facial' vs. [ə.nu.ál] 'annual'; Recasens 1993: 117; Cabré and Prieto 2004: 124), which some authors have related to the marked character of the labial articulation of [w] in comparison to the coronal articulation that the palatal [j] displays (Jiménez 1999: 62). Though MajC is more reluctant to allow the formation of rising diphthongs than other Catalan dialects, the same trend is reported (Bibiloni 2016: 93–94). The asymmetry is also consistent with the typological observations attested when confronting the frequency and co-occurrence relations of alike-sounds as phonemic units in the UCLA Phonological Inventory Segment Database (UPSID): 86.1 % of the languages have /j/ or a closely similar segment, while 75.7 % have /w/ or a closely similar segment, with the presence of /w/ usually implying the occurrence of /j/ in the same language (only 4 % of the languages have /w/ without /j/) (Maddieson 1984: 91–92).

2.3.2.3 Comparison between [j] and [w]

To establish if there is any difference in the degree of aperture between [j] and [w], we compared their F1 value and their Intensity Ratio in intervocalic position across words. The tokens considered included the two glides after a stressed [é] and preceding either a stressed [á] or an unstressed [ə] (i.e., *un r*[éj á]*rab* 'an Arabian king', *un r*[éj ə]*tent* 'a kind king' *vs. un d*[éw á]*rab* 'an Arabian god', *un d*[éw ə]*tent* 'a kind god'). Whereas the F1 value is not significantly different for the two glides ($t_{(49.63)} = -1.186$, $p = 0.241$), the variation in intensity between the glides and the next vowels almost reaches significance ($t_{(43.67)} = -1.995$, $p = 0.052$). Nevertheless, divergences in the two parameters are small enough to regard them as non-relevant, so that we can assume that [j] and [w] are roughly equivalent in terms of aperture: that is, that they occupy the same position on the sonority scale (see Table 3). Contrariwise, and as expected, there are notable differences in place of articulation between the two glides, as their F2 values reflect ($t_{(51.43)} = 34.71$, $p < 0.001$).

Table 3: F1, F2 (in Hz), and Intensity Ratio of [j] and [w] in intervocalic position across words (the standard deviation of each variable is shown in parentheses beneath the variable means).

FEMALE SUBJECTS	[j]	[w]
Cases	32	36
F1	426.41	441.83
	(31.49)	(70.54)
F2	2681.03	976.75
	(238.19)	(151.55)
Intensity Ratio	0.970	0.985
	(0.039)	(0.019)

2.3.2.4 Distribution and characterization of [ʋ]

As indicated above, some MajC varieties exhibit a pattern of almost general alternation between intervocalic [ʋ] and coda [w], far beyond the cases reflected in the spelling. The speakers from Palma and Capdepera, for instance, present [ʋ] in the words *viuen* and *beuen* 'they drink'; the subject from Capdepera additionally shows the labiodental in the words *cauen* and *riuada* 'flood'. The words *creuen* 'they cross' and *creuaran* 'they will cross', which are rather uncommon in MajC, present instead a labial glide [w] in both speakers. Neither participant shows intervocalic [ʋ] across words (i.e., *dé*[w] *àrab*) or in loans (i.e., *Po*[w]*erPoint*).[11] It seems, then, that in our sample the presence of [ʋ] is lexically determined, without any sign of stylistic variation between [ʋ] and [w] in onsets.[12]

11 Realizations with [ʋ] are also attested in sequences involving clitics, such as *No **ho** ha fet* [no.**ʋ**a.fə́t] '(s)he didn't do it' or *Escolta**u**-ho* [əs.kol.tá.**ʋ**o] 'listen.2PL to it'.

12 Although in some cases the informants pronounced the same word with both [w] and [ʋ] (see Figure 1), their behavior does not point to a pattern of stylistic variation: in all cases, they produced the first occurrence of the word with [w], probably influenced by the spelling, and, then, after recognizing the word, the six remaining tokens presented [ʋ]. The speaker from Artà, excluded from the analysis, even explicitly corrected herself after initially pronouncing the word *viuen* with [w].

Throughout the study, we have represented all intervocalic labiodentals with the symbol [ʋ] rather than with the symbol [v]. Indeed, intervocalic labiodentals tend to be realized with a low degree of stricture, i.e., as approximants (Recasens 2014: 103–122).[13] Hence, these segments do not usually contain any component of fricative noise, as can be observed in the two spectrograms corresponding to the word *cauen* in Figure 1, which was produced with [w] and [ʋ], respectively, by the subject from Capdepera: while in both variants, [w] and [ʋ], the formants are discernible ([w]: F1, 413 Hz – F2, 770 Hz; [ʋ]: F1, 612 Hz – F2, 1256 Hz), no traces of friction are visible in either case.

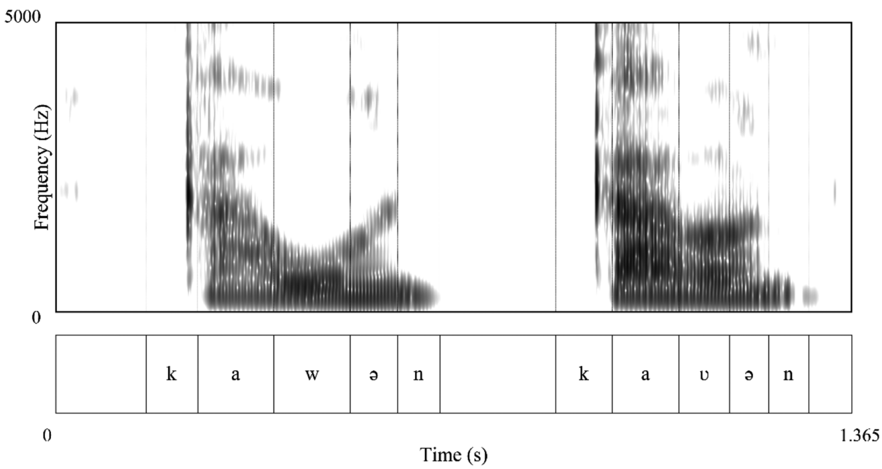


Figure 1: Spectrograms showing two different pronunciations of the word *cauen* in the sentence *Ses fulles cauen* 'The leaves are falling', produced by the same subject (a female from Capdepera): with [w], on the left, and with [ʋ], on the right. The dynamic range of the spectrogram was set to 40 dB.

2.3.2.5 Comparison of [w] and [ʋ]

The last remaining issue is to determine whether, in intervocalic position inside the word, there are constriction and articulatory differences between [w] and [ʋ] (see Table 4).[14] We expected [w] to have lower F2 values than [ʋ], due to the

13 According to Recasens (2014: 112–116) and our own data, intervocalic /v/ may also be realized as an approximant bilabial [β̞]. The specific place of articulation of /v/, though, does not affect its position on the sonority scale, which is the main goal of this part of our phonetic experiment.

14 In this comparison, we pooled together cases in which [w] and [ʋ] are followed by stressed [á] (as in *cre*[wá]*t*) and by unstressed [ə] (as in *cre*[wə]*n*).

velar component of [w], as the data indeed reveal ($t_{(232.07)} = -16.71$, $p < 0.001$). As for the features correlated with stricture, there are no statistical differences in F1 between [w] and [ʋ] ($t_{(224.64)} = 1.63$, $p = 0.105$); instead, the contrast in Intensity Ratio between [w] and [ʋ] are salient enough to substantiate a distinction between the two segments, with the expected sonority ranking [w] > [ʋ] ($t_{(233.60)} = 6.63$, $p < 0.001$).

Table 4: F1, F2 (in Hz), and Intensity Ratio of [w] and [ʋ] in intervocalic position inside the word (the standard deviation of each variable is shown in parentheses beneath the variable means).

FEMALE SUBJECTS	[w]	[ʋ]
Cases	79	159
F1	425.08	404.87
	(72.84)	(117.46)
F2	793.73	1302.38
	(140.43)	(328.14)
Intensity Ratio	0.970	0.908
	(0.044)	(0.100)

2.3.2.6 Summary

The acoustic analysis confirms a sonority distinction between the palatal glides [j] and [e̯] in MajC, with the sonority ranking, crucial to our proposal, [e̯] > [j]. A parallel contrast between [w] and [o̯], though, is not supported by the data. There is no evidence either for a distinction in stricture between [j] and [w]; hence, we assume that both segments occupy the same position on the sonority scale. Differences in F2 values signal a sharp articulatory contrast between [w] and [j], on the one hand, and between [w] and [ʋ], on the other. Given the differences between [w] and [ʋ] in Intensity Ratio, we presume that their contrast in place of articulation is reinforced by a difference in stricture, with the sonority ranking [w] > [ʋ].

3 Strengthening and weakening patterns

In what follows we present the data for /i/ and /u/ (as well as the alternations involving /v/) that we analyze, organized according to the syllabic margin position they occupy. We keep to previous descriptions in Bibiloni (1983: 133–139, 2016: 89–94) and Dols (2000: 225–282), and the data drawn from own personal inquiries.

3.1 The palatal vocoid

In word-initial position, the palatal vocoid is generally realized as [j], with regular gliding (7), although in some areas it may occasionally undergo fricativization ([ʒ]*ogurt* 'yogurt', [ʒ]*ate* 'yacht') (Dols 2000: 225; Bibiloni 2016: 89). Most words with an initial [j] are recent introductions into the language or are plain loans.

(7) Word-initial position: REGULAR GLIDING

UR	Almost all varieties					
/i/	[j]ena	'hyena'	[j]ogurt	'yogurt'	[j]ate	'yacht'
/i/	[j]anqui	'Yankee'	[j]ode	'iodine'		

In intervocalic position inside words, the palatal vocoid surfaces differently depending on the variety. When the vowels surrounding /i/ are not palatal (i.e., when they are not [i], [e] or [ɛ]), the palatal vowel undergoes either a process of mid-gliding, which leads to [e̯] (8a), or a process of vowel loss (8b), depending on the area. To demonstrate the presence of /i/ in the underlying representations, we compare these patterns, whenever possible, with examples in which /i/ appears in coda position in the same morpheme.[15] (In the following examples we transcribe the vowels surrounding the vocoid whenever needed for clarity.)

(8) Intervocalic position (in contact with non-palatal vowels: [a], [ə], [o], [ɔ], [u]): MID-GLIDING / VOWEL LOSS

UR	a. Varieties A	b. Varieties B		
/aiə/	t[á.e̯ə]	t[á.ə]	*talla* '(s)he cuts'	(cf. *t*[áj] 'I cut')
/əiə/	f[ə́.e̯ə]	f[ə́.ə]	*feia* '(s)he was doing'	(cf. *f*[ə́j]*s* 'you-PL do')
/oiu/	d[o.e̯ú]t	d[o.ú]t	*doiut* 'nonsense-like'	(cf. *d*[ój] 'nonsense')
/ɔiə/	j[ɔ́.e̯ə]	j[ɔ́.ə]	*joia* 'happiness'	(cf. *j*[ɔ́j] OCat. 'joy')
/uiə/	emb[ú.e̯ə]	emb[ú.ə]	*embulla* '(s)he mixes up'	(cf. *emb*[új] 'I mix up')

15 According to Bibiloni (1983, 2016: 90, 92), the realizations with mid-gliding, more prestigious, are typical of the varieties spoken in Palma, Capdepera, Pollença, Manacor, Felanitx, Santanyí, Algaida, etc. (Varieties A), whereas the realizations with vowel loss correspond to the varieties spoken in Llucmajor, Campos, Montuïri, Sóller, la Pobla, Muro, etc. (Varieties B). Accordingly, the two speakers from Llucmajor in our sample present more cases with deletion than the remaining speakers.

However, when the vowel preceding or following the input vowel /i/ is also a high palatal /i/ (either stressed or not), vowel loss occurs in all varieties (9).[16] In these examples, the elements of contrast providing evidence for the presence of an underlying /i/ may be hidden by a parallel process of /i/ loss word-finally (as in *fill* [fíj] ~ [fí]; Bibiloni 1983: 129, 2016: 91). The loss of /i/ is also the regular outcome when the contiguous palatal vowels are [e] or [ɛ] (10), although mid-gliding realizations are attested in Varieties A as well, especially when the other vowel surrounding /i/ is [u] (as in *vellura* /eiu/: *v*[e.e̯ú]*ra* ~ *v*[e.ú]*ra* 'old age', *aguller* /uie/: *ag*[u.e̯é]*r* ~ *ag*[u.é]*r* 'thread').[17]

(9) Intervocalic position (in contact with a high palatal vowel [i]): VOWEL LOSS

UR	All varieties		
/ii/	f[í]a	*filla* 'daughter'	(cf. *f*[íj], but also *f*[í] 'son')
/ii/	f[i]et	*fillet* 'kid'	(cf. *f*[íj], but also *f*[í] 'son')
/ii/	con[i]era	*conillera* 'burrow'	(cf. *con*[íj], but also *con*[í] 'rabbit')
/ii/	ve[í]ssim	*vellíssim* 'old-MASC.SUPERL'	(cf. *ve*[j] 'old-MASC')
/ii/	embu[i]	*embulli* '(s)he mixes up-SUBJ'	(cf. *embu*[j] 'mixed thing')
/ii/	treba[i]	*treballi* '(s)he works-SUBJ'	(cf. *treba*[j] 'work')

(10) Intervocalic position (in contact with the palatal vowels [e] or [ɛ]): VOWEL LOSS

UR	All varieties		
/ei/	v[é]a	*vella* 'old-FEM'	(cf. *v*[éj] 'old-MASC')
/ei/	v[e]et	*vellet* 'old man-DIM'	(cf. *v*[éj] 'old-MASC')
/ei/	v[e]ona	*vellona* 'old woman-DIM'	(cf. *v*[éj] 'old-MASC')
/ɛi/	ximen[ɛ́]a	*ximeneia* 'chimney'	

According to Bibiloni (1983: 135, 2016: 91) and Dols (2000: 243), intervocalically across words it is possible to find parallel processes, with mid-gliding (11a) or vowel loss (11b) depending on the area. In our sample, except for sequences containing clitics (see footnote 10), the palatal glide generally surfaces faithfully across words.

16 The crucial adjacent vowel is typically the one preceding the target segment, but it can also be the one following it.

17 Note that in *vellura*, *vellet*, and *vellona* the preceding unstressed vowel is [e] and not [ə], as would be expected from general vowel reduction. For the conditions under which underapplication of vowel reduction to [ə] in MajC applies, see Bibiloni (1998, 2016) and Pons-Moll (2011).

(11) Postlexical intervocalic position: MID-GLIDING / VOWEL LOSS

UR	a. Varieties A	b. Varieties B		
/i/	ma[e̯] acaba	ma[Ø] acaba	'(s)he never finishes'	(cf. *ma*[j] 'never')
/i/	mira[e̯] alt	mira[Ø] alt	'high mirror'	(cf. *mira*[j] 'mirror')
/i/	lle[e̯] orgànica	lle[Ø] orgànica	'organic law'	(cf. *lle*[j] 'law')

In coda position, both word-internally and word-finally, /i/ surfaces as a regular glide (except in word-final position after another /i/, in which case vowel loss is an alternative to regular gliding; see *f*[íj] ~ *f*[í] in (9)).

(12) Coda position, word-finally and word-internally: REGULAR GLIDING

UR	All varieties			
/i/	ve[j]	'old'	ca[j]re	'aspect'
/i/	ma[j]	'never'	esca[j]re	'corner'

3.2 The labial vocoid and the fricative /v/

Word-initially, /u/ is realized as a regular glide ([w]), although sporadic realizations with [v] have also been documented. Except for some onomatopoeic expressions (i.e., *uep!*), the occurrences of the labial vocoid in word-initial position generally correspond again to words recently introduced into the language or loanwords (13).

(13) Word-initial position: REGULAR GLIDING

UR	All varieties					
/u/	[w]eb	'website'	[w]ep!	'hey!'	[w]ifi	'Wi-Fi'
/u/	[w]atsApp	'WhatsApp'	[w]isky	'whisky'		

In intervocalic position, some varieties (Varieties I) show regular gliding ([w]) (14a) in cases in which others (Varieties II) display the labiodental approximant [ʋ] (14b), which are neutralized as [w] in coda position. The division between the two varieties, though, is far from sharp, since some lexical items exclusively display the aforementioned [ʋ] ~ [w] alternation (15). Since the distribution of the two patterns is not only geographically conditioned but also lexically determined,[18] we assume, in line with Wheeler (2005: 339), that all the syllabically conditioned [ʋ] ~ [w] alternations derive from the labiodental fricative /v/ (through /v/-weakening), and not from /u/.

18 Bibiloni (1983, 2016: 96) localizes regular gliding ([w]) in a small area represented by Palma, Algaida, Marratxí, Santa Maria, Alaró, Bunyola, Escorca, and Andratx, whereas most areas tend to generalize the approximant [ʋ] intervocalically. (See also Section 2.3.2.4.)

(14) Intervocalic position: Regular gliding / /v/-weakening

UR	a. Varieties I	UR	b. Varieties II		
/u/	vi[w]en	/v/	vi[ʋ]en	'they live'	(cf. *vi*[w] '(s)he lives')
/u/	ca[w]en	/v/	ca[ʋ]en	'they fall'	(cf. *ca*[w] '(s)he falls')
/u/	co[w]en	/v/	co[ʋ]en	'they cook'	(cf. *co*[w]*re* 'to cook')
/u/	cre[w]eta	/v/	cre[ʋ]eta	'cross-DIM'	(cf. *cre*[w] 'cross')

(15) Intervocalic position: /v/-weakening

UR	All varieties		
/v/	no[ʋ]et	'new-DIM'	(cf. *no*[w] 'new-MASC')
/v/	acti[ʋ]a	'active-FEM'	(cf. *acti*[w] 'active-MASC')

In Bibiloni's (2016: 97) data the approximant [ʋ] may also be found across words in Varieties II (16b). In our data, however, again excluding sequences with clitics (see footnote 11), realizations with [ʋ] are only attested word-internally.

(16) Intervocalic position (across words): Regular gliding / /v/-weakening

UR	a. Varieties I	UR	b. Varieties II		
/u/	de[w] o dotze	/v/	de[ʋ] o dotze	'10 or 12'	(cf. de[w] '10')
/u/	tre[w] es cap	/v/	tre[ʋ] es cap	'(s)he appears'	(cf. *tre*[w] '(s)he removes')
/u/	a[w] idò	/v/	a[ʋ] idò	'let's, then'	(cf. *a*[w] 'let's')
/u/	canta[w] això	/v/	canta[ʋ] això	'sing-2PL this!'	(cf. *canta*[w] 'sing!')

As with /i/, vowel loss can occur intervocalically when /u/ is contiguous to a labial vowel [o] or [ɔ] in Varieties I, both within the word and across words (Dols 2000: 235) (17a). As always, in the same context /v/ weakens to [ʋ] (17b).

(17) Intervocalic position (in contact with the labial vowels [o] and [ɔ]): Vowel loss / /v/-weakening

UR	a. Varieties I	UR	b. Varieties II		
/ɔu/	b[o]et	/ɔv/	b[o.ʋ]et	'ox-DIM'	(cf. *b*[ɔ́w] 'ox')
/ou/	p[o]al	/ov/	p[o.ʋ]al	'bucket'	(cf. *p*[ów] 'well')
/ɔu/	c[ɔ́] un poc	/ɔv/	c[ɔ́.ʋ] un poc	'cook-2SG a little!'	(cf. *c*[ɔ́w] 'cook!')
/ou/	p[ó] immens	/ov/	p[ó.ʋ] immens	'huge well'	(cf. *p*[ów] 'well')

In coda position, in both word-final and word-internal position, there is regular gliding, irrespective of the underlying representation (18) (except in word-final

/uu/ sequences, in which vowel loss is an alternative to regular gliding; see *n*[úw] ~ *n*[ú] 'naked', Bibiloni 2016: 99–102).

(18) Coda position, word-finally and word-internally: REGULAR GLIDING

UR	All varieties			
/v/	no[w]	'new-MASC'	acti[w]	'active-MASC'
/u/ or /v/	bo[w]	'ox'	po[w]	'well'
/u/ or /v/	ca[w]	'(s)he falls'	ca[w]re	'to fall'

4 A unified formal approach to the patterns involving high vocoids and /v/

In this section we provide a unified OT analysis of the word-internal patterns presented in Section 3.[19] We start with the context that induces the application of different processes to the high vocoid /i/ in varieties A and B (i.e., the intervocalic position; Sections 4.1 and 4.2). After that, we focus on the contexts in which the same solutions for /i/ prevail in both varieties: coda position (Section 4.3) and word-initial position (Section 4.4). We close by showing that the rankings proposed for /i/ are extensible to the behavior of the labial segments /u/ and /v/ (Section 4.5). In our proposal all the outcomes of /i/, /u/, and /v/ derive from the same set of sonority-related constraints and, essentially, from the same ranking.[20] A key feature of our analysis is the distinction we make between fusion and deletion in outcomes that surface with apparent vowel loss.

4.1 Mid-gliding and conditioned fusion of /i/ in intervocalic position (Varieties A)

In Section 3.1, we showed how Varieties A present mid-gliding of the palatal vocoid /i/ when surrounded by non-palatal vowels (see (8a): *ta*[e̯]*a*) and vowel loss when adjacent to palatal vowels (see (9): *f*[í]*a*, and (10): *v*[é]*a*), which, as we

19 We focus our analysis on word-internal position, because this is the context in which our data and the data documented in the previous literature coincide completely. Our analysis, though, is extensible to the intervocalic resolutions across words.

20 All the rankings proposed throughout the paper have been checked with OTSoft (Hayes et al. 2013), using the constraint demotion algorithm (cf. Tesar and Smolensky 1994). Accordingly, constraints for which neither the data nor a universal hierarchy impose a rank ordering have been placed as high as possible. In Section 5 we summarize the overall constraint ranking for all varieties in a Hasse diagram.

argue below, cannot be interpreted as mere deletion but as fusion. In these varieties, thus, mid-gliding applies intervocalically, unless /i/ and the adjacent vowel share the feature [Palatal], in which case fusion applies. The constraint ranking for these varieties is given in (19), where, besides some sonority-related constraints belonging to the sets presented in (5) and (6), we include the local constraint conjunction ONSET&ONSET]$_{\text{ADJSYLL}}$ and the relevant faithfulness constraints, defined in (20). The faithfulness constraint referred to manner, instead of targeting individually the features [±consonant], [±sonorant], and [±high], rates changes in a four-step stricture scale S: 'S4: Fricatives > S3: Approximant [ʋ] > S2: High vocoids > S1: Non-high vocoids'. Hence, IDENT is split into a series of constraints penalizing different degrees of featural disparity (20d). Given that a modification of one step in stricture is more faithful than, for instance, a change involving two steps, sub-constraints with lower *n*-indexes are always dominated in the ranking by those with higher *n*-indexes; in our analysis, IDENT$_{[\text{STRICT}],3}$ ≫ IDENT$_{[\text{STRICT}],2}$ ≫ IDENT$_{[\text{STRICT}],1}$ (see similar proposals in Gnanadesikan 1997; Alderete et al. 1999).

(19) Conflated hierarchy for Varieties A
ONS&ONS]$_{\text{ADJSYLL}}$, ID-[PAL], MAX-[PAL], IDENT$_{[\text{STRICT}],3}$ ≫ IDENT$_{[\text{STRICT}],2}$ ≫ *VM1$_{\text{GLIDE}[+\text{HI}]}$V ≫ IDENT$_{[\text{STRICT}],1}$, *M1$_{\text{GLIDE}[-\text{HI}]}$, *VM1$_{\text{GLIDE}[-\text{HI}]}$V ≫ ONSET ≫ *M2$_{\text{GLIDE}[+\text{HI}]}$, *M1$_{\text{GLIDE}[+\text{HI}]}$, UNIFORMITY

(20) Relevant markedness and faithfulness constraints
a. ONSET&ONSET]$_{\text{ADJSYLL}}$: Assign one violation mark for every sequence of two adjacent onsetless syllables (see, e.g., Cabré and Prieto 2004).
b. ID-[PAL]: Assign one violation mark for every palatal segment in S_1 whose output correspondent in S_2 is not palatal (see McCarthy and Prince 1995).
c. MAX-[PAL]: Assign one violation mark for every palatal segment in S_1 that has no correspondent in S_2 (see McCarthy and Prince 1995).
d. IDENT$_{[\text{STRICT}],n}$: Assign one violation mark for each segment in S1 whose output correspondent in S2 has a difference in stricture of *n* degrees on the segmental stricture scale S (see Gnanadesikan 1997; Alderete et al. 1999).
e. UNIFORMITY: Assign one violation mark for every output segment that has two input correspondents (≈no coalescence; see McCarthy and Prince 1995).

The tableau in (21) illustrates cases with mid-gliding in contact with a non-palatal vowel. The faithful candidate (21a) is discarded due to the presence of two adjacent onsetless syllables. The competition between candidates with regular gliding (21b) and mid-gliding (21c) is solved in favor of the latter, because in intervocalic position the non-high glide (i.e., [e̯]), which is more sonorous, is more harmonic: the candidate with [j] (21b) violates *VM1$_{GLIDE[+HI]}$V, which is crucially ranked above 'IDENT$_{[STRICT],1}$, *M1$_{GLIDE[-HI]}$, *VM1$_{GLIDE[-HI]}$V' (an alternative ranking, with at least one of these constraints above *VM1$_{GLIDE[+HI]}$V, would produce regular gliding). Note, on the other hand, that the ranking 'ID-[PAL] ≫ IDENT$_{[STRICT],1}$, *M1$_{GLIDE[-HI]}$, *VM1$_{GLIDE[-HI]}$V' explains why mid-gliding (21c) is preferred over fusion (21d): ID-[PAL] guarantees that fusion only applies when two adjacent segments share the feature [Palatal] (see, e.g., the tableau in (22)). The constraint MAX-[PAL] also has a critical role in preventing deletion to satisfy *VM1$_{GLIDE[+HI]}$V (21e).

(21) Mid-gliding of /i/ in contact with a non-palatal vowel

/ta$_1$i$_2$+ə/	ONS&ONS]$_{ADJSYLL}$	ID-[PAL]	MAX-[PAL]	*VM1$_{GLIDE[+HI]}$V	IDENT$_{[STRICT],1}$	*M1$_{GLIDE[-HI]}$	*VM1$_{GLIDE[-HI]}$V	ONSET	*M1$_{GLIDE[+HI]}$	UNIFORMITY
a. [tá$_1$.i$_2$.ə]	*!							**		
b. [tá$_1$.j$_2$ə]				*!					*	
☞c. [tá$_1$.e̯$_2$ə]					*	*	*			
d. [tá$_{1,2}$.ə]		*!			*			*		*
e. [tá$_1$.ə]			*!					*		

In our analysis, then, *VM1$_{GLIDE[+HI]}$V straightforwardly favors mid-gliding in contact with a non-palatal vowel. The emergence of mid-gliding in these cases has previously been addressed by Dols (2000). In his analysis, the mid-gliding realization of /i/ pivots around the constraint *ONSET/GLIDE (similar to *M1$_{GLIDE[+HI]}$), which penalizes a glide syllabified in onset-initial position. The [ə̯] realization in intervocalic position is regarded as a consequence of the syllabification of the palatal vocoid in the coda: in this position, the segment loses its place specifications and is reinterpreted as a default vowel ([ə]), which becomes [ə̯] (equivalent to [e̯]) as a result of a general postlexical process affecting adjacent vowels (cf. *talla* [táe̯.ə]). Apart from generating unnecessarily marked syllables, the main drawback of this analysis is the behavior of the glide in undoubted coda position, where it does not undergo lenition (*ve*[j], **ve*[e̯]) (see Section 4.3).[21]

The tableau in (22) illustrates cases with fusion in contact with another /i/. It shows how the subranking ‘ONSET&ONSET]$_{\text{ADJSYLL}}$, MAX-[PAL] ≫ *VM1$_{\text{GLIDE[+HI]}}$V’ limits the options to mid-gliding (22c) or fusion (22d). This gives the next group of constraints, ‘IDENT$_{\text{[STRICT],1}}$, *M1$_{\text{GLIDE[−HI]}}$, *VM1$_{\text{GLIDE[−HI]}}$V’, a chance to play a crucial role in selecting the candidate with fusion (22d): although this candidate incurs a violation of ONSET and the candidate with mid-gliding (22c) does not, this has no consequences because ONSET is subordinate to the cluster ‘IDENT$_{\text{[STRICT],1}}$, *M1$_{\text{GLIDE[−HI]}}$, *VM1$_{\text{GLIDE[−HI]}}$V’, all violated by the candidate with mid-gliding.

(22) Fusion of /i/ in contact with a palatal high vowel

/fi$_1$i$_2$ + ə/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[PAL]	MAX-[PAL]	*VM1$_{\text{GLIDE[+HI]}}$V	IDENT$_{\text{[STRICT],1}}$	*M1$_{\text{GLIDE[−HI]}}$	*VM1$_{\text{GLIDE[−HI]}}$V	ONSET	*M1$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [fí$_1$.i$_2$.ə]	*!							**		
b. [fí$_1$.j$_2$ə]				*!					*	
c. [fí$_1$.e̯$_2$ə]					*(!)	*(!)	*(!)			
☞d. [fí$_{1,2}$.ə]								*		*
e. [fí$_1$.ə]			*!					*		

The same arguments extend directly to sequences with /i/ contiguous to a non-high palatal vowel, [e] or [ɛ], in which the candidate with fusion is selected as well (23). In this case, though, the candidate with mid-gliding (23c) is not penalized by IDENT$_{\text{[STRICT],1}}$ (since the winning candidate (23d) also has a deviation of one step on the stricture scale), but only by the two constraints prohibiting mid-glides in M1.

21 A reviewer suggests that, if the mid-glide in [táe̯ə] was considered to be ambisyllabic, there might be a formal difference between *talla* and *vell* that could explain their different realizations. Although the argument seems entirely correct, it would lead to a three-way distinction between regular codas (M2, *ve*[j]), initial non-ambisyllabic onsets (M1, [j]*ena*), and intervocalic ambisyllabic positions (approximately, intervocalic M1, *ta*[e̯]*a*), which is the main purpose of our paper.

(23) Fusion of /i/ in contact with a non-high palatal vowel

/ve$_1$i$_2$ + ə/	Ons&Ons]$_{\text{AdjSyll}}$	Id-[pal]	Max-[pal]	*VM1$_{\text{Glide[+hi]}}$V	Ident$_{\text{[Strict],1}}$	*M1$_{\text{Glide[−hi]}}$	*VM1$_{\text{Glide[−hi]}}$V	Onset	*M1$_{\text{Glide[+hi]}}$	Uniformity
a. [vé$_1$.i$_2$.ə]	*!							**		
b. [vé$_1$.j$_2$ə]				*!					*	
c. [vé$_1$.e̯$_2$ə]					*	*(!)	*(!)			
☞d. [vé$_{1,2}$.ə]					*			*		*
e. [vé$_1$.ə]			*!					*		

Before closing this section, it is worth highlighting the consequences of the presence, in tableaux (22) and (23), of a candidate which is phonetically identical but structurally different to the winner. In (22e) and (23e), [i] is the result of deleting the second palatal vowel, whereas in the winners (22d) and (23d) it is the result of merging the two adjacent palatal vowels. It is a case of structural ambiguity, but the selection of the candidate with deletion is clearly untenable: it would demand permuting the ordering of Uniformity and Max-[pal] and, furthermore, demoting Max-[pal] below the cluster 'Ident$_{\text{[Strict],1}}$, *M1$_{\text{Glide[−hi]}}$, *VM1$_{\text{Glide[−hi]}}$V'; that ranking, though, would wrongly entail the deletion of /i/ in heterorganic sequences, with mid-gliding in these varieties (cf. (21)). Promoting instead Uniformity while still maintaining the top-position of Max-[pal] in the ranking would lead to mid-gliding in all intervocalic positions, even in contact with a high palatal vowel in (23), since candidates with fusion would violate Uniformity and candidates with deletion, Max-[pal]. Although a variety with generalized intervocalic mid-gliding is very likely to occur, all MajC varieties described here show instances of fusion and require a subordinate position of Uniformity in the ranking.

4.2 Deletion and conditioned fusion of /i/ in intervocalic position (Varieties B)

Varieties B show generalized loss of the palatal vocoid /i/ intervocalically. In these varieties, deletion applies except when /i/ is adjacent to another /i/, in which case fusion is triggered. Therefore, Varieties A and B show a different outcome when /i/ is in contact with a non-palatal vowel and with a non-high palatal vowel, but the same one when /i/ and the adjacent vowel are identical. The gross ranking structure is the same in both varieties, except for Max-[pal], which occupies a lower position in the ranking of Varieties B, specifically, the same as Onset (24).

(24) Conflated hierarchy for Varieties B
Ons&Ons]$_{AdjSyll}$, Id-[pal], Ident$_{[Strict],3}$ ≫ Ident$_{[Strict],2}$ ≫ *VM1$_{Glide[+hi]}$V ≫ Ident$_{[Strict],1}$, *M1$_{Glide[-hi]}$, *VM1$_{Glide[-hi]}$V ≫ Onset, Max-[pal] ≫ *M2$_{Glide[+hi]}$, *M1$_{Glide[+hi]}$, Uniformity

The tableau for *talla* in (25) illustrates how the main difference between Varieties A (with mid-gliding) and B (with deletion) arises from the position of Max-[pal]. The low ranking of Max-[pal] in Varieties B explains why deletion (25e) is preferred over mid-gliding (25c) when the adjacent segment is not a high palatal vowel, even though it entails the loss of the palatal feature of /i/. As in Varieties A, Id-[pal] rules out fusion as an alternative in this case (25d).

(25) Deletion of /i/ in contact with a non-palatal vowel

/ta$_1$i$_2$ + ə/	Ons&Ons]$_{AdjSyll}$	Id-[pal]	*VM1$_{Glide[+hi]}$V	Ident$_{[Strict],1}$	*M1$_{Glide[-hi]}$	*VM1$_{Glide[-hi]}$V	Onset	Max-[pal]	*M1$_{Glide[+hi]}$	Uniformity
a. [tá$_1$.i$_2$.ə]	*!						**			
b. [tá$_1$.j$_2$ə]			*!						*	
c. [tá$_1$.e̯$_2$ə]				*(!)	*(!)	*(!)				
d. [tá$_{1,2}$.ə]		*!					*			*
☞e. [tá$_1$.ə]							*	*		

As can be seen in tableau (26), the low-ranked constraint Max-[pal] is still relevant for deciding that, in sequences of two high palatal vowels, the selected strategy is fusion again (26d), and not mere deletion (26e). However, in this grammar, when /i/ is contiguous to a non-high palatal vowel, as in (27), the outcome with deletion (27e) is also preferred, since it does not violate Ident$_{[Strict],1}$, unlike the candidate with fusion (27d), which involves a deviation from a high to a non-high vocoid. Note that the lower ranking of MAX-[PAL] with respect to IDENT$_{\text{[STRICT]},1}$ in Varieties B explains the discrepant formal solution between these varieties (with deletion) and Varieties A (with fusion) in cases such as *vella*.[22]

(26) Fusion of /i/ in contact with a high palatal vowel

/fi$_1$i$_2$ + ə/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[PAL]	*VM1$_{\text{GLIDE[+HI]}}$V	IDENT$_{\text{[STRICT]},1}$	*M1$_{\text{GLIDE[−HI]}}$	*VM1$_{\text{GLIDE[−HI]}}$V	ONSET	MAX-[PAL]	*M1$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [fí$_1$.i$_2$.ə]	*!						**			
b. [fí$_1$.j$_2$ə]			*!						*	
c. [fí$_1$.e̯$_2$ə]				*(!)	*(!)	*(!)				
☞d. [fí$_{1,2}$.ə]							*			*
e. [fí$_1$.ə]							*	*!		

(27) Deletion of /i/ in contact with a non-high palatal vowel

/ve$_1$i$_2$ + ə/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[PAL]	*VM1$_{\text{GLIDE[+HI]}}$V	IDENT$_{\text{[STRICT]},1}$	*M1$_{\text{GLIDE[−HI]}}$	*VM1$_{\text{GLIDE[−HI]}}$V	ONSET	MAX-[PAL]	*M1$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [vé$_1$.i$_2$.ə]	*!						**			
b. [vé$_1$.j$_2$ə]			*!						*	
c. [vé$_1$.e̯$_2$ə]				*(!)	*(!)	*(!)				
d. [vé$_{1,2}$.ə]				*!			*			*
☞e. [vé$_1$.ə]							*	*		

22 The importance of having a different interpretation of *filla* (fusion) and *vella* (deletion) in Varieties B will become clear when we treat the behavior of /i/ in word-final position (see Section 4.3).

4.3 Regular gliding and conditioned fusion of /i/ word-finally (Varieties A and B)

In word-final position, the relevant margin hierarchy is the one referring to codas, that is, the *M2$_\lambda$ ranking (see (5b)). In M2, segments of high sonority are favored, so gliding is a welcome strategy. The low degree of markedness of high glides in M2 is captured by the outranked position of *M2$_{\text{GLIDE[+HI]}}$ in Varieties A and B, specifically, at the same level as UNIFORMITY. Given that this ranking leads to identical outcomes in both varieties, here we exemplify only the behavior of Varieties B, which are more likely to show instances of vowel loss. Interestingly enough, once again the solution differs according to the preceding segment: fusion is allowed after another /i/; otherwise, regular gliding is preferred. As illustrated in (28) with the word *vell*, the candidates with mid-gliding (28c) and fusion (28d) present a gratuitous deviation of one step on the stricture scale and are both ruled out. In this context, ONSET and MAX-[PAL] enforce the selection of regular gliding (28b).

(28) Regular gliding of /i/ in contact with a vowel different from /i/ (Varieties B)

/ve$_1$i$_2$/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[PAL]	IDENT$_{\text{[STRICT],1}}$	ONSET	MAX-[PAL]	*M2$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [vé$_1$.i$_2$]				*!			
☞ b. [vé$_1$j$_2$]						*	
c. [vé$_1$e̯$_2$]			*!				
d. [vé$_{1,2}$]			*!				*
e. [vé$_1$]					*!		

Following another /i/ (29), though, neither the faithfulness constraints ID-[PAL], MAX-[PAL], and IDENT$_{\text{[STRICT],1}}$ nor ONSET distinguish regular gliding (29b) from fusion (29d). Since both candidates also fare equally with respect to the unranked constraints from the lowest level, regular gliding and fusion arise as possible outcomes.[23]

23 The only difference between Varieties A and B is that, in the former, outputs with deletion — (28e) and (29e) — are ruled out by the top-ranked MAX-[PAL] before moving on to consider lower-ranked constraints.

(29) Fusion of /i/ in contact with another /i/ (Varieties B)

/fi$_1$i$_2$/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[PAL]	IDENT$_{\text{[STRICT],1}}$	ONSET	MAX-[PAL]	*M2$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [fí$_1$.i$_2$]				*!			
☞b. [fí$_1$j$_2$]						*	
c. [fí$_1$e̯$_2$]			*!				
☞d. [fí$_{1,2}$]							*
e. [fí$_1$]					*!		

In closing this section, we would like to mention the intricate ways in which the constraints affecting intervocalic M1 and M2 are intertwined. We have noted above that the interpretation of the outputs for *filla* and *vella* shifts from a single interpretation in Varieties A — fusion — to a double interpretation in Varieties B: fusion (*filla*, (26)) and deletion (*vella*, (27)). Reducing *filla* and *vella* to the same formal interpretation in Varieties B, though attractive, would entail undesirable consequences for the outcomes of /i/ in other contexts. On the one hand, in order to select deletion in *filla* (26), as in *vella* (27), UNIFORMITY should outrank MAX-[PAL]. But then, to allow deletion in *fill* (29), we should demote MAX-[PAL] to the same level as *M2$_{\text{GLIDE[+HI]}}$, and that ranking would wrongly allow the selection of candidates with deletion in forms such as *vell* as well (28). On the other, a grammar in which the outcome for *vella* in (27) was interpreted as fusion would need ranking MAX-[PAL] over IDENT$_{\text{[STRICT],1}}$. However, that ranking would incorrectly favor the candidate with mid-gliding in *talla* (25), just as in Varieties A.

4.4 Regular gliding of /i/ in word-initial position (Varieties A and B)

This section is intended to exemplify that the constraint rankings discussed thus far yield correct results word-initially, as the tableau in (30) demonstrates for Varieties B. In this context, the relevant markedness hierarchy is the one relative to M1 in general (5a). Although the *M1$_\lambda$ ranking favors lower-sonority variants of the high vocoids, the selection of regular gliding (30b) is accomplished by the faithfulness constraint IDENT$_{[\text{STRICT}],2}$, which plays a crucial role for the first time: strengthening strategies such as fricativization (30c), which have to be considered fair options given the *M1$_{\lambda}$ hierarchy, are ruled out because they imply an unnecessary deviation of two steps on the stricture scale with respect to the input /i/. Merging /i/ with the next vowel to prevent a regular glide to surface word-initially is ruled out by IDENT$_{[\text{STRICT}],1}$ (30d), whereas the possibility of deleting the high vocoid is excluded by either MAX-[PAL] or ONSET (30e).[24]

(30) Regular gliding of /i/ (Varieties B)

/i_1e_2n + ə/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[PAL]	IDENT$_{[\text{STRICT}],2}$	IDENT$_{[\text{STRICT}],1}$	*M1$_{\text{GLIDE}[-\text{HI}]}$	ONSET	MAX-[PAL]	*M1$_{\text{GLIDE}[+\text{HI}]}$	UNIFORMITY
a. [i_1.$é_2$.nə]	*!					**			
☞b. [$j_1é_2$.nə]								*	
c. [$ʒ_1é_2$.nə]			*!						
d. [$é_{1,2}$.nə]				*!		*			*
e. [$é_2$.nə]						*(!)	*(!)		

4.5 Analysis of the patterns involving labials

As seen in Section 3.2, all MajC varieties display instances in which [w] in a coda alternates with [ʋ] intervocalically, either occasionally (Varieties I) or almost generally (Varieties II). Along with this alternating pattern, Varieties I show cases with [w] in both positions, as in *ca*[w]*en* ~ *ca*[w] (14a) (only sporadically in Varieties II), and even vowel loss when /u/ is adjacent to another labial vowel, as in *bouet* [bo.ə́t] (16a) (an unattested pattern in Varieties II). In order to properly understand the full system, we should bear in mind that, in our approach, Varieties I and II do not differ in their grammar, but in the set of lexical units showing [ʋ] ~ [w] alternation. Outputs with this alternation are derived from underlying /v/, whereas outputs without alternation or with vowel loss are derived from /u/.

24 As before, in Varieties A MAX-[PAL] directly rules out candidate (30e) without considering lower-ranked constraints.

We essentially depart from the same rankings presented in (19) and (24) for Varieties A and B, although in this case the relevant faithfulness constraints, undominated in both varieties, are referred to the labial character of /u/ and /v/ (31a-b). Moreover, the context-free markedness constraint *LABIALGLIDE$_{[-\text{HI}]}$ (shortened as *[o̯]), top-ranked in the grammar (see (32) and (33) below), explains why /u/ mid-gliding is not a possible strategy. As we have shown in Section 2.3, our experimental analysis undoubtedly confirms that [o̯], unlike [e̯], is not attested in MajC, and this fits the typological generalizations according to which palatal glides are more frequent than their labial counterparts.

(31) Relevant faithfulness and markedness constraints
  a. ID-[LAB]: Assign one violation mark for every labial segment in S_1 whose output correspondent in S_2 is not labial (see McCarthy and Prince 1995).
  b. MAX-[LAB]: Assign one violation mark for every labial segment in S_1 that has no correspondent in S_2 (see McCarthy and Prince 1995).
  c. *LABIALGLIDE$_{[-\text{HI}]}$ (*[o̯]): Assign one violation mark for every labial glide characterized as [–high].

The complete constraint rankings for Varieties A and B are presented in (32) and (33), respectively. In both cases, we have added the set '*M2$_{\text{FRIC}}$, *VM1$_{\text{FRIC}}$V' at the top of the ranking, *M2$_{\upsilon,\text{LIQUID}}$ a step below, *VM1$_{\upsilon,\text{LIQUID}}$V below IDENT$_{[\text{STRICT}],2}$ and '*M1$_{\upsilon,\text{LIQUID}}$ ≫ *M1$_{\text{FRIC}}$' at the bottom. The two rankings only differ in the position of MAX-[PAL], which is clearly irrelevant for labials, and, therefore, give exactly the same outputs in Varieties A and B. Note also that splitting MAX(F) into MAX-[PAL] and MAX-[LAB] is decisive because these two constraints need to be freely rankable in order to justify the different outcomes of /i/ and /u/ in Varieties B, allowing /i/-deletion but not /u/-deletion.

(32) Conflated hierarchy for Varieties A (complete)
ONS&ONS]$_{\text{ADJSYLL}}$, *[o̯], ID-[PAL], ID-[LAB], MAX-[PAL], MAX-[LAB], IDENT$_{[\text{STRICT}],3}$, *M2$_{\text{FRIC}}$, *VM1$_{\text{FRIC}}$V ≫ *M2$_{\upsilon,\text{LIQUID}}$ ≫ IDENT$_{[\text{STRICT}],2}$ ≫ *VM1$_{\upsilon,\text{LIQUID}}$V ≫ *VM1$_{\text{GLIDE}[+\text{HI}]}$V ≫ IDENT$_{[\text{STRICT}],1}$, *M1$_{\text{GLIDE}[-\text{HI}]}$, *VM1$_{\text{GLIDE}[-\text{HI}]}$V ≫ ONSET ≫ *M2$_{\text{GLIDE}[+\text{HI}]}$, *M1$_{\text{GLIDE}[+\text{HI}]}$, UNIFORMITY ≫ *M1$_{\upsilon,\text{LIQUID}}$ ≫ *M1$_{\text{FRIC}}$

(33) Conflated hierarchy for Varieties B (complete)
ONS&ONS]$_{\text{ADJSYLL}}$, *[o̯], ID-[PAL], ID-[LAB], MAX-[LAB], IDENT$_{[\text{STRICT}],3}$, *M2$_{\text{FRIC}}$, *VM1$_{\text{FRIC}}$V ≫ *M2$_{\upsilon,\text{LIQUID}}$ ≫ IDENT$_{[\text{STRICT}],2}$ ≫ *VM1$_{\upsilon,\text{LIQUID}}$V ≫ *VM1$_{\text{GLIDE}[+\text{HI}]}$V ≫ IDENT$_{[\text{STRICT}],1}$, *M1$_{\text{GLIDE}[-\text{HI}]}$, *VM1$_{\text{GLIDE}[-\text{HI}]}$V ≫ ONSET, MAX-[PAL] ≫ *M2$_{\text{GLIDE}[+\text{HI}]}$, *M1$_{\text{GLIDE}[+\text{HI}]}$, UNIFORMITY ≫ *M1$_{\upsilon,\text{LIQUID}}$ ≫ *M1$_{\text{FRIC}}$

In the next three tableaux we illustrate how the grammar selects the expected candidates intervocalically when the underlying forms contain /u/ and /v/. The tableau for *creuen* 'they cross' in (34) shows how intervocalic /u/ surfaces as a regular glide [w] when surrounded by non-labial vowels. In this case, strengthening /u/ into a fricative [v] is discarded by $*VM1_{FRIC}V$ (34b); strengthening it into [ʋ] incurs a violation of $*VM1_{ʋ,LIQUID}V$ and is also rejected (34c). The constraint set 'ONS&ONS]$_{ADJSYLL}$, *[o̯], ID-[LAB], MAX-[LAB]' blocks candidates with hiatus (34a), mid-gliding (34e), fusion (34f), and deletion (34 g), respectively, yielding candidate (34c), with regular gliding, as the winner.

(34) Regular gliding of intervocalic /u/ in contact with non-labial vowels

/kɾə$_1$u$_2$ + ən/	ONS&ONS]$_{ADJSYLL}$	*[o̯]	ID-[LAB]	MAX-[LAB]	IDENT$_{[STRICT],3}$	$*VM1_{FRIC}V$	IDENT$_{[STRICT],2}$	$*VM1_{ʋ,LIQUID}V$	$*VM1_{GLIDE[+HI]}V$	IDENT$_{[STRICT],1}$	ONSET	$*M1_{GLIDE[+HI]}$	UNIFORMITY
a. [kɾə́$_1$.u$_2$.ən]	*!										**		
b. [kɾə́$_1$.v$_2$ən]						*!	*						
c. [kɾə́$_1$.ʋ$_2$ən]								*!		*			
☞d. [kɾə́$_1$.w$_2$ən]									*			*	
e. [kɾə́$_1$.o̯$_2$ən]		*!								*			
f. [kɾə́$_{1,2}$.ən]			*!							*	*		*
g. [kɾə́$_1$.ən]				*!							*		

A different situation arises when /u/ is contiguous to a labial vowel, as in (35). Once excluded candidates (35b-c), with impossible strengthening due to the high-ranked constraints $*VM1_{FRIC}V$ and $*VM1_{ʋ,LIQUID}V$, the ranking establishes the candidate with fusion (35f) as the most harmonic one: first, unlike candidates (35a,e,g), it does not violate any constraint of the cluster 'ONS&ONS]$_{ADJSYLL}$, *[o̯], MAX-[LAB]'; second, unlike the candidate with regular gliding (35d), it does not violate $*VM1_{GLIDE[+HI]}V$. Thus, as in parallel cases with /i/-fusion (see especially (23)), it is preferable to merge /u/ with the next labial vowel (35f) than to have a regular glide as an intervocalic onset (35d).

(35) Fusion of intervocalic /u/ in contact with a labial vowel

/bɔ$_1$u$_2$ + ət/	ONS&ONS]$_{\text{ADJSYLL}}$	*[o̯]	ID-[LAB]	MAX-[LAB]	IDENT$_{\text{[STRICT]},3}$	*VM1$_{\text{FRIC}}$V	IDENT$_{\text{[STRICT]},2}$	*VM1$_{\text{ʋ,LIQUID}}$V	*VM1$_{\text{GLIDE[+HI]}}$V	IDENT$_{\text{[STRICT]},1}$	ONSET	*M1$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [bo$_1$.u$_2$.ə́t]	*!										**		
b. [bo$_1$.v$_2$ə́t]						*!	*						
c. [bo$_1$.ʋ$_2$ə́t]								*!		*			
d. [bo$_1$.w$_2$ə́t]									*!			*	
e. [bo$_1$.o̯$_2$ə́t]		*!								*			
☞f. [bo$_{1,2}$.ə́t]										*	*		*
g. [bo$_1$.ə́t]				*!							*		

In tableau (36), we consider the realizations of lexical items with intervocalic /v/ in the input. Leaving (36a) aside momentarily, several other candidates are ruled out by constraints on the first level: ONS&ONS]$_{\text{ADJSYLL}}$ (36c), *[o̯] or IDENT$_{\text{[STRICT]},3}$ (36e), IDENT$_{\text{[STRICT]},3}$ (36f), and MAX-[LAB] (36 g). The fatal violation of IDENT$_{\text{[STRICT]},3}$ in (36f) renders impossible the coalescence of /v/ with an adjacent non-high labial vocoid, since that merging would produce excessive stricture modifications. IDENT$_{\text{[STRICT]},2}$ crucially eliminates the candidate with regular gliding (36d), parallel to the winner in (34), because in this case mapping /v/ into [w] implies an unnecessary two-step stricture deviation.[25] Among the two remaining candidates ((36a) and (36b)), the ranking '*VM1$_{\text{FRIC}}$V ≫ *VM1$_{\text{ʋ,LIQUID}}$V' accounts for the [ʋ]-realization in intervocalic M1, with a minimal deviation on the stricture scale (36b).

25 Given the ranking 'IDENT$_{\text{[STRICT]},2}$ ≫ *VM1$_{\text{ʋ,LIQUID}}$V', merging /v/ with a high labial vowel would also be excluded: *bra*[ʋú]*ra*, **bra*[ú]*ra* 'bravery'.

(36) /v/-weakening in intervocalic position

/nɔ$_1$v$_2$ + ət/	Ons&Ons]$_{\text{AdjSyll}}$	*[o̯]	Id-[lab]	Max-[lab]	Ident$_{\text{[Strict],3}}$	*VM1$_{\text{Fric}}$V	Ident$_{\text{[Strict],2}}$	*VM1$_{\text{ʋ,Liquid}}$V	*VM1$_{\text{Glide[+hi]}}$V	Ident$_{\text{[Strict],1}}$	Onset	*M1$_{\text{Glide[+hi]}}$	Uniformity
a. [no$_1$.v$_2$ə́t]						*!							
☞ b. [no$_1$.ʋ$_2$ə́t]								*		*			
c. [no$_1$.u$_2$.ə́t]	*!						*				**		
d. [no$_1$.w$_2$ə́t]							*!		*			*	
e. [no$_1$.o̯$_2$ə́t]		(*!)			(*!)								
f. [no$_{1,2}$.ə́t]					*!						*		*
g. [no$_1$.ə́t]				*!							*		

As for sequences with a postvocalic labial segment in word-final position, the stems that need a deeper explanation are those with final /v/ (37).[26] In M2, unlike in M1, changes in /v/-stricture beyond one step are allowed. The ranking '*M2$_{\text{Fric}}$ ≫ *M2$_{\text{ʋ,Liquid}}$ ≫ Ident$_{\text{[Strict],2}}$', indeed, gives preference to the candidate with regular gliding (37d) over the candidates that respect Ident$_{\text{[Strict],2}}$ (37a-b).[27] The subset '*[o̯], Max-[lab], Ident$_{\text{[Strict],3}}$' prohibits, as above, candidates with mid-gliding (37e), /v/-deletion (37 g), and fusion with the preceding labial vowel (37f). The ranking of Onset over *M2$_{\text{Glide[+hi]}}$ favors the candidate with regular gliding (37d), as was the case for stems with a high palatal vowel.

26 Stems with final /u/ essentially behave like morphemes with final /i/ (see Section 4.3): regular gliding of /u/ is generally attested, except after another /u/, in which case regular gliding of the final vowel and fusion of the two vowels are equally harmonic (cf. *n*[úw] ~ *n*[ú]).
27 The final /v/ in candidate (37a) appears as a voiceless fricative due to general obstruent devoicing in word final position (see, e.g., Wheeler 2005: 145–165).

(37) /v/-weakening in word-final M2

/nɔ$_1$v$_2$/	*[o̯]	ID-[LAB]	MAX-[LAB]	IDENT$_{[\text{STRICT}],3}$	*M2$_{\text{FRIC}}$	*M2$_{\text{ʋ,LIQUID}}$	IDENT$_{[\text{STRICT}],2}$	IDENT$_{[\text{STRICT}],1}$	ONSET	*M2$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [nɔ́$_1$f$_2$]					*!						
b. [nɔ́$_1$ʋ$_2$]						*!		*			
c. [nɔ́$_1$.u$_2$]							*		*!		
☞d. [nɔ́$_1$w$_2$]							*			*	
e. [nɔ́$_1$o̯$_2$]	(*!)			(*!)							
f. [nɔ́$_{1,2}$]				*!							*
g. [nɔ́$_1$]			*!								

The constraint rankings proposed until now also yield the correct results word-initially. Since in this position there is no [ʋ] ~ [w] alternation, all word-initial [w] may be derived from underlying /u/. IDENT$_{[\text{STRICT}],2}$ and IDENT$_{[\text{STRICT}],1}$ rule out any strengthening ((38c) and (38d)). ONS&ONS]$_{\text{ADJSYLL}}$ rules out the faithful mapping of /u/ (38a), whereas MAX-[LAB] excludes /u/-deletion (38d). Hence, as in word-initial /i/, regular gliding emerges as the optimal outcome (38b).

(38) Regular gliding of /u/ in word-initial position

/u$_1$e$_2$b/	ONS&ONS]$_{\text{ADJSYLL}}$	ID-[LAB]	MAX-[LAB]	IDENT$_{[\text{STRICT}],2}$	IDENT$_{[\text{STRICT}],1}$	ONSET	*M1$_{\text{GLIDE[+HI]}}$	UNIFORMITY
a. [u$_1$é$_2$p]	*!					**		
☞b. [w$_1$é$_2$p]							*	
c. [ʋ$_1$é$_2$p]					*!			
d. [v$_1$é$_2$p]				*!				
e. [é$_2$p]			*!			*		

One of the advantages of grounding our approach on the split margin hierarchy is that the behavior of /v/ in non-intervocalic M1 is correctly predicted by the same set of formal considerations. Word-initially, for instance, inputs such as *vol* /vɔl/ 'flight' preserve the fricative [v], without further weakening, given that less sonorous segments are generally favored in M1. According to the syllabic organization in (4), the second element in a coda should follow the same pattern, as indeed occurs in MajC. We exemplify this argument in (39), with the 1SG.PI verbal form, *conserv* /konserv/ 'I conserve', in which /v/ surfaces as a final devoiced fricative (39a).

(39) Fricative realization of /v/ in word-final M1

/konserv/	*M1$_{\text{GLIDE[+HI]}}$	*M1$_{\text{ʋ,LIQUID}}$	*M1$_{\text{FRIC}}$
☞a. [kon.séɾf]			*
b. [kon.séɾʋ]		*!	
c. [kon.séɾw]	*!		

There are alternative analyses available for the [ʋ] ~ [w] alternation, but they either demand a sonority treatment of the labial vocoids different from that of the palatal ones or do not completely hold for our data. For example, one can try to generate the [ʋ] ~ [w] alternation from /u/ (as in Sanskrit, e.g.; Levi 2011: 349), with regular gliding in M2 — enforced by ONSET — and consonantal strengthening in M1 — compelled by ONSET and *M1$_{\text{GLIDE[+HI]}}$. That proposal, though, requires a prominent position of *M1$_{\text{GLIDE[+HI]}}$ in the ranking, which is incompatible with the grammar needed to account for /i/ mid-gliding in intervocalic M1. The very same problem arises if we build our analysis on an underspecified labial segment, as suggested in Dols (2000: 263–271), who does not consider the coexistence of cases with [w] and cases with [ʋ] intervocalically.[28] For alternating stems, Dols proposes the existence of a consonant /V/ which would only be specified as [Labial], [+voiced], and [+continuant]. Following Dols' analysis, /V/ would surface as [w] in coda position due to *CODA/[v], but as [v] in onset position due to the conjoined effect of *ONSET/glide (equivalent to *M1$_{\text{GLIDE[+HI]}}$) and a constraint demanding the alignment of a marked place of articulation in the onset (AL-PA$_{\text{marked}}$).

28 Dols' grammar is consistent with the behavior of a small part of the older generation of Varieties II, which forbids [w] in any onset (*Ha*[v]*ai*, [v]*isky*), even in recent loans ([v]*atsApp*).

There is a formal option to obtain [ʋ] — either from /u/ or from an underspecified segment /V/ — while still allowing /i/ mid-gliding intervocalically. We can split $*M1_{\text{GLIDE}[+\text{HI}]}$ into a top-ranked constraint referring to the labial vocoids and another low-ranked constraint referring to the palatal vocoids. A split of this kind— with the order 'Labial < Palatal' — has been proposed to deal with asymmetrical glide patterns in some languages (see, e.g., Kiparsky 1979; Baertsch 2008), and would fit varieties prohibiting [w] in M1 altogether, but it is again untenable for our data. For the younger generations under study (in both Varieties I and II) the strengthening of the labial vocoid in intervocalic position is not a productive process, since loans and learned words such as *Hawaii, Power* or *PowerPoint* are realized with an intervocalic [w]. Similar realizations are found in native non-common words, such in the verbal forms of *creuar* 'to cross'. What is more, strengthening into [v] is not even usual in word-initial M1, where it would be a much better outcome since the affected segment is not preceded by a vowel. All in all, for the speakers under study, positing an underlying /v/ for alternating stems and using the same sonority-related constraints for both vocoids give rise to the simplest grammar.

The system displayed by the younger generations, though, is far from stabilized, and its whole interpretation is very likely to be modified (and may already have been modified by some younger speakers). For example, MajC presents first singular present indicative forms of verbal stems ending in a postvocalic -/v/ such as *renov* 'I renovate' or *arxiv* 'I file'. The traditional pronunciation of such forms showed a final glide (*reno*[w], *arxi*[w]), alternating with intervocalic [ʋ] (*reno*[ʋ]ar 'to renovate', *arxi*[ʋ]ar 'to file'); that is, they followed the usual [ʋ] ~ [w] alternation derived from inputs with /v/. Nowadays, however, some (not all) of these verbal forms tend to appear with a voiceless fricative (*reno*[f], *arxi*[f]) and hence may contrast with their glided nominal counterparts (*no*[w] 'new', *arxi*[w] 'file') (Bibiloni 2002: 281, 2016: 102–103). Although the realizations with [f] can be explained through paradigmatic effects (see, e.g., Lloret 2004; Pons-Moll 2004; Wheeler 2005: 269–275), the adaptation of foreign words such as *Steve* or *love* and acronyms such as *TAV* ('Tren d'Alta Velocitat' ['high-speed train']) with a voiceless fricative as well ([əstíf], [lɔ́f], [táf]) indicates that the link between [ʋ] and [w] is being severed. In the end, MajC might well end up with a grammar with two allomorphs (*no*/v/and *no*/u/, as explored in Jiménez et al. in press), similar to other Catalan varieties that display a distribution of allomorphic morphemes that clearly goes beyond phonology, like Eastern Central Catalan: *bo*[w], *bo*[w]*et* vs. *no*[w], *no*[β̞]*et; no*[w] 'walnut', *no*[ɣ̞]*era* 'walnut tree' (Wheeler 2005: 338–340).

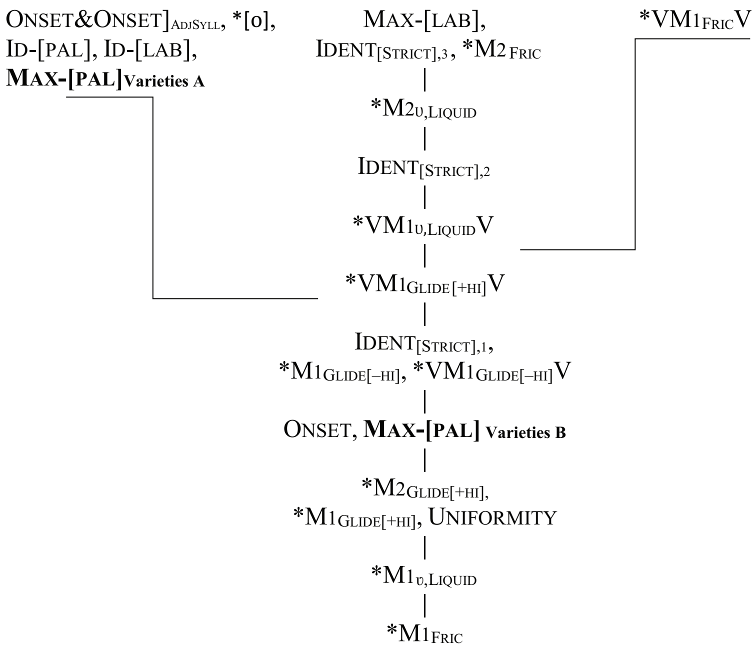
5 Final remarks

In this paper we have provided a complete description and a unified formal account of the patterns concerning the palatal vocoid, the labial vocoid, and the fricative /v/ in MajC, focusing particularly on their behavior in word-internal intervocalic position. The outcomes observed include regular gliding, mid-gliding, deletion, conditioned fusion, /v/-preservation, and /v/-weakening.

From an empirical point of view, we have corroborated the distinction found in MajC between [+ high] and [–high] palatal glides, already detected by Mascaró and Rafel (1981) and Recasens and Espinosa (2005). Significantly, though, our data do not support the existence of a [–high] labial glide. We have also confirmed the approximant character of /v/ in intervocalic position, previously advanced in Recasens (2014). As for the sonority relations involving vocoids, we have compiled evidence for a scale '[e̯] > [j], [w] > [ʋ]', which plays a decisive role in justifying the distribution of these segments in the MajC system.

From an analytical point of view, one important argument offered in this paper is that the behavior of high vocoids can be derived from the same ranking (with small ordering differences to account for dialectal variation), without splitting the sonority-related constraints for palatals and labials and without resorting to unconnected explanations for each series. In particular, we have shown that the alterations that vocoids undergo can be accounted for straightforwardly through the interaction of the general constraint hierarchy regulating the sonority preferences for singleton onsets (*$M1_{\lambda}$), which demands segments of low sonority, and the specific constraint hierarchy governing the sonority preferences for singleton onsets in intervocalic position (*$VM1_{\lambda}V$), which in contrast favors segments of higher sonority. The latter partially outranks the former, and this neatly explains why mid-glides, deletion or fusion may be preferred over regular gliding in intervocalic position unless faithfulness intervenes (see the complete ranking in (40)). In fact, the vast array of outcomes found is ruled by the intricate intertwining of these markedness hierarchies with place faithfulness constraints, which crucially determine which strategies are promoted in each specific dialectal variety (an external factor) depending on the context (an internal factor). Lastly, we have shown that changes further follow a strategy of strictural faithfulness that allows no disparity in non-intervocalic M1 (either word-initial or as the second element of a complex coda), one-step disparity in intervocalic M1, and two-step disparity in M2. Other aspects related to ongoing changes have been pointed out and may represent appealing avenues for research in the future.

(40) Ranking lattice for MajC varieties



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