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# A phonetic interpretation of the sound changes affecting dark /l/ in Romance\*

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The paper reviews experimental and descriptive data on /l/ vocalization and elision and related vowel shifts in the Romance languages, and argues that a given sound change may be achieved through different evolutionary paths. While prevailing theories tend to attribute a single articulatory or acoustic cue to changes affecting /l/, we propose instead an explanatory account based on an evaluation of the relative prominence of cues in different contextual and positional conditions on the part of the listener. According to this proposal, several prominent articulatory and/or acoustic characteristics may be responsible for segmental insertions, segmental elisions and sound shifts.

## 1. Introduction

The articulatory characteristics of dark /l/ are well understood, i.e., this consonant is produced with a primary apical closure or constriction at the dentoalveolar or alveolar zone and some predorsum lowering and postdorsum retraction towards the pharyngeal wall or the soft palate (Browman & Goldstein 1995; Narayanan et al. 1997). Sound changes affecting dark /l/, mostly vocalization into [w] (also into a mid back glide) and /l/ effacement, appear to be closely determined by several factors affecting darkness degree in the consonant: primarily syllable position, vowel and consonant context and dialect, but also word type and stress position. The goal of this paper is to propose an integrated interpretation of the phonetic causes of the sound changes affecting dark /l/ in the Romance languages through a careful evaluation of the articulatory and acoustic

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characteristics of the consonant in the contextual and positional conditions where those changes have taken place<sup>1</sup>.

A main goal of this paper is to show that a given sound change may be achieved through different evolutionary paths. This is in line with the fact that the perceptual salience of the acoustic characteristics of a phonetic segment may be affected in specific ways by the contextual and positional conditions involved. This view is generally in contrast with current theories of sound change which, as shown below, often attribute a given change to a single triggering articulatory mechanism or acoustic cue.

The present paper integrates experimental and descriptive data and is organized as follows. Section 2 reviews two hypotheses put forward to account for the direct replacement of dark /l/ by [w] along with a number of parameters affecting this process, presents an alternative hypothesis of /l/ vocalization involving glide insertion, and evaluates the predictive power of the direct replacement and glide insertion accounts. Other processes impacting dark /l/, i.e., vowel shift and /l/ elision, are reviewed in Section 3. Finally, Section 4 argues that the sound changes affecting dark /l/ may follow more than one evolutionary path.

## 2. Vocalization

This section reviews historical, dialectal and perceptual data suggesting that the vocalization of dark /l/ in Romance may derive from two distinct processes: direct replacement (/l/ > [w]) and glide insertion (/l/ > [wl] > [w]). The main phonetic factors favoring vocalization are also reviewed.

### 2.1 Direct replacement

Two hypotheses have been proposed to account for the vocalization of dark /l/ into [w], namely, the acoustic equivalence hypothesis and the articulation-based hypotheses. According to the former, /l/ vocalization is triggered by the spectral similarity of the original and resulting phonetic segments and, more specifically, by the two segments sharing a low frequency F2 of about 800–1000 Hz

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1. The replacement of dark /l/ by [w] will be referred to as /l/ vocalization everywhere in the paper. The phonetic variants are usually accompanied by their original source and an English gloss the first time that they appear in the text of the manuscript. The original forms belong to Latin most of the time and are represented in capitals; in these forms, LL stands for [l:], Y stands for [j], and the presence of an asterisk indicates that the forms in question have been reconstructed. Graphic forms taken from written texts are reproduced in italics; in these forms, the italicized grapheme *o* may correspond to either of the two realizations [ɔ] and [o].

(Ohala, 1974). Spectral similarity results from the two sounds being produced with a low predorsum, and with some postdorsum narrowing at the velar region ([w]) or at the upper pharynx (dark /l/). According to the articulation-based hypothesis, /l/ vocalization is triggered by alveolar contact loss which may be attributed to articulatory reduction and renders /l/ a [w]-like or *o*-like approximant (Straka 1968; Gick, Kang & Whalen 2002). In the following sections, 2.1.1 to 2.1.3, we review the evidence at the basis of the direct replacement explanations and the factors involved in the process of /l/ vocalization.

### 2.1.1 Syllable and word position

/l/ vocalization has operated extensively in syllable final position before a heterosyllabic consonant in all major Romance languages (except for Romanian), whereas in intervocalic syllable initial position it is only found in a few Romance dialects (Western Campidanese ['sawi] SALE “salt”, ['sɔwi] SOLE “sun”, Northern Occitan ['awo] ALA “wing”, Calabrian ['pawa] PALA “shovel”; Ronjat 1930–41, 2: 144; Rohlfs 1966: 308). The difference in vocalization due to syllable position is consistent with /l/ being darker and more prone to undergo alveolar contact loss syllable finally than syllable initially (Lehiste 1964; Recasens 2009; Wrench & Scobbie 2003).

Turning to the effect of word position, dark /l/ tends to change into [w] more often in preconsonantal word medial position than word finally in Romance. Word final vocalization has occurred more or less systematically only in a few Romance languages and dialects where the vocalization process has applied before a consonant as well, namely, in a subset of words (and presumably under analogical pressure in certain cases) in French ([ʃe'vø] *cheveu* CAPILLU “hair”, [mu] *mou* MOLLE “soft”; Pope 1934: 156), rarely in Northern Italian dialects (Rohlfs 1966: 426–427), and systematically in Gascon (see Section 2.1.3) and modern Brazilian Portuguese dialects ([sɔw] SOLE “sun”; Parkinson 1988: 135; Feldman 1972). The most common pattern may be exemplified by French, where dark /l/ typically shifted to [w] before a heterosyllabic consonant and was preserved word finally ([otr] *autre* ALTERU “other”, [ʃə'val] *cheval* CABALLU “horse”). This scenario appears to be in contrast with that for other language families where [w] or another back glide may replace dark /l/ both preconsonantly and word finally, i.e., Southern British English ([mɪwk] *milk*, [dɔw] *doll*), Ukrainian, Serbo-Croatian, Bulgarian and Slovene (Carlton 1990).

An explanation why /l/ vocalization may be less prone to apply word finally than word medially before a consonant could be sought in a trend for /l/ to overlap with the following phonetic segment preconsonantly but not prepausally (see Scobbie & Pouplier 2010 for relevant experimental data), and for word final /l/ to occur in several alternating contexts, i.e., not only before consonants but also

before vowels and before a pause (Timberlake 1978). The failure of word final /l/ to vocalize may also be related to consonants exhibiting segmental lengthening and undergoing less articulatory reduction prepausally than in other syllable final conditions (Keating & Wright 1999).

Word final vocalization may be triggered by the anticipation of the tongue dorsum lowering and backing motion with respect to the tongue tip raising gesture during the production of syllable final dark /l/ (Sproat & Fujimura 1993; Browman & Goldstein 1995; Scobbie & Pouplier 2010). Data for American English reveal that this temporal mismatch may cause the alveolar closure to occur after voicing offset such that the [w]-like component becomes the only /l/ signaling cue (Recasens & Farnetani 1994). Preliminary linguopalatal contact data reveal that such oral-glottal coordination may not be present in all languages and dialects showing a strongly dark variety of /l/. Thus, in Majorcan Catalan where /l/ is also strongly dark, the apical gesture for the word final consonant occurs typically while the vocal fold are still vibrating.

### 2.1.2 *Effect of the following consonant*

According to data for the Romance languages, the outcome [w] of dark /l/ may occur most frequently before labials and velars (Gevaudanés Occitan [paw'pa] PALPARE “to touch”, [ʼawbo] ALBA “dawn”, [faw'ku] FALCONE “falcon”; Camproux 1962: 316), and before dentals as well (Tuscan from Lucca [ʼawto] ALTU “high”, [ʼkawdo] CALDU “warm”, Comelican [ʼfawθi] FALCE “sickle”, Rohlf’s 1966: 342; Tagliavini 1926: 29). It may also take place before the alveolars [(t)s, (d)z] and [n] and the alveolopalatals [(t)ʃ, (d)ʒ] and [ç], as shown by lexical forms from Old Provençal (*faus* FALSU “false”, *feunia* for *fel(o)nia* derived from Frankish \*FILLO “felony”; Appel 1918: 79), Old Catalan (*sautze* SALICE “willow”; Gulsoy 1993: 180), Piedmontese ([ʼawtsa] ALTIAT “he/she raises”, [fawtʃ] FALCE, [ʼfewdʒo] FILICE “fern”; Morosi 1890: 344; Salvioni 1886: 196; Kolovrat 1923: 246), and Ladin from Val Gardena ([caw'cap] CALCANEU “heel”; Ascoli 1873: 363).

The vocalization process in Romance may apply more or less systematically in several C2 scenarios (where C2 stands for the consonant following /l/), largely to the exclusion of other C2 conditions, depending on the language or dialect taken into consideration:

- Before any consonant, in French and Occitan zones (e.g., Northern Occitan, Provençal, Gascon).
- Before labials and velars, or before labials only, in Occitan zones (e.g., Gévaudan) and, occasionally, in Catalan dialects (e.g., Majorcan).
- Before labials, dentals and alveolars, in Old Portuguese and Old Spanish.

- Before dentals and alveolars in Old Provençal, Old Catalan, Occitan dialects (e.g., Tolosan, Foissenc; Alibèrt 1976: 33), Northern, Central and Southern Italian dialects, and Romansh and Ladin.

If /l/ vocalization is phonetically conditioned and thus triggered by consonants causing an increase in darkness degree and/or alveolar contact loss, one would expect it to operate before labials and velars as in scenario (2) rather than before dentals and alveolars as in scenario (4). A preference for /l/ vocalization before labials and velars has been reported to occur in other language families (Australian and New Zealand English; Horvath & Horvath 2002), and is consistent with articulatory data showing that apical closure for dark /l/ is frequently lacking before consonants not involving a front lingual closure or constriction and hence allowing contact loss to occur (see Hardcastle & Barry 1985, Wrench & Scobbie 2003 and Lin, Beddor & Coetzee 2011 for several English dialects, and Recasens 2009 for Majorcan Catalan). At the acoustic level, tongue predorsum lowering and tongue postdorsum backing and raising for velars, and lip closing and the absence of lingual activity for labials, cause F2 for dark /l/ to stay low at about 800–1000 Hz. Perception data using short /VICV/ stimuli extracted from natural speech sentences uttered by Majorcan Catalan speakers confirm that dark /l/ may be categorized as /w/ before labials and, to some extent, before velars as well as before the fricative /s/; moreover, the highest number of /w/ percepts was obtained for stimuli exhibiting both a low F2 and little or no alveolar contact, which suggests that both spectral and articulatory cues contribute to /l/ vocalization (Recasens & Espinosa 2010a).

In principle, /l/ vocalization before dentals and alveolars in scenarios (3) and (4) is hard to reconcile with the alveolar contact loss hypothesis since, as revealed by articulatory data, the fact that /l/ and /t, d/ share the same closure location prevents closure decay from taking place (Hardcastle & Barry 1985; Recasens 2009; Lin, Beddor & Coetzee 2011). A more plausible articulatory mechanism triggering /l/ vocalization before dentals and alveolars could be gestural merging between a reduced and shortened realization of /l/ and the following homorganic consonant by which the alveolar lateral may cease to be heard and the /w/-like transitions may become its only signalling cue. Merging is expected to occur most plausibly whenever lingual contact for /l/ is made at the sides of the palate in anticipation of /t/ or /d/, which would endanger the manner of articulation characteristics of the lateral by preventing airflow from exiting through one or both sides of the tongue. In principle, vocalization before dentals should not pose a serious problem for the spectral equivalence hypothesis since /l/ may stay dark in this context in line with dentals and presumably some alveolars being articulated with a relatively lowered predorsum position and some postdorsum retraction (Recasens 2009). Darkness

degree in /l/, however, should be less before dentals than before labials and velars, as confirmed by the fact that /l/ vocalization is less prone to take place before dentals and alveolars than before labials and velars according to descriptive accounts (Australian and New Zealand English; Horvath & Horvath 2002) and to speech perception studies (Recasens & Espinosa 2010b; Martín 2005)<sup>2</sup>. It may be then that in scenarios (1) and (3) above where /l/ vocalization has occurred not only before labials and/or velars but also dentals and alveolars, the change of /l/ into [w] has extended gradually through the lexicon by operating first before the former consonants, which clearly favor darkness in /l/, and then before the latter ones. (See Bybee and Harrington, this volume, for a similar view).

There is also a possible explanation for why /l/ vocalization may apply before dentals and alveolars but not before labials and velars in scenario (4), namely, that listeners factor out the dark quality from /l/ only when it is followed by a labial or velar consonant endowed with a dark, ‘grave’ quality as well (Recasens 1996b; Rohlfs 1966: 342). This dissimilatory account appears to be consistent with the presence, in dialectal domains falling under scenario (4), of phonetic outcomes before labials and velars which are typical of clear varieties of /l/, i.e., [l] in Rhaetoromance and [r], [j] or vowel epenthesis in Italian dialects (Abbruzzi dialect from Campobasso [‘maləva] MALVA ‘mallow’, Piedmontese [‘marva], Emilian [‘ajbre] ALBARU ‘poplar’; Rohlfs 1966: 341–346, 472).

### 2.1.3 *Effect of the preceding vowel*

Data for the Romance languages show that /l/ vocalization into [w] may operate mostly after back vowels in intervocalic word medial position (see Section 2.1.1) and after any vowel in word final position (Gascon [hiw] FILU ‘thread’, [saw] SALE, [pew] PILU ‘hair’, [mew] MEL ‘honey’, [dɔw] DOLU ‘mourning’, [kyw] CULU ‘bottom’; Bec 1968: 136). The reason why word final /l/ vocalization may operate after any vowel rather than just after back vowels may be sought in the dissociation between the tongue tip and the tongue dorsum activity whenever /l/ is strongly dark giving rise to a [w] percept (see Section 2.1.1).

As for preconsonantal position and in parallel to the intervocalic position just reviewed, the resulting glide shows up more frequently after back vowels than after front vowels in Romance (see also Ash 1982 and Hall-Lew & Fix 2010 for American English dialects). Moreover, among back vowels, the glide [w] is found more often after low /a/ than after back rounded /ɔ, o, u/, as in Gevaudanés Occitan, Old Portuguese, Old Spanish, Modern Catalan and Southern Italian dialects (e.g., Sicilian [‘awtru] ALTERU, [‘sawtu] SALTU ‘jump’, but [‘dutʃi] DULCE ‘sweet’,

2. In any case, dark /l/ appears to have undergone vocalization only before /t, d/ and after a low back vowel in Old Dutch ([ɔwt] *oud* for ‘old’, [xɔwt] *goud* for ‘gold’; van der Torre 2003: 173).

['putru] \*PULLITRU “colt”; Rohlf 1966: 343–344). Whenever /l/ is preceded by a front vowel and more specifically by /i/, the vocalization process appears to have taken place only when the alveolar lateral was strongly dark (Old Provençal *viutat* for *viltat* VILITATE “wickedness”; Old Northern French *fi(e)us* FILIOS “sons”; Appel 1918: 79; Pope 1934: 155), or else /l/ may have dropped instead of undergoing vocalization (Old French [fits], Modern French [fis] FILIOS; Pope 1934: 155).

Preference for /l/ vocalization after back vowels may be accounted for by the acoustic equivalence hypothesis rather than by the alveolar contact loss hypothesis. Darkness degree in /l/ should increase after /a, ɔ, o, u/ in line with the F2 frequency for these vowels being much lower (between 800 and 1200 Hz) than that for front /i, e, ε/ (between 1700 and 2000 Hz). Accordingly, F2 for moderately dark /l/ in Eastern Catalan occurs around 1000 Hz or less next to back vowels which are produced with a similar tongue body configuration to that for the consonant, and may rise to about 1300 Hz next to front vowels which cause some tongue body raising and fronting to occur during the consonant (Recasens 1986; Recasens & Farnetani 1994). Perceptual data also reveal that dark /l/ is more prone to be categorized as /w/ after /a/ than after front vowels (Martín 2005). Moreover, more prominent F2 vowel transitions for /a/ than for /ɔ, o, u/ could explain why, among back vowels, the glide is more prone to be perceived after low /a/ than after the back rounded /ɔ, o, u/. As for the articulatory-based hypothesis, apical contact loss could be favored by an increase in predorsum lowering and postdorsum retraction degree whenever /l/ is coarticulated with back vowels though there is no conclusive evidence in this respect. Thus, /l/ vocalization in English has been shown to occur not only following low vowels (Giles & Moll 1975) but also after both front and back vowels and even more frequently in the former vs latter context, e.g., more frequently in *milk* than in *bulk* (Hardcastle & Barry 1985)<sup>3</sup>.

A special case is the outcome [j] of dark /l/ between the back vowels /o, u/ and dental or alveolar consonants in dialects favoring /l/ vocalization into [w], as for Occitan *coisna* \*CULCINA “mattress”, *co(u)itre* CULTER “coulter”, *coitivar* derived from CULTIVU “to grow”, [kwi'dza] COLLOCARE “to place”, [fwi'dada] \*FALDATA “what fits in one’s lap” (Bouvier 1976: 241; Ronjat 1930–1941, 2: 208–209; Straka 1968: 298; Millardet 1923: 272–275). Later on, the outcome [jt] of this vocalization process underwent simplification into [t] in Portuguese ([i]fku'tar] AUSCULTARE “to listen to”, [ku'telu] CULTELLU “blade”; Williams

3. A reviewer points out that the high frequency of /l/ vocalization after /i/ in *milk* may be related to the high frequency of occurrence of this word, which undermines the effect of a preceding front vowel on the consonant vocalization process. A back vowel placed after the consonant following syllable final /l/ appears to contribute to the vocalization process as well (Martín, 2005, Roussel & Oxley, 2010).

1938: 90), and palatalization into [tʃ] in Spanish ([esku'tʃar] AUSCULTARE, ['mutʃo] MULTU “much”; Menéndez Pidal 1968: 140). The vocalization of dark /l/ into [j] has been attributed to tongue body raising and fronting during the production of /l/ before /t/, perhaps through the intermediate solution [ʌt] (Menéndez Pidal 1968: 140; Grammont 1971: 236). Considering that dark /l/ is not prone to undergo palatalization in this C2 context condition (see Section 2.1.2), another possibility is that the high front glide has originated through two separate changes, i.e., /l/ vocalization into [w] followed by a dissimilatory process affecting the offglide of the resulting diphthongs [ow] and [uw], i.e., /ol, ul/ > [ow, uw] > [oj, uj]. This evolution parallels the change /ow/ > [oj] in Portuguese, as in [dojʃ] (nowadays [doʃ]) derived from *dous* DUOS “two” and [ojru] (nowadays [oru]) derived from *ouro* AURU “gold” (Malmberg 1971: 361). Essentially the same outcome may result if /l/ vocalization is implemented not through direct replacement but through glide insertion, i.e., /ol, ul/ > [owl, uwl] > [ow, uw] > [oj, uj] (see Section 2.2).

## 2.2 Glide insertion

In contrast with the widespread belief that /l/ vocalization in Romance has taken place through the direct replacement of /l/ by [w] (as illustrated in (a)), several scholars have proposed that the change of interest was implemented through glide insertion<sup>4</sup> followed by /l/ loss (as illustrated in (b)) (see Fouché 1961, Operstein 2010: 165–167, Recasens 1996b and, more specifically, Tuttle 1991 and Merlo 1952: 1381 for Northern Italian dialects, Gartner 1910: 131–132 for Rhaetoromance, and Leite de Vasconcellos 1928: 206 for Portuguese):

- a. /Vl/ > [Vw]
- b. /Vl/ > [Vwl] > [Vw].

This hypothesis is based on the presence of the realization [Vwl] of /Vl/ in Romansh especially when the vowel preceding /l/ is /a, o/ (Surselvan from Disentis [fawltʃ] FALCE, [ˈvawltʃa] \*VOLVITA “vault”; Gartner 1910: 131; Lorient 1952: 120), and in the Minho dialect of Portuguese where the vowel in question is low and much less often front and /l/ may have been replaced by a rhotic (*auldeia* for *aldeia* “village”, *caurdo* CALDU, *siurba* SILVA “forest”, *reurba* for *relva* derived

4. One reviewer suggests that ‘vowel diphthongization’ may be a better term than ‘glide insertion’ to denote the presence of [w] at vowel offset. In my view the integration of the vowel transitions as an independent segment by the listener parallels cases where the term ‘insertion’ is widely used for referring to processes such as, for example, the generation of an excrescent short vocalic segment between two consonants of a cluster. In both cases listeners may assign phonemic status to a transitional event.

from RELEVARE “to relieve”; Leite de Vasconcellos 1928: 205–206). Vocalization through glide insertion is also consistent with the presence of the sequence *aul* in old written texts from Padanian dialects (Old Venetian *faulssamentre* “falsely”, *aultro* “another one”; Tuttle 1991: 580). The co-occurrence of forms with [wl] and [w] in Romansh localities, e.g., [awt] ALTU in Tavetsch, [awl] in Disentis and [awlt] and [awt] in Ems, suggests that the outcome [w] has been generated through two stages, i.e., [w] insertion (e.g., /al/ > [awl]) followed by /l/ elision (e.g., [awl] > [aw]) (Loriot 1952: 120; Luzi 1904: 813). [w] insertion followed by /l/ elision has also been reported to affect preconsonantal /al, ol/ in Old and Middle English ([fowk] *folk*, [wowk] nowadays [wɔ:k] *walk*; Knowles 1987: 82–83). Another argument in support of the glide insertion account is the perceptual categorization of the F2 vowel transitions in VC sequences with front vowels as other glides whose quality may be originally [e]-like after /i/ (Occitan [fiɔ̃/ɛ̃], fje/a/ɔw) FILU; Ronjat 1930–41, 1: 126, 2: 308–311), [ɛ]-like after /e/ (Provençal [ˈpjɛ/alo] PILA “mortar”; Bouvier 1976: 247) and [a]-like after /ɛ/ ([French [ɛw] > [ɛaw] > [aw] > [ɔw] > [ow] > [o], as in the case of the word *chapeau* CAPELLU “hat”; Lausberg 1970: 265).

There are several objections to the hypothesis that /l/ vocalization was implemented through [w] insertion in Romance. It is plausible that the written sequence *ul* for /l/ in old texts was not used in order to represent an independent glide but rather to indicate either the presence of a strongly dark realization of /l/ (Old South Eastern French *saule* SALA “hall”; Pope 1934: 154) or that syllable final [w] corresponded to original /l/ (Old French *paulme* “palm”, *aultre*; Nyrop 1967: 131, 351). Moreover, in light of the few dialectal domains where both [wl] and [w] are still present, it remains unclear whether the evolution /Vl/ > [Vwl] > [Vw] has operated in linguistic areas other than Romansh and dialectal Portuguese.

In our view, the issue as to whether [w] has been generated through direct replacement or through glide insertion is relevant for determining the phonetic cues and the perceptual mechanisms involved in /l/ vocalization. Perception data for synthesized /VICV/ stimuli show that both the steady-state frequency and the timing and the change in frequency of the vowel transitions may contribute to the categorization of dark /l/ as /w/. Indeed, the chances that /l/ is heard as /w/ have been found to increase with both the lowering of F2 from 1000 Hz down to 700 Hz and the anticipation of the /Vl/ transitions from 15 to 45 ms before the steady-state period of /l/ (Recasens & Espinosa 2010a). Even though the perception task consisted of identifying dark /l/ as either /l/ or /w/, instances of /wl/ could be heard in the case of stimuli exhibiting a very low F2 frequency and very early vowel transitions. Therefore, [w] insertion could very well take place whenever /l/ is strongly dark and the VC transitions take place especially early.

### 2.3 Summary

Historical and dialectal data as well as results from speech perception studies suggest that both evolutionary paths /Vl/ > [Vw] and /Vl/ > [Vwl] > [Vw] may have applied independently in the Romance domain (see Kolovrat 1923: 271 for a similar proposal). The two processes, direct vocalization and glide insertion, are most prone to occur with an increase in /l/ darkness in preconsonantal position and after a back vowel, mostly /a/ in line with the prominence of the vowel transitions. Vocalization before labials and velars is compatible with both an articulatory account (apical decay) and an acoustic account (spectral similarity). While acoustic similarity may also explain the change dark /l/ > [w] before dentals, /l/ vocalization before dentals and alveolars are naturally accounted for through gestural merging or, if not co-occurring before labials and velars, through perceptual dissimilation.

## 3. Vowel shift and /l/ elision processes

Other sound changes besides vocalization into [w] have affected dark /l/ in Romance, to wit, the shift of preceding /a/ to [ɔ], followed possibly by further closing to [o], and consonant effacement after the back vowel.

### 3.1 Shift from /a/ to [ɔ]/[o]

Two paths may account for the rounding and raising of /a/ to [ɔ]/[o], namely, a direct path /a/ > [ɔl]/[ol] and an indirect one with intermediate forms, /a/ > [aw] > [ɔw]/[ow].

#### 3.1.1 /a/ > [ɔ]/[ol]

Low /a/ may have turned into [ɔ]/[o] before syllable final /l/. The presence of [ɔl] or [ol] in the place of preconsonantal /a/ is attested in Padania (Lombard ['molta] MALTHA “malt”, [‘folda] FALDA “lap”, [ol'ta] ALTARE “altar”, Old Venetian *oltro* ALTERU, *folso* FALSU; Salvioni 1884: 43; Rohlfs 1966: 37), Sutselvan (Ems [ɔ:lt] ALTU, Domleschg [cɔlt] CALDU; Luzi 1904: 813; Gartner 1910: 131) and Surmeiran ([sɔlta] SALTAT “he/she jumps”; Lutta 1923: 54). This change takes place essentially before dentals and alveolars and thus in the same C2 context triggering /l/ vocalization in the dialectal domains just referred to, and occasionally before labials as well (Milanese [‘tɔpa] TALPA “mole”, [sko'pel] SCALPELLU “scalpel”; Salvioni 1884: 92). The outcome [ol] may give rise to [o] whenever a reduced realization of dark /l/ ceases to be perceived in line with the spectral similarity between

the preceding vowel and the consonant (Lombardy ['oter, 'olter] ALTERU; Ascoli 1873: 299).

Scholars disagree regarding the interpretation of the causes of the change /al/ > [ɔl]/[ol]. According to one hypothesis, the outcome [ɔl]/[ol] derives from [awl], i.e., /al/ > [awl] > [ɔl] > ([ol]) (Tuttle 1991; Merlo 1952: 1381; Fouché 1961: 854–860). This possibility is however hard to reconcile with the absence of lexical variants exhibiting the realization [awl] in those Padanian, Surmeiran and Sutselvan dialects where [ɔl] or [ol] is often found instead of /al/. A second hypothesis claims that the sound change /al/ > [ɔl]/[ol] has proceeded through three consecutive stages, i.e., /l/ vocalization followed by vowel raising (i.e., [aw] > [ɔw] > ([ow])) and the reintroduction of /l/ in the place of the glide as in cases where the same replacement has operated on original /w/ (Old Padanian *aldi* AUDIT “he/she listens to”; Videssot 2009: 312, 332). A third and perhaps more plausible explanation is that the outcome [ɔl]/[ol] was generated through regressive assimilation (see also Kolovrat 1923: 245; Meyer Lübke 1974: 232). This assimilatory change may be attributed to anticipatory C-to-V effects in F2 lowering and is attested in other languages (English [sɔ:lt] *salt*, [ɔ:l] *all*; Knowles 1987: 83) and dialectal domains (Catalan ['sego/ul] SECALE “rye”, [ol'zina] *alzina* ILICINA “holm oak”; Recasens 1996a: 127); it is also in line with perception data showing that schwa may be categorized as a back rounded vowel when followed by dark /l/ (Roussel & Oxley 2010). Moreover, the reason /al/ changed to [ɔl]/[ol] before dentals and alveolars rather than before labials or velars may be sought in the same dissimilatory mechanism causing /l/ vocalization to operate in the former consonant context vs the latter (see Section 2.1.2).

### 3.1.2 /al/ > [aw] > [ɔw]/[ow]

The replacement of /a/ by [ɔ]/[o] may also operate before [w] derived from /l/ through the evolutionary path /al/ > [aw] > [ɔw]/[ow] > [ɔ]/[o], whether systematically as in French ([o] *haut* ALTU, [ob] *aube* ALBA) or in a subset of words in Spanish ([ʔotro] ALTERU, [koθ] CALCE “kick”, but [ʔalto] ALTU, [ʔalβa] ALBA).

The intermediate stage [ow] is attested in Old Portuguese (*souto* SALTU, *outro* ALTERU, nowadays [ʔotu], [ʔotru]; Williams 1938: 89), though rarely in Old French (Pope 1934: 155, 199–200; Posner 1997: 283–286) and Old Spanish (*auta*, *ota* ALTA, *sauto*, *salto*, *soto* SALTU; Menéndez Pidal 1986: 100–102). Moreover, the mid back vowel [ɔ]/[o] has also been reported to co-occur with [aw] and/or the intermediate realizations [ɔw] and [ow] in modern Romance dialects both word finally and preconsonantly (Provençal from the Drôme [maw], [mo] MALE “harm, bad”, Franc-comtois Francoprovençal [saw], [sɔ] SALE, Southern Italian [ʔawtu, ʔowtu], Sutselvan [awlt, ɔ:lt], Low Engadinian [awt, ɔt] ALTU, Auvergnat Occitan [kow'fa, tso'fa] CALEFACERE “to warm”, dialectal Catalan [ʔɔwβit, ʔβit]

ALVEU “trough”; Bouvier 1976: 225; Dondaine 1972: 232–233; Rohlfs 1966: 67; Luzi 1904: 813; Pult 1897: 60; Kolovrat 1923: 179; Recasens 1996a: 303). In other dialectal domains, the back rounded vowel appears to be the only possible option (Surmeiran [o:t] ALTU, [co:t] CALDU, Surselvan from Tavetsch [utá] ALTIARE, [sutá] SALTARE, Fassan Ladin [fu'tʃer] FALCARE “to scythe”; Lutta 1923: 54; Lorient 1952: 121; Elwert 1943: 82).

### 3.2 Absence of /l/

The alveolar lateral /l/ may drop when preceded by /a/ or by /ɔ, o, u/, the issue being whether this change has occurred through direct elision or through [w] elision after /l/ vocalization.

#### 3.2.1 Outcome [a]

The sequence /al/ may have yielded [a] before dentals and alveolars in several Italian and Rhaetoromance dialectal areas, e.g., Ligurian and Emilian ([<sup>l</sup>atu], [at] ALTU; Rohlfs 1966: 342; Gorra 1890: 148), Lazio ([<sup>l</sup>katʃe] CALCE, [a'tsa] ALTIARE; Merlo 1922: 78), Abruzzi ([<sup>l</sup>fatsə] FALCE; Maiden & Perry 1997: 324), Calabrese ([<sup>l</sup>katʃi] CALCE; Rohlfs 1966: 344), Sicilian (Corleone [<sup>l</sup>fatʃi] FALCE, [sa'tari] SALTARE; Dulcibella 1934: 446) and Lower Engadinian (Müstair [a:t] ALTU, [ca:t] CALDU; Schorta 1938: 26). The outcome [a] from /al/ has been accounted for through the elision of [w] after /l/ vocalization, i.e., /alC/ > [awC] > [aC] (Meyer Lübke 1974: 232; Videssot 2009: 332; Rohlfs 1966: 342), as suggested by the presence of lexical forms with [aw] in many of the same dialectal areas referred to above (Ligurian [<sup>l</sup>awtu] ALTU, Lazio [<sup>l</sup>fawtʃə], Abruzzi [<sup>l</sup>fawtsə], Sicilian [<sup>l</sup>fawtʃi] FALCE, Calabrese [<sup>l</sup>kawtʃe] CALCE, Lower Engadinian [awt]; Kolovrat 1923: 240; Rohlfs 1966: 67, 343–344; Ascoli 1873: 228), the co-occurrence of graphic symbols such as *ao* and *a* in the place of /al/ in Old Genoese texts, and the simplification of original /aw/ into [a] in Lower Engadinian ([a:r] AURU, [ta:r] TAURU “bull”; Schorta 1938: 25).

An alternative explanation is that /al/ has yielded [a] through merging of the front lingual gestures of /l/ and the following dental or alveolar consonant into a single homorganic consonant realization. This interpretation is consistent with dark /l/ failing to undergo alveolar contact loss in this C2 condition, and with the co-occurrence of the grapheme *a* for original /al/ not only with *ao* and *au* but also with *al* in Old Genoese texts (Kolovrat 1923: 242). It may account for the lack of the alveolar lateral in phonetic variants of the frequently used lexical form ALTERU in dialects where /l/ does not vocalize before dentals (Catalan [<sup>l</sup>atrə]) or /al/ does not reduce to [a] (Old Provençal *atresi*, *autressi* ALTERU + SI “likewise”; Appel 1918: 79).

The change /al/ > [a] may also occur before labials presumably through gestural hiding of the apical gesture by the labial gesture, as suggested by the absence of lexical forms with [aw] in this C2 context as a general rule (e.g., Emilian from Piacenza [ˈsavja] SALVIA “sage”, Catalan [sam] PSALMU “psalm”, [pam] PALMU “handspan” though also [pawm] in Majorcan Catalan; Gorra 1890: 148; Gulsoy 1993: 203). Similar examples occur in other language families, as in English, where the change has occurred not only before labials ([ka:m] *calm*, [ˈsa:mən] *salmon*) but also before velars (e.g., [wɔ:k] *walk*, where /l/ loss took place in Middle English at the time when the alveolar lateral was preceded by [ɔ:]; Lass 1999: 94–95).

### 3.2.2 Outcomes [ɔ]/[o], [u]

The outcomes [ɔ]/[o] and [u] may result not only from /al/ (see Section 3.1) but also from the original sequences /ɔl/-/ol/ and /ul/, the main issue being whether the change /ɔl/-/ol/, /ul/ > o, [u] has taken place through direct /l/ elision (as in (a)), or through [w] elision after /l/ vocalization (as in (b)):

- a. /ɔl/-/ol/, /ul/ > [ɔ]/[o], [u]
- b. /ɔl/-/ol/, /ul/ > [w]/[ow], [uw] > [ɔ]/[o], [u]

Several sources of evidence may be adduced in support of the latter possibility. In the first place, doublets with and without a diphthong may be found in the same language/dialect, e.g., Old Provençal *dous* and *dos* in addition to *dols* DULCE, *mout*, *mot*, *molt* MULTU, *coutel*, *cotel*, *coltel* CULTELLU, Ladin from Nonsberg [dɔwtʃ, dotʃ] DULCE, Occitan from Haute Loire [ˈmowze, ˈmuze] MULGERE “to summon”, [mowˈtu, muˈtu] MULTONE “ram, mutton”, Neapolitan [ˈvowtse, ˈvotse] *volsi* for ‘vulli’ VOLUI “I wanted”, Gascon [dɔ, dɔw] DOLU, [ky, kyw] CULU (Appel 1918: 79; Battisti 1908: 91; Nauton 1974: 111; Ledgeway 2009: 106; Bec 1968: 136–138). In the second place, a dissimilatory process may have caused a diphthong with [w] derived from /l/ to turn into another vocalic sequence, e.g., in the case of lexical variants such as Occitan [piwts, ˈpiwze] PULICE “flea” and Eastern Catalan [pɹuəˈɣo] \*PULICONE “plant louse”, where both [iw] and [uə] might have issued from [uw] (Ronjat 1930–41, 2: 205; Gulsoy 1993: 202). Finally, the raising of /ɔ/ derived from Latin Ū was presumably induced by following [w] through the stages /ul/ > [ɔw] > [u] in Spanish lexical forms such as [duθ] DULCE, [aˈθufre] SULPHURE “sulphur”, [emˈpuxa] IMPULSAT “he/she pushes” and [ˈkumbre] CULMINE “summit” next to other words such as [ˈoβa] ULVA “rush, reed”, [ˈpotro] \*PULLITRU and [ˈposo] PULSU where the Latin vowel has undergone its regular evolution into [o] and therefore vowel raising has not occurred (Menéndez Pidal 1968: 140).

Scholars disagree, however, about whether the change of /ɔl/-/ol/ and /ul/ into [ɔ]/[o], [u] has taken place through [w] elision after /l/ vocalization (/ɔl/-/ol/, /ul/ > [ɔw]/[ow], [uw] > [ɔ]/[o], [u]) or through direct /l/ elision (/ɔl/-/ol/, /ul/ > [ɔ]/[o],

[u]) in dialectal zones lacking doublets such as [ow]/[o]. The former option has been reported to operate in Italian dialects, and has been argued to account for the closing of original *o* except for in Southern dialects where stressed /o/ raised to [u] across the board (Lazio [ˈpotʃe] PULICE, [ˈmutu] MULTU, [skoˈta] AUSCULTARE, Sicilian [ˈpusu] PULSU, [ˈdutʃi] DULCE; Merlo 1922: 77–78; Rohlf 1966: 96–97, 343). The latter hypothesis has been advocated for Gevaudanés Occitan ([bɔs] VOLES “you want”, [ˈume] ULMU “elm”, [dus] DULCE, [ˈmuze] MULGERE, [kuˈtel] CULTELLU; Camproux 1962: 314–321), Catalan ([kɔp] COLAPHU, [pop] POLYPU “octopus”, [ˈsofrə] SULPHURE; Meyer Lübke 1974: 435), Neapolitan ([ˈvota] \*VOLVITA, [ˈpuzo] PULSU, [ˈdotʃe] DULCE; Ledgeway 2009: 107), and Comelican Ladin ([ˈkotro] CULTER, [desˈkoθo] \*DISCULCEU “barefoot”; Tagliavini 1926: 39, 53).

In our opinion, (most of) these lexical variants may have arisen through a perceptually driven process by which listeners fail to identify dark /l/ after a back rounded vowel in light of the spectral affinity between the two sounds and the limited salience of the vowel transitions. Similar instances of dark /l/ elision may occur word finally (Auvergnat Occitan [ˈpibu] POPULU “black poplar”, [ˈgrifu] \*ACRIFOLU “holly tree”, [ˈkosu] CONSUL “consul”, dialectal Catalan [ˈkɔðu] COTULU “pebble”, [ˈseyu] SECALE; Dauzat 1938: 37–38; Recasens 1996a: 316), as well as syllable initially after a labial consonant and before a back rounded vowel (Occitan and dialectal Catalan *pus* PLUS “more”; Coromines 1980–91, 6: 625). In addition, the direct elision of the alveolar lateral may have been assisted by gestural hiding before a labial and by gestural merging before a dental or an alveolar. Furthermore, segmental shortening and articulatory reduction in pretonic position may have played a role, as shown by the following examples: Lazio [skoˈta] AUSCULTARE, [mpoˈza] IMPULSARE (Merlo 1922: 77–78), Catalan [kuˈɣa] COLLOCARE, [puˈɣo] PULICONE (Recasens 1996a: 316), Gévaudan [kuˈtel] CULTELLU, [suˈda] SOL(I)DARE, [puˈmu] PULMONE (Camproux 1962: 318, 321). Finally, the argument that /l/ vocalization must have been at work in order to account for the final outcome [u] of original *o* may be dispensed with if we assume that *o* raising may be triggered by the closing action of a preceding labial or velar consonant, as suggested by the large number of words referred to in this section where these contextual conditions are met. In this case, mid back vowel closing may be triggered by spectral changes, i.e., F1 and F2 lowering, induced by lip closing (next to a labial consonant) and tongue dorsum raising towards the velar zone (next to a velar consonant).

### 3.3 Summary

Preconsonantal dark /l/ may induce assimilatory /a/ raising into [ɔl]/[ol] mostly before dentals and alveolars, or else /al/ may yield [ɔ]/[o] through /l/ vocalization

followed by [w] elision. The direct elision of /l/ after /a, ɔ, o, u/ may be attributed to articulatory factors (gestural merging before dentals and alveolars, gestural hiding before labials) as well as to acoustic factors (spectral affinity between the vowel and /l/ and the limited salience of the vowel transitions in the case of the sequences /ɔl, ol, ul/).

#### 4. General interpretation

Several sound changes affecting dark /l/ in preconsonantal position in Romance appear to have been implemented through more than one evolutionary path. In particular, the following evolutionary stages (where the sequences appearing with-in parentheses apply optionally) have been proposed in order to account for /l/ vocalization and elision depending on the dialect taken into consideration:

/al/ > ([awl]) > [aw] > [a]  
 /al/ > [aw] > [ɔw]/[ow] > [ɔ]/[o]  
 /al/ > [a]  
 /al/ > [ɔl]/[ol] > [ɔ]/[o]  
 /ɔl/-/ol/, /ul/ > ([ɔwl]/[owl], [uwl]) > [ɔw]/[ow], [uw] > [ɔ]/[o], [u]  
 /ɔl/-/ol/, /ul/ > [ɔ]/[o], [u].

It has been suggested that /l/ vocalization may be achieved through glide insertion or direct replacement depending on the degree of anticipation of the tongue dorsum lowering and backing motion with respect to the tongue tip gesture and therefore the degree of prominence of the vowel transitions. In principle, both processes should be most prone to apply before consonants exhibiting a low F2 frequency such as labials and velars, and are favored by preceding /a/ vs back rounded vowels in line with differences in the prominence of the VC transitions. While /l/ vocalization before dentals may operate through the two processes just mentioned, the change of dark /l/ into [w] before dentals and alveolars may also be attributed to gestural merging between the primary gesture for /l/ and the following consonant, or to a perceptual dissimilation in dialectal scenarios where the process does not operate before labials and velars. The change /a/ > [ɔ]/[o] may be triggered by articulatory anticipation of either dark /l/ or of its vocalized counterpart [w]. On the other hand, the absence of /l/ in the final outcomes [a], [ɔ]/[o] and [u] may be generated either through [w] elision, or else through /l/ elision triggered by spectral affinity with the preceding vowel and/or by gestural hiding (preceding a labial consonant) or merging (preceding a dental or alveolar consonant).

The findings reported in this paper are relevant for theories of sound change. While prevailing theories tend to attribute a single articulatory or acoustic cue to

a given change, we propose instead an explanatory account based on an evaluation of the relative prominence of cues in different contextual conditions on the part of the listener. According to this proposal, several prominent articulatory and/or acoustic characteristics may be responsible for segmental insertions and sound shifts. Thus, dark /l/ vocalization and preceding vowel change may proceed either through processes affecting (i) the consonant itself, i.e., through replacement of a strongly dark realization of /l/ by [w] or through gestural merging, or (ii) the offset of the preceding vowel, i.e., through glide insertion whenever listeners pay attention to the vowel transitions. Articulatory reduction and/or acoustic similarity may be at the origin of more than one path towards segmental elision, i.e., the effacement of dark /l/ may occur through contextually-determined /l/ elision or through elision of the previously generated glide [w].

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