CHAPTER ###
CARRARINO SYLLABIC STRUCTURE
EDOARDO CAVIRANI

1. Introduction

Given the diachronic and synchronic processes of unstressed vowel reduction and deletion, the syllable structure of Carrarino shows a pretty high level of complexity. This complexity is mitigated by the vowel epenthesis repair strategy only in certain contexts, i.e. when the consonant cluster resulting from unstressed vowel deletion doesn’t meet the language-specific requirements on sonority contour. Synchronically, the syllabic structure is argued to be accounted for by a phonological grammar that, within an Optimality Theoretic (henceforth OT; Prince & Smolensky 1993[2004]) perspective, corresponds to a set of hierarchically ranked universal constraints. Along the diachronic development that changed the Latin grammar into the Carrarino one, some of these constraints have been demoted or promoted, landing in different levels of the constraint hierarchy that makes up the dialect’s grammar.

In what follows, after a discussion of some crucial theoretical concepts related to the syllable structure in section 2, the Carrarino data are presented in section 3 together with an OT analysis of the right word periphery and of deletion/reduction/epenthesis alternations characterizing this phonological domain (section 3.2).

2. Syllable structure

2.1. Sonority

From the typological survey of 104 languages, Greenberg (1978) derives a set of implicational universals concerning the syllable structure. These universals can be understood as the formalization of the preference for unmarked over marked structure, and of the implicational relationship between them: the presence in a given language of a marked structure implies the presence of the unmarked one.

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1 Notice that, thanks to the OT formalism, a novel approach to dialectometry (Wieling & Narbonne 2015) can be proposed in which the distance between languages is computed taking into account the Competence of the speakers, i.e. on their (internalized) grammar, rather than their Performance, i.e. the structures that are the products of these grammars. This approach is currently being developed by the Maps & Grammar project (2013-2018; NWO-Vrije competitie) at the Meertens Instituut (Amsterdam), which is founding the author’s research on the morphosyntactic and phonological variation in Dutch, Lunigiana and Basque dialects.

2 For a detailed analysis of these processes see Cavirani (2015), where an account is proposed of the diachrony and the phonologization of these processes in Lunigiana dialects.
For instance, CV is argued to represent the less marked syllable structure (Jakobson 1941; Greenberg 1978; Vennemann 1988; Blevins 1995): every language displays CV syllables3; during the babbling stage, the children produce syllables consisting of just one consonant, i.e. a simple Onset (hereafter O), and a vowel (and, crucially, no Coda (Cd)): furthermore, a lot of phonological processes, such as vowel epenthesis and consonant deletion, turn marked syllabic structures into unmarked structures, while no process can be found neither in the diachronic nor in the synchronic dimension that explicitly aims at adding Cd’s or increasing the complexity of O’s4. In other words, “a syllable head [i.e. an O] is the more preferred: (a) the closer the number of speech sounds is to one”, while “a syllable coda is the more preferred: (a) the smaller the number of speech sounds in coda” (Vennemann 1988: 13-21).

By adding consonantal segments to one of the edges of CV, slightly more marked structures are obtained: closed syllable (CVC) and open syllables with a binary O (CCV)5.

Languages can also be found that (apparently6) display O’s with more than two consonants and/or Cd’s with more than one segment. A well-known example is English, where complex syllable structures are tolerated. This is shown, for instance, by the form ‘strengths’ (ˈstɛŋkθəz), which represents a CCCVCCCC monosyllable. As hinted at above, the presence in a given language of these marked syllable structures implies the presence of the less marked ones’:

1) Syllable structure markedness implicational hierarchy

\[ CV \subset CVC/CCV \subset (C)CCVC(C) \]

Implicational universals have thus been established on the distribution and the number of consonants and vowels within the syllabic domain. However, these universals alone are not enough for a satisfactory description of the observed sound patterns. In fact, the

3 Within a sample of 486 languages, 61 show a ‘simple’ syllabic structure, i.e. the only possible syllable type is (C)V (Maddison 2011).
4 As shown below, though, processes resulting in vowels deletion (apocope, syncope and apheresis) may increase (as a side effect) the complexity of syllabic edges.
5 Within a sample of 486 languages, 274 show a ‘moderately complex’ syllabic structure, i.e. (C)CVC(C) (Maddison 2011).
6 In various phonological theories, consonantal segments that surface in phonetic representations violating the binary constraint for O and Rhyme (henceforth R) are accounted for by means of theoretical devices that assign them a special (hetero- or extra-syllabic) status. For a detailed discussion of these perspectives see Vaux & Wolfe (2009) and Cavirani (2014).
7 Within a sample of 486 languages, 151 show a ‘complex’ syllabic structure (Maddison 2011). It is worthwhile to point out, however, that these complex structures are usually found at word-edges. Furthermore, notice that the numbers referring to the languages displaying the relevant syllable structures have been set up considering only the ‘core’ lexicon, thus letting aside of borrowings, which may violate the phonotactics of the borrowing languages.
8 Interestingly, Kaye & Lowenstamm (1981) noticed an implicational relationship between these two syllable structures: if a language has CCV, then it has CVC as well. Hence, the implicational hierarchy would be: \( CV \subset CVC \subset CCV \subset (C)CCVC(C) \). Within their approach (see also Cyran 2003) this is accounted for by the licensing strength of the vowel, namely by a typologically variable parameter determining whether the O can govern only leftward (resulting in a Cd-O sequence, as in It. *conto, ‘account’, where /t/ governs /n/) or rightward as well (resulting in a C-d complex O sequence, as in It. *contro, ‘against’, where /t/ ‘governs’ /n/ as well as /r/). Hence, within this theoretical approach, the rightward O government implies the leftward O government.
distribution of consonants around the vowel is not completely free: letting aside language-specific constraints imposing limitations on the distribution of specific segment classes, it is commonly assumed that the more sonorous a consonant, the closer it is to the nucleus (henceforth N) of the syllable. This generalization has been already proposed by Sievers (1881) and Jespersen (1904), and has been formalized by Greenberg (1978: 270), according to whom “[n] relation to the peak of the syllable, combinations are favored in which sonants are closer to the peak than obstruents and in which voiced consonants are closer to the peak than unvoiced”. Sonority, thus, turns out to be a crucial concept for an accurate description of the internal structure of the syllable. This concept has therefore been used to shape a well-known theoretical device: the Sonority Sequencing Principle/Generalization (henceforth SSG; Hooper 1976; Selkirk 1984; Blevins 1995; Cho & King 2003; Zec 2007; Parker 2011):

2) Sonority Sequencing Generalization (SSG; Blevins 1995: 210)

Between any member of a syllable and the syllable peak, a sonority rise or plateau must occur.

SSG is thus a strong universal tendency used to account for the melodic content of the segments that make up a syllable and its margins. In particular, SSG expresses a preference for O and R clusters with increasing and decreasing sonority contours respectively, namely for the less marked structures. In order to quantify the degree of sonority of a segment, where sonority is defined as “an abstract phonological property that correlates with intensity” (Berent, Lennertz & Smolensky 2011: 470), Parker (2011: 1177) proposes the universal hierarchy presented in 3):

3) Universal hierarchy of relative sonority

<table>
<thead>
<tr>
<th>Natural class</th>
<th>Sonority Index (SI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>low vowels</td>
<td>17</td>
</tr>
<tr>
<td>mid peripheral vowels (not [ə])</td>
<td>16</td>
</tr>
<tr>
<td>high peripheral vowels (not [ɨ])</td>
<td>15</td>
</tr>
<tr>
<td>mid interior vowels ([ə])</td>
<td>14</td>
</tr>
<tr>
<td>high interior vowels ([ɨ])</td>
<td>13</td>
</tr>
<tr>
<td>glides</td>
<td>12</td>
</tr>
<tr>
<td>rhotic approximants ([ɹ])</td>
<td>11</td>
</tr>
<tr>
<td>flaps</td>
<td>10</td>
</tr>
<tr>
<td>laterals</td>
<td>9</td>
</tr>
<tr>
<td>trills</td>
<td>8</td>
</tr>
<tr>
<td>nasals</td>
<td>7</td>
</tr>
<tr>
<td>voiced fricatives</td>
<td>6</td>
</tr>
<tr>
<td>voiced affricates</td>
<td>5</td>
</tr>
<tr>
<td>voiced stops</td>
<td>4</td>
</tr>
<tr>
<td>voiceless fricatives (including [h])</td>
<td>3</td>
</tr>
<tr>
<td>voiceless affricates</td>
<td>2</td>
</tr>
<tr>
<td>voiceless stops (including [ʔ])</td>
<td>1</td>
</tr>
</tbody>
</table>

For instance, /r l N S/ (where the capital letters indicate the lack of [place] and [voice] specification) and the first segment of a geminate are the only possible Cd’s of Standard Italian (Loporcaro & Bertinetto 2005).
In addition to SSG, another theoretical device has been proposed (Steriade 1982; Selkirk 1984) to account for the structure of the well-formed syllables: the Minimal Sonority Distance (henceforth MSD) presented in 4).

4) Minimal Sonority Distance (adapted from Parker 2011)

Given an onset composed of two segments, \( C_1 \) and \( C_2 \), if \( a = \text{Sonority Index of } C_1 \) and \( b = \text{SI}(C_2) \), then \( b - a \geq x \), where \( x \in \{0, 1, 2, 3 \ldots 11\} \).

MSD can be referred to for the formalization of the inter-linguistic differences observed in the slope of the consonant cluster sonority contours, as well as for the formalization of the implicational hierarchy of the contours. For instance, while English tolerates the O cluster of blik but not the one of bnik, Hebrew tolerates both ("22 [bnei] 'sons'"). For Russian speakers, instead, even a decreasing sonority contour as the one in әба [iba] ‘of forehead’ is well-formed. In other words, different languages set a specific MSD value representing the threshold under which a cluster is ill-formed and therefore needs a repair. For instance, English sets this value to 5, i.e. 9 (lateral’s SI) – 4 (voiced stop’s SI), while Hebrew and Russian tolerate a lower value. Furthermore, as indicated by the symbol \( \geq \) in 4, the well-formedness of a cluster with a MSD of \( x \) implies the well-formedness of a cluster with a SD of \( x+1 \). This means that the presence in a language of a marked cluster implies the presence of an unmarked one, i.e. of a cluster with a higher SD value: Russian, for example, admits negative (пра [rta] ‘of mouth’) as well as plateau (птица ['ptj:tza] ‘bird’) and positive contours (бр [brat] ‘brother’).

2.2. SSG: Strong typological tendency, Hard Phonological Universal or Violable Markedness Constraint?

In the previous section I hinted at Russian, whose forms are apparently allowed to violate SSG. Indeed, the sonority contour of Russian consonantal clusters can be rising, even or decreasing both to the left and the right side of syllabic peak, as shown in 5):

5) Russian consonant clusters

<table>
<thead>
<tr>
<th></th>
<th>Word-initial Onset</th>
<th>Word-final Coda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising</td>
<td>два [dva] ‘two’</td>
<td>присмотр [pris'motr] ‘watch’</td>
</tr>
<tr>
<td>Plateau</td>
<td>ткач [tkaf] ‘weaver’</td>
<td>аспект [as p'ekt] ‘aspect’</td>
</tr>
<tr>
<td>Decreasing</td>
<td>вторник [vtornik] ‘Tuesday’</td>
<td>звёзд [zvjost] ‘of stars’</td>
</tr>
</tbody>
</table>

Violations of SSG can actually be found in many languages\(^{10}\). In Italian, for example, SSG is violated by the initial /S+/C clusters (Vennemann 1988; Kaye et al. 1990; Kaye 1992; Marotta 1995; Loporcaro & Bertinetto 2005; Goad 2011). Indeed, as shown in 6),

\(^{10}\) Blevins (1995: 219) describes Totonac, English, Nisqually, Gilyak, Tamazight Berber, Cairene Arabic, Spanish, Dakota, Italian and Mokilese as SSG violating languages. Other languages that posit no constraints on consonant cluster sonority contours are Georgian (Vogt 1971; Deprez 1988; Chitoran 1994), Polish (Cyran 2008), Seri (Marlett 1988), Serbo-Croatian (Hodge 1946), Tsou (Wright 1996) and Yateé Zapotec (Jaeger & Van Valin 1982).
forms can be found where a sibilant, namely [s] (SI=3) or [z] (SI=6), precedes a more sonorous segment as well as a segment displaying the same or even a lower sonority degree:

6) Italian /S/+C clusters sonority contours

<table>
<thead>
<tr>
<th>Δ = C₂-C₁</th>
<th>9</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-2</th>
<th>-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>sonority contour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI value</td>
<td>3-12</td>
<td>6-9</td>
<td>6-8</td>
<td>6-7</td>
<td>3-3</td>
<td>3-1</td>
<td>6-4</td>
</tr>
</tbody>
</table>

Furthermore, as shown by forms such as It. [ˈstra.no] ‘strange’ and [ˈzbrondza] ‘bender’, /S/ can precede binary O’s, which entails a violation of the binarity constraints observed for all the other Standard Italian O clusters.

However, it has to be noticed that, in Italian as well as in other languages, the violations of SSG occur mainly at word edges (Vaux & Wolfe 2009; Côté 2011; Topinzi 2011). Indeed, when occurring word-medially, this violation is repaired by the split of the ill-formed sequence in two different syllables (Seo 2011), as shown by It. [ˈstra.nɔ] ‘strange’ vs. It. [ma.ˈɛs.tra] ‘mistress’.

The fact that word edges are allowed to violate SSG has been accounted for by the resort to a wide set of theoretical devices assigning “disturbing” consonants a special syllabic status (Vaux & Wolfe 2009). For instance, the word-initial preconsonantal /S/ has been considered an extra-prosodic segment (Steriade 1982) linked to one of the prosodic nodes dominating the syllable (Goldsmith 1990; Goad & White 2006) or directly to the syllable (Hulst 1984). Alternatively, it has been described as a Cd of a degenerate, i.e. vowel-less, syllable (Vennemann 1988; Kaye 1992; Shaw 1993). Something similar is maintained by Government Phonology (henceforth GP; Kaye et al. 1990; Kaye 1992; Charette 1990; Harris 1994, 1997; Cyran 2008), in which the word-initial /S/, if not followed by a higher sonority segment, is syllabified as the Cd of a preceding vowel-less syllable.

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11 The binarity constraint is assumed to hold for every sub-syllabic constituent of all languages. Indeed, within the Government Phonology literature (Kaye et al. 1990; Charette 1990; Harris 1994, 1997; Cyran 2008), as well as within other approaches (Blevins 1995; Morelli 1999; Baertsch 2002; Topinzi 2011), it is considered a universal structural principle.

12 An argument for the Cd status of the sibilant is represented by the shortness of the stressed vowel. Indeed, it is generally assumed (Marotta 1985; Kaye 1992; Loporcaro & Bertinetto 2005; Canals & Garrapa in press) that vowels lengthen when stressed except in word-final position or in closed syllables, as in the form just presented. Other evidence for the heterosyllabicity of the sibilant in /S/+C clusters is represented by the allomorphy of definite articles (Davis 1990; Marotta 1991) the raddoppiamento fonosintattico (Kaye 1992). See Bertinetto (1999, 2004) for a different interpretation of /sC/ clusters.
7) /S/+C cluster in GP: It. [s.'traː:no] 'strange'

As can be noticed, notwithstanding the phonetic realization of forms such as the one in 7) seems to violate SSG and MSD, within a GP-like approach the SSG and MSD can be considered exception-less phonological universals. Indeed, the (highly conditioned) resort to empty nuclei allows the linguist/speaker to split up the segment sequences in well-formed, i.e. SSG- and MSD-respecting, syllables.

However, it is well known that the phonological theory has become more ‘tolerant’ with respect to the violations. For instance, in an OT approach, the phonological component maps the underlying forms to phonetic forms that are no longer considered the well-formed, perfect ones, but rather the best-formed ones, namely the ones that, among a list of possible forms, satisfy the most important constraints. In this framework, the ‘traditional’ typological generalizations have been translated into formal theoretical devices (viz. constraints) that, for instance, state a preference for a syllable with a simple O and no Cd (ONSET and *CODA, respectively). Beside the set of constraints that, as the ones just mentioned, evaluate the markedness of an output structure, a set of faithfulness constraints is assumed that evaluates the identity of input-output pairs, stating a preference for an input-output mapping in which the output form is the more similar as possible to the corresponding input form. Given that within this approach a grammar consists of a language-specific ranking of these two families of constraints, and that the constraints are assumed to be universal, the change a speaker is allowed to perform on an input form (violating some faithfulness constraint) to produce a ‘better’ output form (thus satisfying some markedness constraint) depends on the relative ranking of the relevant constraints. Within such an approach, SSG and MSD can be formalized as (a set of) markedness constraints and thus included in the constraint hierarchy defining the grammar of a given language. As a consequence, in order to satisfy a higher ranked faithfulness constraint, the constraints formalizing SSG and MSD can be violated (section 3.2).

The next section is devoted to a brief introduction of Carrarino. This is the result of a survey of phonetic reports (Bottiglioni 1911, 1955; Maffei Bellucci 1977), a summary dialect description (Luciani 1999) and a two-volumes dictionary (Luciani 2002).\(^{13}\)

\(^{13}\) In Cavirani (2015), the data presented in the relevant literature have been checked against first-hand data and analyzed both phonologically and acoustically. Notice that the picture that emerges by this fieldwork-grounded study is slightly different with respect to the one presented here.
3. Carrarino

Carrarino is a dialect spoken in the town center of Carrara\textsuperscript{14}, a pretty small district (65,441 inhabitants) in the southeastern periphery of Lunigiana.

8) Lunigiana

As can be noticed, this region is closed on the western, northwestern and eastern sides by a crown of mountains (the Apuan Alps) and on the southern side by the Tyrrenhian Sea. This notwithstanding, within this half-moon, different populations met and clashed, the \textit{limes} periodically moving and separating Ligurians from Etrurians and Romans, Byzantines from Langobards, Maritime Republics of Genoa from the one of Pisa, Florence from Modena and Parma and, nowadays, Tuscany from Liguria and Emilia. Interestingly, this area was cut through by important commercial and pilgrim routes such as the pre-Roman path from the modern Lucca to Piacenza, the Via Aurelia (Rome - Arles), the Via Francigena (Rome - Canterbury) and a pair of routes from Luni (Ortonovo), i.e. one of the most important Roman harbor, to the richer centers of Emilia. Along these routes, together with salt, flour, marble and swords, different languages crossed for many centuries. As a consequence, Lunigiana represents a transition area between the Northern-Italian varieties of Ligurian, Emilian and central varieties such as Tuscan. This area is thus characterized by a rich variation, the influence of the surrounding varieties increasing as much as we get closer to the boundaries of this geolinguistic domain. To get an idea of this rich variation, it suffices to have a look to sub-varieties spoken in Carrara district. Indeed, within this pretty small area, the percentages of etymologically and phonetically Ligurian, Emilian and Tuscan forms vary across the vocabularies of the different sub-varieties: while the syncopated (Emilian-like)

\textsuperscript{14} The term \textit{carrarino} contrasts with \textit{carrarese} in Luciani (1999), the latter referring to the set of (slightly different sub-)varieties spoken in Carrara district. In the present work, I kept the terminology of Luciani (1999).
forms characterize Carrarino vocabulary, as soon as we get closer to the seaside (Avenza), the percentage of Ligurian-like words (displaying a lesser degree of vowel reduction and other Ligurian features) increases. Similarly the percentage of Tuscan-like forms increases in the southeastern villages of Colonnata, Bedizzano and Bergiola Foscarina (notice that in these varieties long consonants resisted the degemination). The form used for ‘to lean’, for instance, is [aram’bara] (see Genov. arembare) in Avenza and [apon’tar] in Carrara. Similarly, the form for ‘anesthesia’ is [a’l’əpjə] in Colonnata, Bedizzano and Bergiola Foscarina, and [ˈdɔrma] in Carrara. The same variation can be found in the whole Lunigiana. Indeed, as shown in the right side of the map in 8), in this area the La Spezia-Rimini/Carrara-Fano bundle of isoglosses splits up in a fan-like shape (Pellegrini 1977).

It has to be pointed out that, as in other Italian areas, the active competence of the dialect is gradually getting lost: even if it is still widely understood by everyone, Carrarino can nowadays be considered the mother tongue of just the generations born before the sixties (Luciani 1999). The younger generations, instead, show most of the time just a passive competence. However, the main features of the vocalic and consonantal systems still color the Italian as spoken also by the younger generations. It is the case, for instance, of the absence of geminates, the persistence of intervocalic /s/ voicing and the reduction of unstressed vowels. Some other feature characterizing the varieties of this area, instead, are getting lost. The retroflex /ɖ/ (< Lat. /LL/), for example, is currently pronounced as an alveolar [d]. Similarly, the stress position is currently moving towards the Standard Italian position. The older form for ‘to enjoy’, for instance, was [ˈɡədər]. Nowadays, the same form is pronounced as [go’dər] (It. [go de:re]). The same happens in the form for ‘to presume’, once pronounced as [prəzu ˈmir] and today as [ˈprəzu mərə]).

Due to these changes, and in particular to the phonological processes that reduce/delete the (etymologically) unstressed vowels in the passage from proto-Romance to Carrarino, the syllable structure of this dialect is quite complex. In the next section, a phonological account of this complexity is presented.

### 3.1. Syllable structure

For descriptive convenience, the syllable structures under analysis are split in the two different classes shown in 9). The first includes the etymological stressed syllables, i.e. the ones that, protected by the stress, didn’t undergo any vowel reduction process. As for the second class, it includes the syllables that did undergo vowel reduction and/or deletion because of their being unstressed.

9) Carrarino syllable structures

<table>
<thead>
<tr>
<th>Stressed syllables</th>
<th>Unstressed syllables</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. V</td>
<td>g. N</td>
</tr>
<tr>
<td>b. CV(V)</td>
<td>h. OC</td>
</tr>
<tr>
<td>c. CCV(V)</td>
<td>i. CØ</td>
</tr>
<tr>
<td></td>
<td>j. CCØ</td>
</tr>
</tbody>
</table>

Syllables which belong to the first class display a quite straightforward structure: O can be absent (a.), simple (b.) or complex (c.), with an upper limit of two segments. R can be simple (a., b. and c.) or complex (d., e. and f.), with an upper limit of two segments. As for their phonotactics, these syllables respect the conditions imposed by the SSG, where the sonority degree of the consonant classes is drawn from the universal hierarchy of
relative sonority presented in 3), which has be adapted to Carrarino in 10). Here, the segment classes have been reduced: affricates and stops have been grouped under the O(obstruent) label, lateral and rhotic under the L(liquid) label and all the vowels under the V(owel) label. Glides (G) remain alone, as well as fricatives (F) and nasals (N).

10) Carrarino’s hierarchy of relative sonority: Segment class (Sonority Index)

<table>
<thead>
<tr>
<th>Sonority</th>
</tr>
</thead>
<tbody>
<tr>
<td>V (6)</td>
</tr>
<tr>
<td>G (5)</td>
</tr>
<tr>
<td>L (4)</td>
</tr>
<tr>
<td>N (3)</td>
</tr>
<tr>
<td>F (2)</td>
</tr>
<tr>
<td>O (1)</td>
</tr>
</tbody>
</table>

The resort to 2) and 10) allows the syllabic peripheries of the stressed syllables to be easily identified: given a sequence of segments, its syllabification can be straightforwardly derived.

Building on what has been established so far, Carrarino stressed syllables can thus be assigned the structures shown in 11):

11) Carrarino stressed syllables representation (the letters correspond to the ones of 9))

![Diagram showing syllable structures]

The classes of segments that can occupy the terminals of these structures are presented in 12):

12) Carrarino stressed syllable content (the letters correspond to the ones in 8) and 9))

a. \( V = \{i \, e \, a \, o \, u\} \)
b. C = every consonant; V = every vowel
Restrictions: *[wV]*; *[ŋV]*

c. C₁ = [p b t d k g f v N r]; C₂ = [l r w j]; V = every vowel
Restrictions: *[v N r]* can be the first elements on a complex O only if the second one has a higher sonority degree, therefore only if it’s [j]; *[w]* can be the second member of a complex O only if the first one is velar ([k g]), and in this case the vowel cannot be neither [o] nor [ɔ] nor [ɛ]; *[tlV dlV gjV]*; MSD ≥ 2

d. V = every vowel; C = [s ŋ l r j]
Restrictions: *[^sC]*

e. C₁ = every consonant; V = every vowel; C₃ = [s ŋ l r j]

f. C₁ = [p b t d k g f v N r]; C₂ = [r l w j]; V = every vowel; C₃ = [s ŋ l r j]
Restrictions and MSD: see 11c.

The data presented so far give us a quite straightforward picture of the stressed syllable structure and its phonotactics: O, R and N, i.e. every constituent but Cd, can be maximally binary, their melodic content respecting SSG and a MSD = 2.

As for complex O (12c. and 12f.), it is constituted by at most two segments, the first being less sonorous than the second: while the first segment of the cluster can be selected from a set that comprises every consonant of Carrarino inventory ([p b t d k g f v s z N r]) displaying a SI lower than that of the lateral (i.e. 4), the second segment can be chosen from a smaller set of more sonorous consonants ([r l w j]), i.e. from the ones with a SI higher than that of nasal consonants (i.e. 3).

As for Cd (12d., 12e. and 12f.), it can occupy only one skeletal position, which can be filled by a segment selected from the /s ŋ l r j/ set.

As for the etymologically unstressed syllables, Carrarino either reduces the vowel to schwa or deletes it. When it is deleted, syllable structures may arise that apparently do not respect neither Carrarino Cd phonotactics, nor the binarity constraint, nor SSP and MSD. As a result of apocope, word-final vowels are deleted and words can thus be found which apparently display Cd segments that are not selected from the set of stressed syllable possible Cd’s: /s ŋ l r j/.

13) Apocope in Carrarino: single word-final consonants

<table>
<thead>
<tr>
<th>C. Lat.</th>
<th>apocope</th>
<th>a. TŌTU(M) ‘all’</th>
<th>b. MARE(M) ‘sea’</th>
<th>c. CANĒ(S) ‘dogs’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carr.</td>
<td>↓</td>
<td>[tut]</td>
<td>↓</td>
<td>[mar]</td>
</tr>
</tbody>
</table>

In the passage from C. Lat to V. Lat. to W. Rom. CLV and GLV sequences became */kjV/ and */gjV*. In Carrarino, then, a process applied that palatalizes the preceding C/G, so that we have It. ['ungja], but Carr. ['undʒa], from UNGŪLA(M), and It. ['kja:ve], but Carr. ['tʃava], from CLĀVE(M). This is the reason why /gjV/ is absent in Carrarino and /kjV/ is extremely rare and restricted to loan words.
Beside these phonotactically irregular forms, apocope can produce forms which apparently violate binary constraint on rhymal constituency: as shown in 14), if the syllable that undergoes apocope is preceded by a closed syllable, consonant clusters can be found in word-final position which, even if respecting SSG, apparently exceed the number of segments allowed in Cd position.

14) Apocope in Carrarino: SSG-abiding word-final consonant clusters

<table>
<thead>
<tr>
<th>C. Lat.</th>
<th>a. HERBA(M) ‘herb’</th>
<th>b. TRISTE(M) ‘sad’</th>
</tr>
</thead>
<tbody>
<tr>
<td>apocope</td>
<td>[erb]</td>
<td>[trist]</td>
</tr>
</tbody>
</table>

Furthermore, if O of the apocopated syllable is complex, the resulting word-final consonants sequence violate the binary constraint as well: the sonority level can display a falling contour, as in 14), and also a rising contour, as in 15). In these cases, Carrarino grammar inserts an epenthetic vowel between the first and the second segment of the etymological word-final syllable’s complex O.

15) Apocope in Carrarino: SSG-violating consonant clusters

<table>
<thead>
<tr>
<th>C. Lat.</th>
<th>a. MÂCRU(M) ‘slim’</th>
<th>b. MONSTRU(M) ‘wonder’</th>
</tr>
</thead>
<tbody>
<tr>
<td>apocope</td>
<td>*magr</td>
<td>*mostr</td>
</tr>
<tr>
<td>ephenthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carr.</td>
<td>[ˈmagər]</td>
<td>[ˈmostə]  (‘monster’)</td>
</tr>
</tbody>
</table>

Given the fact that Latin corresponding forms lack this nuclear segment, that the presence of epenthetic vowel alternates with its absence in morphologically correlated forms, and that in this context this vowel is always a schwa, i.e. the least marked vocalic segment (van Oostendorp 1995; Silverman 2011), we can conclude that it is not an etymologic vowel, and that its insertion is due to a phonological process triggered by well-formedness constraints on the syllabic constituent shapes and their melodic content (for a slightly different analysis of Carrarino epenthesis, though, see Cahirani 2015).

The same process of vowel epenthesis occurs when the apocope is combined with the syncope in words stressed on the antepenultimate syllable: forms can this way be generated which display consonant clusters with a sonority plateau. In the forms presented in 16), for example, we can see how the word-final [tk] sequence created by syncope and apocope is repaired by means of epenthesis.

---

16 Epenthesis doesn’t occur if a SSG-violating form is followed by a vowel-initial form. In these cases the etymological O cluster is re-syllabified as the O of the following form: Carr. [ˈkwatə] ‘four’ vs. Carr. [kwatr aˈmike] ‘four friends PL.F’.
16) Apocope+syncope in Carrarino: SSG-violating word-final consonant cluster

<table>
<thead>
<tr>
<th>C./V. Lat.</th>
<th>SILVĀȚĪCU(M) ‘wild’</th>
</tr>
</thead>
<tbody>
<tr>
<td>syncope</td>
<td>*salvatko</td>
</tr>
<tr>
<td>apocope</td>
<td>*salvat</td>
</tr>
<tr>
<td>epenthesis</td>
<td>[salvatk]</td>
</tr>
<tr>
<td>Carr.</td>
<td></td>
</tr>
</tbody>
</table>

As seen so far, the right periphery of words seems to be allowed to violate phonotactic and structural well-formedness constraints. The same situation can also be found in the left periphery. This happens, for example, when O is preceded by a sibilant (Kaye 1992; Marotta 1995; Goad 2011). In these cases, the sonority contour decreases from the word-initial segment to the second one (which can consist in any consonantal segment) and then rises again toward the highest sonority level represented by the vowel. Furthermore, if O of the word-initial stressed syllable is etymologically complex, the sibilant in first position would also entail a violation of the binarity constraint on constituent structure.

An interesting set of forms is represented by the word-initial closed syllables that underwent apheresis: as shown in 17), an etymologically word-initial vowel-nasal sequence underwent apheresis. Another process then applied that make the nasal syllabic:

17) Apheresis in Carrarino VN sequences

<table>
<thead>
<tr>
<th>C. Lat.</th>
<th>a. UMBĪLĪCU(M) ‘navel’</th>
<th>b. INTRĀRE ‘to go in’</th>
</tr>
</thead>
<tbody>
<tr>
<td>apheresis</td>
<td>*ŋbōd̚iko</td>
<td>*ŋtrare</td>
</tr>
<tr>
<td>apocope</td>
<td>*ŋbōd̚ik</td>
<td>*ŋtrar</td>
</tr>
<tr>
<td>N&gt;Ñ</td>
<td>[ŋbɔˈd̚ik]</td>
<td>[ŋtrar]</td>
</tr>
</tbody>
</table>

Interestingly, the point of articulation of these nasals supports the hetero-syllabicity of these segments. Indeed, in this position, the place of articulation of the syllabic nasal is always velar, no matter its etymological place of articulation. Crucially, this segment displays the place of articulation that characterizes all nasal codas of Carrarino (Luciani 2002). The vocalization process that applies afterward can then be considered a repair strategy that shares the same aim of the epenthesis: by making the nasal syllabic, the SSG-violating word-initial consonants cluster resulting from apheresis is well-formed.

Another functionally similar mechanism is the low vowel prosthesis represented in 18):

---

18 The neutralization of N’s place of articulation to velar in Cd position can be considered as a phonological reduction to a place-less N, which is pronounced as a velar nasal for phonetic reasons: “A placeless nasal will necessarily be pronounced as a dorsal nasal (i.e. as velar [ŋ] or uvular [ɴ]) if it has a complete oral closure because it is not possible to produce nasal air flow if the oral cavity is completely closed behind the uvula” (Kingston & de Lacy to appear: 22).
18) Syncope and prosthesis in Carrarino

C.Lat. a. RE-FACTU(M) ‘re-made’  

\[ \text{syncope} \]

\[ \downarrow \]

\[ \text{prosthesis} \]

\[ \downarrow \]

Carr. \[ \text{[arˈfat]} \]

By means of the [a] prosthesis\(^{19}\), hence, the highly sonorous [r] is no more syllabified as the first segment of a decreasing-sonority-contour O cluster. Instead, it is syllabified as the Cd of the preceding syllable.

Given what has been presented so far, Carrarino unstressed syllables that underwent vowel deletion or reduction processes can be assigned the structures in 19):

19) Carrarino unstressed syllables representation (the bold letters correspond to the syllable represented immediately above; the letters correspond to the ones of 9))

---

\(^{19}\) Notice that this is not an instance of A-prosthesis (Sampson 2010). A-prosthesis, indeed, is not necessarily considered as a syllable structure repair process, being instead a strengthening process of word-initial /r/ in romance varieties in which this sound was particularly intense and long (see for example Gasc. [aɾˈrɪ], Sard. [ar rɪ:u], Arom. [aˈɾɪ] < RĪVU(M) ‘river’). Sampson (2010: 194) labels the one under discussion as U-prosthesis, even though he admits that it “led to the appearance of a vowel that has been rather more variable in quality although a low value [a] has predominated”. This type of prosthesis is “directly conditioned by the sonority profile of the complex word-initial onsets created by [the syncope of pre-tonic initial vowels]” (Sampson 2010: 213). Within the Northern Italian dialects, the focal area of the development of this kind of prosthesis (which in other varieties can actually occur also before [l n] (Bol. [alˈkrːr] < Germ. *līkkon ‘to lick’; Bol. [anˈvʊvːd] < NEPÔTE(M) ‘nephew’)), is Piedmont and Emilia-Romagna. Liguria and Lombardy, as well as Tuscan varieties, didn’t undergo this process, except in peripheral areas such as Lunigiana.
These structures represent the syllables in which the etymological nuclear melodic content has been deleted. As hinted at above, if followed by a vowel-initial form, the complex O of these vowel-less syllables is post-lexically linked to the syllable node projected by the vowel of the following form (19j). The same holds for simple O: it remains O if followed by a vowel-initial form (19i.), but it is resyllabified as Cd’s if it precedes a phonological boundary or a consonant with a SI ≤ 2 (19i’). Similarly, if complex O’s are followed by another consonant or by a phonological boundary, they undergo epenthesis (19j’). As for 19h., it represents syllables with a pre-rhotic prosthesis.

From this brief survey of etymological unstressed syllable, it is possible to notice how complex the Carrarino syllables can be: the binarity constraint on rhyme and the Cd phonotactics requirements are no more respected. Furthermore, O clusters can be found which don’t occur in etymological stressed syllables: /tsr dzr dʒr vr tl dl gl dzl tʃl dʒl vl nm/ are only possible as result of a syncope. Some of these forms are presented in 20):

20) Carrarino new O clusters

<table>
<thead>
<tr>
<th>Carr.</th>
<th>Meaning</th>
<th>Cognate forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>[dzidzla]</td>
<td>‘jujube’</td>
<td>It. ['dyud.3ola]</td>
</tr>
<tr>
<td>[fli.pa]</td>
<td>‘maid of honour’</td>
<td>Lucch. [fi lip.a]</td>
</tr>
<tr>
<td>[vli.no.za]</td>
<td>‘poisonous (fem.)’</td>
<td>It. [vele no:za]</td>
</tr>
<tr>
<td>[vri.ta]</td>
<td>‘truth’</td>
<td>It. [veri.ta]</td>
</tr>
<tr>
<td>[b(ə)de.tar]</td>
<td>‘slime’</td>
<td>Av. [bo dətra]; It. [bel’let:a]</td>
</tr>
<tr>
<td>[mni tsar]</td>
<td>‘to crumble’</td>
<td>Castm. [meni tsaе]; *minutiāre</td>
</tr>
</tbody>
</table>

---

20 As in Carr. ['ska.tla] ’box’, It. ['ska.to.la].
In the next section, an account of the Carrarino syllable typology and the vowel insertion/reduction processes occurring in the right periphery of the words is proposed.

3.2. Formal analysis

As just discussed, SSG, MSD, (Cd) phonotactics and binary constraint can be violated. It seems, therefore, that typological generalizations such as SSG should be rather considered as tendencies that admit exceptions. As claimed by Kiparsky (2006: 221), however, “[a] further point of caution is in order here: unlike typological generalizations, universals interact dynamically within a linguistic system. Hence ‘exceptionless’ does not mean ‘inviolable’. In the spirit of OT, I assume that even true universal constraints may be violated, but only when a more highly ranked constraint forces it”.

In the model developed below to account for the Carrarino generalizations, the same OT “spirit” is adopted. Crucially, such an approach allows us to consider the (earlier autonomously treated) issues of syllable structure (i.e. a ‘static’ generalization), epenthesis and deletion (i.e. two ‘dynamic’ generalization) as interacting generalizations.

As shown in the preceding sections, Carrarino can have a quite complex syllable structure. Indeed, it can have complex O’s as well as complex Cd’s, both resulting from the application of the vowel reduction processes: syncope, apocope and apheresis. These processes tend to reduce the size of a given language’s forms: as stated by Vennemann (1988: 2), “syncope and apocope […] are manifestations of the functional preference for briefness” in language. This preference for ‘briefness’ thus triggers the deletion of unstressed vowels. In OT terms, it means that in the phonological grammar of Carrarino there is a constraint favoring vowel deletion, which must be ranked high enough (within the constraint hierarchy) to exert its power:

21) Preference for shortness (Miglio 2005)

\[ *_{\text{STRUC}(\sigma)}: \text{No syllable.} \]

Given the high ranking of this constraint, a candidate with no vowels at all would be selected as the optimal candidate. In order to prevent the selection of the wrong candidate and, more generally, the deletion of all vowels of a form, constraints must be introduced in the hierarchy that penalize the input-output mismatches. Some of these faithfulness constraints assign violation marks to candidate forms where some phonological material is added which is not present in the input (DEP). Other faithfulness constraints assign violation marks to candidates in which some input material has been deleted (MAX):

22) Basic faithfulness constraints (McCarthy & Prince 1995)

\[ \text{DEP: Every element of the output form has a correspondent in the input form.} \]

\[ \text{MAX: Every element of the input form has a correspondent in the output form.} \]

The constraints presented in 22) need to be further specified: a variable must be considered that refers to the phonological material whose faithfulness need to be evaluated. DEP and MAX constraints must hence refer to vowels. As a consequence, a
faithfulness constraint against V epenthesis (Féry 2003) and two anti-deletion constraints that take as argument, respectively, vowels in general (Wheeler 2007), and prosodic heads (i.e. stressed vowels; Wheeler 2007), are introduced in 23):

23) Carrarino faithfulness constraints

\[
\begin{align*}
\text{DEP}V: & \quad \text{A V in the output form has a correspondent in the input form.} \\
\text{MAX}V: & \quad \text{Every vowel of the input form has a correspondent in the output form.} \\
\text{MAXPROSHEAD}: & \quad \text{Every prosodic head of the input has a correspondent in the output form.}
\end{align*}
\]

These anti-deletion constraints should be ranked in the constraint hierarchy in a position such that only unstressed vowels undergo the reduction/deletion process. The constraint that favors the faithful preservation of stressed vowels, i.e. MAXPROSHEAD, must hence be ranked above the constraint that triggers vowel deletion, i.e. *STRUC(σ). Finally, given that unstressed vowels are preferably deleted, MAXV must be low ranked. As shown in 24), this ranking accounts for the selection of the attested [ˈtrist] against [ˈtr̩st], i.e. against the candidate that fares better with respect to *STRUC(σ). Interestingly, the same hierarchy would produce the right output even if the input form displayed a word-final vowel.

24) Carrarino /trist/ 'sad' (cfr. It. [*tris.te])

<table>
<thead>
<tr>
<th></th>
<th>/trist/</th>
<th>MAXPROSHEAD</th>
<th>*STRUC(σ)</th>
<th>MAXV</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>/tris.te</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>tris</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>trst</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>/triste/</td>
<td>MAXPROSHEAD</td>
<td>*STRUC(σ)</td>
<td>MAXV</td>
</tr>
<tr>
<td>e.</td>
<td>tris</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>trst</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DEP\text{V}, though, i.e. to the constraint that penalizes the insertion within the output form of a vowel, must still be ranked. In order to rank it, other forms must be considered, together with some requirement on the sonority contour.

As shown in the preceding section, while word-final SSG-abiding consonant clusters are considered well-formed output representations, an epenthetic schwa is unfaithfully epenthesized if the word-final consonant clusters would otherwise display an even or rising sonority contour. The markedness constraint triggering this repair strategy is presented in 25):
25) SSG\textsuperscript{21} constraint

SSG: The margins of the syllable only consist of segments of decreasing sonority from the nucleus to the periphery.

Comparing the behavior of the two sets of candidates in 27), it is possible to establish the ranking of DEP\textsuperscript{V} within the hierarchy: if we consider the lower set of candidates, we can notice that e. and f. incur in a violation of DEP\textsuperscript{V}, which is not required by the higher ranked SSG. In other words, there’s no need to add a schwa to breaks the cluster. On the contrary, the violation pattern of the higher set of candidates shows that the DEP\textsuperscript{V} violation allows for the satisfaction of the otherwise violated SSG. As can be noticed, however, another constraint must be introduced to let the grammar epenthesize a vowel in the right position:

26) Preventing word-final epenthesis

\textsuperscript{*V\#}: Vowels are prohibited at the end of a word.

This is a non-finality constraint (McCarthy 2008) that formalizes the preference for words ending in a consonant, forcing this way the word-final vowel deletion. The insertion of this constraint in the same hierarchical level of DEP\textsuperscript{V} let the grammar decide between epenthesis and epiphesis: the winning candidate is the one which incurs in the fewer violation of the constraints ranked in the same level.

27) Carrarino /kwatr/ ‘four’ and /kwart/ ‘fourth’

\[
\begin{array}{|c|c|}
\hline
\text{/kwatr/} & \text{SSG\textsuperscript{*V\#DEP\textsuperscript{V}}} \\
\hline
\text{a. kwatr} & \text{\textsuperscript{*}!} \\
\text{b. \textsuperscript{\texttt{\textquotesingle}} kwa.ta.t} & \text{\textsuperscript{*}} \\
\text{c. \textsuperscript{\texttt{\textquotesingle}} kwa.tar} & \text{\textsuperscript{*}!} \\
\hline
\text{/kwart/} & \text{SSG\textsuperscript{*V\#DEP\textsuperscript{V}}} \\
\hline
\text{d. \textsuperscript{\texttt{\textquotesingle}} kwart} & \text{} \\
\text{e. \textsuperscript{\texttt{\textquotesingle}} kwa.tar} & \text{\textsuperscript{*}} \\
\text{f. \textsuperscript{\texttt{\textquotesingle}} kwar.t\textsuperscript{\texttt{\textquotesingle}}} & \text{\textsuperscript{*}!} \\
\hline
\end{array}
\]

As already hinted at, however, Carrarino displays forms where a schwa appears in otherwise SSG-abiding word-final consonant clusters, and cannot therefore be considered an epenthetic segment. Crucially, these are etymologically proparoxitonic forms, like [ˈgo.mət] ‘elbow’, [ˈsto.mək] ‘stomach’, [ˈma.nək] ‘handle’, [ˈu.məd] ‘damp’ or [ˈka.rik] ‘load\textsuperscript{22}’, i.e. forms with an etymological vowel in the same position in which Carrarino

\textsuperscript{21} Notice that SSG should be considered a cover term that actually refers to the intertwining of the Universally fixed Peak and Margin Hierarchies (Prince & Smolensky 1993[2004]). These, in turn, consist of a complex of constraints governing the compatibility of segments with particular syllabic positions accordingly to their SI: high sonority segments are favored in the peak position and low sonority segments in the margin position.

\textsuperscript{22} See the quasi-minimal pair [koʊpt] ‘bill’, [mank] ‘not even’ and [mark] ‘Marc’, where the same sequences are well-formed. As a side remark, notice that, on the contrary, others etymologically proparoxitonic forms displaying SSG-abiding word-final clusters and, crucially, an [S] in cluster first position, do not display any schwa, as shown by [ˈtsk] ‘toxic’ (It. [ˈtsi.ko]). Given the
displays a schwa. Besides SSG, well-formedness and etymology, another argument that supports the view according to which the schwas of proparoxitonic form are not there to improve the right periphery well-formedness can be found in alternations like [ˈgo.məә] ‘elbow’ vs. [ˈgo.məә.t] ‘elbows’, or [ˈsto.məә] ‘stomach’ vs. [ˈsto.məә.k] ‘to disgust’: in these cases, in fact, the presence of a vowel after the last segment of the root-final hypothetical cluster would determine a resyllabification that brakes the cluster and makes the epenthesis useless. If, in other words, the schwa were epenthetic, as in [ˈma.go] ‘thin’, we would expect not to find it in derived or inflected forms, as in [ˈma.gri] ‘thin M.P.L.

Other proparoxitonic forms, however, are affected by vowel deletion if the resulting consonant cluster can be resyllabified as a SSG-abiding complex O because of the presence of a word-final vowel. It is the case, for example, of [ˈdzi.dzəә.l] (It. [ˈdʒud.dʒo.la]) ‘jujube’ and [ˈtra.pləә.l] (It. [ˈtræ.po.la]) ‘trap’, as opposed to [ˈtiŋ.fo.na] (It. [ˈtiŋ.fo.na]) ‘antiphon’ and [ˈte.na.ri] (It. [ˈte.nə.ro]) ‘soft’. The last two forms point to the MSD as a possible responsible for the blocking of the deletion of the vowel and the resyllabification of the two consonant in a complex O. As argued above, indeed, Carrarino tolerates complex O with a MSD ≥ 2. This means that, when a process like syncope would produce a MSD violation, i.e. an onset with a sonority distance lower than 2, the process is blocked.

In order to make this generalization part of Carrarino grammar, MSD must be translated in a constraint and inserted in the hierarchy. To do this, let’s consider first the possible combinations of the sonority distance values for O and Cd clusters:

28) Consonant classes combination and relative sonority distance values (from Montreuil 2000: 213)

<table>
<thead>
<tr>
<th>Consonant classes combinations</th>
<th>Onset Sonority Distance</th>
<th>Cd Sonority Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GO</td>
<td>-4 Marked</td>
<td>Unmarked +4</td>
</tr>
<tr>
<td>GF</td>
<td>-3</td>
<td>+3</td>
</tr>
<tr>
<td>GN</td>
<td>-2</td>
<td>+2</td>
</tr>
<tr>
<td>GL</td>
<td>-1</td>
<td>+1</td>
</tr>
<tr>
<td>GG</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LG</td>
<td>+1</td>
<td>-1</td>
</tr>
<tr>
<td>NG</td>
<td>+2</td>
<td>-2</td>
</tr>
<tr>
<td>FG</td>
<td>+3</td>
<td>-3</td>
</tr>
<tr>
<td>OG</td>
<td>+4</td>
<td>Unmarked Marked -4</td>
</tr>
</tbody>
</table>

The sonority distances just presented can now be translated in the constraints given in 29. It has to be noticed that, given the implicational relationship observed in the typological surveys of complex O’s (Greenberg 1978; Berent, Lennertz & Smolensky 2011), SD constraints relative ordering is universally fixed: *SD-4 >> *SD-3 >> *SD-2 >>> *SD-1 >> *SD0 >> *SD+1 >> *SD+2 >> *SD+3 >> *SD+4. As shown below, though, the domain of these constraints should be specified: they must refer, indeed, to O (SDO\_X) as well as to Cd (SD\_X) clusters. A reason to keep the constraints targeting O distinct from the ones targeting Cd is the asymmetry between O and Cd licensing power of Carrarino. Indeed, Cd admits consonant clusters with a SD ≥ +1.

special status of /SC/ clusters (Vennemann 1988; Kaye et al. 1990; Kaye 1992; Marotta 1995; Loporcaro & Bertinetto 2005; Goad 2011), they will not be considered in the present work.
29) Sonority distance constraints

*SD_{O\text{-Cd}}-4: No clusters whose SD is -4 or lower.
*SD_{O\text{-Cd}}-3: No clusters whose SD is -3 or lower.
*SD_{O\text{-Cd}}-2: No clusters whose SD is -2 or lower.
*SD_{O\text{-Cd}}-1: No clusters whose SD is -1 or lower.
*SD_{O\text{-Cd}}0: No clusters whose SD is 0 or lower.
*SD_{O\text{-Cd}}+1: No clusters whose SD is +1 or lower.
*SD_{O\text{-Cd}}+2: No clusters whose SD is +2 or lower.
*SD_{O\text{-Cd}}+3: No clusters whose SD is +3 or lower.
*SD_{O\text{-Cd}}+4: No clusters whose SD is +4 or lower.

Given that Carrarino onset MSD must be \( \geq 2 \)\(^{23}\) and that the constraints in 29) are arranged in a universally fixed hierarchy, constraints above *SD_{O\text{-Cd}}+1 must be undominated, while the lower part of the hierarchy must interact with the other constraints.

As shown in the lower input-output mapping of 30), if a consonant cluster violates *SD_{O\text{-Cd}}+1 (candidate d.), then the otherwise preferred unstressed vowel deletion is blocked. However, the same segments can be resyllabified as complex Cd’s, as shown by candidate a.. Here, epenthesis and epithesis are both blocked, and candidate a. is selected because it fares better with respect to both *V\# and De\#V and the higher *SD_{O\text{-Cd}}+1. This means that Carrarino Cd’s tolerate an MSD lower than 2. If, in other words, an input has a word-final cluster with a SD \( \geq +1 \), it is considered well-formed and there is no need to resort to the epenthesis repair strategy. If, on the other hand, SD is lower, then the epenthesis is triggered (as showed in 27) for the decreasing sonority contour clusters).

At the same time, as shown by the candidate f., the tolerance of the grammar towards Cd’s with a SD = +1 is overlooked if such a cluster is the consequence of the otherwise preferred unstressed vowel deletion: similarly to what happens with candidate d., candidate f. is ruled out notwithstanding a) it fares better than the winning candidate with respect to *STRUC(\( \sigma \)) and b) the same Cd cluster is elsewhere tolerated (as in candidate a.).

\(^{23}\) See, for example, Carr. [(fi.ˈlip.po)] ‘Filippo’ vs. [(fi.ˈniː.to)] ‘finished’.
30) Carrarino Cd’s higher licensing power: [taNF] ‘stink’ vs. [ŋtiNFna] ‘antiphon’

<table>
<thead>
<tr>
<th></th>
<th>/taNF/</th>
<th>*SDO+1</th>
<th>*V#DepV</th>
<th>*SDcd+1</th>
<th>*Struc(σ)</th>
<th>MaxV</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>taNF</td>
<td>⋯</td>
<td>⋯</td>
<td>⋯</td>
<td>⋯</td>
<td>⋯</td>
</tr>
<tr>
<td>b.</td>
<td>taŋ发掘</td>
<td>*!</td>
<td>⋯</td>
<td>⋯</td>
<td>**</td>
<td>⋯</td>
</tr>
<tr>
<td>c.</td>
<td>taŋ发掘</td>
<td>⋯</td>
<td>*!</td>
<td>⋯</td>
<td>**</td>
<td>⋯</td>
</tr>
<tr>
<td>d.</td>
<td>/N’tiNFna/</td>
<td>*SDO+1</td>
<td>*V#DepV</td>
<td>*SDcd+1</td>
<td>*Struc(σ)</td>
<td>MaxV</td>
</tr>
<tr>
<td>e.</td>
<td>ŋ’tiŋ发掘</td>
<td>*!</td>
<td>⋯</td>
<td>⋯</td>
<td>**</td>
<td>⋯</td>
</tr>
<tr>
<td>f.</td>
<td>ŋ’tiŋ发掘</td>
<td>⋯</td>
<td>*!</td>
<td>⋯</td>
<td>**</td>
<td>⋯</td>
</tr>
</tbody>
</table>

In other words, both O’s and Cd’s with a SD = +1 are ill-formed enough to block the syncope (*SDO+1 >> *SDcd+1 >> *Struc(σ)) while Cd’s with the same SD is not ill-formed enough to trigger epenthesis (*V#, DepV >> *SDcd+1). Hence, to account for this O/Cd asymmetry, SD constraints has to be referred either to O or to Cd, and the anti-epenthesis constraint has to be inserted between them. The anti-deletion constraint, instead, must be sited below.

Given the analysis of [əə]/Ø alternation just presented, therefore, Carrarino right periphery can be accounted for by the phonological grammar in 31\(^\text{24}\).

31) Carrarino right periphery’s phonological grammar

\[ \text{MaxProsHead, } *SDO+1 >> *V#, \text{ DepV} >> *SDcd+1 >> *Struc(σ) >> \text{MaxV} \]

4. Conclusion

After a brief discussion of the universal principles that have been proposed to account for the syllable structure, such as the Sonority Sequence Generalization and the Minimal Sonority Distance (section 2), and a brief introduction to Carrarino (sections 3 and 3.1), an OT analysis has been worked out (section 3.2) that accounts for both a static generalization, such as the syllable structure description, and the two inter-connected processes of deletion/syncope and epenthesis. This interaction is taken care of by a single system, i.e., by the dialect-specific ranking of a set of independently needed and widely attested universal constraints making up the Carrarino grammar.

In particular, it has been shown that a functionally well-justified markedness constraint assigning a preference to shorter forms, thus favoring the deletion of syllables (*Struc(σ)), must be ranked higher than the faithfulness constraint that blocks the deletion of vowels (MaxV), but lower than the constraint blocking the deletion of stressed

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\(^{24}\) In order to block the apocope of /-a -e -i/ when these vowels represent, respectively, the singular and plural feminine and plural masculine morphemes, another constraint must be placed on the top of the hierarchy. This way, no lower constraint can force its violation. This constraint, formalized as MaxMorph (McCarthy & Prince 1993; Miglio 2005), assigns a violation mark for every morphologically significant segment that is deleted from input form (see Cavirani 2015 for a different approach).
vowels (MAXPROSHEAD). As a consequence of this ranking, only the unstressed vowels can be deleted.

It has also been shown that *STRUC(σ) and DEPv interact with the typologically and functionally well-justified markedness constraints that order tautosyllabic consonant cluster sonority contours in a universal hierarchy, and that these constraints have to be specified relatively to their domain of application (*SDcCdX). Indeed, an asymmetry can be observed between codas and onsets: while the consonants belonging to the onset clusters must respect a SD of at least 2, codas tolerate a SD of at least 1. Hence, *SDcCd+1 must be lower than DEPv, which in turn must be lower than *SDcOn+1. This allows a schwa to be epenthesized only if the consonant cluster with a sonority distance of 1 is a complex onset, being instead blocked if it is a coda.

5. Abbreviations’ list

Av. Avenzino
Arom. Aromanian
Bol. Bolognese
C.Lat. Classical Latin
Carr. Carrarino
Castm. Castelnovese (Castelnuovo Magra)
Gasc. Gascon
Genov. Genovese
Germ. Germanic
It. Italian
Lat. Latin
Lucch. Lucchese
Sard. Sardinian
V.Lat. Vulgar Latin
W.Rom. Western Romance

Bibliography


