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ON THE FORM OF SEGMENT DELETION AND INSERTION RULES*

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1. INTRODUCTION

In this paper I propose a modification of the operation of certain phonological processes in the direction of allowing free, optional application of phonological rules of a very general sort, in some sense in a form similar to the one they have in other components. This mode of application leads to an overgeneration of structures which must then be corrected by enriching the representational structure and the set of principles that control these structures. Thus instead of having an obligatory rule with the form (1a), which leads to the derivation in (1b,c,d), we would have an optional rule of the form (2a) and correct by some filtering mechanism with the effect of (2a') the overgeneration. Given the same initial structures (1b), (2b), optional application of (2a) will give in the second case (2c), namely [B, +F] and [B, -F] by application of the rule, and [A, +F], [A, -F] by no application. These structures will then be affected by (2a') giving (2d). The final output will be (2e), which is identical to (1d), the result of the application of the obligatory rule.

(1)

a. $A \rightarrow B / [\underline{+F}]$

b. [A, +F], [A, -F]
c. [B, +F] ———
d. [B, +F], [A, -F]

(2)

a. $A \rightarrow B$
a.' *[A, +F], *[B, -F]

b. [A, +F], [A, -F]
c. [A, +F], [B, +F], [A, -F], [B, -F]
d. *[A, +F], [B, +F], [A, -F], *[B, -F]
e. [B, +F], [A, -F]

Notice that overgeneration arises both by overapplication ([A, -F] → [B, -F]) and by underapplication (unaffected [A, +F]).

The decisive advantage of the second analysis hinges on the possibility of transferring the effect of filters like (2a') from particular grammars to universal principles, or to universal principles and independently justificated language particular conditions.

I will try to motivate this move by examining problems in a specific

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area, the interaction between rules that create syllabic structure and two kinds of segmental rules that clearly affect syllabic structure, namely deletion and insertion of phonological segments.

Notice that there are two issues involved in the adoption of a model like this. First there is the simplification of language-specific rules, which should increase the parametrization of phonology. Some recent and radical instances of this way of proceeding are Archangely and Pulleyblank (1986), Mascaró (1987), and Yip (1988). The second issue is optionality. It should be clear that this optionality is not the transparent optionality of postlexical and phonetic rules that give a multiple output. The type of rules proposed here might, but don't have to yield a multiple output, since most of the outputs are not licensed, i.e. they are marked as ill formed.

I will not be concerned with the more difficult question of what the exact extent of this mode of operation is. I will try to show only that it solves some problems in the domain under examination. In other domains the conversion of obligatory processes into optional ones might prove difficult, and ultimately inadequate.

Most of my data are drawn from Central Catalan. In some domains where the dialect shows variation, they correspond more specifically to the variety of Barcelona.

2. INSERTION

In Central Catalan, any single consonant (except *r* which is tensed to *r*, and voiced obstruents which are devoiced) can occur word-finally. When a cluster occurs, several changes may take place. The neutral situation, i.e. when the underlying structure is always preserved, is best viewed when the cluster is not word final and it is followed by a vowel, in which case the cluster is not affected, the situation shown in (3a). When the cluster is word final (3b), or before a consonant (3c), there are three possibilities: No operation (the cluster is preserved (3bi, ci)), deletion (the second consonant is deleted (3bii, cii)), or insertion (an epenthetic *ə* is inserted after the cluster (3biii, ciii)).

(3)	a.i.		b.i.		c.i.	
	ərk+ét	'arc' dimin.	árk	'arc'	árks	pl.
	sərp+étə	'snake' dimin.	sérp	'snake'	sérps	pl.
	kəlk+á	'to trace'	kálk	'tracing'	kálks	pl.
	furn+ét	'oven' dimin.	fórn	'oven'	fórns	pl.
	básk+ə	'Basque'fem. sg.	básk	masc.sg.	básks	masc. pl.
			kásp	*Casp* (p.n.)	kásps	pl.

a.ii.		b.ii.		c.ii.	
ʎəmp+ét	'lightning' dim.	ʎámø	'lightning'	ʎámøs	pl.
əlt+ét	'high' dim.	álø	'high'	áløs	pl.
bint+i+ú	'twenty-one'	bínø	'twenty'	bínøs	pl.
siŋk+é	'fifth'	síŋø	' five'	síŋøs	pl.

a.iii.		b.iii.		c.iii.	
əpt+ísim	'apt' superl.	áptə	'apt' masc.	áptəs	'apt' masc. pl.
əðikt+ísim	'addict' superl.	əðíktə	masc.	əðíktəs	pl.
teətɾ+ál	'theatrical'	teátrə	'theater'	teátɾəs	pl.
nəʏɾ+ét	'black' dim.	néʏɾə	masc.	néʏɾəs	masc. pl.
ən+sufɾ+á	'to treat with s.'	sófrə	'sulphur'	sófɾəs	pl.
ʎiβɾ+ét	'book' dim.	ʎíβɾɛ		ʎíβɾəs	pl.
əlumn+át	'student body'	əlúmnə	'student'	əlúmnəs	pl.
síkl+ik	'cyclic'	síklə	'cycle'	síkləs	pl.

The adequate descriptive generalizations that cover these and similar cases should specify the contexts that determine no operation, deletion, or insertion. Clearly, syllable structure is involved, since the changes under examination never take place when the second element of the cluster is in the onset, as shown by ərkét (syllabified ər.két), and the other examples in (3a). Syllabification of more than one consonant to onsets and rhymes is dependent on the sonority hierarchy, which for Catalan makes the following distinctions:

(4)

Stops (including approximants that alternate with voiced stops)	*Fricatives*	*Nasals*	*Liquids*	*Glides*	*Vowels*
p t k b (β) d (ð) g (ʏ)	f s ʃ z ʒ	m n ɲ ŋ	l ʎ ɾ	j w	a ɛ u, *etc.*
1	2	3	4	5	6

Except for the special status of *s* which can always appear as the second element of the cluster (a fact parallel to its occurrence as first element in onsets in many languages),[1] syllable final clusters are governed by the following sonority condition:

(5) Rhymes must show decreasing sonority (i.e. if X precedes Y in the rhyme, then sonority of X > sonority of Y)

Let's now determine the sonority relation of the clusters we are examining. (6) gives the underlying forms of examples of each relevant case of a rhyme cluster in (3):

(6) a. (cf. (3bi))
básk fórn árk
621 643 641

b. (cf. (3biii))
ápt sɔ́fr əlúmn
611 624 633

c. (cf. (3aiii))
ə p t+ísim
6 1 1

d. (cf.(3bii))
á l t
641

Consider (6a). All the rhymes show decreasing sonority for every pair of successive elements, hence the rhyme is well formed, and no process applies. In (6b) the rhyme shows either increasing or level successive sonority, and the structures are ill-formed; in (6c) this same sonority pattern appears, but there *p* and *t* are in different syllables. Finally, (6d) shows a special case: even if decreasing in sonority, homorganic clusters behave differently from nonhomorganic ones, as shown by all the other examples in (3bii, cii, and bi, ci, respectively). We formulate this fact descriptively as in (7):

(7) Rhyme consonants cannot be homorganic

The generalizations in (5) and (7) are exemplified in (8), where $[X]_{PL}$, $[Y]_{PL}$ represent place nodes. An asterisk marks the structural domain that determines surface ill-formedness of underlying structures that have to be affected by rule.

(8)

	a.	b.	c.	d.
Segmental structure	$[X]_{PL}$ $[Y]_{PL}$	$[X]_{PL}$ $[Y]_{PL}$	$[X]_{PL}$ $[Y]_{PL}$	* $[X]_{PL}$
	básk	apt	ə p tí sim	á l t
Sonority	621	* 611	6 1 1	641
σ-structure	R	*R	R	R

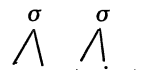
Both in (8a) and (8c) the final clusters are well-formed, but for different reasons. In the first case the rhyme cluster is well-formed because it shows decreasing sonority; in the second case the *pt* cluster in *əptísim* is broken up by resyllabification: the rhyme consists only of [əp] which is well-formed. In these two cases no process applies to the underlying forms. The other two cases show illicit rhymes. In (8b) the 611 sonority is not decreasing,

it violates thus the language particular condition on syllabification (5). (8d) shows a licit rhyme, as far as (5) is concerned, but it violates (7), because both consonants are linked to the same place node.

An obligatory rule approach would consist typically of an insertion rule operating after clusters like *pt*, and a deletion rule deleting the second member of clusters like *lt*. Such approaches, like the standard analyses of Wheeler (1979) and Mascaró (1978), cover the data, but they fail in several respects.

The main problem is the unrelatedness between the form of the rules and their teleological goal, namely to produce certain well formed syllabic structures, structures that later will be able to be syllabified properly by the syllabification rules of the language. In other words, context-sensitive insertion and deletion rules fail because the context in which they apply is the same as the context that is mentioned by syllabification rules. A solution is possible in some cases, because the descriptive link can be established in the rule itself. A typical case is the rule deleting liaison consonants. Clements and Keyser (1983: 96-114) improve in this direction a standard analysis of French liaison and truncation which would consist of a rule of the form of (9b) that deletes e.g. the final *t* of a full representation *petit* (9a). Instead the structure (10a) is posited with unsyllabified final *t* which is syllabified when possible by (10b), or deleted, if left unsyllabified, by (10c).

(9) a. petit b. $C \rightarrow \emptyset / \_\_\_\_ (\#) \quad \left\{ \begin{matrix} \# \\ C \end{matrix} \right\}$

(10) a. 

b. 

(under appropriate syntactic conditions)

c. 

The first case would apply to *petit ami*, but in (10a) the *t* has had no chance to syllabify as an onset, and is deleted.

When we turn to other cases, however, this analysis is not possible. In many cases, for example, an insertion rule is involved in which case a corresponding analysis is not obvious; in other cases the syllabifiable structure is the result of the application of more than one rule, each rule separately not yielding the appropriate surface form.

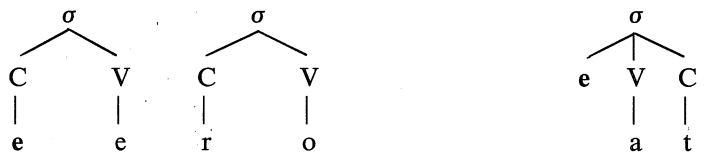
A second problem with standard insertion and deletion analyses is that there is little hope for a reduction of the class of possible rules. As they stand, rules of the type $A \rightarrow \emptyset$ / B———C, or $\emptyset \rightarrow A$ / B———C, can have any value for A, B, C.

The line of inquiry I will follow here is in a sense the reverse than the one described before. Instead of letting deletion and insertion rules operate to yield those structures to which syllabification rules can apply to give fully syllabified forms, I will propose an extension of the set of underspecified structures and of the rules of syllabification. Syllabification will be extended so as to be able to create and syllabify empty elements. Both underlying structures, and syllabification rules will allow two kinds of partially specified structures in addition to unsyllabified (extrasyllabic) segments, like the one in (10a) above. First, representations can contain empty syllabic terminals in the skeleton, e.g. [$_{\sigma}$e [$_{R}$a t]], with an empty onset, an onset that does not dominate any CV timing, or skeletal unit. Second, a skeletal unit can appear unspecified for C and V, and will be represented here by X. In the case of syllabification, segmental material can be left unsyllabified (as in (10a)). In order to prevent undesirable proliferation of empty slots that would be filled in by insertion (e.g. an unbound number of extra syllables), this extended syllabification will be limited by the following general convention:

(11) *Empty Syllabification*: Syllabification applies so as to syllabify all segmental material. To do so it creates the minimal structure necessary containing empty nodes.[2]

Notice that this structure, represented in tree form in (12b), is different from the structure (12a) proposed to deal with cases like French hache muet (Clements and Keyser (1983: 108)) where the melody alone, not the skeletal unit, is empty:

(12) a. héros 'hero' b.



To these "enriched" syllabic structure we will let rules of insertion and deletion apply quite freely to introduce new empty elements in the case of deletion, or to eliminate empty elements by insertion of segments, which will be allowed only into empty, or unspecified positions. The result will be a (phonological) surface structure containing empty or unspecified positions which will have to be well-formed by general principles, maybe also language particular conditions. One major technical departure from current models is the fact that syllabification and insertion/deletion rules

applying freely, lexical structures will receive multiple interpretations, most of which will be disallowed by these principles.

To introduce this approach, let's begin with the case of vowel insertion in Catalan which makes unsyllabifiable final clusters like in *apt* syllabifiable by inserting a final vowel (*áptə*), as illustrated with other examples in (3biii,ciii)). We will deal later with the deletion cases and with the problem of how to determine the correct partition between insertion and deletion in unsyllabifiable structures. In general I will illustrate insertion and deletion with word-final, singular forms. The preconsonantal (before the plural morpheme in most cases) contexts are covered by the same mechanisms.[3]

Recall that the descriptive generalization that determines the set of clusters that undergo insertion is the condition that the cluster in the rhyme present no decreasing sonority. Thus clusters with level sonority (pt, mn) or with increasing sonority (tɾ, kl) have to be adapted by insertion to be properly syllabified. Let us develop the analysis for the first example in (3biii), the morpheme /ápt/. We must first motivate an insertion analysis in front of the possible reverse alternative, namely to have underlying /áptə/ and deletion of *ə* (or its underlying source) before a vowel. The first objection would be that this alternative analysis does not exclude the existence of morphemes ending in /pt/ and similar clusters; to prevent this a prohibition against such underlying clusters would have to be added to the grammar. The main problem however is the existence of vowel final morphemes that behave differently from the ones exemplified in (3biii) in that they do not trigger deletion of *ə*. Thus *brəktə+ifórmə* 'brachteiform' contrasts with *fiβɾ+ifórmə* 'fibriform', *nuklə+ínə* 'nucleine' with *tɛtrasikH+ínə* 'tetracycline'.

As a point of departure I will adopt the syllabification system of Dell and Elmedlaoui (1985) with the modifications of Harris (1987). The first operation, Core Syllabification, syllabifies nuclei with their onsets. The segmental sequence is scanned and the maximally sonorous possible segments are categorized as nuclei; any possible onset is adjoined to the nucleus in the same operation. After this, a second operation takes place: Right Adjunction, which adjoins remaining segments following the nucleus as constituents of the rhyme. I assume Right Adjunction takes place in two steps in Catalan. First any C immediately following the nucleus is adjoined to it in the rhyme. Let's call this first step Right C Adjunction. To syllabify a second C to the right of the nucleus, its sonority relation to the previous, already syllabified C must be determined. Following the descriptive statement (5), C_1C_2 in rhymes is allowed only if C_2 is lower than C_1 in sonority. In this case C_2 (and eventually a third C_3, see fn.1) is incorporated into the rhyme; I will call this second process Right Rhyme Incorporation. If the reverse obtains, i.e. if C_2 is lower than or equal to C_1 in sonority, C_2 is an impossible rhyme element and is syllabified as

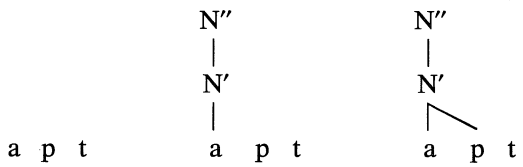
an onset. Following Empty Syllabification (11) the minimal structure to create a well-formed syllabic configuration is introduced (13c). (13) gives the syllabification processes discussed so far:

(13) *Syllabification*
- a. *Core Syllabification*: Categorize sonority peaks as nuclei; adjoin any C or permissible cluster as an onset.
- b. *Right C Adjunction*: Associate any adjacent right C to the nucleus.
- c. *Maximal Syllabification*: If the application of a. and b. leaves unsyllabified Cs that violate onset or rhyme sonority requirements, reapply a. and b. to syllabify these Cs with empty skeletal elements created following Empty Syllabification (11).
- d. *Rhyme Incorporation*: Adjoin a second C to a word final VC rhyme. Adjoin any following *s* to a VC(C) rhyme.

Notice that Rhyme incorporation will adjoin only Cs that satisfy the sonority requirement (5) because those that do not will have been already syllabified as onsets by Maximal Syllabification.

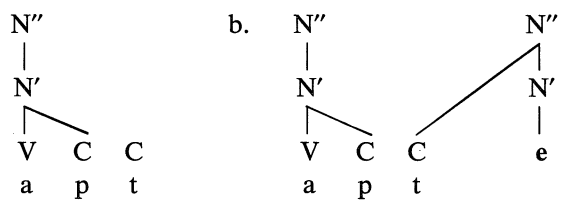
Applying the first two steps (13a,b) to /ápt/ we would get the derivation shown in (14):

(14) a. b. c.



We now apply the following step (13c), Maximal Syllabification to the final *t* in (14c). Since by the sonority scale (4) $C_1 = C_2$ in sonority, the cluster C_1C_2 violates rhyme requirements, and C_2 is syllabified as the onset of an empty nucleus, the "minimal structure necessary", according to Empty Syllabification (11), to syllabify C_2. We then reapply (13a,b) following (13c) to derive (15b) from (14c) (=(15a)).[4]

(15) a. b.



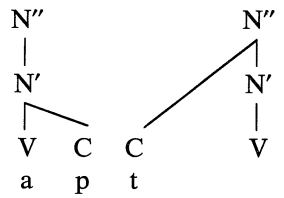
If affixation adds a vowel initial suffix (as in it *əpt*+*ísim* in (3a.iii)) the *í* will be adjoined immediately to the final *t* and syllabification will apply regularly to give *əp.tí.sim*.[5]

Of course other applications of free syllabification can give rise to too many structures containing empty elements. In general an empty element, either created by syllabification, as in (15), or by deletion rules, should be allowed or "licensed" by general principles. The structure (15b) is disallowed because there is an empty nucleus. One way to make a structure containing an illicit empty element well-formed is to eliminate the empty element by insertion of segmental material into the empty position. Assume that the vowel insertion rule for Catalan has the simplest possible form:

(16) *V Insertion*: Insert V

Insertion is defined as a process substituting an empty element **e** by phonological material. Insertion has to create a legitimate configuration. It cannot be inserted, say, between the *p* and the *t* where no nucleus N will dominate it. The only site of insertion in (15b) is the second nucleus position; the result of V insertion on (15b) is (17).

(17)

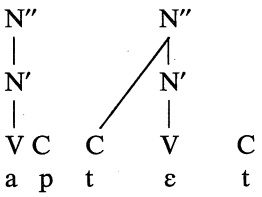


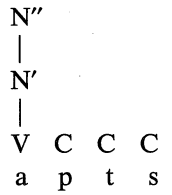
Following standard theories of underspecification, V will be interpreted as the unspecified vowel, which is *ə* in Catalan, and we will get *áptə*.

Vowel insertion also applies when the cluster is followed by a consonant, as illustrated already in (3c). Within our framework it is not necessary to include the conjunctive set {#, C}. In both cases, CC# and CCC, only the first C is syllabifiable; the empty nucleus will be created and filled in by insertion. C_3 in $C_1C_2C_3$, which initially would be unsyllabifiable, will be syllabified with the added nucleus in the rhyme. The possibility of inserting the V after C_3 by creating the empty nucleus at the end is ruled out because both VC_1C_2-C_3V and VC_1-C_2C_3V are impossible syllabifications: VC_1C_2 is not a possible rhyme, as already seen, and C_2C_3 is not a possible onset. V insertion at the end would be ruled out independently if syllabification is cyclic (see fn. 5). To illustrate this, consider the two possible cases of nonfinal clusters, when the cluster is followed by a vowel and when it is followed by a consonant. When *ápt* is followed by the diminutive suffix *ét* and the plural suffix *s*, syllabification proceeds as shown in (18):

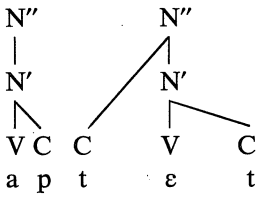
(18) a. á p t é t b. á p t s

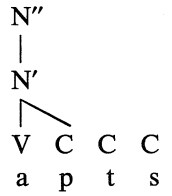
Core Syllabification



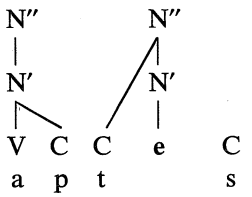


Right Adjunction

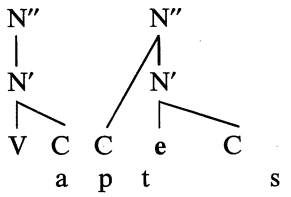




Core Syllabification (by Maximal Syllabification)



Right Adjunction



After insertion of V we get, in the case of (18b), áptəs.

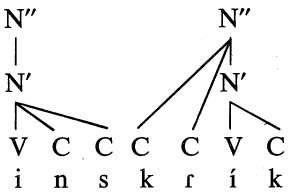
Consider now the mirror image case, namely initial vowel insertion before word initial unpermissible clusters. What are the predictions if we just apply the same mechanisms developped for final insertion? Consider the case of word-initial *sC* clusters. In noninitial position the cluster is broken up by syllabification. Thus *in*+*scric* 'I inscribe' is syllabified *ins.cric*, because *s*, as mentioned before, can allways be attached as second C element of a rhyme (see fn. 1). When the prefix *in* is not present, the *s* is not syllabifiable as an onset and triggers *ə* insertion. Other examples follow:

(19)

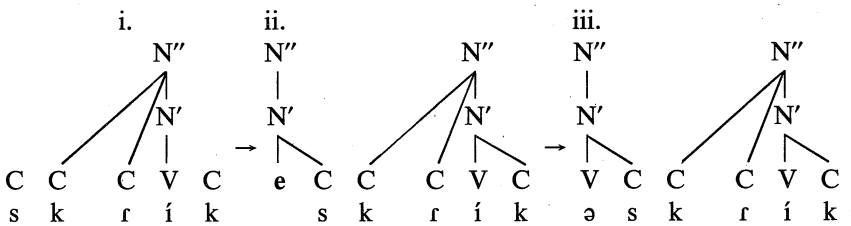
Initial	*Noninitial*
əskɾík 'I write'	in+skɾík 'I inscribe'
	ət+skɾík 'I ascribe'
	pɾə+skɾík 'I prescribe' (cf.pɾə+téŋ 'I pretend')
	pɾu+skɾík 'I proscribe' (cf. pɾu+iβéʃu 'I prohibit')
əspiɾəsjó 'aspiration'	in+spiɾəsjó 'inspiration'
	kun+spiɾəsjó 'conspiration'
	rə+spiɾəsjó 'breath'

(20) shows the syllabification of *inskɾík* and the different stages in the derivation of [əskɾík] from /skɾík/:

(20) a.



b.



In (20a) the morpheme initial *s* can be syllabified with the prefix syllable; in (20b) it is word initial and only the second and third consonants of the cluster can be syllabified as an onset (20bi). The *s* is assigned, as in the case of epenthesis, to a rhyme node which by Maximal Syllabification proceeds to add the minimal material to syllabify the *s*: an empty nucleus is created and the *s* is adjoined to its rhyme (20bii) (see fn. 4). The "Insert V" applies and V is interpreted as *ə* giving (20biii).

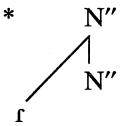
It is important to notice that a simple rule inserting V will have different effects depending on the context of insertion. In the case of epenthesis the site is created by addition of an extra nucleus. There will be no adjacent vowel features (except in a language with vowel harmony) and the quality of the vowel is gotten by redundancy rules: we get the unmarked vowel. If V Insertion introduces a vowel adjacent to another vowel we predict

spreading, hence lengthening. This is the case of Italian Vowel Lengthening (Nespor and Vogel (1986, 131-132)). A stressed vowel is lengthened in nonfinal open syllables: *p[é]nsa* 's/he thinks', *pens[á:]va* 's/he thought', *penser[á]* 's/he will think'. Imagine, simplifying matters somewhat, that we require that nonfinal stressed syllables are always syllabified with a (binary) branching rhyme. In *p[é]nsa* the branching rhyme syllabifies the *é* and the *n*. In *pens[á:]va* the *v* is syllabified as an onset; since the preceding syllable is stressed and nonfinal, it will branch, creating an empty position into which the vowel will be inserted. Being adjacent to another vowel, it will get its quality from it, and lengthening will result.

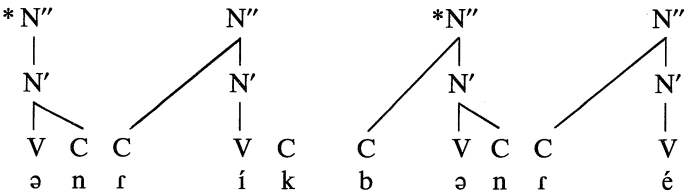
This predicts an asymetry between vowels and consonants in the cases we are examining here. Creation of an empty nucleus will always result in the appearance of a vowel that is not in contact with another vowel. When a consonant is inserted to allow proper syllabification, it might be isolated from other consonants, as in the case of so-called antihiatic consonants, or the initial onset insertion in Arabic that will be mentioned at the beginning of next section. But very often it will be adjacent to other consonants and it will get (partially or totally) the segmental specifications by spreading, as will be shown directly.

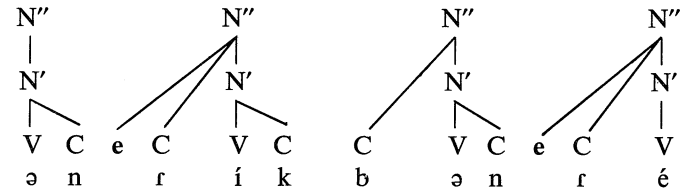
I will now turn to consonant insertion. I will examine a case which affects syllable initial *r*. The distribution of Catalan tense [r] and the alveolar flap [ɾ] is similar, though not identical, to the one found in Portuguese and Spanish. Intervocalically they contrast, the tense variant being traced back in most analyses to a geminate/ɾɾ/. Word initially and syllable finally only the tense variant is found, whereas in the onset [r] appears at the absolute beginning of a postconsonantal onset, and [ɾ] as the second member of the onset. Leaving aside the case of intervocalic [ɾ], in the onset *r* has to be tense or preceded by another consonant. Imagine that in general we require that /ɾ/ can only be the second member of an onset, a structure like (21) not being able to be syllabified.[6]

(21) *



Consider now two examples, /ənɾík/'Henry' and /bə́n+ɾé/ 'I'll sell'.[7] Unlike other consonants in *Cr* clusters, *n* cannot be syllabified as the first element of the onset. Onsets must show increasing sonority, but this is not the only condition. Particularly, *r* can only be preceded by obstruents in the onset. Usually syllabification rules would create (22a), which is not properly syllabified. Hence by Maximal Syllabification we get (22b) instead. Empty Syllabification creates the minimal structure with empty material to allow proper syllabification: an empty **e** preceding *r*:

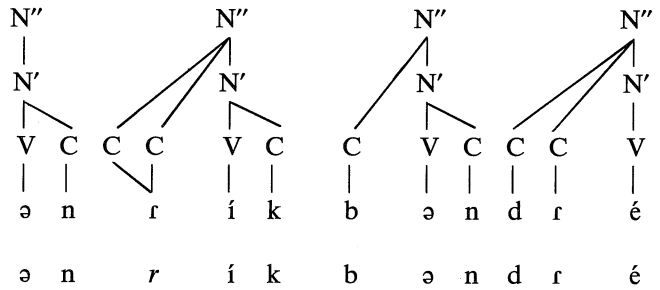
(22) a. 

b. 

Insertion of V would create an extra syllable, hence according to the stipulation of Empty Syllabification (11) that only the "minimal structure necessary" be created, C insertion is preferred. Notice that in principle **e** could also be inserted after *ɾ*; but in this case, since an unmarked C is interpreted as an obstruent, the *ɾC* onset will show increasing sonority, the C will be not syllabifiable, and the structure will be marked as ill formed.

We therefore get the structures in (23) where C insertion has applied to (22b). The interpretation of CCC is however different in each case:

n r

(23) 

The segmental properties of the empty C are governed by Underspecification Theory, by the Association Conventions, and language particular rules. As justified in Mascaró (1987), the derived character of *n+ɾ* in the second case allows rules of Voice and Place Spreading to apply, the C getting these specifications from the *n*. In the first example the *nɾ* sequence is underived; the Association Conventions just associate the C to the segmental properties of the *ɾ*. Geminate *ɾ* is interpreted, like in the case of intervocalic /ɾɾ/, as tense *r*. Hence the contrast between [ə*n*rík] and [bə*nd*ɾé].[8]

Since we have already a rule of V insertion (16), the rule of C insertion and (16) can be viewed as particular instances of a rule that inserts a skeletal slot. All cases of insertion, moreover, insert elements into empty syllabified positions. The insertion rule is restricted to introduce V or C to "licit" sites, i.e. propery syllabified es:

(24) *X Insertion*: Insert X (X = C, V; e is dominated by N″)

The rule "Insert X" is also operative in other cases. In Mascaró (1986), a rule that geminates *b* and *g* before *l* under certain rather complex conditions, and which would have the standard form of (25a) is simplified to (25b):

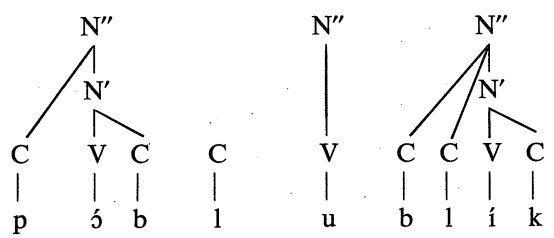
(25) a. $C \rightarrow CC/V \underline{\quad} C+$ (b/g, l)

b. $C \rightarrow CC$ / [+voice] ___ R (R=rhyme)

Overapplication of (25b) in contexts other than those of (24a) is dealt with through an independent rule of degemination. The basic idea of the analysis is that the effect of (25b) is to make the unsyllabifiable *bl* and *gl* sequences syllabifiable by addition of an extra consonant. A reanalysis of Mascaró (1986) along the lines proposed here is straightforward: following Empty Syllabification (11), creation of empty skeletal slots e will operate only in those cases in which an unsyllabified sequence is rendered syllabifiable. Thus the contrast between geminated [pɔ́bblə] 'people' and nongeminated [ublík] 'oblique' (phonetically [uβlík] by spirantization) is due to the fact that underlying *bl* in /pɔ́bl/ cannot be syllabified properly, whereas *bl* in /ublík/ can. Maximal Syllabification must create not only a final nucleus, but it must also create an extra onset element for /pɔ́bl/ which becomes thus [pɔ́bblə]:

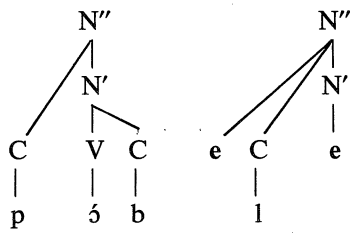
(26) *Core Syllabification, Right C Adjunction*

a.



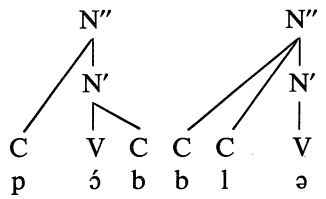
Reapplication by Maximal Syllabification

b.



C, V Insertion

c.



3. DELETION

We now turn to the cases of deletion.

To illustrate the kind of the problem that an obligatory rule analysis faces, let's consider a typical case. Standard Arabic syllable structure allows a consonantal (including glide) onset followed by a rhyme which consists of a complex nucleus, or a simple nucleus plus a single consonant coda. Hence the possible patterns are CV, CVC, and CVV Exceptionally, the slightly more complex structures CVVC, CVCC can arise; I will not discuss them here. These are surface patterns. In some cases we find a word ending in a long vowel followed by an (underlyingly) CC initial word. A sequence ...VV#CC... cannot be syllabified, because either we get a syllabic division ...VVC/C... with a syllable ending in *...VVC, or a syllabic division ...VV/CC... with a syllable beginning in *CC... In these cases the well formed pattern is gotten by deletion: the long vowel is shortened.

(27) a. fii kutub
'in' 'books'
fii l kutub
'the' 'books'

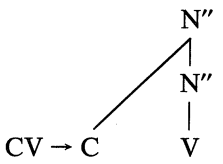
b. fii kutub (no change)

fiØ l kutub

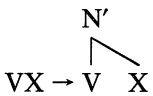
Consider a typical analysis positing the rule in (28a) and rules of syllabification like (28b,c) that syllabify all and only the permissible structures:

(28) a. $V \rightarrow \emptyset / \_\_ V\ C$

b.



c.

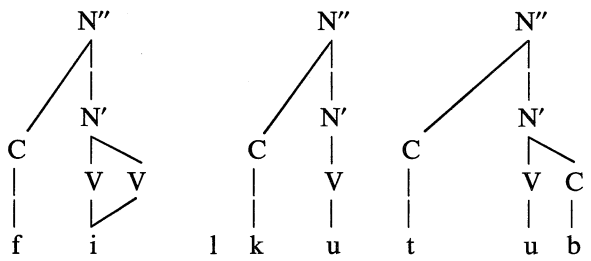


X = C,V

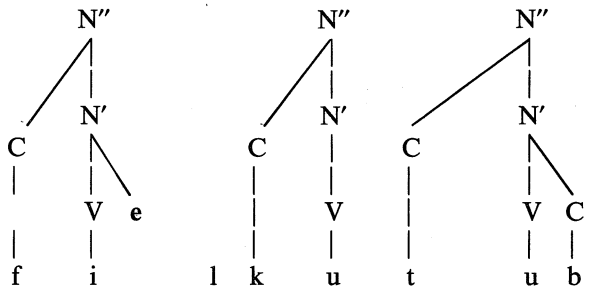
It can be easily seen that the problem that such an analysis presents is that there is no relation whatsoever, in the formalism, between the rule (28a) and the rules (28b,c). If vowel deletion is optional and context free, it will either delete a syllabified vowel, leaving an ill-formed structure, or it will delete and unsyllabified vowel giving rise to a well-formed structure. An alternative to (28), along the lines of French C deletion mentioned in section 2, would be to propose that the deleting V is not syllabified and that unsyllabified vowels delete. But this still faces a problem. How do we ensure that the nonsyllabified element is the V? We would have to complicate (28c) by saying that when VX are grouped in a rhyme an intermediate V can be skipped, namely the unsyllabified V that will delete. Under the present analysis, instead, the syllabification rules (28b,c) will apply in the following way to *fii lkutub*:

(29) a. fii lkutub

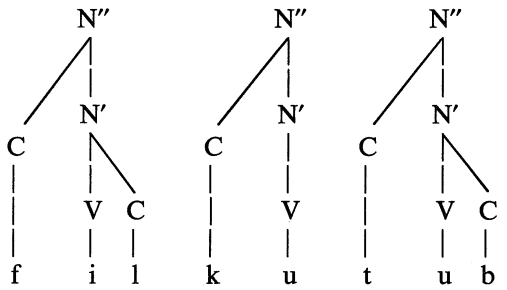
b. *Syllabification*



c. *Delete V*



c. *(Re)syllabification*



Syllabification proceeds in the usual way, and only the VV of the VVC sequence will be syllabified. V deletion will give an ill-formed structure containing [$_{N'}$ V **e**], a form which will be avoided if resyllabification applies, as in (29c). If V deletion is applied to *fii kutub* (27a) it will give *fie kutub*, with an unpermissible unsyllabified **e**. Thus free application of V deletion gives rise to the correct structures. When the conflict arises because of too complex C clusters, an insertion strategy is used instead of deletion. Thus in absolute initial C_1C_2, or in ...$C_0C_1C_2$, only C_1 cannot be syllabified neither as onset nor as rhyme. Consider for instance underlying *ktub lkutub* 'write the books!' with a $C_1C_2VC_0C_1C_2VCVC$ sequence. After the first two steps of syllabification (13a,b) we will get $C_1[_\sigma C_2VC_0]C_1[_\sigma C_2V][_\sigma CVC]$. By Minimal Syllabification (13c) the minimal structure to syllabify both C_1 is created. A nucleus is enough, as it was for Catalan, for the second C_1, since C_1V is a permissible syllable. For the first V, however, an external nucleus[9] is not enough, because all syllables must have a C onset. Hence a nucleus and an onset are created which are filled by V and C insertion to give *CVC*. We thus get finally *ʔuktubi lkutub* (the nature of the inserted vowels is partly idiosyncratic).

I now turn to a more detailed examination of the clusters *lt, mp, nt,* and *ŋk* illustrated in (3); these have been always treated as a case of consonant deletion. In several analyses, since Lleó (1970), it has been correctly pointed out that the additional condition for deletion in consonantal clusters is homorganicity: within clusters of nondecreasing sonority those which are homorganic trigger deletion (3bii,cii), whereas the rest are left unaffected (3bi,ci). In Mascaró (1984) this property was related to some recoverability of deletion effect. In other words, not the whole consonant is deleted, only the timing unit: the other properties are recoverable through the preceding unit, because there has been assimilation.

Deletion occurs in the cases of *lt, mp, nt*, and *ŋk*. To begin with, there is a problem which affects the underlying representation of such segments. In the cases of heteromorphemic clusters, like *mb* and *l'λ* in (30d), the underlying form of the members is determined by the form of morphemes in nonassimilatory environments like those in (30a,b,c):

(30) a. ben 'well"
mal 'ill, wrongly'

b. əstá 'to be, stay'
biŋgút 'come' participle
λéŋgwə 'tongue'

c. benəstá 'well-being'
maləstá 'disconfort'

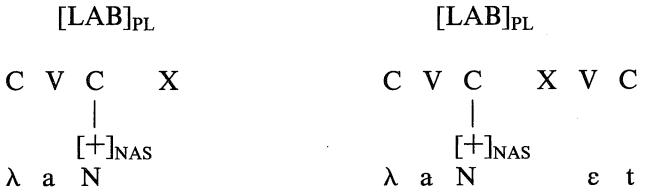
d. bembiŋgút 'welcome'
mal'λəŋgwát 'foul-mouthed'

Consider now homomorphemic clusters. For nasal + C they come out phonetically as [mp], [nt], [ŋk]. Since there is independent assimilation, as shown by (30d), it has been proposed that the place has not to be stipulated for each element of the cluster. Since assimilation is regressive, the second element could be specified for place, whereas the first not: /Np/, /Nt/, /Nk/, where /N/ is the unspecified nasal. This is the analysis in Kiparsky (1985). I will propose instead that underlying structures are still less specified, in fact with the minimal necessary specifications: the first element of the cluster is specified for nasality (for lateral in the case of *l*), the second is an unspecified timing slot, represented here as X. They also have a floating place autosegment that will determine the place properties of the cluster. The rule of Deletion will have the general structure (31):

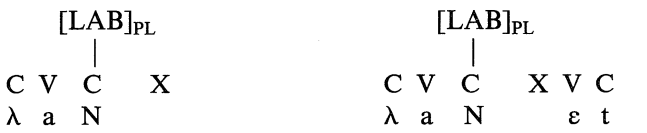
(31) Delete timing unit (i.e. delete X, V, C)

Consider the case of /λámp/ → [λám] vs. /λamp+ét/ → [λəmp+ét]. Their underlying structures are those in (32a), where only the properties of the cluster are represented; nasality is also omitted in the rest of the derivation, and syllable structure appears in a more simplified form.

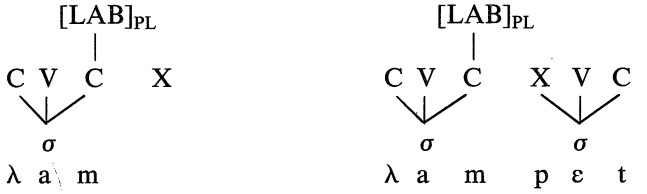
(32) a.



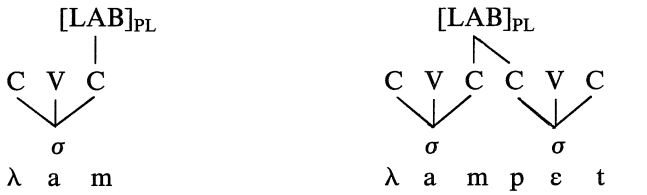
b. *Association Conventions*



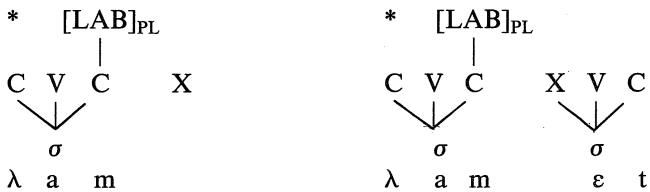
c. *Syllabification*



d. *Insert C, Delete X* (applied); *Spreading*



d.′ *Insert C, Delete X* (not applied)



The Association Conventions will link $[LAB]_{PL}$ to the nasal C, and the Syllabification rules (13) will apply. By Core Syllabification and Right C Adjunction the first syllable of each example will be created. By Maximal Syllabification (13c) the empty slot X is syllabified as an onset in the second example. In the first example of (32a) this is not possible because an empty X can only be syllabified by Core Syllabification and Right C Adjunction, whereas X in *λamp* is syllabifiable only by Rhyme Incorporation (13d); recall that (13d) requires information about sonority that the empty X cannot furnish. Now insertion (24) and Deletion (31) are free to apply (32d) or not (32d'). Insertion cannot apply to *λamp* because it only applies to syllabified Xs. The structures in (32e) are ill formed because they contain an empty timing unit. I rely on the reasonable assumption that C can be interpreted by redundancy rules as the unmarked consonant and V as the unmarked vowel (*t* and *ə*, respectively in Catalan), but X cannot receive a proper interpretation.

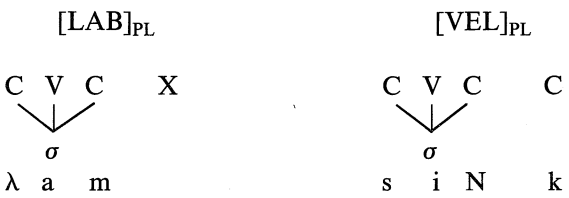
The facts of deletion of consonants in clusters are quite more complex than our presentation so far has assumed. These complexities regard the cases of *ŋk, lt*, and also the clusters *rt* and *st*, which haven't been examined before. I exemplify the relevant data below and will then organize them in the right descriptive generalizations.

(33)	a.	siŋk+é 'fifth'	síŋ, siŋk 'five'	síŋ+s pl.
	b.	ált+ét 'high' dim. mɔ́l+tə 'ground' fem.sg.	ál 'high' mɔ́l+t, mɔ́l masc. sg.	ál+s pl. mɔ́l+s masc. sg.
	c.	gúst+ét 'taste' dim. súrt+i 's/he goes out' subj.	gúst, gús 'taste' súrt, súr 's/he goes out' indic.	gúst+us pl. súr+s 'you go out'

Let's begin with the cluster *ŋk*. Unlike *nt* and *mp*, *ŋk* can optionally retain the second member in absolute final position. But *ŋk*, differs from *nt, mp*, and also *lt* in that /n/, /m/ and /l/ are underlying segments, but [ŋ] is not. Now consider the lexical derivations that follow from the structures posited above for /λamp/ and /sink/:

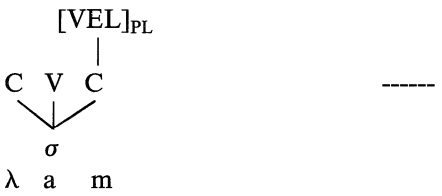
(34) a.

b. *Syllabification*



c. *Delete X* (not applied), *Association Conventions*

c.′ *Delete X* (applied), *Association Conventions*



Syllabification will not create an extra syllable in the case on /sink/ because the sonority in the cluster is decreasing. The final consonant will then be adjoined to the rhyme by Rhyme Incorporation (13d). Since ŋ is not an underlying segment, structure preservation does not allow $[VEL]_{PL}$ to be attached to a nasal by the Association Conventions in (34c); hence it is linked to the unmarked (ultimately obstruent) C. This will be the final structure.

Postlexically the $[VEL]_{PL}$ node in (34c) will be able to associate to the nasal, postlexical rules being not subject to structure preservation. This will be gotten through an independent process of Spreading (see Mascaró (1987)) that is responsible of place assimilation. We thus get [síŋk]. Application of "Delete X" takes also place postlexically, and it is responsible for the (optional) deletion of the *k*. I will return to this postlexical deletion later.

Let's now consider the case of *lt* (33b). When we have homomorphemic *lt* we get always deletion; when we have heteromorphemic *l+t*, deletion

applies only before consonants obligatorily. This is the single case where we find examples of "deleting" clusters which are not monomorphemic, but arise by affixation. It involves verb stems ending in consonant and the irregular past participate marker *t* (regular past part. morpheme is *d*). In this case the segmental values of the *t* are not dependent on the preceding segment, since it can appear in different environments. Compare the 3 pres. ind. forms which consist of the bare root, and the participial forms, exemplified in their fem.sg. and masc. sg. forms:

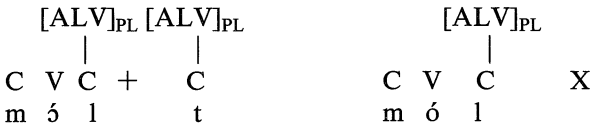
(35) a.	3 Pres. ind.	Past part. (fem. sg.)	Past part. (masc. sg.)	
	dú	dú+tə	dú+t	'bring'
	mɔ́r	mɔ́r+tə	mɔ́r+t	'die'
	mɔ́l	mɔ́l+tə	mɔ́l+t	'grind'
	rəzɔ́l	rəzɔ́l+tə	rəzɔ́l+t	'solve'
	əpsɔ́l	əpsɔ́l+tə	əpsɔ́l+t	'acquit'
	dizɔ́l	dizɔ́l+tə	dizɔ́l+t	'dissolve'

The cases we are interested in are those with final *l+t*. Compare their phonetic forms with those of the monomorphemic *lt* clusters:

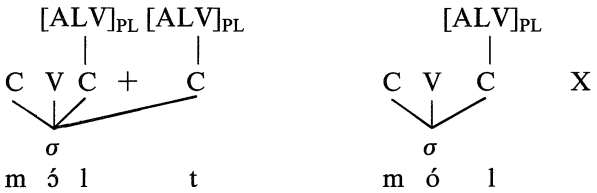
(36) a.	rəzɔ́l+t	rəzɔ́l+tə	
	əpsɔ́l+t	əpsɔ́l+tə	
	dizɔ́l+t	dizɔ́l+tə	
	mɔ́l+t	mɔ́l+tə	
b.	mɔ́l	mɔ́lt+ə	'many' masc. sg.-fem. sg.
	məlál	mələ́lt+íə	'sick' – 'sickness'
	sál	sált+ən	'jump' – 'they jump'
	əmpél	əmpə́lt+át	'graft' – 'grafted'
	bɔ́l	bɔ́lt+ən	'turn' – 'they turn'
	insúl	insult+án	'insult' – 'insultant'

As opposed to monomorphemic cases in (36b), the examples in (36a) show optional preservation of the final stop. Before postlexical regressive assimilation applies, yielding [l̪t] in case the *t* is preserved, the representations of polimorphemic *mɔ́l+t* 'ground' and monomorphemic *mɔ́l(t)* 'a lot' are as in (37a):

(37) a.



b. *Syllabification*



Again X cannot be syllabified, whereas the fact that the *t* in the first example is an independent morpheme, hence a C specified for place, allows syllabification.[10] The X will be able to syllabify if a suffix vowel follows as we have seen above.

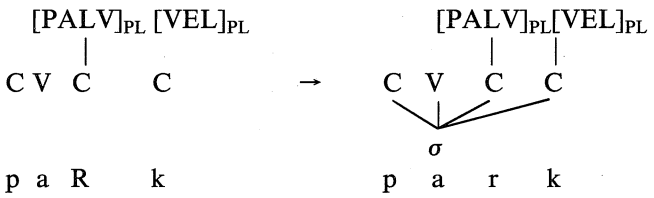
Consider now the case of *rt* and *st*. The precise phonetic representation of the examples of (33c) is shown below:

(38) a. gus̪t̪ét gúst̪, gús gúst̪us
súrt̪i súrt̪, súr

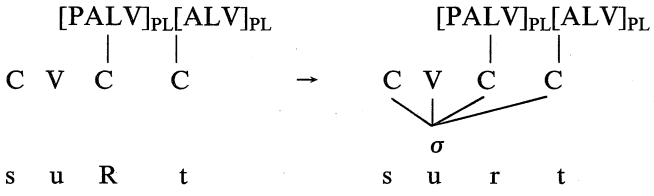
[s], [r] are both postalveolar, and [t̪] is dental. This means that there is no place assimilation. This precludes the possibility of having for the clusters *st* and *rt* underlying structure CX posited for *mp, nt, lt*, and *ŋk*, which by assimilation (Spreading) become homorganic, after C insertion. If this were the case we would expect homorganicity in the cases where the *st* and *rt* clusters are preserved. The place values for the sonorant and for the obstruent are gotten independently by redundancy rules. Postlexically we can get optional deletion, like in the case of *ŋk*, a process which I will not discuss here.

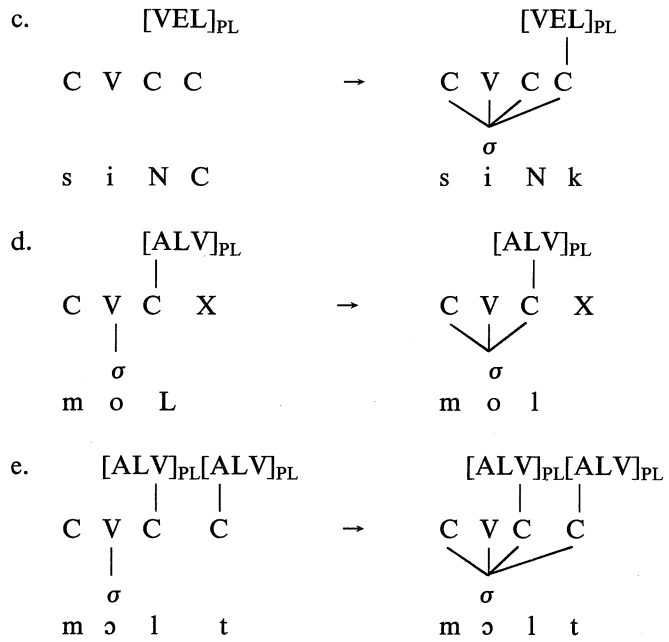
To summarize, I give an example of every cluster or group of clusters:

(39) a.



b.



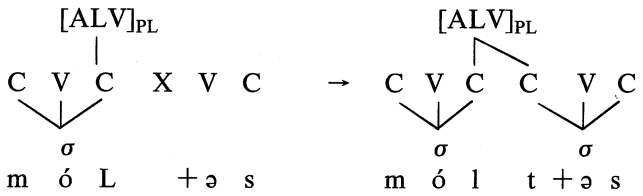


The lexical derivation is the same for *rk* (39a) and *rt* (39b). They do not undergo assimilatory processes and show up their final cluster unaffacted. Only postlexically the closeness of place of *rt*, *st* determines optional deletion. For *nk* (39d) optional deletion is also due to postlexical application, but here there is no lexical deletion because structure preservation prohibits $[VEL]_{PL}$ linking to the nasal; since it is linked to the final element of the cluster C deletion would leave at the end of lexical phonology an illicit floating $[VEL]_{PL}$. Unlike *nk*, *lt* is a case of obligatory deletion; here $[ALV]_{PL}$ can attach to the initial member of the cluster and the free X can undergo lexical deletion. Finally *l*+*t* differs from *lt* in that *t* is a separate morpheme and is separately specified for place. The result is a situation similar to *rt*, namely two different place autosegments that prevent deletion of the C, which can take place only (optionally) at a postlexical stage.

Finally I exemplify the cases of nondeletion caused by affixation of word-initial morphemes. The first column shows the structure after affixation. In (40a) the empty X is syllabified, which allows "Insert C" to apply. The single $[ALV]_{PL}$ place autosegment determines, through Spreading, an independent language particular rule, the homorganicity of the cluster. In the case of *nk* (40b) Spreading is able to apply postlexically, not being subject to structure preservation. In the other cases (40c) the structure is resyllabified; the rules of assimilation (Deassociation of place

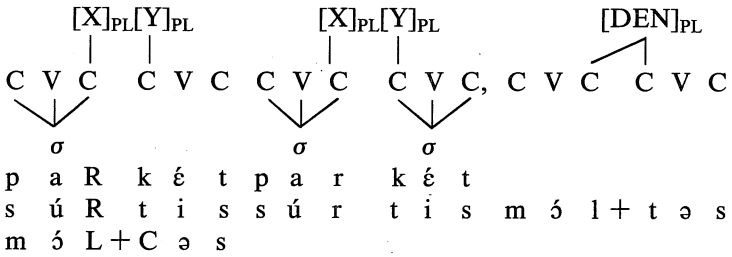
in the rhyme and Spreading, see Mascaró (1986), (1987)) apply in the case of *lt*.

(40) a.



b.

c.



I will finally examine a case of postlexical vowel deletion. This is again of deletion under identity. Vowel degemination is a common phenomenon (see Nespor (1987) for Greek and Italian). In Catalan word internally sequences of two vowels are generally maintained, even if identical. In rapid speech their length can vary but they are clearly distinguished from true degeminated vowels. (Of course some morpheme internal sequences are reanalized lexically with a single vowel; thus for some speakers orthographic *neerlandès* is always [nərləndés]):

(41) ʃiíta 'Shiite'
gíi 's/he guide' pres. subj.
niilístə 'nihilist'
bəəmén 'vehement'
nəərləndés 'Dutch'
səərjá 'Saharian'
suurétə 'sweat' dimin.
əlkuulízmə 'alcoholism'

fluurá 'to fluoride'
əktúu 'I act'

Across word boundaries we find deletion, which is controlled by prosodic factors which I will not discuss here. What is more interesting is the fact that the other necessary conditions for deletion to take place are either identity of the vowels, or presence of a shwa. In other words, two identical vowels can be reduced to a single vowel, and a shwa in contact with another vowel can delete. Here are some examples: —

(42)	a.	Dem[á á]n de venir	[á]	'They have to come tomorrow'
		Aix[ó ó]bre la porta	[ó]	'This opens the door'
		N[ó ó]mplən la sala	[ó]	'They do not fill the room'
		Per qu[é é]poques curtes	[é]	'Why short periods'
		Pots[é é]rba fresca	[é]	'Perhaps fresh grass'
		Alg[ú ú]sa el mateix	[ú]	'Someone uses the same'
		Ten[í í]infims resultats	[í]	'To have poor results'
	b.	Dem[á ə]rribaràs	[á]	'You will arrive tomorrow'
		Cas[ə á]lta	[á]	'High house'
		Aix[ó ə]grada	[ó]	'This pleases'
		Sempr[ə ú]sa el mateix	[ú]	'S/he always uses the same'
		Ten[í ə]quests resultats	[í]	'To have these results'
		Sempr[ə ə]grada	[ə]	'It always pleases'
	c.	Dem[á ó]bre la porta	[áó],*[ó], *[á]	'S/he opens the door tomorrow'
		Per qu[é ó]mplən la sala	[éó], *[ó], *[é]	'Why do they fill the room'
		Pots[é ú]sa el mateix	[éú],*[ú], [*é]	'Perhaps s/he uses the same'
		Ten[í é]rba fresca	[íé], *[é], *[í]	'To have fresh grass'

The fact that shwa deletes in contact with a different vowel seems odd at first sight. But since shwa is the unspecified vowel in Catalan, the condition for deletion can be reformulated in terms of nondistinctness. Identical vowels are nondistinct, and a vowel with no properties is not distinct from a specified vowel.

It should be pointed out that shwa in contact with another vowel behaves parallely to geminate vowels word internally, and does not delete, neither in nonderived nor in derived environments:

(43)

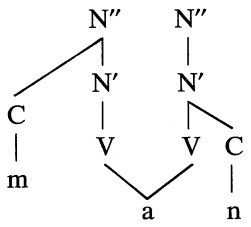
Nonderived	*Morphologically derived*
rəó 'reason'	nú+ə 'nude' fem.
bəínə 'neighbor'	rə+iŋgɾés+u 'I reenter'
diəβétik 'diabetic'	kɾé+ə 's/he creates'
pləé 'pleasure'	tɾí+ə 's/he choses'

Phonologically derived
ʒuənét 'John' dimin. ← ʒuán
kəɔ́tik 'chaotic' ← káus
gɾəəλétə 'grid' dimin. ← gɾəéλə
əmbɾiəγézə 'drunkenness' ← əmbɾiák

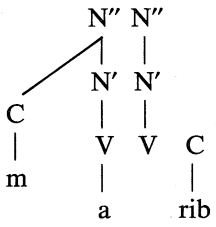
This postlexical deletion involves more radical elimination of structure than the processes discussed before, since it implies the elimination of a whole syllable. Still the rule can be formulated in a very general form. Consider the structures that trigger deletion (44a,b) and those that do not (44c), (42), (43). Recall that the umarked vowel *ə* is represented as a V having no segmental specifications:

(44)

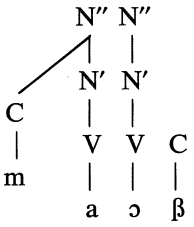
a. De*m*[*á á*]*n* de venir



b. De*m*[*á ə*]*rr*ibaràs



c. De*m*[*á ɔ*]*b*re la porta

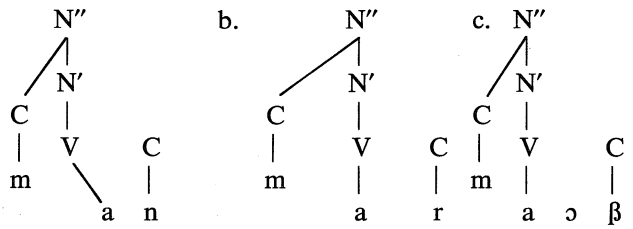


The rule of that is responsible for postlexical vowel deletion has the form of (45):

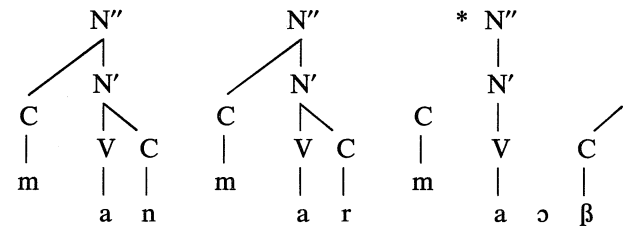
(45) *Postlexical Syllabic Deletion*: Delete N″

I will assume that (45) has the effect of deleting a syllable node and all nodes from which it is projected, i.e. N' and N. Delete N'' and Delete V apply only postlexically. The structures resulting from both rules are resyllabified and produce a licit structure only in the first two cases (46a,b); in the third case (46c) we will have a floating *ɔ* (or, depending on which syllable is deleted, a floating *a*). Notice that nondistinctness has precisely the effect of leaving no floating material, hence a permissible structure.

(46) a. *Delete N″*



b. *Resyllabification*

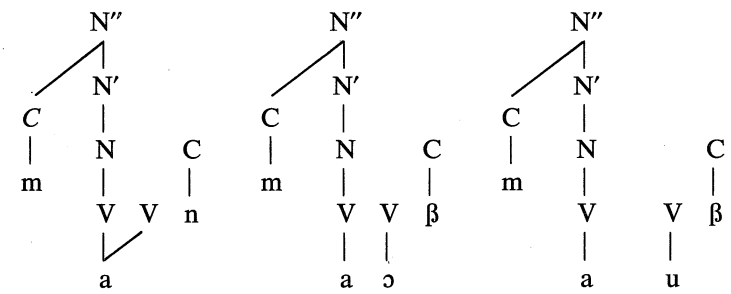


Dem[á]n de venir Dem[á]rribaràs *Dem[á]bre la porta

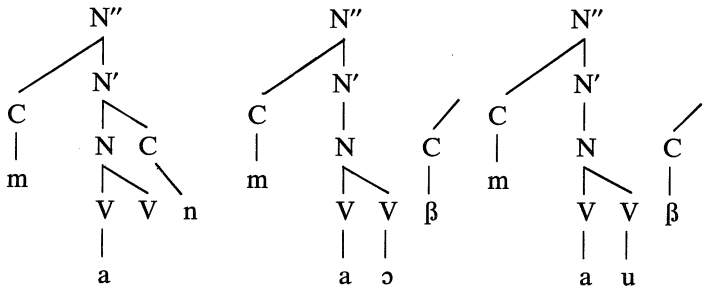
Consider now an apparently different process, glide formation. I will assume that glides are dominated by N, the syllabic nucleus. Thus *naus* 'vessels' has the structure [[n [[$_N$ a u] s]]. There is in fact no process of glide formation. Glide formation is a particular instance of Syllable Deletion. A phrase like *Dem[á] [u]brirà* becomes usually *Dem[á] [w]brirà*. Compare now this case with our previous examples *Dem[á á]n de venir*, *Dem[á] [ɔ]bre*. If Delete N″ does not apply we get (47a); N″ deletion derives (47b), and then the V will be attached to N (47c). Then optional V deletion can apply (47d); if it does not apply the surface structure will be (47c):

(47) a. Dem[á á]n de venir Dem[á] [ɔ]bre Dem[á] [u]brirà

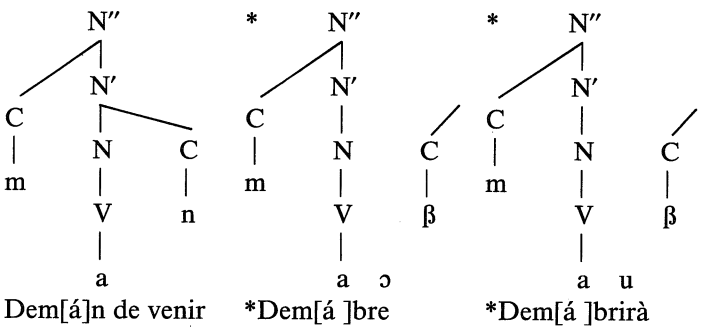
b. *Delete N″*



c. *Resyllabification*



d. *Delete X*



The final structures in (47) show deletion which is allowed for *Dem[áá]n* because of nondistinctness, but in the other two cases the segmental specifications are distinct, and deletion leaves an illicit floating autosegment. It shoud be pointed out that all the starred structures are impossible, whereas the unstarred ones are possible, but under different conditions, both of structure and performance. The most normal result would be [á], [áó] and [áw]. Both [á:] and [au] require slow tempo or syntactic distance (e.g. topicalization or dislocation of *demà*). The structures which result from N" deletion coupled with no deletion of the timing unit deserve some comment. I have already said that a branching nucleus is interpreted as a diphthong. Thus in the third example we get [áu̯] (equivalently, [áw]). [áɔ̯] is a monosyllabic decreasing diphtong. If the sequence is inverted we get [ɔ̯a], as in *O ara o mai* 'either now or never' [ɔ̯árɔmáj]. Whenever there are vowels of equivalent sonority, whether the diphtong is rising or decreasing depends on stress and other not well understood conditions. This is the case of what we have transcribed as [aa̯] in (47d), and of cases like the sentence in (42c) *Per qu[é ó]mplən la salâ*, which cannot be **Per*

qu[*é*]*mplən la sala*, nor **Per qu*[*ó*]*mplən la sala*, but both the disyllabic solution [é ɔ́] and the monosyllabic solution *Per qu*[$\overset{\varepsilon}{\wedge}$ ó]*mplən la sala* are possible. In the last case there is no immediate reason to prefer [ɛ̂ɔ́] over [é$\hat{\text{ɔ}}$], or any intermediate solution [$\overset{\varepsilon}{\wedge}$ɛɔ$\overset{\circ}{\wedge}$], i.e. a rising-falling diphtong whose segmental structure is [ɛɔ], which is consistent with our final structure where both *ɛ* and *ɔ* are dominated by a single nucleus.

NOTES

1. CCs, for any C, is possible in homomorphemic clusters, *esfi*[*ŋks*] 'sphinx', and very common in heteromorphemic ones, by suffixation of the plural *-s* suffix: *po*[*rks*] 'pigs', *infe*[*rns*] 'hells', *amo*[*rfs*] 'amorphous-pl.', *go*[*lfs*] 'gulfs', *desf*[*alks*] 'embezzlements'. The same is not true of the mirror-stage situation: syllable initially sCC is impossible, and sC extremely restricted to s-glide sequences, which are very uncommon word-initially (loans like [*sw*]*ing*). In all other cases those sequences trigger *ə* insertion. Loanwords with final CCs and with initial sCC are also treated regularly in a different way: *hertz* [rts], [rs], *urbs* (<Lat.) [rps], *Marx* [rks], *Aux* (Aux(iliary)) [wks], -compared to *Stravinsky* [əstr], *Springsteen* [əspɾ], *Scriabin* [əskɾ], *squib* [əskw].
2. (11) should be probably weakened to "syllabify *all/all syllabifiable* segmental material", where the option to sillabify, say *apt* as [ap]$_\sigma$[t e]$_\sigma$ or as [ap]$_\sigma$t is language particular. The second case would be a candidate for deletion.
3. The other possible case of insertion and deletion is that of second person singular verbal forms. Thus /sént/ → [sén] 's/he hears' and /sénts/ → [séns] 'you hear' are parallel to /bínt/, /bínts/ in our nominal examples; /ɔ́bɾ/ → [ɔ́βɾə] 's/he opens' and /ɔ́bɾs/ → [ɔ́βɾəs] 'you open' are parallel to /λíbɾ/, /λíbrs/(3biii, ciii). Other contexts are hard to come by; the singulars [gáŋstər] 'gangster', [əsfíŋs] 'sphynx' should have underlying /Vnk/ sequences, to be able to derive *ŋ*, since it is not underlying.
4. In principle there are two possible ways to syllabify /ápt/ according to (11), namely to create an empty nucleus before the *t* (*[ápət]), or after the *t* ([áptə]). I will tentatively assume that external insertion is preferred, the first option being more complex because it affects the adjacency of the CC cluster (the same applies to word initial vowel insertion). If this should turn out not to be the case, or for languages for which the first option is chosen, Empty Syllabification (11) could establish the preference, in the way suggested in fn. 2.
5. If Syllabification is shown to be cyclic, *apt* would first be syllabified into [$_\sigma$ap][$_\sigma$te], then when *ísim* would be affixed its skeletal tier would be adjoined to the right of *apte*, *í* occupying the empty position.
6. (21) will be part of the rules of syllabification. There are some reasons to believe that in VɾV the *ɾ* is treated as ambisyllabic, thus escaping both syllable final and onset initial tensing. I will not pursue this possibility here.
7. The same happens with *lɾ* and *mɾ* clusters. See Mascaró (1978, 80-82), Wheeler (1979, 29-30), and Mascaró (1987) (only the last reference deals with *mɾ*).
8. We must assume that Maximal Syllabification applications can take place at different stages. For *ənɾík* → *ənɾɾík* it should apply before the unmarked C is interpreted as *t* to prevent *ɾ* → *ɾɾ* in *bən+ɾé* → *bənɾɾé* (=*bənré*), or in underlying *tɾ* sequences with *t* represented as unmarked C (e.g. *éntɾis* 'you-sg. come in-subjunctive' → **énɾɾis* (=*[énris]).
9. As noted in fn. 5, there seems to be a preference for external insertion, but the choice of internal insertion (CCC → CVCC, in our case) should also be available.
10. Actually, being dentoalveolar, a *t* will be unspecified for place and specified by redundancy rules. This however makes it different from X which is *unspecifiable* for place.

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