Chapter 5

EDGE EFFECTS

5.1. INTRODUCTION

In this chapter I investigate in more detail what I call edge effects, which refer to the fact that more complex combinations of consonants are typically allowed at edges of prosodic domains, as opposed to domain-internal positions. This observation is recurrent and has established itself as one of the basic generalizations in phonology. The greater tolerance for consonant clusters at edges explains the presence of an asymmetry in the application of certain phonological processes between internal positions and edges of prosodic constituents. The cases I am concerned with are given in (1). All of them result in more consonants being licensed at domain edges than domain-internally.

(1) ASYMMETRICAL APPLICATION OF DELETION AND EPENTHESIS:
a. Consonant deletion applies domain-internally but not at domain edges.
b. Vowel epenthesis applies domain-internally but not at domain edges.
c. Vowel deletion applies at domain edges but not domain-internally.

One example of each of the asymmetrical application of the processes in (1) is given below. Consonant deletion in Kamaiurá is illustrated in (2) (McCarthy & Prince 1993; Wiltshire, to appear; based on Everett & Seki 1985). This language has a reduplication process that copies to the right the last two syllables of the base. When the base ends in a consonant, for example /ŋ/ in (2a) or /k/ in (2b), this consonant is lost word-medially and surfaces only word-finally in the reduplicant.

(2) CONSONANT DELETION IN KAMAIURÁ:

a.	/o-mo-tumuŋ-tumuŋ/	→ [o-mo-tumu-tumuŋ]	'he shook it repeatedly'
b.	/je-umirik-mirik/	→ [je-umiri-mirik]	'I tie up repeatedly'

In (3) I provide two examples of vowel epenthesis in Ponapean (Rehg & Sohl 1981). Here we have a reduplication pattern which copies to the left the first CVC sequence of the base. The final consonant of the reduplicant triggers the insertion of a copy of the preceding vowel, underlined in the data. But the same consonant freely appears word-finally. Compare the reduplicant-final [p] with the word-final [d] in (3a): only the former triggers [i]-insertion.

(3) VOWEL EPENTHESIS IN PONAPEAN:

a. /sip-siped/	→	[sipi̲-siped]	'to shake out-DURATIVE'
b. /was-wasas/	→	[wasa̲-wasas]	'to stagger-DURATIVE'

Vowel deletion is illustrated in (4). In Lardil (K. Hale 1973), stem-final vowels delete word-finally, but they are kept before a morpheme inside the word, for example the future morpheme /-wuṛ/ below. See also Piggott (1980, 1999) for a similar pattern in Ojibwa.

(4) APOCOPE IN LARDIL:

a. /karikari/	→	[karikar]	'butter-fish'
	vs.	[karikari̲-wuṛ]	'butter-fish-FUTURE'
b. /yiliyili/	→	[yiliyil]	'oyster *sp.*'
	vs.	[yiliyili̲-wuṛ]	'oyster *sp.*-FUTURE'

The standard solution to these edge effects provided by the prosodic approach to phonotactics involves extrasyllabicity. This concept was already discussed in the more general context of the role of syllable well-formedness in deletion and epenthesis processes, in chapter 1, section 1.2.1.1. I simply repeat the relevant points here. According to the requirement of exhaustive syllabification, consonants have to be incorporated into well-formed syllables. But it has been proposed that consonants at margins of prosodic domains may remain extrasyllabic and escape syllable well-formedness conditions. This idea has been implemented in various ways, which differ on how edge consonants are represented and how they are ultimately licensed. The following four approaches were mentioned:

(5) APPROACHES TO EXTRASYLLABICITY:
a. *Extrametricality:* Edge consonants are marked as extrametrical for syllabification purposes, and are ultimately licensed by adjoining to a syllable late in the derivation, once syllable well-formedness conditions no longer apply (Borowsky 1986; Itô 1986; Booij 1999).
b. *Final consonants as onsets:* Final consonants are represented as onsets of empty-headed syllables and are not subject to the coda conditions that apply to domain-internal codas. This approach is prominent in Government Phonology (e.g. Kaye 1990); see also Dell (1995) for French.
c. *Indirect licensing*: Edge segments are licensed not by the syllable but by a higher constituent, especially the prosodic word (Piggott 1999; Spaelti 1999; Auger & Steele 1999; Steele & Auger 1999).

d. *Alignment* (Wiltshire 1994, 1998, to appear; Clements 1997): Extrasyllabicity is derived by interactions between constraints on syllable structure and alignment constraints with higher prosodic domains.

The Kamaiurá case in (2), for instance, would be accounted for by simply positing a CV syllable template with word-final extrasyllabicity. The word-internal base-final consonant /ŋ/ or /k/ cannot be incorporated in a CV syllable; therefore it deletes. But the same consonant is licensed word-finally, where the effects of syllable well-formedness conditions are suspended.

I have argued that syllable well-formedness is irrelevant in conditioning the application of deletion and epenthesis processes. Extrasyllabicity is therefore not a viable concept. I have proposed a different approach to edge effects, based on the Principle of Perceptual Salience and the existence of cue enhancement processes at edges of prosodic domains. The perceptibility of consonants in peripheral positions is enhanced by a number of phonetic processes: lengthening, articulatory strengthening, and reduction of the amount of overlap with adjacent segments (see section 3.1.5). This increased perceptibility is what makes consonants more easily tolerated at edges of prosodic constituents. This idea is encoded in the constraints in (6), repeated from (14) in chapter 3, which are inherently ranked as in (7). This inherent ranking expresses that, all else being equal, the higher the prosodic boundary a consonant is adjacent to, the more easily it surfaces without the support of a following or adjacent vowel. It follows that consonants that are not adjacent to any prosodic boundary, i.e. word-internal consonants, are the weakest.

(6) CONSTRAINTS ENCODING THE ROLE OF PROSODIC BOUNDARIES:

a.	$C\|_i \leftrightarrow V$	A consonant that is next to a boundary i is adjacent to a vowel.
b.	$C\|i \rightarrow V$	A consonant that is next to a boundary i is followed by a vowel.

(7) INHERENT RANKINGS BETWEEN MARKEDNESS CONSTRAINTS:

a.	$C\|_i \leftrightarrow V >> C\|_j \leftrightarrow V$	if i is a boundary weaker than j (including Ø)
b.	$C\|_i \rightarrow V >> C\|_j \rightarrow V$	if i is a boundary weaker than j (including Ø)

Since the right and left edges of domains do not necessarily behave in a parallel fashion (which is consistent with the fact that the phonetic processes associated with initial and final positions are partly distinct), the constraints in (6) and their corresponding inherent rankings have to be specified for the left or right edge, as in (8) and (9).

(8) CONSTRAINTS ENCODING THE ROLE OF FOLLOWING BOUNDARIES:

a.	$C]_i \leftrightarrow V$	A consonant that is followed by a boundary i is adjacent to a vowel.
b.	$C]i \rightarrow V$	A consonant that is followed by a boundary i is followed by a vowel.

(9) CONSTRAINTS ENCODING THE ROLE OF PRECEDING BOUNDARIES:

a.	$_i[C \leftrightarrow V$	A consonant that is preceded by a boundary i is adjacent to a vowel.
b.	$_i[C \rightarrow V$	A consonant that is preceded by a boundary i is followed by a vowel.

This chapter contributes both empirically and theoretically to the study of edge effects. First, edge effects have been investigated almost exclusively at the word level, and the existence of similar effects at levels higher than the word has not been properly described and analyzed. Moreover, edge effects appear to be cumulative as we go up the prosodic hierarchy; that is, consonants are more and more easily tolerated as the strength of the prosodic boundary increases. This cumulativity effect has gone essentially unnoticed. The main goal of this chapter is therefore to present patterns of consonant deletion, vowel epenthesis, and vowel deletion that display edge effects at levels above the word and cumulative edge effects. Cumulativity has already been illustrated in the application of degemination in Hungarian (section 1.2.3.1) and schwa epenthesis in French (section 2.3.6); additional patterns will be provided. We will also see how the perceptual approach advocated here naturally and simply accounts for edge effects and their cumulative behavior, without the need for exceptional mechanisms such as extrasyllabicity. I will develop in greater detail one case study: consonant deletion and vowel epenthesis in Basque, with special emphasis on the dialect of Ondarroa.

5.2. EXPANDING THE EMPIRICAL BASIS OF EDGE EFFECTS

Deletion and epenthesis patterns that display edge effects can be characterized in terms of four parameters, listed in (10).

(10) PARAMETERS FOR PATTERNS DISPLAYING EDGE EFFECTS:

a. *Configuration tolerated at edges but avoided domain-internally:*
   Consonant not followed by a vowel / Consonant not adjacent to a vowel
b. *Edge:* Left / Right
c. *Levels:* PW, PP, IP, U
d. *Process:* Consonant deletion / vowel epenthesis / vowel deletion

The first parameter (10a) describes the segmental configuration that is avoided domain-internally but tolerated at domain edges. Two cases arise in the context of the phonological processes investigated here: 1. consonants need to be adjacent to a vowel domain-internally but not at edges; 2. consonants need to be followed by a vowel domain-internally but not at edges. The Kamaiurá, Ponapean, and Lardil cases in (2)-(4) exemplify the first option: in all three cases, the deletion or epenthesis process applies in such a way that the same consonant is followed by a vowel word-internally but not word-finally, e.g. [s] in [was<u>a</u>-wasas] (3b). Other patterns described in this chapter will illustrate the other possibility: consonants are adjacent to a vowel word-internally but not at edges. These two configurations are directly related to the two types of markedness constraints I have been using: C→V and C↔V. Also, edge effects often preferentially or exclusively affect stops, which, more than other consonants, want to be adjacent to or followed by a vowel. All consonants may be tolerated at edges but only non-stops in internal positions, so that edge effects only benefit stops.

The last parameter (10d) simply states what process edge effects arise from. The second parameter (10b) tells whether the freer distribution of consonants is permitted at the left edge only (domain-initially), at the right edge only (domain-finally), or at both edges. The third parameter (10c) specifies the prosodic level or levels that display(s) edge effects, that is the domain or constituent in which a certain configuration is less easily tolerated in internal positions than at edges. Our three examples above are all cases of final or left edge effects, at the level of the Prosodic Word. Other combinations will obviously be exemplified in the remainder of this chapter. Crucially, edge effects may be cumulative and appear at more than one level. I adopt the simple prosodic hierarchy in (11), given for example in Inkelas & Zec (1995), and assume that constituents below the PW level belong to a separate hierarchy (Selkirk 1986; Zec 1988; Inkelas 1989).[1]

[1]It follows from this assumption that my approach makes no prediction with respect to the existence of edge effects below the PW, in particular at the foot level. Green (1997), looking at syllabification in Munster Irish, finds that all sequences of rising sonority are tolerated word-initially, only a subset of them foot-initially, and none foot-internally. Epenthesis applies to break up the disallowed sequences. Such results suggest that we may have to add the foot level to our hierarchy of edge effects. However, it seems that the pattern described can be reanalyzed without reference to the foot but only to the position of stress. Rising sonority clusters are better tolerated before stressed vowels than unstressed ones.

(11) THE PROSODIC HIERARCHY:

Utterance (U)	↑	
|	|	
Intonational phrase (IP)	|	Edge effects
|	|	increase
Phonological phrase (PP)	|	
|	|	
Prosodic word (PW)	|	

In the table below I provide several examples of processes displaying edge effects above the PW level. For each of them I specify the four parameters in (10), including whether stops are preferentially or exclusively targeted, together with the references in which the pattern is described. For some patterns the phrasal level at which edge effects appear is not made clear in the sources; in these cases I have only indicated "(phrase)", which could correspond to either a PP, an IP, or the Utterance.

Before describing and analyzing these patterns, we may look at the table in more detail and see whether any tendencies or generalizations emerge regarding the four parameters listed. The small number of cases does not permit me to make secure statements, but I will venture three hypotheses, which further research should confirm or disconfirm.

(12) SOME LANGUAGES DISPLAYING EDGE EFFECTS ABOVE THE PW IN THE APPLICATION OF DELETION OR EPENTHESIS PROCESSES:

LANGUAGE	L/R EDGE	AVOIDED CONFIGURATION	LEVEL(S)	PROCESS(ES)	REFERENCES
Cairene Arabic	R	C not adjacent to V	(Phrase)	V epenthesis	Broselow 1980, 1992; Selkirk 1981; Wiltshire 1994, 1998, to appear
Iraqi Arabic	L	C not adjacent to V	(Phrase)	V epenthesis	Broselow 1980, 1992; Selkirk 1981
Arrernte	L, R	C not adjacent to V	(Phrase)	V deletion V epenthesis	Breen & Pensalfini 1999
Ondarroa Basque	R	Stops/affricates (marginally other C's) not followed by V	PW, IP	C deletion V epenthesis Affricate simplif.	Côté 1999
Vimeu Picard	R, L	C not adjacent to V	PW, IP	V epenthesis	Steele & Auger 1999; Auger & Steele 1999; Auger (2000, p.c.)
French	R, L	C not adjacent to V, stops in particular	PW, PP, IP	V epenthesis V deletion	Dell 1977
Marais Vendéen	R	Stops not followed by V	PP	C Deletion	Svenson 1959; Morin 1986
Kayardild	R	C not adjacent to V, stops in particular	IP	V deletion	Evans 1995a,b
Tiwi	R	C not adjacent to V	IP / U	V deletion	Lee 1987

First, in all but two of these cases, which deal with edge effects above the PW, the avoided configuration is consonants that are not *adjacent* to a vowel. This contrasts with the three patterns in (2)-(4), in which consonants need to be *followed* by a vowel PW-internally but not PW-finally. This correspondence between the avoided configuration and the level at which edge effects appear may be a statistical accident, but I can also see one plausible explanation for it. The requirement that consonants be followed by a vowel is more demanding than the one stating that consonants should only be adjacent to a vowel. It is possible that this stricter requirement is relaxed more easily than the looser one, that is at lower prosodic levels. Consonants may be required to be followed by a vowel only in the smallest domain, that is PW-internally, where they benefit from no cue enhancement, with edge effects showing up already at PW edges. But relaxing the requirement that consonants be adjacent to a vowel demands better perceptual conditions, which may be obtained only at edges of stronger boundaries, which are associated with significantly better cues.

Second, one may discern a slight tendency for edge effects to be more frequent at the right edge. I suspect that such a tendency, if it is confirmed, is related to the importance of word-initial material for lexical access and processing, which tends to make the left edge more stable across prosodic contexts, and consequently less subject to the type of alternations investigated here (see also Beckman's (1998) root-initial faithfulness). Crucially, we are concerned with asymmetries in the application of phonological processes, not with segmental patterns found in the lexicon. It could be that edge effects at the left edge are more often lexicalized, while those at the right edge are more easily subject to phonological alternations.[2]

Finally, edge effects appear to be more frequent at the PW and IP levels, as opposed to the PP and U ones. One may wonder whether there is anything in the phonetics that makes these domains special. About the PW, I would like to suggest that the inter-segmental timing of gestures, which determines the amount of overlap between adjacent segments, is more variable at word boundaries than word-internally. So timing and the amount of overlap at PW junctures may be actively manipulated by speakers, if necessary, in order to accomodate more complex sequences of segments. Manipulation may be more constrained word-internally, which limits the range of possible phonotactic combinations. Phonetic experiments are necessary to enlighten this issue.[3] As for the IP level, it is the one at which pauses may be introduced (Nespor & Vogel 1986, Keating et al. 1998, Wightman et al. 1992), which lead to a complete elimination of overlap with adjacent segments.

5.3. FIRST CASE STUDIES

Six of the patterns listed in the table in (12) will now be described and analyzed. They illustrate the various aspects of the approach developed here and all

[2]As noted in chapter 2, underlying schwas in morpheme-initial syllables in French tend to stabilize or disappear altogether. This could be interpreted as a consequence of the tendency to avoid domain-initial phonological alternations.

[3]Byrd (1994) compared the amount of overlap between two adjacent segments in different prosodic contexts: separated by a word boundary $C_1\#C_2$, word-initially $\#C_1C_2$, and word-finally $C_1C_2\#$. The results she obtained are not consistent. For the sequence [sk], she found that overlap between the two consonants was most variable when they were separated by a word boundary, less variable in coda clusters, and least variable in word-initial clusters. But for the sequences [g#d] vs. [gd#] and [g#s] vs. [ks#], she found no significant difference between the word-final clusters and those separated by a word juncture (the corresponding onset clusters were not examined for these combinations). These results only partly bear on the hypothesis made here about the special status of PW boundaries, since all the clusters investigated by Byrd are adjacent to a word boundary. Comparisons have to be made with similar clusters in word-internal position. Moreover, Byrd's experiments were conducted on clusters embedded in meaningless carrier sentences like "Type bag sab again" [g#s]. Different results might obtain with natural speech.

present a specific interest. Cairene and Iraqi Arabic are first used to introduce the analysis of right and left edge effects (5.3.1). Schwa epenthesis in French shows the interaction of initial and final cumulative edge effects with the contrast between stops and other consonants in the probability of epenthesis (5.3.2). The process of stop deletion in Marais-Vendéen is noteworthy as it seems to involve a categorical distinction based on the Maximal Phonological Phrase, which is an unusual level in categorical edge effects (5.3.3). Epenthesis in Vimeu Picard brings in the support of statistical data obtained from real speech (5.3.4). The complex case of edge effects in Basque is described and analyzed in detail in section 5.4. The interest of this pattern lies mainly in the application of several different processes to avoid a marked situation. In addition, the processes are dependent upon the existence of lexical distinctions between closed and open lexical categories, and interactions of phonotactics with the opacity present in the inflectional system, through the use of flectional markers as phonotactically-motivated epenthetic elements.

5.3.1. Epenthesis in Cairene and Iraqi Arabic

Let us first consider the simple and often mentioned epenthesis patterns in Cairene and Iraqi Arabic, which are convenient for a first illustration of our approach. The patterns in the two dialects are essentially the mirror image of each other (Broselow 1980, 1992; Selkirk 1981; Wiltshire 1994, 1998, to appear). In both dialects consonants appear adjacent to a vowel phrase-internally. To enforce this rule an epenthetic [i] is inserted when necessary, that is inside clusters of three (or more) consonants.[4] This vowel appears between the first two consonants in Iraqi (13) and the last two in Cairene (14), a distinction that does not concern us here.

(13) Obligatory epenthesis phrase-internally in Iraqi Arabic:

a.	/gil-t-l-a/	→	[gil̪tla]	'I said to him'
b.	/katab-t ma-ktuub/	→	[katab̪tmaktuub]	'I wrote a letter'
c.	/triid ktaab/	→	[triid̪ktaab]	'you want a book'

(14) Obligatory epenthesis phrase-internally in Cairene Arabic:

a.	/katab-t-l-u/	→	[katabt̪ilu]	'I/you wrote to him'
b.	/katabt gawaab/	→	[katabt̪igawaab]	'you (m.) wrote a letter'
c.	/bint nabiiha/	→	[bint̪inabiiha]	'an intelligent girl'

[4]Broselow (1980), however, notes that epenthesis may fail to apply in Iraqi between a word-final sonorant+obstruent clusters followed by a consonant, e.g. [banj ʏaali] 'an expensive local anesthetic'. I will disregard this case.

At phrase boundaries, consonants not adjacent to a vowel are tolerated and do not automatically trigger epenthesis. The two dialects, however, differ on whether the requirement that consonants be adjacent to a vowel is relaxed initially or finally. In the Iraqi dialect, epenthesis is only optional in phrase-initial clusters (15), so that a phrase-initial consonant variably surfaces without an adjacent vowel. But vowel insertion still applies phrase-finally (16). In Cairene, epenthesis fails to apply phrase-finally, where we find consonants that are not adjacent to a vowel (17), but still takes place phrase-initially (18).

(15) Optional epenthesis phrase-initially in Iraqi Arabic:

a.	/qmaaʃ/	→	[(i̪)qmaaʃ]	'cloth'
b.	/klaab/	→	[(i̪)klaab]	'dogs'

(16) Obligatory epenthesis phrase-finally in Iraqi Arabic:

a.	/kitab+t/	→	[kitab̪it]	'I wrote'
b.	/gil+t/	→	[gil̪it]	'I said'

(17) No epenthesis phrase-finally in Cairene Arabic:

a.	/katab+t/	→	[katabt]	'you wrote'
b.	/bint/	→	[bint]	'girl'

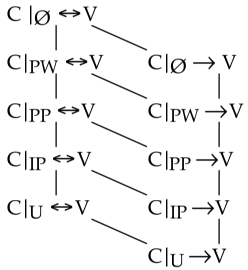
(18) Obligatory epenthesis phrase-initially in Cairene Arabic:

	/ktib/	→	[(ʔ)i̪ktib]	'write!'

Whereas Broselow (1980, 1992) and Wiltshire (1994, 1998, to appear; for Cairene only) are not explicit on the nature of the precise phrasal level that manifests edge effects, Selkirk (1981) states that the positions that tolerate consonants not adjacent to a vowel correspond to the postpausal (Iraqi) or prepausal (Cairene) ones, which she equates with utterance-initial and utterance-final. I assume that her use of "utterance" corresponds to the U level in the prosodic hierarchy in (11).

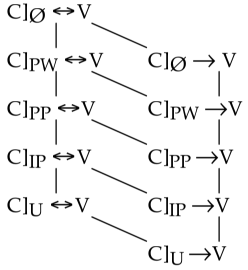
The constraint ranking that yields the Arabic patterns is easy to establish. The hierarchy in (11) associated with the rule for establishing inherent rankings in (7) yields the fixed rankings of markedness constraints in (19), which also incorporate the inherent dominance between any constraint of the type C↔V and the corresponding C→V constraint. When necessary, the rankings apply specifically to the right (20a) and left (20b) edges of prosodic domains. The symbol Ø obviously refers to the absence of a prosodic boundary, found in PW-internal positions. Our task in all the patterns investigated in this chapter will then be to appropriately rank faithfulness constraints within this web of markedness constraints.

(19) INHERENT RANKING OF BOUNDARY-SPECIFIC CONSTRAINTS:

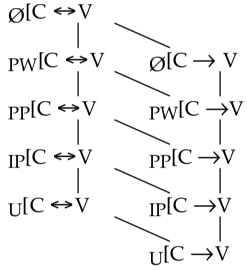


(20) INHERENT RANKINGS FOR FOLLOWING AND PRECEDING BOUNDARIES:

a.



b.



In both Iraqi and Cairene Arabic, the relevant markedness constraints are those of the C↔V type, which ban consonants that are not adjacent to a vowel. Violations of these constraints are avoided by epenthesis, which violates DEP-V. This constraint has to rank lower than other faithfulness constraints dealing with alternative processes, in particular MAX-C.[5] Insertion is obligatory U-internally in both dialects, so we have $C]_{IP} \leftrightarrow V$ >> DEP-V. In Iraqi it is also obligatory U-finally (18), from which we derive $C]_U \leftrightarrow V$ >> DEP-V, but optional U-initially, which is accounted for with an indeterminate ranking between DEP-V and $_U[C \leftrightarrow V$. In Cairene epenthesis is obligatory U-initially but excluded U-finally, hence the ranking $_U[C \leftrightarrow V$ >> DEP-V >> $C]_U \leftrightarrow V$. The final rankings for both dialects are provided in (21) and illustrated in the following tableaux. I disregard the locus of epenthesis and the issue of how it is determined in each dialect (see chapter 3, sections 3.2.3 and 3.3.1).

(21) RANKINGS SPECIFIC TO CAIRENE AND IRAQI ARABIC:

a. Iraqi: $C]_Ø \leftrightarrow V$ >> ... >> $C]_{IP} \leftrightarrow V$; $C]_U \leftrightarrow V$ >> DEP-V ; $_U[C \leftrightarrow V$

b. Cairene: $C]_Ø \leftrightarrow V$ >> ... >> $C]_{IP} \leftrightarrow V$; $_U[C \leftrightarrow V$ >> DEP-V >> $C]_U \leftrightarrow V$

[5]The fact that the repair strategy chosen in each language is associated with the lowest-ranked faithfulness constraint will be implicit in all the analyses to come.

(22) VOWEL EPENTHESIS IN IRAQI ARABIC:

/triid ktaab/	C]Ø ↔V >>...>> $C]_{IP} \leftrightarrow V$	$C]_U \leftrightarrow V$	DEP-V	$_U[C \leftrightarrow V$
triidktaab	(k) !			
→ triidiktaab			*	
/qmaaʃ/				
→ $_U$ [qmaaʃ				*
→ $_U$ [iqmaaʃ			*	
/kitab+t/				
kitabt]$_U$		(t) !		
→ kitabit]$_U$			*	

(23) VOWEL EPENTHESIS IN CAIRENE ARABIC:

/bint nabiiha/	C]Ø ↔V >>...>> $C]_{IP} \leftrightarrow V$	$_U[C \leftrightarrow V$	DEP-V	$C]_U \leftrightarrow V$
bintnabiiha	(t) !			
→ bintinabiiha			*	
/ktib/				
$_U$ [ktib		(k) !		
→ $_U$ [(ʔ)iktib			*	
/katab+t/				
→ katabt]$_U$				(t)
katabti]$_U$			* !	

5.3.2. EPENTHESIS IN FRENCH

The role of the prosodic hierarchy in schwa epenthesis in French was discussed in section 2.3.6. I now provide a formal analysis of it. It was established that in the same segmental context $C_1C_2C_3$, the likelihood that C_2 triggers schwa insertion is inversely correlated with the strength of the prosodic boundary that it is adjacent to. This holds at both left and right edges. The following data, repeated from chapter 2, illustrate cumulative edge effects domain-finally in French. In (24) we have the sequence [ktm] with [t] followed by an increasingly stronger boundary, from Ø to IP. Three levels of acceptability for schwa can be observed: schwa is obligatory PW-internally, excluded at the right edge of IP, and optional at PW, SPP, and MPP boundaries.[6] These levels are indicated by the darkness of the background, according to the following:

[6]Recall that I follow Selkirk (1986) and de Jong (1990, 1994), who have proposed that the PP is split between a Small and a Maximal Phonological Phrase (SPP, MPP).

Schwa obligatory
Schwa optional
No schwa

(24) EFFECT OF THE FOLLOWING BOUNDARY WITH CLUSTER-MEDIAL STOPS:
[kt]$_i$ m], with i ∈{ Ø, PW, ...IP}

cluster more easily tolerated ↓

a. C_2]$_Ø$	*tu fais que te moucher*	'you only blow your nose'
	/ty=fɛ k=t=muʃe/	*[tyfɛktmuʃe] [tyfɛk(ə)t(ə)muʃe]
b. C_2]$_{PW}$	*infecte manteau*	'stinking coat'
	/ɛ̃fɛkt mɑ̃to/	[ɛ̃fɛkt(ə)mɑ̃to]
c. C_2]$_{SPP}$	*insecte marron*	'brown insect'
	/ɛ̃sɛkt marɔ̃/	[ɛ̃sɛkt(ə)marɔ̃]
d. C_2]$_{MPP}$	*l'insecte mangeait*	'the insect was eating'
	/l=ɛsɛ̃kt mɑ̃ʒɛ/	[lɛ̃sɛkt(ə)mɑ̃ʒɛ]
e. C_2]$_{IP}$	*l'insecte, mets-le là*	'the insect, put it there'
	/l=ɛ̃sɛkt mɛlœla/	*[lɛ̃sɛktəmɛlœla] [lɛ̃sɛktmɛlœla]

In addition, Dell (1977) showed the existence of clear frequency effects within the optional zone. He compared the probability of schwa omission in the context $C_1C_2\#C_3$ in adjective+noun, noun+adjective, and subject+verb sequences, which correspond to $C_1C_2]_{PW}$, $C_1C_2]_{SPP}$, and $C_1C_2]_{MPP}$, respectively. His numbers for three segmental clusters in which C_1 is an obstruent and C_2 a stop are given below:

(25)

$C_1C_2C_3$	$C_2]_{PW}$	$C_2]_{SPP}$	$C_2]_{MPP}$
[skv]	81	60	15
[ktv]	78	60	12
[stv]	78	18	6

The prosodic structure interacts with the nature of the consonants. It was demonstrated in chapter 2 that schwa insertion is more easily triggered by stops than by other consonants, everything else being equal. The data in (24) can be replicated with the fricative [s] (the reflexive clitic) rather than the stop [t] (the 2nd sg object clitic) in the position of C_2.[7] We obtain the data in (26), which crucially differ from those in (24) in that schwa is no longer obligatory before a null boundary Ø. In the same prosodic context, schwa is less likely if C_2 is a fricative than if C_2 is a stop.

[7]The context adjective+noun ($C_2]_{PW}$) is not given because I did not find an adjective ending in the cluster [-ks] that could naturally appear in prenominal position.

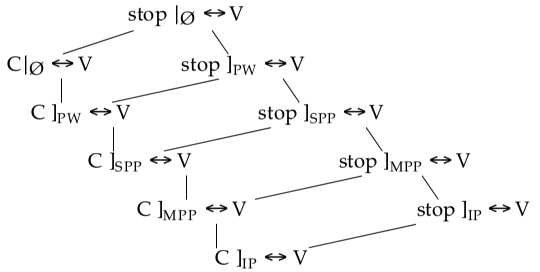
(26) EFFECT OF THE FOLLOWING BOUNDARY WITH CLUSTER-MEDIAL FRICATIVES:
k s]$_i$ m, with i ∈{ Ø, PW, ...IP}

cluster more easily tolerated ↓

a. C_2]$_Ø$	*il fait que se moucher*	'he only blows his nose'
	/il=fɛ k=s=muʃe/	[ilfɛk(ə)s(ə)muʃe]
b. C_2]$_{SPP}$	*annexe marron*	'brown annexe'
	/anɛks marɔ̃/	[anɛks(ə)marɔ̃]
c. C_2]$_{MPP}$	*l'annexe manquait*	'the annexe was missing'
	/l=anɛks mɑ̃kɛ/	[lanɛks(ə)mɑ̃kɛ]
d. C_2]$_{IP}$	*l'annexe, mets-la là*	'the annexe, put it there'
	/l=anɛks mɛ la la/	*[lanɛksəmɛlala] [lanɛksmɛlala]

These data involve the markedness constraints C]$_i$↔V and stop]$_i$↔V, with i being any prosodic boundary and stop]$_i$↔V inherently outranking the corresponding C]$_i$↔V. We obtain the web of inherently ranked constraints in (27), in which we have to integrate the constraint against epenthesis DEP-V.[8]

(27) INHERENT RANKINGS OF MARKEDNESS CONSTRAINTS:

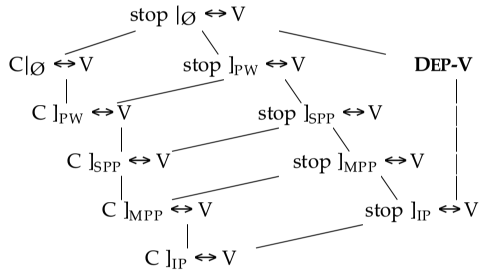


Schwa is obligatory only in the context stop]Ø (24a) which follows from the ranking stop]Ø↔V >> DEP-V. It is excluded IP-finally, even with stops (24e), so DEP-V >> stop]$_{IP}$↔V. The ranking of DEP-V with all the markedness constraints ranked between stop]Ø↔V and stop]$_{IP}$↔V remains undetermined, which yields optional schwa insertion. The inherent rankings among these constraints, however, generate the desired frequency effects. Epenthesis is more probable with weaker prosodic boundaries and with stops in cluster-medial position. The final ranking we obtain for the right edge is given in (28). The tableaux in (29) and (30) illustrate the

[8]I disregard segmental factors other than the contrast between stops and fricatives. For instance, schwa insertion is less likely with a stop in cluster-medial position if C_1 is /r/ rather than /k/; see section 2.3.5.1. These distinctions ultimately have to be integrated into the constraints, but I omit doing this in order to focus on the prosodic factor.

contrast between stops (obligatory schwa) and fricatives (optional schwa) PW-internally, and the exclusion of schwa IP-finally, respectively.

(28) PARTIAL GRAMMAR OF FRENCH (FOLLOWING BOUNDARIES):



(29) SCHWA WITH MEDIAL STOPS AND FRICATIVES PW-INTERNALLY:

/ty=di k=t=mãtir/	stop]Ø ↔V	DEP-V	C]Ø ↔V
tydikt]Ø mãtir	(t) !		
→ tydiktə]Ø mãtir		*	
→ tydikət]Ø mãtir		*	
/ty=di k=s=mãtir/			
→ tydiks]Ø mãtir			*
→ tydiksə]Ø mãtir		*	
→ tydikəs]Ø mãtir		*	

(30) NO SCHWA IP-FINALLY:

/l=ɛ̃sɛkt mɛ lœ la/	DEP-V	stop]IP ↔V	C]IP ↔V
→ lɛ̃sɛkt]IP mɛlœla		(t)	
lɛ̃sɛktə]IP mɛlœla	* !		
/l=anɛks mɛ la la/			
→ lasɛks]IP mɛlala			(s)
lanɛksə]IP mɛlala	* !		

Exactly the same situation is found at the left edge of prosodic domains. In (31) and (32) we have the sequences [ktf] and [ksf] with [t] and [s] preceded by a boundary of increasing strength, from Ø to IP. Here we observe that epenthesis is, again, only obligatory with stops PW-internally (31a). But it is optional at IP boundaries, unlike in the examples given in (24) and (26). The difference follows from the different morphological contexts in which the effect of the left and right edges can be tested. In the data below the middle consonant is a clitic, and epenthesis

at clitic boundaries is *always* optional in interconsonantal position (see chapter 2). The ranking we obtain (33) is identical to that given in (28), except for DEP-V, which does not dominate IP[stop ↔V.

(31) EFFECT OF THE PRECEDING BOUNDARY WITH CLUSTER-MEDIAL STOPS:

[k i[t f], with i ∈{ Ø, PW, ...IP}

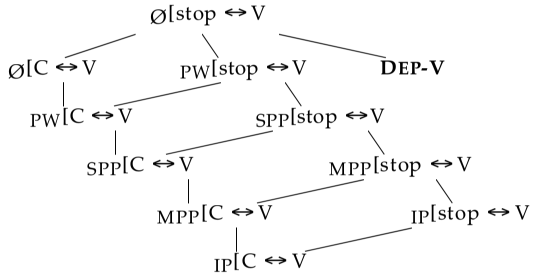
		Ø[C2	*tu fais que te faire mal*	'you only hurt yourself'
			/ty=fɛ k=t=fɛr mal/	*[tyfɛktfɛrmal] [tyfɛk(ə)t(ə)fɛrmal]
cluster		MPP[C2	*Jean-Luc te fait mal*	'J. hurts you'
more			/ʒãlyk t=fɛ mal/	[ʒãlykt(ə)fɛmal]
easily		IP[C2	*Jean-Luc, te fais pas mal!*	'J., don't hurt yourself!'
tolerated	↓		/ʒãlyk t=fɛ pa mal/	[ʒãlykt(ə)fɛpamal]

(32) EFFECT OF THE PRECEDING BOUNDARY WITH CLUSTER-MEDIAL FRICATIVES:

k i[s f, with i ∈{ Ø, PW, ...IP}

		Ø[C2	*il fait que se faire mal...*	'he only hurts himself.'
			/il=fɛ k=s=fɛr mal/	[tydik(ə)s(ə)fɛrmal]
cluster		MPP[C2	*Jean-Luc se fait mal*	'J. hurts himself'
more			/ʒãlyk s=fɛ mal/	[ʒãlyks(ə)fɛmal]
easily		IP[C2	*Jean-Luc, se faire mal...*	'J., hurting oneself...'
tolerated	↓		/ʒãlyk s=fɛr mal/	[ʒãlyks(ə)fɛrmal]

(33) PARTIAL GRAMMAR OF FRENCH (PRECEDING BOUNDARIES):



5.3.3. STOP DELETION IN MARAIS-VENDÉEN

Marais-Vendéen - a French dialect spoken in Western France - has a large set of words which appear with and without a final stop, especially [t], in different prosodic/grammatical contexts (Svenson 1959; Morin 1986). The stop is clearly retained before vowel-initial words and at the pause (therefore at least U-finally) (34).

(34) FINAL STOP RETENTION PRE-PAUSALLY:

a.	ptit]$_U$	→	no change	'small'
b.	ʃat]$_U$	→	no change	'cat'
c.	surt]$_U$	→	no change	'dumb'
d.	hɛjt]$_U$	→	no change	'game'
e.	lə mɑ̃ʒat]$_U$	→	no change	'they are eating'

But these final stops are generally omitted in preconsonantal position. These alternations originate from the Old French rule that productively deleted word-final stops (and non-strident fricatives) before consonant-initial words, while maintaining them phrase-finally and prevocalically (Morin 1986).[9] The interest of Marais-Vendéen, however, lies in the precise preconsonantal contexts that trigger deletion. Final stop deletion is attested in various syntactic contexts, illustrated in (35) with the words given in (34). These contexts are distinguished from subject+predicate sequences, in which Svenson (1959) reports no deletion. The example in (36) contrasts with that in (35b) in retaining the final [t] of /ʃat/ before a verbal group (including preverbal auxiliaries and clitics), as in (34b) above.

(35) STOP DELETION ATTESTED:

a.	Adj + noun:	[ɛ̃ pti pulan]	'a/one small colt'
		a/one small colt	
b.	Noun + adj:	[ɛ̃ ʃa nwɛr]	'a/one black cat'
		a/one cat black	
c.	Adj + PP:	[l ɛ sur km ɛ̃ pɔt]	'he's dumb like a pot'
		he is dum like a pot	
d.	Noun + PP:	[ɛ̃ he d kart]	'a card game / card deck'
		a/one game of card	
e.	Verb + object:	[lə mɑ̃ʒɑ̃ do patat]	'they are eating potatoes'
		they eat.3PL DET.IND.PL potatoes	

(36) STOP DELETION UNATTESTED:

Subject + verb:	[lə ʃat m at egrosinaj]	'the cat scratched me'
	the.MASC cat me has scratched	

Morin (1986) suggests about the absence of deletion in subject+verb sequences in Svenson's (1959) data that the relevant examples were obtained in slow speech, as deletion may be suppressed "whenever speakers slow down, or make a slight pause" (Morin 1986: 191). I would like to propose a different and more

[9]This rule is at the origin of the process of 'liaison' in Modern French.

principled explanation. The example in (35a) involves a sequence of a noun preceded by an adjective of the restricted set of pre-nominal ones. Such sequences are always very closely related in French, syntactically and prosodically. The examples in (35b-e) all involve lexical maximal projections consisting of head-complement sequences: [Noun-AP]$_{NP}$ (35b), [Noun-PP]$_{NP}$ (35c), [Adj-PP]$_{AP}$ (35d), [V-NP]$_{VP}$ (35e). These sequences form smaller syntactic and prosodic units than subject-verb sequences (everything else being equal), however the syntax-prosody mapping operates (see Inkelas & Zec 1995 for a summary). In particular, objects are closer to the verb than subjects. A stronger prosodic boundary thus separates the verb from its subject (36) than from its object (35e). So in Marais-Vendéen, the prosodic boundary that separates the subject from its verb is strong enough to license word-final stops. Lower boundaries are not, which explains the contrast between (35) and (36).

For French, Selkirk (1986) and de Jong (1990, 1994) propose that an adjective is separated from a following noun by a simple PW boundary, and a noun from a following adjective by a SPP boundary. These are the syntax-prosody correspondences we used in the preceding section and in section 2.3.6. SSP boundaries actually have a wider distribution and appear between a lexical head and its complement, i.e. in all the contexts in (35b-e). In contrast, subjects are separated from the following predicate by at least a MPP boundary. If we follow the rules given above for Parisian French, we can formulate the generalization that, in Marais-Vendéen, stops delete when followed by a PW or SPP boundary, but are retained before a MPP or higher boundary. A formal analysis of stop deletion in this language along the line I have suggested involves the ranking in (37). The relevant faithfulness constraint is MAX-C/V__, as the deleted stop usually occurs in postvocalic position.

(37) RANKING SPECIFIC TO MARAIS-VENDÉEN:
stop]$_{PW}$→V >> stop]$_{SPP}$→V >> MAX-C/V__ >>
stop]$_{MPP}$→V >> stop]$_{IP}$→V >> stop]$_U$→V

5.3.4. EPENTHESIS IN VIMEU PICARD

As French above, the variety of Picard spoken in Vimeu (northeastern France) displays cumulative edge effects, where more than one prosodic level are crucially involved, both domain-initially and domain-finally. Sequences of consonants are avoided by the insertion of the vowel [e] at morpheme junctures. This process has been described and analyzed in recent work by Julie Auger, in collaboration with Jeffrey Steele. I rely here on Auger (2000), Auger & Steele (1999), and Steele & Auger (1999). The interest of these data lies in particular in the

availability of a statistical analysis performed on a sizeable speech corpus. The results establish a convergence between real speech, monitored speech, as used by Dell (1977) for French (see chapter 2), and native intuitions in the description of edge effects. The Picard pattern, however, also reveals the possibility of epenthesis in certain contexts adjacent to a vowel, which is unpredicted in our approach as it is currently implemented.

Let us first look at the domain-initial facts. Words beginning in an underlying two-consonant sequence other than those composed of an obstruent followed by a liquid or glide alternate between [C_1C_2-] and [eC_1C_2-], depending on the preceding segmental and prosodic context. These clusters are of the type obstruent+nasal (e.g. /kminɛ/ 'chimney'), obstruent+obstruent, including /s/+stop (e.g. /dpi/ 'since'), or sonorant+obstruent, i.e. sequences of decreasing sonority (e.g. /rbeje/ 'watch, look'). Auger (2000) has performed a statistical analysis of these word-initial clusters in various prosodic positions. She has found that /e/-epenthesis is obligatory (with minor exceptions) IP-internally after a consonant-final word (38), and excluded after a vowel (39). The word-initial cluster appears in bold, the epenthetic vowels are underlined.

(38) OBLIGATORY EPENTHESIS IP-INTERNALLY AFTER A CONSONANT:

a.	/ɛ̃ mɔrsjø d **km**inɛ/	→	[ɛ̃mɔrsjød**e̲km**inɛ]	'a piece of chimney'
b.	/pur **km**ɛ̃ʃe/	→	[pur**e̲km**ɛ̃ʃe]	'to start'
c.	/sasir **dv**ã/	→	[sasir**e̲dv**ã]	'sit in front of'

(39) NO EPENTHESIS IP-INTERNALLY AFTER A VOWEL:

a.	/il ɑ **km**ɛ̃ʃɛ/	→	[ilɑ**km**ɛ̃ʃɛ] / *[ilɑ**e̲km**ɛ̃ʃɛ]	'he has started'
b.	/pasɛ **dv**ã/	→	[pɑsɛ**dv**ã] / *[pasɛ**e̲dv**ã]	'passed in front of'

The generalization underlying these facts is simple: IP-internally, consonants want to be adjacent to a vowel. When a three-consonant sequence is formed at word boundaries, epenthesis applies to provide the middle consonant ([k] in (38a-b), [d] in (38c)) with an adjacent vowel. When the word-initial consonant is already preceded by a vowel, there is no motivation for epenthesis. This follows straightforwardly from the ranking in (40), in which the constraint against epenthesis is ranked lower than the constraints requiring that every consonant preceded by a boundary lower than IP be adjacent to a vowel.

(40) RANKING SPECIFIC TO VIMEU PICARD:
PW[C ↔V >> PP[C ↔V >> DEP-V

(41) EPENTHESIS IP-INTERNALLY IN VIMEU PICARD:

/sasir **dv**ã/	PW[C ↔V >> PP[C ↔V	DEP-V
sasir**dv**ã	(d) !	
→ sasir**e̲dv**ã		*
/pasɛ **dv**ã/		
→ pasɛ**dv**ã		
pasɛ**e̲dv**ã		* !

IP-initially (for example after a dislocated element) and U-initially, however, this absolute contrast between a preceding vowel and a preceding consonant disappears. Epenthesis is variable regardless of the preceding context. The examples below illustrate the optionality of initial /e/ after a consonant (42), a vowel (43), and in absolute initial position (44). They are given in their orthographic forms, with only the relevant cluster in phonological and phonetic representations.

(42) OPTIONAL EPENTHESIS IP- AND U-INITIALLY AFTER A CONSONANT:
qui dit Gnace, édvant | dvant partir 'that he says Ignace, before leaving'
/...s **dv**ã.../ → [...s IP[(e̲)**dv**ã...]

(43) OPTIONAL EPENTHESIS IP- AND U-INITIALLY AFTER A VOWEL:
Il étouot bértcheu, dpis | édpis l'âge d'onze douze ans
'He was a shepherd, since the age of eleven twelve years old'
/...berkø **dp**i.../ → [...bertʃø IP[(e̲)**dp**i...]

(44) OPTIONAL EPENTHESIS U-INITIALLY IN ABSOLUTE INITIAL POSITION:

a. *Dvant qu'éch co i cante* 'Before the cock crows'
/**dv**ã.../ → U[**dv**ã...]

vs. *Edvant d'élver cho's séance* 'Before closing the meeting'
/**dv**ã.../ → U[e̲**dv**ã...]

b. *J'sus garde-champête sermenté* 'I am rural police officer certified'
/**ʒ s**y.../ → U[**ʃs**y...]

vs. *Ej sus ein pige-moi-ça* 'I am in pajamas'
/**ʒ s**y.../ → U[e̲**ʒs**y...]

This is not to say that from the IP level up the strength of the prosodic boundary and the preceding segmental context have no more effect. Auger observed significant statistical differences between the IP and U levels and between the postvocalic, post consonantal, and absolute initial positions. The probabilities of epenthesis obtained by Auger for each context are given in the table below.

(45) FREQUENCY OF EPENTHESIS IP- AND U-INITIALLY:

	IP-initially	U-initially
V—	23%	36%
C—	80%	57%
Ø—	N/A	43%
Average	47%	44%

First, the rate of epenthesis is quite high postconsonantally IP-initially (80%) but significantly lower U-initially (57%). This follows from the inherent ranking $_{IP}$[C↔V >> $_{U}$[C↔V. If DEP-V is unranked with respect to these two constraints, there are three possible rankings of these constraints: two of them generate epenthesis IP-initially ($_{IP}$[C↔V>>$_{U}$[C↔V>>DEP-V and $_{IP}$[C↔V>>DEP-V>>$_{U}$[C↔V); only one yields epenthesis U-initially ($_{IP}$[C↔V>>$_{U}$[C↔V>>DEP-V). The possibility of epenthesis after a vowel, however, is totally unexpected. Since a vowel is already present, there should not be any motivation for vowel insertion; yet it applies. And it is more likely at the U level than at the IP one.

The intuition behind these data seems fairly clear. A vowel across an IP or U boundary is "too far" from the consonant in need of an adjacent vowel. Markedness constraints that require consonants to appear next to a vowel then may not "see" the vowel across the boundary and trigger epenthesis. The probability that a vowel may not be seen by a constraint depends on the strength of the prosodic boundary that intervenes between the vowel and the consonant: the stronger the juncture, the farther the vowel, and the more likely to be violated the markedness constraint is. A vowel across an IP boundary is closer than one across a U boundary, hence the higher rate of epenthesis at the U level after a vowel: 36% vs. 23%. A vowel across a PP or lower boundary, however, always counts in the evaluation of the markedness constraints, as shown by the absence of epenthesis IP-internally after a vowel (39).

This uncovers a weakness in the constraint system that was designed: the markedness constraints C↔V and C→V do not take into consideration the proximity of the vowel. I do not propose a formal solution to this problem here, but notice that adding a proximity parameter to the constraint schema is clearly in the spirit of the general approach taken here: the farther the vowel, the less it affects the perceptibility of adjacent segments.

Let us now consider morpheme-final two-consonant clusters /-C_1C_2#/. Here we find that epenthesis before a consonant is obligatory PW-internally, for example in the compounds in (46). It is optional across a PW boundary (47), and excluded IP-finally (48).

(46) OBLIGATORY EPENTHESIS PW-INTERNALLY:

a. /bu**rk**+d+ɔ / → [bu**rk**e̲dɔ] 'town of Ault'
b. /pɔ**rt**+bagaʒ/ → [pɔ**rt**e̲bagaʒ] 'luggage rack'

(47) OPTIONAL EPENTHESIS PW-FINALLY:

a. *ch'qu'i s'in vo t'ête au juste d'éch Pèrc CanteRaine*
'what CanteRaine Park will really look like'
/ʒy**st** d.../ → [ʒy**st**]$_{PW}$ d..]

vs. *assise justé dérriére éch chauffeur*
'seated directly behind the driver'
/ʒy**st** d.../ → [ʒy**st**e̲]$_{PW}$ d..

b. *Echl histoére a n'pérle point d'éch qu'il a pinsé*
'The story doesn't tell us what he thought'

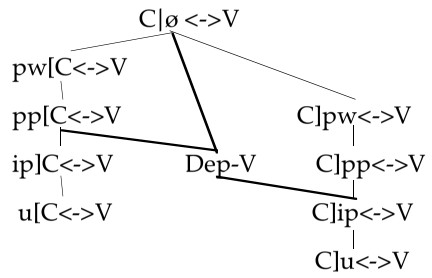
vs. /pe**rl** p.../ → [pe**rl**]$_{PW}$ p..]
édpi ène cope éd moés, o n'pérlé pu d'reuvrie
'People haven't talked about daydreaming for a couple of months'
/pe**rl** p.../ → [pe**rl**e̲]$_{PW}$ p..]

(48) EPENTHESIS EXCLUDED IP- AND U-FINALLY:

a. *in dirécte* 'in direct=live' /ɛ̃dire**kt**/ → [ɛ̃dire**kt**]
b. *qué j'dorche* 'that I sleep+SUBJ' /k ʒ dɔ**rʃ**/ → [keʒdɔ**rʃ**]

The epenthesis patterns at both the right and left edges are generated by the constraint ranking in (49). This mini-grammar establishes three major zones with respect to /e/-insertion: obligatory epenthesis PW-internally and PW- and PP-initially, no epenthesis IP- and U-finally, and variable epenthesis PW- and PP-finally and IP- and U-initially.

(49) PARTIAL GRAMMAR OF VIMEU PICARD:



5.4 EPENTHESIS AND DELETION IN BASQUE

Basque, and specifically the Biscayan dialect spoken in Ondarroa (Spain), constitutes our final illustration of the desirability for consonants, especially non-edge ones, to appear next to a vowel.[10] This language displays cumulative edge effects as well as a contrast between stops/affricates and other consonants. Morpheme-final consonants, in particular stops and affricates, are subject to a number of processes to avoid appearing in non-prevocalic position: consonant deletion, vowel epenthesis, and affricate simplification. These processes become less likely to apply as we move from PW-internal positions to IP-final ones. But the application of these processes is subject to a lexical distinction between nouns/adjectives and closed-category lexical items, and to the status of the post-nominal singular marker /a/, which itself depends on the degree of opacity between singular and indefinite forms present in the inflectional system of the dialect.

I first present some basic facts regarding the phonemic inventory of Basque and the morphosyntactic contexts in which final stops and affricates are found in Basque, especially Ondarroa. A complete description and analysis of the Ondarroa variety then follows (sections 5.4.2 to 5.4.6). I end this chapter with a brief comparison of the Ondarroa facts with data from other dialects. The results support the approach taken here, against the OCP account to stop deletion that has become standard in the literature (5.4.7).

5.4.1. (ONDARROA) BASQUE: SOME BASIC FACTS

In this section I provide basic information on the grammar of Basque, which is necessary or useful to a proper understanding of the data presented in the following sections. More attention is given to Ondarroa Basque. I start with simple facts about the phonemic inventory and the phonotactics of the language, and go on with a presentation of the different words and contexts in which the relevant stops and affricates are found.

Most Basque dialects, including Ondarroa, have a simple five-vowel system /i,e,a,o,u/. A common consonantal inventory is given in (50) (from Hualde 1991: 10). Ondarroa Basque has a somewhat simpler inventory, as shown in (51):

[10]For the Basque data, I thank Ikuska Ansola for being such a good informant and José Ignacio Hualde for insightful comments on the data and the relevant literature. Thanks also go to Karlos Arregi for discussion on various aspects of the linguistic structure of Basque.

(50) COMMON BASQUE INVENTORY:

p	t		c	k
b	d		ɟ	g
f	ɕ	s	ʃ	x
	t͡ɕ	t͡s	t͡ʃ	
m	n		ɲ	
	l		ʎ	
	ɾ			
	r			

(51) INVENTORY IN ONDARROA:

p	t		k
b	d		g
f	s	ʃ	x
	t͡s	t͡ʃ	
m	n	ɲ	
	l	ʎ/j	
	ɾ		
	r		

One important difference between the inventories in (50) and (51) concerns the coronal fricatives and affricates. Many dialects have three series of coronal fricatives and affricates, detailed in (52):

(52)

POINT OF ARTICULATION	PHONEMIC TRANSCIPTION	ORTHOGRAPHY
Apico-alveolar	/s/ - /t͡s/	<s> - <ts>
Predorso-alveolar	/ɕ/ - /t͡ɕ/	<z> - <tz>
Palato-alveolar	/ʃ/ - /t͡ʃ/	<x> - <tx>

In all Biscayan (including Ondarroa) and some Guipuscoan varieties, the contrast between apico-alveolar and predorso-alveolar fricatives and affricates has been lost. The unique non-palatal coronal fricative in Ondarroa is [s], whereas the corresponding affricate is [t͡ɕ]. However, I represent both sounds by /s/ and /t͡s/, without indicating the articulatory distinction between the affricate and the fricative.[11] Also, the realization [j] in (51) results from the delateralisation of [ʎ] in younger Ondarroan speakers, including my informant (Hualde, p.c.)

Stems may end in one of the coronal sonorants (/n/, /l/, /r/-/ɾ/) and voiceless obstruents (/t/, /s/, /ʃ/, /t͡s/, /t͡ʃ/). /ɲ/ is also possible in Ondarroa (as a result of palatalization). Some coronal clusters are also allowed stem-finally: /st/, /nt/, /nt͡s/, /lt͡s/, /rt͡s/. /k/ is not found in stem-final position but is frequent word-finally as part of a number of frequent affixes: e.g. ergative /-k/, absolutive plural /-ak/, ablative /-tik/.

Morpheme-final consonants, in particular stops and affricates, are subject to phonotactic processes when in contact with a following suffix or word. These are the contexts that are of interest to us. We can distinguish between major lexical

[11]I must mention that when affricates simplify, I do not know whether the resulting fricative is consistently apico- or predorso-alveolar. See Urrutia, Etxebarria & Duque (1988) for an acoustic analysis of sibilant consonants in Biscayan dialects.

categories and what I will refer to as "closed" categories. Nominal, adjectival, and verbal stems may end in a stop or affricate. Nominal and adjectival stems may be followed by a suffix or may surface in their bare form, when uninflected or before a null inflectional suffix. DPs are inflected for number and case; there are three numbers: singular, plural, and indefinite. The latter is used in particular in quantified contexts, with numerals and quantifiers. Inflectional markers appear only once, at the right edge of the DP. Nouns, adjectives, and other elements of nominal phrases thus appear in their bare form when not in DP-final position. Modifying adjectives follow the noun; the numerals *bat* 'one', which also functions as an indefinite determiner, and *bi* 'two'[12] follow both nouns and adjectives. Other numerals and determiners (demonstratives, quantifiers) precede the noun. Demonstratives are always inflected for case, even in pre-nominal position. DPs containing a demonstrative thus carry two inflectional markers, and are an exception to the above-mentioned rule. In Ondarroa (and Getxo; see Hualde & Bilbao 1992), the distinction between indefinite and other forms is maintained only in the absolutive case. The absolutive indefinite form of a noun or adjective is identical to its bare (uninflected) form.

Verbal stems are different from nominal and adjectival ones in that they never appear in their bare form, but only in one of their three participial forms, accompanied by an auxiliary. Only a handful of synthetic verbal forms depart from this rule. All participles end in a vowel or /n/ (not an obstruent), and are mostly irrelevant to the present study. As for the rules that govern the formation of the participial forms, by adding participial suffixes to the stem, they would require a separate study, which I will not undertake here. So verbs will not be considered, although it is already clear that adding them to our data set would not alter the conclusions of this investigation, as the same basic principles are operative in verbal and nominal morphology (see Hualde, Elordieta & Elordieta 1994 for a description of the verbal morphology in Lekeitio Basque, a dialect very close to Ondarroa).

In addition to the major lexical categories, there are a number of words in restricted categories that end in a stop. For Ondarroa, these include the numeral / determiner *bat* 'one', the numeral *bost* 'five', the quantifier *semat* 'how much / how many', some auxiliaries and synthetic verbal forms, e.g. *dot* 'transitive auxiliary, 1st sg. subject, 3rd sg. direct object', and *dakat* 'I have'. Inflectional affixes may also end in a stop, e.g. those ending in /k/ cited above. These can be added to nouns, adjectives, pronouns, and determiners. There is one inflectional suffix that ends in an affricate, the directional case marker /-ɾutˢ/. I have not investigated the behavior of this final affricate in preconsonantal position, so only stops at the end of closed-category items will be described and analyzed.

[12]This is true in Biscayan dialects. In other varities, *bi* behaves like other numerals and precedes the noun.

To summarize, the behavior of morpheme-final stops and affricates will be investigated in the contexts given in (53), which leave aside verbal stems and the formation of participial forms as well as the directional suffix /ɾutˢ/. These contexts can be described in terms of two parameters: whether they are found in nouns/adjectives or in closed-category items, and whether they appear word-internally or finally.

(53) CONTEXTS WITH MORPHEME-FINAL STOPS/AFFRICATES:
Word-internally:
a. At the end of a nominal or adjectival stem, followed by an inflectional or derivational suffix
Word- or phrase-finally:
b. At the end of the bare form of a noun or adjective (including its absolutive indefinite form)
c. • At the end of inflectional suffixes (stops only)
• At the end of a number of closed-category lexical items (not nouns or adjectives) (stops only)

Since final affricates essentially only appear in nouns or adjectives, it follows that all the examples of affricate simplification found in the literature involve words in these two categories (contexts in (53a-b)). However, by contrast, almost all the examples of stop deletion involve words other than nouns and adjectives (contexts in (53c)). This can be explained by the fact that nominal and adjectival stems ending in a stop are fairly rare, much more so than those ending in an affricate. Moreover, some of the other words or morphemes ending in a stop are among the most frequent elements in the language, e.g. the absolutive plural and ergative case markers /-ak/ and /-k/ and the determiner *bat* 'one/a'.

This categorial distinction between examples with affricates and stops is not innocuous, as a more careful examination of stops in morpheme-final position shows that those in contexts (53b) do not behave like those in context (53c) (at least in Ondarroa). Therefore, any generalization mixing the contexts in (53b) and (53c) may be misleading. This is why in the rest of the discussion I treat nouns and adjectives separately from other categories, which I group under the label 'closed categories'.

5.4.2. STOPS AND AFFRICATES IN PREVOCALIC POSITION

No change takes place when morpheme-final stops and affricates are followed by a vowel-initial word or suffix. No deletion, epenthesis, or any other strategies are used. This is illustrated in (54)-(57) for Ondarroa Basque, with stops in closed categories across word boundaries (54), and stops and affricates in nouns or adjectives before inflectional suffixes (55), derivational suffixes (56), and separate words (57).[13,14] The relevant consonants appear in boldface.

(54) STOPS IN CLOSED CATEGORIES (ACROSS WORD BOUNDARIES):

a. /pijo ba**t** isot^{s}/ → [pijoba**t**isot^{s}]
pile one ice.ABS.IND
'a lot of ice'

b. /ore-**k** at^{s}amar-ak dis/ → [ore**k**at^{s}amaratis][15]
that-ERG.PL finger-ERG.PL are
'that's the fingers'

[13]I use the following abbreviations and conventions for glosses:
• The lexical content is in lower-case, grammatical information in small capitals.
• Inflectional suffixes are separated from the stem by a hyphen "-"; derivational ones by "+".
• Abbreviations for suffixes:

Case:	- ABS	absolutive	Number:	- SG	singular
	- ERG	ergative		- PL	plural
	- DAT	dative		- IND	indefinite
	- ABL	ablative			
	- GEN	genitive	Derivational suffixes:		
	- DIR	directional		- SUPERL	superlative degree
	- PROL	prolative		- COMP	comparative degree
	- GEN LOC	genitive locative		- DIM	diminutive

• Abbreviations for verbal expressions:

Verbs:	- PERF	perfective participle		
Auxiliaries:	-AUX	auxiliary	- S	subject
	- 1/2/3	first/second/third person	- D	direct object
	- SG/PL	singular/plural	- I	indirect object

Basque has a very complex system of auxiliaries, which agree in person and number with the subject, direct object, and indirect object.

[14]In Basque, as in Spanish, voiced stops [b, d, g] have spirantized allophones [β, ð, ɣ]. Stops are found word-initially, after a nasal, and, for /d/, after a lateral. I disregard this allophonic distribution in the data, using only the symbols for voiced stops.

[15]Auxiliaries and synthetic verb forms cliticize onto the preceding word. If they begin in /b/ or /d/, devoicing applies when the preceding word ends in a voiceless consonant (even if this consonant deletes). See Arregi (1998) for an analysis of stop devoicing in auxiliaries in Ondarroa, and Gaminde (1998). /d/ in initial position of auxiliaries and synthetic forms also rhotacizes into [ɾ] intervocalically, for instance in (57b,d).

c. /basu-**k** eɾosi ʧus/ → [basu**k**eɾositʃus]
glass-ABS.PL buy.PERF AUX.3SGS.3PLD
's/he has bought glasses'

(55) STOPS/AFFRICATES IN NOUNS/ADJECTIVES BEFORE INFLECTIONAL SUFFIXES:

a. /koko**t**-an/ → [koko**t**an]
neck-GEN.SG

b. /kiʃke**t**-a/ → [kiʃke**t**a]
lock-ABS.SG

c. /bijoʧ-an/ → [bijoʧan]
lamb-GEN.SG

d. /balt^{s}-a/ → [balt^{s}a]
black-ABS.SG

(56) STOPS/AFFRICATES IN NOUNS/ADJECTIVES BEFORE DERIVATIONAL SUFFIXES:

a. /aberat^{s}+en/ → [aberat^{s}en]
rich+SUPERL
'richest'

b. /gaʧ+ao/ → [gaʧao]
difficult+COMP
'more difficult'

c. /galan**t**+en/ → [galan**t**en]
beautiful/robust+SUPERL
'more beautiful/robust'

d. /galan**t**+ao/ → [galan**t**ao]
beautiful/robust+COMP
'most beautiful/robust'

(57) STOPS/AFFRICATES IN NOUNS/ADJECTIVES ACROSS WORD BOUNDARIES:

a. /kiʃke**t** andi bat/ → [kiʃke**t**andibat]
lock big one.ABS
'a/one big lock'

b. /iɾu ʧikoe**t** eɾosi dot/ → [iɾuʧikoteɾosiɾot]
three rope.ABS.IND buy.PERF AUX.1SGS.3SGD
'I have bought three ropes'

c. /eskat^{s} andi bat/ → [eskat^{s}andibat]
kitchen big one.ABS
'a/one big kitchen'

d. /lau sit**s** eɾosi dot/ → [lausit**s**eɾosiɾot]
four woodworm.ABS.IND buy.PERF AUX.1SGS.3SGD
'I have bought four woodworms'

It has been established that final stops and affricates are always licensed before a vowel. When no vowel follows, a variety of processes may apply, depending on a number of factors:
• whether it is a stop or an affricate;
• whether the stop/affricate is part of a closed-category item or a noun/adjective;
• what prosodic boundary, if any, follows the stop / affricate.
I look at closed-category items and nouns/adjectives separately, starting with the former group. In both groups a major distinction is found at the IP level, between IP-internal and IP-final segments. For nouns/adjectives, PW-internal stops and affricates also contrast with PW-final ones.

5.4.3. Deletion in closed-category lexical items

5.4.3.1. IP-internal deletion

IP-internally, final stops in closed-category lexical items are generally characterized by their instability in pre-consonantal position. They easily delete in this context, but this is not obligatory. Final stops can also be pronounced in a reduced form, as an unreleased stop, a weak fricative, or a glottal stop, in part depending on the following segment. But deletion remains the most frequent strategy. It takes place before any following consonant: stops (58), affricates (59), nasals (60), fricatives (61), laterals (62), and rhotics (63). The optionality of stop deletion is indicated with parentheses. The reason why I am giving examples of each type of consonants will become clear when we discuss cross-dialectal data, as deletion is blocked in other dialects before certain consonants (section 5.4.7).

(58) Before stops:
a. /ore-**k** paper-ak dis/ → [ore(**k**)paperatis]
that-ERG.PL papers-ERG.PL are
'that's the papers'
b. /giʃon-a**k** topa dau/ → [giʃona(**k**)topaɾau]
man-ERG.SG find.PERF AUX.3SGS.3SGD
'the man has found it/him/her'
c. /liburu ba**t** galdu dot/ → [libuɾuba(**t**)galduɾot]
book one.ABS lose.PERF AUX.1SGS.3SGD
'I have lost a book'

(59) Before affricates:
a. /sema**t** ʧakur/ → [sema(**t**)ʧakur]
how many dog.ABS.IND
'how many dogs'
b. /ore-**k** ʧakur-ak dis/ → [ore(**k**)ʧakuratis]
that-ERG.PL dog-ERG.PL are
'that's the dogs'
c. /at**s**amar ba**t** ʧupa dot/ → [at**s**amarba(**t**)ʧupaɾot]
finger one.ABS suck.PERF AUX.1SGS.3SGD
'I have sucked a pencil'

(60) Before nasals:[16]
a. /sema**t** mutil/ → [sema(**t**)mutil]
how many boy.ABS.IND
'how many boys'
b. /basu-**k** nai tʃus/ → [basu(**k**)naitʃus]
glass-ABS.PL want.PERF AUX.3SGS.3PLD
's/he has wanted glasses'
c. /giʃon ba**t** mima dau/ → [giʃomba(**t**)mimaɾau]
man one.ABS mime.PERF AUX.3SGS.3SGD
's/he has mimed a man'

(61) Before fricatives:
a. /ore-**k** sagusar-ak dis/ → [ore(**k**)sagusaratis]
that-ERG.PL bat-ERG.PL are
'that's the bats'

[16]Rotaetxe (1978) mentions that stop deletion occurs before stops and fricatives, but not nasals, in Ondarroa. She provides the following examples to illustrate stop retention in this context:

(i)	a.	<badot meriku on bat...>	/t m/	→	[tm]	'I have a good doctor'
	b.	<dakat naigabe andixe...>	/t n/	→	[tn]	'I have a big disgust'
	c.	<tresnak mai gamin...>	/k m/	→	[km]	'the dishes on the table'
	d.	<okanak nai...>	/k n/	→	[kn]	'to want cherries'

My own experience does not confirm this contrast between nasals and other consonants, and I cannot explain Rotaetxe's data. Recall that stop deletion is not obligatory, so the examples in (i) are not problematic in themselves. Notice, however, that the first two sentences are puzzling for reasons independent from stop deletion. They are considered ungrammatical by my informant. First, the verbal form *dot* in (a) (preceded by the emphatic particle *ba*) is only used as an auxiliary in Ondarroa and cannot mean 'I have' (as is possible in other – non-Biscayan – varieties). Second, a sentence cannot begin with an inflected verb as in (b); the emphatic particle *ba* has to be prefixed to it. As for the sentences in (c-d), my informant does not agree with Rotaetxe on the obligatoriness of stop retention.

b. /ore-**k** familiʃa-k dis/ → [ore(**k**)familiʃatis]
that-ERG.PL family-ERG.PL are
'that's the families'
c. /sema**t** sagusar/ → [sema(**t**)sagusar]
how many bat.ABS.IND
'how many bats'
d. /sema**t** familiʃa/ → [sema(**t**)familiʃa]
how many family.ABS.IND
'how many families'
e. /sema**t** xeneral/ → [sema(**t**)xeneral]
how many general.ABS.IND
'how many generals'
f. /gu-**k** sartu dou/ → [gu(**k**)sartuɾou]
we-ERG put in.PERF AUX.1PLS.3SGD
'we have put it/her/him in'
g. /gu-**k** fiʃa ga/ → [gu(**k**)fiʃaga]
we-ERG trust.PERF AUX.1PLS
'we have trusted'

(62) BEFORE LATERALS:
a. /gu-**k** lortu dou/ → [gu(**k**)lortuɾou]
we-ERG get.PERF AUX.1PLS.3SGD
'we have gotten it/him/her'
b. /baso ba**t** lortu dau/ → [basoba(**t**)lortuɾau]
glass one.ABS get.PERF AUX.3SGS.3SGD
's/he has gotten a glass'
c. /sema**t** lapitˢ/ → [sema(**t**)lapitˢ]
how many pencil.ABS.IND
'how many pencils'

(63) BEFORE RHOTICS:
a. /ore-**k** radiʃu-k dis/ → [ore(**k**)radiʃutis]
that-ERG.PL radio-ERG.PL are
'that's the radios'
b. /sema**t** radiʃo/ → [sema(**t**)radiʃo]
how many radio.ABS.IND
'how many radios'
c. /gu-**k** rosa dou/ → [gu(**k**)rosaɾou]
we-ERG get together.PERF AUX.1PLS.3SGD
'we have gotten together'

There is evidence that the stop may indeed be completely deleted in preconsonantal position. Compare the two sentences in (64), which differ only by the inflectional marker on the noun. In (64a), *giʃon* 'man' is the subject of the sentence and carries the ergative case /-ak/. In (64b), *giʃon* is the object and appears with the absolutive case /-a/.

(64) COMPLETE DELETION OF WORD-FINAL /-k/:
a. /giʃon-a**k** topa dau/ → [giʃonatopaɾau]
man-ERG.SG find.PERF AUX.3SGS.3SGD
'the man has found it/her/him'
b. /giʃon-a topa dau/ → [giʃonatopaɾau]
man-ABS.DEF.SG find.PERF AUX.3SGS.3SGD
's/he has found the man'

The sentences in (64a) and (64b) were recorded by my informant. Both were then randomly played to her, and she had to tell whether 'the man' was the subject or the object of the sentence. Interestingly, she was wrong or could not tell in all cases, which strongly suggests that the deletion of the stop is complete in sentences like (64). No apparent perceptual cues to the underlying /k/ remain in (64a).

5.4.3.2. IP-final retention

By contrast, IP- and U-final stops never delete, as shown in (65a) and (66). In the sentence in (65a), the object has been fronted and is separated from the rest of the sentence by an IP boundary. This example minimally differs from (65b), which uses the neutral SOV order, in which both noun phrases appear IP-internally. In (66) each example corresponds to an utterance, so the final stops are followed by a U boundary.

(65) NO STOP DELETION IP-FINALLY:
a. /prak-a**k** giʃon-ak eɾosi dau/ → [praka**k**]$_{IP}$ giʃonakeɾosiɾau]
pants-ABS man-ERG buy AUX.3SGS.3SGD (*prakak* left-dislocated)
'pants, the man has bought'
b. /giʃon-a**k** prak-ak eɾosi dau/ → [giʃona(**k**)prakakeɾosiɾau]
man-ERG pants-ABS buy AUX.3SGS.3SGD (*giʃonak* not left-dislocated)
'the man has bought pants'

(66) NO STOP DELETION U-FINALLY:
a. /sema**t**/ → [sema**t**] *[sema]
'how much / how many'

b. /libuɾu bat/ → [libuɾubat] *[libuɾuba]
book one.ABS
'a book'

c. /iɾu oratˢ eɾosi dot/ → [iɾuoratˢeɾosiɾot] *[iɾuoratˢeɾosiɾo]
three comb.ABS.IND buy.PERF AUX.1SGS.3SGD
'I have bought three combs'

d. /ore-k umi-k/ → [orekumik] *[orekumi]
that.ABS.PL child.ABS.PL
'those children'

The contexts for mandatory and optional stop retention are not to be distinguished by whether a consonant or a pause follows. Dislocated elements and IP boundaries are not necessarily separated by a pause from the rest of the sentence. Although the claim is often made that dislocation is characterized by the presence of a pause, more careful phonetic studies always indicate that this is not the case; see Dubuisson et al. (1983), Barnes (1985), Dupont (1985), and Deshaies et al. (1992) about left-dislocation in French. I have not conducted an experimental study of the intonation of dislocation in Ondarroa Basque, but my judgments corroborate those obtained for French.

So whether or not word-final stops in closed categories delete is determined by their position within IPs. IP-final stops do not delete, whether a vowel, a consonant, or a pause follows; IP-medial ones are optionally dropped when they are not followed by a vowel.

5.4.4. Epenthesis and simplification in nouns/adjectives

Stops and affricates at the end of nouns and adjectives differ in two respects from stops in closed categories. First, they appear word-internally before suffixes, which allows us to extend our investigation to word-internal contexts. It is observed that word-internal stops and affricates are even more restricted than word-final ones, which follows in the most natural way from the perceptual approach to consonant licensing argued for in this thesis. Second, stops in nouns/adjectives never delete; they are prevented from appearing in non-prevocalic position by other strategies: affricate simplification and insertion of the marker /a/ in contexts where it is not otherwise expected. These two processes are unavailable with closed categories since, for the most part, affricates are not found in final position in this group, and the /a/ marker, discussed in the section to come, is used only with nouns and adjectives.

I again present the data according to the prosodic context in which the final stop/affricate occurs: PW-internally, IP-internally, and IP-finally. But before we move on to the description of consonant-final nouns and adjectives, a discussion of some aspects of the nominal inflectional system of Ondarroa, as opposed to other dialects, is necessary in order to understand the nature of the marker /a/. We will see that the structure of the inflectional system interacts in interesting ways with phonotactic constraints, with distinct effects in different dialects, depending on the relative opacity of the singular/indefinite distinction in the system.

5.4.4.1. Excursus on the inflectional system

Most Basque dialects maintain a distinction between singular, plural, and indefinite forms for each case (except prolative and partitive, which have only one form). The structure of inflected nouns is [stem+number marker+case marker]; the singular marker is /a/ and the plural one /a(k)/[17]; the indefinite marker is phonetically null. So, for the most part, singular and indefinite forms differ in that the former carries a marker /a/ that is missing in the latter. When consonant-final stems and consonant-initial case markers come in contact in the indefinite form, an epenthetic vowel /e/ is inserted. The marker /a/ also raises to [e] when the last vowel of the stem is high, so that for these stems there is no distinction between the indefinite and singular forms with consonant-initial case endings (e.g. [lagunek] for both ergative sg. and ind. (67c) vs. [giʃonek] for erg. ind. and [giʃonak] for erg. sg. (67a)). The following examples for the stem *giʃon* 'man', *baso* 'forest', and *lagun* 'friend' are taken from the dialect spoken in Gernika. Note that the absolutive case marker is phonetically null.

(67) Absolutive and ergative in Gernika (Hualde & Bilbao 1992):

		indefinite		*singular*	
a.	absolutive	giʃon-Ø-Ø	[giʃon]	giʃon-a-Ø	[giʃona]
	ergative	giʃon-Ø-k	[giʃonek]	giʃon-a-k	[giʃonak]
b.	absolutive	baso-Ø-Ø	[baso]	baso-a-Ø	[basoa]
	ergative	baso-Ø-k	[basok]	baso-a-k	[basoak]
c.	absolutive	lagun-Ø-Ø	[lagun]	lagun-a	[lagune]
	ergative	lagun-Ø-k	[lagunek]	lagun-a-k	[lagunek]

Certain dialects, including Ondarroa (Hualde 1995) and Getxo (Hualde & Bilbao 1992), have lost the indefinite-singular distinction in all the cases but the absolutive. This has come as a consequence of the acquisition of a vowel deletion

[17] Plural forms are often segmentally identical to singular ones, but the two differ on the position of the accent: singular suffixes are unaccented, while plural ones are pre-accented.

rule that has removed the singular marker after another vowel. This process has affected stems ending in a vowel, like *baso* 'forest', *mendi* 'mountain', *neska* 'girl'. The loss of the marker /a/ in a large proportion of nouns/adjectives has made its interpretation more opaque, so that now it only plays a role in the most common case - the absolutive - which is used for objects and subjects of intransitive verbs (the absolutive singular is also the citation form). The partial declensions corresponding to (67) in the Getxo and Ondarroa varieties are given below (see Hualde & Bilbao 1992 and Hualde 1995 for the complete paradigms).

(68) ABSOLUTIVE AND ERGATIVE IN GETXO (Hualde & Bilbao 1992):

		indefinite	*indefinite/singular*	*singular*
a.	absolutive	[gison]		[gisona]
	ergative		[gisonak]	
b.	absolutive		[baso]	
	ergative		[basok]	
c.	absolutive	[lagun]		[lagune]
	ergative		[lagunek]	

(69) ABSOLUTIVE AND ERGATIVE IN ONDARROA (Hualde 1995):

		indefinite	*indefinite/singular*	*singular*
a.	absolutive	[giʃon]		[giʃona]
	ergative		[giʃonak]	
b.	absolutive	[baso]		[basu]
	ergative		[basuk]	
c.	absolutive	[lagun]		[lagune]
	ergative		[lagunak]	

There is, however, one important difference between Getxo and Ondarroa. In Getxo, as a consequence of the deletion rule, absolutive singular and indefinite forms have become identical for most vowel-final stems. The distinction is consistently marked only for consonant-final stems, e.g. *gison* 'man' and *lagun* 'friend'. In Ondarroa, on the other hand, a series of processes affecting vowel sequences have left their trace on the stem-final vowel before the singular marker deleted, notably vowel raising and /ʃ/-insertion. As a consequence absolutive indefinite and singular forms are different for most vowel-final stems, although the distinction is not made by the addition of /a/, as in consonant-final stems, but by raising the stem vowel or by inserting [ʃ], as in [mendiʃe] (70c). See the examples below for both dialects.

(70) ABSOLUTIVE CASE IN GETXO AND ONDARROA:

	Getxo		Ondarroa	
	Indefinite	*Singular*	*Indefinite*	*Singular*
a. 'forest'	baso	baso	baso	basu
b. 'house'	etˢe	etˢe	etʃe	etʃi
c. 'mountain'	mendi	mendi	mendi	mendiʃe
d. 'girl'	neska	neske/neska	neska	neski

The changes that the Getxo and Ondarroa dialects have undergone have had important consequences outside of the inflectional system itself. First, the marker /a/ is no longer consistently interpreted as a singular marker. So the absolutive singular form is now being used in contexts where the indefinite one is expected. As a further step, /a/ is also on its way to even losing its suffixal status, forms in /a/ being used in place of the uninflected ones, i.e. as non-final elements inside DPs. What we seem to witness is the emergence of stem allomorphy between the /a/-final and consonant-final forms. This is particularly true in Getxo, where the blurring of the indefinite and singular forms is more advanced (see the discussion in Hualde & Bilbao 1992).

This reinterpretation of the formally singular forms in /a/ has affected the treatment of stem-final stops and affricates in Ondarroa and Getxo. The /a/-final forms are now being used to break up the disprefered or impossible consonant sequences which the use of the consonant-final form would have created. So /a/ plays the role of an epenthetic vowel, restricted to nouns and adjectives (it cannot be used with e.g. closed-category items ending in a stop). We will see plenty of examples of this use in the sections below. The behavior of final consonants in Ondarroa can most relevantly be compared with that in the Lekeitio variety, where the use of a proxy /a/ marker does not seem to be attested. This dialect, otherwise very close to Ondarroa, has fully retained the distinction between indefinite and singular forms in all cases, and consequently has maintained a consistent interpretation of /a/ as a singular marker.

5.4.4.2. PW-internal contexts

Let us first look at stem-final stops and affricates at PW-internal morpheme boundaries. The general rule, both before inflectional and derivational suffixes, is that stops and affricates cannot surface before a consonant. The choice of /a/-final forms represents the main strategy used to prevent this undesired situation, but affricate simplification is also possible. Insertion of a truly epenthetic vowel /e/ is also attested in restricted and frozen contexts, but seems to be no longer productive.

Inflectional suffixes fall under two categories: locative and nonlocative. Apart from the prolative, nonlocative cases are irrelevant here since they all begin in a vowel, or automatically take the marker /a/ between the stem and the case ending proper. The prolative is different in that it makes no number distinction, and the case marker /-tˢat/ attaches directly to the stem. The consonant-initial locative suffixes include the genitive locative /-ko/, the ablative /-tik/, and the directional /-ɾuts/. In most dialects, locative cases do not take the marker /a/; an epenthetic vowel always appears between consonant-final stems and consonant-initial suffixes, irrespective of the nature of these consonants. In Ondarroa, we observe the first effect of the reinterpretation of the marker /a/. Unlike most dialects (e.g. Lekeitito), which only use true epenthesis after consonant-final stems, Ondarroa oscillates between epenthesis and the addition of the marker /a/, as shown in (71)-(73). It appears that the structure of locative cases is being reanalyzed to make it more like that of non-locative forms, so that the /a/ marker, which is used in all non-locative cases, now tends to be prefered over epenthesis in locative cases as well. The same process replacing epenthesis with the marker /a/ is attested, in a more advanced form, in Getxo, where /a/ is now the only vowel used.

(71) AFFRICATE-FINAL STEMS + LOCATIVE INFLECTIONAL SUFFIXES:

a.	/biʃo**tˢ**-ko/	→	[biʃo**tˢ**e̲ko]	'heart-GEN LOC'
b.	/bijo**tʃ**-tik/	→	[bijo**tʃ**e̲tik]	'lamb-ABL'
c.	/eska**tˢ**-ɾutˢ/	→	[eska**tˢ**e̲ɾutˢ] / [eska**tˢ**a̲ɾutˢ]	'kitchen-DIR'

(72) STOP-FINAL STEMS + LOCATIVE INFLECTIONAL SUFFIXES:

a.	/koko**t**-tik/	→	[koko**t**e̲tik] / [koko**t**a̲tik]	'neck-ABL'
b.	/silbo**t**-ɾutˢ/	→	[silbo**t**a̲ɾutˢ]	'prominent belly-DIR'
c.	/apa**r**t-ɾutˢ/	→	[apa**r**ta̲ɾutˢ]	'excellent-DIR'

(73) STEMS ENDING IN OTHER CONSONANTS + LOCATIVE INFLECTIONAL SUFFIXES:

a.	/asa**l**-tik/	→	[asa**l**e̲tik]	'skin-ABL
b.	/ada**r**-tik/	→	[ada**r**e̲tik] / [ada**r**a̲tik]	'branch/horn-ABL'
c.	/iʃe**n**-tik/	→	[iʃe**n**e̲tik] / [iʃe**n**a̲tik][18]	'name-ABL'
d.	/araiɲ-tik/	→	[araiɲa̲tik] / *[araiɲe̲tik]	'fish-ABL'
e.	/lanba**s**-tik/	→	?[lamba**s**e̲tik] / [lamba**s**a̲tik]	'mop-ABL'
f.	/tʃiʃ-tik/	→	[tʃiʃe̲tik]	'urine-ABL'
g.	/lanba**s**-ɾutˢ/	→	[lamba**s**a̲ɾutˢ]	'mop-DIR'

[18]Stems ending in a nasal may also in certain cases form the ablative without the epenthetic vowel, but with voicing of the suffix-initial /t/: [araindik] 'fish', ?[iʃendik] 'name', [asafrandik] 'safran'. I do not know what factors are involved in the possibility of using this exceptional process.

These inflectional suffixes do not tell us anything about the particular behavior of stops and affricates since epenthesis occurs after all consonants. But they do point to the general preference for open syllables in Basque, as well as to the reanalysis of the /a/ marker. I will not consider these affixes in the rest of the analysis.

The prolative suffix /-tˢat/, unlike those illustrated in (71)-(73), does not normally trigger epenthesis when attached to a consonant-ending stem in other dialects (e.g. Lekeitio in Hualde, Elordieta & Elordieta 1994).[19] But the partial reanalysis that has extended the use of the marker /a/ in the inflectional paradigm makes it also available in the prolative. Interestingly the use of /a/ seems to be linked to the sonority of the stem-final consonant: the less sonorous it is, the more likely it is for /a/ to be used. Stems ending in /r/ are incompatible with the vocalic marker (74a-b)[20], those ending in a nasal accept both the forms with direct addition of the suffix and insertion of /a/ (74c), those ending in a fricative slightly favor the use of the vowel (74d-e).

(74) STEMS ENDING IN OTHER CONSONANTS + PROLATIVE CASE:

a.	/atˢama**r**-tˢat/	→	[atˢama**r**tˢat] / *[atˢama**r**a̲tˢat]	'finger-PROL'
b.	/liko**r**-tˢat/	→	[liko**r**tˢat] / *[liko**r**a̲tˢat]	'liquor-PROL'
c.	/giʃo**n**-tˢat/	→	[giʃo**n**tˢat] / [giʃo**n**a̲tˢat]	'man-PROL'
d.	/xue**s**-tˢat/	→	?[xue**s**tˢat] / [xue**s**a̲tˢat]	'judge-PROL'
e.	/frantˢe**s**-tˢat/	→	?[frantˢe**s**tˢat] / frantˢe**s**a̲tˢat	'Frenchman-PROL'

With stems ending in a stop or an affricate, the situation is clear: the /a/-final form is required in all cases (75)-(76).

(75) AFFRICATE-FINAL STEMS + PROLATIVE CASE:

a.	/lapi**tˢ**-tˢat/	→	[lapi**tˢ**a̲tˢat]	'pencil-PROL'
b.	/aro**tˢ**-tˢat/	→	[aro**tˢ**a̲tˢat]	'carpenter-PROL'
c.	/so**tˢ**-tˢat/	→	[so**tˢ**a̲tˢat]	'toothpick-PROL'

[19]But the examples given in Hualde et al. (1994) involve stem-final consonants that are attested in coda position stem-internally. It is not clear what happens with stop- and affricate-final stems, these consonants never appearing in internal codas.

[20]An exception is /ur/ 'gold', whose prolative form is [ure̲tˢat] rather than [urtˢat]. Notice that /ur/ contrasts with /uɾ/ 'water', whose prolative form is [uɾe̲tˢat]. The flap and the trill only contrast in intervocalic position, rhotics being trilled in other positions. The /a/-final form could then be favored here to preserve the distinction between the two rhotics. (Recall that /a/ raises to [e] after high vowels, although I have found that this is not consistently done by my informant.)

d. /eskatˢ-tˢat/ → [eskatˢa͡tˢat] 'kitchen-PROL'
e. /atʃ-tˢat/ → [atʃa͡tˢat] 'rock-PROL'
f. /bijotʃ-tˢat/ → [bijotʃa͡tˢat] 'lamb-PROL'

(76) STOP-FINAL STEMS + PROLATIVE CASE:
a. /kiʃketˢat/ → [kiʃketa͡tˢat] 'lock-PROL'
b. /kokotˢat/ → [kokota͡tˢat] 'neck-PROL'
c. /apartˢat/ → [aparta͡tˢat] 'excellent-PROL'
d. /galantˢat/ → [galanta͡tˢat] 'elegant / robust-PROL'

The situation in derivational morphology is slightly more complex.[21] Neither affricates nor stops are allowed before consonant-initial derivational suffixes, as before the prolative suffix /-tˢat/. Vowel insertion is the most general strategy used to prevent this situation, but simplification into a fricative is also an option for affricates. True epenthesis is well attested in the established vocabulary, but the use of the /a/-final form is now prefered in the more productive morphology.

With the verbalizing suffix /-tu/, usually only one form is good, although with [abeɾatˢ] (77a) and [latˢ] (77b), both epenthesis and simplification are acceptable. Here the epenthetic vowel is /e/ or /i/, /t/ palatalizing into [tʃ] when the latter is used. Which repair strategy is to be prefered does not seem to be predictable from the shape of the stem, cf. for example the contrast between [mostu] (77c) and [otˢitʃu] (77g).

(77) AFFRICATE-FINAL STEMS + SUFFIX /-tu/:
a. /abeɾatˢ+tu/ → [abeɾatˢi͡tʃu] / [abeɾastu] 'to become rich'
b. /latˢ+tu/ → [latˢe͡tu / lastu] 'to become rough'
c. /motˢ+tu/ → *[motˢi͡tʃu] / [mostu] 'to shorten'
d. /sorotˢ+tu/ → *[sorotˢi͡tʃu] / [sorostu] 'to sharpen'
e. /garatˢ+tu/ → *[garatˢi͡tʃu] / [garastu] 'to become sour'
f. /oratˢ+tu/ → *[oratˢi͡tʃu] / [orastu] 'to comb'
g. /baltˢ+tu/ → [baltˢi͡tʃu] / *[balstu] 'to blacken'
h. /otˢ+tu/ → [otˢi͡tʃu] / *[ostu] 'to get cold'
i. /gatʃ+tu/ → ??[gatʃe͡tu] / *[gaʃtu] 'to get difficult'

[21]Very few derivational suffixes are productive enough to be freely associated with a reasonable number of stems ending in affricates and stops. The most productive one is the diminutive suffix /-tʃo/. Also useful is the adjectival suffix /-sale/ 'fond of'. The verbalizing suffix /-tu/ appears in a large number of items but its synchronic productivity is limited.

But I have found this suffix to have very limited synchronic productivity, other strategies being prefered to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning 'do'). Other examples of affricate-final stems followed by suffixes with null or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis.

(78) AFFRICATE-FINAL STEMS + OTHER (UNPRODUCTIVE) DERIVATIONAL SUFFIXES:
a. /biʃotˢ+dun/ → [biʃosdun] 'courageous'
b. /oratˢ+keri/ → [oraskeri] 'hair style'
c. /maʃatˢ+ro/ → [maʃatˢe͡ro] 'every May'

With synchronically fully productive suffixes, in particular the diminutive /-tʃo/, but also /-sale/, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems (79).

(79) STOP-FINAL STEMS + SUFFIXES /-tʃo, -sale/:
a. /kokot+tʃo/ → [kokota͡tʃo] 'neck+DIM'
b. /kiʃket+tʃo/ → [kiʃketa͡tʃo] 'lock+DIM'
c. /kaset+tʃo/ → [kaseta͡tʃo] 'cassette+DIM'
d. /tʃalet+tʃo/ → [tʃaleta͡tʃo] 'chalet+DIM'
e. /tʃalet+sale/ → [tʃaleta͡sale] 'fond of chalets'

With affricates, the form with the /a/-final stem is always acceptable, while the one with simplification of the affricate is more variable. While it is fully grammatical in some words (80a-c, m), it is impossible or very marginal in others (80f-l). Nothing special needs to be said about /-sale/ (81), apart from the fact that it is not clear whether the fricative resulting from the simplification of the affricate forms or not a geminate with the following /s/-initial suffix.

(80) AFFRICATE-FINAL STEMS + SUFFIX /-tʃo/:
a. /lapitˢ+tʃo/ → [lapitˢa͡tʃo] / [lapistʃo] 'pencil+DIM'
b. /sitˢ+tʃo/ → [sitˢa͡tʃo] / [sistʃo] 'woodworm+DIM'
c. /sotˢ+tʃo/ → [sotˢa͡tʃo] / [sostʃo] 'toothpick+DIM'
d. /aritˢ+tʃo/ → [aritˢa͡tʃo] / (?)[aristʃo] 'oak tree+DIM'
e. /otˢ+tʃo/ → [otˢa͡tʃo[/ ?[ostʃo] 'cold+DIM'
f. /oratˢ+tʃo/ → [oratˢa͡tʃo] / ??[orastʃo] 'comb+DIM'
g. /eskatˢ+tʃo/ → [eskatˢa͡tʃo] / ??[eskastʃo] 'kitchen+DIM'
h. /aberatˢ+tʃo/ → [aberatˢa͡tʃo] / ??[aberastʃo] 'old+DIM'
i. /autˢ+tʃo/ → [autˢa͡tʃo] / ??[austʃo] 'dirt+DIM'

j. /gilt^{s}+ʧo/ → [gilt^{s}a̲ʧo] / *[gilsʧo] 'key+DIM'
k. /irunt^{s}+ʧo/ → [irunt^{s}a̲ʧo] / *[irunsʧo] 'dew+DIM'
l. /aʃ+ʧo/ → [aʃa̲ʧo] / *[aʃʧo] 'rock+DIM'
m. /bijoʃ+ʧo/ → ?[bijoʃa̲ʧo] / [bijoʃʧo] 'lamb+DIM'

(81) AFFRICATE-FINAL STEMS + SUFFIX /-sale/:
a. /gat^{s}+sale/ → [gat^{s}a̲sale] / *[ga(s)sale] 'fond of salt'
b. /leat^{s}+sale/ → [leat^{s}a̲sale] / [lea(s)sale] 'fond of hake'

In derivational morphology, as with the prolative suffix /-t^{s}at/, the use of the marker /a/ is also available with consonants other than stops and affricates, even though the form without epenthesis contains consonant sequences that are attested stem-internally. It is particularly relevant to compare stem-final /t^{s}/ with /s/ (82). With the non-productive verbalizing suffix /-tu/, only one form – with or without /a/ – is acceptable in (82a-b), but it does not seem possible to predict which. With the productive suffix /-ʧo/, both forms are acceptable, with perhaps a slight preference for /a/-insertion.

(82) STEMS ENDING IN OTHER CONSONANTS + DERIVATIONAL SUFFIXES:
a. /eres+tu/ → *[resatu] / [restu] 'to get easy'
b. /gris+tu/ → [grisa̲tu] / *[gristu] 'to make grey'
c. /lanbas+ʧo/ → [lambasa̲ʧo] / (?)[lambasʧo] 'mop+DIM'
d. /ames+ʧo/ → [amesa̲ʧo] / (?)[amesʧo] 'dream+DIM'
e. /tes+ʧo/ → [tesa̲ʧo] / ?[testʃo] 'test+DIM'

Let us now summarize the results obtained for word-internal contexts. Stops and affricates can never surface before a consonant-initial suffix. A repair strategy must then be adopted. The use of /a/-final stems is the prefered option in general. Simplification is also available in derivation morphology but is slightly disprefered. True epenthesis of /e/ seems to have become synchronically non-productive. Consonants other than stops and affricates are also disfavored in word-internal preconsonantal position, a situation that the use of the marker /a/ often prevents.

5.4.4.3. PW-final, IP-internal contexts

It is across word boundaries that we find the greatest amount of variation and number of possible strategies. Unlike stops in closed categories, those in nouns and adjectives never delete. Unlike stops and affricates preceding word-internal suffixes, both categories of segments can surface as such in preconsonantal position. But the

use of the form containing the marker /a/ is also generally possible, as well as affricate simplification, these two options being associated with faster speech and/or more colloquial registers. So we get two possibilities with stops, three with affricates, as illustrated in various syntactic contexts in (83) and (84).

(83) STOPS IN PW-FINAL, IP-INTERNAL POSITION:
a. /kokot bat/ → [kokot(a̲)bat]
neck one.ABS
'a/one neck'
b. /iɾu kiʃket dakat/ → [kiʃketdakat] / [kiʃketa̲ɾakat]
three lock.ABS.IND I-have
'I have three locks'
c. /iɾu kiʃket bota dot/ → [iɾukiʃket(a̲)botaɾot]
three lock.ABS.IND throw.PERF AUX.1SGS.3SGD
'I have thrown three locks'

(84) AFFRICATES IN PW-FINAL, IP-INTERNAL POSITION:
a. /eskat^{s} bat/ → [eskat^{s}(a̲)bat] / [eskasbat]
kitchen one.ABS
'a/one kitcheń
b. /lau biʃot^{s} meɾesi dot/ → [laubiʃot^{s}(a̲)meɾesiɾot] / [laubiʃosmeresiɾot]
four heart.ABS.IND deserve.PERF AUX.1SGS.3SGD
'I have deserved three hearts'
c. /iɾu lapit^{s} topa dot/ → [iɾulapit^{s}(a̲)topaɾot] / [iɾulapistopaɾot]
three pencil.ABS.IND find.PERF AUX.1SGS.3SGD
'I have found three pencils'

Fricative-final words can also marginally take the /a/-marker in indefinite contexts (85). This confirms the tendency that revealed itself in word-internal position for fricatives to be avoided in pre-consonantal position, although to a lesser degree than affricates.

(85) FRICATIVES IN PW-FINAL, IP-INTERNAL POSITION:
/frant^{s}es bat/ → [frant^{s}esbat] / ??[frant^{s}esa̲bat]
Frenchman one.ABS
'a/one Frenchman'

However, there is one context in which the choice of the /a/-final form of nouns is really marginal, that is before an adjective inside a noun phrase (86). Interestingly, this contextual restriction on the use of the /a/-form is not found in

Getxo, where the form with the marker /a/ in preadjectival position is more frequent than the one that uses simplification (87) (it seems that affricates cannot be kept intact in preconsonantal position in this dialect).

(86) FINAL STOPS AND AFFRICATES IN DP-INTERNAL POSITION IN ONDARROA:
a. /kiʃke**t** gori bat/ → [kiʃke**t**goribat] / ??[kiʃke**t**a̲goribat]
lock red one.ABS.IND
'one/a red lock'
b. /eska**t**^{s} balt^{s}-a/ → [eska**t**^{s}balt^{s}a]/[eska**s**balt^{s}a]/ ??[eska**t**^{s}a̲balt^{s}a]
kitchen black-ABS.SG
'the black kitchen'

(87) FINAL STOPS AND AFFRICATES IN DP-INTERNAL POSITION IN GETXO:
/ike**t**^{s} balt^{s}-a/ → [ike**t**^{s}a̲balt^{s}a] / [ike**z**βalt^{s}a]
coal black-ABS.SG
'black coal' (from Hualde & Bilbao 1992)

In determining why /a/ is highly disfavored in noun+adjective sequences in Ondarroa, we have to consider the contexts where this marker appears in the DP. /a/ normally surfaces DP-finally, as it affects the interpretation of the whole noun phrase. The position of /a/ in (86) between the noun and the adjective does not conform to this rule, nor do all the instances of /a/ before the indefinite determiner /bat/ in (83a, 84a, 85) and those appearing between stems and case or derivational suffixes in section 5.4.4.2. But when we put aside the singular interpretation of /a/, which is what spearkers do when they use it in non-singular contexts for phonotactic purposes, another generalization on the placement of /a/ becomes available. /a/ only appears on the last noun or adjective in the DP. In other words, /a/ attaches to the last element in the DP that may bear it, which excludes DP-final elements that are not nouns or adjectives, e.g. /bat/ 'a/one', /bi/ 'two', and several case and derivational suffixes, like prolative /-t^{s}at/ and diminutive /-ʧo/. This interpretation accounts for the distinction between (86a), where /a/ attaches to a non-final noun/adjective in the DP, and previous examples of /a/ followed by morphemes other than nouns or adjectives.

5.4.4.4. IP-final contexts

At the right edge of IPs and utterances, stops and affricates never delete nor simplify, as was the case for stops at the end of closed-category items. The choice of the form ending in /a/ is possible, but marginal and much less acceptable than in

PW- and IP-internal contexts. This is shown in (88) at the right edge of dislocated constituents, i.e. at an IP boundary, and in (89) utterance-finally.

(88) NO DELETION/SIMPLIFICATION OF STOPS AND AFFRICATES IP-FINALLY:
a. /lau kiʃke**t** giʃon-ak ɛrosi dau/ → [laukiʃke**t**]$_{IP}$ giʃonakeɾosiɾau] / ??[laukiʃketa̲]$_{IP}$ giʃonakeɾosiɾau]
four lock.ABS.IND man-ERG.SG buy.PERF AUX.3SGS.3SGD
'Four locks, the man has bought'
b. /lau lapit^{s} giʃon-ak ɛrosi dau/ → [laulapit^{s}]$_{IP}$ giʃonakeɾosiɾau] / ??[laulapit^{s}a̲]$_{IP}$ giʃonakeɾosiɾau]
four pencil.ABS.IND man-ERG.SG buy.PERF AUX.3SGS.3SGD
'Four pencils, the man has bought'

(89) NO DELETION/SIMPLIFICATION OF STOPS AND AFFRICATES U-FINALLY:
a. /lau silbo**t**/ → [lausilbo**t**] / ?? [lausilbota̲]
four prominent belly.ABS.IND
'four prominent bellies'
b. /lau kiʃke**t**/ → [laukiʃke**t**] / ??[laukiʃketa̲]
four lock.ABS.IND
'four locks'
c. /lau ʧiko**t**/ → [lauʧiko**t**] / ??[lauʧikota̲]
four rope.ABS.IND
'four ropes'
d. /bost oko**t**^{s}/ → [bostoko**t**^{s}] / ??[bostoko**t**^{s}a̲]
five chin.ABS.IND
'five chins'
e. /pijo bat beaka**t**^{s}/ → [pijobabeaka**t**^{s}] / ??[pijobabeaka**t**^{s}a̲]
pile one garlic.ABS.IND
'a lot of garlic'
f. /lau gorpu**t**^{s}/ → [laugorpu**t**^{s}] / ??[laugorpu**t**^{s}a̲]
four body.ABS.IND
'four bodies'

5.4.5. SUMMARY

The table below summarizes the relevant facts about the behavior of final stops and affricates in both nominal and adjectival stems and closed-category items. The table tells whether stops and affricates are tolerated in non-prevocalic position in PW-internal, IP-internal, and IP-final position, and whether each of the possible

repair strategies – stop deletion, affricate simplification, and /a/-epenthesis[22] – is attested, and to what extent. The second half of the table provides the same information about morpheme-final consonants other than stops and affricates, notably fricatives.

(90) SUMMARY OF THE BEHAVIOR OF MORPHEME-FINAL CONSONANTS:

	PW-internal	IP-internal (PW- or PP-final)	IP-final
Stops and affricates Stops/affricates allowed?	**no**	**yes**	**yes**
Repair strategy?	**obligatory**	**optional**	**marginal**
Stop deletion	N/A	yes	no
Affricate simplification	?yes	yes	no
/a/-epenthesis	yes	yes	??yes
Other consonants (fricatives) Other consonants allowed?	**yes**	**yes**	
Repair strategy?	**optional**	**marginal**	
/a/-epenthesis	yes	(??yes/no)	
Deletion	no	no	

The higher they appear in the prosodic hierarchy, the more easily stops and affricates – and to a lesser extent other consonants – are licensed, from PW-internal to IP-final contexts.[23] First, these segments are disallowed in PW-internal position in non-prevocalic position, but tolerated PW- and phrase-finally. There are three possible strategies to prevent stops and affricates from surfacing in non-prevocalic position: the use of the /a/-final form, deletion (for stops), and simplification (for affricates). Stop deletion is impossible in all contexts with nominal and adjectival stems, but it is easily available for closed categories. The two remaining processes are available PW- and IP-internally, and only /a/-epenthesis is marginally allowed IP-finally. So fewer and fewer repair strategies are used as we go up the prosodic hierarchy, leaving more room for stops, affricates, and other consonants to surface.

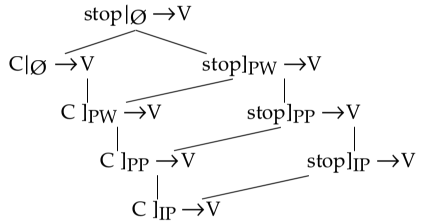
[22]I disregard "true" epenthesis, as it seems to be deprived of real synchronic productivity in the data under consideration. This omission has no significant effect on the subsequent analysis.

[23]I do not know whether /a/-epenthesis is an option at all with IP-final consonants other than stops and affricates, that is whether it is marginal, as with stops and affricates in (88)-(89), or clearly impossible. Without clear evidence, I will disregard this detail. Note that if the latter alternative holds, we should add DEP-/a/ >> C]Ø→V to the rankings in (94), to exclude IP-final /a/-insertion with consonants other than stops/affricates.

5.4.6. ANALYSIS OF EDGE EFFECTS IN ONDARROA BASQUE

I present in this section a formal analysis of edge effects in Ondarroa Basque. The backbone of the analysis consists in a series of markedness constraints against stops and other consonants not followed by a vowel. The inherent ranking of the constraints, given in (91), reflects the role of the strength of the adjacent prosodic boundary and the greater vulnerability of stops, compared to other consonants.[24]

(91) MARKEDNESS CONSTRAINTS AND THEIR INHERENT RANKING:



What has to be determined is how these constraints interact with the various faithfulness constraints that deal with the available repair strategies. This interaction yields a significant amount of variation, which manifests itself in the existence of several options or possible outputs for many inputs.

The faithfulness constraints I will be using are listed in (92). The constraint in (92a) deals with the deletion of postvocalic consonants. This constraint is violated in cases of stop deletion (observed only in closed-category lexical items). The constraint in (92b) penalizes affricate simplification, which I assume results in the deletion of an underlying [-continuant] feature. True vowel epenthesis violates the constraint in (92c); this constraint is high-ranked in Ondarroa Basque.

I suppose that the use of the /a/-final form of nouns and adjectives in contexts where it is not expected violates DEP-/a/ (92di), which could be viewed as an interpretative constraint that requires that the morpheme /a/ be associated with a singular meaning. A possible rule for the placement of /a/ has also been suggested: it normally appears on the last noun or adjective in the DP. This accounts for why /a/ is highly disfavored between nouns and adjectives in Ondarroa (86a).

[24]The constraints specific to stops in (91) crucially apply to affricates in Basque. This constrasts with the Hungarian pattern, described in section 1.2.3.1 and partly analyzed in section 4.2.4, in which affricates behave like fricatives rather than like stops. This ambivalence of affricates is not unexpected given their dual nature: like fricatives they include frication noise; like stops they have crucial information concentrated in the release. I will not try to solve this ambiguity here.

The constraint in (92dii) penalizes the use of /a/ in contexts that do not conform to this rule. Notice that /a/-epenthesis is not at all an option with words other than nouns/adjectives since /a/ is a nominal morpheme. Epenthesis in closed-category items is concerned with the general DEP-V constraint; the constraints over /a/-epenthesis in (92d) are not even relevant in this case.[25]

(92) RELEVANT FAITHFULNESS CONSTRAINTS:
- a. Constraint against deletion:
  MAX-C/V__ Do not delete a postvocalic consonant.
- b. Constraint against the simplification of affricates:
  MAX-[cont] Do not delete a feature [continuant].
- c. Constraint against epenthesis:
  DEP-V Do not insert a vowel.
- d. Constraints against /a/ insertion:
  - i. DEP-/a/ Do not insert a proxy singular marker /a/ in nouns and adjectives (i.e. in contexts where the marker does not have the expected interpretation).
  - ii. /a/=FINAL /a/ attaches to the last element (noun or adjective) that may bear it inside the DP.

We now have all the necessary elements for the final stage of the analysis of stops and affricates - and consonants more generally - in Ondarroa Basque. The list of outputs that our grammar has to generate is given in (93), together with the constraints that each of them violates. I use the words /eskatˢ/ 'kitchen', /kokot/ 'neck', and /lanbas/ 'mop' as examples of nouns/adjectives, and /semat/ 'how much, how many' as an example of a closed-category lexical item.

(93)	Input		Output		Constraints violated
PW-internally:					
a.	/eskat**ˢ**+tʃo/	→	[eskat**ˢ**at͡ʃo]	'kitchen-dim'	DEP-/a/
		→	?[eskas**t**ʃo]		C]Ø→V, MAX-[cont]
b.	/kokot+tʃo/	→	[kokot**a**t͡ʃo]	'neck-dim'	DEP-/a/
c.	/lanbas+tʃo/	→	[lambast͡ʃo]	'mop-dim'	C]Ø→V
		→	[lambas**a**t͡ʃo]		DEP-/a/

[25]To prevent /a/-epenthesis with words other than nouns/adjectives we could have an undominated morphological constraint prohibiting the use of nominal suffixes with non-nominal morphemes. I will leave such a constraint aside here to avoid unnecessary complications.

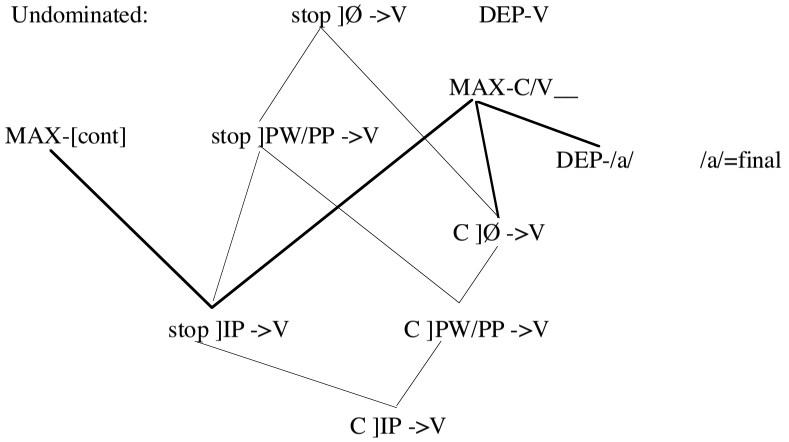
PW-finally:					
d.	/eskat**ˢ** bat/	→	[eskat**ˢ**bat]	'a kitchen'	stop]$_{PW}$→V
		→	[eskat**ˢ**abat]		DEP-/a/
		→	[eskasbat]		C]$_{PW}$→V, MAX-[cont]
e.	/kokot bat/	→	[kokotbat]	'a neck'	stop]$_{PW}$→V
		→	[kokotabat]		DEP-/a/
f.	/lanbas bat/	→	[lambasbat]	'a mop'	C]$_{PW}$→V
		→	??[lambasabat]		DEP-/a/
g.	/eskat**ˢ** gori/	→	[eskat**ˢ**gori]	'red kitchen'	stop]$_{PW}$→V
		→	[eskasgori]		C]$_{PW}$→V, MAX-[cont]
		→	??[eskat**ˢ**agori]		DEP-/a/, /a/=FINAL
h.	/kokot gori/	→	[kokotgori]	'red neck'	stop]$_{PW}$→V
		→	??[kokotagori]		DEP-/a/, /a/=FINAL
i.	/semat mutil/	→	[sematmutil]	'how many boys'	stop]$_{PW}$→V
		→	[semamutil]		MAX-C/__V
IP-finally:					
j.	/lau eskat**ˢ**/	→	[laueskat**ˢ**]	'four kitchens'	stop]$_{IP}$→V
		→	??[laueskat**ˢ**a]		DEP-/a/
k.	/lau kokot/	→	[laukokot]	'four necks'	stop]$_{IP}$→V
		→	??[laukokota]		DEP-/a/
l.	/semat/	→	[semat]	'how many'	stop]$_{IP}$→V

Two constraints are never violated: stop]Ø→V (since stops and affricates are banned from word-internal preconsonantal positions) and DEP-V (since true epenthesis is not used). I assume that constraints are undominated, unless there is evidence to the contrary. This assumption is justified for learnability reasons (Tranel 1995, 1996; Tesar & Smolensky 2000), but also has the virtue of simplifying the presentation. There cannot be evidence for unviolated constraints that they are dominated, so stop]Ø→V and DEP-V will be considered undominated.

The only language-specific rankings (apart from the undominatedness of stop]Ø→V and DEP-V) that need to be established in order to derive the data presented in the previous sections and summarized in (93) are given in (94), together with the empirical motivation for each ranking. We obtain the partial grammar in (95), in which dark and light lines indicate language-specific and inherent (universal) rankings, respectively. I have merged the constraints stop]$_{PW}$→V and stop]$_{PP}$→V and C]$_{PW}$→V and C]$_{PP}$ →V into the constraints stop]$_{PW/PP}$ →V and C]$_{PW/PP}$ →V, since no distinction between the PW and PP levels is made in the data.

(94) RANKINGS SPECIFIC TO ONDARROA BASQUE:
a. Consonants other than stops never delete:
⇒ MAX-C/V__ >> C]Ø →V
b. Affricate simplification is ruled out IP-finally:
⇒ MAX-[cont] >> stop]IP →V
c. Stop deletion is ruled out IP-finally:
⇒ MAX-C/V__ >> stop]IP →V
d. /a/-epenthesis is used instead of deletion with final stops in nouns:
⇒ MAX-C/V__ >> DEP-/a/

(95) PARTIAL GRAMMAR OF ONDARROA BASQUE:



This mini-grammar generates all the outputs in (93). The large number of indeterminate rankings that remain among the constraints in (95) yields all the observed variation in the data. This is illustrated in the tableaux below for closed-category items IP-internally (96) and IP-finally (97), and for nouns/adjectives PW-internally (98), PW-finally (99), and IP-finally (100). Examples from (93) will be used.

In the discussion of this constraint system, two separate issues arise. First, does the grammar in (95) generate all and only the attested outputs in (93), irrespective of their relative well-formedness? Second, does it also yield the observed preferences or gradient well-formedness judgments among different possible forms, for example the fact that [eskatˢatʃo], with /a/-insertion, is prefered over ?[eskastʃo], with affricate simplification, in (93a)? The answer to the first question is yes; this is already a very welcome conclusion. The second issue is more difficult, but the results also clearly go in the expected direction. First, the data are subtle and establishing clear preference hierarchies is not straightforward. Second, analyzing

preferences involves calculating the proportion of total orders compatible with the grammar that generate each of the possible outputs. In the case of [eskatˢatʃo] vs. ?[eskastʃo], we expect that the former will be generated by a significantly greater number of total rankings than the latter. One problem here is that it is not clear what counts as relevant total orders in each particular case of variation. For example, when comparing [eskatˢatʃo] vs. ?[eskastʃo] and the number of rankings that generate each of them, do we consider the entire grammar, or should we disregard constraints and rankings that are irrelevant to this particular piece of data, e.g. constraints concerned with vowel quality, or those dealing with IP-final consonants? In other words, how local are the computations?

Such decisions may affect significantly the proportions obtained. For example, suppose that variation between two forms 1 and 2 results from ranking indeterminacy between two constraints A and B; 1 violates A and 2 violates B, so 1 wins if B dominates A and 2 wins if A dominates B. If we consider only these two constraints, forms 1 and 2 are predicted to be equally likely, since the probabilities that A outranks B and B outranks A are both 0.5. But suppose an additional constraint C, not relevant for the evaluation of the forms at hand. C is unranked with respect to A but strictly dominates B. There are three possible total rankings of these constraints: C>>B>>A, C>>A>>B, and A>>C>>B. B dominates A in one of these rankings, A dominates B in two of them. This creates an asymmetry in the likelihood of occurrence of 1 and 2, since the latter form is predicted to surface with a probability of 2/3, against only 1/3 for form 1. This shows that the relative well-formedness or frequency of competing forms generated by the grammar depends on what constraints and rankings are considered relevant in the computation.

In the absence of clear guidelines on these issues, the following discussion is highly exploratory. No strong claims are being made, but interesting indications do emerge. First, computations performed over strictly local portions of the grammar, which involve only the relevant constraints and rankings, generally yield the desired results, that is the expected proportions of total rankings generating each of the possible outputs.[26] Second, only in one situation do constraints not strictly relevant to the example at hand seem to play a crucial role in the evaluation of candidates. When dealing with constraints of the type $C]_i \rightarrow V$, the corresponding higher-ranked constraints $C]_j \rightarrow V$, where j is lower in the prosodic hierarchy than i, crucially intervene in the computation. Interestingly, the constraints $C]_k \rightarrow V$, where k is

[26] Although this will not be demonstrated here, the inclusion of additional constraints and rankings, e.g. all those in (95), results in proportions of total rankings generating a possible output that do not as closely match the expected ones. That is, the well-formedness judgments in (93) are better predicted by strictly local portions of the grammar than by more global ones.

higher in the prosodic hierarchy than i, play no role. In other words, it seems that when evaluating the well-formedness of a certain segmental configuration at a certain prosodic boundary, an implicit comparison is made with the same configuration at lower boundaries, which serve as a reference point. This situation arises in (99c) and (100) and will be further discussed below.

In going over the data in (93), let us first consider the situation for closed-category items, which is rather simple. The constraint against consonant deletion (MAX-C/V__) and that banning PW-final stops and affricates (stop]$_{PW}$→V) are unranked with respect to each other, which yields optional stop deletion IP-internally, as illustrated in (96). Other repair strategies like vowel epenthesis violate higher-ranked constraints and are unavailable. The two outputs in (96) are predicted to be equally well-formed since there are only two possible rankings of the relevant constraints. IP-finally, as illustrated in (97), only the faithful output is generated since stop]$_{IP}$→V is dominated by the relevant faithfulness constraints, which rule out epenthesis or deletion to prevent the appearance of IP-final stops.

(96) IP-INTERNAL STOPS IN CLOSED-CATEGORY ITEMS:

/semat mutil/ 'how many boys'	DEP-V	stop]$_{PW}$ → V	MAX-C/V__
→ sematmutil		(t)	
→ semamutil			*
sematVmutil	* !		

(97) IP-FINAL STOPS IN CLOSED-CATEGORY ITEMS:

/semat/ 'how many'	DEP-V	MAX-C/V__	stop]$_{IP}$ → V
→ semat			(t)
sema		* !	
sematV	* !		

The situation in nouns and adjectives is much more complex since more constraints are involved and more variation is attested. Dealing first with word-internal contexts (98), the constraint stop]$_{Ø}$→V is undominated and unviolated, which bans any morpheme-final stop or affricate followed by a consonant-initial suffix, in particular the faithful outputs in (98a-b). "Pure" vowel epenthesis, indicated by an underlined V, is also ruled out by the undominatedness of DEP-V. The available repair strategies are /a/-insertion (which violates DEP-/a/) and affricate simplification (which violates MAX-[cont]); the ranking MAX-C/V__ >> DEP-/a/ eliminates consonant deletion as a possible repair for morpheme-final stops.

(98) PW-INTERNAL STOPS, AFFRICATES, AND FRICATIVES IN NOUNS/ADJECTIVES:

a. /eskat^{s}+ʧo/ 'kitchen+DIM'	DEP-V	stop]$_{Ø}$→V	MAX-C/V__	C]$_{Ø}$→V	DEP-/a/	MAX-[cont]
eskat^{s}ʧo		(t^{s}) !		*		
→ eskat^{s}aʧo					*	
→ ?eskasʧo				*		*
eskat^{s}VtʃO	* !					
b. /kokot+ʧo/ 'neck+DIM'						
kokotʧo		(t) !		*		
→ kokotaʧo					*	
kokotʃo			* !			
kokotVʧo	* !					
c. /lanbas+ʧo/ 'mop+DIM'						
→ lambasʧo				*		
→ lambasaʧo					*	
lambatʃo			* !			
lambasVtʃO	* !					

Starting with (98b), only the candidate with /a/-insertion survives in this case, the relevant competitors being straightforwardly eliminated by the highest three constraints in the tableau. In (98c), [lambasʧo] and [lambasaʧo] fare equally well, which follows from the undetermined ranking between DEP-/a/ and C]$_{Ø}$→V; [lambasʧo] wins out if DEP-/a/ >> C]$_{Ø}$→V, [lambasaʧo] wins with the opposite ranking of these two constraints, both rankings having the same probability.[27] The example in (98a) is slightly more complex. Two outputs are also attested, [eskat^{s}aʧo] and ?[eskasʧo], but with a preference for the first one. The candidate with affricate simplification violates two constraints: MAX-[cont] and C]$_{Ø}$→V, whereas /a/-insertion results in only one violation of DEP-/a/. Taking these three constraints to be unranked, ?[eskasʧo] only wins if DEP-/a/ dominates both C]$_{Ø}$→V and MAX-[cont], whereas the prefered [eskat^{s}aʧo] survives if either C]$_{Ø}$→V or MAX-[cont] is the highest-ranked of the three. Only 1/3 of the rankings generate ?[eskasʧo], against 2/3 for [eskat^{s}aʧo], which accounts for the observed contrast in well-formedness and likelihood between these two forms.

[27]Notice here the irrelevance of a lower-ranked constraint such as C]$_{PW}$→V, which is also unranked with respect to DEP-a; had we included it in the computation, [lambasaʧo] would be predicted to be more likely or better formed, which does not appear to be the case.

The greatest amount of variation is observed PW- and PP-finally, as shown in (99). In this tableau not all the constraints are relevant to all the examples; to enhance its readability I have put in black for each example the constraints that can be disregarded. The constraint /a/=FINAL is irrelevant in (99a-c) since we are dealing with nouns that are the last ones in their DP. MAX-[cont] only plays a role in forms involving affricates (99a, 99d).[28] The constraint stop]$_{PW}$→V can be disregarded in (99c), which only has a fricative in the relevant position. This example rather involves the markedness constraints C]$_{Ø}$→V and C]$_{PW}$→V, which are irrelevant to all the other forms containing stops and affricates, since it is the higher-ranked stop]$_{PW}$→V that takes care of them.

(99) PW-FINAL STOPS, AFFRICATES, AND FRICATIVES IN NOUNS/ADJECTIVES:

a. /eskat^{s} bat/ 'a kitchen'	MAX-C/V__	DEP-/a/	MAX-[cont]	/a/=final	stop]$_{PW}$→V	C]$_{Ø}$→V	C]$_{PW}$→V
→ eskat^{s}bat					(t^{s})		*
→ eskat^{s}abat		*					
→ eskasbat			*				*
b. /kokot bat/ 'a neck'							
→ kokotbat					(t)		*
→ kokotabat		*					
kokobat	* !						
c. /lanbas bat/ 'a mop'							
→lambasbat							*
→??lambasabat		*					
lambabat	* !						
d. /eskat^{s} gori/ 'red kitchen'							
→eskat^{s}gori					(t^{s})		*
→??eskat^{s}agori		*		*			
→ eskasgori			*				*
e. /kokot gori/ 'red neck'							
→kokotgori					(t)		*
→??kokotagori		*		*			
kokogori	* !						

[28]MAX-[cont] is presumably also violated in cases of stop or fricative deletion, but such forms are taken care of by the constraint MAX-C/V__, so I make the simplifying assumption that MAX-[cont] plays no role in the computation of forms involving consonants other than affricates.

In (99a) each of the three possible outputs violates one constraint among DEP-/a/, MAX-[cont], and stop]$_{PW}$→V. Considering again the ranking between these constraints to be free, the system generates these three outputs with equal probability, which is consistent with the observed well-formedness judgments. A similar situation holds in (99b): [kokotbat] violates stop]$_{PW}$→V, [kokotabat] violates DEP-/a/. Both constraints are unranked with respect to each other, which results in the two outputs being equivalent in likelihood. The forms in (99c-e) also involve multiple possible outputs, but one of them is clearly disprefered over the other(s). Let us see how the rankings predict this. In (99c), the faithful and prefered output [lambasbat] violates C]$_{PW}$→V, while the marginal output ?[lambasabat] violates DEP-/a/. These constraints are crucially unranked, which could be interpreted as predicting the two candidates to be equally likely, which is not the case. Here is where the higher-ranked constraint C]$_{Ø}$→V, which is also unranked with respect to DEP-/a/, crucially intervenes. There are three possible rankings of the three constraints C]$_{Ø}$→V, C]$_{PW}$→V, and DEP-/a/: DEP-/a/>>C]$_{Ø}$→V>>C]$_{PW}$→V, C]$_{Ø}$→V>>DEP-/a/>>C]$_{PW}$→V, C]$_{Ø}$→V>>C]$_{PW}$→V>>DEP-/a/. The candidate [lambasbat] is optimal in the first two rankings, while [lambasabat] only wins in the third one. These distinct proportions account for the observed contrast in well-formedness between the two possible outputs. The cases in (99d) and (99e) are similar to (98a): three and four constraints, respectively, are involved in the variation observed. All of them are ranked freely with respect to each other, but in both examples the candidate with /a/-epenthesis violates two of these constraints (DEP-/a/ and /a/-FINAL), whereas the other possible outputs violate only one constraint (stop]$_{PW}$→V or MAX-[cont]). As a result, the candidates with /a/-epenthesis are less likely to emerge as optimal as the alternative candidates.[29]

The final forms to be analyzed are the IP-final ones, as shown in (100). Stop deletion and affricate simplification being eliminated by the higher-ranked constraints MAX-C/V__ and MAX-[cont], the variation between the faithful outputs and the ones with /a/-epenthesis is accounted for as in (99c) above. Dep-/a/ is unranked with respect to both stop]$_{IP}$→V and the higher-ranked stop]$_{PW}$→V. Free ranking among these constraints leads to /a/-epenthesis being disfavored, as the corresponding candidates are generated by only one third of the possible rankings. In evaluating the well-formedness of ??[laueskat^{s}a] and ??[laukokota] at IP boundaries, an implicit comparison is made with the same forms at PW/PP boundaries, where consonants are less easily tolerated in non-prevocalic position.

[29]In (99d) there are 24 possible rankings of the four relevant constraints; 4 of them select ??[eskat^{s}agori], again 10 each for [eskat^{s}gori] and [eskasgori]. In (99e) there are 6 possible rankings of the three relevant constraints; 4 of them select [kokotgori], against 2 for ??[kokotagori].

(100) IP-FINAL STOPS AND AFFRICATES IN NOUNS / ADJECTIVES:

a. /lau eskat^{s}/ 'four kitchens'	MAX-C/V__	MAX-[cont]	DEP-/a/	stop]$_{PW}$→V	stop]$_{IP}$→V
→ laueskat^{s}					(t^{s})
→ ?? laueskat^{s}a			*		
eskas		* !			
b. /lau kokot/ 'four necks'					
→ laukokot					(t)
→ ?? laukokota			*		
koko	* !				

Before we move on to the next section, I would like to comment on certain aspects of this grammar, which concern the phonetic characteristics of stops in Ondarroa Basque, morpheme-internal stop-liquid sequences, and the ranking of DEP-/a/ and /a/=FINAL in other dialects.

First, I believe that the perceptual approach adopted here may receive some support from the phonetic characteristics of stops in IP-internal and IP-final position in Ondarroa Basque. IP-internal stops are consistently unreleased or reduced to a glottal articulation, whereas IP-final ones are quite systematically strongly released. The strength of the release burst is clearly associated with the lengthening and strengthening effects associated with domain-final positions, which are at the basis of the proposal developed in this thesis.

Second, it is worth mentioning that the ranking given above wrongly predicts the simplification of complex onsets in stem-internal position, e.g. in *proklama* 'proclaim' (see also note 26 in chapter 1). Other constraints are then necessary to distinguish between stem-internal consonant sequences and those created across word or morpheme boundaries. The former are never simplified, whereas morpheme-final stops do delete before liquids (/r, l/), even when the stop+liquid sequence forms a permissible morpheme-internal sequence, e.g. [kl] in (62a) and [kr, tr] in (63). I suggest that stem/root-medial consonants, such as /k/ in *proklama*, are saved by a STEM-CONTIGUITY constraint. Stem/root-initial ones (/p/ in the same example) could fall under the scope of specific root-initial faithfulness constraints (Beckman 1998), which are motivated by the psycholinguistic prominence of root-initial position. We could also define faithfulness constraints that distinguish between consonants that are followed by some segment in the same morpheme and consonants that are not (i.e. final consonants).

Finally, it has been noted that the Ondarroa dialect contrasts with Getxo, on the one hand, and Lekeitio, on the other hand, with respect to the use of /a/-final forms. The Getxo dialect is more advanced than Ondarroa in the reinterpretation of the marker /a/, which has almost completely lost its original meaning. As a consequence, /a/-forms are used more often and in more contexts than in Ondarroa. This presumably correlates with a lower ranking of DEP-/a/ and /a/=FINAL. In Lekeitio, by contrast, the marker /a/ has fully retained its function, and is never used in contexts where the singular form is not appropriate. In this dialect, DEP-/a/ and /a/=FINAL are therefore undominated.

5.4.7. CROSS-DIALECTAL COMPARISONS AND THE OCP APPROACH

The stop deletion and affricate simplification process in Basque has been amply discussed in the literature, especially in relation to the featural structure of affricates (see e.g. Hualde 1987, 1988, 1991; Lombardi 1990; van de Weijer 1992; H. Kim 1997; Fukazawa 1999). According to the standard description given in these works, the deletion/simplification process is triggered by a following [-continuant] consonant, but blocked in case a fricative follows. The process is viewed as an OCP effect on the [continuant] tier; it suppresses sequences of [-continuant] consonants by deleting stops and removing the [-continuant] part of affricates (which are assumed to be both [-continuant] and [+continuant]).

This is obviously not the account developed here, and I would like to comment on why I believe the OCP approach to be wrong. First, given an OCP constraint on [-continuant], it is not clear in this account why only stops, and not other [-continuant] consonants (nasals and possibly laterals; see note 30) are not subject to deletion before another [-continuant] feature. Second, the OCP approach is not supported by a crossdialectal comparison of stop deletion in Basque. The OCP analysis is largely based on the dialect spoken in Baztan (although this is not always explicitely mentioned). There is, however, a great deal of dialectal variation in various aspects of this phenomenon, and the data provided in many other dialectal descriptions, including Ondarroa presented above, are incompatible with the OCP. As we will see below, the evidence for the OCP in Baztan itself is not compelling, and may be reinterpreted in light of what is observed in other varieties.

The study of a number of other Basque dialects supports our idea that the driving force in the behavior of stops and affricates is that these consonants want to be followed by a vowel. Pre-consonantal stop deletion and affricate simplification should not be analyzed in an isolated way, as they appear to be part of a more general process of avoidance of non-prevocalic stops and affricates, in which the

OCP is not involved. First, deletion and simplification are not sensitive to the continuancy value of the following segment (except partly in Baztan; see 5.4.7.3), which is evidence against the OCP. Second, alongside deletion and simplification other strategies are used to prevent the prohibited or disprefered configurations from surfacing, namely epenthesis and, as shown below, coalescence. Third, the pre-consonantal context, central in the OCP account, is not empirically adequate since pre-pausal stops and affricates also participate in the process. In Ondarroa, /a/-epenthesis is marginal pre-pausally (while other repairs are unavailable in that position), but a completely productive process of vowel epenthesis IP-finally is found in Arratia (5.4.7.1).

Below I review the stop deletion patterns observed in several varieties of Basque, other than Ondarroa. Only closed-category items will be discussed, as authors generally do not consider nominal and adjectival stems. The list of Basque dialects I will be using, together with the references where the data are taken from, is given in (101). This list is short and does not do justice to the extreme dialectal diversity found in Basque. But even this limited set shows enough variation for the analyst to get a reasonably good understanding of the processes involving stops and affricates in the language.

(101) a. Biscayan:
  i. Northern Biscayan:
    • Lekeitio (Hulade, Elordieta & Elordieta 1994)
  ii. Southern Biscayan:
    • Arratia (Etxebarria Ayesta 1991)
  iii. Western Biscayan:
    • Getxo (Hualde & Bilbao 1992)
  b. Baztan (Salaburu 1984; H. Kim 1997; N'Diaye 1970)
  c. Souletin (Hualde 1993)

In all the dialects I have looked at, final stops (in closed-category items) clearly delete when followed in the same phrase by words beginning in a stop, an affricate, a nasal, and a lateral, as in Ondarroa above (58)-(60), (62). These consonants correspond to the set of [-continuant] segments[30], and deletion is expected under both the OCP and my approach. No examples involving [-continuant] consonants will be provided in this section. Let us now look at the other, [+continuant], consonants that can follow the stop: fricatives and rhotics. Here dialects differ and

[30]The status of liquids with respect to continuancy has been disputed, but Hualde (1991) provides independent evidence that laterals are [-continuant] in Basque (see also van de Weijer (1995) and Kaisse (1998) for arguments for laterals being [-continuant]).

we find gaps in the data. Rhotics do not occur word-initially in the native Basque vocabulary. They appear in this position only in recent borrowings, older ones showing prothesis of /e/ or /i/ before /r/. As a consequence, most authors do not give examples of stops before /r/-initial words, which deprives us of one crucial piece of evidence for the OCP account. As for fricatives, different patterns are described, which do not generally support the OCP.

5.4.7.1. Biscayan dialects

In the Biscayan dialects stops delete before all consonants, without any noticeable contrast based on continuancy (or any other feature). As in Ondarroa, stop deletion before /r/- as well as fricative-initial words is clearly observed in Lekeitio and Getxo, as shown in (102)-(103).[31] For Arratia, Etxebarria-Ayesta (1991) does not provide examples of stops before /r/, but deletion before fricatives is well attested (104).[32]

(102) STOP DELETION BEFORE FRICATIVES AND RHOTICS IN LEKEITIO:

a.	<lagúnak feúuk dira>	/k f/ →	[f]	'the friends are ugly'
b.	<nik sokia daukat>	/k s/ →	[s]	'I have the rope'
c.	<sémat jeneral>	/t x/ →	[x]	'how many generals'
d.	<giʃónak jenižodúnak dira>	/k x/ →	[x]	'the men are grumpy'
e.	<sémat rradížo>	/t r/ →	[r]	'how many radios'
f.	<Jonek rradižúa dauko>	/k r/ →	[r]	'Jon has the radio'

(Hualde, Elordieta & Elordieta 1994: 29-30)

(103) STOP DELETION BEFORE FRICATIVES AND RHOTICS IN GETXO:

a.	/bat falta da/	→	[báfaltaðá]	'one is missing'
b.	/nik fiɾukes/	→	[nifiɾukés]	'I (erg.) with thread'
c.	/ikus dot ʃitánu/	→	[ikuzðóʃitánu]	'(I) have seen the gypsy'
d.	/entsun dot rádion/	→	[entsundoráðion]	'I heard it on the radio'

(Hualde & Bilbao 1992: 18-19)

[31]As is the case in Ondarroa, Hualde, Elordieta & Elordieta (1994) and Hualde & Bilbao (1992) note for Lekeitio and Getxo that deletion is not obligatory. This optionality is not marked in the examples but should be kept in mind.

[32]I give complete phonological and phonetic representations of the examples whenever possible, using the traditional slashes and square brackets. But many descriptions of Basque dialects transcribe data using the Basque orthographic conventions, and do not always provide all the necessary phonological and phonetic details of the dialect under study for me to give complete representations. In this case, I put the orthographic representations in angled brakets, and provide phonological and phonetic forms only for the relevant part of the example, which is underlined in the orthographic form.

(104) STOP DELETION BEFORE FRICATIVES IN ARRATIA:

a.	<jan dot sagara>	/t s/	→	[s]
b.	<nik badaukat xaxarea/	/t ʃ/	→	[ʃ]
c.	<es dok falta>	/k f/	→	[f]
d.	<posik satos>	/k s/	→	[s]

(Etxebarria Ayesta 1991: 262-268)

Arratia also displays an interesting process of IP- and utterance-final epenthesis. To save IP- or utterance-final stops, the last vowel is simply copied after the stop, as in (105).[33]

(105) IP-FINAL EPENTHESIS IN ARRATIA:

a.	/gu-**k**/ *we-ERG*	→	[gu**k**(u)]
b.	/ni-**k**/ *I-ERG*	→	[ni**k**(i)]
c.	/gison-a**k**/ *man-ABS.PL or ERG*	→	[gisona**k**(a)]

5.4.7.2. Souletin

In Souletin, stops behave differently from those in Biscayan dialects before fricatives. Hualde (1993) reports that stops do not delete before a sibilant fricative (nothing is said about non-sibilant ones). Rather, the sequence becomes an affricate with the point of articulation of the fricative, as shown with /k/+fricative sequences in (106).

(106) STOP-FRICATIVE COALESCENCE IN SOULETIN:

a.	<húak zápha>	/k ɕ/	→	[tᶝ]	'compress those'
b.	<húak sáa>	/k s/	→	[tˢ]	'weed those'
c.	<húak xáña>	/k ʃ/	→	[tʃ]	'wash those'

(Hualde 1993; from Larrasquet 1928)

[33] I assume that IP-final epenthesis in Arratia follows from DEP-V being unranked with respect to stop]$_{IP}$→V (while MAX-C/V__ dominates both of them). But why can't epenthesis also apply IP-medially? I suggest that a contiguity constraint over the IP domain prevents IP-internal epenthesis, but has no effect at the right edge of IPs. This constraint has to rule out IP-medial epenthesis, but allow stop deletion. This is exactly what O-CONTIG (McCarthy & Prince 1995) accomplishes. This constraint is formulated in (i). (I-CONTIG would do the reverse, banning deletion but allowing epenthesis).

(i) O-CONTIG (IP) Segments that are contiguous in the input must be contiguous in the output in the IP domain (no epenthesis within IP).

Coalescence of the two segments into an affricate has, just like deletion, the effect of removing the stop from its pre-consonantal position, with minimal changes in feature composition. If we consider affricates to be both [+continuant] and [-continuant], the resulting affricate retains all the features of the fricative, and all those of /t/. Only /k/ loses its place feature in the process. We can therefore see coalescence as a different means of avoiding pre-consonantal or non-prevocalic stops, on a par with deletion and epenthesis. The difference between this dialect and the Biscayan ones for stop+fricative sequences does not lie in the motivation of the process, but in the repair strategy adopted.

Stops merge with following fricatives but not with following stops, nasals, and liquids. Merging, however, would not be inconceivable as the complex segments that could result from the coalescence of stops with these categories are also attested: geminate stops, doubly articulated stops (e.g. labio-velar stops), post-nasal stops, and laterally-released stops. The fact that only stop-fricative coalescence is attested is certainly related to the fact that affricates are the only complex segments allowed in Basque, an effect akin to Structure Preservation.

5.4.7.3. Baztan

We are now left with the Baztan dialect. The Souletin and Biscayan patterns just described shed light on the Baztan one, which is why I postponed its description. In this dialect, stops do not delete before a sibilant fricative. I cannot tell from the references on Baztan how stops behave before non-sibilant fricatives, i.e. /f/ and /x/. Notice that /x/ is extremely marginal in this dialect (Salaburu 1984; N'Diaye 1970), and /f/ generally rare in Basque. The data in (107) illustrate the retention of /k/ before a sibilant fricative.

(107) STOP RETENTION BEFORE FRICATIVES IN BAZTAN:

a.	<ederrak zineten>	/k ɕ/	→	[kɕ]	'you-PL. were beautiful'
b.	<andreak sartu dire>	/k s/	→	[ks]	

(Salaburu 1984)

This single fact has motivated the claim that deletion occurs only before [-continuant] consonants, i.e. stops, affricates, nasals, and laterals, and that the deletion process, which removes a [-continuant] specification, follows from the OCP. But the dialects just reviewed suggest a different interpretation of the facts, and additional data in Baztan itself raise doubts concerning the validity of the OCP approach for this variety.

First, notice that examples with /r/-intial words in Baztan are absent from the sources, which deprives us of a crucial test for the account based on an OCP-[continuant] constraint. Second, in the case of word-final /t/ followed by a fricative, there is no doubt in Baztan that we get the corresponding affricate (Hualde p.c.), just as in Souletin (108). Now, why are both the stop and the fricative retained in the case of /k/ (107)? There is no deletion, as in Biscayan, nor do we get an affricate, as in Souletin. But this is only the general case. In the specific context of pronoun+finite verb constructions, /k/+fricative sequences turn into affricates with the point of articulation of the fricative, just as in /t/+fricative sequences (109). Pronoun+finite verb constructions thus contrast with e.g. noun/adjective+finite verb ones, as in (107a), and noun+non-finite verb, as in (107b).

(108) /t/-FRICATIVE COALESCENCE IN BAZTAN:
<eztakit_zer erran> /t ɕ/ → [tɕ] 'I don't know what to say'
(N'Diaye 1970)

(109) /k/-FRICATIVE COALESCENCE IN BAZTAN IN PRONOUN+FINITE VERB:
a. <hunek zuen> /k ɕ/ → [tɕ] 'this one had it'
b. <hek ziren> /k ɕ/ → [tɕ]
(Salaburu 1984)

There are reasons to believe that the coalescence process illustrated in (109) used to be more general in Baztan. The examples in (107) represent the present state of affairs. But N'Diaye (1970), who uses the same example (107a), gives a different output, one with the affricate:

(110) /k/-FRICATIVE COALESCENCE IN BAZTAN:
<ederrak zineten> /k ɕ/ → [tɕ]
(N'Diaye 1970)

Hualde (p.c.) remarks that "N'Diaye's informants belonged to an older generation, and it could very well be the case that at that point in time the [coalescence] rule had a wider domain of application in Baztan". This hypothesis seems natural in view of the Souletin pattern and the generality of the affrication process with word-final /t/ in Baztan itself. It is further supported by the fact that the coalescence of a non-coronal stop with a following sibilant fricative is well attested in this area in general. It also exists in Gascon and manifests itself in the adaptation of borrowings in the Northern Basque dialects, e.g. *etsenplu* 'example', *atsolutu* 'absolute'.

The hypothesis, then, is that Baztan was like Souletin at an earlier stage of the language. It has later undergone a change, which restricted affrication with /k/ and a following fricative to specific morpho-syntactic contexts. The difference between /t/ and /k/ with respect to the affrication process is obviously related to the fact that /k/, but not /t/, loses its place of articulation in the process. We can think that this change is linked to the promotion of a MAX-Place constraint. Looking at the present situation in Baztan, the specific behavior of /k/ before sibilants results from a localized change in the grammar, but there is no indication that the pattern has been reanalyzed as an OCP-based one (in particular in view of the fact that affrication is still attested in /k/+fricative sequences in some contexts). This being said, a synchronic analysis of Baztan raises a couple of issues, which I leave open. First, after affrication ceased to be productive with /k/+sibilant, why did not /k/ simply delete, as it does before other consonants? Second, how should we account for the contemporary situation in which the application of affrication depends on the precise morpho-syntactic context?

5.5. CONCLUSIONS

In this chapter I have proposed a new approach to edge effects, which refer to the greater tolerance for consonants and consonant combinations at edges of prosodic constituents as opposed to domain-internal contexts. Edge effects arise in particular through the asymmetrical behavior of phonological processes such as consonant deletion, vowel epenthesis, and vowel deletion. The standard approach to edge effects relies on the concept of extrasyllabicity, whereby edge consonants escape syllable well-formedness conditions. In the present account, edge effects rather follow from the increased perceptibility of segments in domain-initial and -final position, in comparison to domain-internal ones. This perceptually privileged situation arises through cue enhancement processes observed at edges: lengthening, articulatory strengthening, and diminution of overlap between adjacent segments. This perceptual approach eliminates the need for exceptional mechanisms such as extrasyllabicity.

From an empirical point of view, I have focused on edge effects above the word level, which have received little attention in the literature in comparison with those observed at the word level. Several patterns displaying cumulative edge effects, which increase as we go up the prosodic hierarchy, have also been described. The gradient or cumulative nature of edge effects follows naturally from the cue-based approach and is straightforwardly accounted for with the constraint system developed in chapter 3. A particularly interesting example of cumulative edge effects

is found in Ondarroa Basque, to which the second half of the chapter is devoted. This language displays stop deletion, affricate simplification, and epenthesis processes that serve to prevent morpheme-final stops and affricates, and to a lesser extent other consonants as well, from appearing in non-prevocalic position. These processes apply with decreasing likelihood as the boundary following the consonant becomes stronger. The analysis of this pattern has revealed interesting interactions between epenthesis and the opacity of some aspects of the nominal inflectional system, illustrating the use of vocalic morphemes for purely phonotactic purposes. This detailed description of the Ondarroa variety sheds new light on the already well-known process of stop deletion and affricate simplification in Basque, and provides evidence against the traditional OCP-based account of it.