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-internally. To illustrate, many languages allow consonant doubling at word boundaries, whereas domain-internally only simple consonants are licensed.

(1) Symmetrical Application of Deletion and Epenthesis:

- Consonant deletion applies domain-internally but not at domain edges.
- Vowel epenthesis applies domain-internally but not at domain edges.
- 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 Kamaiura' is illustrated in (2) (McCarthy & Prince 1993; Wiltshire, to appear; based on Everett & Seki 1985). This language has a doubling process that copies the first consonant to the right. For example, in (2a) /m/ is lost word-medially and surfaces only word-finally in the reduplicant.

(2) Consonant Deletion in Kamaiura':

- /a-/omotumomotum/
  [a-o-tumotum\-
    /omotumomotum/]
  'he shook it repeatedly'
- /je-umirikumirik/
  [je-umirik\-
    /umirik/]
  '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 the first CVC sequence of the base. For example, in (3a) 

(3) Vowel Epenthesis in Ponapean:

- /sip-siped/ [sip i-siped] 'to shake out-DURATIVE'
- /was-wasas/ [was a-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 /-wur/ below. See also Piggott (1990, 1999) for a similar pattern in Ojibwa.

(4) A POCPOPE IN LARDIL:

- /karikari/ [karikar] 'butter-fish'
  vs. [karikar i-wur]. 'butter-fish-FUTURE'
- /yiliyili/ [yiliyil]'oyster sp.'
  vs. [yiliyil i-wur]. '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 phonology of prosodic domains in chapter 1. In this chapter, I will focus on how edge consonants are represented and how they are licensed in the various theories of prosodic domains. The standard approach is to view extrasyllabicity as a way of marking edge consonants as extrametrical for syllabification purposes. This allows edge consonants to escape the constraints that apply to syllable formation, and to be licensed at a later stage in the derivation, once some other conditions are satisfied. The following four approaches were mentioned:

(5) Approaches to Extrasyllabicity:

- Extrametricality: Edge consonants are marked as extrametrical for syllabification purposes, and are ultimately licensed by adjoining to a syllable late in the derivation, once the coda conditions no longer apply. This approach was taken by (Borowsky 1986; Itofl 1986; Booij 1999).
- 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.
- Indirect licensing: Edge segments are licensed not by the syllable but by a higher constituent, especially the prosodic word. This approach was taken by Piggott (1990, 1999), Spaelti (1999), Auger & Steele (1999), and Steele & Auger (1999).

In the following sections, we will examine how edge effects are represented in the various theories of prosodic domains and how they are licensed. This will help us understand how the edge consonants are represented in different theories of prosodic domains and how they are licensed. We will also see how these theories can be applied to a variety of languages and how they can be used to account for the observed phonetic phenomena.

5.2. Syllable Structure
Chapter 5: Edge effects

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 Kamaiura' case in (2), for instance, would be accounted for simply by positing a CV syllable template with word-final extrasyllabicity. The word-internal base-final consonant /˜/ or /k/ cannot be licensed as extrasyllabic, since the effects of syllable well-formedness conditions are suspended. But the same consonant is licensed word-finally, where the effects of syllable well-formedness conditions do not apply. Thus, 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. $C_{\text{left}} \leftrightarrow V$ A consonant that is adjacent to a vowel.

b. $C_{\text{left}} _ V$ A consonant that is followed by a vowel.

(7) INHERENT RANKINGS BETWEEN MARKEDNESS CONSTRAINTS:

a. $C_{\text{left}} \leftrightarrow V >> C_{\text{right}} \leftrightarrow V$ if $\text{left is a boundary that is weaker than right}$(including $\text{right}$)

b. $C_{\text{left}} _ V >> C_{\text{right}} _ V$ if $\text{left is a boundary that is weaker than right}$(including $\text{right}$)

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 word-initial and word-final consonants are often different), the parameters in (6) and their corresponding inherent rankings have to be specified for the left or right edge. Therefore, the constraint in (6) and their corresponding inherent ranking in (7) have to be specified for the left or right edge. For instance, the constraint $C_{\text{left}} \leftrightarrow V$ is weaker than $C_{\text{right}} \leftrightarrow V$ because the right edge is more sensitive to the presence of vowels than the left edge.

5.2. EXPANDING THE EMPIRICAL BASIS OF EDGE EFFECTS

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 edge effects has been inferred from a limited number of observations. However, the constraints in (6) and (7) provide a more comprehensive framework for the study of edge effects. This chapter proposes a different approach to the study of edge effects. First, edge effects have been inferred from observations at the word level, and the constraints in (6) and (7) provide a more comprehensive framework for the study of edge effects. This chapter proposes a different approach to the study of edge effects.

(10) PARAMETERS FOR PATTERNS DISPLAYING EDGE EFFECTS:

a. Configuration tolerated at edges but avoided domain-internally:

$\text{Consonant not followed by a vowel / Consonant not adjacent to a vowel}$

b. Edge: Left / Right

c. Levels: PW, PP, IP, U

d. Process: Consonant deletion / vowel epenthesis / vowel deletion

(11) CONSTRAINTS ENCODING THE ROLE OF FOLLOWING BOUNDARIES:

a. $C_{\text{right}} \leftrightarrow V$ A consonant that is preceded by a boundary.

b. $C_{\text{right}} _ V$ A consonant that is preceded by a vowel.

(12) CONSTRAINTS ENCODING THE ROLE OF PRECEDING BOUNDARIES:

a. $i[\text{Consonant]} \leftrightarrow V$ A consonant that is preceded by a boundary i.

b. $i[\text{Consonant]} _ V$ A consonant that is followed by a boundary i.

(13) 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).
Chapter 5: Edge effects

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 described in this chapter: 1. consonants need to be followed by a vowel domain-internally but not at edges; 2. consonants need to be followed by a vowel word-internally but not word-finally. The Kamaiura', Ponapean, and Lardil cases in (2)-(4) exemplify the first option: in all three cases, the deletion or pentalthesis 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\-a-wasas] (3b). Other patterns described in this chapter will illustrate the other possibility: consonants are adjacent to a vowel word-internally but not word-finally. 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. It follows from this assumption that my approach makes no prediction with respect to the existence of edge effects below the PW level, in particular at the foot level. Green (1997), looking at syllabification in Japanese, reports some evidence that rising sonority clusters are better tolerated before stressed vowels than non-stressed ones.

In the table below I provide several examples of processes displaying edge effects.

<table>
<thead>
<tr>
<th>Process</th>
<th>P_W (P)</th>
<th>Phonological Phrase (pp)</th>
<th>Unphonological Phrase (dp)</th>
<th>Utterance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge effects</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>The prosodic hierarchy</td>
<td>(11)</td>
<td>The prosodic hierarchy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 strong claims, but it is clear that edge effects are more frequent in the PW level than in the PP level, as is evident from the table above. The last parameter (10d) simply states what process edge effects arise from.
SOME LANGUAGES DISPLAYING EDGE EFFECTS ABOVE THE PW IN THE APPLICATION OF DELETION OR EPENTHESIS PROCESSES:

<table>
<thead>
<tr>
<th>Language</th>
<th>Avoided Configuration</th>
<th>Level(s)</th>
<th>Process(es)</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iraqi Arabic</td>
<td>L C not adjacent to V</td>
<td>Phrase</td>
<td>V epenthesis</td>
<td>Broselow 1980, 1992; Selkirk 1981</td>
</tr>
<tr>
<td>Arrernte</td>
<td>L, R C not adjacent to V</td>
<td>Phrase</td>
<td>V epenthesis</td>
<td>Breen &amp; Pensalfini 1999</td>
</tr>
<tr>
<td>Ondarroa</td>
<td>R Stops/affricates (marginally other C's) not followed by V</td>
<td>PW</td>
<td>PW, IP</td>
<td>V epenthesis, V deletion, V epenthesis, Affricate simplif.</td>
</tr>
<tr>
<td>Vimeu</td>
<td>R, L C not adjacent to V</td>
<td>PW, IP</td>
<td>V epenthesis</td>
<td>Steele &amp; Auger 1999; Auger &amp; Steele 1999; Auger (2000, p.c.)</td>
</tr>
<tr>
<td>French</td>
<td>R, L C not adjacent to V</td>
<td>PW, PP, IP</td>
<td>V epenthesis</td>
<td>V deletion</td>
</tr>
<tr>
<td>Marais</td>
<td>R Stops not followed by V</td>
<td>PP</td>
<td>C deletion</td>
<td>Svenson 1959; Morin 1986</td>
</tr>
<tr>
<td>Kayardild</td>
<td>R C not adjacent to V, stops in particular</td>
<td>IP</td>
<td>V deletion</td>
<td>Evans 1995a,b</td>
</tr>
<tr>
<td>Tiwi</td>
<td>R C not adjacent to V, stops in particular</td>
<td>IP / U</td>
<td>V deletion</td>
<td>Lee 1987</td>
</tr>
</tbody>
</table>

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 consonants are deleted may have a theoretical significance, since it may indicate that edge effects are more frequent at the right edge. I suspect that such a correspondence is significant, since more frequent edge effects are more frequent at the right edge, which is a consequence of the fact that more frequent edge effects are more frequent at the right edge.

In the second case, any discussion of a similar level, for example above the PW, is not possible. See chapter 5 for further discussion of this issue.
Chapter 5: Edge effects

In this chapter, we will discuss the case of epenthetic phenomena. The chapter will focus on the application of the edge effect, which is a phenomenon observed in languages where certain phonemes are inserted at the edge of a word. This chapter will cover the application of edge effects in various languages, including Cairene and Iraqi Arabic. The chapter will also discuss the process of stop deletion and the interaction of initial and final edge effects in Marais-Vendeën.

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 as follows:

**Table 1: Obligatory Epenthesis Patterns**

<table>
<thead>
<tr>
<th>Language</th>
<th>Pattern 1</th>
<th>Pattern 2</th>
<th>Pattern 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cairene Arabic</td>
<td>/katab-t-l-u/</td>
<td>/katab-ilu/</td>
<td>/bint-inabiiha/</td>
</tr>
<tr>
<td>Iraqi Arabic</td>
<td>/gil-t-l-a/</td>
<td>/gil-itla/</td>
<td>/trid-iktaab/</td>
</tr>
</tbody>
</table>

The constraint ranking that yields the above patterns is easy to establish. The constraint corresponding to the case in (11) is associated with the rule of epenthetic insertion in (9), which also incorporates the requirement that consonants not adjacent to a vowel are tolerated and do not automatically trigger epenthesis. The two dialects, however, differ in whether the requirement that consonants be adjacent to a vowel (13), but not adjacent to a vowel (17), applies.

**Table 2: Optional Epenthesis Patterns**

<table>
<thead>
<tr>
<th>Language</th>
<th>Pattern 1</th>
<th>Pattern 2</th>
<th>Pattern 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cairene Arabic</td>
<td>/katab+t/</td>
<td>/katabt/</td>
<td>/bint/</td>
</tr>
<tr>
<td>Iraqi Arabic</td>
<td>/qmaaß/</td>
<td>/qmaaß/</td>
<td>/klaab/</td>
</tr>
</tbody>
</table>

Whereas Broselow (1980, 1992) and Wiltshire (1994, to appear) are not explicit on the nature of the precise phrasal level that manifests edge effects, Selkirk (1981) and Utterance-final (1982) are more explicit on the use of faithfulness constraints within the framework of phonological phonology. The constraint ranking that yields the Arabic patterns is easy to establish. The constraint rankings are as follows:

**Table 3: Constraint Rankings**

<table>
<thead>
<tr>
<th>Language</th>
<th>Constraint 1</th>
<th>Constraint 2</th>
<th>Constraint 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cairene Arabic</td>
<td>C_V → V_C</td>
<td>C</td>
<td>V</td>
</tr>
<tr>
<td>Iraqi Arabic</td>
<td>C_V → V_C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this chapter, we will discuss the case of epenthesis in Cairene and Iraqi Arabic.
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 how epenthesis is determined in each dialect (see chapter 3, sections 3.2.3 and 3.3.1).

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.

Insertion is obligatory U-internally in both dialects, so we have CìIP ↔ V >> DEP-V. In Iraqi it is also obligatory U-finally (18), from which we derive CìU ↔ V >> DEP-V, but optional U-initially, which is accounted for with an indeterminate ranking between DEP-V and U↔C. In Cairene epenthesis is obligatory U-initially but excluded U-finally, hence the ranking U↔C >> DEP-V >> CìU ↔ 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).

Vowel Epenthesis in Iraqi Arabic:

<table>
<thead>
<tr>
<th>(i)</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kabbāl</td>
<td>Kabbāl ←</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>(i)</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>(i)</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>(i)</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>A ↔ C</td>
<td>DEP-VC↔V</td>
</tr>
<tr>
<td>[h up</td>
<td><img src="https://example.com/diagram.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Vowel Epenthesis in Cairene Arabic:

<table>
<thead>
<tr>
<th>(i)</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kabbāl</td>
<td>Kabbāl ←</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>(i)</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>(i)</td>
</tr>
<tr>
<td>/hup/</td>
<td></td>
</tr>
<tr>
<td>A ↔ C</td>
<td>DEP-VC↔V</td>
</tr>
<tr>
<td>[h up</td>
<td><img src="https://example.com/diagram.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

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 C₁C₂C₃, the likelihood that C₂ triggers schwa insertion is inversely correlated with the strength of the prosodic boundary that it is adjacent to. This holds for both left and right edges. The following diagram shows the levels of the prosodic hierarchy and their interaction with schwa insertion in French.

These levels are indicated by the darkness of the background, according to the following:

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).
Chapter 5: Edge effects

Schwa obligatory
Schwa optional
No schwa

(24) EFFECT OF THE FOLLOWING BOUNDARY WITH CLUSTER-MEDIAL STOPS:

a. C2 \[^\] tu fais que te moucher
'you only blow your nose'
/bu\ f\ k\ m\ mu\/

b. C2 \[PW\] infecte manteau
'stinking coat'
/\ f\ t\ m\ a\ t\ /

c. C2 \[SPP\] insecte marron
'brown insect'
/\ s\ t\ m\ a\ r\ /

d. C2 \[MPP\] l'insecte mangeait
'the insect was eating'
/l\ s\ t\ m\ a\ /

e. C2 \[IP\] l'insecte, mets-le là
'the insect, put it there'
/l\ s\ t\ m\ l\ /

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 C1C2#C3 in adjective+noun, noun+adjective, and subject+verb sequences, which correspond to C1C2\[PW\], C1C2\[SPP\], and C1C2\[MPP\], respectively. His numbers for three segmental clusters in which C1 is an obstruent and C2 a stop are given below:

(25)

\[
\begin{array}{ccc}
\text{C1C2C3} & \text{C2}[\text{PW}] & \text{C2}[\text{SPP}] & \text{C2}[\text{MPP}] \\
\text{skv} & 81 & 60 & 15 \\
\text{ktv} & 78 & 60 & 12 \\
\text{stv} & 78 & 18 & 6 \\
\end{array}
\]

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. Therefore, the fricative [s] (the reflexive clitic) rather than the stop [t] (the 2nd sg object clitic) in the position of C2.

We obtain the data in (26), which crucially differ from those in (24) in that schwa is no longer obligatory before a null boundary [\(^\)] in the same prosodic context. Schwa is less likely if C2 is a fricative than if C2 is a stop. The context adjective+noun (C2\[PW\]) is not given because I did not find an adjective ending in the cluster [-ks] that could naturally appear in that position.

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.

(27) INHERENT RANKINGS OF MARKEDNESS CONSTRAINTS:

\[
\begin{array}{cccc}
\text{stop} & \text{C}[\text{[^]}\quad\text{V}] & \text{C}[\text{[PW]}\quad\text{V}] & \text{C}[\text{[SPP]}\quad\text{V}] & \text{C}[\text{[MPP]}\quad\text{V}] \\
\text{C}[\text{[^]}\quad\text{V}] & \text{stop} & \text{stop} & \text{stop} \\
\text{C}[\text{[PW]}\quad\text{V}] & \text{stop} & \text{stop} & \text{stop} \\
\text{C}[\text{[SPP]}\quad\text{V}] & \text{stop} & \text{stop} & \text{stop} \\
\text{C}[\text{[MPP]}\quad\text{V}] & \text{stop} & \text{stop} & \text{stop} \\
\end{array}
\]

Schwa is obligatory only in the context stop\[^\] (24a) which follows from the ranking stop\[^\]↔V >> DEP-V. It is excluded IP-finally, even with stops (24e), so schwa is optional only in the context stop\[^\] (24a) which follows from the ranking stop\[^\]↔V >> DEP-V.

The final ranking we obtain for the right edge is given in (27). The tableaux in (28) and (29) are given below:

The context adjective+noun (C2\[PW\]) is not given because I did not find an adjective ending in the cluster [-ks] that could naturally appear in that position.
Chapter 5: Edge effects

Between stops (obligatory schwa) and fricatives (optional schwa) PW-

ternally, and the exclusion of schwa IP-finally, respectively.

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

<table>
<thead>
<tr>
<th>stop</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>e h</td>
<td>p</td>
</tr>
<tr>
<td>C</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>PW</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

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

/ty=di k=t=må~tir/

<table>
<thead>
<tr>
<th>stop</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

(30) NO SCHWA IP-FINALLY:

/l=´~s´kt m´ lœ la/

<table>
<thead>
<tr>
<th>stop</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

Exactly the same situation is found at the left edge of prosodic domains.

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

[k t f], with i ∈ { , PW, ...IP}

More easily

MPP

IP

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

[k s f, with i ∈ { , PW, ...IP}

More easily

MPP

IP

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

<table>
<thead>
<tr>
<th>stop</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PW</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

5.3.3 STOP DELETION IN MARAIS-VENDEEN

Marais-Vendeen - 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).
The interest of Marais-Vendeën, 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 ... retaining the final [t] of /ßat/ before a verbal group (including preverbal auxiliaries and clitics), as in (34b) above.

(35) TOP DELETION ATTESTED:

a. Adj + noun: [´~ pti pulan] 'a/one small colt'

b. Noun + adj: [´~ ßa nw´r] 'a/one black cat'

c. Adj + PP: [l ´ sur km  ´~ pøt] 'he's dumb like a pot'

d. Noun + PP: [´~ he d kart] 'a card game / card deck'

e. Verb + object: [l må~Ωå~ do patat] 'they are eating potatoes'

(36) STOP DELETION UNATTESTED:

Subject + verb: [l ßa t m at egrosinaj] 'the cat scratched me'

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 is suppressed. "stopping speakers slow down, or make a slight pause" (Morin 1986: 191). I would like to propose a different and more principled explanation. The examples in (35a) involve 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, ... separates the verb from its subject (36) than from its object (35e). So in Marais-Vendeën, 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 French-transparent corrections which explain the contrast between (35) and (36). But these final stops are generally omitted in preconsonantal position. This rule is at the origin of the process of liaison in Modern French.
Chapter 5: Edge effects

...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 ... 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. /kmin´/ ’chimney’),...word (38), and excluded after a vowel (39). 

(38) **OBLIGATORY EPENTHESES IP-INTERNALLY AFTER A CONSONANT:**

| a. /´~ mørsjØ d km̩ in´/ _ [´~mørsjØd e km̩ in´] ’a piece of chimney’ |
| b. /pur km̩´~ße/_ [pur e km̩´~ße] ’to start’ |
| c. /sasir dv a~/ _ [sasir e dv a~] ’sit in front of’ |

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

| a. /il â km̩´~ß´/ _ [ilå km̩´~ß´] / *[ilå e km̩´~ß´] ’he has started’ |
| b. /pas´ dv å~/ _ [pås´ dv å~] / *[pas´ e dv å~] ’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 any consonant that is not adjacent to a vowel, thus creating a boundary 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 a~/ \[PW[C ↔ V] >> PP[C ↔ V] >> DEP-V\] ! sasir e dv a~

/pas´ dv å~/ \[PV[C ↔ V] >> pp[C ↔ V] >> DEP-V\] ! pas´ e dv å~

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 vowel or consonant. 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, e’dvant / dvant partir ’that he says Ignace, before leaving’

(43) **OPTIONAL EPENTHESIS IP- AND U-INITIALLY AFTER A VOWEL:**

/Il e’touot be’rtcheu, dpis / e’dpis l’aflge d’onze douze ans ’he was a shepherd, since the age of eleven twelve years old’

(44) **OPTIONAL EPENTHESIS IP- AND U-INITIALLY A CONSONANT:**

/s...berkØ dp...i.../ _ [s...bertߨ dp...i...]

(45) **OPTIONAL EPENTHESIS IP- AND U-INITIALLY AFTER A VOWEL:**

/...berkØ dp...i.../ _ U[+] [s...bertߨ dp...i...]

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 L levels and between boundary-boundary and the proceeding segmental context. Nevertheless, the result of the statistical analysis performed on a sizeable speech corpus is that the possibility of epenthesis in certain contexts adjacent to a vowel is not predicted by our approach as it is currently implemented.
Chapter 5: Edge effects

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

<table>
<thead>
<tr>
<th></th>
<th>IP-initially</th>
<th>U-initially</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>23%</td>
<td>36%</td>
</tr>
<tr>
<td>C</td>
<td>80%</td>
<td>57%</td>
</tr>
<tr>
<td>^</td>
<td>N/A</td>
<td>43%</td>
</tr>
</tbody>
</table>

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 be adjacent always enter into 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 described: the markedness constraint 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 constraint C_v → C would address this problem. The farther the vowel, the less it affects the perceptibility of adjacent segments.

Let us now consider morpheme-final two-consonant clusters /-C1C2#/. Here we find that epenthesis occurs only postconsonantally IP- and U-internally, for example in the compounds in (46). If it is optional across a PW boundary (47), and excluded IP- and U-finally (48), then the general approach taken here: the farther the vowel, the less it affects the perceptibility of adjacent segments. Since there are no constraints that require consonants to be adjacent in these environments, the possibility of epenthesis is unrestricted with respect to these two constraints.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

And, IP- and U-finally.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.

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- and PP-initially, no epenthesis IP- and U-initially, and variable epenthesis PW- and U-initially.
Chapter 5: Edge effects

5.4. EPISTHESIS 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.

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 phonological processes when in contact with a following vowel or word.

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 inventory of these contexts is provided 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

Most Basque dialects, including Ondarroa, have a simple free-word system in which the occurrence of stops and affricates is determined by the phonological structure of the dialect.

Younger Ondarroa speakers include my informant (J. Hualde), and without the distinction between the affricate and the corresponding fricative results in a merger of the two sounds. However, the distinction between the two is maintained in the religious, legal, and administrative contexts of the dialect.

In all Basque (including Ondarroa) and some Guipuscoan varieties, the contrast between apico-alveolar and predorso-alveolar fricatives and affricates has disappeared or is less distinct. Some coronal clusters are also allowed stem-finally: /st/, /nt/, /nts/, /lts/, /rts/.

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. The following sections analyze these processes and the resulting edge effects in the Biscayan dialect.

10 For the Basque data, I thank Ikuska Ansola for being such a good informant and Jose' 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.

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.

Appendix A: FOR THE READER: ADDITIONAL FACTS FROM THE BIBLIOGRAPHY OF THE TEXT.

Chapter 5: Edge effects
Chapter 5: Edge effects

... 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 a morpheme-final position, e.g. stops at the end of nominal and adjectival phrases due to structural reasons such as post-nominal pronominal or adjectival suffixes.

This categorial distinction between examples with stops and affricates, i.e., these are a number of words, for example in addition to the major lexical categories, there are a number of words in restricted categories that end in a stop or affricate.

In addition to the major lexical categories, there are a number of words in restricted categories that end in a stop or affricate. For example, the verb "bat" (one) and the verb "bi" (two) follow both nouns and adjectives. Other numerals and determiners (demonstratives, quantifiers) precede the noun. Demonstratives are always inflected for case, even 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 few examples of verbal stems with affricates or stops have been observed.

In 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" (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 /-‰uts/. 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.

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 /‰uts/. 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:

- a. At the end of a nominal or adjectival stem, followed by an inflectional or derivational suffix
- b. At the end of the bare form of a noun or adjective
- c. At the end of a nominal or adjectival stem, followed by an inflectional or derivational suffix

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 (53b)).

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 follow the same basic principles as stops in nouns/adjectives. For example, the absolutive plural and ergative case markers /-ak/ and /-k/ and the determiner "bat" /determiner one/a' are included in these categories. 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 follow the same basic principles as stops in nouns/adjectives.
Chapter 5: Edge effects

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 nouns or adjectives before inflectional suffixes (55a), derivational suffixes (56), and separate words (57).

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 - DAT dative - IND indefinite - ABL ablative - GEN genitive - LOC genitive locative - DIM diminutive
  - Derivational suffixes:
    - DIR direction - 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 - 1/2/3 first/second/third person - D direct object - S subject

14 In Basque, as in Spanish, voiced stops [b, d, g] have spirantized allophones [∫, ∂, ©]. 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 in a context where a voiceless consonant never has this deletion. In Basque, /d/ in initial position of auxiliaries and synthetic forms also rhotacizes into [©] intervocalically, for instance in (57b,d).

STOPS/AFFRICATES IN NOUNS/ADJECTIVES ACROSS WORD BOUNDARIES:

(55)

<table>
<thead>
<tr>
<th>a. /pijo ba t isots/</th>
<th>_</th>
<th>[pijoba t isots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>pile one ice.ABS.IND</td>
<td></td>
<td>'a lot of ice'</td>
</tr>
<tr>
<td>b. /ore-k atsam-ak dis/</td>
<td>_</td>
<td>[ore k atsamatis]</td>
</tr>
<tr>
<td>that-ERG.PL finger-ERG.PL are</td>
<td></td>
<td>'that’s the fingers'</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>a. /pijo ba t isots/</th>
<th>_</th>
<th>[pijoba t isots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>pile one ice.ABS.IND</td>
<td></td>
<td>'a lot of ice'</td>
</tr>
<tr>
<td>b. /ore-k atsam-ak dis/</td>
<td>_</td>
<td>[ore k atsamatis]</td>
</tr>
<tr>
<td>that-ERG.PL finger-ERG.PL are</td>
<td></td>
<td>'that’s the fingers'</td>
</tr>
</tbody>
</table>

STOPS/AFFRICATES IN NOUNS/ADJECTIVES BEFORE INFLECTIONAL SUFFIXES:

<table>
<thead>
<tr>
<th>a. /pijo ba t isots/</th>
<th>_</th>
<th>[pijoba t isots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>pile one ice.ABS.IND</td>
<td></td>
<td>'a lot of ice'</td>
</tr>
<tr>
<td>b. /ore-k atsam-ak dis/</td>
<td>_</td>
<td>[ore k atsamatis]</td>
</tr>
<tr>
<td>that-ERG.PL finger-ERG.PL are</td>
<td></td>
<td>'that’s the fingers'</td>
</tr>
</tbody>
</table>

STOPS/AFFRICATES IN NOUNS/ADJECTIVES BEFORE DERIVATIONAL SUFFIXES:

<table>
<thead>
<tr>
<th>a. /pijo ba t isots/</th>
<th>_</th>
<th>[pijoba t isots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>pile one ice.ABS.IND</td>
<td></td>
<td>'a lot of ice'</td>
</tr>
<tr>
<td>b. /ore-k atsam-ak dis/</td>
<td>_</td>
<td>[ore k atsamatis]</td>
</tr>
<tr>
<td>that-ERG.PL finger-ERG.PL are</td>
<td></td>
<td>'that’s the fingers'</td>
</tr>
</tbody>
</table>

STOPS IN CLOSED CATEGORIES (ACROSS WORD BOUNDARIES):
Chapter 5: Edge effects

297

295 Chapter 5: Edge effects
d. /lausieeosidots e‰osi dot / [laufaisidots e‰osi e‰ot]

four woodworms. 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...

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 the case 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. /gißon-a k topa dau / [gißona(k) topa‰au]

man-ERG.SG find.PERF AUX. 3SGS. 3SGD

'the man has found it/him/her.'

c. /liburu ba t galdu dot / [libu‰uba(t) galdu‰ot]

book one.ABS lose.PERF AUX. 1SGS. 3SGD

'I have lost a book.'

(59) BEFORE AFFRICATES:

a. /sema-tßakur / [sema(tßakur)]

how many dog.ABS. IND

'how many dogs.'

b. /ore-k tßakur-ak dis / [ore(k) tßakuratis]

that-ERG.PL dog-ERG.PL are

'that's the dogs.'

c. /atsamar ba t tßupa dot / [atsamarba(t) tßupa‰ot]

finger one.ABS suck.PERF AUX. 1SGS. 3SGD

'I have sucked a pencil.'

(61) BEFORE NASALS:

a. /sema-t mutil / [sema(t) mutil]

how many boy.ABS. IND

'how many boys.'

b. /basu-k nai tßus / [basu(k) naitßus]

glass-ABS.PL want.PERF AUX. 3SGS. 3PLD

's/he has wanted glasses.'

c. /gißon ba t mima dau / [gißomba(t) mima‰au]

man one.ABS mime.PERF AUX. 3SGS. 3SGD

's/he has mimed a man.'

(60) 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. <bado t meriku on bat...> /t m/ [tm]

'I have a good doctor.'

b. <daka t naigabe andixe...> /t n/ [tn]

'I have a big disgust.'

c. <tresna k mai gamin...> /k m/ [km]

'the dishes on the table.'

d. <okana k 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 findings 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 obligatory nature of stop retention in closed-category lexical items. Generally, closed stops in closed-category lexical items are considered ungrammatical by my informant.
5.4.2.1. Final deletion

Unlike (64), no apparent exceptional cases to the underling /k/ remain in (65). In (64a), the object has been fronted and is separated from the rest of the sentence in (66). The sentence in (64a) and (66) 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. ... of the stop is complete in sentences like (64). No apparent perceptual cues to the underlying /k/ remain in (64a).

5.4.3. 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...

(65) NO STOP DELETION IP-FINALLY:

a. /prak-a k gißon-ak e‰osi dau/ _ [praka k]IP gißonake‰osi‰au
   pants-ABS man-ERG buy AUX.3SGS.3SGD (prakak left-dislocated)
   ‘pants, the man has bought’
   b. /gißon-a k prak-ak e‰osi dau/ _ [gißonatopa‰au]
   man-ERG pants-ABS buy AUX.3SGS.3SGD (gißonak not left-dislocated)
   ‘the man has bought pants’

(66) NO STOP DELETION U-FINALLY:

a. /sema t _ [sema t] *[sema]
   ‘how much / how many’
Chapter 5: Edge effects

b. /libu‰u ba

[libu‰u ba]

book one.ABS

'a book'

c. /i‰u orats e‰osi do

[i‰u orats e‰osi do]

three comb.ABS.IND buy.PERF AUX.1SGS.3SGD

'I have bought three combs'

d. /ore-k umi-

[ore-k umi-]

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... 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. E

PENTHESIS 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 generalization to include suffixes. Second, stops in non-sentential stops are more frequently dropped when followed by a vowel.

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)/; the indefinite marker is phonetically null. So, for the most part, singular and indefinite forms differ in that the former carries a marker /a/ (as in gißon-a for absolutive sg. and gißonak for absolutive ind.), while the latter is phonetically null.

(67) ABSOLUTIVE AND ERGATIVE IN GERNIKA (Hualde & Bilbao 1992):

indefinite singular

a. absolutive gißon-[^a] gißon-a[^a]

b. absolutive baso-[^a] baso-a[^a]

c. absolutive lagun-[^a] lagun-a[^a]

ergative

a. gißonek[^a] gißonak[^a]

b. basok[^a] basoak[^a]

c. lagunek[^a] lagunek[^a]

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...
Chapter 5: Edge effects

... process has affected stems ending in a vowel, like baso 'forest', mendiko 'mountain', neskiko 'girl'. The loss of the marker /a/ in a large proportion of nouns/adjectives has made interpretation more opaque, so that now it is not possible to distinguish between formal oppositions in inflection.

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, so that the singular marker /e/ in most cases of /a/-final forms is now either raised or lost to break up the oppositions of impersonal agreement.

Let us first look at examples below to show why this is so:

### Example 1: Getxo

<table>
<thead>
<tr>
<th>Indefinite</th>
<th>Singular</th>
</tr>
</thead>
<tbody>
<tr>
<td>baso</td>
<td>baso</td>
</tr>
<tr>
<td>mendiko</td>
<td>mendiko</td>
</tr>
<tr>
<td>neskiko</td>
<td>neskiko</td>
</tr>
</tbody>
</table>

### Example 2: Ondarroa

<table>
<thead>
<tr>
<th>Indefinite</th>
<th>Singular</th>
</tr>
</thead>
<tbody>
<tr>
<td>gißon</td>
<td>gißon</td>
</tr>
<tr>
<td>basu</td>
<td>basu</td>
</tr>
<tr>
<td>lagun</td>
<td>lagun</td>
</tr>
</tbody>
</table>

The changes that the Getxo and Ondarroa dialects have undergone have had other important consequences outside the inflectional system itself. First, the marker /a/ is no longer consistently used to distinguish between formal oppositions in inflection.

### Example 3: Getxo

*The changes that the Getxo and Ondarroa dialects have undergone have had other important consequences outside the inflectional system itself. First, the marker /a/ is no longer consistently used to distinguish between formal oppositions in inflection.*

### Example 4: Ondarroa

*The changes that the Getxo and Ondarroa dialects have undergone have had other important consequences outside the inflectional system itself. First, the marker /a/ is no longer consistently used to distinguish between formal oppositions in inflection.*
<table>
<thead>
<tr>
<th>STEMS ENDING IN OTHER CONSONANTS + LOCATIVE INFLECTIONAL SUFFIXES:</th>
<th>/-ko/</th>
<th>/-tik/</th>
<th>/-‰uts/</th>
<th>/-tsat/</th>
</tr>
</thead>
<tbody>
<tr>
<td>head</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>heart</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>toothpick</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>pencil</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>mouth</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>ear</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>mouthpiece</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>finger</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>liquor</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>judge</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>Frenchman</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter-PROL</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>chef</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter-PROL</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>chef</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter-PROL</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>chef</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>carpenter-PROL</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
<tr>
<td>chef</td>
<td>/ko/</td>
<td>/etik/</td>
<td>/‰uts/</td>
<td>/tsat/</td>
</tr>
</tbody>
</table>
Very few derivational suffixes are productive enough to be freely associated with a reasonable number of stems in African languages. The most productive are the diminutive and proclative suffixes, which are used to form new nouns and adjectives from existing ones. The diminutive suffix /-tßo/ is particularly productive, appearing in a wide variety of stems. It is used to form diminutives of nouns, adjectives, and verbs, and can be combined with other suffixes to form more complex derivatives.

With the diminutive suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(76) STOP-FINAL STEMS + PROLATIVE CASE:

One possible output when this suffix is added to stop-final stems.

(77) AFFRICATE-FINAL STEMS + OTHER (UNPRODUCTIVE) DERIVATIONAL SUFFIXES:

Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(78) AFFRICATE-FINAL STEMS + OTHER (UNPRODUCTIVE) DERIVATIONAL SUFFIXES:

With the verbalizing suffix /-tu/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, 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) AFFRICATE-FINAL STEMS + SUFFIX /-tu/:

With the verbalizing suffix /-tu/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(80) AFFRICATE-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(81) STOP-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(82) STOP-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(83) STOP-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(84) STOP-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(85) STOP-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.

(86) AFFRICATE-FINAL STEMS + SUFFIX /-tßo/:

With the verbalizing suffix /-tßo/, usually only one form is good, although other strategies being preferred to form verbs from nouns and adjectives (in particular the use of a dummy verb meaning "to become ..." or limited synchronic productivity are given in (78). Two of the forms involve simplification, the other one epenthesis. With /-tßo/ as the starting suffix, the vowel used is always /a/, never /e/. So there is only one possible output when this suffix is added to stop-final stems.
Chapter 5: Edge effects

However, these are one context in which the choice of the /a/-final form of
affricates is motivated. This option is more frequent in pre-consonantal
position, but the use of the form containing the marker /a/ is also
possible. This is illustrated in various syntactic contexts in (83) and
(84). Both categories of affricates can surface in situ in pre-consonantal
positions, never before stops and affricates preceding word-final suffixes,
in a number of possible structures. The stops in close contexts, those in open
and affricates with epenthesis are also disfavored in pre-consonantal
position and across word boundaries. We find the greatest amount of variation

affricates in PW-FINAL, IP-INTERNAL position:

(83) STOPS IN PW-FINAL, IP-INTERNAL POSITION:

a. /koko\ts\bat/ _ [koko\ts\bat] / \[koko\ts\bat] 'a/one neck'
b. /i‰u kißke\ts\dakat/ _ [kißke\ts\dakat] / [kißke\ts\a‰akat] 'I have three locks'c. /i‰u kißke\ts\bota dot/ _ [i‰ukißke\ts\bota\‰ot] / [i‰ulißke\ts\a‰ot] 'I have thrown three locks'

(84) AFFRICATES IN PW-FINAL, IP-INTERNAL POSITION:

a. /eska\ts\bat/ _ [eska\ts\bat] / ??[eska\ts\abat] 'a/one Frenchman'b. /lau bißo\ts\me‰esi dot/ _ [laubißo\ts\me‰esi‰ot] / [laubißo\ts\meresi‰ot] 'I have deserved three hearts'c. /i‰u lapi\ts\topa dot/ _ [i‰ulapi\ts\topa‰ot] / [i‰ulapi\ts\topa‰ot] 'I have found three pencils'

(85) Fricatives in PW-FINAL, IP-INTERNAL position:

a. /frantse\ts\bat/ _ [frantse\ts\bat] / ??[frantse\ts\abat] 'a/one Frenchman'

However, there is one context in which the choice of the /a/-final form of
affricates is motivated. This option is more frequent in pre-consonantal
position, but the use of the form containing the marker /a/ is also
possible. This is illustrated in various syntactic contexts in (83) and
(84). Both categories of affricates can surface in situ in pre-consonantal
positions, never before stops and affricates preceding word-final suffixes,
Chapter 5: Edge effects

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, marked in red, and in (89) utterance-finally.

(88) NO DELETION / SIMPLIFICATION OF STOPS AND AFFRICATES U-FINALLY:

| a. /lau kißke t gißon-ak e‰osi dau/ _ [laukißke t] / ?? [laukißke t a] |
| b. /lau lapi ts gißon-ak e‰osi dau/ _ [lau lapi ts] / ?? [lau lapi ts a] |
| c. /lau tßiko t/ _ [lautßiko t] / ?? [lautßiko t a] |
| d. /bost oko ts/ _ [bostoko ts] / ?? [bostoko ts a] |
| e. /pijo bat beaka ts/ _ [pijobabeaka ts] / ?? [pijobabeaka ts a] |
| f. /lau gorpu ts/ _ [laugorpu ts] / ?? [laugorpu ts a] |

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- and IP-internal position, and whether each of the possible simplifications is possible in PW- and IP-internal position.

5.4.4.5. Summary

The form ending in /a/ is possible but marginal and much less acceptable than in PW- and IP-internal position. In the case of the last element in the DP, the form ending in /a/ is tolerated in PW-internal context.

(87) FINAL STOPS AND AFFRICATES IN DP-INTERNAL POSITION IN GETXO:

/a. /ike ts balts-a/ _ [ike tsabaltsa] / [ike z altsa] '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 is found in (86), (87), and several case and derivational suffixes, like prolative /-tsat/ and diminutive /-tßo/. 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 non-nominal and non-adjectival morphemes in PW-internal, IP-internal, and IP-final position. This is shown in (88), where /a/ appears in non-prevocalic position in PW- and IP-internal contexts, and in (89) utterance-finally.

(88) NO DELETION / SIMPLIFICATION OF STOPS AND AFFRICATES U-FINALLY:

| a. /lau kißke t gißon-ak e‰osi dau/ _ [laukißke t] / ?? [laukißke t a] |
| b. /lau lapi ts gißon-ak e‰osi dau/ _ [laulapi ts] / ?? [laulapi ts a] |
| c. /lau tßiko t/ _ [lautßiko t] / ?? [lautßiko t a] |
| d. /bost oko ts/ _ [bostoko ts] / ?? [bostoko ts a] |
| e. /pijo bat beaka ts/ _ [pijobabeaka ts] / ?? [pijobabeaka ts a] |
| f. /lau gorpu ts/ _ [laugorpu ts] / ?? [laugorpu ts a] |

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- and IP-internal position, and whether each of the possible simplifications is possible in PW- and IP-internal position.

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- and IP-internal position, and whether each of the possible simplifications is possible in PW- and IP-internal position. This is shown in (88) at the right edge of dislocated constituents, marked in red, and in (89) utterance-finally.

(88) NO DELETION / SIMPLIFICATION OF STOPS AND AFFRICATES U-FINALLY:

| a. /lau kißke t gißon-ak e‰osi dau/ _ [laukißke t] / ?? [laukißke t a] |
| b. /lau lapi ts gißon-ak e‰osi dau/ _ [laulapi ts] / ?? [laulapi ts a] |
| c. /lau tßiko t/ _ [lautßiko t] / ?? [lautßiko t a] |
| d. /bost oko ts/ _ [bostoko ts] / ?? [bostoko ts a] |
| e. /pijo bat beaka ts/ _ [pijobabeaka ts] / ?? [pijobabeaka ts a] |
| f. /lau gorpu ts/ _ [laugorpu ts] / ?? [laugorpu ts a] |
Chapter 5: Edge effects

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 present in PW-internal position (section 5.1). These constraints are derived from the observation that stops are more easily licensed when the prosodic hierarchy is lower (section 5.2). The constraints I will be using are listed in (91). The constraint in (91a) deals with the deletion of postvocalic consonants. This constraint is violated in cases of stop deletion (observed only in deep-concatenative lexical items). The constraint in (91b) deals with the deletion of coda consonants. This constraint is violated in cases of stop deletion (observed only in surface structure). The constraint in (91c) deals with the deletion of non-coda consonants. This constraint is violated in cases of stop deletion (observed only in surface structure).

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 deep-concatenative lexical items). The constraint in (92b) deals with the deletion of coda consonants. This constraint is violated in cases of stop deletion (observed only in surface structure). The constraint in (92c) deals with the deletion of non-coda consonants. This constraint is violated in cases of stop deletion (observed only in surface structure). The constraint in (92d) deals with the deletion of postvocalic consonants. This constraint is violated in cases of stop deletion (observed only in deep-concatenative lexical items). The constraint in (92e) deals with the deletion of coda consonants. This constraint is violated in cases of stop deletion (observed only in surface structure). The constraint in (92f) deals with the deletion of non-coda consonants. This constraint is violated in cases of stop deletion (observed only in surface structure).

The higher they appear in the prosodic hierarchy, the more easily stops, affricates, and other consonants are licensed, from PW-internal to IP-final contexts. 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 – stop deletion, affricate simplification, and /a/-epenthesis. The strategies are used as we go up the prosodic hierarchy, leaving more room for stops and affricates, and other consonants to surface.
The constraint in (92dii) penalizes the use of /a/ in contexts that do not conform to this rule. Notice that /a/-epenthesis is not an option with words other than nouns/adjectives since /a/ is a nominal morpheme. Epenthesis in closed-category items is concerned with the general D\textsubscript{EP-V} constraint; the constraints over /a/-epenthesis in (92) are not even relevant in this case.

(92) **RELEVANT FAITHFULNESS CONSTRAINTS:**

a. Constraint against deletion:

\[
\text{MAX-C/V} \rightarrow \text{Do not delete a postvocalic consonant.}
\]

b. Constraint against the simplification of affricates:

\[
\text{MAX-[cont]} \rightarrow \text{Do not delete a feature [continuant].}
\]

c. Constraint against epenthesis:

\[
\text{DEP-V} \rightarrow \text{Do not insert a vowel.}
\]

d. Constraints against /a/-insertion:

i. \[
\text{DEP-/a/} \rightarrow \text{Do not insert a proxy singular marker /a/ in nouns and adjectives (i.e. in contexts where the marker does not have the expected interpretation).}
\]

ii. \[
\text{a. /a/} \rightarrow \text{FINAL} /a/ attaches to the last element (noun or adjective) that may bear it inside the DP.}
\]

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)

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Constraints violated</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ /eskats ] +tßo/</td>
<td>[ /eskats ] ßo/ 'kitchen-dim'</td>
<td>DEP-/a/</td>
</tr>
<tr>
<td>[ /kokot ] +tßo/</td>
<td>[ /kokot ] ßo/ 'neck-dim'</td>
<td>DEP-/a/</td>
</tr>
<tr>
<td>[ /lanbas ] +tßo/</td>
<td>[ /lanbas ] ßo/ 'mop-dim'</td>
<td>C[] \rightarrow \text{V}, \text{MAX-[cont]}</td>
</tr>
</tbody>
</table>

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.

The only phoneme-specific rankings (apart from the undominatedness of \text{PW-V} and \text{DEP-V}) will be considered undominated. Two constraints are never violated: stop\[\] \rightarrow \text{V} (since stops and affricates are output before word-final) and \text{DEP-V} (since the constraint is violated only in contexts where the marker does not have the expected interpretation). The expected input is given in (94), together with the empirical motivation for each line. The last line indicates language-specific and inherent (universal) rankings, respectively. I have merged the constraints stop\[\] \rightarrow \text{V} and \text{PW-V} and \text{C\[\] } \rightarrow \text{V} and \text{PW-V} into the constraints stop\[\] \rightarrow \text{V} and \text{C\[\] } \rightarrow \text{V}, since no distinction between the PW and PP levels is made in the data.
Chapter 5: Edge effects

315 Chapter 5: Edge effects

[94] RANKINGS SPECIFIC TO ONDARROA BASQUE:

a. Consonants other than stops never delete:

⇒ MAX-C/V— ▶ C ]^ _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/

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 ... 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 ... or gradient well-formedness judgments among different possible forms, for example the fact that [eskats atßo], with /a/-insertion, is preferred over [eskastßo], 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 desired direction. Interestingly, the constraints C\]i_V, where i is lower in the prosodic hierarchy than the constraint C\]j_V, where j is higher in the prosodic hierarchy, can only rule out output candidates that are fully dominated by the constraint C\]j_V. When competing C\]i_V and C\]j_V constraints are ranked such that C\]i_V is higher in the hierarchy than C\]j_V, the constraint C\]j_V can only rule out output candidates that are fully dominated by C\]i_V. This means that the proportion of total rankings generating each of the possible outputs depends on the relative ranking of the constraints C\]i_V and C\]j_V.

Such decisions may affect significantly the proportions obtained. For example, 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 with the grammar in (95) yield the desired results, that is the expected proportions of total rankings generating each of the possible outputs.

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_V and C\]j_V, where j is lower in the prosodic hierarchy than i, crucially intervene in the computation. Interestingly, the constraints C\]k_V, where k is lower in the prosodic hierarchy than j, do not seem to play a crucial role in the evaluation of candidates. This is illustrated in the proposition that the proportion of total rankings generating the output [eskats atßo] is significantly greater than the proportion generating the output [eskastßo], even though the differences between the two outputs are subtle.

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 well-formedness judgments in (93) are better predicted by strictly local portions of the grammar than by more global ones.
Chapter 5: Edge effects

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 knowledge of a covert-ranked constraint such as $\text{C} \rightarrow \text{PW}$, which is also

In going over the data in (99), let us first consider the situation for closed-category items, which is rather simple. The constraint against consonant deletion ($\text{MAX-C/V} \leftarrow \text{DEP}^*$) and that banning PW-final stops and affricates ($\text{stop}^* \text{PW} \text{V}$) are unranked with respect to each other, which yields optional stop deletion IP-internally, as illustrated in (96). Other cases involve a reference point. This situation arises in (99c) and (100) and will be further discussed below.

In going over the data in (99), let us first consider the situation for closed-category items, which is rather simple. The constraint against consonant deletion ($\text{MAX-C/V} \leftarrow \text{DEP}^*$) and that banning PW-final stops and affricates ($\text{stop}^* \text{PW} \text{V}$) are unranked with respect to each other, which yields optional stop deletion IP-internally, as illustrated in (96). Other cases involve a reference point. This situation arises in (99c) and (100) and will be further discussed below.

In going over the data in (99), let us first consider the situation for closed-category items, which is rather simple. The constraint against consonant deletion ($\text{MAX-C/V} \leftarrow \text{DEP}^*$) and that banning PW-final stops and affricates ($\text{stop}^* \text{PW} \text{V}$) are unranked with respect to each other, which yields optional stop deletion IP-internally, as illustrated in (96). Other cases involve a reference point. This situation arises in (99c) and (100) and will be further discussed below.
The greatest amount of variation is observed 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).

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]-^_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. In (99d) there are 24 possible rankings of the four relevant constraints; 4 of them select [eskatsagori], again 10 each for [eskatsgori] and [eskasgori].

In evaluating the well-formedness of these constraints, the cases of stop or fricative deletion 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): [kokotabat] 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 the examples (99b) is 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 in (99a) above. DEP-/a/ is assumed to be /a/-V-final, so its ranking is crucial. The constraints C]-^_V, C]-PW_V, and DEP-/a/ are crucially unranked, which predicts the two candidates to be equally likely, which is not the case. Here is where the higher-ranked constraint C]-^_V, which is also unranked with respect to DEP-/a/, crucially intervenes. There are three possible rankings of the three constraints C]-^_V, C]-PW_V, and DEP-/a/:  DEP-/a/>C]-^_V/>C]-PW_V, C]-^_V/>DEP-/a/>C]-PW_V, C]-^_V/>C]-PW_V/>DEP-/a/. The candidate [eskatsagori] is optimal in the first two rankings, while [eskatsabat] only wins in the third one. These distinct proportions account for the observed contrast in well-formedness between the two possible outputs. In (99d) there are 24 possible rankings of the four relevant constraints; 4 of them select [eskatsagori], again 10 each for [eskatsgori] and [eskasgori]. In (99e) there are 6 possible rankings of the three relevant constraints; 4 of them select [kokotagori], against 2 for [kokotagori].
Chapter 5: Edge effects

321 Chapter 5: Edge effects

322 Chapter 5: Edge effects

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 /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 have a greater effect on the perception of liquids following them, which is consistent with the proposal developed in this thesis. The conclusion here is not clear in this account, and a more refined analysis of the data would be necessary.

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 and morpheme-internal consonant clusters, 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 phonological prominence of root-initial 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 similar to the singular form is not appropriate. In this dialect, /a/=FINAL are undominated. 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, /a/=FINAL are undominated.

The study of a number of other dialects supports our ideas that the constraints that are followed by some segments in the same morpheme and word have different rankings in different dialects. This is obviously not the account developed here, and I would like to comment on why I believe the OCP approach to be an oversimplification. The proposal developed in this thesis is consistent with the data from Ondarroa and Baztan, and it is supported by the fact that the OCP approach is not consistent with the data from other dialects.

The stop deletion and affricate simplification process in Basque has been widely discussed in the literature, especially in relation to the featural structure of affricates (see e.g. Hualde 1987, 1995). The processes of stop deletion and affricate simplification are triggered by a lack of [-continuant] features on the consonant. This is consistent with the proposal developed in this thesis, which is based on the observation that the OCP approach is not consistent with the data from other dialects.

The proposal developed in this thesis is consistent with the data from Ondarroa and Baztan, and it is supported by the fact that the OCP approach is not consistent with the data from other dialects.
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. 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 cases. The following examples are intended to provide the analyst with a reasonably good understanding of the processes involving stops and affricates in the language.

- Biscayan:
  - Northern Biscayan: Lekeitio (Hulade, Elordieta & Elordieta 1994)
  - Southern Biscayan: Arratia (Etxebarria Ayesta 1991)
  - Western Biscayan: Getxo (Hualde & Bilbao 1992)

- Baztan (Salaburu 1984; H. Kim 1997; N'Diaye 1970)
- 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, 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 provide evidence for the OCP account. As for fricatives, different patterns are described, which do not generally support the OCP. 

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

a. <lagu'na k feu'uk dira> /k f/ _ [f] 'the friends are ugly'
b. <ni k sokia daukat> /k s/ _ [s] 'I have the rope'
c. <se'ma t jeneral>/t x/ _ [x] 'how many generals'
d. <gißo'na k jeniz~odu'nak dira> /k x/ _ [x] 'the men are grumpy'
e. <se'ma t rradi z~o> /t r/ _ [r] 'how many radios'
f. <Jone k rradiz~u'a dauko> /k r/ _ [r] 'Jon has the radio'

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

STOP DELETION BEFORE FRICATIVES AND RHOTICS IN GETXO:

a. /ba tfalta da/ _ [ba'falta∂a'] 'one is missing'
b. /ni k fi‰ukes/ _ [nifi‰uke's] 'I (erg.) with thread'
c. /ikus doßita'nu/ _ [ikuz∂o'ßita'nu] '(I) have seen the gypsy'
d. /entsun doßira'dion/ _ [entsundora'∂ion] 'I heard it on the radio'

(Hualde & Bilbao 1992: 18-19)

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.
Chapter 5: Edge effects

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). 

(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). 

IP-FINAL EPENTHESIS IN ARRATIA:

a. /gu-

we-ERG

b. /ni-

I-ERG

c. /gison-a

man-ABS.PL or ERG

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 fricatives). In this dialect, stops do not delete before a sibilant fricative. I assume that this is due to a similar constraint. 

TOP-FRICATIVE COALESCENCE IN SOULETIN:

a. <hu'a

'compress those'

b. <hu'a

'weed those'

c. <hu'a

'wash those'

(Hualde 1993; from Larrasquet 1928)

This single fact has motivated the claim that deletion occurs only before stops. 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).

STOP DELETION BEFORE FRICATIVES IN ARRATIA:

[Hualde 1993; from Larrasquet 1928]

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 fricatives). In this dialect, stops do not delete before a sibilant fricative. I assume that this is due to a similar constraint. 

TOP-FRICATIVE COALESCENCE IN SOULETIN:

a. /gu-

we-ERG

b. /ni-

I-ERG

c. /gison-a

man-ABS.PL or ERG

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. Hualde (1993) reports that stops do not delete before a sibilant fricative. This has motivated the claim that deletion occurs only before stops. 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 epentheses within IP).
Chapter 5: Edge effects

First, notice that examples with /r/-initial 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 examples collected in Baztan, the contrast between (107a) and (107b) is further supported by the fact that the process would work with word-initial /r/ in Basque itself. It is further supported by the fact that, on the input, the contrast between the two readings is retained in comparison with word-final /r/.

FRICATIVE COALESCENCE IN BAZTAN:

(107a) <eztaki t zer erran> /tÇ/tÇ/\ 'I don’t know what to say'

(N’Diaye 1970)

(107b) <hune k zuen> /kÇ/kÇ/\ 'this one had it'

(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:

FRICATIVE COALESCENCE IN BAZTAN:

(110) /k/-FRICATIVE COALESCENCE IN PRONOUN+FINITE VERB:

a. <ederra k zineten> /kÇ/kÇ/\ 'example',

b. <atsolutu k ziren> /kÇ/kÇ/\ 'absolute'.

Hualde (p.c.) remarks that N’Diaye’s informants belonged to an older generation, and it could very well be the case that in the main the phenomenon that N’Diaye discusses belongs to an older generation.

5.5. CONCLUSIONS

Although we see the need to reconsider the need for exceptional mechanisms such as extrasyllabicity and its interaction with the OCP constraint, we also need to consider the potential role of perceptual factors. 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. 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. In this chapter, I have proposed a new approach to edge effects, which may be of interest for further research.
provides evidence against the traditional OCP-based account of it. 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. The use of sociolinguistic data is employed to explore the interaction between gender and the opacity of some aspects of the nominal inflectional system, illustrating the use of social markers for purely phonological purposes. The analysis of this pattern has revealed interesting interactions between phonological and semantic properties. The process applies to decreasing morphemes such as the boundary condition. These other consonants as well from appearing in non-preceding position. These process effects displays stop deletion, affricate simplification, and epenthesis process effects. Further details on this occurred in Ondarroa Basque, which is the second half of the chapter is developed. This