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UMI
STYLISTIC VARIATION IN SPANISH PHONOLOGY

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of the Ohio State University

By

Richard E. Morris. M.A.

* * * * *

The Ohio State University
1998

Dissertation Committee:

Professor Fernando Martínez-Gil. Adviser
Professor Wayne J. Redenbarger
Professor Javier Gutiérrez-Rexach

Approved by

Department of Spanish and Portuguese
ABSTRACT

This dissertation is an investigation of phonological variation occurring as a function of stylistic choice in Spanish. The main variable processes include glide formation, vowel coalescence, vowel deletion, nasal and lateral place assimilation, nasal neutralization, continuancy assimilation, obstruent devoicing, voicing assimilation, and aspiration. Optimality Theory (OT) is the theoretical framework.

Previous generative work on phonological variation in Spanish and other languages has been couched in discussions of "optional" or "variable" rules. More recently, a principle of "floating" constraints (FCs) has been applied to explain inter-speaker variation. The present study develops the FC theory of variation and applies it systematically to the analysis of stylistic data from several dialects of Spanish. It is argued that stylistic variation in Spanish - and indeed in all languages - is the result of variable dominance relations among ranked universal constraints. The primary advantage of the FC model is its ability to account for all speech processes, variable as well as categorical, within a single framework.

Under this model, constraints fall into two broadly-defined constraint families, **MARKEDNESS** and **FAITHFULNESS**. Data from a variety of Spanish dialects are given to show that when **FAITHFULNESS** constraints outrank **MARKEDNESS** constraints, maximally distinctive (careful speech) forms are optimized. When the reverse is true, maximally economical (casual speech) forms are optimized. Forms associated with intermediate speech styles are allowed by the interleaving of **FAITHFULNESS** and **MARKEDNESS** constraints, and often represent a "compromise" between careful and casual style.
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VITA

May 13, 1968 ......................... Born - Rapid City, South Dakota, USA

1990 ........................................... B.A. French, German, Cornell College, Iowa

1990 - 1992 ............................... Graduate Teaching Associate
                        Department of French and Italian
                        The Ohio State University

1992 ........................................... M.A. French linguistics, The Ohio State University

1993 ........................................... Instructor of French
                        Columbus State Community College, Ohio

1995, 1996 ................................. Research Assistant
                        The Ohio State University

1997 ........................................... Instructor of English as a Second Language
                        Capital University, Ohio

1994 - 1997 ............................... Graduate Teaching Associate
                        Department of Spanish and Portuguese
                        The Ohio State University

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FIELDS OF STUDY

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>iii</td>
</tr>
<tr>
<td>Vita</td>
<td>iv</td>
</tr>
<tr>
<td>Chapters:</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>1.1 Variability in language</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Speed and style</td>
<td>8</td>
</tr>
<tr>
<td>1.2.1 Optional and variable rules</td>
<td>9</td>
</tr>
<tr>
<td>1.2.2 Gestural overlap and gestural reduction</td>
<td>18</td>
</tr>
<tr>
<td>1.2.3 Fast speech and control</td>
<td>20</td>
</tr>
<tr>
<td>1.3 The Theoretical framework: Optimality Theory</td>
<td>24</td>
</tr>
<tr>
<td>1.3.1 Preview of OT constraints</td>
<td>25</td>
</tr>
<tr>
<td>1.3.2 FAITHFULNESS vs. MARKEDNESS</td>
<td>26</td>
</tr>
<tr>
<td>1.3.3 Colina (1995)</td>
<td>28</td>
</tr>
<tr>
<td>1.3.4 Partial ranking theories of variation</td>
<td>29</td>
</tr>
<tr>
<td>1.3.5 Constraining FCs? Some acquisition evidence</td>
<td>34</td>
</tr>
<tr>
<td>1.3.6 Probabilistic prediction in the FC theory</td>
<td>36</td>
</tr>
<tr>
<td>1.4 Distinctive feature structure</td>
<td>38</td>
</tr>
<tr>
<td>1.5 Preliminary conclusions and organization of the study</td>
<td>39</td>
</tr>
<tr>
<td>2. FEATURAL, SEGMENTAL, AND MORAIC FAITHFULNESS</td>
<td>41</td>
</tr>
<tr>
<td>2.1 Syllable merger</td>
<td>41</td>
</tr>
<tr>
<td>2.1.1 Previous treatments of syllable merger</td>
<td>42</td>
</tr>
<tr>
<td>2.1.2 Experimental evidence for mid glide raising</td>
<td>47</td>
</tr>
<tr>
<td>2.1.3 Preliminaries to an OT analysis</td>
<td>51</td>
</tr>
<tr>
<td>2.1.4 MAX-µ and MAX-µ-WI</td>
<td>54</td>
</tr>
<tr>
<td>2.1.5 The Data</td>
<td>56</td>
</tr>
<tr>
<td>2.1.6 An OT account</td>
<td>59</td>
</tr>
<tr>
<td>2.2 Stressed syllable merger</td>
<td>64</td>
</tr>
<tr>
<td>2.2.1 The Data</td>
<td>71</td>
</tr>
<tr>
<td>2.2.2 An OT account</td>
<td>75</td>
</tr>
<tr>
<td>2.3 Vowel deletion in Chicano Spanish</td>
<td>83</td>
</tr>
<tr>
<td>2.3.1 Rule ordering and rule persistence</td>
<td>84</td>
</tr>
<tr>
<td>2.3.2 An OT account</td>
<td>88</td>
</tr>
<tr>
<td>2.3.3 More about Chicano: the OCP</td>
<td>93</td>
</tr>
</tbody>
</table>

vi
CHAPTER 1

INTRODUCTION

Phonological variation associated with speech style in Spanish has been well documented and analyzed (cf. Bowen 1956; Stockwell, Bowen, & Silva-Fuenzalida 1956; Navarro Tomás 1967; Harris 1969; Hutchinson 1974; Hooper 1976; Kaisse 1985; Penny 1986; Roca 1991; Hualde 1994; Colina 1995; and others). In this chapter, I review some of the original studies of variable rules in general (cf. Labov 1969; Cedergren 1973; Cedergren & Sankoff 1974) and discuss how such rules have been incorporated into the generative framework. I then propose an Optimality Theoretic (OT) model in which variable processes may be explained parametrically, using a device called the floating constraint (FC)(cf. Prince & Smolensky 1993; McCarthy & Prince 1995a, b; Reynolds 1994; Colina 1995; Jun 1996a, b; Rosenthal 1997; Nagy & Reynolds 1997).

1.1 Variability in Language

"Phonological variation is an inherent characteristic of continuous speech." This observation, made by Neu (1980: 37), succinctly expresses a fact which has plagued phonologists for some time. Variation is a problem for phonology, because if it is truly inherent in speech - and it seems to be - then how can the facts of language ever be formalized into "rules?" One early generative study, Cedergren (1973), analyzed the variability of /s/-deletion in Puerto Rican Spanish. The essential results of her study are given in (1).
Acoustic realizations of /s/ in Puerto Rican Spanish (Cedergren 1973: 14)

<table>
<thead>
<tr>
<th>Variant</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>11</td>
</tr>
<tr>
<td>h</td>
<td>41</td>
</tr>
<tr>
<td>Ø</td>
<td>48</td>
</tr>
<tr>
<td>N</td>
<td>22.167</td>
</tr>
</tbody>
</table>

The data in (1) show that in a sampling of 22.167 tokens, /s/ was most frequently deleted altogether, less frequently aspirated (/s/ → [h]), and still less frequently realized as |s|. This kind of variation poses a substantial problem for generative phonology. In traditional generative work, a rule either operates on an input in a given context or it does not. If an underlying segment has more than one phonetic realization in the same context, then one realization must be the product of a "variable" or "optional" rule, the difference between which will be discussed presently.

One of the earliest attempts to describe variability in language in a systematic way was Labov (1969). Labov argued that the study of variation in language is necessarily a quantitative endeavor. His approach to variation was a highly systematic one involving three basic steps (1969: 728-729): 1) Identify the total population in which the utterance occurs; 2) Decide on the number of variants which can be reliably identified; and 3) Identify all the sub-categories which would reasonably be relevant in determining the frequency with which the rule in question applies (e.g. the preceding or following segment).

Using the quantitative information retrieved in these three steps, facts of systematic variation could be incorporated into the structural description of the optional rules themselves. With Labov, Cedergren & Sankoff (1974) found that the distribution of variable events in the speech of a community is "well-patterned" and therefore "reproducible." If the frequency of a rule application is known from monitored elicitations, then the probability of its application in future elicitations may be estimated with a high degree of accuracy (345).
It is generally understood that the variable rules which are of interest to Cedergren (1973), Cedergren & Sankoff (1974), Wolfram (1975), Guy (1980), and others were to some extent correlated not only with social factors, but also with style. In a quantitative study of variable stop deletion in American English, Guy (1980) lists nine contextual factors which bear on the application or nonapplication of a variable rule. Six of these are linguistic in nature: grammatical category of the word, following segment, preceding segment, stress, length of cluster, and articulatory complexity. The remaining three are factors concerned not with the segment sequence itself but rather with the manner and circumstance of its delivery. These factors include rate of speech, style of speech, and "social" considerations. Although Guy states that the probability of stop deletion increases with rate of speech, he declines to factor speech rate into an overall equation on the grounds that "we have not yet developed a simple, reliable system for measuring and coding rate of speech in natural conversation" (9).

Other accounts of variability did develop systems of coding speech rate. Perhaps the most enduring approach was based on the assumption that although speech rates form a gradual continuum from slowest to fastest without any remarkable subdivisions, the number of rules associated with the continuum is finite. The speech rate continuum could therefore be subdivided into "speed styles" using discrete rules as signposts. Following this assumption, Harris (1969) identified four speed styles for Spanish. Although they are best described in relative rather than absolute terms, Harris does offer a prose description of each: he also gives a sample situation in which each style would most likely be preferred by speakers (1969: 7):  

**Largo:** very slow, deliberate, overprecise; typical of, for example, trying to communicate with a foreigner who has little competence in the language or correcting a misunderstanding over a bad telephone connection.

**Andante:** moderately slow, careful, but natural; typical of, for example, delivering a lecture or teaching a class in a large hall without electronic amplification.

---

1 Harris' system of speed style categorization has been followed and developed in other significant studies of speech rate in Spanish and other languages, such as Hooper (1976), Rudes (1976), Kaisse (1985), Nespor (1987), and others. Other systems exist as well, and will be mentioned as the need arises.
Allegretto: moderately fast, casual, colloquial. In many situations one might easily alternate between Andante and Allegretto in mid-discourse or even mid-sentence.

Presto: very fast, completely unguarded.²

The most common speed styles for everyday speech are the two intermediate styles, Andante and Allegretto; indeed a speaker may fluctuate between the two within a single sentence.

It is important to recognize that “speed” style is potentially misleading. Although speech style may correlate with speed on a probabilistic level - in that fast speed is generally casual speech and slow speech is generally careful speech - such a correlation is far from absolute. In traditional sociolinguistic studies (primarily those modeled after Labov 1966 and 1969), “style” is typically described as the measure of attention a speaker gives to his own speech production. Careful style is therefore precisely that: speech in which the speaker pays careful attention to his own output. Casual style is speech which is not characterized by such attention. An interesting experiment serves as the basis for this definition of style. Mahl (1972) had subjects listen to their own voices through headphones during conversations. For brief periods, white noise was fed over the headphones so that speakers were unable to hear their own output. Other portions of the experiment were conducted with the speaker facing away from the listener. Interestingly and not too surprisingly, during the phases of white noise, when self-monitoring could not easily occur, subjects elicited stigmatized variants more often than they did when they were able to monitor themselves. Likewise when they were not directly facing the listener (see also Labov 1972).

In a reinterpretation of the results of Mahl’s experiment, Bell (1984) observes that whether or not a subject was facing the listener had a greater effect on speech style than the interfering white noise. In Bell’s view, this disproportion indicates that style is sensitive not so much to degree of attention, as claimed by Labov, but to the listener - specifically the communicative situation shared by the listener and speaker.

² Harris identifies Presto as a style but does not make use of it in any of his subsequent speed style discussion. It will be of no further interest here either.
Traditional sociolinguistic studies also recognize social and stylistic axes of variation. The social axis encompasses the range of extralinguistic factors (cf. Guy 1980), including gender, age, economic background, etc., and accounts for differences between speakers. The stylistic axis, on the other hand, accounts for variation within the speech of a single speaker. Bell (1984) proposes a system of factors which contribute to language variation in general. Included within this system are "interspeaker" (social) factors as well as "intraspeaker" (stylistic) ones (see 2).

(2) Linguistic variation (Bell 1984: 146)

In his study, Bell relates intraspeaker factors to interspeaker factors: he maintains that intraspeaker variation models the variation observed in the surrounding dialect, and is therefore loosely derived from interspeaker variation (151). A speaker's individual mode of variation, modeled after the variation of the group, in turn contributes to the standard of variation for the group (cf. also Romaine 1980). In general, this and other studies relate style to social factors, without reference to speed.

Other studies, such as Hasegawa (1972), Ramsaran (1978), and Siptár (1979), argue that style is correlated more with level of formality (demands of the speaker-listener
situation) than with speed. In a discussion of data acquisition methods, Labov (1972) distinguishes between casual style, careful style, text reading, word list reading, and minimal pair reading. Each manner of acquisition tends to be associated with a certain style (or degree of self-attention in Labovian terms). Likewise, each style is associated with different rule probabilities. For example, in a study of /s/-aspiration in the Spanish of Cartagena, Colombia, Lafford (1982) finds an inversely proportional correlation between degree of speech formality and frequency of rule application. In his study, /s/ was realized one of three ways: [s], [h], or [Ø], depending on the level of formality. The percentages of occurrence of each realization are tabulated in figure (3).

(3) Percentages of usages of variants of /s/ in Cartagena (Colombia) Spanish (Lafford 1982)

<table>
<thead>
<tr>
<th>style</th>
<th>[s]</th>
<th>[h]</th>
<th>[Ø]</th>
</tr>
</thead>
<tbody>
<tr>
<td>less formal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>casual</td>
<td>20</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>careful</td>
<td>28</td>
<td>39</td>
<td>33</td>
</tr>
<tr>
<td>reading</td>
<td>66</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>more formal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>word list</td>
<td>87</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

Lafford's data show that the rules converting /s/ to [h] and /s/ to [Ø] are most likely to fail in most formal style: in this style the rule applies in only 5% and 8% of elicitations, respectively. In least formal style (casual), a preference for deleting or aspirating /s/ is evident: in this style, /s/ is realized as [s] only 20% of the times, compared to 35% for [h] and 45% for [Ø].

Building on the work of Labov and other sociolinguists, Silva-Corvalán (1989: 90) provides detailed descriptions of the three essential formality styles. I paraphrase these below:

**Casual style.** There are three basic identifying features: 1) Presence of paralinguistic factors: fast rate, change in rate, changes in intervals between high and low
tones, changes in respiratory rhythm, laughing; 2) Digressions within the conversation which are spontaneously and enthusiastically introduced by the speaker; 3) Speech directed toward third persons such as family and/or friends of the speaker.

**Careful style.** Characteristic of recorded speech, when the speaker is aware of the data collection situation and (unconsciously) monitors the formality of his/her speech.

**Formal style.** Typical of a public lecture or job interview, reading aloud, or other activity requiring the speaker to pay especially careful attention to language. Silva-Corvalán observes that speakers may associate reading or similar focused language activities with schooling and the “notions of linguistic correctness” learned there.\(^3\)

It is not necessarily the case, however, that all speakers of a dialect recognize which activities are “formal” and which ones are “informal.” Labov (1994: 157-158) finds that there is a small number of speakers in any community who show little variation between formal and informal speech styles. Building on a similar observation, Guitart (1997) argues that formal speech is associated with *formal situations* as dictated by linguistically conservative education. Individuals with less educational background tend to lack the ability to speak formally; instead, they use informal speech in all social situations. Not surprisingly then, slow speech is not necessarily formal speech. Guitart points to instances in which individuals use informal speech patterns even at slow speeds. These same individuals seldom have the communicative experience necessary to gauge effectively the linguistic demands of different contact situations. In Guitart’s view, speakers master stylistic variation by learning to *control* competing internalized grammars. They develop such control by repeated exposure to the different circumstances in which these grammars are most operative, whether public lectures, informal chats, news broadcasts, etc. How much control a speaker develops depends on numerous environmental factors, not the least of which are educational background and personal experience.

It has been shown that in some languages formality styles and speed styles have similar but independent grammars. Hasegawa (1972) distinguishes between two such grammars, each with a distinct set of rules, in Tokyo Japanese. One set of rules is

\(^3\) “Notiones de corrección lingüística” (p. 90).
sensitive to speed, and the other is sensitive to formality. In general, fast speech rules are those which are more likely to apply as speed increases, such that given a high enough speed, they apply without exception. Casual speech rules apply across speed styles and do not tend to apply more frequently with increased rate. Japanese has this distinction probably because the language is by nature more sensitive to notions of formality.

Siptár (1979) is a study of speed and formality styles in Hungarian. In this study, three speed styles and three formality styles are identified. The three formality styles are intimate, neutral, and formal. The three speed styles are casual, colloquial, and guarded. Although independent, the formality and speed styles frequently intersect, in which case they are given a third set of designations: casual, swift, and accelerated (29). These designations express the common but unrequired coincidence of casualness and speed.

In most languages, however, distinctions between speed and formality are not clear-cut. Speaking generally of all languages, Browman & Goldstein (1990) define casual speech as a “subset” of fast speech, and they do not rely on a distinction between the two in their discussion of gestural overlap in English. The typical sound changes they cite for casual speech are the same ones we will observe in this study: segmental deletion, insertion, substitution, and assimilation (359).4

For Spanish, no substantial argument has been made to date which differentiates formality rules and speed rules. In this study, it will be maintained that the intersection of fast speech with low formality and slow speech with high formality is the norm for Spanish. Situated in this way, fast speech is the often inevitable by-product of casual style.

1.2 Speed and style

As mentioned earlier, the first major attempt to delineate speed styles in Spanish was Harris (1969). Building on work begun by Navarro Tomás (1956), Bowen (1956).

---

4 Browman & Goldstein (1990: 360) attribute casual-fast speech effects on the sound sequence to two factors: decreased gestural magnitude (in both time and space), and increased temporal overlap. They propose that gestures do not delete; rather, they lose magnitude and become acoustically obscured by gestures overlapping them. This argument will be reviewed later on.
and Stockwell, Bowen, & Silva-Fuenzalida (1956), Harris selected several variable rules associated with "fast speech" - such as partial and total assimilation to voice and place - and cross-referenced each rule with one or more of four labeled speed styles: Largo, Andante, Allegretto, and Presto. The result was a phonological model which simultaneously accounted for speaker performance and competence.

In this section, the fundamental generative literature on speech style and variable rules is reviewed (cf. Hooper 1976; Kaisse 1985; John Harris 1989; Silva-Corvalán 1989; and others). Various approaches to connected speech phonology will also be examined in detail (Poplack 1980; Browman & Goldstein 1990; Jun 1996a; Jun 1996b).

1.2.1 Optional and variable rules

In traditional generative theory, phonological variation has been explained many ways, two of which will be reviewed here. The first notion, that of the "optional rule," was used by Harris (1969) and further developed in much of the subsequent Natural Generative Phonology literature on variation, such as Hooper (1976) and Bolozky (1977). The "variable rule" was used mainly in the field of sociolinguistics to express an uncategorical substitution whose frequency in speech was predictable on the basis of a large body of observed data (Labov 1969; Cedergren 1973, 1978; Cedergren & Sankoff 1974, 1975; and many others).

In a general study of sociolinguistic principles and methods, Silva-Corvalán (1989) distinguishes three different types of phonological rules: categorical, optional, and variable. A categorical rule is one which applies invariably in a certain phonological context. Optional rules and variable rules are used to describe processes which are not categorical. In traditional phonological theory, a rule which is not categorical produces what is commonly called "free variation." or in sociolinguistics "conditioned variation." Categorical, optional, and variable rules each have a separate schematic notation (see 4).
(4) Categorical, optional, and variable rules (see Silva-Corvalán 1989: 59)

a. Categorical rule  
\[
X \rightarrow Y \quad \left/ \begin{array}{c}
A \\ B
\end{array} \quad \_ C
\]

b. Optional rule  
\[
X \rightarrow (Y) \quad \left/ \begin{array}{c}
A \\ B
\end{array} \quad \_ C
\]

c. Variable rule  
\[
X \rightarrow <Y> \quad \left/ \begin{array}{c}
A \\ B
\end{array} \quad \_ C
\]

Rule (4a) rewrites X as Y in the environment A\_ C or B\_ C without exception. Rule (4b) rewrites X as Y in the environment A\_ C or B\_ C at the speaker's discretion. Rule (4c) rewrites X as Y variably in the environment A\_ C or B\_ C, with the context A\_ C being more likely than B\_ C to trigger application.

Zamora Munné & Guitart (1982: 51) offer morphophonological rules as an example of categorical rules in language. For example, Spanish contains a rule of diphthongization which changes /e/ to [je] in the third person of some lexically marked verb forms, creating alternations of the type pensar ~ piensa. One does not hear an alternation between piensa and *pensa; therefore the rule is a categorical one.

Optional and variable rules can refer to the same types of phonological operations. In general, an optional rule carries less information than a variable rule with regard to the exact context of application. An optional rule is one which is not categorical in a certain phonological context (i.e. A\_ C). Non-linguistic factors in the application of the rule are not incorporated into the rule in any way. Instead, application is simplistically attributed to "optionality" or even "randomness."

Most optional rules operate across the board, as it were, without reference to morpheme- or word-boundary information. For this reason, lexical phonological models

---

5 The variable rule is, however, first and foremost a generalization based on quantitative data. Because the variable rule is handled in primarily sociolinguistic studies, its phonological triggers are considered integrally with its social triggers. If the linguist's goal is to study language variability in a social context, the mere labeling of rules as "optional" is inadequate. The reader is referred to Cedergren (1973; 1978), Cedergren & Sankoff (1974), Neu (1980); López Morales (1981); Terrell (1981), and Silva-Corvalán (1989) for thorough quantitative studies on variation in Spanish.
generally situate them late in the phonology, in the postlexical stratum. Kaisse (1985) argues for two sequential postlexical rule modules P1 and P2, the first of which contains external sandhi rules, and the second of which contains (optional) "fast speech" rules. Kaisse's phonological model is presented in (5) in a somewhat simplified form.

(5) Speed rules in lexical phonology (Kaisse 1985: 20)

As shown in diagram (5), Kaisse's model situates fast speech rules in the postlexical stratum. The two types of postlexical rules she formulates - P1 and P2 - are similar except for the fact that P1 rules are sensitive to phonological and syntactic context.
and P2 rules are sensitive only to phonological context. An example of an external sandhi rule in Spanish is the deletion of word-final stressed [a] in a verb form whenever it precedes a mid vowel. This is common in Puerto Rican dialect. Kaisse argues that word-final stressed [a] may delete only if it is contained in a verb. This deletion rule is necessarily a sandhi rule because its structural description requires syntactic information (see figure 6).

(6) External sandhi: stressed [a] deletion rule (simplified from Kaisse 1985: 128)

\[
\begin{align*}
a & \rightarrow \emptyset / \verb \{ e \} \\
& / o \\
\end{align*}
\]

The following data illustrate how the deletion rule applies in verbs, but fails in nouns and adverbs.

(7) External sandhi: stressed [a] deletion data (Kaisse 1985: 127-128)

<table>
<thead>
<tr>
<th>non-verbs</th>
<th>verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>mamá entró</td>
<td>podrá empezar</td>
</tr>
<tr>
<td>sofá elegante</td>
<td>volverá enamorado</td>
</tr>
<tr>
<td>acá encontré</td>
<td>contará entre</td>
</tr>
<tr>
<td>allá olvidé</td>
<td>comprará ochenta</td>
</tr>
</tbody>
</table>

Stressed [a] deletion is syntactically conditioned and must therefore be classified as a P1 rule. A different variety of /a/-deletion, which targets the unstressed vowel, may apply in any syntactic context and is therefore classified as a P2 rule.

The formal line between P1 rules and P2 rules is a thin one. In some cases, such as in very relaxed speech, a P1 rule may become syntactically unconstrained and apply in the P2 module. Likewise, a P2 rule may, over time, become sensitive to morphological or

---

6 This deletion process must not be confused with a more general variety of /a/-deletion, which targets any unstressed /a/ before any vowel, across a word boundary, and is common in many Latin American dialects.
syntactic information and become a P1 rule. In this way, more productive processes become less productive as new productive processes are added late in the ordered rule system.

The development of a connected speech rule [external sandhi rule -- REM] from a fast speech rule is ... a movement upward [in the ordered rule system -- REM] that entrains the development of sensitivity to syntactic structure. Moreover it is occasionally noted that the syntactic conditions on some external sandhi rules may disappear as the speech rate increases. (...) A connected speech (P1) rule that “loses” its syntactic conditions is simply one that also has P2 as its domain (Kaisse 1985: 16).

In addition to partitioning lexical rules, sandhi rules, and optional speed rules in a lexical phonology, Kaisse’s model makes a significant statement about the nature of rule evolution and language change, namely that language change begins at the postlexical level, i.e. in the domain of connected speech.

Stampe (1969), Hooper (1976), and other proponents of Natural Generative Phonology (NGP), held a view similar to Kaisse’s regarding rule innovation and evolution. In NGP, a distinction is made between language-specific MP-rules (morpho-phonological rules) and language-general P-rules (phonological rules) (Hooper 1976: 16-17).

P-rules describe processes governed by the physical properties of the vocal tract. Obviously, these processes are not random and totally language-specific, but their form and content can be predicted on universal principles.

... MP-rules ... take part in the sound-meaning correlation of a language and are therefore language-specific. They are apt to be quite arbitrary ..., and they are likely to have exceptions.

In Hooper’s model, linguistic innovation is driven by universal phonetic principles. P-rules are expressions of these principles. Any rule added to the “bottom” of the rule inventory as an innovation is necessarily phonetically motivated. With time, and with the addition of subsequent innovations, each P-rule is literally pushed deeper into the grammar.
and often becomes subject to morphological conditions which are language-specific. Thus
language-specific phonological rules may be described as vestiges of language-general
phonetic processes. A simplified version of Hooper's rule evolution diagram is shown in
(8).

(8) Rule innovation and evolution in language (Hooper 1976: 86)

Universal phonetic tendencies, which are determined by the fundamental
physiological and acoustic limitations of the articulating organs, find their way into the
grammar of a language as variable rules. With the addition of new variable rules describing
other processes, older variable rules become embedded in the lexicon, and often become
morphologically conditioned, as is the case with stressed /a/ deletion in Puerto Rican
Spanish.

John Harris (1989) argued for a characterization of language change very similar
to Hooper's. In a discussion of rule morphologization in several English dialects, he
maintained that the lexical phonology model, with its layered strata (recall figure 5), allows
elegant formalization of the gradual incorporation of new rules - as well as the
morphologization of old ones. I cite his two principles of new rule incorporation in (9).

---

7 John Harris (1989) is identified here by first and last name to avoid confusion with James Harris
(1989), a study on Spanish verb stress.
New rule incorporation in lexical phonology (John Harris 1989: 38-39)

a. Gradient patterns of variation are controlled by rules which apply post-lexically. Any rule operating within the lexicon necessarily involves categorical distinctions.

b. Only post-lexical rules may introduce 'novel' structure, i.e. feature values that are not marked in underlying representation.

In John Harris' study, various phonological rules in English (such as coronal dentalization or /æ/-tensing) are shown to be morphologically conditioned in some dialects but not others. It is understood that rules which are so conditioned represent a more advanced stage in linguistic innovation, whereas rules which are not conditioned represent the initial stages of change.

The initial stage of a sound change may take the form of an intrinsic phonetic contrast undergoing phonologization, becoming controlled by a low-level rule operating in the post-lexical stratum. Over time the original phoneticity of the change may become obscured by a number of factors. The rule may acquire lexical exceptions, or it may, as a result of analogical pressures, become implicated in morphological structure. Either of these developments involves the rule making a transition into the lexicon (John Harris 1989: 54).

If, as Stampe (1969), Hooper (1976), and John Harris (1989) claim, optional rules reflect universal phonetic tendencies, then variable (stylistic) processes reflect universal tendencies to some degree as well. We will take for example nasal place assimilation. This is arguably a general phonetic tendency of languages: most languages place-assimilate nasals to following stops sporadically if not categorically. Consider the Spanish data in (10), in which the underties indicate coarticulated, or gesturally overlapped, segments.
Nasal assimilation: basic data (cf. Harris 1969: 8-18; also Harris 1984a, b)

<table>
<thead>
<tr>
<th></th>
<th>banco</th>
<th>inmenso</th>
<th>un beso</th>
</tr>
</thead>
<tbody>
<tr>
<td>Largo</td>
<td>[baŋko:]</td>
<td>[in.men.so.</td>
<td>[un.be.so.</td>
</tr>
<tr>
<td>Andante</td>
<td>[baŋko:]</td>
<td>[in.men.so.</td>
<td>[unm.be.so.</td>
</tr>
<tr>
<td>Allegretto</td>
<td>[baŋko:]</td>
<td>[in.men.so.</td>
<td>[um.be.so.</td>
</tr>
</tbody>
</table>

The data in (10) are based on Harris' general discussion of nasal place assimilation and its relationship to speed. Following Navarro Tomás (1967), Harris observes that nasal place assimilation occurs variably depending on the position of the nasal within the segment sequence. For example, nasals seem always to place-assimilate totally to a following stop found in the same morpheme. 8 This fact is illustrated by forms like banco, realized with total place assimilation regardless of speed or level of formality: [baŋko]. 9 Before a stop in a different morpheme, however, nasals place assimilate totally only in very casual speech. For example, the underlying /n/ in un beso is unassimilated [n] in Largo speech, partially assimilated (coarticulated) [nm] in Andante, and totally assimilated [m] in Allegretto.

Hualde (1989a) contains a typical autosegmental expression of place assimilation. In his formulation of the rule, he gives the feature [+nasal] as a dependent of the root node itself. Total assimilation includes concomitant delinking of the nasal segment's original place node structure, whereas partial assimilation allows the original place node to be retained.

---

8 Harris (1984b) identifies only one commonly-used word containing identical tautomorphemic nasals: perenne 'perennial', but he specifies that [nn] sequences in this and other less common words (such as pinnipipedo 'pinniped'), are generally realized short in conversational speech, i.e. as [n].

9 In this study, we follow Clements (1985: 231) in distinguishing three types of assimilation: total, partial, and single-feature. Each type involves the same fundamental process of node "spreading." In total assimilation, the spread argument is the root node. Partial assimilation is achieved by spreading of a class node (such as supralaryngeal or laryngeal). Single feature spreading is the spreading of a terminal feature node, such as [coronal].
As already stated, nasal place assimilation (rule 11) applies obligatorily within a morpheme, and variably between morphemes. In addition, the variable version of the rule may apply partially (without delinking) or totally (with delinking). The result in the former case is an overlapped segment such as [nm] or [nn], as are found in medium-speed utterances like un beso [unm.be.so.] and un cacto [unp.kak.to.].

Navarro Tomás (1967: 113) describes the partially assimilated segment found in Andante style as a coarticulation, or overlap, of the bilabial and coronal gestures:

En el grupo nm la articulación de la primera consonante, en la conversación ordinaria [i.e. casual speech -- REM], va generalmente cubierta por la de la m: la lengua realiza, de manera más o menos completa, el contacto alveolar de la n: pero al mismo tiempo la m forma su oclusión bilabial, siendo en realidad el sonido de esta última el único que acústicamente resulta perceptible: inmóvil \([n]\), conmigo \([m]\).10

Navarro Tomás's account of the data is consistent with actual X-ray pellet trajectory studies carried out in the study of speech rates. The findings of one of these studies is briefly reviewed in the section 1.2.2.

---

10 Hualde (1989) concurs with Navarro Tomás, but claims that total place assimilation between nasals is not unheard of, just infrequent. Thus the coarticulated form co[n]migo seems to be preferred to the assimilated form co[m]migo (19).
1.2.2 Gestural overlap and gestural reduction

Articulatory Phonology, originally developed by Browman & Goldstein (1990) and further elaborated by Zsiga (1994), Byrd & Tan (1996), Byrd (1996), and others, correlates phonological processes with a set of articulators whose movements are independent and therefore independently measurable. Such studies have found that when speech rate increases, the articulators (lips, tongue tip, tongue body) move more quickly and the resulting gestures become temporally and spatially compressed. However, the speed at which articulators are able to move is limited physiologically. In very fast speech, these limitations force gestures to overlap - at least partially - across one or more tiers. To illustrate the effect of fast speech on the sound sequence, two "gestural scores" for the English phrase *must be* are shown in figure (12). Figure (12a) represents the canonical score, in which each gesture is proportionally timed and therefore not overlapped. In (12b), the fluent speech score, the gestures are compressed, and as a result, the tongue tip and lip gesture [tb] is overlapped, thus [tb].

(12) Gestural shortening and overlap: English *must be* (Browman & Goldstein 1990: 18)

a. canonical score

<table>
<thead>
<tr>
<th>Tier</th>
<th>Gestures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue Body</td>
<td>![Tongue Body Diagram]</td>
</tr>
<tr>
<td>Tongue Tip</td>
<td>![Tongue Tip Diagram]</td>
</tr>
<tr>
<td>Lips</td>
<td>![Lips Diagram]</td>
</tr>
</tbody>
</table>

---

18
In (12b), the tongue tip gesture is still physically present; acoustically, however, it is "hidden" by the lip gesture overlapping it and is therefore imperceptible. These data led Browman & Goldstein (1990: 26) to state a general principle of overlapping in casual speech:

...[C]asual speech processes may not introduce units (gestures), or alter units except by reducing their magnitude. This means that all gestures in the surface realization of an item are present in their lexical representation: casual speech processes serve only to modify these gestures, in terms of diminution or deletion of the gestures themselves, or in terms of changes in overlap. Phonological rules of the usual sort, on the other hand, can introduce arbitrary segments, and can change segments in arbitrary ways.

This principle bans intrusion of nonunderlying material in the output sequence, attributing surface discrepancies instead to changes in the phasing of the underlying gestures. In the Articulatory Phonology framework, it is not the case that the canonical tongue tip gesture /t/ in *must be* has been deleted from the fast speech [mʌsbi]; rather, the gesture is physically present but not acoustically salient. This principle concurs with Navarro Tomás's observation for Spanish that although [nm] sequences may be coarticulated [nm], it is only the bilabial gesture which is perceptible.

Jun (1996a) is a study of how listeners perceive consonant gestures in Korean and English. Four gestures combinations were examined in the study: non-overlapped, overlapped, reduced, and deleted. Jun found that listeners perceive overlapped labial and velar gestures as overlapped, and reduced gestures are perceived as deleted. In other
words. /pk/ is perceived as two gestures [pk] whether the gestures are sequential [pk] or overlapped [pk]. Only when the labial gesture is reduced or geminated is this gesture no longer perceived. This observation holds true across two articulation styles, casual and formal, for both English and Korean.

Jun’s conclusion, that “the boundary between perceptual assimilation and non-assimilation can be characterised by gestural reduction, not by gestural overlap” (393), clearly challenges Browman & Goldstein’s claim that gestural overlap causes the perception of place assimilation.

1.2.3 Fast speech and control

A secondary claim made by Jun (1996a: 378) is that gestural overlap is not strictly the result of physiological restrictions on speech mechanisms, as argued by Browman & Goldstein. Rather, overlap and reduction are speaker controlled (cf. also Barry 1992: 399). Because of this basic control, the incidence of overlap and reduction are variable in fast speech and therefore do not necessarily correlate with speech rate. Zsiga (1994: 139) made a comparable observation: increased speech rate does not necessarily result in increased gestural overlap; however, where overlap is present, it is usually in fast speech. These observations suggest that speakers have enough control over the various speech organs to prevent gestural overlap (i.e. the perceived loss of a segment) in accelerated speech.

If, as Zsiga (1994) and Jun (1996a) suggest, speakers are able to control both overlap and reduction, why do they not opt for the “most effortless” style in every speech situation? Flege (1988: 99), a study of gestural timing and overlap correlated with speech rate, sheds light on the matter.

A balance of two countervailing forces influences how phonetic segments are articulated: the need to maintain sufficient distinctiveness between segments to ensure that words are recognized correctly, and the need to minimize effort while rapidly interleaving the multistructural movements that characterize successive phonetic segments.
Ni Chiosáin & Padgett (1997: 20) make a similar observation:

There is a tendency to maximise the perceptual distinctiveness (dispersion) of contrasts; however, there is also a need for articulations to be minimally complex.

Casual or highly compressed speech involves substitutions of the type X --> Y (cf. /n/ --> [m] in *un beso*). Any substitution potentially neutralizes a meaningful contrast in the language; thus such substitutions may be at a cost. It is in precisely those contexts where a meaningful contrast is at stake that casual speech substitutions are most likely to fail. For example, studies of optional coda /s/ deletion in various dialects, such as Puerto Rican, have shown that aspiration is likely to be avoided if the resulting form is ambiguous (see 13).

(13) /s/ deletion resulting in loss of meaningful contrast (Poplack 1980: 61)

/la kasa bonita/  

[la kasa βonita]  

/las kasas bonitas/

Figure (13) shows how deletion of Puerto Rican coda /s/ in the phrase *las casas bonitas* ‘the pretty houses’ results in a potential confusion with the phrase *la casa bonita* ‘the pretty house.’ It is not always the case, however, that /s/ deletion results in ambiguity with singular forms, as shown by the examples in (14).

(14) /s/ deletion which does not result in loss of meaningful contrast (Poplack 1980: 59)

a. arroz con habichuela(s)

b. un par de cosa(s)

c. hablan con muerto(s)
In (14), each parenthetic /s/ is a plural morpheme. Its deletion, therefore, constitutes a loss of morphological information. In these instances, however, /s/ may be deleted because the plurality of the noun in question is recoverable from context. In (14a), deletion does not result in ambiguity because of “cultural or shared knowledge;” it is generally understood that rice is accompanied by more than just one bean. (14b) is not ambiguous because the phrase *un par* indicates plurality. Likewise, it is understood in (14c) that *muerto(s)* is plural because it is not preceded by a definite or indefinite article, as would be the case if it were singular: *hablan con un/el muerto.*

The speaker’s need for articulatory economy is therefore counterbalanced by the need to be unambiguously understood by listeners (cf. Flege 1988; Ní Chiosáin & Padgett 1997). These needs are in direct competition. From a generative viewpoint, one could say that there is a rivalry between the lexical word-formation rules, one effect of which is the generation of contrasts, and the phonological processes, which potentially neutralize them.

Faced with these two competing communicative goals (to speak economically yet still be understood unambiguously), a speaker weighs the relative importance of each on a situation-by-situation basis.

(15) Inversely proportional factors in speech rate

![Diagram of speech rate continuum](image)

Figure (15) is a graphic representation of a speech rate “continuum” along which “effort” is held constant, whether articulatory or perceptual, between speaker and listener. Articulatory ease seldom correlates with perceptual ease; here, the two are considered to be in direct opposition. As the task of articulation becomes easier - whether by deletions, reductions, or substitutions - the task of perception becomes more difficult, because the listener must do more to “reconstruct” the speaker’s intended utterance. In a discussion of

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11 The reader is referred to Cedergren (1973), Poplack (1980), Terrell (1981) for complete analysis of /s/ deletion and its restriction in various dialects. For examples of ambiguity resulting from other fast speech processes, please see Bowen (1956) and Stockwell, Bowen, & Silva-Fuenzalida (1956).
perceptual cues in /s/-aspirating dialects. Widdison (1997: 253) makes the following statement, which summarizes the perceptual challenges faced by listeners in reconstructing casual speech:

Auditory processing of the speech signal involves a procedure that normalizes an utterance by factoring out distortions originating from gestural overlay and other sources in order to reconstruct the idealized symbolic form found in memory. ... Listeners must interpret the signal in order to discover the psychological intent of speakers.

In a situation which - by the speaker's judgment - merits careful speech, the speaker represents the acoustic signal as faithfully to the underlying form as possible: this, in effect, makes the listener's processing task "easier" in that the listener does not have to exert great effort to reconstruct the intended form. For example, a foreign language teacher might over-articulate each sound in an utterance in order to be understood easily by students. The burden on the students to reconstruct the utterance in the unfamiliar language is taken over, as it were, by the teacher, who must exert great articulatory effort in order to keep the perceptibility level high. This speech mode is represented by a diagram in which the balance between ease of articulation and ease of perception has been skewed in favor of perception (see 16).

(16) Perception vs. articulation

Among native speakers of the same language, however, such careful attention to perceptibility is often unnecessary. Native speakers are accustomed to the sound substitutions, reductions, and deletions which characterize the casual, gesturally relaxed speech of their dialect, and they take these characteristics for granted both as speakers and

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12 For other discussions of speech processing, see Andersen (1973) and Fowler (1984).
listeners. The speaker is freer to organize the sound sequence so as to favor his or her own economy of articulation, rather than the ease of perception of the listener. In this mode, ease of articulation is given priority - at the expense of some ease of perception (see 17).

(17) Articulation vs. perception

| ease of perception | ease of articulation |

Even in speech between two very familiar people, it is possible for speech to become so casual that it is - even if momentarily - incomprehensible. This is especially true if other contributory cues, such as facial expression or even body language, are absent, as on a telephone call. The solution in such instances, naturally, is for the misunderstood interlocutor to repeat the utterance - in a more careful style. Over time, speakers learn how much articulatory care is needed in which types of contact situations, and learn to temper their desire for articulatory simplicity with the need to be understood. It is by experiencing and engaging in a wide range of speaker-listener situations that speakers develop a sensitivity to notions of formality, and therefore to speech styles in general. These observations are consistent with Guitart's (1997), and will serve as a foundation for the discussion of intraspeaker variation throughout this study.

1.3 The Theoretical framework: Optimality Theory

Optimality Theory (OT) (Prince & Smolensky 1993; McCarthy & Prince 1995a, b; and others) is a theory based on ranking hierarchies. Competing linguistic constraints on surface structure have unequal force and therefore fall into an array of dominance relations. In the event that two constraints conflict, the lower-ranked one may be violated in order to satisfy the higher-ranked one. In this framework, the "competing" speech goals discussed in the last section may be schematically represented and compared. In this section, two classes of constraints (MARK and FAITH) are presented and compared, and their relevance
to speech variation is established. Next, a tentative OT discussions of variability in Spanish is reviewed (Colina 1995). Finally, an alternative approach is presented, following Reynolds 1994 and Nagy & Reynolds 1997, which enables a more elegant description of stylistic variation.

1.3.1 Preview of OT constraints

Two families of constraints are posited to comprehensively explain casual speech data in Spanish and in languages in general: FAITH(FULNESS) and MARK(EDNESS).\(^{13}\) FAITH constraints monitor the phonetic realization of underlying featural, segmental, and suprasegmental material. In this capacity, they ban deletion or addition of nonunderlying features, segments, and moras. In contrast, MARK constraints monitor macrosegmental details such as syllable and feature associations ranging across segments. It is understood that MARK constraints serve to make a sound sequence as unmarked as possible in that natural processes (assimilations, reductions, etc.) are realized.

In (18), the primary constraints to be used in this study are summarized. Others will be introduced and discussed as the need arises. They are grouped by category: FAITH constraints are listed in (18a), and MARK constraints are listed in (18b).\(^{14}\)

(18) Principal constraints used in the study

a. **FAITH category**: underlying material is preserved

   IDENT [place]: “Input place nodes are parsed in the output.”

   No place assimilation or deletion

   IDENT [feature]: “Input features are parsed in the output.”

   No segment raising, lowering, backing, fronting, etc.

---

\(^{13}\) It is not necessarily the case that all constraints are either MARK and FAITH; no assertion one way or the other will be made here. These categories should be seen as “constraint families” not necessarily exclusive of other families.

\(^{14}\) The IDENT and MAX constraint families are presented in McCarthy & Prince (1996a: 370) and developed throughout OT literature. LICENSE is developed in Padgett (1996).
MAX-IO: “Input segments have output correspondents.”
No segmental deletion.

MAX-μ: “Input moras must be parsed in the output.”
No glide formation (also constrains vowel deletion).

MAX-μ-WI: “Word-initial moras are parsed in the output.”
No word-initial glide formation (or vowel deletion).

b. MARK category: minimize articulatory effort

HIGLIDE: “All glides are [+high].”
No mid glides.

LICENSE-X: “A coda consonant must be licensed by the X node of a syllable onset.”
X assimilation is mandatory. (LIC-X)

HNUC: “The syllable nucleus is also a sonority peak.”

ONSET: “Syllables have onsets.”

1.3.2 Faithfulness vs. Markedness

Faithfulness and Markedness constraints have been classified and defined in a variety of ways. Jun (1996b) refers to these same families as Preservation and Weakening, respectively (see 19).
(19) **PRESERVATION** and **WEAKENING** constraint families (Jun 1996b)  

a. **PRESERVATION** (PRES)\(^1\)

   Preserve underlying featural, segmental, and moraic information.

b. **WEAKENING** (WEAK)

   Minimize articulatory effort.

Jun's **PRESERVATION** (FAITH) constraints ensure that underlying features are realized faithfully in the output. In general, these constraints monitor information internal to the segment, such as structural nodes and distinctive features. Most of them fall under either the MAX or IDENT sub-family, e.g. MAX-µ and IDENT [high]. MAX-µ requires that an underlying mora (µ) be "maximized" - realized phonetically - in the output. IDENT [high] states that the value of an underlying feature [high] must not change in the output. Hammond (1997: 36) sums up the function of FAITH constraints very succinctly: "Pronounce everything as is." In short, FAITH constraints command absolute identity between the input and the output.

On the other hand, **WEAKENING** (MARK\(^1\)) constraints monitor information spanning more than one segment, i.e. at a level of representation higher than the segment, such as the syllable, morpheme, foot, or prosodic word. For example, **ONSET** is a MARK constraint because it examines a unit larger than the segment: the syllable. It is provisionally maintained that FAITH constraints monitor intrasegmental information.

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1. In an analysis of stylistic variation in French, Dutch, and Turkish, Van Oostendorp (1997: 209) makes a distinction between two constraint roughly equivalent to Jun's:
   - The first subset consists of well-formedness requirements, such as the constraint against onsetless syllables ONSET...
   - The second subset consists of so-called faithfulness constraints requiring phonological output forms to be maximally faithful to the output.

2. In Jun's (1996b) analysis, PRESERVATION constraints take the form 'PRES (X)', where X is a perceptual feature. In his analysis, perceptual features are those with primarily acoustic, rather than articulatory, correlates; e.g. nasal, continuant, sonorant (note also that these are the "manner" features). In my analysis, FAITH is used as an abstract category heading rather than a multi-argumed constraint. My category FAITH contains all constraints which monitor a candidate's identity - structural, segmental, perceptual, or otherwise - to its underlying form.

3. Pulleyblank (1997: 64) refers to these constraints as "Syntagmatic constraints," which "impose restrictions on sequences of sounds" (stress mine).
whereas MARK constraints monitor information which is intersegmental: i.e. shared place nodes, syllable positions, relative sonority of segments, etc. It will also be maintained that feature complexes within segments - such as feature contours - are subject to simplification in casual speech and are therefore monitored by MARK constraints as well.

1.3.3 Colina (1995)

Colina (1995) is the first major study of Spanish syllabification undertaken in the OT framework. In her study, she posits that stylistic variation within a dialect may be achieved in the same way interdialectal variation is achieved: by constraint reranking. The only difference, of course, is that ranking relations between constraints must be left flexible. Colina shows how the ranking relation of the constraints ONSET and MAX-μ (she calls this constraint PARSE-μ), may be either ONSET » MAX-μ or MAX-μ » ONSET. Each ranking optimizes a different candidate. Two of her examples are shown in tableaux (20) and (21). Her constraint PARSE-μ is replaced with MAX-μ (which has the same function) for the sake of consistency.

(20) Slow speech: maestro (cf. Colina 1995: 154)

\[
\text{maestro} \quad /\text{maestro}/ \quad \text{MAX-μ} \quad \text{ONSET}
\]

\begin{tabular}{ll}
\hline
\text{a. ma.esтро.} & * \\
\text{b. maesтро.} & *! \\
\hline
\end{tabular}


\[
\text{maestro} \quad /\text{maestro}/ \quad \text{ONSET} \quad \text{MAX-μ}
\]

\begin{tabular}{ll}
\hline
\text{a. ma.esтро.} & *! \\
\text{b. maesтро.} & * \\
\hline
\end{tabular}

The examples in (20) and (21) illustrate the effect of two constraints ONSET and MAX-μ on syllable merger. As defined, ONSET requires that syllables begin with a consonant. MAX-μ requires that an underlying mora be parsed into syllable structure on
the surface. MAX-μ is violated when a nuclear segment becomes nonnuclear, as is the case in glide formation.

In (20) and (21), the (a) candidate [ma.es.tro.] contains one syllable that begins with a vowel; this syllable incurs a violation of ONSET. The (b) candidate [maês.tro.] contains syllable merger and therefore satisfies ONSET. When the syllables ma and es merge, however, /e/ becomes a mid glide. This means its underlying mora is unparsed in the surface form, thereby violating MAX-μ. In (20), the slow speech ranking, candidate (20a) is optimal. In (21), the ranking associated with fast speech, candidate (21b) is optimal. Thus two surface possibilities of maestro, one with a vowel and one with an offglide, are explained in terms of parametrization of the FAITH constraint MAX-μ and the MARK constraint ONSET.

In Colina’s model, a speaker of a dialect in which both [ma.es.tro.] and [maês.tro.] are attested outputs of /m aestro/ has internalized two parallel or “competing” categorical hierarchies, one in which MAX-μ » ONSET and another in which MAX-μ » ONSET.

Colina’s argument that reranking is the operative mechanism in intradialectal (i.e. stylistic) variation is a significant one. It shows that it is possible, and even desirable, to incorporate variable processes into the “standard” grammar.

1.3.4 Partial ranking theories of variation

One of the central arguments of OT is that languages differ not in constraint inventory, but rather in constraint ranking. The sole differentiating factor between languages, then, is the ranking of universal constraints. Dialectal variation is typically explained as reversals of key constraints (recall the ranking of MAX-μ-WI and IDENT [high], which varies across Spanish dialects). In OT, dialectal differences, as well as divergence and convergence, are expressed in terms of constraint reranking.

The approach to stylistic variation has been somewhat different. Reynolds (1994) proposed a theory of “floating constraints,” or FCs, to account for facts of variation within speech communities (cf. also Nagy & Reynolds 1997; Kang 1997; Anttila 1997; Anttila & Cho 1998; and others). Like Colina’s model, the FC theory expresses variation in terms of
the variable ranking of constraints. In this theory, however, the grammar is defined by a single constraint hierarchy in which some constraints, specifically those which monitor the effects of variation, are ranked relative to some constraints but not others. The result is a single hierarchy in which some constraints are partially ranked, rather than a number of “parallel” hierarchies in which constraints are categorically ranked. Whereas the parallel hierarchy approach requires that speakers have knowledge of multiple hierarchies, one for every attested output, the FC approach requires that speakers internalize only one hierarchy, in which a subset of the constraints are incompletely ranked relative to other constraints.

In traditional OT, it is maintained that every constraint in the hierarchy is explicitly ranked with respect to every other (cf. Anttila & Cho 1998: 36). In a partial ranking theory, however, some constraints are left unranked with respect to others. The result is what Reynolds (1994) terms “floating” constraints, or PCs.

... within a given language or dialect, it may be the case that a particular constraint X may be classified only as being ranked somewhere within a certain range lying between two constraints W and Z, without specifying its exact ranking relative to a certain other constraint Y (or constraints Y₁, Y₂, etc.) which also falls between W and Z. A graphic representation of such a variable constraint ordering is as follows:

```
..............CONX............
CONW » CONY₁ » CONY₂ » ... » CONYₙ » CONZ
```

Here, the constraint (or constraints) which appears on the higher level in the representation is the FC, while those on the lower level are “hard-ordered” or “anchored” constraints. The range over which the PCs may extend is defined, not in terms of the constraints (W and Z) which the FC lies between, but rather in terms of the particular subset of fixed or anchored constraints (Y₁, Y₂, ... Yₙ) with regard to which the FC is considered to be unranked. In other words, the FC may be allowed to fall in any position with respect to its anchored subset -- above Y₁, below Yₙ, or at any point in between; this is the sequence of the FC’s relationship with its anchored subset or range (Reynolds 1994: 116).

Reynolds’ model allows a constraint to be unranked relative to one set of constraints (CONY₁ » CONY₂ » ... » CONYₙ), yet ranked relative to another; i.e. it must be
dominated by \text{CONW} and must dominate \text{CONZ}. This incomplete ranking allows the constraint in question - \text{CONX} - to "float" along a specified range of the hierarchy. As an FC, it may "fall" into a categorical ranking relation with any of the fully-ranked constraints along the specified range.

An alternative approach which uses the same basic mechanism has been proposed by Anttila (1997) and Anttila & Cho (1998) to account for diachronic sound changes in Finnish. In this model, there is no reference to floating constraints, only to partial ranking (PR).

To illustrate how the PR model works, let us imagine that three constraints A, B, C are fully ranked - as required in traditional OT. Then the ranking relation of every possible constraint pair is expressed within the grammar. The ranking A » B » C may be viewed as a combination of three separate pairwise rankings (see 22).

\begin{equation}
(22) \text{Full ranking of A, B, C}
\end{equation}

\begin{align*}
A & \gg B \\
B & \gg C \\
A & \gg C
\end{align*}

Because all rankings are total, only one constraint hierarchy is available, and likewise only one optimal candidate.

Let us now imagine that one of the three pair-wise rankings - A » B - is neutralized. This means that A is now ranked only with respect to C. A is unranked relative to B, and vice-versa (see 23).
Partial ranking of A, B, C

\[
\begin{array}{ccc}
A & B & C \\
B & C & A \\
\end{array}
\]

two possible tableaux, two possible outputs:

With the relation A » B neutralized. A and B may now be ranked either of two ways: A » B or B » A, but only as long as both A and B still dominate C. Each ranking has an associated tableau and optimal form. Thus the partial pairwise ranking in (23) permits the existence of not one but two tableaux, and therefore two optimal forms.

Additional variants may be accounted for by removing additional pair-wise rankings, such that if no rankings exist, i.e. if A, B, and C are unranked relative to each other, then six variants (3 factorial = 6) are indicated. It is not necessarily the case that each ranking is associated with a distinct output candidate, because not all constraints apply to all inputs.

Anttila argues that this reanalysis of OT ranking allows a larger body of data to be accommodated. On the one hand, relations between fully ranked constraints determine categorical, or nonalternating outputs. On the other, partially ranked constraints admit a range of output alternants.

Although Anttila’s method and Reynolds’ method both describe variation using similar means, they are not identical. Note that Anttila’s approach makes no reference to “floating constraints,” and important theoretical ingredient in Reynolds’ variation model. Although both theories make the same basic predictions, the constraint rankings are defined differently. The two ranking methods are compared in (24).
(24) Two approaches to linguistic variation

   Nagy & Reynolds (1997)

b. Anttila (1997):
   Anttila & Cho (1998)

A » X » C
A » Y » C

thus: A » X » Y » C AND
A » Y » X » C

AND

A » X » C
A » Y » C

thus: A » X » Y » C AND
A » Y » X » C

In (24), A, B, X, and Y represent constraints. Downward lines denote hierarchical dominance. Totally ranked constraints are circled. In (24a), X is part of the ranked hierarchy A » X » C, and Y is part of the hierarchy A » Y » C. In (24b), both rankings A » X » C and A » Y » C are partially ranked.

If the subhierarchies predicted are combined into one hierarchical representation, it becomes obvious that two ranking relations are possible: A » X » Y » C and A » Y » X » C. This prediction is made by both models. The FC model (24a), however, goes one step further by identifying one of the intervening constraints, either X or Y, as totally ranked, and the other one as floating, an FC (see 25).

(25) FCs versus PRs

a. FCs

b. PRs

A » X » C
A » X » C

A » Y » X » C
A » Y » X » C
In (25), fully ranked constraints are shown in the bottom line. Partially ranked constraints are shown above the diagram, between vertical bars. These bars represent the upper and lower boundaries for partial ranking. For example, in (25a), \( Y \) is a partially ranked constraint and may rank either above or below \( X \), but not above \( A \) or below \( C \). In (25b), both \( X \) and \( Y \) are partially ranked constraints. They may fall into any ranking relation relative to each other, but neither may rank above \( A \) or below \( C \).

For the set of ranking relations shown in (25), it is unclear which analysis is more parsimonious, because both make identical predictions. As there are no variable Spanish data available to motivate preference of one model over the other, further examination of the two approaches will not be taken up here. In this study, the FC model of Reynolds (1994) and Nagy & Reynolds (1997) is maintained.

1.3.5 Constraining FCs? Some acquisitional evidence

Gnanadesikan (1995) provides evidence that children initially rank all MARK constraints above all FAITH constraints, as a requirement of innate grammar. Over time, by listening to and imitating adult speech, children promote the FAITH constraints into dominant positions, thereby enforcing greater feature faithfulness.\(^{18}\) Gnanadesikan maintains that when a child says \([\text{su}]\) instead of \([\text{fu}]\) (for English \textit{shoe}), it is because the markedness constraint against \([\text{f}]\) dominates the faithfulness constraint for \(/\text{f}/\). This ranking must consequently be unlearned so that, by the time acquisition is complete, the child has inverted the ranking, and \(/\text{fu}/\) is realized faithfully as \([\text{fu}]\).\(^{19}\)

---

\(^{18}\) Gnanadesikan's argument concurs with Stampe (1969: 444), who makes the following assertion about the initial state of the grammar (i.e. the grammar before language acquisition actually begins):

\[\ldots\text{in its language-innocent state, the innate psychological system expresses the full system of restrictions on speech: a full set of phonological processes, unlimited and unordered.}\]

The key term in Stampe's statement is "phonological processes," which in NGP (recall discussion of Hooper (1976) above) refer to universal tendencies. Intriguingly, many of the data Stampe observed as predominant in child speech are typical of adult casual speech, e.g. the tendencies to maintain CV as the maximal syllable shape; to simplify consonant clusters; to simplify consonant coarticulations; to delete unstressed syllables, etc.

\(^{19}\) See also Boersma (1997b) for a similar explanation of ranking acquisition.
Hale & Reiss (1996) argue against this position on the basis that it fails to factor in the immaturity of the child's production system. Interestingly, children who hear adult [fju] yet say [su] are able to differentiate the two, because they reject adult mispronunciations (cf. Hale & Reiss 1996: 7). This perceptual acuity suggests that the child has posited both an underlying /s/ and /ʃ/. That both /s/ and /ʃ/ are realized [s] is not a fault of the child's grammar, but rather a fault of the child's production ("body," in Hale & Reiss's explanation). If the child's pronunciation of /ʃ/ as [s] is the result of an innate Mark » Faith ranking relation, then it is a bit of a mystery why the child does not simply rerank the constraints Faith » Mark, in order to better emulate adult speech, especially if the distinction between /s/ and /ʃ/ is recognized. Instead, the child persists in imitating adult [fju] as [su], even though the child's posited input is clearly /ʃu/. According to Hale & Reiss, these facts can only be explained if faithfulness (Faith) constraints are ranked high in the child's hierarchy. They provide further illustration with a different example:

A child who hears [kʰætʃ] posits this form as the target output for his or her grammar, and stores this as his or her underlying form has - through that act - posited high-ranking for faithfulness to all the features of [kʰætʃ]. Put another way, only if UG had high-ranking for faithfulness constraints could the child ... posit /kʰætʃ/ as the underlying form for a perceived target of the shape [kʰætʃ] (14).

Having posited the underlying form /kʰætʃ/, the child will soon learn from other heard forms that syllable-initial aspiration is predictable and may be omitted from the underlying representation. If omitted, it will have to be accounted for by demotion of the relevant faithfulness constraint, e.g. one banning the insertion of aspiration.

Hale's & Reiss's (1996) observations suggest that the high ranking of Faith optimizes learning: with Faith constraints ranked below Mark constraints, underlying representations would be impossible to reconstruct. If the grammar is to be acquirable, then it must be the case that UG dictates the ranking of all Faith constraints above all Mark constraints (i.e. Faith » Mark).
These same observations have a direct bearing on the designation of floating constraints. If the initial state of the grammar is maximally FAITHful, then the constraint reordering required to define the grammar of any particular language can be achieved by elevating MARK constraints relative to specific FAITH constraints. It will be maintained here that variable ranking is the result of ambivalent reranking of MARK constraints from their innately-determined position below all FAITH constraints. It follows then, that all FCs belong to the MARK constraint family.

1.3.6 Probabilistic prediction in the FC theory

Another advantage of the partial ranking theory is clearly enunciated by Reynolds (1994), Nagy & Reynolds (1997), as well as Anttila & Cho (1998). All three argue that partial ranking allows a very accurate quantitative prediction of outputs. For example, if partial ranking defines a system in which 20 distinct rankings are possible, then the statistical probability of each hierarchy applying in the language is 1/20. It may be the case, however, that these 20 rankings select only three distinct outputs. Let us assume that four of the 20 rankings predict output #1, seven rankings predict output #2, and nine rankings predict output #3. Because the total number of rankings which predict each output is different for each output, the probability of each output is different as well, even though the probability of each ranking remains equal. In the case of this thought experiment, output #1 would be predicted to occur in 4/20 (20%) of elicitations, output #2 would be predicted in 7/20 (35%) of elicitations, and output #3 would be predicted in 9/20 (45%) of elicitations. Anttila & Cho state this principle formally (see 26).

(26) Output probability in partially ordered grammars (Anttila & Cho 1998: 39)

a. A candidate is predicted by the grammar iff it wins in some tableau.

b. If a candidate wins in $n$ tableaux and $t$ is the total number of tableaux, then the candidate's probability of occurrence is $n/t$. 

36
Although some of the data observed by Nagy & Reynolds (1997) for Faetar and by Anttila & Cho (1998) for English and Finnish appear to support this probabilistic analysis of partial ranking, the proposal itself makes a hazardous assertion. The probability of any output is determined by the percentage of total rankings in which it is the optimal candidate. Extralinguistic factors - such as speaker age, gender, education, and control - have no bearing on the probability of a particular output.

Nagy & Reynolds (1997: 47) recognize the potential error of the this prediction and discuss it briefly:

We posit that social factors affect the relative likelihood of the various rankings possible for an FC. For example, older speakers may tend to posit a particular FC at the high end of the set of constraints within which it is anchored, whereas younger speakers may tend to position that same FC at the low end of the set of constraints.

In other words, in the final analysis, the correlation of variation with at least some degree of speaker control is inescapable.

Zubritskaya (1997), too, questions the assumption of the FC theory that frequency of variants is determined by the number of actual rankings expressed as a percentage of the total. In her opinion, it is not necessary for the theory even to make specious assertions regarding the frequency of outputs, because speaker control (“grammar selection”) must be factored into the variability equation regardless:

...[I]n a grammar competition model, the choice of a particular outcome simply means the choice of a particular grammar, and any frequencies of data distribution are therefore possible in principle. Thus, although fixed ranking offers some help in modeling variation in a grammar competition model, it does not change the model’s dependence on the extragrammatical mechanism of grammar choice in production (141).

In this study, I adopt the FC model of the partial ranking theory to account for variation across speech styles in Spanish. However, I will not seek to develop the theory that the FC model makes quantifiable predictions with regard to frequency of rankings or
individual outputs, and leave this area to future investigation.

To summarize the primary theoretical assertions made in this study: First, two types of variation are accounted for within the same grammar: categorical processes, determined by fully-ranked constraints, and variable processes, determined by partially ranked constraints (PCs). Second, the grammar itself does not distinguish types of variation; it merely accommodates facts of variation, whether social or stylistic.

1.4 Distinctive feature structure

Stylistic variation involves the alteration of distinctive features: therefore feature structure merits special presentation early on in the study. Previous work on the organization of features in Spanish generally follows the analyses of Clements (1985), Sagey (1986), and others (cf. Harris 1986; Hualde 1989). In this study, I adopt the following feature geometric structure based largely on Sagey (1986) and Hualde (1989), shown in (27).

(27) Distinctive feature geometry
In Spanish, phonological rules recognize distinctions between continuant and noncontinuant stops (/p~f/, /t~s/, /k~x/, etc.), voiced and voiceless stops ([b~p], [d~t], [g~k]), high and mid vowels ([i~e], [u~o]), and also between back and nonback vowels ([i]~[u], [e]~[o]), and bring about surface distinctions between stops and continuants ([b~β], [d~δ], [g~γ]). However, rules do not generally refer to a minus value of nasal or round; therefore these features are usually classed as monovalent.

Recent studies of feature structure provide evidence which suggests that front vowels are dependents of the "V-PLACE" coronal node rather than a dorsal node (Hume 1994; Clements & Hume 1995). This solution dispenses with the feature [±back] for vowels, since in this particular theory [+back] vowels are considered dorsal, and [-back] vowels are reclassified as coronal. This model is advantageous in the discussion of assimilation-type processes in which coronal consonants and [-back] vowels appear to form a natural class. Because processes of this type will not be encountered in the present study, however, and also in the interest of representational simplicity, a more traditional feature geometry (32) will be maintained.

1.5 Preliminary conclusions and organization of the study

Phonological operations associated with speech rate may be expressed in terms of ranking arguments between two or more constraints. Optional rules are therefore dispensed with altogether. Operations traditionally expressed as optional additions to the generative rule system are deemed well-formed (optimal) depending on the relative ranking of key FAITH and MARK constraints. Hypothetically, ranking all FAITH constraints above all MARK constraints requires that the phonetic form be identical to the underlying form without exception. Conversely, ranking all MARK constraints above all FAITH constraints requires that minimization of articulatory effort must prevail over all featural, segmental, or suprasegmental faithfulness. In Spanish, and arguably in all languages, it is not the case that all MARK constraints dominate all FAITH constraints or vice-versa. Interleaving these constraints, and allowing some to be partially ranked ("floating" in Reynolds' 1994
terminology), brings about differing degrees of competition between FAITH and MARK considerations, and therefore an impressive range of variable effects.

In chapter 2 of this dissertation, I present and analyze, in the present Ranking Control Theory model, variable processes which apply to vowels. These include syllable merger, raising and gliding, shortening, and deletion. Discussion of deletion focuses primarily on a corpus of data from Chicano Spanish, with frequent comparison to more conservative Peninsular dialects. The effect of stress on these processes is also systematically accounted for.

Chapter 3 analyzes the variable processes which apply to consonants. The focus of this chapter is on types of assimilation, such as nasal and lateral place assimilation, and voicing assimilation; as well as continuancy spreading, obstruent devoicing, and aspiration. The principal data are drawn from Peninsular Spanish and also from Havana Cuban Spanish.

Chapter 4 summarizes the general principles laid out in the study and reviews some of the implications of the study.
In this chapter, the interaction of prosodic constraints in a number of connected speech processes is examined. These processes include merger of different and identical vowels, merger of stressed vowels, vowel deletion, and vowel shortening. Each section contains a brief review of the central issues, followed by an OT analysis. Because of the richness of available data, discussion will focus primarily on syllable merger across word boundaries (also called synalepha).

2.1 Syllable merger


\[
\begin{array}{c}
\sigma \quad \sigma \\
\downarrow & \downarrow \\
V & V
\end{array}
\quad \rightarrow 
\quad
\begin{array}{c}
\sigma \\
\downarrow \\
V & V
\end{array}
\]

---

1 See Schane (1987) for a general discussion of syllable merger in an autosegmental framework.
According to Navarro Tomás (1967: 148), syllable merger reflects a general articulatory tendency in Spanish:

Nuestra pronunciación tiende, preferentemente, a convertir, siempre que es posible, todo conjunto de vocales en un grupo monosilábico: pero diversas circunstancias históricas, analógicas o eruditas suelen oponerse en muchos casos a dicha tendencia, dando lugar, fuera del caso de los dipíongos y triplíongos etimológicos, a vacilaciones que a veces hacen posible en una misma palabra una doble forma de pronunciación.

In other words, vowel merger is subject to both stylistic and categorical restrictions. In this section (and throughout the chapter), I will investigate and substantiate Navarro Tomás's claim regarding the tendency of vowel sequences to undergo merger.

2.1.1 Previous treatments of syllable merger

In an analysis of syllable merger in Castilian Spanish, Navarro Tomás (1967) observes that in slow speech, vowels are usually realized in hiatus, while in faster speech, they undergo merger. The more "open," or sonorous, vowel in the pair becomes the nucleus of the merged syllable. In cases of equal sonority, however, the second segment becomes the nucleus. This dialect-specific stipulation follows from observations that Spanish generally prefers onglides to offglides (Holt 1984; Harris 1989), as shown by the realizations of syllable nuclearity in words containing sonority plateaus, such as *triunfo* tr[ju]nfo and *cuidado* c[wj]dado. These observations are further supported by evidence from diphthongization (Harris 1985). We restate Holt's (1984) sonority rule in (29).
Rhyme Nucleus Convention (modified from Holt 1984: 172)

a. If two V are associated to the same Rhyme, the more sonorous of the two is the Rhyme nucleus.

b. If two V of the same sonority score are associated to the same Rhyme, the rightmost V is the Rhyme nucleus.

The Rhyme Nucleus Convention holds for Penseninsular Spanish: in American Spanish, it will be shown, merger is conditioned not by the relative sonority of the vowels but rather by their linear precedence.

While rule (28) merges adjacent vowels under one syllable head, rule (29) determines how the two segments must be configured to match - as closely as possible - the unmarked syllable structure for the language: CV (cf. Hutchinson 1974). It is un preferable to have a syllable containing two vowels, as this type of syllable would be CVV rather than CV. The solution is to assign peak status to the more sonorous vowel, and satellite (nonnuclear) status to the less sonorous one. If the sonority score for both vowels is the same (often referred to as a "sonority plateau," distinct from a "sonority slope"), then the first vowel is made nonnuclear. In both cases (29a and 29b), nonnuclearity may be expressed as the disassociation of an underlying mora (cf. Hualde 1994; Martínez Gil in press). The result is a glide.

---

2 In her version of the rule, Holt refers to vowel height rather than vowel sonority. In this dissertation, I follow Clements (1990), Hualde (1994) and others in maintaining that it is sonority, not tongue height per se, which is relevant in syllable merger. To this end, I adopt the sonority scale developed by Hualde (1994: 639). In the present analysis, only the sonorities of vowels and glides will be relevant.

least sonorous

| consonants | glides | high vowels | mid vowels | vowel /a/ |

most sonorous
In (30), two vowels in separate syllables merge per rule (28). Because the merged syllable can have only one nucleus, one segment must be realized as a glide. Rule (29) involves the delinking of the mora of the less sonorous segment. The result is either an onglide or an offglide.

In Peninsular Spanish, whether an onglide or offglide is formed is determined by the relative sonorities of the two vowels in question. As long as the sonorities of the merged syllable nuclei are unlike, either onglides or offglides may be formed, with the more sonorous vowel always forming the peak of the new syllable.³

(31) Merged syllable adjustments in Peninsular Spanish: onglides with sonority slopes (Hualde 1994: 635)

a. mi abuelo m[ja]buelo
b. tu abuelo t[waj]buelo
c. traigo alhajas traig[qa]lhajas

(32) Merged syllable adjustments in Peninsular Spanish: offglides with sonority slopes (Hualde 1994: 635)

a. toda España tod[ae]spana
b. tengo usados teng[low]sados

³ See also Roca (1991) for discussion of syllable merger in the same dialect. Stockwell, Bowen, & Silva-Fuenzalida (1956) is an analysis of syllable merger in Chilean Spanish. Hutchinson (1974), Goldsmith (1979), and Martínez-Gil (in press) treat Chicano Spanish.
In (31) and (32), syllable merger data from Peninsular Spanish are given. In each example, the less sonorous vowel in the merged syllable is made nonnuclear; thus /i/ --> [j], /u/ --> [w], /o/ --> [ο], and /e/ --> [e] per rule (34a). Also in each example, the type of glide is determined by the relative sonority of the two vocoids. The syllable nucleus is the most sonorous vocoid, except when both are of equal sonority.

The output syllable is therefore entirely predictable based on sonority considerations (29a). If, however, both vowels are of the same sonority ranking, then rule (29b) applies, forming an onglide by default. Examples of like-sonority mergers, all of which contain onglides, follow in figure (33).

(33) Merged syllable adjustments in Peninsular Spanish: onglides with sonority plateaus (Hualde 1994: 635-636)

<table>
<thead>
<tr>
<th>Example</th>
<th>Merged Vowel Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tribu indigena</td>
<td>trib[w]i</td>
</tr>
<tr>
<td>b. mili urgeente</td>
<td>mil[ju]rgente</td>
</tr>
<tr>
<td>c. tengo enchufes</td>
<td>teng[ge]nchu</td>
</tr>
<tr>
<td>d. vende orugas</td>
<td>vend[go]rugas</td>
</tr>
</tbody>
</table>

The vowel sequences in (33) each contains a sonority plateau. Following rule (29b), the first vowel in each pair is glided. In (33a) and (33b), the outcome is the high glides [w] and [j], respectively. Examples (33c) and (33d) contain mid vowels. In these examples, the first vowel is made a mid glide: [e] or [o]. This type of gliding is characteristic of casual speech.

The Peninsular variety of merger described by Navarro Tomás and Hualde is not the only one observed for Spanish. In American dialects, merger is formulated differently. In many of these varieties, merger favors the formation of onglides to offglides, even if sonority sequencing is disregarded. E.g. *come uvitas* in American Spanish is realized *com[gu]vitas*, with an onglide (cf. Stockwell & Bowen 1965: 111; Harris 1970: 131). In
Peninsular Spanish, this same sequence is realized with an offglide, thereby honoring sonority sequencing: com[ew]vitas (cf. Hualde's 1994: 635 example te utiliza --> t[ew]tiliza). In addition, stress on the first vowel, if it is less sonorous than the second, blocks glide formation in Mexican Spanish (e.g. papámita --> pap[a]jmita, but comí alguno --> com[i]alguno). Consequently, offglides may be formed in this dialect, but only if they follow a stressed vowel of greater sonority (compare sé inglés --> s[é]jingles but come y toma --> com[i]etoma). In Chicano Spanish, a variety of Mexican Spanish spoken mostly among immigrants to the United States, merger exhibits yet a different flavor. All three varieties - Peninsular, Mexican, and Chicano Spanish - will be considered in turn in the OT analysis at the end of this section.

American Spanish dialects display an interesting connected speech development which standard Peninsular varieties do not: mid vocoid raising. In Peninsular dialects, vowel sequences resolve into glide-vowel or vowel-glide sequences. The same is true in American Spanish dialects. In these dialects, however, it is common to hear the glide component of a merged syllable realized [+high] in casual style (cf. Stockwell, Bowen, & Silva-Fuenzalida 1956, Bowen 1956, Stockwell & Bowen 1965, and many others). The examples in (39) are borrowed from Martínez-Gil (in press), a study of Chicano Spanish. Note that in these sequences, neither vowel is stressed.

(34) Mid glide raising in Chicano Spanish (Martínez-Gil in press, 4)

<table>
<thead>
<tr>
<th>en español</th>
<th>en español</th>
</tr>
</thead>
<tbody>
<tr>
<td>te humilló</td>
<td>t[ju]milló</td>
</tr>
<tr>
<td>lo hirió</td>
<td>l[wi]rió</td>
</tr>
<tr>
<td>porque Adán</td>
<td>porqu[ja]dán</td>
</tr>
<tr>
<td>como Adán</td>
<td>com[wa]dán</td>
</tr>
</tbody>
</table>

4 Navarro Tomás (1967: 68) points out that although mid vocoid raising occurs only in popular Peninsular speech (habla vulgar), it is common, even widespread in American Spanish.

El habla popular hace en muchos de estos casos ei > ja, ca > wa: teatro t[ae]tro, passear pasja[r], Joaquín xwakín ... etc. La evolución de ei > ja, con j más o menos cerrada, se da también abundantemente en América hasta en la pronunciación de las personas cultas.

46
The examples in (34) show that in this dialect, mid vowels may be realized as high glides in casual style. To state the unmarked value of the feature [high] for Spanish glides. Harris (1985) proposed a high glide redundancy rule. This rule is adapted as a raising rule in (35).

(35) High glide redundancy rule (Harris 1985: 39)

[-cons, -syl] \rightarrow [+high] \quad \text{thus} \quad \varepsilon \rightarrow \mathbf{j} \\
\quad \quad \quad \quad [o] \rightarrow [w]

I recapitulate the basic facts discussed so far in this subsection: In slow speech, vowels tend to be realized in hiatus, i.e. without merger (no rules apply). In casual speech, merger (28) occurs following both universal and language-specific sonority guidelines (29a) and (29b). In many American dialects, such as Chicano, merger occurs and glides are systematically made [+high] (35).

2.1.2 Experimental evidence for mid glide raising

Cloward (1984) is a study of all types of vowel sequences in Spanish. A portion of the study includes an experiment geared to elicit Allegretto speech from a native speaker of Ecuadoran Spanish (identified as subject EC). The results of this experiment allowed two significant observations to be made: 1) Increased familiarity with the frame sentence was correlated with an increased tendency to glide mid vowels or to raise and glide mid vowels: and 2) the vowel quality perceived - e.g. [e], [e], or [j] - was born out on sound spectrogram.

The experiment was designed as follows. Cloward composed a list of frame sentences grouped into triads (see 36).

(36) Experimental sentences (Cloward 1984: 152)

a) \textit{Vivo en la cuarta avenida.}

b) \textit{Vivo en la calle veinte.}

c) \textit{Vivo en la última casa.}
In these sentences, the point of interest was the cross-boundary vowel sequence “oe” in “Vivo en.”

Cloward had the subject read the first sentence in the set, then cued the remaining elicitations in the manner shown in (37).

(37) Experimental procedure (Cloward 1984: 153)

FC (reading from the page): Vivo en la cuarta avenida.
Cloward (reading cue from the page): la calle veinte
FC (still looking at the page): Vivo en la calle veinte.
Cloward (cuing): la última casa
FC: Vivo en la última casa.

(and so on for each sentence triad)

Cloward had predicted that within each triad, FC would first read slowly/formally, and then accelerate his speech with each subsequent elicitation, as familiarity with the frame sentence increased. This prediction was born out by virtually all of the subject’s elicitations. The “Vivo en...” sentence set yielded vowel hiatus in the first utterance, a mid glide in the second, and a high glide in the third (155). The sound spectrograms in (38) illustrate these findings.
(38) Cloward's findings: 'Vivo en...' at slow, medium, and fast speed (1984: 160)

a. Vivo en la cuarta avenida (slow).

b. Vivo en la calle veinte (medium).

c. Vivo en la ultima casa (fast).
Tracings of the formants of the “o–e” transitions shown in (38) are provided in (39). These tracings show that the vowel qualities in each elicitation were distinct. In (39a), the F2 transition from about 750 Hz to about 1250 Hz is gradual, exactly the type of transition one would expect with tongue raising from neutral to high position. In this tracing, the first gesture is acoustically [o]. Figure (39b) shows not only a more abrupt transition between the first and second gestures, but the first gesture also has a slightly higher locus, about 1000 Hz (compared to 750 Hz in 39a). Finally, (39c) shows that the locus of the first gesture is higher than 1000 Hz, acoustically equivalent to [u].

The slightly higher F2 in (39b) is articulatorily consistent with a raised tongue position somewhere between that of [o] and [u], and is phonetically consistent with [o], although Cloward identifies it phonetically as (nonnuclear) [o] (155). This distinction is not relevant in Spanish, however, because Spanish does not distinguish [o] and [u].

---

5 The acoustical observations in this section are my own, based on comparison to a chart in Ladefoged (1993: 154).
Therefore, the phonetic [o] may be recognized as an allophone of [o] without further comment. The occurrence of the raised gestures [o] and [u] in Cloward's findings supports Harris' (1985) claim that it is [+high] glides which are favored in Spanish casual speech.

2.1.3 Preliminaries to an OT analysis

The primary effects of syllable merger are determined by the interaction of seven constraints: HNUC, MAX-IO, MAX-μ, IDENT [X], HIGHDE, ONSET, and MAX-W1-μ. Brief explanations of these constraints are presented in (40). Other constraints will be presented in due course. Most of the constraints may also be found in Prince & Smolensky (1993) and McCarthy & Prince (1995a, 1995b), and throughout the OT literature.

(40) Constraints involved in syllable merger

HNUC: "The syllable peak is a sonority peak."

In the syllables *pie* [pje] and *rey* [rej], the sonority peak is [e], and [e] is also the syllable peak; therefore this constraint is satisfied (cf. Clements 1990; Hualde 1994).

MAX-IO: "No segmental deletion."

MAX-μ: "No moraic deletion."

An input mora may be left unparsed to form an onglide, as is the case for the *i* in *pie* [pje] or the *y* in *rey* [rej].

MAX-W1-μ: "No word-initial moraic deletion."

IDENT [high]: "The value (+ or -) of input feature [high] may not change."

This constraint is violated whenever the input value (+ or -) for the feature [high] of a non-low vowel (i.u.e.o) is changed to the opposite value in the output. IDENT [high] bans vowel raising and lowering, and also vowel deletion.
HIGHLIDE: "Nonnuclear vocoids are [+high]."

Ensures that all glides are [+high], i.e. either [j] or [w]. It bans mid glides [ɛ] and [ɔ] and also the illicit low glide [a] (cf. Casali 1996: 56).

ONSET: "Syllables have onsets."

In her analysis of Spanish syllable structures, Colina (1995) argues that the constraint ONSET is instrumental in a wide range of fast speech processes. As defined throughout the OT literature, ONSET requires that syllables begin with a consonant. Colina explains: "In general, the faster the speech the more necessary to satisfy ONSET: in other words, the more highly ranked ONSET will be" (147). Referring back to our data, we note that an instance of vowel hiatus in careful style violates ONSET yet satisfies MAX-μ. In casual style, ONSET is satisfied but MAX-μ is violated. Thus the [e]~[ɛ] alternation may be explained in terms of the relative ranking of ONSET and MAX-μ.

It was shown in chapter 1 that Colina uses two constraints, ONSET and PARSE-μ, to account for the facts of syllable merger as well as vowel hiatus. In her discussion, PARSE-μ is used as an all-purpose constraint to ban all glide formation, whether rising or falling. Hualde (1991b), a well-accepted analysis of onglide and offglide structure in Spanish, makes a structural distinction between the two types of glides. In his analysis, a prenuclear vocoid is associated directly to the syllable nucleus to form a complex nucleus. Such is the case in a word like pie [pje]. In this word, nonnuclear /i/ forms a complex nucleus with /el/, and the latter segment, being more sonorous, is the syllable peak. However, a postnuclear vocoid, such as the [j] in rey, is associated with syllable structure at a different level of representation. The two structures are compared in figure (41).

[^52: In Asturian, onglides trigger anticipatory vowel harmony, whereas offglides do not. Compare cogiera [ku.xe ra.] 'get-3RD-PAST-SUBJ' to aflojdis [a.ʃlo.xa.js] 'you-PL loosen.' Onglides therefore form a nuclear satellite at node N, whereas offglides (and coda consonants) form a satellite at node N'. The reader is referred to Hualde (1991) for the complete arguments in favor of this analysis.]
(41) Onglides and offglides in N-projection theory (cf. Hualde 1991b)

In (41), the prenuclear high vocoid in *pie* forms part of the syllable nucleus and is linked to the structural node N. The postnuclear high vocoid in *rey* however, is linked to intermediate node N'. In my analysis of Spanish syllable merger, I employ the individual constraint MAX-μ to constrain both types of glides, i.e. those linked to either N or N'. Some examples of MAX-μ violation follow in figures (42) and (43)

(42) Onglide formation from underlying vowels: *tengo alhajas*

---

53
Offglide formation from underlying vowels: *toda España*

The mora/syllable structure in (42a) satisfies $\text{MAX-}\mu$ because all underlying moras are retained in the output (i.e. no onglides are formed). However, $\text{ONSET}$ is violated because the second syllable is vowel-initial. In (42b), $\text{MAX-}\mu$ is violated, but $\text{ONSET}$ is satisfied. By merging the two vowels into a single syllable, hiatus is resolved. In the process, however, the first vowel is made nonnuclear.

Figure (43) shows that offglide formation, like onglide formation, causes $\text{MAX-}\mu$ violation. In both (42a) and (43a), $\text{MAX-}\mu$ is satisfied, because no vowel is realized as a glide. In both cases, $\text{ONSET}$ is violated because of vowel hiatus. In (42b) and (43b), hiatus is resolved and $\text{ONSET}$ is therefore satisfied. However, $\text{MAX-}\mu$ is now violated, because in each instance a glide has been formed.

### 2.1.4 $\text{MAX-}\mu$ and $\text{MAX-WI-}\mu$

In Peninsular Spanish, syllable merger produces either onglides or offglides across word boundaries, depending on the relative sonority of both vowels. In Chicano Spanish, syllable merger occurs only if the result is an onglide; indeed there are no offglides spanning word boundaries.
Offglide formation across word boundaries

<table>
<thead>
<tr>
<th></th>
<th>Peninsular Spanish</th>
<th>Chicano Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.  <em>te humilló</em></td>
<td>{ew}milló</td>
<td>tju{w}milló</td>
</tr>
<tr>
<td>b.  <em>lo hirió</em></td>
<td>l{oj}rió</td>
<td>l[wi]rió</td>
</tr>
</tbody>
</table>

The data in (44) show that in Chicano Spanish, offglides are avoided one of two ways. The first way is to alter the height identities of the vowels so that relative sonority requires the formation of an onglide instead. If this cannot be done, i.e. if the first member of the sequence is unglidable /a/, then vowel deletion occurs.

These data also suggest that the offglide restriction observed for Chicano Spanish does not hold in Peninsular Spanish. However, sonority plateau data reveal that it does. For example, if the two vowels to be merged form a sonority plateau, then the merger is invariably an onglide, regardless of dialect. In Peninsular Spanish, this restriction is witnessed only in cases of sonority plateaus, because it is only in these cases that pressure from higher-ranked HXUC is absent.

To address this asymmetry which underlies both varieties, we turn to some of the basic principles of vowel identity enumerated by Casali (1997). In a study of vowel deletion in some 68 Niger-Congo and 19 non-Niger-Congo languages, Casali found a clear pattern: if deletion of one vowel in a V₁V₂ sequence occurs, it is almost always the first. In addition, the overwhelming majority of languages with V₂ deletion also feature V₁ deletion, a fact which suggests that V₁ deletion is universally unmarked and represents a clear cross-linguistic preference.

Casali argues that the productivity of deletion rules varies depending on a number of factors. Between two lexical words, all the surveyed languages deleted the first vowel in the sequence, rather than the second. Casali maintains that V₁ deletion is the standard at word boundaries because of the importance of preserving word-initial information - and therefore of retaining V₂. This important generalization motivated the formulation of his
constraint MAXWI ("Max-word-initial"), which requires that "every word-initial segment in the input must have a corresponding segment in the output" (500). A similar constraint, used throughout Casali (1996), is PARSE(F)-[w]. Like MAXWI, this constraint monitors the faithfulness of word-initial material. Unlike MAXWI, however, it monitors not whole segments but rather individual features.

Martínez-Gil (1998) proposes a positional constraint modeled after PARSE(F)-[w] which is sensitive not to feature faithfulness, but rather to moraic faithfulness: MAX-WI-μ. This constraint requires that any word-initial vowel must be realized as a syllable nucleus. It is motivated by data from various dialects of American Spanish which suggest that glide formation from underlying vowels is subject to special restrictions word-initially. For example, in Chicano Spanish, there are no instances of word-initial glides, even though glides occur freely in other positions. This fact suggests that in Chicano Spanish, MAX-WI-μ is ranked above ONSET and MAX-μ. As a result, syllable merger may never leave a word-initial mora unparsed.

In Peninsular dialects, by contrast, MAX-WI-μ ranks below MAX-μ and ONSET, and therefore serves only to resolve ties left undecided by HNUC - i.e. if the vowels form a sonority plateau (e.g. tengo enchufes --> teng[oe]nchufes) but toda España --> tod[ae]spañoa).

2.1.5 The Data

Unstressed syllable merger data from Peninsular, Mexican, and Chicano Spanish are provided in (45)-(47). As shown in (45), rising sonority mergers are handled the same in all three dialects; the resulting syllable invariably contains an onglide. Likewise, sonority plateaus (46) yield onglides regardless of dialect. The three dialects diverge in their treatment of falling sonority mergers. In Peninsular Spanish (46a), such mergers are permitted, provided that they respect sonority sequencing. In Mexican Spanish and Chicano Spanish (46b and 46c), such mergers are disallowed. In Mexican Spanish, onglides are enforced even if sonority sequencing is disrespected. In Chicano, the solution
in such cases is to delete the first vowel. 7

(45) Rising sonority (onglides in all Spanish dialects) (Hualde 1994: 635-636)
   a. Peninsular Spanish (Hualde 1994: 635-636)
      \[ \begin{align*}
      \text{mi abuelo} & \rightarrow \text{m[ja]buelo} \\
      \text{tu abuelo} & \rightarrow \text{t[wa]buelo} \\
      \text{traigo alhajas} & \rightarrow \text{traig[oa]llhajas}
      \end{align*} \]
   b. Mexican Spanish (Martínez-Gil 1996: 4)
      \[ \begin{align*}
      \text{mi amigo} & \rightarrow \text{m[ja]migo} \\
      \text{tu amigo} & \rightarrow \text{t[wa]migo} \\
      \text{tengo amigos} & \rightarrow \text{teng[oa]migos}
      \end{align*} \]
      \[ \begin{align*}
      \text{casi acabó} & \rightarrow \text{cas[ja]cabó} \\
      \text{su amante} & \rightarrow \text{s[wa]mante} \\
      \text{tengo amigos} & \rightarrow \text{teng[wa]migos}
      \end{align*} \]

(46) Sonority plateau (onglides in all Spanish dialects) (Hualde 1994: 635-636)
   a. Peninsular Spanish (Hualde 1994: 635-636)
      \[ \begin{align*}
      \text{tribu indígena} & \rightarrow \text{trib[wi]ndígena} \\
      \text{tengo enchufes} & \rightarrow \text{teng[œ]nchufes} \\
      \text{vende orugas} & \rightarrow \text{vend[œ]rugas}
      \end{align*} \]
      \[ \begin{align*}
      \text{su historia} & \rightarrow \text{s[wi]istoria} \\
      \text{debo estar} & \rightarrow \text{deb[œ]estar} \\
      \text{pague ochenta} & \rightarrow \text{pagu[œ]chenta}
      \end{align*} \]

7 This phenomenon will be examined in a later section.
In all three dialects, the preservation of vowel hiatus in connected speech depends on the dominance relation between ONSET and MAX-μ. It is argued that in all dialects of Spanish MAX-μ is a fully-ranked constraint, and ONSET is an FC (floating, partially ranked). As such, it may rank either above or below MAX-μ.

In Peninsular Spanish, merger invariably respects sonority sequencing, even if it entails the formation of a word-initial glide. These facts require the ranking HNuc >> ONSET. MAX-μ >> MAX-WI-μ. In Mexican Spanish, merger invariably forms onglides, even if sonority sequencing is disrespected. In this variety, MAX-WI-μ must dominate HNuc, but must itself be dominated by ONSET and MAX-μ. In Chicano Spanish as in Mexican, MAX-WI-μ ranks below ONSET and MAX-μ, but above HNuc. However, in Chicano, HIGLIDE dominates IDENT [high], requiring that all glides are [+high]. These three rankings are shown in (48). Other constraints will be added in due course.
(48) Constraint rankings (unstressed syllable merger)

a. Peninsular Spanish

\[
\ldots \text{ONSET} \ldots \\
\text{HNUC} \gg \text{MAX-} \mu \gg \text{MAX-WI-} \mu \gg \text{IDENT [high]} \gg \text{HIGLIDE}
\]

b. Mexican Spanish

\[
\ldots \text{ONSET} \ldots \\
\gg \text{MAX-} \mu \gg \text{MAX-WI-} \mu \gg \text{HNUC} \gg \text{IDENT [high]} \gg \text{HIGLIDE}
\]

c. Chicano Spanish

\[
\ldots \text{ONSET} \ldots \\
\gg \text{MAX-} \mu \gg \text{MAX-WI-} \mu \gg \text{HNUC} \gg \text{HIGLIDE} \gg \text{IDENT [high]}
\]

The diagrams in (48) show the categorical rankings of HNUC, MAX-WI-\(\mu\), MAX-\(\mu\), HIGLIDE, and IDENT [high] in the three dialects under consideration. In addition, the FC ONSET is also shown.

2.1.6 An OT account

As shown in (45), rising sonority unstressed mergers are permitted in Peninsular, Mexican, and Chicano Spanish. Such mergers are permitted because they invariably satisfy MAX-WI-\(\mu\) in all three varieties. I will use traigoalhajas as an example (recall Hualde 1994: 635-636). This form is realized with an onglide in all three dialects (see 49). Note that the ranking MAX-\(\mu\) » ONSET enforces vowel hiatus, which characterizes careful speech. For the sake of simplicity, only the relevant segmental sequence is included in the candidate list.
(49) Largo (careful): *traigo alhajas

<table>
<thead>
<tr>
<th>/traigo alhajas/</th>
<th>MAX-μ</th>
<th>ONSET</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. go.a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. goa.</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. goa.</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>d. go(o)a.</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>e. go(a).</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

The partial tableau in (49) shows that the ranking MAX-μ » ONSET enforces hiatus regardless of dialect. Any attempt to create a glide or delete a vowel fatally violates MAX-μ. Deleted output segments are shown in parentheses. In all three dialects, hiatus is enforced by this ranking.

In Allegretto speech, merger is determined by the reverse ranking ONSET » MAX-μ, and its interaction with other constraints. In all dialects, rising sonority mergers are permitted (see 50-51). For now, only Peninsular and Mexican Spanish will be considered. Chicano Spanish will be discussed presently.

(50) Peninsular Spanish Allegretto: *traigo aljahas

<table>
<thead>
<tr>
<th>/traigo aljahas/</th>
<th>HNUC</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-W1-μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. go.a.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. goa.</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. goa.</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

8 In this study, Largo refers to careful speech, i.e. speech which is maximally faithful to the input. Allegretto will refer to casual or conversational (connected) speech in general. The label Andante will be used only if an intermediate style is clearly attested. In Peninsular syllable merger of different vowels, this is not the case.
(51) Mexican Spanish Allegretto: *tengo amigos*

<table>
<thead>
<tr>
<th>/tengo amigos/</th>
<th>ONSET</th>
<th>MAX-µ</th>
<th>MAX-W1-µ</th>
<th>HNUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. go.a.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. goa.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. goa.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

In the case of a sonority plateau, the result in all dialects is an onglide. Because sonority plateaus pose no problem for HNUC, the offglide is dispreferred in both Peninsular and Mexican Spanish by MAX-W1-µ, which acts as a tiebreaker regardless of ranking (see 52 and 53).

(52) Peninsular Spanish Allegretto: *tengo enchufes*

<table>
<thead>
<tr>
<th>/tengo enchufes/</th>
<th>HNUC</th>
<th>ONSET</th>
<th>MAX-µ</th>
<th>MAX-W1-µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. go.en.</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. goen.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. goen.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

(53) Mexican Spanish Allegretto: *debo estar*

<table>
<thead>
<tr>
<th>/debo estar/</th>
<th>ONSET</th>
<th>MAX-µ</th>
<th>MAX-W1-µ</th>
<th>HNUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. bo.es.</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. boes.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. boes.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

As stated earlier, Peninsular and Mexican Spanish diverge primarily in their treatment of falling sonority mergers. In Peninsular Spanish, such mergers are realized as offglides because HNUC outranks MAX-W1-µ. In Mexican Spanish, with MAX-W1-µ ranked above HNUC, these mergers are invariably onglides which defy sonority sequencing (see 54-55).
(54) Peninsular Spanish Allegretto: *toda España*

<table>
<thead>
<tr>
<th>/toda espana/</th>
<th>HNUC</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. da.es.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. da¿es.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. da¿es.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

(55) Mexican Spanish Allegretto: *paga Evita*

<table>
<thead>
<tr>
<th>/paga ebita/</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
<th>HNUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ga.e.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. gae.</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. gae.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

Chicano Spanish resembles Mexican Spanish in its satisfaction of MAX-WI-μ. In Chicano, MAX-WI-μ violations are resolved by deletion of the first vowel: thus *paga Evita* would be realized with deletion of the first vowel, thus pag[ø]vita (cf. Martínez-Gil’s 1998:2 comparable example *una hermana*, which is realized un[ø]rmana). This optimal candidate satisfies MAX-WI-μ, yet violates MAX-IO. In Chicano Spanish, MAX-IO is ranked below MAX-WI-μ (cf. Martínez-Gil 1998). Chicano deletion will be examined in a later section.

There is another peculiarity of Chicano Spanish which merits consideration at this point. In this dialect, all glides are uniformly realized [-high]. This change potentially violates the input-output correspondence, or identity, of the parameter in question, in this case, the binary value of the feature [high]. In Chicano, two additional constraints are active on the candidate set in unstressed syllable mergers in which the first vowel in the sequence is [-high]. These are IDENT [high] and HIGLIDE.

We will consider IDENT [high] first. IDENT [high] is part of a family of constraints which monitor the input-output correspondence of feature values for individual binary features. For example, it is generally accepted that the tongue-height feature [high] has two values, [+high] and [-high]. When the value of a feature [high] in the input changes in the
output, then the relevant identity constraint, \textsc{ident} [\textit{high}], is violated. Therefore, when input /\textit{e}/ is realized as [\textit{j}] in fast speech, \textsc{ident} [\textit{high}] is violated because the underlying value of [\textit{high}] for /\textit{e}/ has changed from [-] to [+]. High gliding incurs a violation of \textsc{ident} [\textit{high}].

That mid glide raising is unattested in Peninsular Spanish suggests that \textsc{ident} [\textit{high}] is ranked above \textsc{hglide} in this dialect. The ranking \textsc{ident} [\textit{high}] \textsc{hglide} suppresses the effect of glide raising in favor of vowel height identity. The Peninsular ranking \textsc{hnuc} \textsc{onset} \textsc{max-\mu} \textsc{ident} [\textit{high}] \textsc{hglide} bans mid vocoid raising. It also specifies that syllable merger is possible only if it 1) obeys sonority sequencing; and 2) respects underlying height features. Because \textsc{onset} is the only FC, only two rankings - and therefore two outputs - are possible: one with hiatus, and one with merger. The Allegretto tableau for \textit{traigo alhajas} is shown for Peninsular Spanish in (56), and for Chicano Spanish in (57).

(56) Peninsular Spanish Allegretto (\textsc{ident} [\textit{high}] \textsc{hglide}): \textit{traigo alhajas}

\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
\textit{traigo alhajas} & \textsc{hnuc} & \textsc{onset} & \textsc{max-\mu} & \textsc{max-w1-\mu} & \textsc{ident} [\textit{high}] & \textsc{hglide} \\
\hline
a. goa. & x & & & & * & \\
\hline
b. goa. & x & & & & * & \\
\hline
c. goa. & x & & & & * & \\
\hline
d. gwa. & x & & & & * & \\
\hline
e. goj. & x & & & & * & \\
\hline
\end{tabular}

(57) Chicano Spanish Allegretto (\textsc{hglide} \textsc{ident} [\textit{high}]): \textit{traigo alhajas}

\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
\textit{traigo alhajas} & \textsc{hnuc} & \textsc{onset} & \textsc{max-\mu} & \textsc{max-w1-\mu} & \textsc{hglide} [\textit{high}] & \\
\hline
a. goa. & x & & & & * & \\
\hline
b. goa. & x & & & & * & \\
\hline
c. goa. & x & & & & * & \\
\hline
d. gwa. & x & & & & * & \\
\hline
e. goj. & x & & & & * & \\
\hline
\end{tabular}
As in Peninsular and Mexican varieties, Chicano Spanish resolves sonority plateaus as onglides, albeit with a [+high] nonnuclear element (see 58).

(58) Chicano Spanish Allegretto: no espero

<table>
<thead>
<tr>
<th>/no espero/</th>
<th>HNUC</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-W1-μ</th>
<th>HIGLIDE</th>
<th>IDENT [high]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. no.es.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. noes.</td>
<td></td>
<td></td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. noes.</td>
<td></td>
<td></td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. nwes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. nojs.</td>
<td></td>
<td></td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this section, unstressed syllable merger in Peninsular, Mexican, and Chicano Spanish is accounted for using five categorically ranked constraints: HNUC, MAX-W1-μ, MAX-μ, HIGLIDE, and IDENT [high]; and one FC: ONSET. Stipulations on merger types emerge directly from the interaction of ONSET and MAX-μ (which in combination drive syllable merger) with the other constraints.

So far in this section, discussion of merger has been limited to unstressed vowels across words boundaries (synalepha). Because merger of unstressed syllables within words seems to occur as freely as it does between words (cf. Navarro Tomás 1967: §140), examples of the former merger type will not be presented here. Instead, I will now explore the merger of stressed syllables.

2.2 Stressed syllable merger

In numerous accounts of stress assignment in Spanish, it has been demonstrated that primary word stress must fall on one of the last three syllables in a word, hence the well-used term “Three Syllable Window” (cf. Harris 1983). In general, words which end in a vowel are stressed on the next-to-last syllable. Words ending in a consonant are stressed on the last syllable.
In Spanish, as in many languages, coda consonants are typically assigned a mora by virtue of their position in the syllable. This assignment is generally referred to as Weight By Position (WBP) (cf. Hayes 1989: 258), and will not be examined in detail here because it does not bear directly on the data at hand.

Unmarked stress in Spanish is simple: vowel-final words are stressed on the next-to-last syllable (paroxytone), and consonant-final words are stressed on the last syllable (oxytone) (cf. Harris 1983: 85). Examples of the unmarked stress types are given in (59).

In (59)-(61), all stresses are shown, whether orthographic or not.

(59) Unmarked stress (cf. Harris 1983: §4)

<table>
<thead>
<tr>
<th></th>
<th>V-final words:</th>
<th>C-final words:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>paroxytonic stress</td>
<td>oxytonic stress</td>
</tr>
<tr>
<td></td>
<td>pistóla</td>
<td>civil</td>
</tr>
<tr>
<td></td>
<td>perdida</td>
<td>mercéed</td>
</tr>
<tr>
<td></td>
<td>sahána</td>
<td>altar</td>
</tr>
</tbody>
</table>

Exceptions to the unmarked patterns are numerous, but statistically in the minority. In no case, however, is it possible for a Spanish word to be stressed outside the Three Syllable Window. All words, regardless of markedness, display oxytonic, paroxytonic, or proparoxytonic stress. Examples of marked stress, which respects the Three Syllable Window, are presented in (60).

(60) Marked stress (cf. Harris 1983: §4)

<table>
<thead>
<tr>
<th></th>
<th>V-final words:</th>
<th>V-final words</th>
<th>C-final words:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>oxytonic</td>
<td>proparoxytonic</td>
<td>paroxytonic</td>
</tr>
<tr>
<td></td>
<td>palené</td>
<td>sáhana</td>
<td>móvil</td>
</tr>
<tr>
<td></td>
<td>Panamá</td>
<td>nómada</td>
<td>césped</td>
</tr>
</tbody>
</table>

In Harris' (1983) account, final vowels are typically invisible to stress computation. This assignment of "extrametricality" follows from a series of observations about the
morphological affiliation of this vowel. First, Harris observes that words ending in a vowel are made up of two morphological components, a "derivational stem" and a "terminal element" (91). In many cases, including virtually all productive cases (e.g. hypocoristics, truncations, and foreign borrowings), stress lodges on the penultimate syllable (cf. the examples in 59a), suggesting that stress applies at the level of the derivational stem, rather than the word. This way, the terminal element remains "invisible" to stress. Harris argues that stress assignment is determined by a right-headed foot structure built from the right edge of the word, ignoring any extrametrical elements. Harris' explanation made extensive use of the extrametricality mechanism, applying it to final consonants as well as nonfinal vowels.

Harris (1989) contains substantial revisions to the earlier theory. In this approach, Harris relates exceptionality to a lexically marked foot structure. The unmarked foot structure, he argues, is right-headed (iambic), whereas marked structure is left-headed (trochaic). As in the earlier theory, terminal elements are extrametrical. In (61), stress computation is given for two words: sabhâna 'savanna' and sâhana 'bedsheet.' The word sabhâna has unmarked (paroxytonic) stress. The word sâhana, however, has marked proparoxytonic stress (cf. 60b).

(61) Stress assignment in Spanish (Harris 1989: 251)

<table>
<thead>
<tr>
<th></th>
<th>a. unmarked: sabhâna</th>
<th>b. marked: sâhana</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sa.ba.na</td>
<td>sa.ba.na.</td>
</tr>
<tr>
<td>line 0</td>
<td>(*  <em>)&lt;</em>&gt;</td>
<td>(*  <em>)&lt;</em>&gt;</td>
</tr>
<tr>
<td>line 1</td>
<td>(*)</td>
<td>(*)</td>
</tr>
<tr>
<td>line 2</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

The diagrams in (61) are interpreted as follows. In line 0, potential stress bearers (vowels) in each word are marked with an asterisk. The rightmost vowel is extrametrical, meaning that it is not computed in the calculation of stress. This vowel is isolated in angled

---

9 Harris (1983: 96) uses a system of s and w nodes, for "strong" and "weak," respectively.
brackets.

Also in line 0, potential stress bearers are grouped into metrical constituents (feet). In Spanish, the dominant foot is the rightmost one. In unmarked foot formation (61a), the dominant foot is right-headed; this fact is shown by augmenting the right-hand element of the dominant foot in line 0 with an asterisk in line 1. In marked foot formation (61b), the dominant foot is left-headed; in this case, the left head of the foot is therefore marked on line 1. Line 1 marks are augmented in line 2, the line representing word stress.

In the above analysis, marked and unmarked stress are accounted for parametrically. Extrametricality and foot formation are the same for both sährina and sähana; the crucial difference lies in the headedness of the dominant foot (trochaic or iambic).

These same parameters account also for unmarked and marked stress in consonant-final words.

(62) Unmarked and marked stress computation in consonant-final words

<table>
<thead>
<tr>
<th></th>
<th>unmarked: esquimál</th>
<th>marked: canībal</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>es. ki. mal.</td>
<td>ka. ni. bal.</td>
</tr>
<tr>
<td></td>
<td>(<em>) (</em>) line 0</td>
<td>(<em>)(</em>) line 0</td>
</tr>
<tr>
<td></td>
<td>(*) line 1</td>
<td>(*) line 1</td>
</tr>
<tr>
<td></td>
<td>* line 2</td>
<td>* line 2</td>
</tr>
</tbody>
</table>

In the examples esquimál and canībal in (62), no terminal element is present. It is therefore possible for the rightmost foot to be built abutting the right edge of both words. In unmarked stress assignment, the dominant foot is right-headed, giving final stress: [es. ki. mál.]. In marked assignment, the dominant foot is left-headed, giving penultimate stress: [ka. ni. bal.]. Antepenultimate stress requires the presence of a terminal element, which must be a vowel; therefore no consonant-final words with antepenultimate stress are

---

10 Note that only one foot can be built in these examples. See Harris (1986) for other examples.
possible.

Vowel-final words with final stress may be counted among those with unmarked stress if the rightmost element is identified as a potential stress bearer, rather than a terminal element. Recent studies generally concur that all vowel-final words stressed on the oxytone have no terminal element and are therefore monomorphemic, i.e. the final vowel is part of the stem itself, rather than a terminal element (cf. Inkelas 1989: 227; Lipski 1997: 566). If the assignment of extrametricality is limited to vowels which are terminal elements, then the final vowel in words like domínó, café, and maní remains visible in stress computation. These words follow the unmarked foot formation pattern: right-headed (see 63).

(63) Unmarked stress computation in vowel-final words with no class marker

\[
\text{paletó} \\
\text{pa.le.to.} \\
(*)(*)(* *) \text{ line 0} \\
(* ) \text{ line 1} \\
* \text{ line 2}
\]

In OT analyses, Spanish foot formation and stress assignment have been accounted for by the ranking of constraints. Rosenthal (1997) invokes three constraints to restrict word stress to the last three syllables in the word: FOOTFORM, NON-FINAL, and ALIGN. The ranking FOOTFORM. NON-FINAL » ALIGN enforces unmarked stress assignment. FOOTFORM and NON-FINAL require that metrical feet are built upon moras and are trochaic (i.e. left-headed), and that the rightmost element is unfooted, or extrametrical.\(^\text{11}\) ALIGN requires that the right edge of the dominant foot coincides with the right edge of the word.

\(^{11}\text{Trochaic footing is maintained for Spanish on the basis of syllable weight, as determined by mora count within syllables. The reader is referred to McCarthy & Prince (1986), Hayes (1987), and Dunlap (1991) for further justification of the trochaic foot for Spanish.}\)
ALIGN is gradationally violable, meaning that all things being equal, the optimal candidate is the one in which the dominant foot is closest to the right edge of the word.  

Rosenthal distinguishes between two stress stypes for Spanish, each determined by a different constraint ranking. The ranking FOOTFORM, ALIGN » NONFINAL is the unmarked ranking. FOOTFORM, NONFINAL » ALIGN is the marked ranking; words with exceptional stress are lexically marked to be stressed under this ranking (see 64 and 65).


FOOTFORM, ALIGN » NONFINALITY

a. V-final: *podadera*

<table>
<thead>
<tr>
<th></th>
<th>FOOTFORM</th>
<th>ALIGN</th>
<th>NONFINAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>/podadera/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. po.đa.(đe.ca.)</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. po.(đa.đe.)ca.</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. (po.đa.)đe.ca.</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. (po.đa.)đe.ca.</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

b. C-final: *remolín*

<table>
<thead>
<tr>
<th></th>
<th>FOOTFORM</th>
<th>ALIGN</th>
<th>NONFINAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>/remolín/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. re.(mo.lon.)</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. re.mo.(lon.)</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. (re.mo.)lon.</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. (re.mo.)lon.</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

12 Morales-Front (1994: 232) takes a somewhat different approach, in which foot form is not stipulatively trochaic, but rather whatever form is necessary to bring the stressed syllable head as far to the right as possible. This observation is akin to one made earlier by Harris (1991: 452): "Place stress as far to the right as possible [regardless of exceptionality -- REM]."

13 I have taken the (perhaps unwarranted) liberty of adding an additional candidate (d) to each tableau in (64) and (65), to illustrate a type of FOOTFORM violation not shown in Rosenthal's examples. In Rosenthal's tableaux, no candidates are given which violate FOOTFORM by presenting an iambic rather than trochaic foot. The candidates I have added contain an iambic foot, and therefore violate FOOTFORM. FOOTFORM may also be violated if the foot contains more than two moras (cf. 64b, candidate a).

FOOTFORM. NONFINAL » ALIGN

a. V-final: antilope

<table>
<thead>
<tr>
<th>/antilope/</th>
<th>FOOTFORM</th>
<th>NONFINAL</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. an.ti.(lo.pe.)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| b. an.(ti.lo.)pe. | | | *
| c. (ant.i.)lo.pe. | * | | * *
| d. an.(ti.lo.)pe. | * | | * |

b. C-final: fusil

<table>
<thead>
<tr>
<th>/fusil/</th>
<th>FOOTFORM</th>
<th>NONFINAL</th>
<th>ALIGN</th>
</tr>
</thead>
</table>
| a. (fu.si)l. | * | | *
| b. (fu.si.l.) | * | | *
| c. fu.(si.l.) | * | | *
| d. (fu.si)l. | * | | * |

Rosenthall's approach maintains a single foot type (trochaic), and accounts for exceptions by the relative ranking of two violable constraints, NONFINAL and ALIGN. This approach is quite different from Harris' (1989) metrical approach, in which exceptionality was attributed to lexically marked foot form. The final predictions are, however, the same.\(^{14}\)

The type of stress which will be of interest in this study is stress which is either word-initial or word-final. Word-final stress is invariably exceptional, and must be marked lexically (e.g. tabú). Word-initial stress is not necessarily exceptional (cf. regular una to exceptional ético). In any case, syllable merger at word boundaries commonly entails either stress shift or stress merger, depending on the dialect. In some dialects, merger of

\(^{14}\) It is beyond the scope of this dissertation to discuss the many issues surrounding stress assignment in Spanish. For such information, the reader is referred to Harris (1983; 1989; 1991b), Roca (1986; 1990; 1991), Inkelas (1989), Dunlap (1991), and Lipski (1997). For analysis of Spanish stress within the OT framework, see Morales-Front (1994), Rosenthall (1997), and Roca (1997). Hammond (1995) contains a unique OT perspective on Spanish stress assignment issues.

70
stressed syllables is blocked altogether.

In this section, stressed syllable merger data from three varieties of Spanish - Peninsular, Mexican, and Chicano - are presented and discussed. Principal sources include Navarro Tomás (1967), Roca (1991), and Hualde (1994) for Peninsular Spanish, Stockwell & Bowen (1965), Harris (1970), and Martínez-Gil (1996) for Mexican Spanish, and Hutchinson (1974), Reyes (1976), and Martínez-Gil (1996, 1998) for Chicano Spanish. All three merger varieties will be accounted for in the OT framework.  

2.2.1 The Data

It has been foreshadowed in the previous section that syllable merger is sensitive to - and often constrained by - primary word stress. The presence of stress in a vowel sequence is handled differently by different dialects. For example, in Peninsular Spanish, syllable merger occurs freely in Andante and Allegretto styles, regardless of word stress. In this variety, either stressed onglides or offglides may be formed. In Mexican Spanish, syllable merger is constrained by the presence of stress on one of the vowels: indeed a stressed vowel may never be glided. In Chicano Spanish as in Peninsular Spanish, stress does not constrain syllable merger; as shown before, however, only onglides are formed in this dialect.

\[\text{\footnotesize 15 In my discussion, I sidestep the complex issue of primary stress as an effect of metrical footing. My description of the interaction between syllable merger and stress does not entail reference to feet or metrical structure, so footing will not be discussed further here.}\]

a.  \(\ddot{v} + \ddot{v}\) (Navarro Tomás 1967: 156; Hualde 1994: 638)

<table>
<thead>
<tr>
<th>Word</th>
<th>Stressed Syllable Merger</th>
</tr>
</thead>
<tbody>
<tr>
<td>mili esta</td>
<td>mil[je]sta</td>
</tr>
<tr>
<td>de otra cosa</td>
<td>d[eg]tra cosa</td>
</tr>
<tr>
<td>vendo esto</td>
<td>vend[eg]sto</td>
</tr>
<tr>
<td>de ambos</td>
<td>d[eg]ambos</td>
</tr>
<tr>
<td>este humo</td>
<td>est[ew]mo</td>
</tr>
<tr>
<td>la otra</td>
<td>l[ag]tra</td>
</tr>
<tr>
<td>la hija</td>
<td>l[aji]ja</td>
</tr>
</tbody>
</table>

b.  \(\ddot{v} + \ddot{v}\)

<table>
<thead>
<tr>
<th>Word</th>
<th>Stressed Syllable Merger</th>
</tr>
</thead>
<tbody>
<tr>
<td>menú antiguo</td>
<td>men[waj]ntiguo</td>
</tr>
<tr>
<td>bisturi afilado</td>
<td>bistur[jaf]lado</td>
</tr>
<tr>
<td>café amargo</td>
<td>caf[eg]margo</td>
</tr>
<tr>
<td>abrigó en su seno</td>
<td>abrig[eg]n su seno</td>
</tr>
<tr>
<td>acné inoportuno</td>
<td>ac[n[e]j]noportuno</td>
</tr>
<tr>
<td>medité un momento</td>
<td>medit[ew]n momento</td>
</tr>
<tr>
<td>vendrá en seguida</td>
<td>vendr[ag]n seguida</td>
</tr>
</tbody>
</table>

\(^{16}\) Fernando Martínez-Gil, a native speaker of Peninsular Spanish, points out to me that of the three stressed syllable merger types in (66), those which have both rising sonority and stress on the second vowel are most "natural" (e.g. de ambos[diegambos]). Note that in such cases, stress has not shifted in order to satisfy sonority requirements. In cases requiring stress shift in order to satisfy sonority, such as busca una busc[aw]na or menú antiguo men[wajntiguo], merger is possible yet less natural to some native speakers (Hualde 1994: 638, for example, finds the former example of merger to be unacceptable). Martínez-Gil indicates that merger of two stressed vowels is the least natural-sounding merger type, and characteristic only of very fast speech (e.g. taba[ew]tico tab[weli]tico, claimed by Roca 1991: 608 to be an unacceptable merger).

Martínez-Gil's observations regarding the feasibility of stressed syllable mergers are consistent with Navarro Tomás (1967: 156). In light of these observations regarding naturalness of merger types, I maintain here that all three types of stressed syllable merger are possible in Peninsular Spanish and therefore must be accounted for (cf. also Navarro Tomás 1967: 156). However, because "degree of naturalness" is not an easy factor to formalize, I will avoid incorporating notions of "more naturalness" or "less naturalness" into my analysis.
c. \( \dot{v} + \dot{v} \)

- *tabú ético*: tab\[\text{wé}\text{tico}
- *frenesí hondo*: frenes\[\text{jó}n\text{do}
- *capó único*: cap\[\text{ó}w\text{nico}
- *chimpancé inaílo*: chmpan\[\text{é}j\text{n}d\text{i}o

(67) Stressed syllable merger: Mexican Spanish (Stockwell & Bowen 1965: 114; Harris 1970: 131)

a. \( \check{v} + \check{v} \)

- *su hijo*: s[wí\text{j}jo
- *le hinca*: l[l\text{é}n\text{ca}
- *como Eva*: com[\text{gé}va
- *como uvas*: com[\text{gú}vas
- *la uva*: l[l\text{gú}va
- *la época*: l[l\text{gé}p\text{oca}
- *le habla*: l[l\text{gá}bla

b. \( \check{v} + \check{v} \)

- *tú imitas*: t[lú\text{j}mit\text{as}
- *está Elena*: est[l\text{á}l\text{e}n\text{a}
- *habló Elena*: hab[l\text{ó}l\text{e}n\text{a}
- *está Orlando*: est[l\text{á}l\text{r}l\text{a}ndo
- *habló Alicia*: hab[l\text{ó}l\text{í}c\text{i}a

(68) Stressed syllable merger: Chicano Spanish (Hutchinson 1974: 186-189; Martínez-Gil 1998: 2-4)

a. \( \check{v} + \check{v} \)

- *mi último*: m[ljú\text{j}lt\text{imo}
- *tu alma*: t[wál\text{l}ma

\footnote{Due to the unavailability of data for sequences of two stressed vowels in Mexican Spanish, data for this category will not be given.}
The data in (66) show that in Peninsular Spanish, merger of stressed syllables is allowed across word boundaries without restriction. Note that both onglides and offglides may be formed, but the nucleus of the merged syllable is always a sonority peak. If the stressed vowel is the less sonorous in the pair, then stress invariably shifts to the more sonorous vowel.

In Mexican Spanish (67), a stressed vowel may never be made nonnuclear in syllable merger. Offglides may only be formed if the first vowel is stressed, regardless of relative sonority (e.g. est[ae]lena and habl[ó]licia). If the second vowels is stressed, then the result is invariably an onglide. In Mexican Spanish, therefore, the position of stress blocks glide formation, and stress shift is impossible.

In Chicano Spanish, finally (68), merger of stressed vowels invariably results in an onglide, regardless of stress and relative sonority. Sonority requirements are satisfied.
however, because the nonnuclear element in the onglide is always [+high] such that
sonority rises across the merged syllable (e.g. t[jó]dian). As in Peninsular Spanish, stress
shift is permitted. In this dialect, however, if stress shift occurs, it is only from the first
vowel to the second (e.g. habl[wá]dán).

2.2.2 An OT account

In Optimality Theory, when any two words are evaluated together (as connected
speech inputs), they are monitored by constraints which ensure their identity to their
respective “bases.” The base is the word as it is realized optimally in isolation. It is an
output form. In the evaluation of stressed syllable merger, each base - or individual word -
is examined for stress faithfulness to its base. In this study, I will combine the stress-
assignment constraint relation FOOTFORM, ALIGN » NONFINAL into a blanket constraint
STRESS.18 The realization of lexically marked stress (however one chooses to represent
it), will be monitored by the constraint MAX-STRESS. These constraints are listed in (69),
along with an additional constraint VOWEL-TO-HEAD, to be discussed presently.

(69) Constraints involved in stressed syllable merger


MAX STRESS “Lexically marked stress must be represented faithfully.” (MAX-S)

VOWEL-TO-HEAD “A vowel parsed by a stressed syllable in the base must be parsed
by a dominant head in the output.” (V-TO-HEAD)

In the proposed stress system, “unmarked” stress means that vowel-final words are
stressed on the next-to-last syllable, and consonant-final words are stressed on the last
syllable. Likewise, lexically marked stress is satisfied as long as it falls on the indicated

---

18 Alderete (1995: 8) introduces the constraint STRESS to refer abstractly to the set of constraints which
interactively assign word stress. Like Alderete, I use this blanket constraint primarily as a space-saver,
and also because issues involving the metrical footing of words will not play a role in the discussion.

75
syllable: last, next-to-last, or pre-next-to-last.

Stress is satisfied only if it is associated with a certain vowel of the prosodic word. Obviously, then, stress shift of the type observed in Peninsular Spanish incurs violation of either STRESS or MAX-S. In Peninsular Spanish, these two constraints must be violable. However, it is not the case that any type of stress violation is acceptable; indeed, stress violation is acceptable only in the case of stress shift. In such cases, stress shifts at most one timing position. It never shifts to some other syllable. This observation provides the necessary motivation for V-TO-HEAD. This base-identity constraint ensures that a vowel parsed by a dominant head in the base (i.e. in the isolated output form) must be parsed by a dominant head in connected speech outputs. Stress shift, provided it occurs only to satisfy sonority sequencing, satisfies V-TO-HEAD even though it violates stress assignment. The putative ranking V-TO-HEAD » STRESS, MAX-S, which is argued for Peninsular Spanish, asserts that stress must be assigned exactly in isolation forms, but may shift in connected speech. In order for stress to shift, HNUC and ONSET must dominate STRESS and MAX-S.

In Mexican Spanish, stress shift is blocked because STRESS and MAX-S dominate ONSET. This putative ranking stipulates that syllable merger may not entail the shift of word stress. In Chicano, as in Peninsular Spanish, ONSET dominates STRESS and MAX-S.

The relationship between stress and head-dominance is shown in (70). In (70a), the bases (output forms) menú and antiguo are shown. Each has independently assigned word stress, shown by the asterisks (the bottom line marks stressable units; the top line marks word stress). Head-dominance of the stressed vowel is shown by the symbol ‘‘.’’ This is the stressed syllable head. In isolation forms (i.e. in the bases), the vowel targeted in stress assignment is, of course, contained in a stressed syllable.

In (70b), the bases menú and antiguo are brought into contact, yet are realized in hiatus in formal style. Because the stress pattern for each output still matches that of its base, MAX-S is satisfied. Likewise, V-TO-HEAD is satisfied.

In (70c), the bases are brought into contact and merged. The sequence /ú-a/ is resolved such that /a/ is nuclear and /u/ forms an onglide: [wá]. Because nonnuclear
vocoids are not legitimate stress-bearers, stress is shifted from /u/ to /a/. This shift forces stress misassignment, because the stress of *menú* does not conform to the pattern enforced by MAX-S. However, because the base vowel /u/ is still parsed by a stressed syllable head, V-TO-HEAD is satisfied.

(70) Bases and stress

a. Bases: *menú* \hspace{2cm} *antiguo*

```

  *  |
  *  |
 me.nu.  |
  |   |
  |   |
  | Σ |

  *  |
  *  |
 an.ti.guo.  |
  |   |
  |   |
  | Σ |
```

b. Connected speech (hiatus): *menú* *antiguo*

```

  *  |
  *  |
 me.nu.  |
  |   |
  |   |
  | Σ |

  *  |
  *  |
 an.ti.guo.  |
  |   |
  |   |
  | Σ |
```

c. Connected speech (merger): *menú* *antiguo*

```

  *  |
  *  |
 me.nu.  |
  |   |
  |   |
  | Σ |

  *  |
  *  |
 an.ti.guo.  |
  |   |
  |   |
  | Σ |
```

In all three dialects, V-TO-HEAD is undominated, thereby ensuring that stress shift, if allowed, is local in nature, i.e. it does not move to another syllable. The function of this constraint is illustrated in (71), for Peninsular Spanish *menú* *antiguo*. 

77
(71) Peninsular Spanish Allegretto: *menú antiguo*

<table>
<thead>
<tr>
<th>/me nu antiguo/</th>
<th>HNUC</th>
<th>V-TO-HEAD</th>
<th>ONSET</th>
<th>MAX-µ</th>
<th>MAX-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. me. nu. aŋ. ti. ywo.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. me. nwaŋ. ti. ywo.</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. me. nwaŋ. ti. ywo.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. me. nu. aŋ. ti. ywo.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. me. nwaŋ ti. ywo.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in (71), stress shift violates MAX-S (candidates 71b-71e). Those in which the base stress for *menú* is shifted to a syllable in which the vowel /u/ is not contained also (fatally) violate V-TO-HEAD. Those which do not violate V-TO-HEAD (71b and 71c) contain local stress shift; i.e. the /u/ in *menú* is still contained in a stressed syllable. Of these two candidates, (71b) is rejected because it violates HNUC, leaving (71b) as the optimal candidate. Note that in (71), candidates (b) and (e) would be tied in evaluation were it not for the intervention of V-TO-HEAD. In other words, on the basis of STRESS and MAX-S alone, the grammar has no way of distinguishing stress shift for the sake of sonority sequencing, and stress shift which is purely gratuitous.

In Peninsular and Chicano Spanish, stressed syllable merger may involve such local stress shift in order to satisfy higher-ranked constraints. In Peninsular Spanish, stress shift occurs to satisfy HNUC. In Chicano Spanish, it serves to satisfy MAX-W1-µ.

In Mexican Spanish, stress shift is banned by the ranking MAX-S, STRESS » ONSET. As a result, no vowel which is stressed in the base may be glided in connected speech.

The proposed constraint rankings for Peninsular, Mexican, and Chicano Spanish are given in (72). As before, ONSET is the only relevant FC.
Constraint rankings (stressed syllable merger)

a. Peninsular Spanish

\[
\begin{array}{c}
\text{V-TO-HEAD} \rightarrow \text{MAX-\( \mu \)} \rightarrow \text{MAX-WI-\( \mu \)} \rightarrow \text{MAX-S} \\
\text{HNUC} \rightarrow \text{STRESS}
\end{array}
\]

b. Mexican Spanish

\[
\begin{array}{c}
\text{V-TO-HEAD} \rightarrow \text{MAX-\( \mu \)} \rightarrow \text{MAX-WI-\( \mu \)} \rightarrow \text{HNUC} \\
\text{MAX-S} \rightarrow \text{STRESS}
\end{array}
\]

c. Chicano Spanish

\[
\begin{array}{c}
\text{V-TO-HEAD} \rightarrow \text{MAX-\( \mu \)} \rightarrow \text{MAX-WI-\( \mu \)} \rightarrow \text{MAX-S} \rightarrow \text{HNUC} \\
\text{STRESS}
\end{array}
\]

It has already been shown that syllable merger is driven by the relative ranking of MAX-\( \mu \) and the FC ONSET. In Allegretto speech, ONSET dominates MAX-\( \mu \). In Peninsular Spanish, the optimal merger is the one which satisfies both HNUC and V-TO-HEAD. MAX-S, STRESS, and MAX-WI-\( \mu \) are low-ranked and therefore violable (see 73 and 74).

Peninsular Spanish Allegretto: café amargo

\[
\begin{array}{|c|c|c|c|c|}
\hline
& \text{HNUC} & \text{V-TO-HEAD} & \text{ONSET} & \text{MAX-\( \mu \)} & \text{MAX-S} & \text{WI-\( \mu \)} \\
\hline
\text{/ka'fe_a.margo/} & & & & & & \\
\text{a. ka.fe.a.mar.yo.} & & & & * & & \\
\text{b. ka.fe.a.mar.yo.} & & & & * & * & \\
\text{c. ka.feg.mar.yo.} & & & * & * & & \\
\text{d. ka.feg.mar.yo.} & & * & * & * & & \\
\text{e. ka.feg.mar.yo.} & * & * & * & * & & \\
\hline
\end{array}
\]
Stressed syllable merger in Peninsular Spanish follows a pattern similar to that of unstressed syllable merger. For example, the vowel sequences *carta* *urgente* (*V_1* and *V_2* are unstressed), *quizá* *una* (*V_1* and *V_2* are stressed), *quizá* *humilde* (*V_1* is stressed, *V_2* is unstressed), and *carta* *útil* (*V_1* is unstressed, *V_2* is stressed) may all merge in Allegretto style. Merger is limited in all examples by the constraint HNUC, which ensures that syllable peaks and sonority peaks coincide. MAX-S and STRESS cooperatively ensure that marked and unmarked stress are correctly assigned, and are violable in this variety of Spanish. The constraint V-TO-HEAD ensures that stress shift, if any, is local; i.e. that it does not shift to a different syllable.

Stressed syllable merger in Mexican Spanish is subject to restrictions different from those of Peninsular Spanish, yet determined by the same set of ranked universal constraints. The main difference between stressed syllable merger in Mexican and Peninsular Spanish can be summed up in a sentence: Peninsular Spanish allows stress shift, whereas Mexican does not. Consequently, the second vowel in the sequence may be glided only if it is the first vowel which is stressed (e.g. *pap[á]mita*). When it is the second vowel which is stressed, merger forms an onglide (e.g. *com[ó]vas*). Note that sonority requirements are met only trivially, i.e. if the second vowel happens to be more sonorous (e.g. *l[é]bla*).

In the last section, the constraint MAX-S was used to ensure that lexically marked stress was realized in the output. At the same time, stress shift is permitted in Peninsular Spanish because MAX-S is ranked below ONSET. In Mexican Spanish, by contrast, MAX-S must rank above ONSET and MAX-μ. This ranking stipulates that a stressed vowel may not be glided. We also know that MAX-S dominates MAX-W1-μ, because word-initial
glides are permitted only when the first vowel in a sequence is stressed (see 75 and 76).

(75) **Mexican Spanish Allegretto**: *papá imita*

<table>
<thead>
<tr>
<th>/papá imita/</th>
<th>MAX-S</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
<th>HNUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. pa. 'pa. i. 'mi.ta.</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. pa. 'paj. 'mi.ta.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. pa. 'paj. 'mi.ta.</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

(76) **Mexican Spanish Allegretto**: *como uvas*

<table>
<thead>
<tr>
<th>/como uvas/</th>
<th>MAX-S</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
<th>HNUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 'ko. mo. 'u. ūاس.</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. 'ko. mow. ūас.</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. 'ko. mou. ūас.</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

Chicano Spanish contrasts with Mexican Spanish in its ranking of **MAX-S** and **STRESS** below **ONSET**, **MAX-μ**, and **MAX-WI-μ**. As in Peninsular Spanish, this ranking permits stress shift in order to satisfy **ONSET**. In Chicano Spanish, unlike Peninsular and Mexican, **HIGLIDE** ranks above **IDENT** [high], thereby enforcing the realization of all glides as [+high] (see 77 and 78).

(77) **Chicano Spanish Allegretto**: *pagué ochenta*

<table>
<thead>
<tr>
<th>/pagué ochenta/</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
<th>MAX-S</th>
<th>HIGLIDE</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. pa. ye.o. 'cen.ta.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. pa. ye.o. 'cen.ta.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. pa. ye.o. 'cen.ta.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>d. pa. 'yjo. 'cen.ta.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. pa. 'yew. 'cen.ta.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
ICHOANO SPANISH ALLEGRETTO: \textit{habló Evita}

<table>
<thead>
<tr>
<th>Rule</th>
<th>Onset</th>
<th>Max-µ</th>
<th>Max-WI-µ</th>
<th>Max-S</th>
<th>HiGlIDE</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. a.blo.e.βi.ta.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. a.blo.e.βi.ta.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. a.blo.e.βi.ta.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>d. a.blwe.βi.ta.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>e. a.bloj.βi.ta.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

The Chicano data in (68) reveal that in this dialect, no offglides are formed. Offglides are banned by the constraint Max-WI-µ. In Chicano, Max-WI-µ dominates Max-S and STRESS, thereby allowing stress shift from the first vowel in a sequence to the second, in order to satisfy Max-WI-µ. In Mexican Spanish, however, offglides do occur, but only when the first vowel in the sequence is stressed (cf. tableaux 75 and 76). In Mexican Spanish, the optimal Allegretto output for \textit{habló Evita} would be habl[ó]vita.

In this section, three varieties of stressed syllable merger are attributed to the ranking of the constraints V-TO-HEAD, Onset, Max-S, STRESS, HiGlIDE, and IDENT [high]. Stress shift upsets the stress pattern of a lexical word and violates either Max-S or STRESS. It additionally violates V-TO-HEAD if it is shifted to another syllable. In Peninsular Spanish, merger of stressed syllables is possible (in most dialects) regardless of stress, as long as sonority requirements are respected. Peninsular Spanish is characterized by the ranking Onset » Max-S, STRESS, Max-WI-µ. In Mexican Spanish, stressed syllable merger is more sensitive to the presence of stress than to the relative sonority of the merged vowels. Stressed vowels are always nuclear; i.e., stress may not shift, even within the same syllable. On glides are preferred unless the first member in the sequence is stressed, in which case an offglide may be formed (e.g. com[ó]vas, pap[á]jimita). These facts are consistent with the ranking Max-S, STRESS » Onset » Max-WI-µ » HiGlIDE.

The Chicano data in (68) reveal a merger pattern similar to that of Peninsular Spanish. In Chicano Spanish, local stress shift is permitted as in Peninsular Spanish.
However, another process is at work in this dialect which is absent in both Peninsular and Mexican Spanish merger varieties. This process, vowel deletion, applies in two different contexts.

Referring back to the Chicano Spanish data, we find only examples of rising sonority or sonority plateau mergers. Whereas rising sonority mergers may contain vowels with the same value for the feature [back] (e.g. com[wé]va, v[∅]lotes), in sonority plateau mergers, the vowels invariably have opposite values for this feature (e.g. com[jú]vitās, Cant[wí]ba). Sequences of vocoids with the same value for [back] are systematically non-occurring, i.e. se iba *s[∅]ba, compró uvas *compr[wú]vas. These sequences are realized instead with a deleted vowel, i.e. as s[∅]ba and compr[u]vas, respectively.

Also systematically absent in Chicano Spanish is the vowel [a] as the first member of any merged sequence. Although [a] could conceivably be raised to form an onglide [j], such raising never occurs; instead, this vowel is deleted. Thus la unión is realized l[∅]ni6n. Chicano Spanish vowel deletion, and its interaction with syllable merger, is the topic of the next section.

2.3 Vowel deletion in Chicano Spanish

In specific cases, Chicano Spanish prefers vowel deletion to syllable merger. Deletion always targets the first vowel in the sequence. In the first case, deletion of the first vowel is mandatory in Allegretto speech if the two vowels in sequence have the same value for the feature [back] and falling sonority. In the second case, deletion is mandatory if the first vowel in the sequence is /a/. Examples of both types of deletion are given in (79).
Vowel deletion in Chicano Spanish (Martínez-Gil, in press)
a. deletion before a vowel of same backness and higher sonority
   *porque Italia*  \(\rightarrow\) porqu[i]ltalia
   *como uniforme*  \(\rightarrow\) com[u]niforme
   *compré higos*  \(\rightarrow\) compr[i]gos
   *comprô uvas*  \(\rightarrow\) compr[u]vas

b. deletion of /a/19
   *una india*  \(\rightarrow\) un[ø]india
   *pasa el pisto*  \(\rightarrow\) pas[ø]pisto
   *lleva ochenta*  \(\rightarrow\) llev[ø]chenta
   *la unión*  \(\rightarrow\) l[ø]u[nión]

In this section, both types of vowel deletion in Chicano Spanish are examined and accounted for in the OT framework. Principal sources for the Chicano data used include Hutchinson (1974) and Martínez-Gil (in press). See also Clements & Keyser (1983), Schane (1987), De Haas (1987), and Martínez-Gil (1996), for discussions of Chicano vowel deletion. Martínez-Gil (1998) is an analysis of Chicano merger/deletion in the OT framework.

2.3.1 Rule ordering and rule persistence

Before considering syllable merger in further detail, we first return to the question of /a/ deletion (cf. the examples in 79b). In a detailed autosegmental study of syllable

19 Other sources for discussion of /a/ deletion include Kaisse (1985) (for Puerto Rican Spanish); Stockwell, Bowen, & Silva-Fuenzalida (1956), Bowen (1956), and Contreras (1969) (for Chilean Spanish).

Although primarily an American phenomenon, /a/-deletion is observed in some Peninsular dialects as well. Some dialects of Andalucía display an interesting variety of /a/-deletion. In such dialects, /a-V sequences are resolved in favor of the /a/ rather than the vowel, e.g. *la encina* -> [aØncina] rather than [l[ø]ncina]. Deletion of the lower sonority vowel, in this instance /e/, is probably in keeping with the general Peninsular tendency to retain the most sonorous segment as the syllable nucleus (Hualde 1994).

merger in Chicano Spanish, Martínez Gil (in press) attributes /a/-deletion to a rule which delinks any low vowel (i.e. any /a/) in prenuclear position. His rule is given in (80).

(80) /a/ deletion in Chicano Allegretto (Martínez Gil in press, 51)

\[
\begin{array}{c}
\text{V} \\
\text{[+low]} \\
\end{array}
\]

In Chicano, non-low vowels are deleted as well, but only before a vowel of the same value for the feature [back], and of higher sonority (recall 79a). Rather than attributing this more restricted variety of deletion to a rule similar to (80), Martínez-Gil proposes that mid vowel deletion interacts with other more general phonological rules, enabling us to state the rule even more broadly. For example, sequences of identical vowels usually collapse into one (see 81).

(81) Identical vowel coalescence in Chicano Allegretto (Martínez-Gil in press)

\[
\begin{array}{ll}
mi \text{ iglesia} & m[i]glesia \\
se \text{ escapó} & s[e]capó \\
paga \text{ Adán} & p[a]dán \\
tu \text{ uniforme} & t[u]nforme \\
como \text{ Homero} & com[o]mero \\
\end{array}
\]

In the interest of descriptive simplicity, Martínez-Gil, Clements & Keyser (1983), and others have taken the position that the same rule which collapses identical vowels (e.g. m[i]glesia) is also responsible for the deletion of mid vowels (e.g. porqu[i]italia). In the case of porqu[i]italia, the underlying mid vowel is raised by the same rule which is
responsible for raising the onglide in merged syllables (e.g. pagu[jó]cienta).

I will now review the basic *modus operandi* of Chicano vowel deletion as laid out by Martínez-Gil. First, Chicano vowel sequences undergo a rule of syllable merger not unlike the merger rule presented at the outset of this chapter. Recall that syllable merger in Chicano invariably favors the formation of onglides, without concern for relative sonority. Syllable merger in Chicano may therefore be achieved with a single rule (contrast Holt's 1984 *Rhyme Nucleus Convention* (29), which consists of two rules). This rule follows in (82).

(82) **Syllable merger in Chicano (Martínez-Gil in press)**

\[
\begin{array}{c}
\sigma \\
\mu \\
V
\end{array} \rightarrow
\begin{array}{c}
\sigma \\
\mu \\
V
\end{array}
\]

*(NOTE: onglides only!)*

Second, identical vocoids (e.g. [aa], [ee], [ii], [oo], [uu]) collapse into a single prosodic (V) position (see 83).

(83) **Identical vowel degemination (Martínez-Gil in press)**

\[
\begin{array}{c}
\sigma \\
\mu \\
V_1
\end{array} \rightarrow
\begin{array}{c}
\sigma \\
\mu \\
V_2
\end{array}
\]

*(where \(V_1 = V_2\))*

Third, the sequences undergo a rule similar to Harris' (1985) High Glide redundancy rule (35), which makes all nonnuclear elements [+high] (see 84).
Glide Raising (Martínez-Gil in press)

\[
\vcenter{\hbox{\rule[-1mm]{1em}{1em}}}
\]

[-cons] --> [+high]

The deletion of mid vowels before a higher vowel of like backness is achieved by the same rule which degeminates identical vowels (83). This way, a separate mid vowel deletion rule is not needed. The /a/-deletion rule (80) is, nevertheless, still required.

Although incisive, this rule module is faced with a rule ordering paradox. For some of the data, it is necessary for rule (83) to apply before rule (84), in order to bleed off possible inputs to the latter. For other data, rule (83) must apply after rule (84), because some outputs of rule (84) must be made available to rule (83). Two sample derivations illustrating this paradox are provided in diagram (85).

(85) Paradoxical rule ordering in Chicano

a. se escapó --> s[e]scapó
b. se iba --> s[i]ba

a. s[e e]scapó input
   s[ε ε]scapó (82) Merger
   s[e]scapó (83) Degem
   -- (84) Raising
   s[e]scapó output

b. s[e i]ba input
   s[ε i]ba (82) Merger
   -- (83) Degem
   s[j i]ba (84) Raising
   * s[j i]ba output

a. s[e e]scapó input
   s[ε e]scapó (82) Merger
   s[l e]scapó (84) Raising
   -- (83) Degem
   * s[l e]scapó output

b. s[e i]ba input
   s[ε i]ba (82) Merger
   s[j i]ba (84) Raising
   s[i]ba (83) Degem
   s[i]ba output
The derivations in (85) show that the rule ordering required for one input, *se escapó*, is different from the one required for another input, *se iba*. Indeed, the ordering required for the correct derivation of one input produces an incorrect derivation for the other.

Martínez-Gil argues that the Degemination rule (83) is actually a language-specific process which applies whenever its structural description is met - a "persistent rule." This way, Raising (84) may either feed or be fed by Degemination, and the ordering paradox is resolved (see 86).

(86) Ordering paradox resolved: "persistent" degemination

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>se escapó</td>
<td>input</td>
</tr>
<tr>
<td></td>
<td>s[e e]scapó</td>
<td>(82) Merger</td>
</tr>
<tr>
<td></td>
<td>s[e]scapó</td>
<td>(83) Degem</td>
</tr>
<tr>
<td></td>
<td>--</td>
<td>(84) Raising</td>
</tr>
<tr>
<td></td>
<td>s[e]scapó</td>
<td>output</td>
</tr>
</tbody>
</table>

The focus of this section will be on providing an OT solution which allows the Chicano deletion data to be handled in a unified way, without the necessity for distinction between ordered and persistent rules.

2.3.2 An OT account

In section 2.1, I provided arguments for the utility of the constraint IDENT [high] in the selection of optimal outputs containing syllable merger. IDENT [high] monitors the binary value of the feature [high] in the output with reference to the input. Any change in this value - introduced by raising, for example - will effect an IDENT [high] violation. If a segment specified for [high] is deleted altogether from the output, then IDENT [high] is not violated, because this constraint monitors only feature identities, not whole segments. Deletion of a vowel satisfies IDENT [high], yet violates MAX-IO, the general constraint against segmental deletion.
The distinction between MAX-IO and IDENT [high] is illustrated in (87). This diagram shows that mid vowel deletion incurs a violation of MAX-IO, whereas feature value adjustment (i.e. raising) violates only IDENT [high].

(87) IDENT [high] versus MAX-IO violation

a. Vowel raising
   
   te humilló → [tju]milló
   
   PLACE
   DORSAL
   [-high]  [+high]

   MAX-IO IDENT [high] ✓

b. Vowel deletion
   
   se iba → [s][ø]ba
   
   PLACE
   DORSAL
   [-high]

   MAX-IO IDENT [high]
   ✓

In (87), two types of structural changes are shown: vowel raising and vowel deletion. In Chicano Allegretto, the sequence te humilló is realized with the underlying mid vowel raised to a high glide. This feature change is represented in (87a), which notes one IDENT [high] violation. Because this operation does not involve segmental deletion, MAX-IO is satisfied.

In (87b), the root node of /e/ in the example se iba is delinked from higher structure (shown by the double bar above the root node ®). This delinking incurs a violation of MAX-IO because the root node is unparsed (not realized phonetically) in the output. IDENT [high], however, is satisfied.
In Chicano Spanish (and indeed in all Spanish dialects), /a/ never raises to [j] to form an onglide. The absence of such raising may be attributed to specific identity constraints, and their ranking relative to MAX-IO. Whereas the change from /e/ to [j] violates only IDENT [high], the change from /a/ to [j] violates both IDENT [high] and IDENT [low] (/a/ is [-high, +low] and [j] is [+high, -low]. Martínez-Gil (1998) accounts for this restriction on raising by the ranking IDENT [low] » MAX-IO » IDENT [high], which states that deletion is preferable to changing the underlying value of [low], but not preferable to changing the underlying value of [high]. This ranking ensures that /a/ is deleted rather than raised, but mid vowels /e, o/ are raised rather than deleted (see 88 and 89).


a. Deletion: habla inglés --> hab[Ø]l inglés

<table>
<thead>
<tr>
<th>/habla inglés/</th>
<th>MAX-μ</th>
<th>MAX-W1-μ</th>
<th>HNUC</th>
<th>IDENT [low]</th>
<th>IDENT [high]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Blain̂</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Blajn̂</td>
<td>*</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Blain̂</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Blein̂</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Bljin̂</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. BlJaín̂</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20 Martínez-Gil’s OT analysis also maintains the Allegretto ranking ONSET » MAX-μ. In his analysis, however, MAX-W1-μ, the IDENT constraints, HIGLIDE, and MAX-IO intervene between ONSET and MAX-μ. Such ranking is not crucial, and in fact predicts a broader range of flotation for the FC ONSET. In my approach, ONSET either immediately dominates or is immediately dominated by MAX-μ.

In Martínez-Gil’s tableaux, sonority requirements are enforced by the constraint HIGLIDE. In my tableaux, I employ HNUC as the decisive constraint, although my analysis uses HIGLIDE as well. Both Martínez-Gil’s and my treatment make the same fundamental predictions.
b. **Raising: me usó --> m[ju]só**

<table>
<thead>
<tr>
<th>/me u'só/</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>WI-μ</th>
<th>HNUC</th>
<th>IDENT [low]</th>
<th>MAX-IO [high]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. meu.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. mew.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. meu.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. mju.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

In Peninsular and Mexican Spanish, vowel deletion is banned in merger contexts because MAX-IO minimally dominates both IDENT [low] and IDENT [high]. Recall that in Peninsular Spanish, HNUC is top-ranked, and MAX-WI-μ is low-ranked. In Mexican Spanish, HNUC is low-ranked, as in Chicano. Peninsular and Mexican Spanish tableaux for Allegretto *habla inglés* are given in (89) and (90).

(89) **Peninsular Spanish Allegretto: *habla inglés***

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. βla.ɪŋ.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. βla.ɪŋ.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. βla.ɪŋ.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. βle.ɪŋ.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e. βlɪŋ.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>f. βl[aliŋ.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

91
The Peninsular, Mexican, and Chicano rankings of MAX-WI-µ, MAX-IO, IDENT [high], IDENT [low], and HNUC vary by dialect. These rankings are summarized in (91).

(91) Constraints on raising and deletion

a. Peninsular Spanish

\[
\begin{array}{cccc}
\text{ONSET} & \text{MAX-µ} & \text{MAX-WI-µ} & \text{IDENT [high]} & \text{IDENT [low]} & \text{HNUC} \\
\text{a. ¡blajngen} & * & & & & \\
\text{b. ¡blajngen} & * & * & & & \\
\text{c. ¡blajngen} & * & & & * \\
\text{d. ¡blajngen} & & * & & * \\
\text{e. ¡blajngen} & * & & & \\
\text{f. ¡blajngen} & * & & & \\
\end{array}
\]

In this section, it has been shown that /a/ deletion occurs when IDENT [low] dominates MAX-IO under pressure from higher-ranked MAX-WI-µ. Mid vowels fail deletion in the same environment because they may be raised/glided without violating IDENT [low]; instead, they violate IDENT [high]. Such violation is preferable to deletion.
because MAX-IO dominates IDENT [high].

The Chicano data show, however, that mid vowels do delete if they precede (across a word boundary) another vowel of same backness and like or greater height (i.e. equal or lesser sonority). Recall that in Martínez-Gil’s serial analysis, a mid vowel preceding another vowel is first raised, then deleted (“degeminated”) if the resulting sequence is identical. Martínez-Gil’s Degemination rule is repeated in (92) for convenience.

(92) Degemination

\[
V_1 V_2
\]

(where \( V_1 = V_2 \))

In (92), the construction of two identical vocoids in a single syllable triggers Degemination because it violates the Obligatory Contour Principle, or OCP. This principle, and its constraining effect on identical vocoid strings, will be the focus of the next section.

2.3.3 More about Chicano: the OCP

The OCP has been developed to account for the cross-linguistic tendency to avoid sequences of identical elements, whether tones, segments, or individual features. Primary discussions of the OCP and its role in phonology may be found in McCarthy (1986) and Odden (1986), and in many subsequent studies. I cite McCarthy’s definition of the OCP in (93).

(93) Obligatory Contour Principle (OCP) (McCarthy 1986: 208)

At the melodic level, adjacent identical elements are prohibited.
In a discussion of the OCP across identical vowel sequences, Schane (1987) gives an example of a vowel construction which violates the OCP. His example is reproduced in (94).

(94) The OCP and vowel sequences (Schane 1987: 280)

The structure illustrated in (94) violates the OCP because it contains two adjacent instances of the vowel /el/. This type of structure, Schane argues, is generally avoided if at all possible in language, usually by reparative rules which force melodic contours. Such strategies are referred to in the generative literature as degemination rules. Martínez-Gil’s rule (93) is such a rule. In a serial analysis of the Chicano data, the segment sequence on which rule (93) operates is an intermediate representation, therefore any geminate sequence produced by Raising (84) is suppressed before it is allowed to surface (see 95).

(95) Identity avoidance in Chicano (cf. Martínez-Gil, in press)

To avoid accidental gemination of vowels in an OT analysis of vowel deletion, the OCP must be formalized as a constraint. It is maintained that OCP is inviolable in syllable
merger in Spanish, and therefore ranked high, along with HNUC and STRESS. Ranked high in this manner, OCP bans all identical vocoid sequences from output forms. In (96), the sequence se iba is evaluated under the Chicano Allegretto ranking.

(96)  Identity avoidance in Chicano Spanish Allegretto: se iba

<table>
<thead>
<tr>
<th>Segment</th>
<th>OCP</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
<th>HIGHLIDE</th>
<th>MAX-IO</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>se iba</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[high]</td>
</tr>
<tr>
<td>a. se.i.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. se.j.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. se.i.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. sji.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. sij.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. s[e].</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. se[i]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In (97), evaluation of lo hirió shows that if onglide formation does not result in feature identity, then no OCP violation is incurred, and glide formation is permitted.

(97)  Non-identity in Chicano Spanish Allegretto: lo hirió

<table>
<thead>
<tr>
<th>Segment</th>
<th>OCP</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-WI-μ</th>
<th>HIGHLIDE</th>
<th>MAX-IO</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>lo hirio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[high]</td>
</tr>
<tr>
<td>a. lo.i.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. lo.i</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. lo.j</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. lwj</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. luj</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. lo[i]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. l[0]i</td>
<td>*</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ranking OCP » ONSET » MAX-μ requires glide formation, except if the resulting glide displays feature identity. As shown in tableaux (96) and (97). OCP
constrains two candidates which contain vowel identity: (d) and (e). In (96), deletion is required, because only deletion allows OCP, HiGLIDE, and MAX-Wl-μ to be satisfied. In (97), it is possible for these constraints to be satisfied without deletion, so raising is preferred.

In Peninsular and Mexican Spanish, OCP is high-ranked as well. However, because MAX-IO does not rank below MAX-Wl-μ in either dialect, deletion is banned. In Peninsular Spanish, se iba is realized s[e]iba. In Mexican Spanish, it is realized s[e]iba (see 98-99).

(98) Peninsular Spanish Allegretto: se iba

<table>
<thead>
<tr>
<th>/se iba/</th>
<th>OCP</th>
<th>HNUC</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-IO</th>
<th>MAX-Wl-μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. se.i.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. sej.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. sei.</td>
<td></td>
<td></td>
<td>*1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. sji.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. sj.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. s[e].</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. se[i].</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

(99) Mexican Spanish Allegretto: se iba

<table>
<thead>
<tr>
<th>/se iba/</th>
<th>OCP</th>
<th>ONSET</th>
<th>MAX-μ</th>
<th>MAX-IO</th>
<th>MAX-Wl-μ</th>
<th>HNUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. se.i.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. sej.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>c. sei.</td>
<td></td>
<td></td>
<td>*1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. sji.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>e. s[j].</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. s[e].</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>g. se[i].</td>
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</tr>
</tbody>
</table>
2.4 Identical (long) vowels

It has been shown in the foregoing sections that syllable merger is characteristic of accelerated spoken Spanish, but not without restrictions. The breadth of its application is constrained by stipulations regarding relative sonority of the segments in question, the position of stress (if any), as well as the overall "acceptability" of the new syllable. Syllable merger also applies to sequences of identical vowels, with a rather different set of restrictions than those already discussed.

Merger of identical vowels does not involve the rebalancing (and potential loss) of underlying information required in the merger of unlike vowels. Two adjacent vowels which are different are somewhat like puzzle pieces in that their merger requires a series of adjustments to their respective sonorities, tongue heights, and to the final syllable shape. These adjustments ensure the "best fit" of the two vowels in a new syllable. The merger of identical vowels is quite simple by comparison. Identical vowels, having all their features in common, are easily subsumed within a single syllable, without questions of relative sonority even arising.

In this section, three basic claims will be reviewed and substantiated. First, in Largo speech, identical vowels are commonly realized in separate syllables. Second, in Andante speech, they tend to be realized as a tatutosyllabic bimoraic (long) vowel. Third, in Allegretto speech, they are generally realized as a monomoraic (short) vowel. Following presentation and discussion of relevant data, an OT analysis will be proposed.

2.4.1 Structure fusion in $V_1V_1$ sequences

Navarro Tomás (1967), Hutchinson (1974), Sanz (1979), Zamora Munné & Guitart (1982), Roca (1991), Hualde (1994), and others concur that long vowels in Spanish are usually realized short in Allegretto style. Such vowel sequences, which I will call $V_1V_1$ sequences, are generally subject to the same constraints in connected speech as different vowels. Because of their identity, however, they invoke a rule of featural
degemination called Identical Structure Fusion (ISF). This rule, defined in (100), dispenses with redundant structure in order to avoid OCP violation.

(100) Identical Structure Fusion (ISF) (cf. Clements 1985: 240)

\[
\begin{array}{c}
\mu & \mu \\
\downarrow & \downarrow \\
V & V \\
\downarrow & \downarrow \\
\alpha F & \alpha F \\
\end{array} \quad \rightarrow \quad
\begin{array}{c}
\mu \\
\downarrow \\
V \\
\downarrow \\
\alpha F
\end{array}
\]

ISF scans the segment sequence for pairs with matching feature structures. Upon finding such a pair, ISF collapses the identical material beneath a single root node. The only elements which do not collapse are the moras associated with each underlying segment; these are retained and doubly-linked to the newly fused segment. An illustrative example of the application of ISF is given in (101). This figure charts the stages involved in the concatenation of the words \textit{esta} and \textit{alma} into the connected speech string \textit{esta alma}. Note that the last segment in \textit{esta} and the first segment in \textit{alma} are identical.

---

21 A word of precaution to the reader: "structure fusion" and "syllable merger" do not refer to one and the same principle. "Structure fusion" is a persistent repair operation referred to here as ISF. ISF applies to any segment sequence in which its structural description is met, \textit{regardless of speed style}, in order to prevent surface structures from containing violations of the OCP. "Syllable merger" is the stylistic process over which the speaker has control, and which varies depending on speed style.

22 A corollary argument in McCarthy’s (1986) discussion of the OCP is that languages generally prefer the simplest structure possible. For example, fused structures are generally favored over unfused structures. I cite McCarthy (1986: 255) below:

\[
\begin{array}{c}
X \quad \alpha \\
\downarrow \\
X \quad \alpha
\end{array}
\]

\[
\begin{array}{c}
X \quad \alpha \\
\downarrow \\
X \quad \alpha
\end{array}
\]

Grammars are highly valued to the extent that they use
In (101a), the words *esta* and *alma* have not yet been brought into contact. Note that each vowel is associated with a mora underlyingly. This is the way the words are represented in isolation, as with a pause in between.

In (101b), the tiers are conflated, bringing the final -a in *esta* and the initial a- in *alma* into contact. Because the identical vowel satisfies the structural description of ISF, this rule is automatically invoked to do away with redundant structure. The resulting structure is shown. Note that the underlying moras are retained, and the resulting vowel is long, i.e. bimoraic. In connected speech, there are only two options: a bimoraic vowel or a monomoraic vowel. In Largo speech, the tendency is to realize a V₁V₁ sequence in hiatus, as a bimoraic tautosyllabic vowel in Andante speech, and as a monomoraic vowel in Allegretto speech. These tendencies are additionally constrained by the presence of stress. The effect of stress on long vowels is the focus of the next subsection.
2.4.2 The Effect of stress on $V_1V_1$ sequences

The reduction of a bimoraic vowel to a monomoraic vowel will be referred to in this study as "shortening." Navarro Tomás (1967: 152) describes shortening as an Allegretto speech process.

Tanto en el grupo fonico como en la palabra, dos o más vocales iguales, sucesivas, sin acento, se pronuncian corrientemente como si se tratase de una sola vocal inacentuada: *angulo oscuro, implacable encono, acreedores, vehemencia, cooperar, preeminente, alcoholismo, zoología.*

He illustrates the generality of this Allegretto speech operation with various additional examples, provided in (102) below.

(102) $V_1V_1$ sequences across word boundaries (Navarro Tomás 1967: 152)

- **única antorcha** → únic[a]ntorcha
- **truéquese en** → truéques[e]n
- **tiempo hollaba** → tiemp[o]llaba
- **a adornar** → [a]dornar

In his definition, Navarro Tomás does not distinguish between structure fusion of unstressed vowels within words and within the "phonic group," i.e. across word boundaries. In the present study, therefore, it is understood that vowel shortening is a postlexical process. As such, it applies to $V_1V_1$ sequences across the board.

Navarro Tomás (1967: 153) finds that the presence of word stress is generally an irrelevant factor in $V_1V_1$ shortening across word boundaries in Peninsular Spanish, i.e. it neither facilitates nor inhibits merger:

Aun cuando alguna de las vocales lleve acento fuerte, si el grupo resulta del enlace de palabras contiguas, dichas vocales se pronuncian también ordinariamente como si se tratase de una sola vocal inacentuada: *el aire entra silbando, la presa hace un ancho remanso, más ven cuatro ojos que dos.*
This general observation for Spanish is born out by Allegretto speech data from Chicano (see 103). In these data, all word stresses are shown for convenience, whether orthographic or not. The examples in (103) show that when a stressed $V_1V_1$ sequence shortens, word stress indicators merge as well.

(103) Merger of stressed $V_1V_1$ sequences in Chicano (Martínez-Gil. in press)

<table>
<thead>
<tr>
<th>Aquí hizo frío</th>
<th>Aquí[z]o frío</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tú úsas</td>
<td>T[û]sas</td>
</tr>
<tr>
<td>Será antes</td>
<td>Ser[â]ntes</td>
</tr>
<tr>
<td>Está alto</td>
<td>Est[â]lto</td>
</tr>
</tbody>
</table>

Navarro Tomás's implication that stress neither inhibits nor facilitates shortening across a word boundary does not hold word-internally. The presence of stress on one of the vowels in the word-internal $V_1V_1$ sequence does have an inhibitive effect on fusion, and also tends to influence how the vowels are syllabified. To illustrate this effect, Navarro Tomás outlines a number of stress leveling processes which tend to constrain $V_1V_1$ shortening word-internally. For example, finite forms in the paradigms of verbs with $V_1V_1$ sequences such as leer and creer tend to mimic the disyllabic pattern found in the infinitives [le.ér.]. [kre.ér.]. According to Navarro Tomás (1967), Roca (1991), and others, stress inhibits syllable merger word-internally, and therefore the vowels are commonly retained in separate syllables. One possible reason for merger inhibition in such paradigms is that the stress contour itself hinders vowel merger. However, a stress contour does not necessarily hinder merger itself in other word categories, such as nouns (cf. alcohol, in which a stress contour does not hinder $V_1V_1$ merger (e.g. /alkool/ --> [al.ko.6l.]. [al.kô.l.]. [al.kôl.]). Whatever the reason for blocking merger may be, the pattern of hiatus modeled by the infinitives permeates the entire verb paradigm, extending even to finite forms in which stress falls away from the $V_1V_1$ sequence: for example, in the conditional creerían [kre.e.rf.an.] and leerían [le.e.rf.an.]. Navarro Tomás argues that in
such cases, hiatus is preferred to merger in order to regularize the syllable pattern of the entire paradigm. Additional examples follow in (104).23

(104) Merger inhibited by paradigmatic stress leveling (Navarro Tomás 1967: §139; see also §141)

\[ \text{cr[e]l} \ldots \ldots \text{cr[e]ncia, cr[e]rían, acr[e]dóres} \\
\text{cr[i.a]l} \ldots \ldots \text{cr[i.a]dór, cr[i.a]túra} \]

Navarro Tomás concedes that ease of merger is also determined by the position of the word within the phrase. He cites no es posible creerlo todo as an example of a phonetic group context in which the V₁V₁ in creer is more readily merged to give cr[e:]rlo (154). In this case, merger is facilitated because the phrasal stress shifts the stress focus away from the V₁V₁ sequence in creer to the phrase-final word todo. Both Navarro Tomás (1967) and Roca (1991) agree that when word stress and phrase stress coincide, merger is generally blocked. For example, the V₁V₁ sequence in creer must be realized in hiatus if it bears phrasal stress, as is the case in no se puede creer.24

In other cases, particularly in words in which the V₁V₁ sequence is morpheme-internal, merger occurs without restriction. For example, Penny (1986: 501) describes three speed variants for the word aceite. In Largo speech, he argues, aceite is customarily realized as three syllables: [a[koe.1]], with stress on the final syllable.

---

23 Navarro Tomás cites other examples of words in which fusion is impaired, including the adjective mohoso [mo.so.so.] 'rusty' and the noun loor [lo.or] 'praise.' Although space prevents a lengthy discussion of the exceptionality of these and other forms, I offer that fusion is impaired in order to ensure the discrete phonetic realization of stem and suffix vowels. In the two above-mentioned examples, the V₁V₁ sequence spans the boundary between a word stem and suffix: [[m[o.o.so]].

24 Recall the discussion of este hombre and tabú éctico in section 2.2.1. Incidentally, Hualde (1994: 638) cites [kre.re], with a short vowel, as an Allegretto speech form of creer 'I will believe.' and [kre.e.re] as the corresponding Largo speech form (see also Hualde's footnote 8). It is unclear whether Hualde agrees with Navarro Tomás's observation regarding the influence of phrasal stress on merger, i.e. whether the form [kre.re] may not bear phrasal stress.
Although the merger of identical vowels word-internally is certainly relevant in a study of syllable merger, it is clearly subject to complex paradigmatic factors which are beyond the scope of this study. For this reason, the OT account will focus exclusively on identical vowels spanning word boundaries.

2.4.3 An OT account

If the ranking OCP » MAX-μ, ONSET is maintained categorically for Spanish, then Identical Structure Fusion (ISF)(see 100) is the only means of resolving V₁V₁ sequences. In Largo speech, the style characterized by the ranking MAX-μ » ONSET, V₁V₁ sequences are realized in hiatus. Because ISF does not violate MAX-μ, both merged and unmerged candidates satisfy MAX-μ. Tableau (105) shows that this ranking falsely predicts merged candidate (105c) l[a:]miga for Largo, when candidate (105c) l[a.a.]miga is the desired output.

(105) Largo: \textit{la amiga}

\begin{table}[h]
\centering
\begin{tabular}{c}
\hline
\textit{la amiga} & OCP & MAX-μ & ONSET \\
\hline
\textit{la amiga} & & & \\
\hline
\textit{la a mi ya} & \checkmark & \checkmark & \\
\hline
\textit{la a mi ya} & \checkmark & \checkmark & \\
\hline
\textit{la mi ya} & \checkmark & \checkmark & \\
\hline
\textit{la mi ya} & \checkmark & \checkmark & \\
\hline
\textit{la mi ya} & \checkmark & \checkmark & \\
\hline
\end{tabular}
\end{table}
In order to constrain $V_1V_1$ merger in Largo speech, we must invoke a constraint to ban its associated configurations, at least in this style. The configuration appears to be either a bimoraic vowel or a bimoraic syllable.

Rosenthal (1997), Hammond (1997a) and Borowsky & Harvey (1997) implement constraints on long vowels. Hammond calls the constraint $\ast \mu V/V$, and uses it to capture fine distinctions between stress and tense vowels in English (9). In a discussion of Warray (a language of northern Australia, spoken near Darwin), Borowsky & Harvey constrain long vowels by a constraint called simply $\ast VV$ (165). In Warray, $\ast VV$ may be violated in order to satisfy the higher-ranked constraint $\text{MINWD}$, which requires that all words are minimally bimoraic. The ranking $\text{MINWD} \gg \ast VV$ expresses the generalization that long vowels are allowed in Warray only to satisfy minimum word length. The negative structure targeted by these constraints is any V linked to more than one $\mu$.

To achieve the same type of result, Rosenthal (1997: 20) formulates his constraint NLV ("No long vowels") to specifically ban bimoraic vowels contained in a single syllable. His version of the rule will be adopted here, and will be called NOLONG (see 106).

(106) NOLONG "No long vowels." (cf. Rosenthal 1997: 20)

Because the configuration in (106) is not banned categorically in Spanish, it is maintained that NOLONG is an FC. If NOLONG is ranked above MAX-$\mu$, then long vowels must either be realized in separate syllables (in hiatus), or shortened. If it is ranked below MAX-$\mu$, then shortening is banned. These relations account for all the stylistic outputs. The Largo speech tableau for la amigo is shown in (107). In this tableau, NOLONG dominates both MAX-$\mu$ and ONSET, and the optimal candidate is (107a): [a.a.]miga.
In casual speech styles, the dominance relation of \textit{Onset} and \textit{Max-\(\mu\)} is reversed: \textit{Onset} \(\gg\) \textit{Max-\(\mu\)}. The ranking of other constraints, such as \textit{Higlide} and \textit{Ident [high]} relative to these is not relevant, because in the case of \(V_1V_1\) sequences, neither constraint need be violated in order to satisfy \textit{Onset}: indeed, violation of either would be gratuitous and incur negative marks in evaluation. In addition, \textit{Nolong} may rank in any position relative to \textit{Max-\(\mu\)} and \textit{Onset}. The ranking \textit{Onset} \(\gg\) \textit{Max-\(\mu\)} \(\gg\) \textit{Nolong} forces a bimoraic syllable in order to satisfy both \textit{Onset} and \textit{Max-\(\mu\)}. This is the ranking relation required for Andante (see 108).
(108) Andante: *la amiga*

\[
\begin{array}{cccccc}
& & \mu & \mu \\
\mu & & \mu & & \mu \\
\end{array}
\]

\[\text{/la amiga/} \quad \text{OCP} \quad \text{ONSET} \quad \text{MAX-\(\mu\)} \quad \text{NOLONG}\]

a. la.a.m.i.ya.  *!

b. laa.mi.ya.  *!

c. la.mi.ya.  *

d. la.m.i.ya.  *!

e. la.m.i.ya.  *!

In Allegretto, underparsing of a mora can only be achieved if NOLONG and ONSET both dominate MAX-\(\mu\). The ranking NOLONG » ONSET » MAX-\(\mu\) indicates that it is preferable to leave a mora unparsed rather than have vowel hiatus or a bimoraic syllable (see 109). Note that in (109), candidates (109d) and (109e) both delete exactly one mora, and are therefore both optimal. There is, however, no phonetic difference between (109d) and (109e); both are realized with a short vowel: [a]miga.
Constraint rankings for the three speech styles are summarized in (110). Because ONSET and NOLONG are both FCs, the total number of possible rankings of ONSET, NOLONG, and MAX-μ is 3-factorial (3!), or 6. However, these six rankings select only three distinct optimal candidates. For this reason, only one representative ranking is given for each style. ONSET and NOLONG are FCs, and belong to the MARK family of constraints. MAX-μ is a FAITH constraint.

(110) Putative rankings by style

a. Largo

NOLONG » MAX-μ » ONSET

Enforces vowel hiatus of $V_1V_1$ sequences.
b. Andante

\[ \text{ONSET} \quad \text{MAX}-\mu \quad \text{NOLONG} \]

Enforces tautosyllabic identity of \( V_1V_1 \) sequences (with moraic faithfulness).

c. Allegretto

\[ \text{ONSET} \quad \text{NOLONG} \quad \text{MAX}-\mu \]

Enforces underparsing of one mora in \( V_1V_1 \) sequences.

2.5 Vowel super-sequences

As we have seen so far in this chapter, a \( VV \) sequence is typically subsumed under a single syllable head in Andante and Allegretto Spanish regardless of the identity or non-identity of its members. In sequences of different vowels, one of the vowels - generally the less sonorous one - is made nonnuclear, i.e. an onglide or offglide. There is another category of vowel sequences which adhere to the same principles. These are sequences of three, four, or even five vowels, which I will refer to here as “super sequences.” Some examples follow in (111).

(111) Vowel super-sequences (Navarro Tomás 1967: 71)

- \( aei \) llega a adorar
- \( ieu \) nadie acude
- \( aeu \) culta Europa
- \( ioæeu \) envidio a Eusebio

In this section, it will be shown that super-sequences such as those in (111) are readily accounted for by the present model, without special accommodation.
2.5.1 Sonority conditions on super-sequences

In his discussion of merger, Navarro Tomás (1967: 73) explains that a sequence of "several" vowels may be realized in a single syllable if certain conditions are met:

Cuando se reunen varias vocales en una misma sílaba, todas ellas, con excepción de la más abierta de cada grupo, que es la que constituye el centro del núcleo silábico, se pronuncian con un rápido movimiento articulatorio, el cual tiende hacia la abertura o la estrechez, según se trate de la parte creciente o decreciente de dicho núcleo.

The "most open" vowel ("la más abierta") is, of course, the most sonorous, as sonority correlates with vowel openness. In any vowel super-sequence, sonority peaks correspond to syllable peaks. Non-peak vowels are made nonnuclear. Vowels preceding the peak become onglides, and those following the peak become offglides.

All the vowel sequences in (111) above have in common the fact that they contain rising sonority approaching the syllable peak, and falling sonority following it. There are therefore four possible super-sequence syllable types, each characterized by a different type of sonority contour. They are: a) sonority plateau; b) rising sonority; c) falling sonority; and d) rising and falling sonority (see 112). Sonority contours are shown by lines; the peak on each line is indicated by a circle.

(112) Sonority contours in vowel super-sequences

\[\begin{array}{ll}
\text{a. plateau} & \text{b. rising} \\
\begin{array}{c}
\text{a a a} \\
\text{llega a adorar}
\end{array} & \begin{array}{c}
\text{i e a} \\
\text{nadie acude}
\end{array}
\\
\text{c. falling} & \text{d. rising and falling} \\
\begin{array}{c}
\circ \\
\text{a e u}
\end{array} & \begin{array}{c}
\circ \\
\text{i o a e u}
\end{array}
\\
\text{culta Europa} & \text{envidio a Eusebio}
\end{array}\]
These diagrams illustrate the fact that any super-sequence, regardless of segmental length, which models one of the above sonority contour types also respects sonority sequencing and is therefore a viable syllable.

Navarro Tomás gives numerous counterexamples of super-sequences which may not be merged into a single syllable because they violate sonority sequencing. In each case, the sequence contains more than one sonority peak. Because each sonority peak must necessarily be the nucleus of a single syllable, total merger of such sequences is impossible. Merger of any of the sequences in (113) disobeys sonority sequencing, and is therefore illicit in any speech style.

(113) Vowel super-sequences: instances of blocked merger

\[ \text{a o a} \quad \text{e u o} \]

\[ \text{esta o aquella} \quad \text{siete u ocho} \]

\[ \text{a i u e} \quad \text{o a i a} \]

\[ \text{casa y huerta} \quad \text{no hay ánimo} \]

\[ \text{u a i a i} \]

\[ \text{agua y aire} \]

Each vowel sequence in (113) contains more than one sonority peak (each peak is circled). In accordance with sonority sequencing, each peak vowel must also be a syllable peak. Although merger in the above syllables is disallowed, it is still possible for non-peak vowels to be affiliated with one of the peaks, provided that they obey the standard sonority sequencing procedure. In no case, however, is it possible to have fewer syllables than sonority peaks, in any speech style.
2.5.2 An OT account

Four sample mergers of vowel super-sequences from Peninsular Andante style are examined in this section. The sequence [iea] in *nadie acude* (114) contains an example of rising sonority across a sequence of three vowels. The sequence [aeu] in *culta Europa* (123) displays falling sonority, also across a sequence of three vowels. The sequence [ioi] in *ocio inútil* (124) displays rising and falling sonority. The [aia] sequence in *sangrienta y ancha* (125), however, contains two sonority peaks which may not be resolved into a single syllable.25

(114) Peninsular Andante: *nadie acude* (rising sonority)

Due to a lack of hard data, the sonority plateau configuration will not be examined here.

111
In tableau (114), ONSET is ranked above MAX-μ, thereby minimizing the number of syllables to the extent permitted by HNUC. Crucially, the optimal candidate must satisfy both HNUC and ONSET. HNUC examines each of the proposed syllables to ensure that syllable peaks coincide with sonority peaks. ONSET militates against vowel hiatus. Because of the tight interaction between HNUC and ONSET, the only possible output for input syllable /diea/ with merger is (114f) [djea]. Note that sonority rises steadily across the syllable, with [a] being both the sonority peak and the syllable peak. All other candidates violate either HNUC for containing syllable peaks which do not coincide with sonority peaks, or ONSET for containing onsetless syllables, or both. Candidate (114f) violates MAX-μ twice - once for each onglide it contains - yet it satisfies both HNUC and ONSET and is therefore optimal.

The same ranking accurately predicts merger of a syllable with falling sonority, as illustrated in table (115) below.
Again, HNUC and ONSET act decisively in evaluation. Only the candidate which maximally satisfies both these constraints is optimal: the winning candidate is (115f). Observe that the optimal syllable [æu] contains two offglides; each one violates MAX-μ. The second glide additionally violates MAX-WI-μ because it is word-initial. Because HNUC and ONSET are satisfied by candidate (115f), such violation is minimal, and the highly marked offglide structure is allowed to surface optimally.
Peninsular Andante: ocio inútil (rising and falling sonority)

A vowel sequence with steadily rising and falling sonority, such as the /ioi/ in ocio inútil (116), may be realized in a single syllable because it has only one sonority peak. The optimal syllable nucleus is realized phonetically: oc[joj]nútil, in which the syllable peak [o] is flanked on both sides by a high glide [j].

As Navarro Tomás indicates, some super-sequences cannot be merged into a single syllable because they contain more than one sonority peak. Evaluation of the trivocalic sequence /aia/ in sangrienta y ancha (117) shows that merged vowel sequences with fewer syllables than sonority peaks are systematically suppressed.
Andante: sangrienta y ancha (two sonority peaks)

Because /a/ is the most sonorous segment and has no licit nonnuclear equivalent (i.e., *[a]), every underlying /a/ must be parsed by its own syllable head. Any attempt to shove /a/ into a marginal position (cf. candidates 117c-e) fatally violates HNUC. Of those candidates which satisfy HNUC by assigning each /a/ to its own syllable, only one does so without also violating ONSET: this is the optimal candidate: (117b) sangrient[a ja]ncha.
2.6 Summary

In this chapter I examined the variability of syllable merger in a variety of syllable types. Following a brief review of syllable merger, sonority sequencing, and glide formation conventions, an OT account for merger was presented. It was proposed that the facts of variation in syllable merger for American dialects may be expediently explained if two MARKEDNESS constraints - ONSET and HIGLIDE - are left partially ranked over a specified range of the constraint hierarchy; i.e. if they are defined as FCs. In Peninsular dialects, HIGLIDE is fully ranked, and only ONSET is an FC.

Next, the effect of word stress on merger was explained in Peninsular, standard Mexican, and Chicano Spanish using the constraint pair STRESS and MAX-S(TRESS). In Peninsular Spanish, stressed syllable merger occurs freely in most dialects, as long as it conforms to the requirements of sonority sequencing. Often the result of merger is a stress shift, in which stress moves to the most sonorous vowel in the merged syllable (e.g. men[wá]ntiguo. Stress shift forces stress misassignment, and therefore violates either MAX-S or STRESS. Because these constraints are ranked below ONSET in Peninsular Spanish, stressed syllable merger is permitted.

In standard Mexican Spanish (and indeed in many Latin American dialects), stress shift is prohibited (e.g. v[jé]lotes, not *v[jé]lotes). These data indicate that the constraints STRESS and MAX-S dominate ONSET in this dialect, because syllable merger may not result in the relocation of word stress. Because offglides occur only if the first vowel is stressed, STRESS and MAX-S must dominate MAX-WI-\(\mu\), which in turn dominates HNUC.

In Chicano Spanish, stress shift is permitted, but vowel deletion at word boundaries is preferred to offglide formation regardless of whether stress is present. In such contexts, the deleted vowel is invariably the first in the sequence. This pattern follows a universal constraint which preserves the nuclearity of word-initial vowels: MAX-WI-\(\mu\). In Chicano, offglide formation is banned by the ranking MAX-WI-\(\mu\) » MAX-IO. In Peninsular and Mexican Spanish, offglide formation is permitted at word boundaries (provided that it does not violate higher ranked HNUC in Peninsular and MAX-S/STRESS in
Mexican), because this ranking is reversed. Feature identity in vocoid sequences is avoided by the constraint OCP, which is undominated in all three dialects.

The final section contained an analysis of identical vowels in sequence and the stylistic options for their realization. Merger of identical vowels was explained using the constraints ONSET and MAX-\( \mu \), and also NOLONG. NOLONG was applied to ban syllables containing more than one mora. As with distinct vowel sequences, Largo speech is characterized by vowel hiatus. In Andante and Allegretto speech, long vowels are represented tautosylabically. In Allegretto speech, NOLONG forces one of the moras to be unparsed, resulting in a short (monomoraic) vowel.

Finally, sequences of three or more vowels were examined. It was shown that these "super-sequences" - apparently regardless of length - may be accounted for in the present FC model without special accommodation. Outputs were shown to be constrained primarily by the constraints HNUC and ONSET.

The present approach also enables a unified description of the possible realizations of identical and distinct vowels in connected speech, all the while accounting for the influence of stress and dialect-specific preferences for certain types of processes related to merger, such as glide formation and segmental deletion.
Spanish phonology is characterized by a broad range of stylistic effects which affect consonants and consonant clusters. For example, in connected speech, a nasal consonant generally assimilates in place to a following obstruent; e.g. con piedras → com[p]iedras. con llaves → com[n]llaves, con ganas → com[g]anas (cf. Navarro Tomás 1967; Harris 1969; Hooper 1972; Goldsmith 1979; Hualde 1989a; and others). The same is true of laterals, e.g. fie[l] novia, fie[l] zorro, fie[k] yegua (Hualde 1989a: 22). Likewise, unvoiced fricatives partially voice before a voiced consonant; e.g. mismo → mi[s]mo. rasgo → ra[s]go. These three types of assimilation - nasal place, lateral place, and voicing - are typical of casual speech styles, and are fairly standard across all Spanish dialects.

At least one variety of Cuban Spanish is characterized by the velarization of morpheme-final nasals. This process allows only one nasal allophone morpheme-finally: [ŋ]. Although nasal place assimilation holds in this dialect morpheme-internally, place assimilation is typically suppressed - at least partially - in favor of velarization across a morpheme boundary. In Largo speech one hears red[m]ir, but rede[n]ción, rede[n]tor (Guitart 1976: 75). Compare this /m-ŋ/ alternation to the expected alternation in a so-called "nonvelarizing" dialect, such as Castilian, in which place assimilation occurs as expected: red[m]ir ~ rede[n]ción ~ rede[n]tor.

Another stylistic process which is common in many areas of the Spanish-speaking world is aspiration. In general, aspiration can be heard with a high degree of frequency in coastal areas, predominantly those in and adjacent to the Caribbean, as well as the Pacific.
coast of South America, and also Argentina, Uruguay, and southern Spain (cf. Canfield
1981; Lipski 1994). Aspiration generally targets syllable-final /s/, and where it exists. /θ/,
converting them to [h]. In Havana Spanish it may occur within a word, at a word
boundary, and at the end of an utterance; e.g. e[h]ta[h] cosa[h] («estas cosas. Guitart 1976:
21). Like place and voice assimilation, aspiration is a variable process sensitive to notions
of style.

Continuancy assimilation and coda obstruent devoicing are two stylistic processes
which interact in connected speech. Hualde (1989a: 35) indicates that a voiced coda
obstruent may have any of four phonetic realizations, depending on style. The word
digno, with its underlying voiced obstruent, may be realized any of the following ways: 1)
[-cont, +voi] di[g]no; 2) [-cont, -voi] di[k]no; 3) [+cont, +voi] di[y]no; 4) [+cont, -voi]
di[x]no. In these examples, coda obstruent devoicing also competes with voicing
assimilation; cf. Hualde's example adquirir, in which the underlying /d/ may be realized
partially voice-assimilated [ðθ], or fully devoiced [θ].

In this chapter, each of the above-mentioned processes is reviewed in turn, and an
OT explanation is provided.

3.1 Place assimilation

Spanish features two types of place assimilation, nasal and lateral. In both types,
the place node, which dominates the place features, is spread (assimilated) from a
following consonant. Assimilation may occur within a word, across a word boundary, or
across a morpheme boundary. Within words, assimilation is generally compulsory. Thus
the nasal segment in banco and the lateral segment in sueldo, both word-internal, are
invariably place-assimilated regardless of speech style (cf. Navarro Tomás 1967: 112;
Harris 1969: 11). Across morpheme or word boundaries, however, place assimilation is
variable, and is indeed more likely to occur across a morpheme boundary than across a
word boundary. In addition, assimilation processes across word boundaries are more
typical of accelerated speech than of Largo speech. Some examples of place assimilation
across a word boundary follow in (118).

(118) Place assimilation (Allegretto speech)\(^1\)

\[
\begin{align*}
\text{a. nasals (Hualde 1989a: 17)} & \quad \text{b. laterals (Hualde 1989a: 22)} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\text{co[n]} & \quad \text{fie[l]} \\
\end{align*}
\]

These data show that nasals and laterals can form homorganic clusters with a following consonant across a word boundary, in Allegretto speech. Although essentially similar processes, nasal and lateral place assimilation are subject to different restrictions. First, nasals may place assimilate absolutely; that is, any nasal may place-assimilate to any following consonant, regardless of its place of articulation. The result: there are as many nasal allophones as there are places of consonantal articulation. On the other hand, laterals place-assimilate only if the following consonant is coronal; before any other type of consonant, such as a dorsal or labial, /l/ is realized [l].

One might argue that the difference in distribution of allophones for nasals and laterals is determined by physiological constraints imposed by the manner of articulation of the consonant in question. For example, nasals have in common only one feature: air flow through the nasal cavity. Any oral occlusion may be combined with nasal air flow. Stated inversely: a nasal may be articulated at any point in the oral cavity without ceasing to be a

\(^1\) Spanish has the three nasal phonemes /n, m, ň/, which share six allophones, one for each major point of oral articulation: bilabial [m], labiodental [ň], interdental [n], dental [ň], palatal [ń], and dorsal [ń]. The two lateral phonemes are /l/ and /ń/. As a phoneme, /ń/ occurs as a phoneme in very few dialects, mostly in the highlands of South America, especially Perú and Bolivia. Both /ň/ and /ń/ are coronal, and /ń/ is additionally [-anteor]. Because of coda conditions, /ń/ never occurs syllable-finally, thus /ń/ has only one phonetic realization: [ń]. /l/, on the other hand, frequently occurs syllable-finally and has three allophones, all coronal: interdental [l], dental [l], and palatal [ń]. See also Penny (1986: 493-494).
nasal.

For laterals, the matter is quite different. In Spanish, as indeed in most languages, laterals are by definition coronal. A speaker would be hard-pressed to articulate a lateral with any other articulator in the oral cavity except the tongue tip. How, for example, could one articulate a “lateral bilabial,” given that the orbicularis oris muscle is practically incapable of producing a lateral constriction? It seems sensible that noncoronal lateral allophones are excluded from the list on the grounds that they are physiologically impractical. In such cases, the coronal [+anterior] allophone is selected instead.

Although bilabial laterals may be unattested in the world’s languages, velar laterals [L] are not. Why does Spanish not recognize [L] as a valid allophone in such lateral-consonant combinations as fiel gorila, which would yield fie[L] gorila? Instead, assimilation of the dorsal place node is suppressed in favor of the heterorganic sequence [-lg-]. The same is true for bilabial and labiodental places of articulation (see 119).

(119) No lateral place assimilation before velars or labials (Hualde 1989b: 181)

| el puerto | e[L] puerto |
| el foco  | e[L] foco   |
| el gorila| e[L] gorila |

In this section, nasal and lateral assimilation are presented as two varieties of a single process of place assimilation. In the OT analysis, it will be demonstrated that the failure of /L/ to assimilate in place before noncoronal consonants is the result of competing IDENT constraints which, arranged hierarchically, must be violated minimally.

3.1.1 Feature spreading

In simplest terms, place assimilation is place node sharing. Two adjacent segments which are place-assimilated are homorganic because they share the place features of one or

---

2 According to Ladefoged (1993), the velar lateral - represented phonetically as [L] - may be found in some languages of Papua New Guinea. English, Catalan, Portuguese, and other languages have a “dark” or “velarized” [L], but this sound is an approximant; i.e. there is no lateral closure perse.
the other segment. This relationship is most expediently expressed autosegmentally (120).

(120) Place assimilation (cf. Goldsmith 1979: 5; Hualde 1989a: 19)

\[
\begin{array}{c}
\text{\textcopyright} \\
\text{SL} \\
\text{P} \\
\end{array}
\quad
\begin{array}{c}
\text{\textcopyright} \\
\text{SL} \\
\text{P} \\
\end{array}
\quad
\rightarrow
\begin{array}{c}
\text{\textcopyright} \\
\text{SL} \\
\text{SL} \\
\text{P} \\
\end{array}
\]

Rule (120) shows two adjacent segments, each with its own root node \textcopyright, supralaryngeal node SL, and place node P. The first segment assimilates the place node of the second segment (shown by the dotted line) and concomitantly delinks its own original place node. The result is a single place node shared between two segments.

In order for place assimilation to be accurately described for Spanish, information must be added to the structural description of the rule. Hualde (1989a: 23) accounts for nasal and lateral place assimilation by means of a single unified rule, shown in slightly modified form in (121).
Place assimilation of nasals and laterals (cf. Hualde 1989a: 23; cf. also Hualde 1989b: 181)³

Hualde’s rule notation treats nasal and lateral segments as the natural class of noncontinuant sonorants. The structural description of the rule excludes the sonorants /r/ and /r/ (as well as the vowels) because all of these are characterized by air flow which is both oral and central, thereby making them [+continuant].

As stated, the rule is insufficient to adequately constrain the possible allophones of /l/. Recall that all allophones of /l/ must be coronal; this rule falsely predicts that noncoronal laterals are possible outputs. In such cases where a labial or velar lateral allophone might result, the alveolar allophone is mandated: [l]. Coronality of laterals must be ensured by separate redundancy rule.

In his discussion of lateral assimilation, Harris (1969) accounts for the restriction on lateral place by limiting the conditioning environment for lateral assimilation to coronal obstruents only. He uses α-β notation, as is the norm in the linear model for referring to assimilation processes (see 122).

³ Hualde’s version of the rule uses ‘X’ rather than ‘C’ notation, and therefore must specify that the first segment occupies a syllable rhyme (coda). Because any CC sequence in which the first member is [-continuant, +sonorant] may only be syllabified C.C, the reference to position within the syllable is unnecessary.
(122) Lateral assimilation (Harris 1969: 19)

\[
/N/ \rightarrow \begin{array}{c}
\alpha \text{ anterior} \\
\beta \text{ distributed}
\end{array} / \\
\begin{array}{c}
+\text{obstruent} \\
+\text{coronal} \\
\alpha \text{ anterior} \\
\beta \text{ distributed}
\end{array}
\]

Harris’ rule enforces homorganicity of /l/ to a following obstruent, but only if the obstruent is coronal. If /l/ precedes a labial or velar, then the rule fails and homorganicity does not obtain.

In more recent approaches (cf. Harris 1989b and Cressey 1978), certain place-manner feature combinations are deemed illicit and are filtered out, as it were, in favor of the [+coronal, +anterior] allophone [l]. Hualde (1989b) envisions a pair of segment well-formedness constraints which forbid the manner feature [+lateral] from being simultaneously linked to either the [+labial] or [+dorsal] place node (see 123).

(123) Well-formedness conditions on lateral place (Hualde 1989b: 181-182)

a. \[
\begin{array}{c}
\ast X \\
[+\text{lat}] \\
[+\text{lab}]
\end{array} \quad \text{(universal)}
\]

"[+labial] cannot be connected to a segment X if X is connected to [+lateral]."

b. \[
\begin{array}{c}
\ast X \\
[+\text{lat}] \\
[+\text{dors}]
\end{array} \quad \text{(Spanish)}
\]

"[+dorsal] cannot be connected to a segment X if X is connected to [+lateral]."

---

4 Hualde (1989a: 23) specifies the restriction on lateral place as follows:

"Todo segmento con el rasgo [+lateral] ha de ser [coronal]."
Cressey (1978: 119) expresses the restrictions on lateral place using two positive redundancy rules (124).

(124) Lateral place: redundancy rules (Cressey 1978: 119)

a. \([+\text{lat}] \rightarrow [-\text{back}]\) “No velar laterals.”

b. \([+\text{lat}] \rightarrow [+\text{cor}] / \begin{array}{c} \text{[+ant]} \end{array}\) “No labial laterals.”

Word-internally, place assimilation is accompanied by delinking of the sonorant’s original place node. Following Harris, it is maintained that the assimilatory operation defined in (121) is compulsory only within words, thus \(\text{ganga} \rightarrow \text{ga}[\text{g}]\text{ga}\) and \(\text{triunfo} \rightarrow \text{triu}[\text{n}]\text{fo}\) regardless of speech style.\(^5\) Between morphemes, or across word boundaries, however, it is variable. Two place nodes linked to a single segment are realized as a partial assimilation, and it is maintained here that partial assimilations do not occur word-internally: e.g. \(*\text{ga}[\text{n}]\text{g}a\), \(*\text{triu}[\text{n}]\text{f}o\) (cf. Harris 1969: 9).\(^6\)

Harris also argues that in Andante speech, place assimilations at word boundaries are generally partial, resulting in coarticulations (overlaps). His argument is based on observations made by Navarro Tomás (1967: 89) for Peninsular Spanish:

---

5 Harris (1969: 11) states: “...there is complete neutralization of nasals before obstruents; that is, only homorganic clusters of nasal plus obstruent occur [word-internally].”

6 The subscript ties indicate any degree of gestural overlap. The phonetic analysis of overlapped segments follows from Sagey (1986: 28): “It is only branchings to specifications on a single tier that are phonologically ordered.” Because distinct place nodes represent distinct tiers, the phonetic realization of a root node linked to two place nodes must be a gestural overlap.

125
Harris interprets Navarro Tomás's assertions as follows: "lentitud o vacilación" corresponds to Largo, or careful speech, in which assimilation across morpheme or word boundaries does not occur. "Conversación ordinaria" corresponds to Allegretto, or casual speech, in which place assimilation is generally total, as within words. The "formas intermedias de asimilación" represent an intermediate style (Andante) in which partial assimilations are permitted, as at morpheme (or word) boundaries. A partial assimilation is characterized by place node spreading without concomitant delinking of the original place node. In other words, a partially assimilated segment has two place nodes: its own, and also the one spread to it by the following segment.

An explanation of place assimilation must account for several different facts. First, a rule is needed which targets nasals and laterals word-internally regardless of speed style. This same rule also applies variably in Allegretto speech. In Andante, however, the rule must be formulated differently so as to allow the targeted segments to remain linked to their original place nodes (see 125).

(125) Place assimilation (cf. Hualde 1989a, 1989b)

a. Andante speech (variable)

```
C      C
├─continuant
 SL  SL
[+sonorant] [-sonorant]
 P    P
```
b. Delinking (Allegretto and word-internally)

In sequence, these rules account for the stylistic variation observed by Navarro Tomás, Harris, Hualde, and others. In Andante, rule (125a) partially place-assimilates a nasal to a following consonant. In Allegretto, rule (125a) applies, followed by rule (125b), which delinks the underlying place node of an assimilated nasal. Nasal place assimilation data illustrating the two assimilation types (as well as non-assimilation) are categorized in (126). Lateral place assimilation data are categorized in (127).

(126) Stylistic variation in nasal place assimilation (Harris 1969; Hualde 1989a: 17)

<table>
<thead>
<tr>
<th></th>
<th>Largo</th>
<th>Andante</th>
<th>Allegretto</th>
</tr>
</thead>
<tbody>
<tr>
<td>triunfo</td>
<td>.................</td>
<td>triu[m]fo</td>
<td>.................</td>
</tr>
<tr>
<td>cuanto</td>
<td>.................</td>
<td>cua[n]do</td>
<td>.................</td>
</tr>
<tr>
<td>canso</td>
<td>.................</td>
<td>ca[n]so</td>
<td>.................</td>
</tr>
<tr>
<td>rancho</td>
<td>.................</td>
<td>ra[n]cho</td>
<td>.................</td>
</tr>
<tr>
<td>ganga</td>
<td>.................</td>
<td>ga[n]ga</td>
<td>.................</td>
</tr>
<tr>
<td>con piedras</td>
<td>co[n] piedras</td>
<td>co[n]m piedras</td>
<td>co[m] piedras</td>
</tr>
<tr>
<td>con fuerza</td>
<td>co[n] fuerza</td>
<td>co[n]m fuerza</td>
<td>co[m] fuerza</td>
</tr>
<tr>
<td>concera</td>
<td>co[n] cera</td>
<td>co[n] cera</td>
<td>.................</td>
</tr>
<tr>
<td>con dientes</td>
<td>co[n] dientes</td>
<td>co[q] dientes</td>
<td>.................</td>
</tr>
<tr>
<td>con latas</td>
<td>.................</td>
<td>co[n] latas</td>
<td>.................</td>
</tr>
<tr>
<td>Largo</td>
<td>Andante</td>
<td>Allegretto</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>alzar</td>
<td>a[l]zar</td>
<td>..................</td>
<td></td>
</tr>
<tr>
<td>caldero</td>
<td>ca[l]dero</td>
<td>..................</td>
<td></td>
</tr>
<tr>
<td>falsedad</td>
<td>fa[l]sedad</td>
<td>..................</td>
<td></td>
</tr>
<tr>
<td>colcha</td>
<td>co[ʃ]cha</td>
<td>..................</td>
<td></td>
</tr>
<tr>
<td>fiel zorro</td>
<td>fie[l] zorro</td>
<td>fie[l] zorro</td>
<td>..................</td>
</tr>
<tr>
<td>fiel toro</td>
<td>fie[l] toro</td>
<td>fie[l] toro</td>
<td>..................</td>
</tr>
<tr>
<td>fiel novia</td>
<td>fie[l] novia</td>
<td>fie[l] novia</td>
<td>..................</td>
</tr>
<tr>
<td>fiel yegua</td>
<td>fie[ʃ] yegua</td>
<td>fie[ʃ] yegua</td>
<td>..................</td>
</tr>
</tbody>
</table>

As the data in (126) and (127) show, slow speech is generally characterized by absence of place assimilation; in each case the phoneme /n/ is realized phonetically as [n] and /l/ is realized [l]. Allegretto speech is generally characterized by total place assimilation.

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7 Hualde (1989a) identifies the allophone which occurs before /l/ as distinct from the one which precedes /l/. I take the position here that all nasal [+coronal, -anterior] places of articulation are "palatal."
assimilation.\(^8\) In Andante speech, the nasal and obstruent gestures are allowed to overlap. It should be noted, however, that certain types of nasal-obstruent overlap are impossible because they involve the same articulator. Obviously a single articulator cannot be in two places at once. Therefore all the coronal allophones of /\textipa{n}/ - that is, [n], [\textipa{n}], [\textipa{n}], and [\textipa{n}] - cannot be coarticulated with another coronal segment. This observation follows from the one made by Sagey (1986: 28). The tokens containing coronal allophones are therefore phonetically the same in Andante and Allegretto speech.

As with the nasals, the coronal allophones of /\textipa{l}/ have the same basic realization in both Andante and Allegretto speech, the main exception being that lateral coarticulation is impossible. In addition, /\textipa{l}/ cannot place-assimilate to a noncoronal consonant for physiological reasons.

3.1.2 The Spreading imperative

Feature spreading in any language for whatever reason requires a “spreading imperative” (cf. Padgett 1996: 20-21). In autosegmental phonology this imperative is achieved by means of a “spreading rule” such as the one in (128). In OT, there can be no “rule” of assimilation; rather, the constraint system must be designed to suppress all candidates which fail to show the effect of assimilation, namely homorganicity. In this study, the preferability of candidates containing homorganic clusters to those without is determined by the relative ranking of five MARK and FAITH constraints: LICENSE-PLACE, *COMP-SEG, ONSET-PLACE, LAT-COR, and IDENT [place]. These constraints are

---

\(^8\) Navarro Tomás (1967: 118) points out that the nasal sequence /\textipa{nm}/ - found in such words as inmediato and iminivil - is exceptional in that it does not allow total place assimilation to occur, even in most Allegretto style. Total assimilation is perceived by the listener, even though the coronal gesture is still physically present. He observes:

En el grupo \textipa{nm} la articulación de la primera consonante, en la conversación ordinaria, va generalmente cubierta por la de la \textipa{m}: la lengua realiza, de manera más o menos completa, el contacto alveolar de la \textipa{n}; pero al mismo tiempo la \textipa{m} forma su oclusión bilabial, siendo en realidad el sonido de esta última el único que acústicamente resulta perceptible.

Hualde (1989a: 19) disagrees with NT’s assessment, arguing that the sequence /\textipa{nm}/ may be realized as a geminate [\textipa{mm}], thus conmigo --> co[\textipa{nm}][\textipa{m}i]go or co[\textipa{mm}][\textipa{m}i]go.

Hams (1969, 1984b) and Hualde (1989a) note similar restrictions on the sequence /\textipa{mm}/, which may be found in words like alumno and himno. These clusters resist assimilation altogether, and in discussions of nasal-nasal assimilation are usually isolated as exceptions (cf. Hualde 1989a: 22).
summarized in (128). Each will be discussed further as appropriate.

(128) Summary of new constraints

LICENSE-PLACE "The place node of a coda consonant must be linked to a syllable onset."\(^9\)

In order to be "licensed," the place node of a coda consonant must have a "path" - via structural linking - to a syllable onset (cf. Padgett 1996: 16). In un beso u[n.b]eso, LICENSE-PLACE is not satisfied because there is no path from the place node of coda consonant [n] to the onset of the following syllable onset [b]. In un beso u[nm.b]eso and u[m]beso, however, this condition is met. (LIC-PLACE)

*COMP-SEG "No complex segments are allowed."\(^10\)

Every time a segment contains two of one type of structural node - whether class, place, or terminal - it is considered structurally complex and violates *COMP-SEG.

ONSET-PLACE (cf. Padgett 1996) "Onset place features have input correspondents."\(^11\)

This constraint expresses the tendency in language to assimilate coda consonants to onset consonants, but not vice-versa. The realization u[m.b]eso (un beso) satisfies ONSET-PLACE. The realization *u[nd]eso, however, violates this constraint, because the coronal place node of the onset [d] has no input correspondent. (ONS-PLACE)

LAT/COR "All laterals are coronal."

This constraint winnows out only those laterals which are coronal; it rejects those which are labial or dorsal (cf. Hualde 1989a: 23).

\(^9\) See Pulleyblank (1997) for a different approach to place assimilation.

\(^10\) This constraint is inspired by Clements & Hume's (1995: 255) No Branching Constraint, cited below: "Configurations of the form

\[ A \rightarrow B C \]

are ill-formed, where A is any class node (including the root node, A immediately dominates B and C, and B and C are on the same tier."

IDENT [place] “Underlying place features are retained in the output.”

This constraint competes with LIC-PLACE. While LIC-PLACE enforces homorganicity of coda nasals to onset consonants, IDENT [place] ensures the faithful realization of the underlying place features. For example, in u[m]beso, IDENT [place] is violated. In u[n]beso, it is satisfied.

The constraint LIC-PLACE is motivated by evidence from many languages. For example, Itô (1986: 20-21) notes that in her native Japanese, syllable codas are systematically disallowed unless they are “doubly linked” such that their place node is linked to the onset of the following syllable. Allowable structures therefore include homorganic nasal-stop clusters as well as geminates (see 129).


<table>
<thead>
<tr>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>sen.see.</td>
<td>‘teacher’</td>
</tr>
<tr>
<td>kam.pai.</td>
<td>‘cheers’</td>
</tr>
<tr>
<td>sek.ken.</td>
<td>‘soap’</td>
</tr>
<tr>
<td>kap.pa.</td>
<td>‘legendary being’</td>
</tr>
<tr>
<td>*kap.sek.</td>
<td></td>
</tr>
<tr>
<td>*sek.pa.</td>
<td></td>
</tr>
<tr>
<td>*kap.ta.</td>
<td></td>
</tr>
</tbody>
</table>

Itô’s observation bears on a similar one made by Steriade (1982) for Attic Greek:

An obstruent can be syllabified as a coda only if it is segmentally linked to the following C.

Steriade’s principle applies to consonant clusters in general. It is not required that the coda consonant be part of a geminate, only that the place node of this coda consonant be linked to the following consonant, which occupies onset position. The principle does not specify how the obstruent must be linked to the following consonant. Padgett’s (1996)
LICENSE constraint, here called LIC-PLACE, specifies how such linkage must be achieved. The place node of the coda consonant must be parsed by the root node of the following (onset) consonant. To illustrate this structure, two examples are given in (130). Example (130a) depicts a consonant cluster in which LIC-PLACE is violated. Example (130b) depicts one in which this constraint is satisfied.

(130) LICENSE-PLACE violation and satisfaction: un beso

a. u[mb]eso

b. u[mb]eso

In Spanish, LIC-PLACE may be violated in some styles but must be satisfied in others. For example, in Largo speech, LIC-PLACE may be violated in order to satisfy any number of constraints on feature faithfulness. In Allegretto style, however, LIC-PLACE is satisfied at the expense of place faithfulness. The principle of homorganicity across heterosyllabic consonant clusters (as expressed by LIC-PLACE) holds almost uniformly for Spanish, but not quite. Unlike Japanese and Attic Greek, Spanish does allow heterorganic clusters between syllables; recall the unassimilated cluster in e[l.g]orila, and also many others not yet mentioned, such as combinations of /r/ or /s/ plus stop: marca -> ma[r.k]a. vasco -> va[s.k]o. This analysis will show that coda licensing may be blocked when
faithfulness to an underlying place node is indicated by a higher-ranked constraint.\textsuperscript{12}

3.1.3 LICENSE-PLACE and consonant release

Padgett (1996) makes a series of important observations which must be incorporated into any detailed discussion of place assimilation. First, a consonant transitioning into a vowel (syllable nucleus) is considered to be "released." A consonant transitioning into another consonant, however, is considered to be "unreleased," \textit{unless} it shares a place node with the following released segment. Release is viewed as a characteristic of any consonant in syllable onset position. Not every consonant is released, however. A consonant occupying a syllable coda does not transition into a syllable nucleus, but rather into a syllable onset. Two types of consonant positions within the syllable, released and unreleased, are illustrated in (131).

\begin{align*}
\text{(131) Consonant release} \\
\text{a. } C_1 \text{ is unreleased} & \quad \text{b. } C_1 \text{ is released} \\
C_2 \text{ is released} & \quad C_2 \text{ is released}
\end{align*}

\begin{center}
\begin{tikzpicture}
\node at (0,0) {$C_1$};
\node at (1,0) {$C_2$};
\node at (2,0) {$V$};
\draw (0,0) -- (1,0);
\node at (0,-1) {$P$};
\node at (1,-1) {$P$};
\end{tikzpicture}
\begin{tikzpicture}
\node at (0,0) {$C_1$};
\node at (1,0) {$C_2$};
\node at (2,0) {$V$};
\draw (0,0) -- (1,0);
\node at (0,-1) {$P$};
\end{tikzpicture}
\end{center}

where $C_1$ = a consonant not syllabifiable as onset
and $C_2$ = a consonant syllabifiable as onset.

Diagrams (131a) and (131b) show two consonants, $C_1$ and $C_2$, preceding a vowel. $C_2$ is the onset of the syllable and is therefore released. $C_1$, for some reason of sonority

\begin{itemize}
\item \textsuperscript{12} "Licensing" may be satisfied by other forms of linking besides place assimilation. For example, the coda $s$ in rasgo $\rightarrow$ ral[st] is licensed because it is linked to the laryngeal node of the following consonant, thereby satisfying a different LICENSE constraint: LICENSE \textit{(LARYNGEAL)}. Such alternative forms of LICENSE satisfaction will be discussed in due course.
\end{itemize}
sequencing, cannot be incorporated into this syllable. Because it transitions into a consonant rather than a vowel, it is unreleased; this is the circumstance diagrammed in (131a). Nevertheless, C₁ may become released "by association" if it becomes linked to C₂ in such a way that its place node is parsed by the root node of C₂. Such release by association is shown in (131b). The necessary association to guarantee release is achieved by place assimilation.

That all coda consonants place-assimilate whenever they can indicates that release is a desirable characteristic for consonants. Place assimilation brings an unreleased consonant into structural association with a released consonant. Not all coda consonants are associated structurally with released consonants in this way, indicating that licensing associations are subject to restriction.

Padgett's observations regarding consonant release allow the key generalization of place assimilation to be expressed: where assimilation occurs, it is always the released consonant - i.e. the one which is a syllable onset - which acts as the trigger. Where place assimilation is permitted, it proceeds from right to left, regardless of the featural identities of the segments involved. Herein lies the motivation for the constraint ONS-PLACE.

Padgett (1996), Jun (1996b), and others have argued for a constraint of this general type to express the fact of directionality in place assimilation. Whereas LIC-PLACE compels assimilation, it makes no provision for the source or target of assimilation. Indeed, assimilation from left to right or from right to left satisfies LIC-PLACE. The constraint ONS-PLACE is therefore necessary to ensure that place features are spread leftward from the released consonant to the unreleased consonant, and not the other way around.

ONS-PLACE operates as follows. First, it scans the output string for consonants which are released. For each released consonant found, it checks to make sure that the consonant's output place features have input correspondents. If so, then ONS-PLACE is satisfied. Structures in violation and in satisfaction of the constraint are diagrammed in (132).
Diagram (132a) portrays a right-to-left place assimilation. The released segment in the cluster is [b]. Because the labial place node of [b] is also present underlyingly, ONS-PLACE is satisfied. Diagram (132b) also portrays place assimilation, but in this instance, it is left-to-right. The released segment, [d], has acquired its coronal place node from the preceding [n], and therefore violates ONS-PLACE.

3.1.4 Assimilation and overlap: some articulatory considerations

In a previous section it was argued that the "spreading imperative" may be achieved by the constraint LIC-PLACE. Like many constraints, LIC-PLACE may be violated in order to satisfy higher-ranked constraints. In Spanish, place assimilation fails precisely when LIC-PLACE satisfaction violates such a higher-ranked constraint, or when LIC-PLACE may be satisfied in a way which causes less structural insult than place assimilation. The notion of "less" is determined, of course, by the ranking of the constraints themselves.

In order for the range of variation observed for Spanish place assimilation to be sufficiently described, the grammar must accommodate three alternatives: 1) no place assimilation; 2) partial place assimilation; and 3) total place assimilation. Of these alternatives, 1 and 3 are straightforward. Alternative 2, however, is - for lack of a better
term - fuzzy. The notion “partial” permits any degree of overlap between the two articulatory gestures involved.

(133) Three types of gestural overlap (cf. Browman & Goldstein 1990)

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>no overlap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>partial overlap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>total overlap</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure (133) illustrates the range of possible gestural overlap between two extremes, 0% and 100%. In instances of no (0%) overlap, place assimilation does not occur: cf. un beso u[nb]eso. In cases of partial overlap, gestures may be overlapped, but neither gesture is omitted. Even if total overlap were possible in human speech, it would fail to serve any economizing purpose, because one of the gestures would be acoustically “masked” by the other, as argued by Browman & Goldstein (1990: 53):

In general, given comparable overlap patterns, the more extreme the constriction associated with a gesture, the better able that gesture is to acoustically mask (or aerodynamically interfere with) another gesture with which it is cooccurring. Thus, overlap by a following consonant (stop or fricative) gesture would be most able to contribute to hiding of an alveolar closure gesture.

This observation concurs with the one made by Navarro Tomás regarding nasal overlaps: the “extreme” constriction associated with a consonant in syllable onset position acoustically masks the gesture immediately preceding it.

In the approach taken here, the grammar itself does not distinguish between “degrees” of overlap. Instead, a constraint ranking which selects overlap as the optimal

13 Total overlap is arguably unachievable in speech because it requires a perfect coordination of gestures, something even skilled speakers are probably incapable of (Keith Johnson, personal communication).
phasing between two segments specifies merely that overlap is permitted. Varying degrees of overlap are the result of idiolectal differences.

Let us return to the question of acoustic masking, raised by Browman & Goldstein (1990) in their discussion of gestural overlap. What exactly happens to a gesture whose acoustic effect is masked by another? Boersma (1997a: 3) maintains that languages generally tend to eliminate any linguistic material which is superfluous, in order to minimize articulatory effort. Along these same lines, Jun (1996b) proposes a Production Hypothesis of acoustic salience (see 134).

(134) Production Hypothesis (Jun 1996b: 224)

Speakers make more effort to preserve the articulation of speech sound with powerful acoustic cues, whereas they relax in the articulation of sounds with weak cues.

On this Hypothesis, Jun comments that

...speakers are reluctant to exert effort on segments which present inherent acoustic weaknesses, since their preservation would not be very helpful for their perception (224).

This hypothesis can be applied to the notion of total place assimilation. In a partially overlapped nasal sequence - such as the \[\text{[nm]}\] in \[\text{ul[nm]beso}\] or the \[\text{[nm]}\] in \[\text{u[nm]foro}\], for example - the acoustic cues of the coronal gesture are partially masked by those of the labial gesture (recall Navarro Tomás 1967). Nevertheless, because the overlap is partial, both segments are acoustically salient. In cases where the gestures are nearly 100% overlapped, the consonant gesture associated with the weaker acoustic cues - i.e. the \[\text{[n]}\] - is less salient. At the same time, the strong consonant gesture associated with the syllable onset is retained. Total overlapping of gestures in rapid speech constitutes a wasted effort; instead, it is more economical to eliminate the acoustically masked gesture on the grounds that it serves no function. The result is a speech style in which categorical
segmental deletion is permitted: u[m]beso, u[m]foro, co[g]ganas.

In summary, partial place assimilation is gradient, allowing a range of degrees of articulatory overlap. Total place assimilation is not possible in practice. Even if it is achieved approximately, it has no real functional value for the speaker, because of its eclipsing effect on acoustic information. Rather than place-assimilate a segment totally, one of the gestures - the acoustically weaker one - may be deleted (cf. Jun 1996a, 1996b).

3.1.5 An OT account

Place assimilation is always categorical within words; i.e. in this context there is no stylistic choice available to speakers. In addition to being categorical, assimilation is also total; i.e. nasals and laterals may not be realized heterorganically or coarticulated, as is the case in assimilation across a morpheme or word boundary. For word-internal place assimilations, the ranking IDENT [nas] . IDENT [lat]. MAX-IO » LIC-PLACE » IDENT [place] is indicated (see 135 and 136).

(135) Word-internal nasal place assimilation (categorical)

<table>
<thead>
<tr>
<th>Ariunfo/ IDENT [nas]</th>
<th>MAX-IO LIC-PLACE IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. trjun.fo.</td>
<td>*1</td>
</tr>
<tr>
<td>b. trjun.fo.</td>
<td></td>
</tr>
<tr>
<td>c. trj[u]n.fo.</td>
<td>*1</td>
</tr>
<tr>
<td>d. trjuf.fo.</td>
<td>*1</td>
</tr>
</tbody>
</table>

(136) Word-internal lateral place assimilation (categorical)

<table>
<thead>
<tr>
<th>kaldero/ IDENT [lat]</th>
<th>MAX-IO LIC-PLACE IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kal.de.ro.</td>
<td>*1</td>
</tr>
<tr>
<td>b. kal.de.ro.</td>
<td></td>
</tr>
<tr>
<td>c. kal[i].de.ro.</td>
<td>*1</td>
</tr>
<tr>
<td>d. kad.de.ro.</td>
<td>*1</td>
</tr>
</tbody>
</table>
IDENT [nas] and IDENT [lat] are "manner" constraints in that they monitor the manner of articulation of a segment, rather than the place. The rankings IDENT [lat] » IDENT [place] and IDENT [nas] » IDENT [place] ensure that the manner features [+nasal] and [+lateral] of a coronal segment are realized in the output. Likewise, assimilation of the nasal or lateral to the following released segment (rather than vice-versa) is ensured by the ranking ONS-PLACE » IDENT [place], as shown in (137).

\[(137)\] Directionality of nasal place assimilation enforced

```
/trujunfo/  ONS-PLACE LIC-PLACE IDENT [place]
```

<table>
<thead>
<tr>
<th></th>
<th>ONS-PLACE</th>
<th>LIC-PLACE</th>
<th>IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>trjunfo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>trjunfo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>trjunso.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In (137), both candidates (137b) and (137c) violate IDENT [place]. Candidate (137c), however, also violates higher-ranked ONS-PLACE, and is therefore rejected as a viable output. Optimal candidate (137b) violates only low-ranked IDENT [place]. As predicted by this tableau, morpheme-internal place assimilation is both compulsory and total.

Across a morpheme boundary, the number of place assimilation choices increases to three (non, partial, total). This limitation will be attributed to a constraint against place linkages spanning morpheme as well as word boundaries. This constraint, an alignment constraint (cf. McCarthy & Prince 1993b), aligns prosodic and feature structure so as to prevent such linkages (see 138).

\[(138)\] ALIGN (morpheme, left, place, left) (cf. McCarthy & Prince 1993: 2)

"Every morpheme is left-aligned with a place node."

Because ALIGN requires every morpheme to be left-aligned with a place node, place nodes shared across morpheme or word boundaries violate ALIGN (see 139).
(139) ALIGN violation and satisfaction

a. violation

The linked structure in (139a) violates ALIGN because the left edge of the morpheme (morph) is not aligned with the left edge of a place node. The left edge of the place node is the leftmost segment to which it is linked. In (139b), ALIGN is satisfied because the left edge of the morpheme forms a “crisp edge” with the labial place node.14

ALIGN and LIC-PLACE are in competition. In Largo speech, this competition is resolved in favor of ALIGN. Thus Largo must be characterized by the ranking ALIGN » LIC-PLACE (see 140 and 141).

(140) Largo: ALIGN » LIC-PLACE: un foro

<table>
<thead>
<tr>
<th></th>
<th>/un foro/</th>
<th>IDENT [nas]</th>
<th>MAX-IO</th>
<th>ALIGN</th>
<th>LIC-PLACE</th>
<th>IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>un.f.o.ro.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>un.f.o.ro.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>uf.f.o.ro.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>u[f].f.o.ro.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14 For a thorough OT discussion of place alignment and “crisp edges” shared by phonological and prosodic categories, the reader is referred to Ito and Mester (1994).
While ALIGN rejects any candidate containing place-linkage across a morpheme boundary (140), this constraint is inactive in assimilation morpheme-internally. In the case of *triunfo* (141), therefore, ALIGN pays no attention to the place-linkage between [n] and [f], because it is morpheme-internal. As a result, total place assimilation is assured.

In order for place assimilation to be enforced across word boundaries, as is the case in Andante and Allegretto, LIC-PLACE must rank above ALIGN. In this analysis, it is maintained that LIC-PLACE (a MARK constraint), is an FC. It may rank either above or below ALIGN. The ranking LIC-PLACE » ALIGN » IDENT [place] will enforce partial place-assimilation across morpheme boundaries (see 142).

As shown by earlier data, nasal-stop sequences are realized with total place assimilation in Allegretto speech. The two types of place assimilation, partial and total, may be accounted for by the ranking of COMP-SEG relative to IDENT [place]. In Andante, partial assimilation (coarticulation) is maintained by the ranking IDENT [place] » COMP-SEG.
SEG. In Allegretto, total assimilation is maintained by the ranking *COMP-SEG » IDENT [place]. *COMP-SEG is assigned FC status. As defined in an earlier section, *COMP-SEG bans any segment with more than two nodes on the same representational tier, thereby enforcing structural simplicity. This intermediate variety satisfies both LIC-PLACE and IDENT [place], in which case the ranking LIC-PLACE » ALIGN » IDENT [place] selects a partially assimilated output. Tableau (143) is identical to (142), with the constraint *COMP-SEG added for completeness. Tableau (144) presents the Allegretto evaluation for the same input.

(143) Andante: LIC-PLACE » IDENT [place] » *COMP-SEG: un foro

<table>
<thead>
<tr>
<th>/un foro/</th>
<th>IDENT [nas]</th>
<th>LIC-PLACE</th>
<th>ALIGN</th>
<th>IDENT [place]</th>
<th>*COMP-SEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. un foro ro.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. um foro ro.</td>
<td></td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. u[n].fo.ro.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. unmp foro ro.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. uf fo.ro.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(144) Allegretto: LIC-PLACE » *COMP-SEG » IDENT [place]: un foro

<table>
<thead>
<tr>
<th>/un foro/</th>
<th>IDENT [nas]</th>
<th>LIC-PLACE</th>
<th>ALIGN</th>
<th>*COMP-SEG</th>
<th>IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. un foro ro.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. um foro ro.</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. u[n].fo.ro.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. unmp foro ro.</td>
<td></td>
<td>*</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>e. uf fo.ro.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

So far in this section, discussion of place assimilation has focused on the place assimilation of nasals. The key dominance relations ONS-PLACE » LIC-PLACE » IDENT

---

15 See Padgett (1996) for a detailed implementation of the constraint *COMP-SEG in the description of partially- and totally-assimilated segments.
[place] motivates place assimilation not just of nasals, but of laterals as well. Indeed, only one additional constraint is needed to fully describe lateral assimilation: the constraint LAT/COR. The interaction of these constraints is shown in the following tables for two tokens, *el beso* and *el chiste*. The first token refuses place assimilation because of LAT/COR. The second allows place assimilation. Note that gestural overlap is not an option in lateral assimilation, as one coronal gesture cannot overlap another, because both occupy the same tier (recall Sagey 1986).

(145) Largo: *el beso*

<table>
<thead>
<tr>
<th>/el beso/</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONS- PLACE</td>
</tr>
<tr>
<td>IDENT [lat]</td>
</tr>
<tr>
<td>MAX- IO</td>
</tr>
<tr>
<td>LAT/COR</td>
</tr>
<tr>
<td>ALIGN</td>
</tr>
<tr>
<td>LIC- PLACE</td>
</tr>
<tr>
<td>a. el.be.so.</td>
</tr>
<tr>
<td>b. el.le.so.</td>
</tr>
<tr>
<td>c. eb.be.so.</td>
</tr>
<tr>
<td>d. el lab.be.so.</td>
</tr>
<tr>
<td>e. el.lat.e.so.</td>
</tr>
<tr>
<td>f. e[1].be.so.</td>
</tr>
</tbody>
</table>

In Largo, assimilation is usually banned on the basis of the ranking ALIGN » LIC- PLACE. As tableau (145) shows, ALIGN is inactive on the set of candidates because any attempt to place-assimilate the sequence [lb] violates one of the three higher-ranked constraints ONS-PLACE, IDENT [lat], or LAT/COR. In Andante speech (tableau 146), LIC-PLACE raised above ALIGN, place-assimilated candidates are still ruled out by the same higher-ranked constraints.
In instances of place assimilation within the coronal articulator node (such as *el chiste* ---> *e[ᵢ] chiste*), **ALIGN** acts decisively in Largo to ban assimilation (see 147).

(147) **Largo: el chiste**

<table>
<thead>
<tr>
<th>/el chiste/</th>
<th>IDENT</th>
<th>MAX-IO</th>
<th>ALIGN</th>
<th>LIC-PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>/el chiste/</td>
<td>[lat]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. el.čis.te.</td>
<td></td>
<td>* !</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. e[ᵢ].čis.te.</td>
<td>* !</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ec.čis.te.</td>
<td></td>
<td></td>
<td>* !</td>
<td></td>
</tr>
<tr>
<td>d. el.lis.te.</td>
<td>* !</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. e[ᵢ].lis.te.</td>
<td></td>
<td></td>
<td>* !</td>
<td></td>
</tr>
</tbody>
</table>

In Andante, **LIC-PLACE** ranks above **ALIGN**, thereby forcing violation of the latter constraint (see 148).

(148) **Andante: el chiste**

<table>
<thead>
<tr>
<th>/el čiste/</th>
<th>IDENT</th>
<th>MAX-IO</th>
<th>LIC-PLACE</th>
<th>ALIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>/el čiste/</td>
<td>[lat]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. el.čis.te.</td>
<td></td>
<td>* !</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. e[ᵢ].čis.te.</td>
<td>* !</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ec.čis.te.</td>
<td></td>
<td></td>
<td>* !</td>
<td></td>
</tr>
<tr>
<td>d. el.čis.te.</td>
<td>* !</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. e[ᵢ].čis.te.</td>
<td></td>
<td></td>
<td>* !</td>
<td></td>
</tr>
</tbody>
</table>
In this section, place assimilation of nasals and laterals was accounted for by the ranking LIC-PLACE » IDENT [place]. Morpheme-internally, place assimilation is both categorical and total. Across morpheme boundaries - i.e. in connected speech - it is gradient. The gradience of assimilation in connected speech is determined by the FC LIC-PLACE and its relationship to ALIGN. Under the ranking ALIGN » LIC-PLACE, place linkages across morpheme boundaries are banned, as is the case in Largo style. The ranking LIC-PLACE » ALIGN forces place linkages across morpheme boundaries. Partial linkages satisfy IDENT [place] but violate *COMP-SEG. Total linkages satisfy *COMP-SEG but may violate IDENT [place]. Because the complex linkages are not categorically enforced or banned across styles, it is maintained that *COMP-SEG (a MARK constraint) is an FC.

Fixed constraint relations include those between the manner and place constraints: these relations are constant regardless of style: IDENT [nas] » IDENT [place] and IDENT [lat] » IDENT [place]. Likewise, the ranking LIC-PLACE » IDENT [place] is independent of style. In order to ensure that all lateral allophones are coronal, LAT/COR must also categorically dominate LIC-PLACE. These relations are summarized in diagram (149).

(149) Constraint hierarchy for nasal and lateral place assimilation

| ONS-PLACE | LIC-PLACE | ALIGN | IDENT [place] | *COMP-SEG |
| MAX-IO | IDENT [nas] | IDENT [lat] | LAT/COR |

Based on this analysis, the following typological predictions can be made (150).

(150) Typological predictions

a. ONS-PLACE » LIC-PLACE

Only coda consonants place-assimilate.
3.2 Nasal neutralization, place faithfulness, and assimilation

The first section of this chapter focused on the assimilation of nasals to a following consonant. In Andante and Allegretto styles, such clusters are homorganic (as required by the FC LIC-PLACE), with the place node of the released consonant spreading to the nasal (enforced by ONS-PLACE). In syllable onset, the nasals generally maintain distinct place features; cf. the oft-cited minimal triad *cana, caña, cama*, realized with alveolar, palatal, and bilabial articulation, respectively. In the Allegretto style of many dialects, underlying nasal place is preserved before any vowel, and relinquished before any consonant. In other positions, specifically phrase-finally, however, nasals neutralize, or fail to be contrastive. The default place of articulation for utterance-final nasals varies across dialects, but is always either [n] or [g]. In no dialect is [m] or [p] the default nasal.

In Castilian Spanish, the default point of articulation of utterance-final final nasals is coronal: [n], thus *álbum* -> álb[u][n]. *footing* -> footi[n], etc. Before a consonant,
however, place assimilation holds as expected: álbu[n] lleno, footi[m] práctico. In a so-called “velarizing” dialect such as Cuban, these same words would be realized with [ŋ] as the default coda nasal, and with a velarized-assimilated overlap before a consonant, thus: álbu[ŋ], footi[ŋ], but álbu[ŋ] lleno, footi[m] práctico. Three processes are therefore in competition in any Spanish dialect: 1) place faithfulness (onset); 2) place assimilation (codas, before a consonant); and 3) neutralization (elsewhere).

I will call dialects which favor [n] in neutralization “alveolarizing” so as to contrast them with “velarizing” dialects. I will abbreviate them A-dialects and V-dialects, respectively.

Nasal place neutralization is generally defined as a lexical rule which affects nasals which are word-final. In connected speech, neutralized nasals resyllabify as syllable onsets before a vowel, and may be place-assimilated before a consonant. Resyllabification and nasal place assimilation are both postlexical rules, which apply across word boundaries as well as within words. Hualde (1991a: 67-68) formulates two nasal neutralization rules, both of which apply in syllable coda ((R)hyme, in his notation), in the noncyclic lexical stratum. These rules obligatorily apply after word-level syllabification (see 150).

(150) Nasal place neutralization in syllable coda (Hualde 1991a: 67-68; cf. also Harris 1991a: 182)

a. Nasal neutralization

\[ [+\text{nasal}] \rightarrow [+\text{coronal}] / \]

b. Nasal velarization

\[ [+\text{nasal}] \rightarrow [+\text{back}] / \]

Hualde (1991a) argues that in an A-dialect, Nasal Neutralization applies but Nasal Velarization does not. In a V-dialect, Nasal Neutralization and Velarization apply in sequence. To illustrate this rule interaction, sample derivations of pan and pan pequeño in
a V-dialect are provided in (151).16

(151) Neutralization and Velarization in a V-dialect (based on Hualde 1991a: 68; cf. also Harris 1991a: 183)

<table>
<thead>
<tr>
<th>Word-level strata</th>
<th>Word</th>
<th>Syllabl (1st cycle)</th>
<th>Neut (50a)</th>
<th>Syllabl (2nd cycle)</th>
<th>Velarizn (150b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>[pan.]</td>
<td>OK</td>
<td>OK</td>
<td>[paŋ.]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[pan.] [a.lemán]</td>
<td>OK</td>
<td>OK</td>
<td>[paŋ.] [a.lemán]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[pan.] [pekeño]</td>
<td></td>
<td></td>
<td>[paŋ.] [pekeño]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Postlexical stratum</th>
<th>Nasal Assim</th>
<th>Resyllab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/A</td>
<td>OK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[paŋ.] [paŋ.] [a.lemán] [paŋ.] [pekeño]</td>
</tr>
</tbody>
</table>

As shown in (151), a velarized nasal surfaces in syllable coda [paŋ.], resyllabified as a syllable onset [paŋ.], or in syllable coda with assimilation to a following consonant [paŋ.]. In an A-dialect, the Velarization rule is omitted, and these same forms emerge with [n]: [pan.], [paŋ.], [paŋ.].

Hualde's analysis assumes that Nasal Neutralization occurs both in A-dialects and V-dialects. Harris (1984b) takes a somewhat simpler approach. In his treatment, word-final nasals delink their place node, and are subsequently assigned place by a dialect-specific redundancy rule (see 152 and 153).

---

16 The focus of Hualde's (1991a) study is Chinato, a V-dialect spoken in the province of Cáceres, Spain. The observations he makes, however, apply to V-dialects in general.
As shown in (152), a rhyme (coda) nasal first delinks its place node \( P \). In (153), the placeless nasal is then assigned either a \([\text{dorsal}]\) place of articulation (153a) or a \([\text{coronal}]\) place of articulation (153b). This approach is preferable to Hualde's, because it defines Neutralization as a place delinking process rather than a place substitution process (recall that in Hualde's analysis, Neutralization assigns the value \([\text{coronal}]\) to all coda nasals). This way, the step in V-dialects in which coda nasals are made \([\text{coronal}]\) before being made \([\text{dorsal}]\) is eliminated. Default place is assigned by dialect-specific rules.

In a serial approach such as the one espoused by Harris and Hualde, nasal neutralization does not apply word-internally because Neutralization feeds Nasal place assimilation. Word-internally, therefore, coda nasals are place-assimilated to a following consonant (e.g. *campo ca[m]po, banco ba[g]ko*). At the end of a word, coda nasals are neutralized in Largo speech, and variably place-assimilated in Andante and Allegretto.
speech. Of course, onset nasals do not satisfy the structural description of the Neutralization rule (152), and are left alone (e.g. cana, cama, caña). The cleanest look at neutralized nasals is made phrase-finall y (i.e. when no consonant follows; e.g. María come pa[g]).

As shown in the foregoing discussion, it is generally accepted that Nasal Neutralization (the process effected by rules 152 and 153 in conjunction) is a word-level one, which may be followed by either of two postlexical, or phrase-level rules: Resyllabification and Nasal place assimilation. Whereas Neutralization is a categorical process, Nasal place assimilation is a variable one. Although both A-dialects and V-dialects allow Nasal place assimilation, there is a crucial difference in the types of assimilation allowed in each dialect. Recall that in A-dialects, nasal place assimilation may be either partial or total; thus un beso is realized [unm.be.so.] in Andante, and [um.be.so.] in Allegretto (cf. Harris 1969). In V-dialects, however, total assimilation does not generally occur. In these dialects, un beso has but one fast speech realization: u[m]beso, and totally assimilated u[m]beso is unallowed. Of course u[g]beso, without assimilation, is permitted in Largo speech.18

This fundamental difference between the assimilation types allowed in A- and V-dialects is shown in (154). Sample derivations of the sequence pan pequeño, with nasal place assimilation, are given for both A-dialects and V-dialects. Overlapped segments are

17 In some V-dialects, such as Panamanian, velarization occurs optionally within morphemes in addition to morpheme-finally. This type of velarization occurs only before [+continuant] consonants; before [-continuant] consonants, nasal assimilation follows the “normal” pattern (Ceder gren & Sankoff 1975; López Morales 1981; Alvarado de Ricord 1971).

18 Hualde (1989a: 21) states that in V-dialects, the operation responsible for delinking the underlying place node of a coda nasal is typically blocked (bloqueado), thereby preventing total assimilation altogether. Guitart (1976: 22) observes that in Havana Spanish, word-final nasals may be place-assimilated to a following consonant, the result of which is a “co-articulation where a dorso-velar element is always present.” See also Hualde (1991a: 68).
indicated by a subscript tie.

(154) Nasal place neutralization and assimilation: pan pequeña

a. A-dialect pattern

Word-level
Syllab [pan] [pekeño]
Neut (152, 153a) n

Postlexical
Nas assim (125a) [pam.pe.ke.no.] → Andante
Delinking (125b) [pam.pe.ke.no.] → Allegretto

b. V-dialect pattern

Word-level
Syllab [pan] [pekeño]
Neut (152, 153b) η

Postlexical
Nas assim (125a) [pam.pe.ke.no.] → Andante
Delinking (125b) BLOCKED

In both dialect types, Neutralization (152, 153) precedes Nasal place assimilation. In both dialects, the Nasal assimilation rule (125a) applies variably. The output of this rule is a partially-assimilated nasal, consistent with Andante speech style: [pam.pe.ke.no.] in A-dialects, [pam.pe.ke.no.] in V-dialects. In A-dialects, the output of Nasal assimilation may be fed into Delinking (125b), which delinks the underlying place node of the coda nasal. In this case, the output is [pam.pe.ke.no.], consistent with Allegretto style.

In V-dialects, the Delinking rule (125b) is not available, and total place assimilation is therefore banned in these dialects. V-dialects have a unique fast speech output: partially
assimilated [pam. pe. ke. no.].

Although Nasal place assimilation may be accompanied by Delinking in A-dialects, in V-dialects, there is tension between place assimilation of syllable-final nasals on the one hand, and neutralization of word-final nasals on the other. When these two contexts coincide, velarization must be satisfied regardless of style. In connected speech styles, partial assimilation emerges as a stylistic compromise, brought about by pressure from competing constraints.

3.2.1 Constraints on nasal place

In the serial approaches reviewed so far, Neutralization need only target a coda nasal. It is not necessary to stipulate that the nasal be word-final, because the subsequent Place assimilation rule uniformly place-assimilates all coda nasals which are word-internal. Thus, at an intermediate level of representation, the word bombón is realized with two neutralized nasals; in an A-dialect, both coda nasals are [coronal] at this stage: [bon.bon.]. This output is then fed to Nasal place assimilation, which adjusts the place of the first nasal, but not the second. The output is [bom.bón.] Word-internally, Neutralization is rendered opaque by the subsequent application of Place assimilation.

In V-dialects, a neutralized nasal is resyllabified as the onset of the next syllable if it precedes a word which is vowel-initial (recall [pa.ga.le mâg.]). This distribution is achieved by ordering the phrase-level Resyllabification rule after the word-level Neutralization rule. In A-dialects, however, Resyllabification and Neutralization are arguably both phrase-level, and in that order. This ordering allows Resyllabification to bleed off possible inputs to Neutralization, and thereby prevent neutralized nasals from appearing in syllable onset. In both dialect types, Neutralization precedes Place assimilation, also a phrase-level rule.
If both varieties of Neutralization were handled in the same stratum, then incorrect results would be given. For example, if A-dialects underwent Neutralization at the word level as do the V-dialects, then the false output *álbu[n]hermoso would indicated. If V-dialects underwent Neutralization at the phrase level, then the output would be the incorrect *álbu[m]hermoso.

An OT analysis cannot rely on distinctions between domains of rule applications, or envision surface-opaque intermediate representations to account for dialectal differences of the type outlined here. Let us say, for instance, that Neutralization is effected by a set of ranked constraints, each of which bans a different nasal place from coda position. In A-dialects, the lowest-ranked constraint would be the one which bans [coronal] nasals. In V-dialects, the lowest-ranked constraint would be the one which bans [dorsal] nasals. If this subhierarchy was in turn ranked below L1C-PLACE, then place assimilation of coda nasals would be enforced within words, and neutral place would emerge at the end of a word.

This approach would fail to explain the fact that in V-dialects, neutralized nasals appear in syllable onset before a vowel (recall the [ál.bu.ϕε.r.mo.so.] example in 155). In serial model, this distribution is the result of Resyllabification. Obviously it is not the case that Neutralization applies in all codas and some onsets; rather, it applies in codas at the word level, and then feeds Resyllabification, which shifts the neutralized nasals to onset.

<table>
<thead>
<tr>
<th>Rule ordering in A-dialects and V-dialects</th>
<th>A-dialects</th>
<th>V-dialects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>input</strong></td>
<td>[álbum][er.moso]</td>
<td>[álbum][er.moso]</td>
</tr>
<tr>
<td><strong>Word level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syllab</td>
<td>[ál bum.[er.m o.so.]</td>
<td>[ál bum.[er.m o.so.]</td>
</tr>
<tr>
<td>Neut (V-dialects only)</td>
<td>η</td>
<td></td>
</tr>
<tr>
<td><strong>Postlexical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resyllab</td>
<td>[ál.bu.mer.mo.so.]</td>
<td>[ál.bu.ϕε.r.mo.so.]</td>
</tr>
<tr>
<td>Neut (A-dialects only)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Other rules</td>
<td>[ál.βu.mer.mo.so.]</td>
<td>[ál.βu.ϕε.r.mo.so.]</td>
</tr>
</tbody>
</table>
position when the following word is vowel-initial.

In OT, there are no strata or stages of syllabification. A neutralized nasal which appears in syllable onset on the surface is therefore subject to the same constraints as a non-neutralized nasal in the same position. Both types either violate or satisfy ONS-PLACE. If ONS-PLACE ranks above the Neutralization subhierarchy, then faithfulness to onset place features is required, and the desired sequence [á.l.βu.μεr.μo.so.] is banned in favor of incorrect *[á.l.βu.μεr.μo.so.], in which all onset place features are faithfully represented. In order to ensure that neutralized nasals are allowed to fall into onset position without relinquishing their neutral place specification, it would have to be the case that the Neutralization constraints dominate ONS-PLACE in this dialect type. It would also require that the Neutralization constraints target not coda nasals, but rather word-final nasals.

If the Neutralization constraints are sensitive not to syllable position but rather morphological affiliation (i.e. prefix, word), then this problem is avoided. The segment at the right edge of a word remains at the right edge of a word regardless of whether it is a syllable onset or coda.

In this analysis, Nasal Neutralization is determined by two positive positional constraints which command nasal place at the right edge of a word. These are NAS/DOR|word and NAS/COR|word. Both constraints are universal, and therefore present in A-dialects as well as V-dialects. They are defined in (156).

(156) Constraints on word-final nasal place

\[ \text{NAS/DOR}|\text{word} \]

"Word-final nasals are [dorsal]."

\[ \text{NAS/COR}|\text{word} \]

"Word-final nasals are [coronal]."

Which place of articulation may occur word-finally is determined entirely by the ranking of these two MARK constraints relative to the FAITH constraints IDENT [place] and ONS-PLACE. In A-dialects, NAS/COR|word ranks above the relevant FAITH constraints and
NAS/DOR\textsubscript{word} ranks below. In V-dialects, the reverse is true.

As shown in earlier examples, Nasal Neutralization may be preempted before a consonant in favor of Place assimilation (cf. pa[n] ~ pa[m]pequeno). This effect is achieved by ranking the FC LIC-PLACE above the Neutralization constraints, and will be demonstrated presently.

Another interesting effect which must be accounted for is the distribution of neutralized nasals in surface onset position. It has already been proposed that in V-dialects, NAS/DOR\textsubscript{word} must dominate ONS-PLACE, in order that neutralized place may be represented in syllable onset (i.e. in “Resyllabification” contexts). In A-dialects, ONS-PLACE must rank above the NAS/COR\textsubscript{word}, because Neutralization fails whenever a word-final nasal is in a surface syllable onset (see 157).

(157) Constraint rankings (revised)

\begin{itemize}
  \item[a.] A-dialects
    \begin{center}
    ONS-PLACE $\gg$ NAS/COR\textsubscript{word}
    \end{center}
  \item[b.] V-dialects
    \begin{center}
    NAS/DOR\textsubscript{word} $\gg$ ONS-PLACE
    \end{center}
\end{itemize}

3.2.2 An OT account

In this section, I will provide an OT account for the interaction of Neutralization, Place assimilation, and onset place faithfulness in Allegretto speech. Representative data will be taken from the following table (see 158).

(158) The Data: A-dialects

\begin{itemize}
  \item[a.] ___##
    \begin{center}
    álbum álbu[n]
    canta[n]
    \end{center}
  \item[b.] ___#C
\end{itemize}
In this OT analysis, outputs are decided by the categorical ranking of ONS-PLACE above the Neutralization constraints (A-dialects) or below (V-dialects) and also by the variable ranking of LIC-PLACE relative to the Neutralization constraints. The Neutralization constraints dominate IDENT [place]. Examples of Allegretto neutralization, place assimilation, and place faithfulness in an A-dialect are given in (160)-(171).
(160) A-dialects: Neutralization before pause

\( \text{\textit{álbum}} \rightarrow \text{álbu[n]} \)

\[
\begin{array}{cccccc}
/\text{álbum}/ & \text{ONS-PLACE} & \text{LIC-PLACE} & \text{NAS/COR\textsubscript{wd}} & \text{IDENT\{place\}} \\
\hline
a. \ldots&m.] & & & * & ! \\
\hline
b. \ldots&n.] & & & * \\
\hline
c. \ldots&q.] & & & * & ! \\
\end{array}
\]

(161) A-dialects: Neutralization preempted by Place assimilation before C

\( \text{\textit{álbum grande}} \rightarrow \text{álbu[g] grande} \)

\[
\begin{array}{cccccc}
/\text{álbum grande}/ & \text{ONS-PLACE} & \text{LIC-PLACE} & \text{NAS/COR\textsubscript{wd}} & \text{*COMP-SEG} & \text{IDENT\{place\}} \\
\hline
a. \ldots&m.] & & & * & ! \\
\hline
b. \ldots&q.] & & & * \\
\hline
c. \ldots&n.] & & & * & ! \\
\end{array}
\]

(162) A-dialects: Neutralization preempted by onset place faithfulness

\( \text{\textit{álbum hermoso}} \rightarrow \text{álbu[m] hermoso} \)

\[
\begin{array}{cccccc}
/\text{álbum hermoso}/ & \text{ONS-PLACE} & \text{LIC-PLACE} & \text{NAS/COR\textsubscript{wd}} & \text{*COMP-SEG} & \text{IDENT\{place\}} \\
\hline
a. \ldots&m.] & & & * \\
\hline
b. \ldots&q.] & & & * & ! \\
\hline
c. \ldots&n.] & & & * & ! \\
\end{array}
\]

In coda position before a pause, \text{NAS/COR\textsubscript{wd}} actively constrains nasal place

(160). If the nasal precedes another consonant, the effect of \text{NAS/COR\textsubscript{wd}} is overridden by the effect of \text{LIC-PLACE}, which is higher ranked. \text{LIC-PLACE} enforces place assimilation at the expense of Neutralization (161). Finally, if the nasal occupies a syllable onset, then \text{ONS-PLACE} actively ensures faithfulness to the underlying place node (162).

In a V-dialect, by contrast, \text{NAS/DOR\textsubscript{wd}} must dominate \text{ONS-PLACE}, in order to ensure that neutralized nasals may occupy any surface syllable position. These constraints
must rank below LIC-PLACE in Allegretto, in order that place assimilation is ensured. Both ONS-PLACE and *COMP-SEG are low-ranked in the V-dialects, and are therefore typically inactive in candidate evaluation. Recall from the earlier discussion of Nasal place assimilation that the ranking IDENT [place] > *COMP-SEG bans total place assimilations. Examples follow in (163)-(165).

(163) V-dialects: Neutralization before pause

\[
\text{\textit{album} } \rightarrow \text{\textit{álbu}[g]}
\]

<table>
<thead>
<tr>
<th>/album/</th>
<th>NAS/</th>
<th>LIC-PLACE</th>
<th>IDENT [place]</th>
<th>ONS-PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ...m.]</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>!</td>
</tr>
<tr>
<td>b. ...n.]</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>!</td>
</tr>
<tr>
<td>c. ...g.]</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>!</td>
</tr>
</tbody>
</table>

(164) V-dialects: Neutralization preempted by (partial) Place assimilation before C

\[
\text{\textit{album} } \text{\textit{fino} } \rightarrow \text{\textit{álbu}[mm] } \text{\textit{fino}}
\]

<table>
<thead>
<tr>
<th>/album fino/</th>
<th>NAS/</th>
<th>LIC-PLACE</th>
<th>IDENT [place]</th>
<th>*COMP-SEG</th>
<th>ONS-PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ...m.] f</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>b. ...n.] f</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>c. ...g.] f</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>d. ...m.] f</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>e. ...g.] f</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>*</td>
<td>!</td>
</tr>
</tbody>
</table>

(165) V-dialects: Onset place faithfulness preempted by Neutralization before V

\[
\text{\textit{álm} } \text{\textit{hermoso} } \rightarrow \text{\textit{álbu}[g] } \text{\textit{hermoso}}
\]

<table>
<thead>
<tr>
<th>/album hermoso/</th>
<th>NAS/</th>
<th>LIC-PLACE</th>
<th>IDENT [place]</th>
<th>*COMP-SEG</th>
<th>ONS-PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ...m] er.</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>!</td>
<td>!</td>
</tr>
<tr>
<td>b. ...g] er.</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>!</td>
<td>!</td>
</tr>
<tr>
<td>c. ...n] er.</td>
<td>*</td>
<td>!</td>
<td>!</td>
<td>!</td>
<td>!</td>
</tr>
</tbody>
</table>
Tableaux (163) and (164) show that nasal neutralization is enforced whenever a nasal is morpheme-final. If the nasal is morpheme-final before a consonant (164), then a compromise is struck between NAS/DOR]word and LIC-PLACE. The optimal candidate is the one which satisfies both constraints by introducing a segment with a complex place node: \([ŋ\])]. In the example, the velar element \([ŋ]\) of this segment satisfies NAS/DOR]word, and the bilabial element \([ŋ\]) satisfies LIC-PLACE.

The V-dialect ranking must categorically ban total assimilation. In the last section, coarticulation was constrained by the FC *COMP-SEG. Ranked below IDENT [place], coarticulation is permitted. Ranked above IDENT [place], coarticulation is disallowed. It must be the case in V-dialects that *COMP-SEG may dominate LIC-PLACE, but not NAS/DOR]word. This ranking crucially ensures that Neutralization cannot be preempted by total Place assimilation, as it is in A-dialects. Tableaux (166) and (167) illustrate this ranking in candidate evaluation of the sequence \(á\′blum\ lindo\). Two speech styles are represented: Largo and Allegretto. In Largo, place assimilation is blocked by the ranking *COMP-SEG » LIC-PLACE. In Allegretto, *COMP-SEG ranks below LIC-PLACE, and place assimilation is permitted provided that Neutralization - NAS/DOR]word - is simultaneously respected. If NAS/DOR]word is held categorically ranked above *COMP-SEG in all styles, then total assimilation is banned from all outputs.

(166) Largo: V-dialects: NAS/DOR]word » *COMP-SEG » LIC-PLACE

\(á\′blum\ lindo\) \(\rightarrow\) \(á\′blu]\ŋ]lindo\)

<table>
<thead>
<tr>
<th>(á\′blum\ lindo/</th>
<th>NAS/DOR]word</th>
<th>*COMP-SEG</th>
<th>LIC-PLACE</th>
<th>IDENT-PLACE</th>
<th>ONS-PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (...)m]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (...)n]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. (...)ŋ]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. (...)mn]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. (...)np]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(167) Andante: V-dialects: NAS/DOR[\textit{word}] \textgreater; LIC-PLACE \textgreater; *COMP-SEG

\textit{álbum lindo} \rightarrow \textit{álbu[\textit{ng}]lindo}

<table>
<thead>
<tr>
<th>/álbum lindo/</th>
<th>NAS/DOR[\textit{word}]</th>
<th>LIC-PLACE</th>
<th>*COMP-SEG</th>
<th>IDENT-PLACE</th>
<th>ONS-PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \ldots m. l</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. \ldots n. l</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. \ldots n. l</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>d. \ldots m\ldots n. l</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>e. \ldots n\ldots n. l</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

In (167), winning candidate (e) is the only one which satisfies both NAS/DOR[\textit{word}] and LIC-PLACE. Candidates satisfying only one or the other - (167a), (167c), (167d) - are rejected. The optimal candidate (167e) satisfies both constraints by observing default place assignment (NAS/DOR[\textit{word}]) and coda consonant release (LIC-PLACE) in a single coarticulated segment.

In A-dialects, a stylistic distinction is maintained between Largo (unassimilated), Andante (partially assimilated), and Allegretto (totally assimilated) representations. For example, the word sequence \textit{álbum grandeis} realized as \textit{álbu[\textit{ng}]grande} in Largo, \textit{álbu[\textit{ng}]grande} in Andante, or \textit{álbu[\textit{ng}]caro} in Allegretto. Note that the representation \textit{álbu[\textit{ng}]grande} simultaneously satisfies the relevant Neutralization constraint NAS/COR[\textit{word}] and the coda licensing constraint LIC-PLACE. The representation \textit{álbu[\textit{ng}]caro} satisfies LIC-PLACE but violates NAS/COR[\textit{word}]. This is possible because NAS/COR[\textit{word}] is ranked categorically below LIC-PLACE. The version \textit{álbu[\textit{ng}]grande} is therefore selected by the ranking LIC-PLACE \textgreater; NAS/COR[\textit{word}] \textgreater; *COMP-SEG. The version \textit{álbu[\textit{ng}]grande} is selected by the ranking LIC-PLACE \textgreater; *COMP-SEG \textgreater; NAS/COR[\textit{word}] (see 168 and 169).\textsuperscript{19}

\textsuperscript{19} As shown earlier, assimilation is blocked altogether (Largo) if ALIGN is ranked above LIC-PLACE. Sample rankings for Largo will not be shown.
(168) Andante: A-dialects: LIC-PLACE » NAS/COR\_word » *COMP-SEG

\textit{álbum grande} \rightarrow \textit{álbum[\texttt{g}]\_grande}

<table>
<thead>
<tr>
<th>/álbum grande/</th>
<th>LIC-PLACE</th>
<th>NAS_word</th>
<th>*COMP-SEG</th>
<th>IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ..\texttt{m}_g</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ..\texttt{n}_g</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ..\texttt{n}_g</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. \texttt{mg}_g</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. \texttt{ng}_g</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

(169) Allegretto: A-dialects: LIC-PLACE » *COMP-SEG » NAS/COR\_word

\textit{álbum grande} \rightarrow \textit{álbum[\texttt{g}]\_grande}

<table>
<thead>
<tr>
<th>/álbum grande/</th>
<th>LIC-PLACE</th>
<th>*COMP-SEG</th>
<th>NAS_word</th>
<th>IDENT [place]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ..\texttt{m}_g</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ..\texttt{n}_g</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ..\texttt{n}_g</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. \texttt{mg}_g</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. \texttt{ng}_g</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

This analysis of default place assignment shows that two different type of nasal place neutralization dialectal variation is the result of reordering of constraints. The two active constraints, NAS/COR\_word and NAS/DOR\_word, are ranked differently in each dialect type, with interesting results. First, the FC *COMP-SEG is an FC in both dialect types. In A-dialects, NAS/COR\_word is ranked within the field of flotation of *COMP-SEG, thereby enabling the higher-ranked constraint LIC-PLACE to be satisfied either of two ways. If *COMP-SEG is ranked below NAS/COR\_word (168), then assimilation is partial. If ranked above, then assimilation is total (169).

In V-dialects, NAS/DOR\_word ranks above LIC-PLACE, out of the field of flotation of *COMP-SEG. As a result, satisfaction of LIC-PLACE is contingent upon NAS/DOR\_word.
satisfied as well. Unless both are satisfied, assimilation is blocked altogether.

The constraint hierarchies for alveolarizing and V-dialects are diagrammed in (170). The constraint ALIGN is included for the sake of completeness. Note that the full range of FC *COMP-SEG is shown.

(170) Ranking summary: nasal Neutralization and Assimilation

a. A-dialects

```
ONS-PLACE » ALIGN » NAS/COR \text{word} » IDENT [place]
```

b. V-dialects

```
NAS/DOR \text{word} » ONS-PLACE » ALIGN » IDENT [place]
```

The typological predictions made by these rankings, as well as their representative dialect types, are summarized in (171). NAS/X refers generically to either type of default assignment constraint.

(171) Typological predictions

a. ONS-PLACE » NAS/X \text{word}

Nasal Neutralization does not occur in syllable onsets (A-dialects).

b. NAS/X \text{word} » ONS-PLACE

Nasal neutralization occurs in syllable onsets (V-dialects).

c. NAS/X \text{word} » IDENT [place]

Nasal neutralization overrides underlying place specifications (A and V dialects).

d. LIC-PLACE » NAS/X \text{word} » IDENT [place]
Nasal place assimilation overrides neutralization (A-dialects).

e. NAS/X » LIC-PLACE » IDENT [place]
Nasal neutralization overrides place assimilation (V-dialects).
f. LIC-PLACE. NAS/X » *COMP-SEG
Nasal neutralization and place assimilation may be simultaneously satisfied
by a place-contour segment (V-dialects and A-dialects).
g. LIC-PLACE » *COMP-SEG » NAS/X
Nasal place assimilation preempts neutralization: no contour segments are
allowed (A-dialects).

3.3 Voicing assimilation, devoicing, and continuancy assimilation

In this section the interaction of three processes is examined: voicing assimilation,
devoicing, and continuancy assimilation. The examples hold for Peninsular dialects, which
may contain one or more of the processes (cf. Hualde 1989a, Martínez-Gil 1991).
Presentation of all the relevant data will be followed by an OT analysis.

3.3.1 Voicing assimilation

Voicing assimilation is the process by which a segment spreads its laryngeal node
to an adjacent segment. Handled as a postlexical rule in generative analyses (cf. Martínez-
Gil 1991), this type of assimilation applies across the board, without reference to
morpheme- or word-boundaries. Like the assimilation types discussed in previous
sections, voicing assimilation is associated with the more casual speech styles. Although
all Spanish dialects seem to allow partial voicing assimilation of segments, few if any allow
total assimilation.

We begin by reviewing some essential voicing assimilation data for Mexico City
Spanish (see 172). The superscript segments in represent the second phase in a voicing
contour.
Voicing assimilation in Mexico City Spanish (Harris 1969: 8)

Largo speech: [mismo]
Andante speech: [mis\(^2\)mo]
Allegretto speech: [mis\(^2\)mo]

The style data shown in (172) for mismo range from Largo to Allegretto. In Largo speech, coda [s] followed by a voiced consonant does not voice-assimilate. In Andante and Allegretto, the coda [s] is partially assimilated to the following voiced consonant. Because the assimilation applies within a single tier (coronal), the result is a voicing contour (recall Sagey 1986: 28). This structure is diagrammed in (173). As with nasal place assimilation, the contour is the result of an undelinked underlying [voice] node.


[Diagram]

Harris (1969: 29), Hooper (1972: 530), and others generally concur that Andante and Allegretto speech styles are characterized in most dialects of American Spanish by partial voicing assimilation. Except in very fast speech (Presto, see Harris 1969), total voicing assimilation is unattested, and will not be treated further here. Examples of partial voicing assimilation in Peninsular Spanish follow in (174).
Voicing assimilation data (Harris 1969: 29, 40-44; Hooper 1972: 10)

- *Agfa* $\rightarrow$ a[γ̃]fa
- *desde* $\rightarrow$ de[sz]de
- *mismo* $\rightarrow$ mi[sz]mo
- *absurdo* $\rightarrow$ a[β̃]surdo
- *adquirir* $\rightarrow$ a[δ̃]quirir
- *zigzag* $\rightarrow$ zi[γ̃]zag  (note: orthographic ‘z’ represents [θ])

The sampling of data from Peninsular Spanish shows that voicing assimilation targets coda fricatives indiscriminately - voiced and unvoiced - before any consonant. Hualde (1989a) expresses this voicing assimilation by means of an autosegmental rule which spreads a consonant’s laryngeal node to a preceding [-sonorant,+voice] consonant in syllable rhyme (coda). Because a [-sonorant] plus consonant sequence cannot be realized in the same syllable for well-formedness reasons, the syllable information is excluded from the representation in (175).

Partial voicing assimilation (based on Hualde 1989a: 33)

---

20 Hualde (1989a) maintains that voicing assimilation is total (i.e. *mismo* $\rightarrow$ [mizmo]), and therefore formulates his version of the rule to concomitantly delink the underlying laryngeal node of the leftward segment. In the version shown here, the underlying laryngeal node is retained.
Hualde's rule shows partial voicing assimilation because the laryngeal class node (L) of the left-hand consonant is retained even though the laryngeal class node of the segment following has been assimilated. This is the type of assimilation which occurs in Andante speech (mi[s]mo). In Largo, underlying [voice] features are faithfully represented, thus mismo --> mi[s]mo (see 172).

3.3.2 Continuancy assimilation

Continuancy assimilation (CA) is the process whereby voiced stops acquire the marking for [continuant] of a previous segment. Spanish has three voiced stop phonemes: /b, d, g/. The fricative allophones of these three segments are represented by the following phonetic symbols: [β, δ, γ]. Mascaro (1991) describes the distribution of voiced stops and spirants as follows:

(176) Distribution of voiced stops and spirants (Mascaró 1991: 168)

a. voiced stops: [b, d, g]

<table>
<thead>
<tr>
<th>After pause</th>
<th>bien</th>
<th>gana</th>
<th>desdén</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[b]en</td>
<td>[g]ana</td>
<td>[d]esdén</td>
</tr>
<tr>
<td>After nasal</td>
<td>ambos</td>
<td>onda</td>
<td>un gato</td>
</tr>
<tr>
<td></td>
<td>am[b]os</td>
<td>on[d]a</td>
<td>un [g]ato</td>
</tr>
<tr>
<td>After lateral</td>
<td>-</td>
<td>-</td>
<td>aldea</td>
</tr>
</tbody>
</table>

b. voiced spirants: [β, δ, γ]

<table>
<thead>
<tr>
<th>After vocoid</th>
<th>hay vino</th>
<th>viuda</th>
<th>hago</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>hay [β]ino</td>
<td>viu[δ]a</td>
<td>ha[γ]o</td>
</tr>
<tr>
<td>After fricative</td>
<td>desvio</td>
<td>desde</td>
<td>afgano</td>
</tr>
<tr>
<td></td>
<td>des[β]io</td>
<td>des[δ]e</td>
<td>afg[γ]ano</td>
</tr>
<tr>
<td>After r</td>
<td>carbón</td>
<td>verde</td>
<td>mar gruesa</td>
</tr>
<tr>
<td></td>
<td>car[β]ón</td>
<td>ver[δ]e</td>
<td>mar [γ]ruesa</td>
</tr>
</tbody>
</table>
Harris (1984a) sums up the distribution of voiced stops and spirants very succinctly; his description is cited in (177).

(177) Stops versus spirants (cf. Harris (1984a: 149-50)

a. stops
   (i) after a pause: [b]an, [d]an, [g]ana
   (ii) after a homorganic stop: hom[b]ro, hon[d]o, tol[d]o

b. spirants in all other contexts: la[β]o, la[δ]o, la[γ]o

How the distribution of stops and spirants is accounted for depends on the posited underlying form. For example, some studies (e.g. Harris 1984a) argue that the stops are underlying, and the spirants derived by rule. Others (e.g. Hualde 1988) propose the opposite, namely that spirants are underlying and the stops are derived by rule. Others (Lozano 1979; Mascaro 1984; Harris 1985) propose that both stops and spirants are derived by rule. Each approach carries with it a different set of predictions. Despite the unresolved controversy, most studies concur that CA is achieved by the rightward spreading of a feature [continuant] from a vowel or consonant to a voiced obstruent. A nonlinear expression of CA is given in (178).

---

21 Continuancy assimilation and related data are discussed in numerous studies, including Lozano (1979), Mascaro (1984, 1991); Harris (1984a); Hualde (1989a); Martinez-Gil (1991, 1997); Palmada (1997).
Because the structural description of the CA rule specifies only \([\alpha \text{ cont}]\) as a necessary element of the spreading segment, CA may be fed by any segment with a feature [continuant], whether a fricative or sonorant consonant, a glide, or a vowel. In addition, it may be fed by the output of a previous application of the same rule. The iterativity of CA as well as its application across morpheme- and word boundaries indicate that CA is a postlexical rule, applying across the board.

Mascaró's (1984) original analysis of CA (which has served as a basis for almost every subsequent study) maintained two specifications for the feature [continuant]: \([+]\) and \([-]\). In his analysis, vowels are marked \([+\text{continuant}]\) and unvoiced stops were marked \([-\text{continuant}]\). Voiced stops, however, are underlyingly unmarked for the feature [continuant]. This featural analysis is motivated by the fact that voiced stops trigger spirantization but unvoiced ones do not; in a radically underspecified feature system, a feature may only be spread to a segment which is unspecified for that feature (e.g. Avery & Rice 1989). In such an analysis, segments unspecified for a specific feature either assimilate the feature from an adjacent segment or are assigned a default value for the feature. In surface representations, all segments are fully specified for all features.
Figure (179) shows how values for the feature [continuant] are assigned to voiced stops in the token *abdica*. This analysis maintains no underlying values for [continuant] for voiced stops: in phonemic representation such segments are typically given as capital "archisegments," thus: /aBDika/. In (179a), all segments except for voiced stops are shown associated to [continuant] features (marked [+CT] in honor of Mascaró’s original nomenclature). In (179b), the feature [+CT] spreads rightward from the initial /a/ in /aBDika/ per rule (178). The result is [aβDika]. In the second iteration of rule (178), the [b] output of the first iteration now satisfies the structural description of the rule and spreads [+CT] one more position to the right, assigning its value to /D/. The result (179c) is an output in which all segments are specified for [continuant]: [aβðika].

In the case of voiced stops preceded by a nasal, it is the feature value [-CT] which is spread, because nasals are [-CT]. Spreading of [-CT] from nasals accounts for the distribution of stops after a nasal: cf. am[b]os, on[d]a, gan[g]a.

There is one environment which cannot be targeted by left-to-right continuancy spreading: utterance-initial. The feature value of a voiced obstruent in this position must be filled in by means of a redundancy rule which assigns the default value [-cont].

(180) Default continuancy assignment

\[
\begin{array}{c}
- \text{son} \\
+ \text{voice}
\end{array}
\] \[\rightarrow\] [-cont]

Rule (180) targets any voiced obstruent which has not acquired a specification for [cont] by virtue of being situated to the right of a segment already so specified. A sample
derivation of the token desde (underlyingly /DesDe/) is given in (181).

(181) Continuancy: assimilation and default assignment: desde

\[
\begin{array}{cccc}
+CT & +CT & +CT \\
\downarrow & \downarrow & \downarrow \\
d & e & s & d & e \\
\end{array} \rightarrow
\begin{array}{cccc}
+CT & +CT & +CT \\
\downarrow & \downarrow & \downarrow \\
d & e & s & d & e \\
\end{array} \rightarrow
\begin{array}{cccc}
\downarrow & +CT & +CT & +CT \\
\downarrow & \downarrow & \downarrow & \downarrow \\
d & e & s & d & e \\
\end{array}
\]

So far, all the examples of CA have targeted [+voice] obstruents. There are instances in which underlying [-voice] obstruents are realized [+cont] as well. The uniform realization of coda obstruents as [+cont] is not attributed to CA, but rather to a separate process which targets all obstruents in this syllable position.

Martínez-Gil (1991: 546) maintains that underlying voiceless stops are realized as stops phonetically whenever they precede an unvoiced segment (e.g. apto -- > a[p]to, not *a[f]to; actuar -- > a[k]tuar, not *a[x]tuar. This argument lends support to his theory that unvoiced fricatives [φ, θ, x] occur as allophones of /p, t, k/ only before a voiced segment (e.g. e[θ]nico), or as a result of devoicing (e.g. a[φ]solver). Although this observation may hold for some speech style, other linguists have argued in favor of a general tendency to neutralize all syllable-final obstruents regardless of their phonological environment or voicing heritage. In a discussion of CA in Peninsular Spanish, Hualde (1989a: 35) argues:

Nótese que ... en posición final de sílaba interna a una palabra hay total neutralización en los dos rasgos [±voz] y [±continuante], de tal modo que [d'ño], [d'ño], [d'ño] y [d'ño] o [ad'k'ir'], [aθ'k'ir'], [aθ'k'ir'] y [aθ'k'ir'] no pueden ser sino realizaciones de una sola palabra...
Although the examples Hualde gives include only tokens which are underlingly [+voice], it is clear that his characterization applies to coda obstruents across the board, regardless of underlying voicing - hence his usage of the symbol [±]. We understand from Hualde that coda neutralization of the features [cont] and [voice] occurs regardless of underlying specification for either feature.

Navarro Tomás (1967) also provides evidence that coda stops which are [-voice] underlingly may be realized as fricatives before an unvoiced consonant (see 182).  

(182) Syllable-final /p, k/ (Navarro Tomás 1967: 87, 138)22

<table>
<thead>
<tr>
<th>Spanish</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>opción</td>
<td>o[β]ción</td>
</tr>
<tr>
<td>actor</td>
<td>a[γ]tor, a[γk]tor</td>
</tr>
</tbody>
</table>

According to Navarro Tomás, the fricative realization of /p, t, k/ reflects relaxed speech style, whereas the stop realizations reflect speech which is loud or emphatic (fuerte/enfática). Navarro Tomás suggests that this neutralization is resolved in favor of the voiced variant, thus /p/ —> [β] in the word opción. Hualde, however, states that the devoiced variant is favored, thus /d/ —> [θ] in adquirir. Both Navarro Tomás' and Hualde's explanations demonstrate that spirantization is indiscriminate in coda position, potentially affecting all obstruents, regardless of underlying voicing. Rejection of certain variants reflects stylistic preference rather than the impossibility of these variants.23

---

22 All the examples Navarro Tomás (1967: 97) gives for syllable-final /t/ realized as a fricative are ones in which it also precedes a voiced consonant. His accompanying clarification, however, refers to syllable-final /t/ in general:

La t final de sílaba ... aparecen [sic] únicamente con su propio sonido de oclusiva sorda en pronunciación fuerte o enfática. En la conversación normal se reduce en estos casos a una d [our [θ] — REM] sonora y fricativa.

23 Hualde (1989a: 35) specifically states that neutralization of the features [voice] and [cont] holds only word-internally; at the end of an utterance, the underlying [-cont] features of unvoiced obstruents are respected in the output: cénit —> cén[γ], not *cén[θ]. Because they have no underlying specification for [cont] (cf. Mascaro 1984), voiced obstruents may be realized as [+cont] or [-cont] in this position: verdad —> verda[θ] OR verda[θ]. I believe that specified [cont] features are licensed by the right edge of the prosodic word and are therefore subject to a special faithfulness provision. In the interest of space, such provision will not be discussed in this study. Henceforth, all mention of "devoicing" will refer only to word-internal obstruents.
In this study it will be maintained that speakers apply voicing assimilation, devoicing, and continuancy spreading - or some combination of these - as an exercise of stylistic choice in connected speech. Obviously some of these processes are incompatible with others. For example, a speaker cannot simultaneously voice-assimilate an obstruent to a following voiced segment, and devoice it. However, if voice-assimilation is to a following unvoiced segment, then devoicing is fortuitously satisfied. When competition arises between processes, preference must be accorded to one or the other, as both cannot be satisfied simultaneously. This observation follows from Hualde’s (1989: 34) statement:

En unos hablantes hay claro predominio de la regla de ensordecimiento; en otros, la regla de asimilación en voz tiene aplicación preponderante.

In the following section, Hualde’s claim regarding stylistic control over these processes will be formalized in a system of variably-ranked constraints.

It will be maintained here that all obstruents, regardless of voicing, may be realized [+cont] syllable-finally in connected speech. Additionally, if a speaker adheres to voicing assimilation, the result is a partially assimilated [+cont] segment. If a speaker favors devoicing, then the result is a segment which is [+cont, -voice] free of voicing contour.

3.3.3 Devoicing

In many dialects, such as Andalusian, obstruent Voicing assimilation is in competition with coda obstruent Devoicing. Whereas Voicing assimilation seeks to link a coda consonant to the laryngeal node of a following consonant. Devoicing works to neutralize all coda consonants in favor of the marking [-voice]. Data presented by Hualde (1989a) indicate that Devoicing, like Voicing assimilation, operates without reference to morpheme or word boundary information (see 183).
Also like Voicing assimilation, Devoicing targets any syllable-final continuant. If devoicing applies, it affects the segment as a whole: i.e. there are no partially devoiced outputs. The Devoicing rule in (184) follows Hualde’s (1989a: 36) formulation.

(184) Coda Obstruent Devoicing (insertion of \[-voice\])(cf. Hualde 1989a: 36)

Because Devoicing targets only coda obstruents, alternations between syllable-final \[-voice\] obstruents alternate with syllable-initial \[+voice\] obstruents: \textit{pared} \(\rightarrow\) [pa.r\(\epsilon\)\(\theta\)]. but \textit{paredes} \(\rightarrow\) [pa.r\(\epsilon\)\(\acute{e}\)\(\acute{s}\)es\(\acute{e}\)].
3.3.4 Constraining the coda

Before proceeding with an OT account of the variable interaction of voicing assimilation, continuancy assimilation, and devoicing, I draw attention to two constraints and their motivation.

(185) *C/OBS[+voice] "No coda [+voice] obstruents."

*C/OBS[-cont] "No coda [-cont] obstruents."

The two constraints defined in (185) are responsible for coda devoicing and coda continuancy, respectively. The notation of these constraints as well as their universal motivation will be briefly reviewed, and their relevance to the Spanish data will be established.

In order to explain the distribution of certain segments in some syllable positions but not others, Prince & Smolensky (1993: §8) envisioned two categories of positional constraints, *P (peak) and *M (margin). *P constraints ban segments from syllable peaks, and *M constraints ban segments from syllable margins (i.e. onset or coda). A *P constraint and a *M constraint presumably exist for every segment, with positional typologies emerging from the ranking of the combined set of constraints. For example, if the constraint *M/i (/i/ may not occupy a syllable margin”) is ranked below MAX-IO in some language, then it is predicted that /i/ may be pushed to a syllable margin - i.e. made a nonnuclear glide - rather than be deleted. If MAX-IO ranks below the constraint *P/a, then it is predicted that /a/ may delete rather than be made nonnuclear. Prince & Smolensky (1993) attributed discrepancies between onset and coda segment inventories to the position of *CODA and ONSET within the hierarchy.

More recently, Colina (1995: 55) exploded the *M constraint family into *O (*Onset) and *C (*Coda), to capture asymmetries in the onset and coda consonant inventories for Spanish. Two of her proposed rankings are given in (186).
(186) Associational constraints in Spanish (Colina 1995: 55)

a. ONSET » *C/I,U

b. *O/I,U , ONSET » *INSERT FEAT

The rankings in (186) express the fact that the Spanish high vocoids /i/ and /u/ may occupy a syllable coda in order to satisfy ONSET, but may not occupy a syllable onset to satisfy ONSET. In syllable onset, of course, these vocoids are reinforced and acquire a nonunderlying feature (presumably [-cont]). The ranking in (196a) allows coda glides as in rey [rej], but the ranking in (196b) bans onset glides in favor of reinforced onset stops.

This type of analysis - in which specific segments or segment classes can be specifically banned from either onset or coda - has inevitably raised the question what other segmental material can be banned from these positions. Other studies, such as Goodman (1995), have further “exploded” (disassembled) the *C constraint class into a family of constraints targeting individual features. The primary argument is that if a segment may be banned from a syllable position, then so may each of its individual features. Under such an analysis, the ranking ONSET » *C/I/U could be restated as ONSET » *C/ [+high], *C/[-low], *C/ [+tense], etc., with no loss of descriptive accuracy.

Ample evidence suggests that languages often do ban individual features from syllable coda position, and, by association, also the segments which contain them. Two examples which will be considered here are drawn from German and Portuguese. Consider first the German data in (187).

(187) German coda condition (Hall 1992: 53)

<table>
<thead>
<tr>
<th>German Word</th>
<th>IPA</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieh</td>
<td>[diːp]</td>
<td>‘thief’</td>
</tr>
<tr>
<td>Diehe</td>
<td>[diːba]</td>
<td>‘thieves’</td>
</tr>
<tr>
<td>brav</td>
<td>[braːf]</td>
<td>‘honest’</td>
</tr>
<tr>
<td>braver</td>
<td>[braːva]</td>
<td>‘more honest’</td>
</tr>
<tr>
<td>Rad</td>
<td>[raːt]</td>
<td>‘wheel’</td>
</tr>
<tr>
<td>Rades</td>
<td>[raːdːas]</td>
<td>‘wheel-GEN-SG’</td>
</tr>
</tbody>
</table>
These data illustrate a process common to many languages, namely coda consonant devoicing. The underlying /b/ in the form *Dieb* is devoiced when it cannot be syllabified as a syllable onset, which is the case in *Diebe*. One version of the coda devoicing rule is given in (188).

(188) German coda devoicing (Hall 1992: 53; cf. also Vennemann 1972; Booij & Rubach 1987: 21; Rubach 1990: 80: and others)

[-sonorant] --> [-voice] / _ \_ \_ σ

This same rule can be formulated as a *C constraint on surface structure: *C/[-son.+voice], or alternately *C/OBS[+voice]. In German, this constraint dominates the constraint IDENT [voice] categorically (i.e. in all speech styles) (see 199).

(189) Coda obstruent Devoicing in German: *Dieb*

/ dib/ *C/OBS[+voice] IDENT [voice]

a. di:b.    "!

b. di:p.   "

Because all constraints are present in all language grammars, *C/OBS[+voice] is present in the grammar of Peninsular Spanish as well. In Spanish, however, it is not ranked categorically above IDENT [voice] as it is in German; rather it is ranked variably with respect to this constraint. This means that speakers may devoice coda obstruents or represent them faithfully as an exercise of stylistic control.

Now let us look at a different type of coda condition in Brazilian Portuguese. The data in (200) are English words pronounced by native speakers of European and Brazilian Portuguese, taken from Blanco (1980), a study on loanword phonology.
Each of the English examples contains at least one coda consonant. In these elicitations, the solution for both the European and Brazilian Portuguese speakers was to epenthesize a vowel ([a] in European, [i] in Brazilian) so as to avoid having a coda stop. Note that /t/ and /s/- both [+cont] - were acceptable codas and did not trigger epenthesis.

In both European and Brazilian Portuguese, the stops /b, d, g, p, t, k/ are all banned from syllable coda. The only consonants permitted in syllable coda are /r, l, s, z/ (cf. Mascherpe 1970: 67; also Mira Anteus 1975, Mattoso Câmara 1972, Giangola 1996). The permitted codas form the natural class of [+cont] consonants. Those excluded are all [-cont]. These consonants can be banned by the coda condition constraint *C/OBS[-cont].

In Portuguese, *C/OBS[-cont] is categorically ranked above DEP-IO, thereby forcing the insertion of epenthetic material (see 191).


<table>
<thead>
<tr>
<th>/fog/</th>
<th>*C/OBS[-cont]</th>
<th>MAX-IO</th>
<th>IDENT [cont]</th>
<th>DEP-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. fog</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. fogQ</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. fo[g]</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. foγ</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

In Peninsular Spanish, coda stops may be realized as [+cont] in one of the casual styles, regardless of underlying voicing (cf. Navarro Tomás 1967). This variable distribution suggests that *C/OBS[-cont] is an FC in Peninsular Spanish. The Spanish
solution to pressure from this constraint is not epenthesis; instead, coda stops are made [+cont]. This option does not exist in Portuguese because the identity constraint on continuancy, IDENT [cont], ranks above DEP-IO in this language (see 191), thereby banning changes to the value [cont] for the sake of coda condition satisfaction. In Peninsular Spanish, *C/OBS[-cont] may rank either above or below IDENT [cont], depending on style. When ranked above the identity constraint, all coda stops are realized as continuants. When ranked below the identity constraint, coda stops are retained as stops.

In the following section, the constraints *C/OBS[+voice] and *C/OBS[-cont] are presented as FCs in Peninsular Spanish. It will be shown that a wide range of stylistic output variants are allowed by the interaction of these two constraints with other MARK and FAITH constraints.

3.3.5 An OT Account

The necessary constraints for voicing assimilation, devoicing, and continuancy are presented in (192).

(192) Constraint summary: voicing assimilation, devoicing, continuancy

LICENSE-LARYNGEAL "The laryngeal node of a coda consonant must be linked to a syllable onset."

Requires the same type of "path" to a syllable onset as required by LIC-PLACE.

(CONT) "The value of the feature [continuant] in voiced obstruents must agree with that of the preceding segment.

This constraint is modeled after Martínez-Gil's (1997: 190) constraint SPIR, which serves the same function.

IDENT [cont] "Underlying values for [cont] may not change."

Unvoiced obstruents are specified for [cont], whereas voiced ones are not. Therefore alternations of the type /p/~[f], /t/~[θ], /k/~[x] constitute IDENT [cont] violations, but those of the type /b/~[β], /d/~[δ], and /g/~[γ] do not.

178
Obstruents are [-continuant]."

Based on an observation made for Spanish by Martínez-Gil (1991: 543) which states that [+sonorant] segments are generally [+voice] and therefore [-sonorant] segments are generally [-voice]. This constraint targets all obstruents as a natural class, voiced and unvoiced: [b, d, g, p, t, k]. A “redundancy constraint,” it serves to ensure that no voiced obstruent is left without a [cont] feature in the output.

*C/OBS[-cont] “Coda obstruents may not be [-continuant].”

This constraint expresses the generalization - for some speech styles - that obstruent continuancy is enforced syllable-finally, regardless of underlying voicing: adquirir → a[θ]quirir; ético → e[θ]nico. The same generalization does not hold for unvoiced obstruents syllable-initially: arde → ar[θ]e; but arte → *ar[θ]e.

*C/OBS[+voice] “Coda obstruents may not be [+voice].”

Sets the default voicing value of syllable-final stops to negative (cf. digno → di[θ]no or alternately di[k]no). In direct competition with LIC-LARYN, which seeks to maintain voicing before a voiced onset.

The distribution of stops and fricatives in Spanish is accounted for cross-stylistically by the constraints IDENT [cont] and CONT. IDENT [cont] examines only those segments specified for [cont], a class which includes unvoiced obstruents but not voiced ones. Therefore changes from /p, t, k/ to [θ, θ, x] constitute IDENT [cont] violations, whereas changes from /b, d, g/ to [β, δ, γ] do not.

CONT examines voiced obstruents for their adherence to continuancy spreading. Because CONT affects only voiced obstruents. unvoiced obstruents are altogether ignored in evaluation. Because they target discrete classes of segments, these two constraints are never in competition, and their relative ranking is insignificant in candidate evaluation.

The following OT analysis classifies the data into three stylistic types. Each category may be characterized by the presence or absence of voicing assimilation and/or devoicing. Voicing assimilation may not occur in conjunction with devoicing, however, as these operations are in opposition (see 193).
Stylistic classifications

Type 1: “All obstruents are [-cont].”
- assim, -devoi e.g. di[g]no, o[b]tener, é[t]nico
+ assim, -devoi e.g. di[g]no, o[bp]tener, é[t^d]nico
- assim, +devoi e.g. di[k]no, o[p]tener, é[t]nico

Type 2: “All [+voice] obstruents are [+cont] after [+cont].”
- assim, -devoi e.g. di[γ]no, o[β]tener, é[t]nico
+ assim, -devoi e.g. di[γ]no, o[βφ]tener, é[t^d]nico
- assim, +devoi e.g. di[x]no, o[φ]tener, é[t]nico

Type 3: “All [+voice] obstruents and coda [-voice] obstruents are [+cont] after [+cont].”
- assim, -devoi e.g. di[γ]no, o[β]tener, é[θ]nico
+ assim, -devoi e.g. di[γ]no, o[βφ]tener, é[θ^d]nico
- assim, +devoi e.g. di[x]no, o[φ]tener, é[θ]nico

This classification assumes - perhaps incorrectly - that continuancy is the primary stylistic correlate. In Type 1, all obstruents are [-cont]. In Type 2, [+voice] obstruents are [+cont], but [-voice] obstruents are [-cont]. In Type 3, all obstruents are [+cont], regardless of voicing (see 194).

Values for [cont] of obstruents in three speech types

<table>
<thead>
<tr>
<th>[+voice]</th>
<th>[-voice]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>-</td>
</tr>
<tr>
<td>Type 2</td>
<td>+</td>
</tr>
<tr>
<td>Type 3</td>
<td>+</td>
</tr>
</tbody>
</table>
Within each speech style, obstruents may additionally assimilate or devoice (but not both, as these processes are in potential opposition). Alternately, they may fail to assimilate or devoice, in which case they are realized faithfully to their underlying voicing, free of voicing contours.

3.3.5.1 Type 1

In Type 1, all obstruents are realized as [-cont]. To constrain the value of the feature [cont] in the output, we begin with four constraints CONT, OBS[-cont], IDENT [voice], and IDENT [cont]. CONT is active only in environments preceded by a segment specified for [cont]. In other positions, such as phrase-initially, there is no preceding segment to spread its feature [cont]. In such cases, the [-cont] allophone is selected stipulatively by the constraint OBS[-cont]. This same constraint ensures that every voiced obstruent surfaces with a specification for [cont]; the default setting is minus.

OBS[-cont] competes with CONT insofar as CONT produces voiced continuants and OBS[-cont] produces voiced stops. How such competition is resolved is determined by the relative ranking of these constraints. In Largo speech, which is characterized by [-cont] obstruents, OBS[-cont] must dominate CONT, as shown in (195).

\[(195)\text{ Type 1: }\text{digno}\]

\[
\begin{array}{ccc}
/digno/ & \text{OBS[-cont]} & \text{CONT} \\
\text{a. dig.no.} & \ast & \\
\text{b. diy.no.} & \ast & \\
\end{array}
\]

Other candidates, which satisfy CONT but display voicing unfaithfulness, violate IDENT [voice], which must rank above CONT in Largo style (see 196).
Because [+voice] obstruents are unspecified for the feature [cont] underlingly, they are made [+cont] at no expense. The [-voice] obstruents are [-cont] underlingly. In Type 1 speech, these obstruents satisfy both OBS[-cont] and IDENT [cont]. Voicing contours are blocked by the constraint *COMP-SEG, which may rank above or below LIC-LARYN, but not above IDENT [voice]. If *COMP-SEG ranked above IDENT [voice], then totally voicing assimilation would be permitted. Note that the [-voice] obstruent /t/ in étnico is of no interest to CONT, which monitors only obstruents which are [+voice]. The only constraint violated by the optimal candidate in tableau (197) is LIC-LARYN.

(197) Type 1: étnico

In order for voicing assimilation to be allowed in Largo speech, LIC-LARYN must dominate IDENT [voice]. This ranking ensures that the laryngeal node of a coda consonant is parsed by a syllable onset. Because voicing assimilation is only partial, it is maintained that the FC *COMP-SEG ranks below both IDENT [voice] and LIC-LARYN, and that the
ranging IDENT [voice] » LIC-LARYN is invariable (198).

(198) Type 1 (with Voicing assimilation): étnico

<table>
<thead>
<tr>
<th>éttniko/</th>
<th>OBS[-cont]</th>
<th>IDENT [voice]</th>
<th>LIC-LARYN</th>
<th>*COMP-SEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 'etni.ko.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. 'etdn.ko.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. 'etd.ni.ko.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. 'etØ.ni.ko.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. 'etØ.ni.ko.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. 'etØ.ni.ko.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Devoicing is achieved by ranking *C/OBS[+voice] above IDENT [voice]. Because Devoicing is stylistic, it is claimed that *C/OBS[+voice] is an FC in this dialect. Ranked above IDENT [voice], Devoicing is ensured. Ranked below, underlying voice specifications are respected (199).

(199) Type 1 (with Devoicing): digno

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dig.no.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. digy.no.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. dik.no.</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. dix.no.</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>e. dixy.no.</td>
<td></td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>f. dikg.no.</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

3.3.5.2 Type 2

In the present analysis, Type 2 speech is characterized by the presence of voiced [+cont] obstruents. In Type 1, all obstruents were uniformly realized [-cont] by the constraint OBS[-cont], which ranked above both IDENT [cont] and CONT. In Type 2,
OBS[-cont] ranks below IDENT [cont] and CONT. As a result, [+voice] obstruents are realized [+cont], and [-voice] obstruents remain faithful to their underlying specification [-cont] (see 200 and 201).

(200) Type 2: obtener

<table>
<thead>
<tr>
<th>/obtener/</th>
<th>IDENT [voice]</th>
<th>CONT</th>
<th>OBS[-cont]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ob.te.ner.</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. op.te.ner.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. of.te.ner.</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. op.te.ner.</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(201) Type 2: étnico

<table>
<thead>
<tr>
<th>/etniko/</th>
<th>IDENT [voice]</th>
<th>IDENT [cont]</th>
<th>OBS[-cont]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. et.ni.ko.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. eθ.ni.ko.</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. eð.ni.ko.</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. ed.ni.ko.</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Voicing assimilation and Devoicing are achieved in Type 2 using the same FC movements as in Type 1 speech. Voicing assimilation is accomplished by ranking the FC *COMP-SEG below LIC-LARYN. The ranking *C/OBS[+voice] » IDENT [voice] effects Devoicing (see 202 and 203).
(202) Type 2 (with Voicing assimilation): obtener

<table>
<thead>
<tr>
<th>/obtener/</th>
<th>IDENT</th>
<th>CONT</th>
<th>OBS[-cont]</th>
<th>LIC-LARYN</th>
<th>*COMP-SEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. obt.te ner.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. op.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. of.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. op.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. obp.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. ofp.te ner.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(203) Type 2 (with Devoicing): obtener

<table>
<thead>
<tr>
<th>/obtener/</th>
<th>*C/OBS</th>
<th>IDENT</th>
<th>CONT</th>
<th>OBS[-cont]</th>
<th>LIC-LARYN</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. obt.te ner.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ob.te ner.</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ofp.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. op.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. obp.te ner.</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. ofp.te ner.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3.5.3 Type 3

As shown earlier, Type 3 speech is characterized by the realization of all [+voice] obstruents and coda [-voice] obstruents as [+cont]. In Type 2, [+cont] assimilation to [+voice] obstruents is enforced by the constraint CONT. This same constraint, however, disregards any segment which is not [+voice] underlyingly. For this reason, the [-voice] obstruents were left [-cont] in Andante speech.

In Type 3, the effect of CONT is supplemented by an FC referred to here as *C/OBS[-cont]. Recall from the discussion of the coda condition in Portuguese that this MARK constraint ensures that all coda obstruents, regardless of voicing heritage, are realized [+cont]. It is in conflict with IDENT [cont] and OBS[-cont], and in Type 3 must outrank both of these constraints. In order to account for the fact that the realization of
[-voice] obstruents as [+cont] varies according to style, it is maintained that *C/OBS[-cont]
is an FC (see 204).

(204) Type 3: ético

<table>
<thead>
<tr>
<th>/etniko/</th>
<th>IDENT</th>
<th>*C/OBS</th>
<th>IDENT</th>
<th>OBS</th>
<th>*COMP-SEG</th>
<th>LIC-LARYN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[voice]</td>
<td>[-cont]</td>
<td>[cont]</td>
<td>[-cont]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. etni.ko.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. etdni.ko.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. edni.ko.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. eO.ni.ko.</td>
<td></td>
<td></td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. eO.ni.ko.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. eO.ni.ko.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Allegretto. Voicing assimilation and Devoicing are achieved as in Largo and
Andante, respectively by promoting LIC-LARYN above *COMP-SEG, and *C/OBS[+voice]
above IDENT [voice] (see 205 and 206).

(205) Type 3 (with Voicing assimilation): ético

<table>
<thead>
<tr>
<th>/etnico/</th>
<th>IDENT</th>
<th>*C OBS</th>
<th>IDENT</th>
<th>OBS</th>
<th>LIC-LARYN</th>
<th>*COMP-SEG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[voice]</td>
<td>[-cont]</td>
<td>[cont]</td>
<td>[-cont]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. etni.ko.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. etdni.ko.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. edni.ko.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. eO.ni.ko.</td>
<td></td>
<td></td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. eO.ni.ko.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. eO.ni.ko.</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>
The putative rankings for the three speech Types are provided in (207) and (208). Mainly for ease of exposition, it has been maintained that the styles differ in their handling of obstruents and the assignment of the feature [+cont] (recall diagram 194). The other processes, which include Voicing assimilation and Devoicing, are shown without style association, although it is understood that these are connected speech processes are more likely to occur in casual than in careful speech style.

(207) Main variable rankings
a. Type 1 All obstruents are [-cont] in all contexts.
   \[
   \text{OBS}[-\text{cont}] \rightarrow \text{CONT}. \text{IDENT} [\text{cont}]
   \]
b. Type 2 All [+voice] obstruents are [+cont] after [+cont].
   \[
   \text{CONT} \rightarrow \text{OBS}[-\text{cont}] . *\text{C/OBS}[-\text{cont}]
   \]
c. Type 3 All [+voice] obstruents and coda [-voice] obstruents are [+cont].
   \[
   *\text{C/OBS}[-\text{cont}] \rightarrow \text{CONT}. \text{IDENT} [\text{cont}]. \text{OBS}[-\text{cont}]
   \]

(208) Other stylistic rankings
a. (-assim.-devoi)
   Obstruents do not assimilate [voice].
   Obstruents are realized faithfully to underlying [voice].
   \[
   \text{IDENT} [\text{voice}] \rightarrow *\text{C/OBS}[-\text{voice}] . \text{LIC-LARYN}
   \]
b. (+assim.,-devoi)

All obstruents (partially) assimilate [voice] of following C.

\[ \text{IDENT [voice]} \rightarrow *C/OBS[+voice] \rightarrow \text{LIC-LARYN} \rightarrow *\text{COMP-SEG} \]

c. (-assim.,+devoi)

All coda obstruents are [-voice].

\[ *C/OBS[+voice] \rightarrow \text{IDENT [voice]} \]

Although the FCs in question may occupy other positions in the hierarchy, it is assumed that FCs do not float to positions in which they do not effect a distinct output. Thus, if the requirement is for \( *C/OBS[-cont] \) to dominate IDENT [cont]. CONT. and OBS[-cont] in order for coda continuancy assimilation to be mandated, then it is assumed that \( *C/OBS[-cont] \) does not float any higher than the lowest ranking position necessary to satisfy this requirement. Likewise, if it does not occupy a ranking position any lower than necessary to produce all the attested outputs. In (209), the minimum flotation range of the three FCs relative to the fully ranked constraints is represented following Reynolds' (1994) schematic model.

(209) FC ranges: \( *C/OBS[+voice], *C/OBS[-cont], OBS[-cont], *\text{COMP-SEG} \)

In this section it was demonstrated that the FC model is well suited to account for variable voicing assimilation, continuancy assimilation, and obstruent devoicing. In addition, the model allows these three processes to be handled independently as well as interactively. Mascaró's (1984) analysis of [+voice] obstruents underspecified for [cont] in...
Spanish was incorporated directly into the present theory, without revision or loss of descriptive accuracy to either theory.

3.4 Aspiration

In the preceding section, tension between voicing faithfulness and voicing assimilation was investigated for the Spanish obstruents /b, d, g, p, t, k/. Coda /s/ was not a focus of the discussion, although /s/ certainly satisfies the structural description of each of the rules presented (/s/, like /b, d, g/, is [-sonorant]) and may therefore be classified as an obstruent. As such, it undergoes partial voicing assimilation just as one would expect.

(210) Partial voicing assimilation: *mismo* (Harris 1969: 8)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Largo</td>
<td>[mismo]</td>
</tr>
<tr>
<td>Andante</td>
<td>[mis^mo]</td>
</tr>
<tr>
<td>Allegretto</td>
<td>[mis^mo]</td>
</tr>
</tbody>
</table>

When voicing assimilation occurs in a dialect, it usually follows the partial pattern illustrated in (210). However, assimilation of /s/ does not occur in all dialects. In many dialects, assimilation of coda /s/ is suppressed in favor of an altogether different process: aspiration. In simplest terms, an aspirated /s/ is realized as [h]. Some examples of aspiration from Coria Spanish (southern Spain) are provided in (211).

(211) Aspiration of /s/ in Coria Spanish (Cummins 1974: 75-76)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a_visa_p</td>
<td>avi[h]p_a</td>
</tr>
<tr>
<td>e_cuela</td>
<td>e[h]c_uela</td>
</tr>
<tr>
<td>p_uesta</td>
<td>pue[h]t_a</td>
</tr>
</tbody>
</table>

The context for aspiration in a vast majority of dialects is syllable coda. One possible statement of the aspiration rule is as a simple substitution of /s/ for [h], in a
syllable "rhyme," or coda.

(212) Aspiration rule (Harris 1991a: 182)

\[
\begin{array}{c}
\text{s} \rightarrow \text{h} \\
\text{R}
\end{array}
\]

Although adequate, rule (212) presents aspiration as an arbitrary substitution of one set of features for another. Why should an unvoiced coronal fricative be replaced by a glottal one? Linear studies of aspiration, such as Guitart (1976), were hard-pressed to identify any difference between [s] and [h] in terms of articulatory complexity, because [s] was generally held to be the least marked continuant cross-linguistically (cf. Chomsky & Halle 1968). As a result, Guitart's approach to the aspiration data for Havana Spanish in his landmark study of segmental markedness was quite tentative:

Segmentally, [/s/] is no more complex than any other nonsyllabic segment, e.g. it is no more complex than /p, t, k, n/, which along with /s/ are the least complex nonsyllabics: ... Why, then, should /s/ be replaced in syllable- and word-final position by a segment that is perceptually inferior, i.e. more marked? For [h] is not as noisy as [s], not as intense, etc. (73-74).

His proposed solution, although sketchy, was in fact directly in line with the now well-accepted autosegmental analysis:

Perhaps it could be argued that [h] is less complex, i.e. more natural, than either [s] or [f] from a physiological point of view. In the first place, one would think of the greater noise intensity of both [s] and [f] vis-à-vis [h] is the product of a relatively greater degree of articulatory effort. Secondly, it seems that the production of either [s] or [f] is mechanically a more complex process than that of [h], for in the stridents there is an additional obstacle involved: the lower teeth in [s] (in addition to the constriction made by the tongue) and the upper teeth in [f]... (74).

Goldsmith (1979), one of the first major autosegmental studies of aspiration, assimilation, and positional neutralization in Spanish, formalizes this very point.
Appealing to the nodular structure of /s/, Goldsmith describes /s/-aspiration not as an inexplicable feature substitution, but rather as place node delinking. His original autosegmental formulation of aspiration is shown in (213).

(213) Aspiration (Goldsmith 1979: 8)

\[
\begin{array}{c}
\text{oral tier: } [+\text{coronal}] \swarrow \\
\emptyset
\end{array}
\]

This formulation makes a significant generalization, one which embodies the descriptive elegance of autosegmental phonology as well as the essence of Guitart's original proposal. Rule (213) targets not the segment but rather a subsegment: the [coronal] place node. Deletion of this feature leaves only the laryngeal features, which occupy a separate tier from the oral tier. The result of the rule is a "placeless" fricative, a specification consistent with [h]. In support of his analysis, Goldsmith offers the following argument:

...[T]here is no clue as to why the change is from s to h rather than z, say, or t, or any relatively common segment. I should like to say that the element which the underlying s becomes is not one specifically marked as having a wide open oral gesture: rather, to use Y.-R. Chao's words (1963: 39), we should say that the "[h] is simply the feature of voiceless glottal friction and [we should] leave the other nonsignificant features unspecified" (7).

Hualde's (1989a: 38) formulation of aspiration as a delinking rule is shown in (214).
In rule (214), a segment which is [+coronal, -voice, +continuant] delinks its supralaryngeal node (SL). Structural dependents of this node include the place node (P) and the feature [+cont]. Without its supralaryngeal node, the resulting segment is marked simply with a laryngeal node (L) and its dependent feature [-voice]: this is the specification for [h].

3.4.1 Some aspiration varieties

The process of /s/ aspiration and deletion discussed in this section is generally considered typical of southern Spain (Andalucía) and the coastal regions of Latin America. Many varieties of aspiration are found across the range of dialects. For example, in Peninsular Spanish, aspiration has three main manifestations. In addition to involving the delinking of a coda /s/ place feature (as is the case in Coria Spanish, see 211), it is possible for aspiration to entail gemination, and even a combination of aspiration and gemination.

---

24 Hualde (1989a) and Lipski (1986) both note that in dialects which distinguish between two unvoiced coronal fricatives, such as Castilian, both fricatives may undergo aspiration in syllable coda; thus diez --> die[θ] without aspiration, die[h] with aspiration (Hualde 1989a: 38). Hualde claims that in his native dialect, the unvoiced velar fricative /x/ also participates in aspiration syllable-finally; thus reloj --> relo[h]. For further discussion of s-aspiration in Spanish, the reader is directed to Ma & Herasimchuk (1971); Cedergren (1973); Goldsmith (1979); Poplack (1980); Terrell (1981); Lipski (1986); Hualde (1989a; 1991); Harris (1991); Widdison (1997); and others.
Alzar (1955: 291) provides examples of these three types, all of which can be heard in central Spain (see 215).


<table>
<thead>
<tr>
<th>los pies</th>
<th>dos toros</th>
<th>las casas</th>
</tr>
</thead>
</table>

In Variety A, typical of Coria, aspiration occurs following rule (214), and no further rules apply. Variety B, which is heard sporadically in Cúllar-Baza, is not aspiration at all, but rather total assimilation of the /s/ to the following consonant, resulting in a geminate. Variety C, which is the common mode of aspiration in Cúllar Baza, is a combination of aspiration and assimilation.

Hualde suggests that the phonetic [ŋ] in Variety B is the result of a voicing contour on the preceding vowel, rather than the result of a place contour on the consonant [s].

Diagram (216) shows the rule responsible for this effect.

---

Rule (216) incorporates two rules which may occur separately or in combination. In either instance, a coda /s/ (syllable position can be surmised phonotactically and need not be expressed in the rule) acquires the supralaryngeal node of an adjacent segment, either a vowel to the left or a consonant to the right. If it acquires the supralaryngeal node of the vowel to its left, the result is [h]. This is the case in lo[h] pie[h] (Variety A). If it acquires the supralaryngeal node of the consonant to its right, the result is a coda consonant homorganic to the following consonant: lo[p] pie[h] (Variety C). If it acquires supralaryngeal nodes from both adjacent segments, the result is a preaspirated geminate: lo[h^p] pie[h] (Variety B). Although perfectly able to account for all three varieties of aspiration in a single rule, Hualde's rule dispenses with the original elegant autosegmental generalization: that aspiration is not a spreading process but rather a delinking one.

3.4.2 Which feature gets left?

Goldsmith's (1979) analysis formalizes aspiration as a structure delinking operation, i.e. one in which feature structure is excluded in the phonetic realization of the segment (recall rule 213). The logical conclusion, then, is that aspiration is not a feature
substitution, but rather a process of structural simplification. The phonetic output [h] is "simpler" than the input segment /s/ because it has less structure: specifically, /s/ has a place node, and [h] does not. This approach to the problem allows [h] to be formalized as less marked than /s/.

In a series of instrumental studies, Widdison (1997) discovered that the perceptual cue for /s/ was physically present in both unaspirated and aspirated words. In words which contain a phonetic /s/, this segment is preceded by glottal widening which slightly overlaps the articulation of the preceding vowel. In words which contain an aspirated /s/, glottal widening is preserved in absence of the phonetic [s].

The glottal widening is an acoustic subcomponent of the /s/ gesture which becomes acoustically salient only if the coronal constriction is removed, as Widdison claims:

The key point is that the aspiration accompanies a fully specified /s/ and reassociation of [h] with the previous vowel occurs not as a stage of production, but as an error in perception (259).

What is the acoustically salient feature underlying both /s/ and /h/? One shared natural class is [+continuant], but vowels are part of this class also. Given Widdison's observations about the overlap of aspiration on the preceding vowel, it does not follow that aspiration could be merely the superimposition of one feature [+continuant] upon another.

It cannot be the feature [strident], because /s/ is [+strident] and [h] is [-strident] (cf. Durand 1990: 57).

It is proposed that the feature associated with aspiration, shared by /s/ and /h/, is [+spread glottis] (henceforth [+SG]), an articulator feature dependent of the laryngeal node. Kenstowicz (1994: 39) identifies this feature as the one associated with aspiration of voiceless stops in English, thus the aspirated [pʰ] in English pin is [+SG] but the unaspirated [p] in spin is [-SG]. Kenstowicz indicates that the feature [+SG] represents the widest possible aperture of the glottis, and is typically associated with consonants, but not vowels.
The phasing of this feature can be represented using phase-window graphics (cf. Browman & Goldstein 1990). Figure (217) shows the orchestration of gestures in unaspirated *pesco*, i.e. [pesko]. Figure (218) shows the orchestration of gestures in aspirated *pesco*, i.e. [pehko]. Both graphics follow essentially from Widdison’s (1997) discussion.

(217) Speech score: unaspirated *pesco* [pesko]

<table>
<thead>
<tr>
<th>tier</th>
<th>gestural score</th>
</tr>
</thead>
<tbody>
<tr>
<td>lips</td>
<td></td>
</tr>
<tr>
<td>tongue tip</td>
<td>s</td>
</tr>
<tr>
<td>tongue body</td>
<td>e k o</td>
</tr>
<tr>
<td>glottis [+SG]</td>
<td></td>
</tr>
</tbody>
</table>

In (217), the [-t-SG] gesture is coordinated with the tongue tip gesture /s/. In (218), the tongue tip gesture /s/ is no longer present, yet the [+SG] gesture is retained. In both instances, inexact phasing of the tongue tip and glottal gestures produces a perceived [+SG] contour on the preceding vowel. Deletion of /s/ involves deletion of the coronal place node as well as the manner feature [+strident], but the feature [+SG] is retained.
3.4.3 An OT account

This analysis will focus on the three aspiration varieties attested in Peninsular Spanish, specifically those of Coria and Cullar Baza (cf. 215). Representative data are organized in (219). Primary data sources include Alzar (1955) for central Peninsular Spanish, Salvador (1958) for Cullar Baza, and Cummins (1974) for Coria. Hualde (1989a and 1989b) contain discussions of these same data in a generative framework.


<table>
<thead>
<tr>
<th></th>
<th>a.</th>
<th>b.</th>
<th>c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>obispo</td>
<td>obi[h]po</td>
<td>obi[hp]po</td>
<td>obi[p]po</td>
</tr>
<tr>
<td>susto</td>
<td>su[h]to</td>
<td>su[ht]to</td>
<td>su[t]to</td>
</tr>
<tr>
<td>mosca</td>
<td>mo[h]ca</td>
<td>mo[hh]ca</td>
<td>mo[k]ca</td>
</tr>
<tr>
<td>esfera</td>
<td>e[h]fera</td>
<td>e[hf]fera</td>
<td>e[f]fera</td>
</tr>
</tbody>
</table>

In this analysis, it will be shown that the three dialectal varieties may be described in terms of variable constraint rankings to which speakers have access. The selection of [h] as the output of /s/ is determined by the interaction of four MARK constraints. *C/[+strident], *C/[+SG], *COMP-SEG, and LIC-ROOT: and three FAITH constraints. IDENT [strident], IDENT [SG], and DEP-LINK. These constraints are reviewed in (220).

(220) Constraints involved in /s/-aspiration

*C/[+strident] “No coda [+strident] segments.”

This constraint bans any [+strident] segment from coda position. In nonaspiring dialects, such as those of the highland Andes, Mexico City, and Castille, *C/[+strident] is dominated by IDENT [strident], and coda stridents are permitted. In aspirating dialects, *C/[+strident] may dominate IDENT [strident], thereby banning such segments from coda position. (*C/[+strid])

197
\textit{*C/\texttt{[+SG]} “No coda \texttt{[+SG]} segments.”}

Like \textit{*C/\texttt{[+strid]}}, this constraint bans any segment bearing the feature \texttt{[+SG]} from syllable coda. While \textit{*C/\texttt{[+strid]}} examines only /s/ (and /\Theta/, if present), \textit{*C/\texttt{[+SG]}} is sensitive to derived [h] as well.

\textsc{Lic-root} “Coda consonants are licensed by an onset root node.”

There are two types of /s/-assimilation which coincide with aspiration (see figure 239). In Variety 3, assimilation is incomplete, because voice features are excluded; cf. \textit{mismo} \textsuperscript{\textminus} \textit{mi[m]mo} rather than \textit{mi[m]mo} (Martínez-Gil 1991: 558). This effect is achieved by ranking \textsc{ident} [SG] \textasciitilde \textsc{Lic-root}. In Variety 2, assimilation is total, and the feature [SG] is forcibly unparsed: \textit{mismo} \textsuperscript{\textasciitilde} \textit{mi[m]mo}. This effect is achieved by the ranking \textsc{Lic-root} \textasciitilde \textsc{ident} [SG].

\textsc{ident} [\texttt{strident}] “The value of \texttt{[strident]} may not change.

This constraint monitors faithfulness of the feature \texttt{[strident]} on segments specified for this feature, specifically /s/ (and in dialects distinguishing a phonemic /\Theta/, this phoneme is included; thus, \textit{la t\texttt{o}s} \textsuperscript{\textminus} \textit{la to[h]}; \textit{la v\texttt{o}z} \textsuperscript{\textminus} \textit{la vo[h]}. (\textsc{ident} [\texttt{strid}])

\textsc{ident} [SG] “The value of [SG] may not change.”

Bans changes to the feature [spread glottis], born underlyingly by /s/ and in surface representations by [h].

\textsc{Dep-link} “No nonunderlying association lines.”

In the following OT analysis, the \textsc{mark} constraints \textit{*C/\texttt{[+strid]}}, \textit{*C/\texttt{[+SG]}}, and \textsc{Lic-root} are FCs. The ranking of these four constraints relative to the \textsc{faith} constraints \textsc{ident} [\texttt{strid}], \textsc{ident} [SG], and \textsc{dep-link}, which are fixed, determines the range of output realizations of coda /s/.

The constraints \textsc{ident} [\texttt{strid}] and \textit{*C/\texttt{[+strid]}} are in competition. As an FC, \textit{*C/\texttt{[+strid]}} may rank either above or below \textsc{ident} [\texttt{strid}]. The ranking \textsc{ident} [\texttt{strid}] \textasciitilde \textit{*C/\texttt{[+strid]}}, enforces feature faithfulness and is the ranking associated with Largo. The ranking \textsc{ident} [\texttt{strid}] \textasciitilde \textit{*C/\texttt{[+strid]}} bans any \texttt{[+strident]} segment from coda position (see 221 and 222).
(221) **Largo: susto**

<table>
<thead>
<tr>
<th></th>
<th>/susto/</th>
<th>IDENT [strid]</th>
<th>*C/[+strid]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>sus.to.</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>suh.to.</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

(222) **Allegretto (Variety A): susto**

<table>
<thead>
<tr>
<th></th>
<th>/susto/</th>
<th>*C/[+strid]</th>
<th>IDENT [strnd]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>sus.to.</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>suh.to.</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

In tableau (221), which shows candidate evaluation for Allegretto, candidate (b) is not the only possible candidate which satisfies *C/[+strid]. The replacement of coda /s/ by any other [-strident] segment would satisfy *C/[+strid] and therefore be a possible output. However, the only alternate to [s] in this position is [h], suggesting that IDENT [SG] dominates *C/[+strid]. This ranking states that the underlying [+SG] feature must be retained, and prohibits the gratuitous substitution of some other [-strid] segment, such as [t] or [p] (see 223).

(223) **Allegretto (Variety A): susto**

<table>
<thead>
<tr>
<th></th>
<th>/susto/</th>
<th>IDENT [SG]</th>
<th>*C/[+strid]</th>
<th>IDENT [strnd]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>sus.to.</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>suh.to.</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d</td>
<td>sus.to.</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>sup.to.</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

The retention of [+SG] at some other point of articulation, such as /f/, violates *C/[+strid] as well as IDENT [place] (see 224 and 225).
(224) Largo: susto

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. su.s.to.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| b. suh.to. | | | * | *
| c. suf.to. | | | | *
| d. su(s).to. | | | * | * |

(225) Allegretto (Variety A): susto

|---------|------------|-------------|---------------|--------------|
| a. su.s.to. | | | | *
| b. suh.to. | | | | *
| c. suf.to. | | | | *
| d. su(s).to. | | | | *

It must be assumed in Largo and Allegretto that MAX-IO dominates both *C/[+strid] and IDENT [strid]; otherwise coda [+strident] segments are subject to deletion rather than aspiration (see 226).

(226) Allegretto (Variety A): susto

<table>
<thead>
<tr>
<th>/susto/</th>
<th>MAX-IO</th>
<th>IDENT [SG]</th>
<th>*C/[+strnd]</th>
<th>IDENT [strnd]</th>
</tr>
</thead>
</table>
| a. su.s.to. | | | | *
| b. suh.to. | | | | *
| c. suf.to. | | | | *
| d. su(s).to. | | | | *

The FC LIC-ROOT may rank either above or below IDENT [strid]. If it is ranked above IDENT [strid], it has the potential to enforce total assimilation, depending on the ranking of other constraints, such as *C/[+SG] and *C/[+strid]. In (227), LIC-ROOT is inactive on the candidate set.
The constraint rankings examined so far in the above tableaux (221)-(227) represent a Variety A dialect (cf. 215). In this dialect class, aspiration may occur, but root node assimilation may not. Thus the assimilated candidates [suh.to.] and [sut.to.] are banned (see 228). The candidate [suh.to.] is tied with [suh.to.] for satisfaction of IDENT [strid] because both retain this feature, but DEP-LINK serves as a tiebreaker and forces [suh.to.] to be rejected. The candidate [sut.to.], as we have already seen, is suppressed because it violates IDENT [SG] (see 228).

If Variety A is characterized by the low ranking of DEP-LINK and LIC-ROOT relative to the faithfulness constraints IDENT [SG] and IDENT [strid], then Varieties B and C may be characterized by the reversal of these same rankings. For example, if LIC-ROOT dominates IDENT [strid], but DEP-LINK remains dominated by this constraint, then the preaspirated variant associated with Variety (b) is indicated (see 229).
(229) Allegretto (Variety B): *susto

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sus.to.</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. suh.to.</td>
<td></td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. sul.to.</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. suhLto.</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td>*</td>
</tr>
</tbody>
</table>

In order for total assimilation to be enforced (Variety C), all coda [+SG] segments must be overtly banned. There is no way to suppress candidate (229d) in favor of (239c) using only the five constraints on hand. One solution is to posit the FC *C/[-SG] which, like the FC *C/[+strid], supplements *CODA by banning certain segment classes from syllable coda. Ranked above IDENT [SG], *C/[-SG] commands the substitution of a [-SG] segment in all syllable coda positions (see 230).

(230) Allegretto (Variety C): *susto

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sus.to.</td>
<td>*!</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. suh.to.</td>
<td></td>
<td>*!</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. sul.to.</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>d. suhLto.</td>
<td></td>
<td></td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

The segment chosen in this instance is not arbitrary: rather, it is a totally assimilated geminate consonant. Everything else being equal, the identity of the output segment is selected by LIC-ROOT, which acts as a tiebreaker among any number of candidates which satisfy *C/[+SG] (see 231).
(231) Allegretto (Variety C): **susto**

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>sur.to.</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>suh.to.</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>sul.to.</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>sur.ko.</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>suh.ko.</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>suh.to.</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

If *C/[+SG] is ranked below IDENT [SG], then the preaspirated (Variety B) variant (f) is indicated (see 232).

(232) Allegretto (Variety B): **susto**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>sus.to.</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>suh.to.</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>sus.to.</td>
<td>*</td>
<td></td>
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<td>*</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>sur.ko.</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>sul.ko.</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>suh.to.</td>
<td>*</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

This OT analysis of aspiration makes use of three FCs: *C/[+strid], *C/[SG], and LIC-ROOT. The first two constraints supplement the constraint *CODA by banning specific segment classes from syllable coda. The third constraint requires that coda consonants assimilate totally to a following onset consonant. The rankings LIC-ROOT » IDENT [SG] and LIC-ROOT » IDENT [strid] ensure that such assimilation affects only [s] and [θ]. Details of variation with regard to aspiration are determined by the ranking of these FCs - which are MARK constraints - to their FAITH counterparts: IDENT [strid] and IDENT [SG]. In many cases, ties between one or more candidates are resolved by other constraints whose
ranking relative to the afore-mentioned constraints is not crucial; for example, DEP-LINK and IDENT [place].

To summarize the principle rankings required to account for the three dialectal varieties of aspiration data, putative hierarchies are provided in figure (233).

(233) Putative constraint hierarchies: /s/-aspiration

a. Varieties A, B, C: Largo

\[ \text{MAX-IO} \rightarrow \text{IDENT} [SG] \rightarrow \text{IDENT} [\text{strid}] \rightarrow \text{DEP-LINK} \]

model: \textit{susto} $\rightarrow$ su[s]to

b. Variety A: Allegretto

\[ \text{MAX-IO} \rightarrow \text{IDENT} [SG] \rightarrow \text{IDENT} [\text{strid}] \rightarrow \text{DEP-LINK} \]

model: \textit{susto} $\rightarrow$ su[h]to

c. Variety B: Allegretto

\[ \text{MAX-IO} \rightarrow \text{IDENT} [SG] \rightarrow \text{IDENT} [\text{strid}] \rightarrow \text{DEP-LINK} \]

model: \textit{susto} $\rightarrow$ su[ht]to

c. Variety C: Allegretto

\[ \text{MAX-IO} \rightarrow \text{IDENT} [SG] \rightarrow \text{IDENT} [\text{strid}] \rightarrow \text{DEP-LINK} \]

model: \textit{susto} $\rightarrow$ su[t]to

204
The putative rankings in (233) may be combined into a single diagram, with the three FCs specially marked, along with their minimum range of flotation within the hierarchy (see 234).

(234) Fully and partially ranked constraints in /s/-aspiration

\[
\begin{array}{c}
\text{Max-IO} \quad \text{ident [SG]} \quad \text{ident [strid]} \quad \text{dep-link}
\end{array}
\]

3.5 Summary

In this chapter I applied the FC theory of variation to several phonological processes which affect consonants. The first process, nasal and lateral place assimilation, was attributed to the interaction of the constraint LIC-PLACE with IDENT [place]. LIC-PLACE ensures that coda consonants are licensed by the place node of a following syllable onset consonant, thereby requiring place node spreading in such contexts. The variability of place node spreading was accounted for by the ranking of the FC LIC-PLACE relative to ALIGN. If LIC-PLACE is ranked below ALIGN, then assimilation is blocked across morpheme boundaries. If LIC-PLACE is ranked above ALIGN, then assimilation is enforced. The ranking LIC-LARYN » IDENT [place] is constant, and expresses the fact that place assimilation is the norm within morphemes. *COMP-SEG, also an FC, constrains assimilated outputs. Ranked above IDENT [place], total assimilation is enforced. ranked below, partial assimilation (overlap) is permitted.

It was shown that in place assimilation contexts, the place node is always spread from a syllable onset to the preceding coda consonant, never vice-versa. The constraint ONS-PLACE acts as a "special case" IDENT [place] constraint which must dominate LIC-PLACE regardless of speech style in order for the correct direction of assimilation to be enforced.
In most dialects of Spanish, Nasal place assimilation poses an additional problem for consideration because it is often preempted by Neutralization, here also called velarization (V) or alveolarization (A). As the names suggest, these processes neutralize word final nasals in favor of a particular place of articulation. In V-dialects, such as Havana Spanish, nasals are typically realized as velar - i.e. [ŋ] - at the end of a word, regardless of position within the syllable. In A-dialects, such as Castilian, word-final nasals are neutralized to [n]. These data were accounted for by two positive neutralizing constraints: NAS/COR₁word for A-dialects, and NAS/DOR₁word for V-dialects.

The difference in distribution of neutralized nasals is determined by the ranking of NAS/DOR₁word and NAS/COR₁word to the already motivated constraint ONS-PLACE. In A-dialects, ONS-PLACE must dominate NAS/COR₁word, because place neutralization never occurs syllable-initially. In V-dialects, however, NAS/DOR₁word dominates ONS-PLACE, because a neutralized word-final nasal before a vowel-initial word is allowed to occupy a surface onset without relinquishing its neutralized place features.

Next, three processes - voicing assimilation, continuancy assimilation, and coda obstruent devoicing - were discussed and analyzed together. Voicing assimilation is driven by the licensing constraint LIC-LARYN. Like LIC-PLACE, LIC-LARYN is a fixed constraint which must always be dominated by IDENT [voice]. The result is a grammar in which obstruents voice-assimilate only partially. Continuancy spreading was attributed to two constraints: CONT, which targets voiced obstruents, and the FC *C/OBS[-cont], which targets all coda obstruents. The ranking of *C/OBS[-cont] relative to IDENT [cont] determines whether or not a coda obstruent is [+continuant] or faithful to its underlying specification for this feature. Coda obstruent devoicing is achieved by the FC *C/OBS[+voice], which ranks either above or below its corresponding faithfulness constraint IDENT [voice]. The FC *COMP-SEG bans all feature contours across a single segment. Ranked above LIC-LARYN, it requires that un-contoured un-voice-assimilated segments be preferred to those which satisfy LIC-LARYN by introducing a voicing contour. These three FCs interact across a broad range of the hierarchy to optimize an equally broad range of output variants, voiced and unvoiced, continuant and noncontinuant, assimilated
and unassimilated.

In the final section, I presented an OT analysis of aspiration. In Spain (mostly southern), aspiration occurs in at least three dialect varieties. In Variety A, coda /s/ is realized as [h]. In Variety B, coda /s/ is realized as a consonant which is totally assimilated to the onset consonant of the following syllable. In Variety C, coda /s/ is both assimilated and aspirated. In the approach taken here, aspiration is effected by the constraint pair \*C/{+strident} and IDENT [strident]. Depending on the ranking of these constraints, aspiration is either indicated or banned. The constraint pair \*C/{+SG} and IDENT [SG] is also instrumental in the selection of candidates. Ranked above IDENT [SG], \*C/{+SG} bans not only [s] but also [h] from syllable coda; the identity of the new segment is chosen by the FC LIC-ROOT, which if ranked above IDENT [strident] ensures total assimilation - gemination - of the coda consonant.

As in chapter 2, the FC model enables a unified treatment of categorical and variable processes. Intermediate effects, such as coarticulation (gestural overlap) and partial voicing assimilation, emerge as the result of competition between MARK and FAITH constraints, which may be simultaneously satisfied by introducing a feature contour, such as [-voice] \longrightarrow [+voice] or [coronal] \longrightarrow [labial]. Future work will further develop some of the issues addressed in this chapter, and resolve some of the problems involved in formalizing segmental markedness into positive and negative constraints.
CHAPTER 4

CONCLUDING REMARKS

Since the time this study was initially proposed and undertaken, the "variationist" subfield of OT has developed into a legitimate school of OT research. Those in favor of a variationist program generally espouse the theory proposed by Reynolds (1994), which has since been developed by Nagy & Reynolds (1997), Kang (1997), Borowsky & Horvath (1997), Van Oostendorp (1997), Rose (1997), Zubritskaya (1997), Anttila (1997), Anttila & Cho (1998), and others. These studies collectively argue for a system in which universal constraints are "floating" or "partially ranked." Learners of this system posit these incomplete rankings in order to account for patterns of linguistic variation within their dialect, and so they can reflect these patterns in their own speech.

Despite the broad scope of some of the studies undertaken so far, none has applied the FC model to a discussion of speech styles. It has been maintained throughout this study that speech styles are, in fact, distinct micro-dialects contained within - and shared among - the speakers of a community. Speakers shift between these micro-dialects much as they would between the grammars of separate languages. In the theory developed here, language is inherently variable because its users are inherently in control of the constraint system which defines language. Linguistic style varies because speakers have, contained entirely within their categorical grammar, a variable grammar within which they may exercise full stylistic control.

In nonvariationist OT studies, it is sufficient to undertake two tasks: 1) identify the set of universal constraints which is active on the data in question; and 2) determine the ranking relations among these constraints. In the present variationist study, it is
additionally necessary to specify the *nature of the rankings*, i.e. *categorical or variable*. 

This study has examined many different constraint rankings, categorical and variable, together. In general, the constraints examined fall into one of two categories: *Faithfulness* or *Markedness*. Whereas Faith constraints monitor input-output correspondence at the segmental and subsegmental (i.e. featural) level, Mark constraints are sensitive to prosodic organization at the suprasegmental level, i.e. spanning one or more segments. In the interest of consistency, it was maintained that all variably ranked or "floating" constraints - FCs - are Mark constraints. It is not the case, however, that all Mark constraints are FCs. Indeed, languages are more or less free to use any Mark constraint as an FC, or to rank it categorically (non-variably).

To summarize the essential claims of the FC theory laid out in this dissertation, I will review some of the constraint types (Mark, Faith) and ranking types (categorical, variable) treated in this study.

First, to say that a pair-wise ranking of two constraints is categorical means that the ranking holds uniformly in all speech styles: i.e. *the reverse ranking is never attested* by linguistic data of any type. One example of a categorical ranking which holds across all dialects of Spanish is the relation V-TO-HEAD » STRESS. This ranking predicts that the shift of word stress (STRESS violation) is permitted *provided that* such shift is local in nature. In other words, if due to pressure from a higher constraint the targeted vowel in a word cannot be stressed, then stress may be shifted to a more suitable vowel as long as the targeted vowel is contained in the stressed syllable. If stress cannot target the vowel itself, then it must at least target the syllable containing it (see 235).

(235) Cross-dialectal categorical ranking: V-TO-HEAD » STRESS

\[
\text{\textit{menu} antiquo/ V-TO-HEAD \quad \text{STRESS}}
\]

\begin{tabular}{ll}
\textit{a. me. nwaŋ. ...} & \textit{...} \\
\textit{b. 'me. nwaŋ. ...} & \textit{...}
\end{tabular}

209
Because the ranking V-TO-HEAD » STRESS is categorical across all Spanish dialects, there is no situation in any dialect in which the reverse ranking STRESS » V-TO-HEAD obtains, because there is no data to justify such a ranking. It is therefore never possible, in any dialect, for candidate (235b) to be selected as optimal. This does not mean that (235a) is optimal in all dialects, because in many dialects, additional constraints intervene in the selection of outputs. Nevertheless, it is sufficient to say that the ranking V-TO-HEAD » STRESS is categorical cross-dialectally in Spanish, because (235b) is not a possible output in any dialect.

There are other constraint rankings which are not categorical for the language as a whole, i.e. they vary across dialects. For example, Peninsular Spanish is characterized by the categorical ranking IDENT [high] » MAX-WI-μ. This ranking states that a word-initial mora may be deleted if such deletion will allow the identity of a feature [high] to be retained. In Chicano Spanish, this ranking is categorically reversed. The reverse ranking states that the value of [high] may be changed in order to avoid word-initial gliding. Both rankings are categorical in their respective dialects (see 236 and 237).

(236) Peninsular Spanish ranking: IDENT [high] » MAX-WI-μ: de uviitas

<table>
<thead>
<tr>
<th>/de ubitas/</th>
<th>IDENT [high]</th>
<th>MAX-WI-μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dew. ...</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. dju. ...</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

(237) Chicano Spanish ranking: MAX-WI-μ » IDENT [high]: de ubitas

<table>
<thead>
<tr>
<th>/de ubitas/</th>
<th>MAX-WI-μ</th>
<th>IDENT [high]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dew. ...</td>
<td>*</td>
<td>*!</td>
</tr>
<tr>
<td>b. dju. ...</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

There are some constraint pairs whose ranking varies not across dialects (as is the case for MAX-WI-μ and IDENT [high]), but rather within dialects. Constraints which are variably ranked within a particular dialect may rank either above or below certain other
constraints, as a matter of stylistic choice. For example, in all dialects of Spanish, \textsc{onset} is variably ranked relative to \textsc{max-\( \mu \)}. This means that in the constraint hierarchy of any Spanish dialect, it may be true that \textsc{onset} \( \gg \) \textsc{max-\( \mu \)} or \textsc{max-\( \mu \)} \( \gg \) \textsc{onset}. The ranking \textsc{max-\( \mu \)} \( \gg \) \textsc{onset} enforces vowel hiatus, and is called the "Largo" (slow/careful speech) ranking. The reverse ranking effects glide formation, and is called the "Allegretto" (fast/casual speech) ranking (see 238 and 239; only the essential candidates and constraints are shown).

(238) Largo: \textsc{max-\( \mu \) \( \gg \) onsets}: te adoro

\begin{tabular}{llll}
 & te adoro & \textsc{max-\( \mu \)} & \textsc{onsets} \\
\hline
\( \vDash \) & a. te.a. & & \\
& b. te.a. & & \\
\hline
\end{tabular}

(239) Allegretto: \textsc{onsets} \( \gg \) \textsc{max-\( \mu \)}: te adoro

\begin{tabular}{llll}
 & te adoro & \textsc{onsets} & \textsc{max-\( \mu \)} \\
\hline
\( \vDash \) & a. te.a. & & \\
& b. te.a. & & \\
\hline
\end{tabular}

Variationist OT therefore allows ranking relations to be classified into three groups: a) categorical within dialects, categorical across dialects; b) categorical within dialects, variable across dialects; and c) variable within dialects. Examples of each group are enumerated in (240).

(240) Categorical within dialects, categorical across dialects

\begin{enumerate}
\item Stress shift
\end{enumerate}

\textsc{v-to-head} \( \gg \) \textsc{stress, max-s}

Stress shift is local.

211
b. Nasal manner/place
\[ \text{IDENT [nasal]} \rightarrow \text{IDENT [place]} \]
Nasals may change place, but not manner.

c. Lateral manner/place
\[ \text{IDENT [lateral]}, \text{LAT/COR} \rightarrow \text{IDENT [place]} \]
Laterals may change place within the [coronal] place node, but may not change manner.

d. Voicing assimilation
\[ \text{IDENT [voice]} \rightarrow \text{LIC-LARYN} \rightarrow \text{*COMP-SEG} \]
Voicing assimilation is partial.

(241) Categorical within dialects, variable across dialects

a. Glides at word boundaries
\[ \text{MAX-W1-} \mu \rightarrow \text{HNUC (Standard Mexican Spanish)} \]
Only onglides at word boundaries, regardless of sonority.
\[ \text{HNUC} \rightarrow \text{MAX-W1-} \mu \text{ (Peninsular Spanish)} \]
Onglides or offglides at word boundaries, as sonority dictates.

b. Glide height
\[ \text{HIGLIDE} \rightarrow \text{IDENT [high] (Chicano Spanish)} \]
All glides are [+high].
\[ \text{IDENT [high]} \rightarrow \text{HIGLIDE (Peninsular Spanish)} \]
Glides are faithful to their underlying specification for [high].

c. Stress and merger
\[ \text{MAX-S}, \text{STRESS} \rightarrow \text{MAX-} \mu \rightarrow \text{MAX-W1-} \mu \rightarrow \text{HNUC (Standard Mexican Spanish)} \]
Stressed vowels cannot be glided: offglides are allowed at a word boundary only after a stressed nucleus, regardless of sonority.
\[ \text{HNUC} \rightarrow \text{MAX-} \mu \rightarrow \text{MAX-S}, \text{STRESS} \rightarrow \text{MAX-W1-} \mu \text{ (Peninsular Spanish)} \]
Stress is invisible in glide formation; onglides or offglides are allowed at word boundaries, as sonority dictates.
d. Vowels at word boundaries

\[ \text{HNUC} \rightarrow \text{MAX-IO} \rightarrow \text{IDENT [high]} \rightarrow \text{IDENT [low]} \rightarrow \text{MAX-WI-\mu} \]

(Peninsular Spanish)

Low vowels remain low, mid vowels raise.

\[ \text{MAX-WI-\mu, HNUC} \rightarrow \text{IDENT [low]} \rightarrow \text{MAX-IO} \rightarrow \text{IDENT [high]} \]

(Chicano Spanish)

Low vowels delete, mid vowels raise.

e. Nasal Neutralization

\[ \text{NAS/X}_{\text{word}} \rightarrow \text{ONS-PLACE} \text{ (V-dialects)} \]

Neutralized nasals may be shoved into surface onset position.

\[ \text{ONS-PLACE} \rightarrow \text{NAS/X}_{\text{word}} \text{ (A-dialects)} \]

Neutralized nasals never occur in surface onset position.

(242) Variable within dialects

a. Syllable merger

\[ \text{ONSET} \rightarrow \text{MAX-\mu} \]

No vowel hiatus (enforces glide formation).

\[ \text{MAX-\mu} \rightarrow \text{ONSET} \]

No glide formation (enforces hiatus).

b. Place assimilation

\[ \text{ALIGN} \rightarrow \text{LIC-PLACE} \]

No place assimilation across word boundaries.

\[ \text{LIC-PLACE} \rightarrow \text{ALIGN} \]

Place assimilation is enforced across word boundaries.

c. Degree of place assimilation

\[ \text{*COMP-SEG} \rightarrow \text{IDENT [place]} \]

Partial place assimilation enforced (no total).

\[ \text{IDENT [place]} \rightarrow \text{*COMP-SEG} \]

Total place assimilation enforced (no partial).
d. Coda obstruent continuancy
   \[ *C/OBS[-\text{cont}] \rightarrow \text{IDENT} [\text{cont}] \]
   All coda obstruents are [+cont].
   \[ \text{IDENT} [\text{cont}] \rightarrow *OBS[-\text{cont}] \]
   Coda obstruents are realized faithfully to underlying [cont].

e. Coda obstruent voicing
   \[ *C/OBS[+\text{voice}] \rightarrow \text{IDENT} [\text{voice}] \]
   All coda obstruents are [-voice].
   \[ \text{IDENT} [\text{voice}] \rightarrow *C/OBS[+\text{voice}] \]
   Coda obstruents are realized faithfully to underlying [voice].

f. Aspiration
   \[ \text{IDENT} [SG] \rightarrow *C/[+\text{strident}] \rightarrow \text{IDENT} [\text{strident}] \]
   Coda [+strident] \rightarrow [h].
   \[ \text{IDENT} [SG] \rightarrow \text{IDENT} [\text{strident}] \rightarrow *C/[+\text{strident}] \]
   Coda [+strident] are represented faithfully to underlying [strident].

This study has not endeavored to derive probabilistic predictions from the availability of constraint rankings within the grammar, even though such quantifications may be possible. Nor has this study examined in detail the many environmental variables which motivate stylistic variation. Applications of variationist OT to specific types of speech situations or are left to future research.

The present study recognizes interspeaker and intraspeaker variation as two inseparable axes in the description of variable speech. The FC theory, originally designed to explain facts of interspeaker variation, has been adapted here to account specifically for intraspeaker variation, without any special modification. The main advantage of the FC model in the description of stylistic data is its ability to accurately describe the interaction of categorical and variable processes. The resulting grammar is comprehensive.


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