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S-WEAKENING IN THE SPANISH OF SAN MIGUEL, EL SALVADOR

by

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ABSTRACT

This thesis undertakes a comprehensive examination of the effects of a variety of social, phonological and morphosyntactic factors on the process of s-weakening in the Spanish of San Miguel, El Salvador. The corpus used in this study consists of sixteen speakers native to San Miguel, evenly distributed according to age, sex and socioeconomic status. It was found that s-weakening appears to be in stable variation and that it is primarily governed by phonological factors: the quality of the segment following the /s/, the position of the /s/ in the syllable and word, and whether the /s/ is in a stressed or an unstressed syllable. Regarding the quality of the following segments, it was found that coronal stops caused /s/ to resist weakening. Consequently, it is argued that /st/ and /sd/ sequences are partial geminates in this dialect of Spanish, i.e. they share a place node. An account of the phonological factors conditioning s-weakening is provided within the framework of Optimality Theory, utilising the notion of crucially unranked constraints.

RÉSUMÉ

Cette thèse entreprend l'examen compréhensif des effets d'un nombre de facteurs sociaux, phonologiques et morphosyntactiques sur le processus d'affaiblissement du 's' de l'espagnol de San Miguel au Salvador. Le corpus étudié est basé sur 16 locuteurs natifs de San Miguel, distribués selon l'âge, le sexe et le statut socio-économique. Nous avons observé un processus d'affaiblissement du 's' en variation stable principalement gouverné par des facteurs phonologiques: la qualité du segment suivant le /s/, la position de /s/ dans la syllabe et le mot, et si le /s/ se trouve dans une syllabe accentuée ou non. Quant à la qualité des segments suivants, les occlusives coronales ont réduit l'effet d'affaiblissement du /s/. Conséquemment, nous proposons que les sèquences /st/ et /sd/ sont des géminées dans ce dialecte de l'espagnol, c.-à.-d. qu'elles partagent un noeud de place. Une explication des facteurs phonologiques qui conditionnent l'affaiblissement du 's' a été élaborée dans le cadre de la théorie de l'optimalité en utilisant la notion de contraintes crucialement non-ordonancées.

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CHAPTER 1

S-WEAKENING - AN INTRODUCTION

1.1 Introduction

The phenomenon of s-aspiration (s~h) and deletion (s~Ø) is a process which is present in many dialects of Spanish and which has been extensively studied over the course of more than two decades. The contribution of this thesis is threefold: I examine this process in a previously unexamined dialect of Spanish, that of San Miguel, El Salvador; to my knowledge, I examine the effects of a greater variety of factors on this process than in any previous study, and distinguish between different phonological environments in more detail than has previously been attempted; and I offer a phonological account for the observed distribution of s-weakening in this dialect within the framework of Optimality Theory, an account which predicts with reasonable accuracy the actual distribution of the different variants.

The layout of the thesis is as follows. In this chapter I offer a historical perspective of this process and examine the results reported in the literature. In chapter two I will discuss the methodology used in data collection and in analysis of the data, and describe the community studied and the corpus selected. In chapter three I will present and discuss the results obtained in my analysis. I will demonstrate that the

factors which have the most effect on s-weakening are the following: sex, class and level of education of the speaker; position of the segment in the syllable and word; following phonological environment, where a following coronal stop word-internally disfavours weakening of the /s/; position of sentential stress; and, in the cases where /s/ constitutes plural marking, whether this plural marking is redundant, i.e. predictable from contextual information.

In chapter four I give an overview of the treatment of variation in phonological theory; I argue that the best method of accounting for the observed phenomena is using Optimality Theory, as proposed by Prince and Smolensky (1993), using crucially unranked constraints, as proposed by Anttila (1995, cf. Reynolds 1994). In chapter five I give an account of s-weakening in Spanish, and demonstrate that it is possible within this approach to predict the rates of s-aspiration and deletion in different environments with reasonable accuracy.

1.2 The history of s-weakening in Spanish

1.2.1 Lowlands vs Highlands dialects

S-weakening is extremely common in many dialects of Spanish such as those of Andalusia, the Carribean, coastal Ecuador and Peru etc, and not as pervasive in other dialects such as those of Mexico City, Bogotá, Guatemala City, Lima etc. It has been

claimed (Canfield 1962) that the frequency of s-aspiration in particular provides a means for classifying Latin American Spanish into two major groups: Highlands Spanish, where aspiration and deletion are not common, and Lowlands Spanish, where they are common in all socioeconomic strata. According to Canfield, s-aspiration originated in Andalusia and spread to those areas maintaining close commercial contact with Seville, while the more isolated, conservative areas, which are further inland, lacked such contact and thus did not adopt this trait.

It must be noted that the evidence cited above does not preclude the possibility that s-weakening originated in Latin America and spread to Spain. It is also possible that the settlers of coastal areas came primarily from areas of Spain where s-weakening was common, as opposed to the settlers of inland areas, a possibility which Canfield does not address. However, it is beyond the scope of this thesis to determine which of these hypotheses is correct; the importance of this evidence is merely to point out that the higher rates of s-weakening in San Miguel as compared to the rest of El Salvador are consistent with the distribution in the rest of Latin America: San Miguel is a coastal city, whereas San Salvador and Santa Ana, the other two major cities in El Salvador, are further inland.

1.2.2 Other Historical Evidence

It is impossible to accurately determine when s-weakening began simply by examining modern Spanish. However, the presence of this process in other dialects and languages, such as the various dialects of Philippine Creole Spanish, which have been influenced by earlier varieties of Spanish, may provide clues. Although examination of these dialects does not allow us to make definitive claims about the state of Spanish during the period in which they were in most contact, from around the middle of the 17th century, the fact that these dialects preserve many traces of the Spanish from this time period allows us to use them as a sort of "window into the past."

Lipski (1986a) reached the following conclusions through a quantitative study of s-weakening in the dialects of Philippine Creole Spanish:

(a) preconsonantal word-final /s/ was already weakened to [h] in the Spanish brought to the Philippines at the end of the 17th century

(b) this reduction affected the pronominal system most strongly

(c) word-final /s/ deleted earlier than word-internal preconsonantal /s/, whereas word-internal preconsonantal /s/ was aspirated first.

However, it must be noted that syllable-structure simplification, where coda consonants are deleted, is extremely common in creoles in general, including English-based creoles. Thus this evidence is far from conclusive, since it is possible that these changes took place in the creole itself rather than in the superstrate, Spanish, or that this process is the result of a combination of the substrate influence and universal tendencies in pidginisation.

Other evidence used to draw conclusions about the state of /s/ in early Peninsular Spanish include orthographic errors collected as early as the 14th century which demonstrate the loss of both word-internal and word-final /s/ as well as hypercorrection. Some examples are given in (1) (taken from Torreblanca 1989):

(1) a. mismo 'same' as *mimo* (word-internal preconsonantal)

b. los cuales 'which(pl.)' as *los quale* (word-final)

c. grandes mercedes 'great mercies' as *grande mercedes* (word-final)

d. recado 'message' as *recasdo* (hypercorrection)

However, the accuracy of the scribes is questionable: they often omitted letters other than 's,' which were no doubt conserved in speech, as well as including letters which were not pronounced, as the following examples demonstrate:

(2) a. católica 'catholic' as *catlica*

b. Gutiérrez as *Guierrez*

c. apreciada 'appreciated' as *aprecianda*

It can be seen from the examples above that scribes' omission of 's' in writing constitutes shaky evidence for the presence of s-weakening in Spanish from the fourteenth to the seventeenth centuries. The earliest certain case of aspiration occurs in the 18th century, in a play written by Gaspar Fernández y Avila, *La Infancia de Jesu-Christo*, in which the playwright makes use of the letters *s* + *j* (or *g*) to show aspiration of 's' in plural articles: *las jorejas* (for las orejas), *los jojos* (for los ojos).

Thus, although no definite conclusions can be drawn about the time of origin of s-weakening in Spanish, there is some evidence that it may have begun at least as early as the 18th century, and more probably in the late 16th or 17th century.

1.3 Distribution of S-weakening

Before going on to discuss the findings of the many studies of s-weakening in Spanish, it is important to give an overview of the general phonological distribution of this process.

S-weakening can take place in almost any phonological environment in Spanish. In general, both aspiration and deletion are permitted in coda position, whether the following environment is (3a) a vowel, (3b) a word-initial consonant, (3c) a pause, or (3d) a word-internal consonant:

(3) a. quiero más arroz
want-1sg more rice
'I want more rice'

b. son más de cincuenta
be-3pl more than fifty
'there are more than fifty of them'

c. te voy a dar más
you-sg go-1sg to give more
'I'm going to give you [some] more'

d. hasta 'until'

Although less common, in some dialects, including that of San Miguel, aspiration, but not deletion, is permitted where the segment is in either (4a) word-internal onset position or (4b) word-initial onset position:

(4) a. casa 'house'

b. yo soy de San Miguel
I am from San Miguel
"I am from San Miguel"

1.4 Quantitative Studies of S-weakening

1.4.1 General Findings

Since Ma and Herasimchuk's groundbreaking study of Puerto Rican Spanish in 1971, which was the first quantitative analysis of s-weakening, a vast number of studies of s-aspiration and deletion have been undertaken in several dialects of Spanish, primarily Cuban (Terrell 1979, Hammond 1980, Uber 1989) and Puerto Rican (Terrell 1978, Poplack 1979, 1980a, 1980b, Hochberg 1986, Flores et al 1983), but also Honduran (Lipski 1983, 1986b), Andalusian (Ranson 1992), Panamanian (Cedergren 1973, 1978), Dominican (Alba 1982), and Argentinian (Fontanella de Weinberg 1974), among others.

Many of these papers deal with the implications of s-deletion for the Functional Hypothesis, a point which I will deal with in the following section. However, they also report results which are consistent across all dialects of Spanish and which can be summarised as follows:

(5) a. s-weakening is most common among lower class speakers. However, the types of factors which constrain speakers, both morphosyntactic and phonological, do not vary according to the socioeconomic status nor level of

education of the speakers; the ratio remains the same, with only the absolute percentages changing (Lafford 1989).

b. s-weakening is most common among less educated speakers.

c. s-weakening is most common in casual speech.

d. as mentioned in section 1.3 above, s-weakening is influenced by the phonological environment, occurring primarily preconsonantally (which in Spanish means syllable-finally, since syllable-initial consonant clusters whose first element is s are not tolerated), and to a lesser degree word-finally where the segment is followed by a vowel or a pause. Least favoured for application of this process are word-initial and intervocalic positions, where deletion does not occur at all, and aspiration is not common.

e. s-weakening is disfavoured where the segment is in a stressed syllable.

f. s-weakening is more common in polysyllabic words (eg *entradas*) than in monosyllabic words (eg *más*).

1.4.2 Social Factors

Few studies have investigated the effect of age and sex on s-weakening; however, Cedergren (1978) found that in Panamanian Spanish the effect of these factors is minimal. Women tend to aspirate slightly more than men and men tend to delete slightly more than women; in addition, younger speakers aspirate more than older speakers and older speakers delete more than younger speakers. This suggests that

aspiration and deletion are two separate processes, a point which has been the subject of debate.[1]

Other studies examining the sex of the speaker have found either no significant effect or higher rates of retention of /s/ in female speakers regardless of age or social class (Ferguson 1990). Since it is clear from the distribution of /s/ according to both formality and socioeconomic status that /s/ is the prestigious variant, and since women tend to use the standard variant more in cases of stable variation (Trudgill 1972), this is consistent with (although not proof of) the hypothesis that s-weakening is in stable variation.

1.5 The Functional Hypothesis

Many studies of s-deletion in Spanish are primarily concerned with testing the validity of the Functional Hypothesis, derived from Kiparsky's (1972) 'distinctness conditions'; the Functional Hypothesis holds that "there is a tendency for semantically relevant information to be retained in surface structure" (Poplack 1980a). In Spanish this hypothesis is testable since /s/ has morphemic status in two different cases: it can function as a plural marker or as a second person singular

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1 In my study I assume that the processes are separate, i.e. that /s/ is either aspirated or deleted (s→h, s→Ø), rather than that /s/ is aspirated and that the derived [h] is then deleted (s→h, h→Ø). The reason for this assumption is that a feeding relation is inconsistent with a non-derivational approach like Optimality Theory. I will demonstrate that within an Optimality Theoretic approach it is possible to obtain the correct results with this assumption; thus there is no need to assume two underlying representations until evidence to the contrary suggests otherwise.

marker. Since as part of my analysis I investigate the validity of this hypothesis for my data, in this section I will outline its implications for Spanish and will briefly review the research conducted in this area.

1.5.1 Nominal /s/

Within the noun phrase, plurality is marked on the determiner, the noun and any adjectives present. In plural NPs, s is the only element distinguishing singular and plural nouns and adjectives; therefore, it should be retained. However, because every determiner, adjective and noun within an NP must agree, this plural marking becomes redundant. If the grammar aims to overtly mark plurality, it becomes possible to delete some instances of s, as long as one s is retained. Furthermore, the masculine determiner changes completely in the plural, meaning that the s is not the only marker of plurality, whereas the feminine determiner maintains the same form, so that in this case the s is the only marker of plurality. Some examples are given below

(6) a. masculine: el libro rojo
the.sg book.sg red.sg

los libros rojos
the.pl book.pl red.pl

b. feminine: la casa blanca
the.sg house.sg white.sg

las casas blancas
the.pl house.pl white.pl

Kiparsky's Functional Hypothesis thus predicts that /s/ should be deleted more frequently in *los* than in its feminine counterpart *las*, as well as being deleted more frequently in plural nouns and adjectives.

1.5.2 Verbal /s/

In Spanish, there are two informal second person singular forms: *tú* and *vos*. In dialects where *tú* is used, s is the only distinction between second person singular verbs and third person singular verbs in the present tense (see 7a), and between second person singular verbs and first or third person singular verbs in the present subjunctive (7d), whose first and third person singular forms are identical. Both in dialects where *tú* is used and those where *vos* is used, s is the only distinction between second person singular verbs and first or third person singular verbs in the imperfect indicative (7b), in the future (7c), and in the imperfect subjunctive (7e).

Examples are given below; since Spanish is a pro-drop language, optionality of subject pronouns is indicated by parentheses:

(7) a. present tense

(tú) caminas
(you) walk

(vos) caminás
(you) walk

(él) camina
(he) walks

b. imperfect indicative

(tú) caminabas
(you) walked

(vos) caminabas
(you) walked

(yo él) caminaba
(I/he) walked

c. future tense

(tú) caminarás
(you) will walk

(vos) caminarás
(you) will walk

(él) caminará
(he) will walk

d. present subjunctive

(tú) camines
(you) walk-subj

(vos) caminés
(you) walk-subj

(yo él) camine
(I he) walk-subj

e. imperfect subjunctive

(tu) caminaras
(you) walk-past-subj

(vos) caminaras
(you) walk-past-subj

(yo él) caminara
(I he) walk-past-subj

Given that /s/ is morphemic in both nominal and verbal morphology, and thus that deletion of the /s/ would in some cases render the noun or verb ambiguous, researchers have undertaken much investigation of the Functional Hypothesis. To summarise, this hypothesis predicts that:

(8) a. /s/ should be deleted (i) less often where an NP would be rendered ambiguous, which means in feminine NPs, and (ii) not necessarily on all items within the NP, since plural marking on just one item is sufficient to clearly mark the NP as plural.

b. where second person singular verbs would be rendered ambiguous by s-deletion, there should either be higher levels of s-retention, or a resultant rise in the use of second person singular subject pronouns.

1.5.3 Results in Spanish

Early investigation of the Functional Hypothesis tested whether /s/ would be retained more where it was morphemic than where it was non-morphemic.[2] It was found that in fact the opposite was true: inflectional /s/ tended to be deleted *more* than non-morphemic s , as is shown in the table below:

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2 I use the term "non-morphemic" here although the term generally used in the literature is "lexical"; this is in order to avoid confusion with the term "lexical" in the sense of lexical phonology

	deletion of inflectional /s/	deletion of non-morphemic /s/
Terrell (1978) Puerto Rican Spanish	32%	23%
Poplack (1980a) Puerto Rican Spanish	65%	54%
Hundley (1987) Peruvian Spanish	26%	12%

Table 1.1 ***Rates of deletion of inflectional and non-morphemic /s/ in dialects of Spanish***

The next step was to investigate whether /s/ tended to be retained on at least one element of the NP to mark plurality: if rates of deletion of /s/ were the same for non-morphemic /s/ and all /s/'s marking plurality within the NP, this would constitute further evidence against the Functional Hypothesis. Although some studies (Terrell 1977b, 1978, 1979) showed that /s/ was retained more on the first element of the NP, this is probably due to phonological factors rather than functional ones: the first element in the NP is typically a determiner which is generally monosyllabic, an environment which Terrell found favours s-retention.

Interestingly, Poplack (1980a) found "a tendency toward concord on the string level" (p. 65), that is, absence of a marker on a segment immediately preceding a token favours deletion of the marker on that token, whereas the presence of a preceding marker favours retention of the marker. This result "clearly runs counter to any functionalist claim".

Finally, researchers attempted to determine if /s/ functioned together with other plural markers to mark plurality in the surface structure, i.e. if /s/ was used where there was no other way of determining that the NP was plural. Ranson (1992) tested this claim in Andalusian Spanish and found that "empirical data from an analysis of the linguistic nominal number markers present in addition to /s/ ... show that [they] do not interact in any systematic way to preserve number marking in surface structure"; i.e. plural marking is not systematically preserved in surface structure in Spanish.

As we have seen, evidence to date in support of the Functional Hypothesis in Spanish is scant. In this thesis I will investigate a weak version of this hypothesis: that /s/ is more likely to be retained where there is no other plural or second person singular marking in the surface structure, and where the speaker cannot know that the token is pluralised or second person singular through his/her knowledge of the world.

Having given an overview of previous investigations of s-weakening in this chapter, I go on in the next chapter to describe my own investigation: the community I examined, the corpus I used, and the factors I considered.

CHAPTER 2

S-WEAKENING IN THE SPANISH OF SAN MIGUEL

2.1 Introduction

This study investigates the phenomenon of s-weakening in a particular speech community: that of San Miguel, El Salvador. In this chapter I will detail the methodology used in collecting and analysing the data, as well as giving background information on the speech community under examination and the subjects who participated in this study.

2.2 Methodology

In order to gather data, interviews were conducted with sixteen residents of San Miguel from a variety of social classes. These interviews were conducted by a native speaker of Spanish known to the interviewees, resulting in a highly informal speech style. Since several of the subjects are illiterate or have poor reading skills, a reading task is not included in the interview, and my study is restricted to examination of informal speech.

From fifteen of the sixteen interviews 250 tokens were gathered and coded according to a variety of factors, which I list in section 2.6. In one of the interviews, the

subject only produced 173 tokens, making for a total of 3923 tokens. Where possible, data were taken from the middle of the interview so that the subjects would have become comfortable with the presence of the tape recorder. However, in some cases the subject did not speak enough to allow this; in these cases, the entire interview was included. Since /s/ is a very common phoneme in Spanish, only about ten minutes of speech are required in order to gather this many tokens, and a variety of phonological environments and morphosyntactic categories are represented without specific control during interviewing.

2.3 The Speech Community

San Miguel is a small city of around 200,000 people in eastern El Salvador, very close to the coast and near the border with neighbouring Honduras. It is well known in this speech community and indeed throughout El Salvador that s-aspiration deletion is common among Migueleños, more so than in the rest of El Salvador, and the general perception is that it is more common among lower class people with little or no education, with the result that [h] and O are stigmatised variants.

As we saw in Chapter 1, all previous studies of the process of s-aspiration/deletion in other speech communities support these general perceptions: although the process is more advanced in some speech communities than others, in all cases [h] and Ø are

the less standard variants, more common among lower class speakers, less educated speakers and male speakers. Furthermore it is unsurprising that the process should be more advanced in San Miguel than in the rest of El Salvador, since the Spanish spoken in coastal areas is much more prone to aspiration and deletion of /s/ than that spoken in inland areas.

2.4 The Corpus

2.4.1 Selection of corpus

My corpus consists of sixteen speakers, all of whom are natives of San Miguel or surrounding villages, evenly divided according to age, sex and social class:

	age 18-36[3]	age 40+
Upper class male	2 speakers	2 speakers
Upper class female	2 speakers	2 speakers
Lower class male	2 speakers	2 speakers
Lower class female	2 speakers	2 speakers

Table 2.1 Distribution of corpus according to social factors

3 Since in some cases it was difficult to find subjects of a certain age and social class, the age division was made post-hoc based on the distribution of the subjects. In fact, the age groups are 18-25 and 40+, with the exception of one subject who was thirty-six. Since each subject was given an individual code during analysis, uncharacteristic behaviour by any individual subject is readily identifiable, meaning that the inclusion of this subject in the younger age group does not reduce the accuracy of the analysis

2.4.2 The subjects

Since in some cases specific speakers behave differently than expected due to specific features of their personal history, such as the type of job they do, a brief history of each speaker is given below.

Lower class, female, age 40+:

1. IG: age: 54 years. Born and currently lives in Guayabol, in the outskirts of San Miguel. Occupation: housewife. Level of education: primary studies only. Married to a "ganadero" (roughly translatable as farm worker).

2. CA: age: 40 years. Lives on an hacienda slightly outside San Miguel; her husband administrates the hacienda. She also works on the hacienda. Low level of education.

Lower class, female, age 18-39:

3. CS: age: 19 years. Born and lives in the city of San Miguel, where she works as a maid. Unmarried; she was brought up by her mother who is also unmarried. Level of education: primary only.

4 DI: age: 21 years. Born in a village east of San Miguel and has resided in San Miguel since the age of three. Single, currently studying at university. Also works helping her mother, who is employed as a maid.[4]

Lower class, male, age 40+:

5. MC: age: 42 years. Born and currently resides in San Miguel. Married with two children. Works as a salesman in a store which deals in refrigerator and air conditioning parts. Level of education: secondary.

6. SS: age: 60 years. Sells lottery tickets in the street for a living. Born in San Miguel to illiterate parents. Level of education: primary.

Lower class, male, age 18-39:

7. TM: age: 36 years. Occupation: owns a small business selling dairy products. Divorced, one daughter. Level of education: university

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4 Although it may appear to the Western observer that this speaker should be classified as upper class, the factors used to determine class are very different in El Salvador from those used in North America: a combination of family background and level of income. Education is reasonably available to the lower classes. This is also the case for subject #7, TM. Although he is a small business owner, this does not mean that he is wealthy; small food store or market stand owners are generally fairly poor.

studies. Born in a village on the outskirts of San Miguel, currently resides in San Miguel.

8. FR: age: 25 years. Occupation: "jornalero" (≈itinerant worker). Born and currently resides in San Miguel. Common law marriage with two children. Brought up by single mother, never met father. Level of education: none.

Upper class, female, age 40+:

9. MH: age: 53 years. Occupation: owns business selling refrigerator & air conditioning parts. Born in a village on the outskirts of San Miguel, currently resides in San Miguel. Parents were lower class but she is married to a landowner of considerable influence, with four children. Level of education: primary only.

10. TO: age: 54 years. Born outside San Miguel but has lived most of her life in San Miguel. Married with four children. Born to a poor family, but has risen in social class due to her marriage. Level of education: primary only.

Upper class, female, age 18-39:

11. MA: age: 19 years. Born in San Miguel, currently studying at university in San Salvador but returns to San Miguel on weekends and holidays. Single, born to upper class parents.

12. YV: age: 22 years. Born in a small village east of San Miguel and resides in San Miguel, where she studies and works in her mother's pharmacy. Single, upper class family, parents divorced.

Upper class, male, age 40+:

13. AA: age: 58 years. Occupation: landowner. Born in a small village east of San Miguel, has resided in San Miguel for 29 years. Married with four children. Level of education: secondary.

14. CQ: age: 48 years. Occupation: veterinarian. Born in a small village north of San Miguel, currently resides in San Miguel. Married with one child. Level of education: university, studied in Mexico.

Upper class, male, 18-39:

15. VM: age: 22 years. Born to upper class parents in San Miguel, currently studying at university in San Salvador. Single.

16. HL: age: 25 years. Born in San Miguel to upper class parents, currently working in San Salvador, commutes to San Miguel on weekends. Occupation: business owner. Single. Level of education: university.

Before discussing the factors which I considered in my analysis, it is crucial to give a brief overview of Spanish phonology, for I focus primarily on the phonological factors in this analysis.

2.5 An Overview of Spanish Phonology

The following is intended to be a brief, non-comprehensive summary of some aspects of Spanish phonology which are important for understanding my selection of factors as well as the analysis provided in Chapter 5.

2.5.1 Coda restrictions

In Spanish there are restrictions on the kind of segment allowed in codas. In this dialect, only coronals, [h] and [ŋ] can appear in coda position. This kind of restriction is observed in many languages (see e.g. Itô 1986). Within underspecification theory it is generally explained by appealing to a constraint that prohibits place-bearing segments from being licensed in coda position. As laryngeals, such as [h], do not involve any supralaryngeal constriction, they are inherently placeless (Steriade 1987, Lombardi 1991, Rose 1996). According to some analyses, coronal segments are underspecified for place in the underlying representation (e.g. Paradis and Prunet 1991, eds.).

It has also been argued that [ŋ] is placeless (Rice 1996). That coronals and velars can both be underspecified for place is motivated by Rice (1996). She claims that in positions in which place contrasts are restricted, languages vary in the realisation of a consonant unspecified for place of articulation. Coronal is inserted as a default feature, or a consonant unspecified for place of articulation is realised as a velar: coronal insertion is understood to be a phonological rule, whereas velar insertion is a mechanism of phonetic interpretation. Since in this dialect of Spanish nasal consonants in word-final position are velar, whereas oral consonants are coronal, it can be assumed that the phonological rule applies only to oral consonants, and that nasals are then interpreted as velar in the phonetics.

For the purposes of my analysis it does not matter whether /s/ is specified as coronal or not, since the only assumption that I make is that /s/ has a place node whereas /h/ does not.[5]

2.5.2 Stress and extrametricality

In Spanish, stress generally falls on the last syllable of a word if it is heavy, and on the penultimate syllable if the last syllable is light; compare (1a) and (1b). However, words with final /s/ or /n/ are stressed in the same way as vowel-final words; as is shown in (1c).

(1) a.	*placér*	'to please/pleasure'	b.	*péro*	'but'
	papél	'paper'		*líbro*	'book'
c.	*grátis*	'free'			
	jóven	'young youth'			

The standard analysis of this fact is that /s/ and /n/ in final position are extrametrical in Spanish (Harris 1982). As a result, they are not visible in the building of foot structure; see (2).

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5 See section 5.4 for a discussion of /st/ clusters in Spanish, where I argue that /s/ and /t,d/ are sharing a place node

(2) a. p a (p é l)$_{Ft}$ 'paper' b. (p é r o)$_{Ft}$

c. (g r á t i)$_{Ft}$ <s> 'free'

Combined with the fact that debuccalisation of /s/ (i.e. /s/ → [h]) is common cross-linguistically (Goldsmith 1981, Clements 1985, McCarthy 1988), the difference in prosodic status between /s,n/ and other consonants provides a clue as to why /s/ is subject to deletion whereas other coda consonants are not. Furthermore, it is interesting to note that in some dialects of Spanish, such as Puerto Rican, /n/ is also subject to deletion, although the process is less advanced than that of s-weakening (Poplack 1980a).

2.5.3 Onsets

In Spanish, s cannot occur as the first element of a branching onset;[6] therefore, where it is followed by a consonant, it must be in coda position. This is also the case where the following consonant is a liquid, despite the fact that the difference in sonority value between s and l is two, which, for onset clusters, is the unmarked distance on the sonority scale according to Clements (1990).[7]

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6 Although it is generally accepted that sC is not a branching onset, but rather that [s] is an appendix, I use this term for convenience here

7 The generally accepted sonority scale is the following:
obstruent < nasal < liquid < glide < vowel

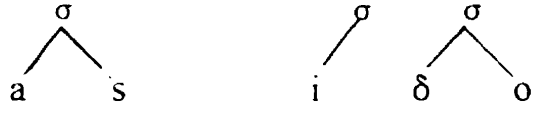
(3)	/estar/ 'to be'	es.tar	*e.star
(4)	/eslobenia/ 'Slovenia'	es.lo.ße.nya	*e.slo.ße.nya

2.5.4 Resyllabification

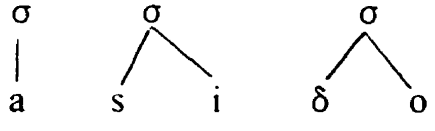
Spanish has obligatory resyllabification in the post-lexical phonology. As a result, a consonantal segment which is word-final but followed by a word-initial vowel or glide (which forms part of the nucleus) is always resyllabified into onset position in the post-lexical phonology, as shown in the following example:

(5) has ido [asiδo] '(you) have gone'

(6) Words in isolation (lexical representations):



(7) Words in a string (post-lexical representations):



These distinctions will be important when discussing the linguistic factors included in the analysis: for example, I treat /s/ in onset position, /s/ in coda position and resyllabified /s/ separately. They will also play a role in Chapter 3, since some factors can predict the effects of others, an important point to keep in mind when attempting to conduct a statistical analysis. For example, if a token of /s/ is followed by a consonant, then we know it must be in coda position. If both following phonological environment and position in the syllable are entered into statistical analysis, then it is impossible to determine which of them is having the perceived effect. This point will be discussed in much more detail in section 3.1. A list of the factors which will be included in the analysis is given below.

2.6 Factors considered in analysis

The factors considered in the analysis are divided into three categories: social, phonological and morphological/syntactic. Although some of these factors have been examined in previous studies of s-weakening, as well as in studies of other types of phonological variation, there are also several that have not.

The social factors I have included are socioeconomic status, age, sex, speaker and level of education, all of which have been found to have an effect in almost all kinds of phonological variation. To my knowledge, the phonological factors considered are more detailed than those included in any previous study of s-weakening. They

are as follows: voice, manner and place of articulation of the preceding and following phonological environment; position of sentential stress; position of the segment in the syllable and word; and length of the word containing the segment. Previous studies of s-weakening have only considered weakening in coda position, whereas I also examine s-weakening in onset position. The morphological and syntactic factors included are primarily designed to test the validity of the Functional Hypothesis, and are based on the factor groups included in the studies outlined in section 1.5: morphological status of the /s/; position in the NP; number of preceding plural markers; and redundancy of plural marking.

2.6.1 Social Factors

1 Socioeconomic status (social class)

This was determined according to current occupation, level of income and family background. Since San Miguel is reasonably small and traditional, women's roles are still largely determined by the position of males in the family, either fathers or husbands. Therefore, married women acquire their husband's social class, and in the case of young people who do not work, the social class is determined according to the father's occupation.

2. Age

As discussed earlier, subjects were divided into two age categories: 40+ and under forty (in practice between eighteen and thirty-six). Forty was chosen as a dividing line since in general subjects fell into these groups: apart from one subject who is thirty-six, the oldest subject in the lower age group was twenty-five years old.

3. Sex

Subjects were evenly divided according to sex. Considerable discussion has been devoted to the distinction between sex and gender (see e.g. Eckert 1989); however, in this study I limited myself to categorising subjects according to sex rather than gender.

4. Speaker

Each subject was given a code which was entered into the analysis so that it would be possible to determine how each individual speaker behaved, independently of social class, age, etc.

5. Level of education

Subjects were divided into four groups according to the level of education received: (i) no education at all, (ii) primary school education (up to the age of ten), (iii) high school education, or (iv) university education.

2.6.2 Phonological Factors

Many of the phonological factor groups presented below have not been examined in previous studies: although the effect of a following consonant versus a following vowel has been examined, I know of no study examining the effects of different types of following consonants, nor of different types of preceding environments. Stress and length of word have been found to be significant in previous studies, as discussed in section 1.3.

6. Preceding phonological environment

This factor group, as well as the following factor group, was included since it is well-attested across languages that phonological processes are sensitive to preceding and following environments. Because in chapter five I attempt to account for s-weakening in terms of current phonological theory, it is crucial to examine the effects of phonological factors.[8]

8 All features were coded, even though some were redundant, such as voicing in sonorants or place for liquids, this was done just in case all voiced segments, coronal segments etc., pattern together

Manner of articulation, place of articulation and voicing were coded separately as follows:

manner of articulation: stop, nasal, liquid, vowel or pause.

place of articulation: labial, coronal or dorsal.

voicing: voiced or voiceless.

7. Following phonological environment

Again, manner of articulation, place of articulation and voicing were coded separately. A wider variety of segments were found in following position than in preceding position:

manner of articulation: stop, affricate, fricative, nasal, liquid, vowel or pause.

8. Position of sentential stress

Six possible positions were identified:

(i) segment was in stressed syllable.

(ii) preceding syllable was stressed.

(iii) following syllable was stressed.

(iv) both the syllable that the segment was in and the following syllable were stressed.

(v) both the syllable that the segment was in and the preceding syllable were stressed.

(vi) stress was elsewhere in the sentence.

9. Position of the segment in the syllable and word

This factor group was included since it has been found in previous studies that there is a difference in the behaviour of /s/ between word-internal and word-final positions; furthermore, since in no previous study has s-weakening in onset position been examined, it is important to compare the probabilitites of s being weakened in different positions within the syllable.

There were five possible positions:

(i) segment was word-initial.

(ii) segment was in word-internal onset position.

(iii) segment was in word-internal coda position.

(iv) segment was word-final, followed by a consonant or pause.

(v) segment was word-final, followed by a vowel (i.e. resyllabified as onset).

10. Length of word

Since it has been found in some studies that s in polysyllabic words is more subject to weakening that s in monosyllabic words, each token of s was coded according to whether it occurred in a monosyllabic or a polysyllabic word.

2.6.3 Morphological/Syntactic Factors

As mentioned above, the morphological and syntactic factors included in my study are the same as those included in previous studies to test the validity of the Functional Hypothesis.

11. Status of /s/

This was divided into the following categories:

(i) Non-morphemic s

(ii) Plural marker on determiner

(iii) Plural marker on noun

(iv) Plural marker on adjective

(v) Plural marker on subject pronoun

(vi) Plural marker on object clitic

(vii) Plural marker on non-clitic object pronoun

(viii) Second person singular marker on verb

12. Position in the NP and number of preceding plural markers

In Spanish, NPs mark plurality on all items in the NP. Thus, in each case where s was a plural marker, the position in the NP and the number of previous items where plural marking was realised were recorded. For

example, (3,0) means that the item is third in the NP and plural marking was not realised on either of the previous items.

13. Redundancy of plural/second person marking

Since plural and second person marking is often redundant due to agreement on the verb, presence of a subject pronoun etc, and there is a posssibility that this redundancy may influence the likelihood of s-weakening, this factor was also included in the analysis. Three categories were included:

(i) marking is redundant due to marking elsewhere in the surface structure.

(ii) marking is redundant due to previous reference in the discourse or shared world knowledge.

(iii) marking is non-redundant.[9]

14. Specific lexical item

I have informally observed that some lexical items are much more likely to have the s deleted or aspirated. In general these items tend to be high-frequency items which rarely take sentential stress. Because of this observation the following items were coded separately:

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[9] It must be noted here that in cases where s is non-redundant and deleted, it is often impossible for the coder to determine that the NP is in fact plural, meaning that coding errors are unavoidable This should be kept in mind when examining the results given in section 3 8

(8) a. *pues* 'well, so'

b. *entonces* 'then'

c. *vos* 'you'. For *vos*, subject pronouns, object pronouns and discourse markers were treated separately. Examples of each of these are given below:

i). Subject pronoun

vos podes ir
you-sg can-2sg go
'you can go'

ii) Object pronoun

te digo a vos que si
clitic-2sg say-1sg to you-sg that yes
'I'm telling you it's true'

iii) Discourse marker

eso dijo vos
that said-3sg you
'That's what he said, you'

d. *nosotros* 'we'. Both s's were coded separately.

e *más* 'more'

f. *es* 'is'

Each token of a word containing an /s/ was coded according to all of the factor groups listed above; a variety of variable rule analyses were then conducted on the entire database. The results are given in Chapter 3 below.

CHAPTER 3

RESULTS AND ANALYSIS

3.1 Introduction

Analysis of the data was conducted using GoldVarb 2.1,[10] which conducts a variable rule analysis, giving probabilities that a given token will be realised as [s], [h] or Ø in the presence of a given factor; the significance of each combination of factor groupings is provided, allowing us to determine which factor groups play the greatest role in determining how a token will be realised. Since current versions of GoldVarb can only conduct a binomial analysis (i.e. contrast one possible realisation with the other two, rather than contrast all three simultaneously), separate analyses were conducted to determine the factors which favour or disfavour weakening, where [s] is contrasted with [h] and Ø, and those which favour or disfavour presence of the segment, where Ø is contrasted with [s] and [h].

A basic restriction on variable rule analyses is that meaningful results cannot be obtained when some of the factor groups included in the analysis are non-orthogonal, i.e. when there is a great degree of overlap between two or more factor groups. This kind of distribution means that it is impossible to determine which of the factor

10 This Macintosh application was designed by David Sankoff and David Rand. Version 2.1 is the most recent version, made available in September of 1996.

groups is responsible for the observed effects on the distribution of the variants. Since there are several cases in my data where there is considerable or absolute overlap between data groups, some of the factor groups had to be analysed separately from others or combined in order to obtain meaningful results. For example, preceding and following environment determine to a large degree the position of the segment in the syllable - if the following segment is a consonant then the /s/ must be in coda position whereas if it is a vowel then the /s/ must be in word-initial onset position (e.g. *ser* 'to be'), or have been resyllabified into onset position (e.g. *has ido* '(you) have gone').[11]

Given below are the factor groups which were treated separately for this reason:

1. **Speaker and other social factors:** Since each speaker can only have one age, sex, level of education etc. there is a lot of overlap between speaker and the other social factors in a small sample. This means that if speaker is included in the analysis together with the other social factors, the programme will not know whether to attribute the trends in the data to social factors or to the individual speaker. For example, if a young upper class male subject's speech exhibits certain characteristics, the programme will not know if this is because he is young, male and upper class or if it is because he is speaker X. Thus speaker must be analysed separately from the

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11 Although it may appear that these environments are the same, it will be seen in this chapter that they behave quite differently

other social factors. It is worth noting, however, that in large samples this is not a problem, since large numbers of speakers per social factor will counteract the effects of individual speakers.

2. **Voice and manner of articulation:** There is considerable overlap here since vowels, nasals and liquids are always voiced. In order to control for this effect, manner and voice are treated separately, and then voice and manner and place of articulation are combined into one factor group to see if each segment behaves as predicted by its features. This type of analysis was conducted for both preceding and following phonological environments.

3. **Position of segment in the syllable and word:** This factor group interacts with almost all of the linguistic factors: preceding and following phonological environment, morphemic status (since for all the categories except non-morphemic s the segment is word-final), length of word (since for monosyllabic words the s must be in word-initial or word-final position), and specific lexical item. For example, consider the sequence ....sk..... s must be in coda position in all cases where this sequence occurs, so it is impossible to determine whether the effects observed here are due to the following segment or to the position in the syllable. An analysis was therefore conducted treating position in the syllable and word only with speaker and stress, and then a second analysis was conducted combining the preceding and following environment with position of the segment into one factor

group. Thus the behaviour of /s/ was assessed according to the specific segment preceding and following it and whether it is a word-internal coda (Vs.CV), a word-internal onset (V(C).sV), word-final and in coda position (Vs#C), word-final and resyllabified into onset position (Vs#V) or word-initial (#sV). This allows us to assess the effect of preceding and following environments both within words and across word boundaries: for example, will an /s/ behave differently with a following coronal when the coronal is in the same word, as opposed to when the coronal is in another word? Do segments in word-initial position behave differently when preceded by a consonant than when preceded by a vowel?

4. **Specific lexical item:** Obviously this factor group interacts with all the linguistic factor groups, since for each lexical item there is only one possible preceding environment, following environment, morphological status, etc. For example, the /s/ in the word 'pues' will always be in coda position, preceded by a vowel, in a monosyllabic word, etc. Thus this factor group is treated separately; social factors were included in this analysis.

For each section below, two analyses were conducted. The first was with [s] as the application value; i.e. the probabilities given are that the segment will be realised as [s], as opposed to [h] or Ø. The second was with Ø as the application value, meaning that the probabilities given are that the segment will be realised as Ø, as opposed to [h] or [s]. In the second group of analyses, which give the probability

that the segment will be deleted, only segments in coda position (including resyllabified segments) were included, since deletion occurred in only six cases in onset position. These six cases are discussed in detail in section 3.5.1.

3.2 Social Factors

The social factors were analysed together with three of the linguistic factors: position in the syllable and word, position of sentential stress and length of word. An additional factor group was also created combining sex and education, since there is interaction between these two factor groups:

	university	secondary	primary	none
male	4	2	1	1
female	3	0	4	1

Table 3.1 Distribution of corpus according to sex and level of education

As can be seen in Table 3.1, speakers with a primary school education are almost all women, while the only two speakers with a secondary school education are male.

The first analysis conducted was with [s] as the application value. Two social factors were selected as significant in this analysis: class and the new factor group combining sex and education, although sex and education were not found to be

significant individually.[12] The following probabilities were obtained, where the probabilities indicate the likelihood that the token will be realised as [s] in the cases where the factor is present. A probability of 0.5 means that the factor has no effect on the realisation of the token; a higher probability indicates a higher likelihood of an [s] being produced, where the closer the number is to one the more likely it is that an [s] will be produced; a lower probability means that it is less likely that the token will be realised as [s]. An asterisk indicates that a group has only one speaker.

socioeconomic class	upper: 0.648 lower: 0.347
sex and level of education	female, university education:: 0.603 male, primary education*: 0.551 female, primary education: 0.547 male, no education*: 0.528 male, university education: 0.472 male, secondary education: 0.358 female, no education*: 0.342

Table 3.2 ***Significant social factor groups - probability that [s] will be produced***

The effect of socioeconomic class is as predicted - [s] is the prestige variant, so it would be expected that upper class speakers would use this variant more. The results for sex and level of education are not quite as clear. It appears that, in general, women tend to weaken /s/ less than men, which is also unsurprising in that women tend to use prestige variants more than men in situations of stable variation

12 The fact that sex and education were not found to be significant by themselves is probably due to the small number of subjects

(Labov 1990). Furthermore, women with higher levels of education use [s] more than women with lower levels of education; there were no women with secondary education in the corpus but university educated women use the prestige variant more than women with primary education, who use it more than the woman with no education at all. Likewise, men with university education use [s] more than those with secondary education. However, men with primary school education or no education tend to use [s] more than those with higher levels of education. This is probably due to the fact that the corpus was not evenly distributed according to level of education, as was shown in table 3.1. Since there is only one male in the corpus with primary education and one with no education, the fact that these results are not as predicted is possibly due to unusual behaviour on the part of these subjects. This result should be checked with a larger corpus in order to test the validity of this explanation.

The fact that age was not selected as a significant factor is also important in that, in combination with the results for sex and class, it is an indication that, as in the other communities where this phenomenon has been investigated, s-weakening is an example of stable variation.

The second analysis conducted with the social factors was identical to the first, but with O as the application value, and excluding tokens in onset position. The

following results were obtained, where factor groups are given in the order in which they were selected. Again, an asterisk indicates that a group has only one speaker:

socioeconomic status	lower class: upper class:	0.563 0.433
sex and level of education	male, secondary education: male, university education: male, primary education*: female, primary education: female, no education*: female, university education: male, no education*:	0.583 0.562 0.502 0.481 0.413 0.411 0.267
age	younger: older:	0.563 0.433

Table 3.3 ***Significant social factor groups - probability that /s/ will be deleted***

The results here are consistent with those obtained in the first analysis: lower class speakers tend to delete more than upper class speakers, and men tend to delete more than women. In this case the effect of the education factor was unclear: the probabilities in general were very similar across the sexes regardless of the level of education. However this analysis yielded one very surprising result: the male subject with no education is less likely to delete than any of the other speakers. This is the same speaker who behaved differently than predicted in terms of s-weakening: he weakened s much less than would be expected given his sex and level of education. Examination of the personal history of the speaker (FR) yields no clue as to why this would be. As suggested above, it is possible that this subject's speech

is uncharacteristic of that of uneducated males in general: only examination of a larger corpus can confirm or disconfirm this hypothesis.

The inclusion of age as a significant factor, albeit less so than social class and sex level of education, is surprising in that it is inconsistent with the hypothesis that s-weakening is an example of stable variation: the fact that younger speakers tend to delete /s/ more than older speakers would suggest that a change is in progress in the direction of loss of /s/. However, it must be remembered that age was selected last: in order to determine how important a part this factor group plays, an analysis was conducted excluding age as a factor and the significance achieved was compared. The levels of significance differ only marginally: where age was included, significance = 0.005 and log likelihood = -1140.999. Where it was excluded, significance = 0.005 and log likelihood = -1145.580. Together with the fact that the probabilities given for each age group were close to 0.5, this suggests that in fact age does not play as significant a part as it may first appear. Furthermore, even if age is a truly significant factor group, this does not constitute definitive evidence that s-deletion is a change in progress, since it is entirely possible that younger speakers delete /s/ more than older speakers, but that as they get older they delete /s/ less.

One other possible explanation of this result is that, since age was not selected as a significant factor when examining retention of /s/ as [s], weakening as a whole is

stable, but deletion is not. It will become clear only with time which of these possibilities is correct.

3.3 Speaker

An analysis where all social factors except speaker were excluded yielded the following results:

	individual probabilities		average probabilities
Upper class male, 20-25	0.849	0.713	0.781
Upper class female, 40-	0.820	0.717	0.769
Upper class female, 18-23	0.712	0.817	0.765
Lower class female, 40-	0.496	0.394	0.445
Lower class male, 40-	0.202	0.535	0.369
Upper class male, 40-	0.410	0.210	0.310
Lower class male, 20-36	0.358	0.201	0.280
Lower class female, 18-23	0.398	0.156	0.277

Table 3.4 Probabilities of production of [s] for individual speakers

It is fairly clear from these figures that in general, lower class speakers tend to produce [s] less than upper class speakers, although other clear trends are not present. Three speakers appear to have rates of production of [s] fairly different from those predicted: both older upper class male speakers (p = 0.210 (AA) and p

= 0.410 (CQ)), and one older lower class male speaker (p = 0.535 (SS)). In the first case, the speaker, AA, is the owner of an hacienda and generally spends his day there, interacting with the workers on the hacienda, which means that we could predict that his speech would resemble that of lower class subjects. In the second case, the speaker is CQ, a doctor; there is no apparent reason for his unexpected behaviour. In the third case, the speaker is SS, a ticket seller. Again, there is no clear reason for his rates of production of [s] in terms of social factors.

The second analysis conducted was identical to the first but with Ø as the application value. The results obtained are given in the table below; the two values given in each case are the probabilities that each of the speakers in that group will delete /s/.

	Individual probabilities		Average probability
Lower class female, 18-23	0.670	0.825	0.748
Lower class male, 20-36	0.407	0.753	0.580
Upper class male, 40+	0.517	0.625	0.571
Lower class female, 40+	0.495	0.529	0.512
Upper class male, 20-25	0.371	0.537	0.454
Lower class male, 40+	0.374	0.533	0.454
Upper class female, 18-23	0.333	0.333	0.333
Upper class female, 40+	0.205	0.438	0.322

Table 3.5 Probabilities of s-deletion for individual speakers

It can be seen that in general, upper class men are more likely to delete than upper class women, and lower class women are more likely to delete than lower class men. One upper class man is considerably less likely to delete than the others ($p = 0.371$), but given that this subject, VM, does not have a social profile very different from the other upper class men, being a university student as are all the other young upper class subjects. I believe that this difference is probably attributable to individual characteristics such as a greater concern for social image.

The fact that lower class men delete less than lower class women is surprising, and possibly attributable to the fact that the lower class men in my corpus tend to work in jobs where they deal with the public more (three of them are salesmen), whereas the women work as a maid ($p = 0.825$), in helping administer an hacienda, which generally involves speaking to farm workers ($p = 0.529$), and as a housewife ($p = 0.495$), respectively. The one exception is a young lower class woman who is studying at university ($p = 0.625$).

However, these results are also compatible with the possibility of change in progress concerning deletion, as suggested above. If this hypothesis is correct, the change is being led by young working class women, which is why these speakers delete more than any others. Upper class women appear to be resisting the change, not just lagging behind. Since it is usual for women and working class speakers to lead a

change in progress (see e.g. Labov 1972, 1990, Haeri 1994), these are precisely the speakers which we would expect to see leading the change.

3.4 Linguistic Factors

The linguistic analysis included the following factors: manner and place of articulation of preceding and following environments, position of sentential stress, length of word, and morphemic status of /s/. These factors were included even though they include a mixture of phonological and morphological criteria, since it is desirable to include as many factor groups as possible while still avoiding interaction between factor groups. This is done in order to avoid the results being skewed due to the exclusion of some factor group which in fact plays a role.

Once again, two analyses were conducted: one with [s] as the application value and one with Ø as the application value.

The first analysis could not be conducted unless the following factors were excluded, since they were "knockout factors":[13]

13 A knockout factor is a factor which displays no variation, i.e. all tokens containing that factor are realised in the same way. These factors cannot be entered into variable rule analysis.

1. manner of articulation of preceding phonological environment: preceding glides and fricatives, of which there were only six tokens, always caused the segment to be realised as Ø. However, the small number of tokens makes this result difficult to interpret. For all analyses, tokens containing this factor were excluded.

2. place of articulation of preceding phonological environment: where the following segment was labial or dorsal, the /s/ was never realised as [s]; variation was only found where the preceding segment was coronal. However since there were only fifteen tokens of a preceding labial or velar, the fact that there was no variation is difficult to interpret.

This group could not be entered into variable rule analysis since exclusion of the knockout factors resulted in a singleton group, i.e. a group with only one member, which cannot be processed under variable rule analysis. However, it should be noted that there were 225 tokens where the preceding segment was a coronal, and in 80% of cases the segment was realised as [s]. This result will be dealt with in Section 3.7 where the effect of the preceding and following environments in combination with position in the syllable and word is discussed.

The factors which were selected as significant are given in the table below, in the order in which they were selected:

manner of articulation of following phonological environment	glide:	0.714
	vowel:[14]	0.680
	stop:	0.402
	pause:	0.359
	liquid:	0.102
	fricative:	0.053
	nasal:	0.053
morphological status of /s/	non-morphemic:	0.591
	second person singular marker:	0.374
	plural marker on determiner:	0.251
	plural marker on subject pronoun:	0.197
	plural marker on noun:	0.133
	plural marker on object clitic:	0.091
	plural marker on adjective:	0.088
place of articulation of following phonological environment:	coronal:	0.742
	labial:	0.243
	velar:	0.191
position of sentential stress:	both preceding syllable and syllable of segment stressed:	0.914
	both following syllable and syllable of segment stressed:	0.662
	segment in stressed syllable:	0.632
	preceding syllable stressed:	0.496
	following syllable stressed:	0.453
	stress elsewhere:	0.359
manner of articulation of preceding phonological environment:	stop:	0.970
	nasal:	0.741
	liquid:	0.660
	pause:	0.618
	vowel:	0.471
length of word:	polysyllabic:	0.540
	monosyllabic:	0.419

Table 3.6 Linguistic factors having a significant effect on production of [s]

14 sV and sGV are predicted to behave similarly since in both cases /s/ is alone in the onset; in the case of sGV, the glide is part of the nucleus, not part of the onset (Harris 1983)

Before moving on to analysis of these results, the results of the second analysis, with Ø as the application value, will be presented. This analysis was conducted excluding the following knockout factors:

An initial analysis of percentile values for each factor yielded the following knockout factors:

1. manner of articulation of preceding phonological environment: once again the factors glide and fricative had to be eliminated from analysis since tokens were never realised as Ø. Recall, however, that there were only five and one token in these groups respectively, making these results uninterpretable.

2. place of articulation of preceding environment: This factor group had to be excluded from analysis since velars and labials were never realised as Ø, leaving a singleton group with only coronals, where in 2% of cases the /s/ was realised as Ø. Since the factors labial and velar comprised only one and fourteen tokens respectively, these results are again uninterpretable.

3. specific lexical item: the first /s/ in *nosotros* was never deleted, since it is in intervocalic onset position.

The analysis yielded the following results, where once again the factors are given in descending order of significance:

manner of articulation of following phonological environment	fricative:	0.939
	glide:	0.874
	liquid:	0.754
	pause:	0.656
	nasal:	0.457
	stop:	0.383
	vowel:	0.327
place of articulation of following phonological environment	labial:	0.740
	velar:	0.590
	coronal:	0.354
morphological status of /s/	plural marker on non-object clitic pronoun:	0.717
	plural marker on noun:	0.712
	plural marker on adjective:	0.632
	plural marker on subject pronoun:	0.594
	plural marker on determiner:	0.592
	plural marker on object clitic:	0.482
	second person singular marker:	0.467
	non-morphemic:	0.408
position of sentential stress	preceding syllable stressed:	0.593
	stress elsewhere:	0.589
	following syllable stressed:	0.461
	segment in stressed syllable:	0.354
	both following syllable and syllable of segment stressed:	0.223
	both preceding syllable and syllable of segment stressed:	0.100
manner of articulation of preceding phonological environment	vowel:	0.503
	nasal:	0.195
	stop:	0.099

Table 3.7 ***Linguistic factors having a significant effect on deletion of /s/***

These results are more or less as predicted: a discussion of each factor group is given below.

3.4.1 Manner of articulation of following phonological environment

The results given by the first analysis are fairly transparent, although, as was mentioned above, it is difficult to distinguish the effects of position in the syllable and word and the effect of the following segment. The fact that across languages onsets and codas display markedly different behaviour from one another favours the hypothesis that position in the syllable plays a greater role in determining whether s will be realised as [s] or not. That the following segments which favour production of [s] are also those where [s] is usually in onset position, further supports this assumption: a following vowel or glide favours the production of [s] ($p = 0.680, 0.741$ respectively) whereas a following pause or consonant disfavours production of [s].

The results given by the second analysis are not as clear. Remembering that the only segments examined here are those in coda position, it can be seen that deletion is favoured for all segments in coda position except those followed by stops, vowels and, to a lesser degree, nasals. The fact that a following stop disfavours s-deletion is unsurprising given that following coronal stops, which constitute 46.8% of all the stops following an s, favour retention of s as [s].

Since only /s/'s in coda position are included in this analysis, all /s/'s followed by a vowel are in resyllabified position; these segments are slightly less subject to deletion. However, this is not the case where the /s/ is followed by a glide. The fact that a following vowel disfavours s-deletion is consistent with the observed distribution of t/d-deletion in English; where /t,d/ is followed by a vowel, deletion is disfavoured (see e.g. Labov 1972, Guy 1980 among many others). For a more detailed discussion of the behaviour of /s/ in resyllabified position, see section 3.12.

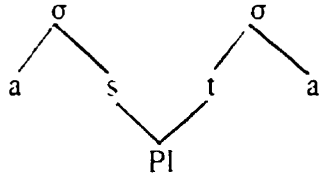
3.4.2 Morphological status of /s/

Morphological status of 's' was considered the second most significant factor when [s] was the application value and the third most significant when Ø was the application value. The results are in general consistent with previous studies of s-weakening: realisation of 's' as [s] is only favoured where the 's' is non-morphemic, and deletion is favoured where 's' is morphemic. Plural markers and second person singular markers are more likely to be weakened, possibly because they are always word-final and often redundant. This hypothesis will be examined in more detail in section 3.9 below, which deals with the Functional Hypothesis.

3.4.3 Place of articulation of the following phonological environment

With regard to the factor group of place of articulation of following environment, the results from the two analyses are very similar: from the first analysis it can clearly be seen that a following coronal favours production of [s] fairly strongly, whereas a following labial or velar strongly disfavour production of [s]; the results from the second analysis show that a following coronal disfavours s-deletion whereas a following labial or velar segment favours s-deletion. It is unsurprising that a following coronal segment encourages the realisation of /s/ as [s] which is itself coronal; indeed, as will be shown later, the fact that this effect is much stronger word-internally than across a word boundary suggests that the place nodes of two consecutive coronals are linked in the underlying representation:

(1) [asta] 'until'



A phonological account for this phenomenon is offered in chapter 5.

3.4.4 Position of sentential stress

Segments in or immediately adjacent to a stressed syllable are more likely to be realised as [s] whereas segments far away from a stressed syllable are more likely to be weakened; these results are unsurprising.[15] In both analyses, the results given were fairly clear: in the case of retention of /s/ as [s], the probability of producing [s] in a stressed syllable is moderately high (p = 0.632), whereas the probability of producing [s] when the stress is elsewhere is reasonably low (p = 0.359). In the case of deletion, the probability of deleting /s/ when in a stressed syllable is fairly low (p = 0.354), whereas the probability of deletion where stress is elsewhere is above 0.5 (p = 0.589). Since it is observed cross-linguistically that stressed syllables can license more material than unstressed syllables (see e.g. Steriade 1995), these are the expected results.

3.4.5 Manner of articulation of preceding phonological environment

For the first analysis, which included segments in both onset and coda position, by far the majority of the tokens of /s/ were preceded by a vowel (87%) and the results show that a preceding vowel weakly disfavours the retention of the /s/ as [s], which

15 It would be expected that there would be a difference between /s/'s in the syllable immediately preceding the stressed syllable and those in the syllable immediately following the stressed syllable, since these have a different prosodic status in Spanish: the syllable following a stressed syllable will be footed, whereas the syllable preceding the stressed syllable will be directly licensed by the prosodic word. However, it seems that mere presence vs absence of stress is the relevant factor here, rather than higher prosodic structure.

is also true of the data in general (a total of 41% of all tokens were realised as [s]). The fact that a preceding consonant favours realisation of the /s/ as [s] is also predicted, since, due to phonotactic constraints in Spanish, in all cases where the preceding segment is a consonant, the /s/ will be in onset position.

For the second analysis, which only included tokens in coda position, the only preceding environment which did not disfavour deletion was a preceding vowel, which had almost no effect on the process. A preceding consonant disfavoured deletion; however, there are only four examples of post-consonantal /s/ in coda position in the entire corpus. Thus the only result given here is that a preceding vowel has very little effect on the process of s-deletion.

3.4.6 Length of Word

Length of word was found to be relevant only when the application value was [s]. That s-weakening was found to be more likely in monosyllabic words than in polysyllabic words is somewhat surprising since previous studies (e.g. Terrell 1979) have shown that in general monosyllabic words are more likely to preserve [s]. One possible explanation for this is that previous studies only included tokens of /s/ in coda position, whereas this study includes /s/ in onset position. Comparing rates of s-weakening in polysyllabic and monosyllabic words in different positions in the syllable and word yields the following results:

	polysyllabic	monosyllabic
word-initial	0.830	0.768
word-internal onset	0.830	n/a
word-internal coda	0.534	n/a
word-final	0.142	0.142
resyllabified	0.090	0.279

Table 3.8 ***Rates of production of [s] by position of segment in word and length of word***

As can be seen, the explanation proposed above does not account for the rates of production of [s]: the probabilities are very similar for monosyllabic and polysyllabic words in the environments which are relevant to both. Weakening is marginally more likely in polysyllabic words where the segment is resyllabified, which again goes against previous claims; however it is clearly favoured in both cases.

3.5 Position in the Syllable and Word

The first analysis done, with [s] as the application value, included only speaker,[16] position in the syllable and word, and stress. All of these factor groups were considered significant; however, since the purpose of the analysis was to determine the effect of position in the syllable and word while including as many other factors

16 Speaker was chosen rather than the other social factors since probabilities for individual speakers fit better with the data due to differences between speakers in the same social group; social factors could not account for all the data as comprehensively. Since the purpose of this analysis is to examine the linguistic factors, this approach is preferable.

as possible, and since the results for the other factor groups are discussed elsewhere, only the results for position in the syllable and word will be discussed here. The results were as follows:

word-internal onset:	0.862	resyllabified:	0.139
word-initial:	0.845	word-final:	0.098
word-internal coda:	0.529		

Table 3.9 Rates of production of [s] by position in the syllable and word

Note that the probabilities for segments in onset position are very similar, regardless of the segment's position in the word. In order to determine if this small difference in probability is significant, an analysis was conducted combining word-initial segments with word-internal onsets. This analysis revealed no significant difference when the two environments are collapsed into one factor (significance = 0.000 in both cases: where the positions are analysed separately, log. likelihood = -1571.957, and where they are analysed together, log. likelihood = -1572.575). This analysis yielded the following probabilities:

onset position:	0.854	word-final:	0.097
word-internal coda:	0.532	resyllabified:	0.144

Table 3.10 Rates of production of [s] by position in the syllable and word, onset positions combined

Likewise, the probability that word-final /s/ will be weakened is very similar to the probability that resyllabified /s/ will be weakened. An analysis in which these environments were collapsed showed that this difference was also barely significant (significance = 0.000 in both cases; log. likelihood = -1571.957 when they are analysed separately, and -1573.61 when they are analysed together). In this analysis the results were as follows:

word-initial:	0.844	word-internal coda:	0.527
word-internal onset:	0.862	word-final (including resyllabified):	0.106

Table 3.11 Rates of production of [s] by position in the syllable and word, word-final positions combined

The fact that resyllabified s patterns as a coda rather than as an onset suggests that the process of s-weakening is a property of the lexical phonology, where word-final s followed by a vowel (...s=V...) is still in coda position, i.e. before post-lexical resyllabification takes place.

Thus it can be seen that, in general, s-weakening is much less likely to occur in onset position than in coda position. However, it appears that production of [s] is slightly favoured when the /s/ is in word-internal coda position. Closer examination of the data reveals a resolution of this problem: in 413 of the 513 cases where the /s/ was in word-internal coda position (80.5%), it was followed by a coronal consonant. This is true of only 354 of the 881 cases where the /s/ is in word-final position

(40.2%).[17] Although in general GoldVarb will take this sort of distribution into account in calculating the probabilities, it must be remembered that the features of following segments were not included in the analysis discussed in this section, since there is interaction between position in the syllable and word and manner of articulation of the following segment. Thus, under the hypothesis that a following coronal favours realisation of /s/ as [s], these results are explained. This hypothesis is examined in detail in sections 3.6 and 3.7.

In the second analysis, where Ø was the application value, again every factor group was considered significant, but since the results for stress and speaker are given elsewhere, only position in the syllable and word will be discussed here. The results obtained are given below:

position in word	probability
word-final	0.646
word-internal coda	0.220
resyllabified	0.426

Table 3.12 Rates of deletion of /s/ by position in the syllable and word

It can be seen from this table that the probability of deletion is lower in word-internal coda position than in resyllabified position, which is lower than in word-

17 I will discuss this further in section 3.12

final position. I claim that this is due to the fact that place node sharing among coronals can only occur within a word, and 413 of the 513 tokens of /s/ in word-internal position are followed by a coronal stop. This claim is supported by the results given in section 3.7, where the effect of specific segments following the /s/ is examined.

The large difference between the probability that /s/ will be deleted in word-final position and the probability that s/ will be deleted in resyllabified position is not as predicted by the hypothesis discussed above that s-weakening is a lexical phenomenon. Recall, however, that in section 3.4.1 it was shown that a segment in coda position followed by a vowel (i.e. a resyllabified segment) had a low probability of deletion, a result which is compatible with this one.

Before pursuing the connection between the probabilities of s-deletion in word-final position and in resyllabified position, I ran an analysis including two new factor groups, in order to distinguish other factors which may be having an effect. The first new factor group had two factors, one which included segments in word-internal coda position with a following coronal stop, and one which included all the other tokens. The goal was to provide a factor group to which can be attributed the abnormally high levels of production of [s] where a segment is followed by a coronal stop, thus providing more meaningful results for the position in the syllable and word factor group. The second new factor group was a combination of length of word and

position in the syllable and word; this eliminates any bias due to the fact that word-internal segments can only occur in polysyllabic words. The factors included in this group were as follows:

(i) segment in initial position of monosyllabic word

(ii) segment in final position of monosyllabic word, not resyllabified

(iii) segment in final position of monosyllabic word, resyllabified

(iv) segment in initial position of polysyllabic word

(v) segment in internal onset position of polysyllabic word

(vi) segment in internal coda position of polysyllabic word

(vii) segment in final position of polysyllabic word, not resyllabified

(viii) segment in final position of polysyllabic word, resyllabified

Interestingly, when these factor groups were included, position in the syllable and word was not found to be significant, meaning that the results obtained previously are in fact attributable to other factors, and that position in the syllable and word plays little or no part in determining how likely it is that a segment in coda position will be deleted.[18]

18 However, see section 3.12 for further discussion, specifically regarding the implications for where in the phonology these processes take place

3.5.1 Deletion in onset position

Although tokens in onset position were excluded from this analysis, there were in fact six tokens of deletion in onset position. Of these six, five were produced by the same speaker, a young upper class male, and four of those were tokens of the word *se*, a reflexive pronoun. The other two cases were the words *son* 'are', and *parece* 'it appears'; this final token was produced by a young upper class female, and is probably a performance error. None of the five tokens produced by the male speaker was in a stressed syllable; stress always fell either on the following syllable, or elsewhere in the sentence. Although the process of deletion in onset position is far from generalised, this could possibly be an indication that the process is spreading to segments other than those normally affected. It is also important to note that for all speakers *se* is affected by weakening much more than is usual in onset position:

	[s]	[h]	Ø
se	51%	47%	2%
other onset	70%	30%	0%

Table 3.13 ***General rates of deletion of /s/ in onset position vs rates of deletion in the lexical item* se**

The high rate of aspiration in this specific lexical item is probably due to the fact that *se* is rarely stressed, a condition which favours weakening. The cases where /s/ is deleted are explicable in two different ways: either these are simply performance

errors, or *se* is undergoing some sort of change in its underlying representation, such that there exist two, or perhaps three, forms of this item in the lexicon. This possibility is discussed further in section 3.9 as regards the other lexical items examined individually; however, I believe that much more evidence is required to support this strong a claim.

3.6 Voice

An analysis was conducted including the following linguistic factors: voice and place of articulation of the following segment, position of sentential stress, length of word, and morphemic status of /s/.[19] These factor groups were selected since they were the only ones which could be assumed not to interact with the voice factor group. The probabilities associated with the voice factor group are given below:

application value [s]	application value Ø
following segment voiced: 0.420	following segment voiced: 0.695
following segment voiceless: 0.732	following segment voiceless: 0.308

Table 3.14 Effect of voice of adjacent segments on s-weakening

19 Voice of preceding phonological environment was excluded since only 16 tokens were preceded by a voiced consonant, making any results uninterpretable

Following voiceless segments obviously disfavour s-weakening to a considerable degree. Once again the explanation can be found by examining the following phonological environment: 447 of the 871 voiceless segments are coronals (51.3%), as opposed to only 304 of the 2701 voiced segments (11.3%). Thus this result is probably due to the effect of a following coronal segment in favouring the retention of s as [s], rather than to the voice of the following segment.

3.7 Following Environment Combined

An analysis where the following environment factor groups were combined into one factor group yielded the results given below, where the segment described is the segment following the s:

application value [s]		application value Ø	
(voiced)[20] glide:	0.803	voiced labial stop:	0.766
(voiced) vowel:	0.766	(voiced coronal) liquid:	0.689
voiceless coronal stop:	0.648	(voiced) glide:	0.642
(voiced) coronal nasal:	0.188	(voiced) labial nasal:	0.609
(voiced coronal) liquid:	0.123	(voiced) coronal nasal:	0.503
voiceless labial stop:	0.122	voiceless velar stop:	0.479
voiceless velar stop:	0.068	(voiced) vowel:	0.363
(voiced) labial nasal:	0.049	voiceless coronal stop:	0.163
voiced labial stop:	0.038		

Table 3.15 Effect of following segment on s-weakening

20 Redundant features are included in parentheses for the reader's convenience.

For both analyses, following voiced coronal stops were excluded since there were only eight tokens; of these eight, only one /s/ was realised as Ø.

As can be seen from the results given by the first analysis, all following segments except glides, vowels, and coronal stops disfavour production of [s]. The fact that only stops favour production of [s] whereas nasals and liquids do not is extremely interesting since it allows us to hypothesise on the linking of (coronal) place nodes in Spanish. This is an issue which will be discussed in more detail in Chapter 5.

From the results of the second analysis it can be seen that coronal stops strongly disfavour deletion, whereas other segments favour deletion, the only exceptions being following vowels and following voiceless velar stops. Again, it is seen that a following vowel disfavours deletion; this will be discussed in section 3.12. In the case of a following voiceless velar stop, the probability given is very near to 0.5, meaning that the effect is very weak.

3.8 Factor Group Combination

In order to check if there were any other effects due to the preceding and following segments which had not been distinguished in previous analyses, a final analysis was conducted examining the effects of each *type* of preceding and following environment. Nasals, liquids, fricatives and stops were combined into one category,

'consonant', and were further specified for voice and place of articulation. This grouping was further divided according to position in the syllable and word. Environments with less than ten tokens were not included; thus twenty-one different environments were examined. The results of the first analysis, with [s] as application value, are given in the table below:

preceding	manner of following	voice of following	place of following	position in word	probability	number of tokens
vowel	glide	voiced	n/a	wd-initial	0.989	19
vowel	glide	voiced	n/a	wd-int. onset	0.958	54
consonant	vowel	voiced	n/a	wd-int. onset	0937	126
consonant	vowel	voiced	n/a	wd-initial	0.916	77
pause	vowel	voiced	n/a	wd-initial	0.896	256
vowel	vowel	voiced	n/a	wd-int. onset	0.876	810
vowel	vowel	voiced	n/a	wd-initial	0.820	472
vowel	consonant	voiceless	coronal	wd-int. coda	0.671	386
vowel	consonant	voiceless	coronal	wd-final	0.402[21]	61
vowel	pause	other	n/a	wd-final	0.201	342
vowel	consonant	voiced	coronal	wd-int. coda	0.191	21
vowel	vowel	voiced	n/a	resyllabified	0.147	286
vowel	consonant	voiceless	labial	wd-int. coda	0.126	47
vowel	glide	voiced	n/a	resyllabified	0.096	23
vowel	consonant	voiceless	velar	wd-int. coda	0.096	25
vowel	consonant	voiced	labial	wd-int. coda	0.094	23
vowel	consonant	voiceless	labial	wd-final	0.086	91
vowel	consonant	voiced	coronal	wd-final	0.048	283
vowel	consonant	voiced	velar	wd-final	0.046	15
vowel	consonant	voiceless	velar	wd-final	0.031	241
vowel	consonant	voiced	labial	wd-final	0.013	179

Table 3.16 Effect of following segment on production of [s]

21 Note that the probability of an /s/ being realised as [s] when followed by a voiceless coronal is slightly higher even where the coronal is in another word This will be discussed in section 3.12

It can be seen from these results that weakening is obviously favoured by the segment being in coda position, more so word-finally than word-internally. Furthermore, weakening is more likely before a velar or a labial than before a coronal, as expected. These are the two clearest results; while it appears that following voiced consonants favour weakening more than following voiceless consonants, the differences in probability are so small (0.013 - 0.126) that they are barely significant; grouping the coda positions together in the analysis does not change the significance (in both cases = 0.000) and the log likelihood drops only 6.245, from -1543.741 to -1549.986.[22]

Finally, it must be noted that a following coronal has more effect word internally (p = 0.191 for voiced coronal segments, 0.671 for voiceless coronal segments) than across a word boundary (p = 0.048 for voiced non-coronal segments, 0.402 for voiceless non-coronal segments). The large difference for voiced and voiceless segments is possibly due to the fact that most of the voiced coronal consonants in this sample were nasals and liquids, and most of the voiceless coronals were stops (/t/); it may be the case that /s/ and /t,d/ can share a place node, whereas /s/ and /n,l,r/ cannot. This hypothesis is supported by the results in Section 3.1.6, where it is shown that retention of /s/ as [s] is favoured by a coronal stop but not by a liquid or

22 Note that log likelihood can vary as much as 200-300 between the best and worst runs in an analysis

nasal. These results are explicable within phonological theory, as will be discussed in chapter 5.

The second analysis conducted was with Ø as the application value. In this case there were only fourteen different environments, since tokens in onset position were excluded from the analysis. The probabilities are given in the table below:

preceding	manner of following	voice of following	place of following	position in word	probability	number of tokens
vowel	glide	voiced	n/a	resyllabified	0.832	23
vowel	consonant	voiced	labial	wd-final	0.774	179
vowel	pause	n/a	n/a	wd-final	0.728	342
vowel	consonant	voiced	coronal	wd-final	0.734	283
vowel	consonant	voiceless	labial	wd-final	0.670	91
vowel	consonant	voiced	coronal	wd-int. coda	0.525	21
vowel	consonant	voiceless	velar	wd-final	0.504	241
vowel	consonant	voiceless	coronal	wd-final	0.485	61
vowel	consonant	voiced	velar	wd-final	0.485	15
vowel	consonant	voiceless	labial	wd-int. coda	0.454	47
vowel	consonant	voiced	labial	wd-int. coda	0.387	23
vowel	vowel	voiced	n/a	resyllabified	0.380	286
vowel	consonant	voiceless	velar	wd-int. coda	0.354	25
vowel	consonant	voiceless	coronal	wd-int. coda	0.128	386

Table 3.17 Effect of following segment on deletion of /s/

The only thing that is clear from these probabilities is that s-deletion is disfavoured where the segment is followed by a coronal stop, and less so where it is resyllabified, as noted before. The probability of /s/ being deleted where followed by a glide is very high, but this is probably due to the small number of tokens, only 23. It can also be seen that the effect of a coronal stop only occurs where the sequence /st/ is word internal (e.g. 0.485 and 0.504 for voiceless coronals and velars respectively across a word boundary).

The range of probabilities given for the other following segments does not show a clear effect for voice or place of articulation: the distribution seems to be almost random. Recombining the groups in any way results in considerable drops in significance (log. likelihood drops more than 20 if segments are regrouped according to place, manner, voice, or position in the word). Thus it is difficult to draw any definite conclusions from these results.

3.9 Specific lexical item

Again, two analyses were conducted for the specific lexical items, the first with [s] as the application value and the second with Ø as the application value. The results of the first analysis are given below:

other word-internal onset:	0.836	nosotros:	0.146
nosotros:	0.411	entonces:	0.132
		más:	0.108
other word-final coda:	0.080	es:	0.097
vos (object pronoun):	0.352	vos (discourse marker):	0.075
vos (subject pronoun):	0.141	pues:	0.061

Table 3.18 Rates of retention of /s/ as [s] in specific lexical items

Although the lexical items selected did show high rates of weakening, the rates are very similar to those given for codas in general. Furthermore, items that show very low rates of retention of /s/ as [s] (*pues, vos* as a discourse marker, *es*), tend to be unstressed, an environment which favours weakening. Thus the fact that weakening is extremely likely in these items is probably due to independent phonological factors.

Note that *nosotros* did show a much higher probability of weakening than other word-internal onsets; although no definite conclusions can be drawn, it is possible that the underlying representation of *nosotros* may be changing, as will be argued for *entonces* and *vos* in this section.

In the second analysis, with Ø as the application value, one of the items, nosotros, was excluded since this analysis included only segments in coda position. For the other eight items, the following probabilities were obtained:

other word-final coda:	0.628	pues:	0.609
vos (discourse marker):	0.902	es:	0.530
entonces:	0.841	vos (object pronoun):	0.507
nosotros:	0.695	más:	0.397
vos (subject pronoun):	0.641		

Table 3.19 Rates of deletion in specific lexical items

The results obtained here show that, with the exception of *más*, all lexical items predicted to show more deletion did so. However, as was found in the first analysis in this section, the probabilities given are in most cases close to the normal rates of deletion; the only exceptions are *entonces* and *vos* where it is used as a discourse marker. There are two possible explanations for these data. Firstly, it could be that these high rates of deletion are due to independent phonological factors such as position of stress. An alternative explanation is that there could be a change in the underlying representation of the items. The fact that cases of all three variants are seen in all of these lexical items which are subject to more deletion can be explained by positing two separate representations. Such doublets do exist in Spanish; e.g. *quizás*, 'maybe', can be written as either *quizá* or *quizás*; it is therefore not unlikely that others might arise.

3.10 The Functional Hypothesis

In order to assess the validity of the Functional Hypothesis with respect to these data, morphological factors were examined. Recall that the Functional Hypothesis states that "there is a tendency for semantically relevant information to be retained in surface structure" (Poplack 1980a). The relevance of this to Spanish is that in Spanish /s/ can be a plural or second person singular marker: where plurality or second person singular is marked elsewhere in the surface structure (or discourse, in a weaker version of this hypothesis), the Functional Hypothesis would predict that /s/ is more likely to be deleted.

An analysis was conducted including the social factors and position of sentential stress, which could be safely assumed not to interact with the factors under examination; redundancy of plural or second person singular marking was also included. Position in the NP and number of preceding plural markers were combined into one factor group as follows: token of /s/ is in the first position in the NP (1), token of /s/ is in the second position in the NP with no preceding plural markers (2,0), token of /s/ is in the second position in the NP with one preceding plural marker (2,1), and token of /s/ is in the third position in the NP with no preceding plural markers (3,0), etc.

This analysis was conducted with Ø as the application value, since aspiration is still salient and can thus be classified as "presence of marking": the distinction which is of interest here is "presence of marking" versus "absence of marking".

Only redundancy of plural or second person marking was found to be significant; the results were as follows:

level of redundancy	probability
nonredundant	0.157
plurality / second person singular marked in discourse/clear through shared knowledge of world	0.417
redundant i.e. plurality / second person singular marked in surface structure	0.574

Table 3.20 Effect of redundancy of plural marking on deletion of /s/

These results show a clear functional effect - the more redundant a morphological marking is, the more likely it is that it will be deleted.

A second analysis including speaker, position in the syllable (where all tokens except word-final codas were excluded), morphological status, position of sentential stress, and voicing, place and manner of articulation of the following phonological

environment yielded the following results, where factor groups are given in the order in which they were selected:[23]

manner of articulation of following phonological environment	affricate:	0.908
	glide:	0.761
	fricative:	0.662
	pause:	0.612
	stop:	0.556
	nasal:	0.373
	vowel:	0.222
position of sentential stress	preceding syllable stressed:	0.592
	stress elsewhere:	0.586
	following syllable stressed:	0.464
	segment in stressed syllable:	0.294
	both following syllable and syllable of segment stressed:	0.150
redundancy of plural marking	redundant:	0.538
	marked in discourse:	0.395
	non-redundant:	0.290
voicing of following phonological environment	voiced:	0.578
	voiceless:	0.347
position in NP and number of preceding plural markers	(3.0)	0.828
	(2.0)	0.629
	(2.1)	0.461
	(1)	0.396
place of articulation of following phonological environment	labial:	0.625
	velar:	0.448
	coronal:	0.441

Table 3.21 Effect of functional and phonological factors on s-deletion

23 Speaker, which was chosen as the fourth most significant factor group, is excluded from this table since we are primarily interested in determining whether functional or phonological factors have more effect on s-weakening

From these results it can be seen that, although functional factors do have a significant effect on s-deletion, it is still the phonological factors, manner of articulation of following segment and position of sentential stress, which have the primary effect on this process.

Another factor group which is found to be significant in this analysis, although not in the previous one, is position in the NP and number of preceding plural markers. These results are consistent with previous research on the Functional Hypothesis: Poplack (1980a) discovered "a tendency toward concord on the string level"; i.e. once a speaker has begun an NP without plural marking it is likely that s/he will continue to delete plural markings. This has been called the "serial effect" and is clearly counterfunctional. The results given in Table 3.21 are consistent with Poplack's finding: where an NP has begun without plural marking (i.e. (3.0) and (2.0)), the speaker is likely to continue deleting plural marking ($p = 0.828, 0.629$ respectively), whereas at the beginning of an NP (i.e. (1)) or where it has begun with plural marking (i.e. (2.1)) it is more likely that plural marking will be retained ($p = 0.396, 0.461$ respectively).

3.11 Conclusion

The results obtained support the hypothesis that s-weakening is most strongly influenced by following phonological environment, where a following coronal will

disfavour weakening; position in the syllable and word, where segments in onset position are more likely to be retained; and sentential stress, where /s/ is more likely to be retained in or adjacent to a stressed syllable. Morphological status was not found to be significant, and functional factors (redundancy of plural/second person singular marking, position in NP and number of preceding plural markers) were found to be less significant than phonological factors such as following phonological environment and position of sentential stress (see table 3.21). Thus, although other factors were selected as significant, many of the results are explicable in terms of following phonological environment, position in the syllable and word, and sentential stress.

With respect to the social factors, as predicted, it was found that upper class subjects were much less likely to weaken s than lower class subjects. Although sex and education were not selected as significant on their own, when these two factor groups were combined, the resulting factor group was found to be significant. This is presumably because there is some degree of interaction between these factors, due to the unbalanced distribution of the corpus. Generally, it appears that female subjects weaken s less than male subjects, again a predicted result. The results for level of education were not as clear, but it seems that in general the higher the level of education of the speaker, the more likely s he is to retain s. A larger study is necessary either to confirm this conclusion or determine if the tendency demonstrated by the two male subjects with low levels of education is indeed

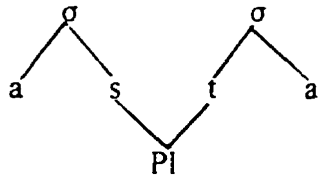
generally exhibited. The possibility was also raised that s-deletion and aspiration are separate processes, with aspiration being stable and deletion being a change in progress, led by working class women. Although the data support this hypothesis, again it is crucial that a larger study be carried out to confirm this.

It was also seen that we can draw conclusions about the validity of the Functional Hypothesis: it appears to have an effect in these data, since redundant or semi-redundant /s/ is more likely to be deleted than non-redundant /s/. Although pure percentages appear to support claims that a serial effect occurs in Spanish, this factor group was not found to be significant.

3.12 Residual Issues: Place Node Sharing and Resyllabification

It was noted above (sections 3.5 and 3.8) that /s/ tends to be realised as [s] much more where the following segment is a coronal stop and the sequence is word internal (...st...) than where it is labial or velar. I have suggested that this is due to the hypothesis that /s/ and /t,d/ share a place node, as shown in (1) above, repeated here as (2) for the convenience of the reader:

(2) [asta] 'until'



As expected, weakening of /s/ in a word-internal /st/ or /sd/ sequence occurs less often than where the /s/ is followed by /t,d/ across a word boundary (...s=t...). However, in the latter context, /s/ still tends to be realised as [s] more than where the following segment is labial or velar.

One way of dealing with the fact that an effect of identical place is observed even across a word boundary would be to treat s-weakening as a post-lexical process: if this were the case, then /s/ and /t,d/ would 'see' each other and the place nodes would fuse in accordance with the Obligatory Contour Principle (McCarthy 1986, originally due to Leben 1973).[24] The lexical and post-lexical representations of /st/ and /sd/ clusters would be as in (3) and (4) below:

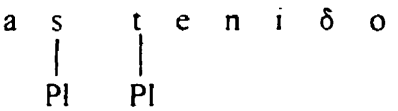
---

24 Alternatively, Place fusion could be motivated by a generalised Structure Preservation constraint (cf. Kiparsky 1985), one which requires the post-lexical melodic representations to mirror the lexical representations.

(3) lexical representations:

a. [asta] 'until'

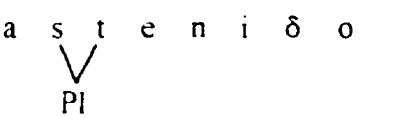
b. [asteniδo] '(you) have had'



(4) post-lexical representations:

a. [asta] 'until'

b. [asteniδo] '(you) have had'



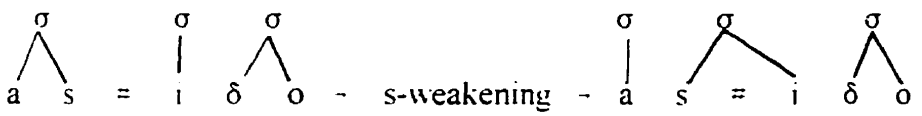
Some evidence that s-weakening may indeed be a post-lexical process comes from the probabilities that s will be deleted when in resyllabified position (see sections 3.4.1, 3.5, 3.7 and 3.8). Before turning to this evidence, I will remind the reader of why I have treated s-weakening as a lexical process until now.

I suggested in section 3.5 that s-weakening should take place before word-final /s/ is resyllabified into onset position in the post-lexical phonology for two reasons. Firstly, unlike in the case of underlying onsets, deletion is possible when /s/ is in resyllabified position. Secondly, rates of aspiration and deletion for resyllabified /s/ approach those of preconsonantal /s/ (i.e. /s/ in coda position).

The structure in (5) below illustrates the consequences of ordering s-weakening before resyllabification, i.e. where s-weakening operates in the lexical phonology. If s-weakening is followed by resyllabification, as in (5), then /s/ will behave as a coda, i.e. it will be weakened as frequently as an /s/ in coda position in the underlying (or lexical) representation.

(5) Lexical analysis: s-weakening followed by resyllabification

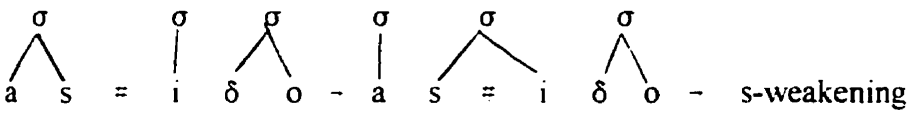
[as iδo] '(you) have gone'



However, if s-weakening operates in the post-lexical phonology as in (6), resyllabification will be followed by s-weakening, and /s/ will behave as an onset, i.e. it will sometimes be realised as [h] but never as Ø.

(6) Post-lexical analysis: resyllabification followed by s-weakening

[as iδo] '(you) have gone'



The problem with (6) is that resyllabified /s/ does not behave like an onset. However, it does not behave like a coda either, as (5) predicts. Detailed examination of the data shows that /s/ is in fact less likely to delete when in resyllabified position than when in underlying coda position; see table 3.22. The value of 55% observed for resyllabified /s/ suggests that, on occasion, it behaves as an onset and, at other times, as a coda.

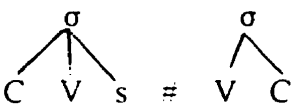
prepausal (coda) /s/ (...Vs=#)	resyllabified /s/ (...Vs=V)	onset /s/ (...sV...)
80%	55%	1%

Table 3.22 Percentage deletion of /s/ in different positions[25]

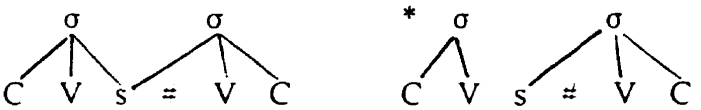
25 Percentages are used here rather than probabilities since GoldVarb can only perform binomial analyses, meaning that probabilities can only be provided where one variant is contrasted with the other two together, but not where all three variants are contrasted with one another. For this reason, percentages will also be used in the phonological analysis given in Chapter Five.

One way to capture this dual behaviour would be to assume that s-weakening is a post-lexical process but that the intervocalic resyllabified /s/ has ambisyllabic status in the post-lexical phonology; this is illustrated in (7b).

(7) a. lexical syllabification



b. postlexical syllabification



If we were to assume this representation, then /s/ could behave either as a coda or as an onset.[26]

Before choosing between these various options, that weakening is a lexical or a post-lexical process, or that word-final intervocalic /s/ is syllabified as an onset, as a coda, or as ambisyllabic, it is necessary to confirm the behaviour of /s/ in the environments s#V and s#t with a larger corpus. For the purposes of this thesis I assume that s-

26 There may be independent evidence for ambisyllabicity in Spanish. Weakening of voiced stops to spirants is favoured in the environment V_V. As stressed syllables prefer to be heavy cross-linguistically, a stressed vowel in Spanish may "pull" an adjacent onset consonant into its syllable, thereby creating an ambisyllabic consonant. If this consonant were /b,d, g/, it would be in a favoured environment to weaken to the corresponding spirant.

weakening occurs before resyllabification, i.e. lexically, an assumption which may be supported by the fact that s-weakening appears to be stable. On the view that new phonological changes are introduced into the grammar through the post-lexical phonology and gradually move up into the lexical phonology, stable variation implies a lexical process (cf. Kiparsky 1988 for discussion of the implications of lexical phonology for variation). However, I leave the problem of determining exactly where each process takes place to future research.[27]

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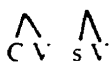
27 During final revision of this thesis, it occurred to me that one way to deal with the behaviour of resyllabified segments would be to assume that aspiration is a lexical rule, and that deletion occurs both in the lexical and the postlexical components, i.e. both before and after resyllabification. Thus true (preconsonantal prepausal) codas would be subject to deletion in both the lexical and post-lexical components, resyllabified codas would be subject to deletion only in the lexical component, (i.e before resyllabification takes place), and onsets would never be subject to deletion This is shown below for resyllabified and true codas

(i) resyllabified segments

lexical	C V s = V	subject to deletion (and aspiration)
postlexical		not subject to deletion, since in onset position

(ii) true (preconsonantal prepausal) codas

lexical	C V s = C	subject to deletion (and aspiration)
postlexical		subject to deletion

If we assume that different OT grammars (i.e. different rankings) exist in the lexical and postlexical components, and that 50% of the tableaux in each component select Ø as the optimal output, then we predict the following percentages of deletion in the environment, in the table these are compared to actual percentages of deletion in each environment:

CHAPTER 4

VARIATION IN PHONOLOGICAL THEORY

In this chapter I provide a summary of approaches to different aspects of variation within phonological theory. I will deal with three issues which have been discussed in the literature: the existence of variation, in spite of what formal approaches to phonological alternations predict; cases where more than two variants exist; and the need to reflect the likelihood of occurrence of each variant in the grammar.

4.1 The Existence of Variation

The first attempt to account for the existence of variation within phonological theory was made by Labov (1969). In this paper, he proposes the notion of *variable rules*.

	predicted % of deletion- lexical	predicted % of deletion- postlexical	predicted total % of deletion	actual % of deletion
true coda	50%	25% (half of remaining 50%)	75%	80%
resyllabified coda	50%	0%	50%	55%
onset	0%	0%	0%	1%

This two-level analysis also has implications for the observed effect of age on aspiration and deletion, as discussed in section 3.2. It was noted that aspiration appears to be in stable variation, while deletion appears to be a change in progress. The two-level analysis is consistent with this observation in that aspiration and deletion are treated as separate processes. It is also consistent with the hypothesis that stable variation implies a lexical process whereas change in progress implies a post-lexical process (see section 3.12).

I leave further investigation of this analysis to future research.

These are understood to be more than merely "optional" phonological rules: the favouring environment for the application of the rule is explicitly stated in the rule. These rules are expressed in the *SPE* format proposed by Chomsky and Halle (1968); the format is given in (1) below:

(1) Variable rule formulation

X - <Y> _ <B>

The angled brackets around the output (proposed by Sankoff and Cedergren 1974) indicate the rule's optionality; the angled brackets around the environment indicate that this is the favoured environment for application of the rule. Thus, for example a rule where s becomes [h] variably, and more before consonants than before vowels or prepausally would be formulated as follows:

(2) s - <h> _ <C>

Although this approach is groundbreaking in that it constitutes the first attempt to account for variation using the formal devices of phonological theory, there are several problems with it. Firstly, its primary function is as a descriptive device. Although it does explicitly express the environments favouring the rule, it does not give any indication as to *how much* the application of the rule is favoured, nor does it offer any explanation as to *why* this environment favours the application of this

rule.[28] For example, consider again the rule in (2). This rule states that /s/ becomes [h] variably, and that the rule is more likely to apply where /s/ is followed by a consonant. However, the two tables which follow are equally well expressed by the rule given above:

	[s]	[h]
_C	45%	55%
_V	55%	45%
_#	55%	45%

Table 4.1 Possible distribution expressed by rule (2)

	[s]	[h]
_C	5%	95%
_V	95%	5%
_#	95%	5%

Table 4.2 Alternative distribution expressed by rule (2)

Within the variable rule approach, there is no way to capture the difference between these situations. Thus it is necessary to approach the problem of accounting for

28 Guy (1990) attempts to address the latter problem. He appeals to lexical phonology in an attempt to account for the fact that /t,d/-deletion in English occurs more frequently where /t,d/ is non-morphemic than where it is morphemic. However, as was seen in Chapter 3, morphosyntactic factors are not the primary constraining factors in s-weakening in Spanish. Furthermore, the results in Spanish and English are conflicting. s-deletion is actually *more* likely where /s/ is morphemic than where it is non-morphemic

variation in a principled way from a different theoretical perspective, leaving the descriptive burden to variable rules or to tables and graphs.

A second problem with this approach is that it does not allow the possibility of three variants, as is the case in s-weakening in Spanish; the only way to capture this would be through two separate rules, either s - h and h - Ø, or s - h and s - Ø.

4.2 The Existence of Multiple Variants

As has been seen above, one of the problems with a standard rule-based approach to variation is that it does not allow the possibility of multiple outputs without postulating more than one rule. Optimality Theory (henceforth OT), as proposed by Prince and Smolensky (1993), has been used for modelling variation since it offers an ideal mechanism for allowing multiple outputs: the fact that the output, or optimal candidate, will always violate some constraints in the language, provides the opportunity to define various outputs as "equally good".

OT holds that a grammar consists of:

1. A generation function (GEN), which will generate all possible outputs (surface representations) for a given input (underlying representation).

2. A series of constraints which are exhaustively ranked. These constraints are taken to be universal; only the ranking is language-specific.
3. An evaluation function (EVAL), which evaluates the possible outputs according to the constraint ranking and selects the optimal output.

The output which best satisfies the constraint ranking (i.e. the optimal candidate) will be the surface form; "best satisfaction" is defined as minimal violation of the constraints.

For example, consider a case where there are four constraints, A, B, C and D, and three possible outputs, X, Y and Z, and where the constraints are ranked A>>B>>C>>D. The selection process is expressed in a "tableau", where the constraints are listed along the top in the order in which they are ranked, and the possible outputs are listed in the left-hand column (see (3)). An asterisk indicates a violation of the relevant constraint, and an exclamation mark indicates a fatal violation, i.e. the point at which a possible output is excluded from contention. Since it is assumed that assessment is parallel, not serial, all candidates are evaluated for all constraints, even if the candidate has been excluded due to a fatal violation of some high-ranked constraint. The optimal output is indicated by a hand in the far left column.

(3) Sample tableau

	A	B	C	D
X	*!			
Y		*!		
☞ Z			*	*

As is clear from the tableau shown above, it is possible for an output to be selected as optimal even if it violates any number of constraints, provided those constraints are not ranked highly. It is this feature of OT that makes it ideal for expressing variation, as will be seen below.

4.3 Variation and Optimality Theory

Although some non-optimal candidates are "closer" to the optimal candidate in terms of relative well-formedness than others, as is the case for Y as opposed to X in (3), it has been claimed (McCarthy & Prince 1994) that this has no formal status in the theory. Furthermore, one of the tenets of OT is that constraints must be exhaustively ranked, allowing only one possible output per input. If these tenets are accepted, then the only way to account for variation is by positing multiple grammars, an approach suggested by Kiparsky (1993). If these tenets are weakened, then variation can be captured within a single grammar; Reynolds (1994) and Anttila (1995) have both attempted to account for variation in this way.

4.3.1 Multiple Grammars

In order to account for /t,d/-deletion in English, Kiparsky (1993) proposes alternate constraint rankings within a single dialect; variation is seen as "codeswitching" between distinct grammars. There are both conceptual and empirical reasons to reject this approach. Firstly, it implies that each individual speaker commands separate grammars for every type of variation within a single language. Since variation is a universal phenomenon and many different types of variation occur in any given language, this approach requires that each speaker command an astronomical number of distinct grammars, unlikely in practical terms. Secondly, no mechanism is offered to predict in which environments variation may occur, nor how likely a given variant is to occur. Since it is well-known that variation is a highly systematic phenomenon, it seems desirable that any theory be able to predict, at least to some degree, this systematicity.

4.3.2 Crucial Non-Ranking

In their 1993 manuscript on Optimality Theory, Prince and Smolensky mention the possibility of "crucial non-ranking", i.e. the non-ranking of two or more constraints, where different rankings of these constraints will give different outputs. They claim that this will not occur, since they have not found empirical evidence for it:

> "We assume that the basic ranking hypothesis is that there is some total ranking which works; there could be (and typically will be) several, because a total ranking will often impose noncrucial dominance relations ... this opens up the possiblity of crucial nonranking ... for which we have not yet found evidence. Given present understanding, we accept the hypothesis that there is a total order of domination on the constraint set; that is, that all nonrankings are noncrucial." (1993, p. 51).

Reynolds (1994) and Anttila (1995) exploit the concept of crucial non-ranking in accounting for variation, arguing that it is attested empirically in cases of variation. The use of OT and crucial non-ranking in modelling variation has two advantages over rule-based approaches: firstly, multiple outputs can be accounted for within a single grammar, and secondly, the likelihood of a given variant occurring can be reflected in the grammar.

4.4 Floating Constraints

The approach proposed in Reynolds (1994; see also Reynolds and Nagy 1994) utilises the concept of a floating constraint, which is defined as a constraint which can fall anywhere within a given range of constraints in a ranking hierarchy. Thus a possible range of outputs is predicted. The concept of floating constraints can be expressed as in (4); a constraint X can be ranked somewhere between two constraints W and Z, without specifying its ranking in relation to the constraints ranked between W and Z:

(4)

$$\text{CONW} \gg \underbrace{\text{CONY}_1 \gg \text{CONY}_2 \gg \ldots \gg \text{CONY}_n}_{\text{CONX}} \gg \text{CONZ}$$

(Reynolds & Nagy 1994)

Thus for any given input there will be more than one optimal output, depending on the position of the floating constraint. More specifically, the number of possible rankings will be equal to the number of constraints in the range over which the constraint floats, plus one. Each ranking will provide an optimal output, although different rankings can give the same optimal output. The probability that a given output will occur should be approximately equal to the percentage of rankings which select that output.

Reynolds offers an account of Spanish s-weakening in coda position within the framework of his proposal. The account is briefly summarised below:

4.4.1 S-Weakening in Spanish: Floating Constraints

The account that Reynolds provides makes use of the following constraints:

(5) ONS^{RISE}:[29] If there is more than one position in an onset, these positions must be filled by segments which are rising (toward the nucleus) in sonority.

PARSECOD-R: The root node of a coda segment is parsed (by μ).

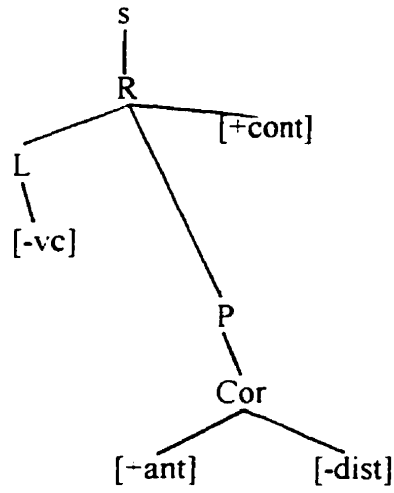
PARSECOD-P: The place node of a coda segment is parsed (by the root node).

*PARSE/Fric: A member of the POSSIBLECODA family, which reflects the fact that more sonorous segments are preferred in coda position. Thus parsing a liquid is more harmonic than parsing a fricative, which in turn is more harmonic than parsing a stop, i.e. *PARSE:Stop >> *PARSE/Fric >> *PARSE:Liq.

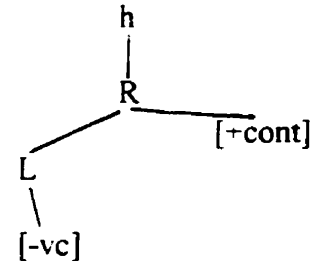
The segmental representations for /s/ and [h] that Reynolds proposes are as follows:

[29] Reynolds assumes that sC is a branching onset in languages which tolerate it.

(6) a.



b.



When s.'s place node is delinked (i.e. when PARSECOD-P is violated) the segment is realised as [h]; in this case, the feature [continuant] is also delinked, in order to avoid an illegal combination of features. When the root node is delinked, (i.e. when PARSECOD-R is violated) the segment is realised as Ø. The latter does not involve a violation of PARSECOD-P since according to the definition in (4) this is only violated where the place node is not parsed by the root node; when the root node is delinked altogether, no subsegmental Parse constraints are violated.

Reynolds orders the constraints as follows:

(7) ONSRISE>>*PARSE/Stop>>{ PARSECOD-R, PARSECOD-P } *PARSE/Fric

This can be interpreted as "PARSECOD-R and PARSECOD-P float in relation to one another, and both float in relation to *PARSE/Fric". Thus there are four possible rankings:

(8) a. ONSRISE>>*PARSE/Stop>>PARSECOD-R>>PARSECOD-P>>*PARSE/Fric

b. ONSRISE>>*PARSE/Stop>>PARSECOD-P>>PARSECOD-R>>*PARSE/Fric

c. ONSRISE>>*PARSE/Stop>>*PARSE/Fric>>PARSECOD-R>>PARSECOD-P

d. ONSRISE>>*PARSE/Stop>>*PARSE/Fric>>PARSECOD-P>>PARSECOD-R

I suggest that there are both empirical and conceptual problems with Reynolds's approach. Empirically, there is a problem with this approach in that it predicts the wrong percentages of [s], [h] and Ø in coda position in actual speech, as is shown in table 4.3 below.[30]

	[s]	[h]	Ø
predicted percentage	50%	25%	25%
actual percentage	15.3%	24.0%	60.7%

Table 4.3 Predicted and actual percentage of occurrence of [s], [h] and Ø

30 Note that Reynolds does not give percentages of different variants; I compare his predictions with my data

Although the empirical problem may be rectified by using different constraints or slightly different rankings, there are also conceptual problems with this approach. Given that Reynolds has allowed for the possibility that groups of constraints can float in relation to other groups of constraints, and that the constraints in the group can also float in relation to one another, it is possible to construct an astronomical number of grammars even if only a small number of constraints are involved in the interaction. [31]

There are two reasons why this approach is problematic. Firstly, the predictive power of the model is too great: not only is it possible to construct grammars which predict outputs that differ from one another by only one or two percent, but there are many different grammars which predict the same percentages using the same constraints. For example, consider the situation displayed in (9), where there exist two variants, X and Y; where there are four constraints involved in the interaction, A, B, C and D; and where X violates A and B, and Y violates C and D.

---

31 It is important to distinguish here between a possible grammar and a possible ranking within a grammar. A grammar involves floating or unranked constraints; within this grammar there exist a number of possible rankings. It is the different outputs given by these rankings which give rise to variation.

(9)

	A	B	C	D
X	*	*	✓	✓
Y	✓	✓	*	*

The grammars in (10) are just some of those which predict that X will be produced 50% of the time and Y will be produced 50% of the time:

(10) a. {{A.C}.{B.D}} i.e. A and C float in relation to one another, B and D float in relation to one another, these groups float in relation to one another.

b. {{A.B}.{C.D}} i.e. A and B float in relation to one another, C and D float in relation to one another, these groups float in relation to one another.

c. {{A. B >>C}.D} i.e. A floats in relation to B and C, which are ranked; D floats in relation to this group.

d. {{A. B>>D}.C} i.e. A floats in relation to B and D, which are ranked; C floats in relation to this group.

e. {{B. A>>C}.D} i.e. B floats in relation to A and C, which are ranked; D floats in relation to this group.

f {{B. A>>D}.C} i.e. B floats in relation to A and D, which are ranked; C floats in relation to this group.

It is preferable to use an approach in which different grammars make different predictions. Furthermore, it is not necessarily desirable to have a theory where grammars give rise to only slightly different predictions given that phonological factors will not be the only influencing factors. In other words, at least in most cases of variation, the phonology cannot be expected to predict the frequency of each variant down to the percentage point.[32]

The second problem with this approach is that there is no evidence that the mechanisms it involves are necessary: until a simpler theory has been proven to be inadequate, these additional mechanisms need not be invoked. Although the notion of floating constraints is not problematic per se in terms of the number of outputs yielded, it is highly problematic that this mechanism is formally consistent with embedding, a notion which allows for an astronomical range of possible grammars with a limited number of constraints.

In the following section I outline a more constrained approach, which utilises the concept of crucially unranked constraints, and which allows only one possible grammar given a group of constraints involved in the interaction. I will demonstrate in Chapter 5 that it is possible to construct a grammar which comes close to

32 See section 4.6 for a discussion of possible ways of encoding social factors or level of formality into the grammar

predicting the actual percentages of [s], [h] and Ø in spoken Spanish within this approach.

4.5 Crucial Non-Ranking of Groups of Constraints

Anttila (1995) proposes an approach similar to Reynolds's, based on the claim that a partial order (i.e. a grammar with nonrankings) qualifies as a single grammar.[33] Within Anttila's approach, there exist groups of constraints which are unranked with respect to one another, with the result that a variety of different rankings is possible:

Constraints: A, B, C

Ranking: None

Corresponding tableaux: A >> B >> C

A >> C >> B

B >> A >> C

B >> C >> A

C >> A >> B

C >> B >> A

33 Anttila also claims that (a) variation will occur where the grammar underdetermines the output and (b) the fewer rankings a grammar has, the simpler it is. This implies that the child begins with no rankings and ranks constraints on the basis of positive evidence, rather than (the more commonly held view) that the child begins with an unmarked ranking and changes rankings on the basis of positive evidence (e.g. Demuth 1995, Gnanadesikan 1995). I make no claim as to which of these views is correct.

Interpretation:

(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*.

(Anttila 1995)

We can compare this approach with Reynolds's in terms of the number of possible grammars it yields as follows (across languages, cf. (10)): since embedding is not included as a possibility within Anttila's approach,[34] only one possible grammar is predicted no matter how many constraints enter into the interaction, a grammar where all the relevant constraints are unranked in relation to one another. For example, compare the grammars given in (10) above with the grammar permitted within Anttila's approach: Anttila allows for only one grammar, where all four constraints are unranked with respect to one another:

(11) A, B, C, D

34 Anttila does not explicitly rule out the possibility of embedding, nor does he mention that it may occur. Since embedding is unnecessary in my analysis, as it was in Anttila's analysis of Finnish case marking, I will adopt the view that embedding is not needed within this theory, until evidence is presented to the contrary.

If any further ranking is given, fewer constraints enter into the interaction; note that A in (12a) and D in (12b) do not enter into the interaction, as opposed to the partially ranked constraints in (10c) through (10e) above:

(12) (a) A > B, C, D (only B, C and D enter into the interaction)

(b) A, B, C > D (only A, B and C enter into the interaction)

Thus Anttila's approach is more constrained than Reynolds's.

This approach is also preferable to Kiparsky's for the following reasons:

(a) it makes definite predictions about the probability of each variant occurring, since it is assumed that the number of rankings which select a given variant is directly correlated with the frequency of that variant in speech, whereas Kiparsky makes no claim about the likelihood of choosing a given grammar;

(b) where a constraint is unranked with respect to other constraints, it is assumed that all possible rankings will occur; e.g. if three constraints are unranked with respect to one another, then there are six possible rankings. Kiparsky's approach makes no assumption of this sort, so that if three constraints are ranked differently in different grammars, there is nothing to prevent the

analysis including only five of those grammars, and arbitrarily excluding one of the possible rankings.

For the reasons given above, I will adopt Anttila's approach in my analysis of s-weakening in Spanish.

4.6 Accounting for Social Factors?

Before turning to my analysis, in this section I will offer some direction for how it may be possible to encode social factors into the phonological analysis. I will attempt to account for the fact that the same speaker may demonstrate differing frequencies of different variants depending on the formality of the situation, as well as the fact that speakers of different social backgrounds use the variants in differing frequencies.

Within Reynolds's theory, it is fairly easy to encode these differences, although he does not attempt to do so: since his account is based on the notion of a constraint floating from one end of a given range to the other, it is possible to label one end of the range 'formal' and the other end 'informal', and claim that the more formal the situation (or the higher the socioeconomic class of the speaker, or the greater the social awareness of the speaker...), the more the speaker will tend to favour the 'formal' end of the scale. However, the notion of embedding proves problematic here

since what this means is that the speaker has "scales within scales", such that in order to encode formality each scale would need to be labelled in terms of formality.

It is not immediately clear how these differences should be encoded within Anttila's approach, since there is no clear scale, the ends of which can be labelled 'formal' and 'informal'. However, within an optimality theoretic approach there are two different kinds of constraints involved in an interaction: faithfulness constraints such as PARSE, and markedness constraints such as NOCODA. The faithfulness constraints can be described as 'listener-oriented' constraints, since the full parsing of all material increases intelligibility, and thus is for the convenience of the listener. On the other hand, markedness constraints can be described as 'speaker-oriented' constraints, since the reduction of structure or the elimination of segments makes the utterance easier to produce,[35] and thus is for the convenience of the speaker.

It is logical to think that in a formal situation, the speaker would be concerned with the listener's convenience; therefore it makes sense to assume that s he would select tableaux where the 'listener-oriented' constraints would be ranked higher. Since these constraints are the same ones that guard against weakening, it follows that in general in more formal situations segments will be retained more than in less formal situations. This argument extends to individual speakers: the more socially aware

35 However, it must be noted that it is not yet entirely clear what the relationship is between reduction of structure and ease of articulation

a speaker is, the more likely it is that s/he will tend to favour the listener-oriented constraints.

In the following chapter I offer an account of s-weakening in Spanish within Anttila's approach. I only give one constraint ranking, based on the average percentages of each variant across speakers.[36] Although it is possible that there are different grammars across different social classes, levels of education, etc., the effects of the social factors are at present still somewhat unclear; i.e. a speaker's behaviour cannot be predicted with a high level of accuracy based on their background. Thus, unless a study conducted with a larger corpus demonstrates that the differences based on social factors are indeed clear enough to justify the positing of separate grammars across speakers, social classes, etc., I believe that an account using only one grammar for all speakers, but giving different 'weights' to different types of constraints, is more parsimonious. Furthermore, an approach such as this can account for the fact that there is intraspeaker variation depending on factors such as the interlocutor, the formality of the situation and so forth (Labov 1972).

36 Recall from footnote 25 that percentages were used in my analysis rather than probabilities since GoldVarb does not do multinomial analysis, meaning that it is not possible to compare all three variants simultaneously, but only to compare one with the other two.

CHAPTER 5

ANALYSIS OF S-WEAKENING IN SPANISH

In this chapter I will offer an optimality theoretic account of s-weakening in Spanish.[37] In section 5.1, I outline my assumptions; in sections 5.2 and 5.3, I provide the constraints I use along with their ranking, and compare the predictions that my analysis makes with the results given in Chapter 3; and in section 5.4, I discuss the possibility that adjacent coronal segments can share place nodes.

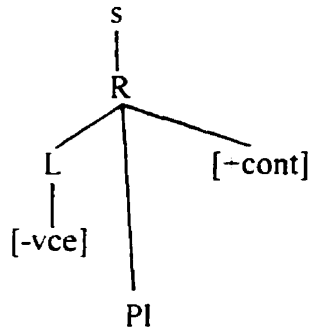
5.1 Assumptions

5.1.1 Feature Geometry

I adopt the position that segments are internally structured (see Clements and Hume 1995 for an overview of this theory). The representations of [s] and [h] that I assume are as follows:

37 I restrict my analysis to syllable structure and place of articulation of following segment, but leave the issue of accounting for stress placement to future research

(1) a.



b.

As can be seen from the representations in (1), I assume that features are binary. However nothing rests on this assumption; my analysis is unaffected if features are treated as monovalent. I have assumed that the coronal node is underspecified (cf. e.g. Paradis and Prunet 1991), but in fact this is of no consequence, since the crucial characteristic of coronals in my analysis is simply that they have a place node, whether or not they are specified as coronal in the input.

As mentioned in section 2.5, /s/ and /n/ are the only consonants which are extraprosodic in Spanish, meaning that we might expect both /s/ and /n/ to behave asymmetrically from other consonants in Spanish. This raises the possibility that /n/ should be affected by deletion; although I do not deal with this type of deletion in this thesis, since to my knowledge it does not occur in Salvadorean Spanish, it is in fact the case that in certain dialects of Spanish, this process does occur (cf. Poplack 1980a for discussion of n-deletion in Puerto Rican Spanish). Nevertheless s-deletion is much more generalised and pervasive than n-deletion, and I claim that this is due

to the fact that, across languages, stops and fricatives are more commonly subject to debuccalisation, possibly because they have laryngeal counterparts, [ʔ] and [h] respectively, and weakening from /h,ʔ/ - Ø is phonetically natural.

5.1.2 Crucial Non-Ranking of Constraints

As outlined in section 4.5 above, I follow Anttila (1995) in assuming that variation arises due to a crucial non-ranking of two or more constraints. As a result, a single grammar yields a variety of different outputs. The number of tableaux in which a given output is selected should more or less correspond to the actual probability of that output occurring.

5.2 Constraints

In my analysis I utilise a number of constraints which have been proposed in the optimality theoretic literature:

ONS: Syllables have onsets (Prince and Smolensky 1993).

NOCODA: Syllables do not have codas (Prince and Smolensky 1993).

PARSEPL: Place nodes are parsed by the root node (see Reynolds 1994 among others).

PARSER: Root nodes are parsed by constituents of the syllable structure (see Reynolds 1994 among others).

The constraint ONS will have the effect of disfavouring s-deletion in onset position. It will not, however, have any bearing on /s/ being weakened to [h]. The constraint NOCODA will have the effect of favouring s-deletion in coda position. PARSEPL will disfavour aspiration in all positions within the syllable, and PARSER will disfavour deletion of /s/ in all positions within the syllable.

Furthermore, I propose three new constraints:

NOSL: There must be no supralaryngeal constriction.[38]

GEM. INALT: -do not act on, i.e. delete or eliminate structure from, half of a geminate.

INTEG: -do not split a geminate.[39]

NOSL states that segments must not have a place node. This constraint is based on the idea that in general speakers prefer to eliminate structure where possible.

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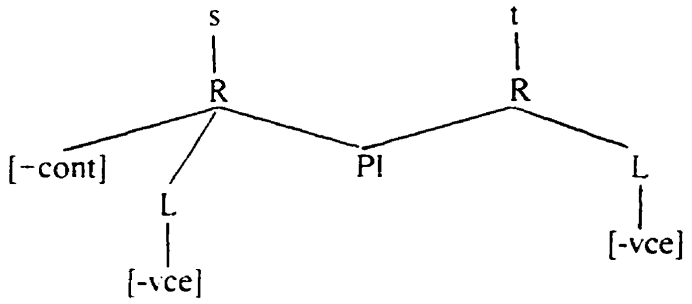
38 Note that [h] does not violate NOSL since, when the place node is delinked, [continuant] is also delinked, because the presence of [continuant] imples constriction in the supralaryngeal cavity, i.e., continuant is irrelevant to segments which don't involve place articulation. It is worth noting that this means that s-h will violate PARSECONT, which must be ranked relatively low, and will therefore not be included in the tableaux.

39 INTEG is included here in order to make it clear how it differs from INALT, however, it does not feature in my analysis

The last constraint family mentioned, GEM (standing for "geminate"), consists of two constraints, INALT (inalterability) and INTEG (integrity). It is supported by evidence from many languages where geminates behave as one unit; processes usually apply either to both halves of a geminate or to neither (inalterability), and geminates often resist epenthesis (geminate integrity) (Hayes 1987, Schein and Steriade 1986). In my analysis I treat word-internal /st/ and /sd/ clusters as partial geminates, sharing a place node. Like a true geminate, they are always heterosyllabic in Spanish:

(2)



INALT is relevant for these cases; aspiration and deletion of an /s/ followed by a /t/ constitutes a violation of INALT. Aspiration results in delinking shared place structure to yield [h]. Deletion results in delinking of the root node to yield Ø.

If we think of the constraints given above in terms of the distinction suggested in section 4.4 between speaker-oriented and listener-oriented constraints, it can be seen that those constraints favouring reduction of structure, namely NOCODA and NOSL, are speaker-oriented constraints, whereas those favouring retention of structure,

namely PARSEPL, PARSER, and INALT, are listener-oriented constraints. I suggest that it is because of the interplay between these two types of constraints that variation occurs.

5.3 Constraint Ranking

I propose that the aforementioned constraints are ranked as follows:

(3) ONS >> NOCODA, PARSER, PARSEPL, NOSL, INALT

Thus ONS is ranked above the next five constraints. These five constraints are crucially unranked with respect to one another, meaning that their ranking in a given case will have an effect on the output.

I will now show the results for different environments, treating coda and onset positions separately. Recall that /s/ deletes or aspirates in coda position, and that in the case where an /s/ is followed by a coronal stop, it resists weakening: deletion does not occur in onset position, and aspiration in onset position is less common than in coda position.

5.3.1 /s/ in coda position

Since the only relevant constraints when /s/ is in coda position are NOSL, PARSER, PARSEPL, INALT and NOCODA, for expository convenience ONS will be excluded from the tableaux. Furthermore, since INALT is only relevant to a subset of cases where s is in coda position, it will be treated separately in section 5.4.

Twenty-four tableaux (possible rankings) arise from the hierarchy of constraints in (3). Two sample tableaux are given below: in (4a) speaker-oriented constraints are ranked highly, with the result that deletion is favoured, whereas in (4b) listener-oriented constraints are ranked highly, with the result that retention of /s/ as [s] is favoured.

(4) a.

	NOSL	NOCODA	PARSEPL	PARSER
[s]	*!	*		
[h]		*!	*	
☞ O				*

(4) b.

	PARSEPL	PARSER	NOSL	NOCODA
☞ [s]			*	*
[h]	*!			*
O		*!		

With all possible rankings of the crucially unranked constraints, the following percentages are arrived at; the numbers in parentheses indicate the number of tableaux in which the output was selected. The predicted percentages are compared to actual percentages:

	[s]	[h]	O
predicted percentage	20.8% (5)	20.8% (5)	58.4% (14)
actual percentage	15.3%	24.0%	60.7%

Table 5.1 Predicted and actual percentages of variants in coda position

That is, with twenty-four possible rankings, [s] is the selected output in five of those rankings, [h] is the output in five of the rankings, and O is the output in fourteen of the rankings. As can be seen, the predicted percentages are within 5.5% of the actual percentages.[40]

40 Although NOSL, PARSER and PARSEPL are adequate to yield the three outputs, if NOCODA is not included among the unranked constraints, the percentages obtained are incorrect [s] 50%, [h] 17%, O 33% Thus it is essential that we not adopt an approach which merely attempts to account for the presence of multiple outputs but rather that we opt for one which attempts to capture the frequency of

The analysis given thus far predicts that all instances of /s/ in coda position will behave identically. However, this position actually comprises three separate situations: preconsonantal /s/, prepausal /s/, and prevocalic /s/ in word-final coda position. Rates of aspiration and deletion are fairly similar in all of these situations, although resyllabified /s/ deletes less than other /s/'s in coda position, as discussed in section 3.12. The analysis proposed here does not account for the difference between rates of deletion for resyllabified /s/ and other coda /s/'s; in section 3.12 it was pointed out that these segments exhibit behaviour intermediate between that of coda /s/'s and onset /s/'s, but that it is crucial to examine a larger body of data before coming to any conclusions about the representation of these segments, namely whether they are ambisyllabic or not.[41]

The percentages for segments in different positions in the syllable and word are given in table 5.2:

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each variant as exemplified here

41 However, see footnote 27 in section 3.12.

	[s]	[h]	Ø
preconsonantal, word-internal[42]	37%	34%	30%
preconsonantal, word-final	5%	21%	74%
prevocalic coda	9%	36%	55%
prepausal	15%	5%	80%

Table 5.2 Rates of weakening of /s/ in preconsonantal, prevocalic and prepausal coda position

Any attempt to account for both resyllabification and s-weakening in prevocalic coda position within a single grammar will meet with failure, since /s/ will ultimately be syllabified as an onset: it appears, however, that resyllabified /s/ is subject to the constraints governing codas in terms of weakening.[43] Thus it seems that the process of s-weakening is restricted to the lexical phonology, and that there are two sets of constraint rankings in the grammar, one which holds over the lexical component and one which holds over the post-lexical component.

5.3.2 /s/ in onset position

Where /s/ is in onset position there are only three relevant constraints: ONS, NOSL and PARSEPL. Since O is always excluded as a possible output by ONS, which is

42 Recall that /s/ in word-internal preconsonantal position was preserved as [s] more than /s/ in other coda positions due to the high proportion of following coronal stops in these tokens

43 See section 3.12, however, for further discussion

always ranked above the other constraints discussed here, PARSER never plays a part in selecting the optimal candidate. The hierarchy is: ONS >> PARSEPL, NOSL, which yields only two possible rankings, given in (5) below:

(5) a.

	ONS	PARSEPL	NOSL
☞ .sV			*
.hV		*!	
.<s>V[44]	*!		

(5) b.

	ONS	NOSL	PARSEPL
.sV		*!	
☞ .hV			*
.<s>V	*!		

The predicted percentages are compared to the actual percentages in table 5.3 below; it will be noted that although there is a difference between the two, given the coarseness of the grammar, i.e. the fact that only two (relevant) constraints are unranked, the model comes as close as possible to predicting the actual outcome:

44 <s> means that 's' is deleted, i.e. realised as Ø

	[s]	[h]	Ø
predicted percentage	50%	50%	0%
actual percentage	66%	33%	1%

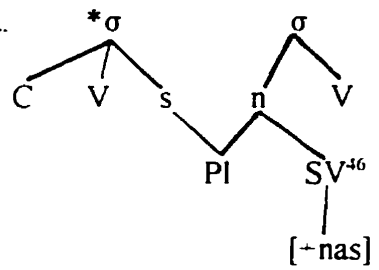
Table 5.3 Predicted and actual rates of weakening in onset position

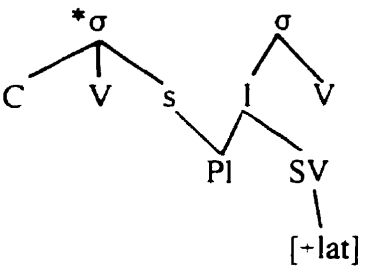
Although the grammar predicts that /s/ in onset position will never be realised as Ø, this actually happens in 1% of cases. As was discussed in chapter 3, /s/ was deleted in onset position in only six instances, five of which were produced by the same speaker and four of which were in the word *se*. The implications of this result were discussed in section 3.5.1.

5.4 Place Node Sharing

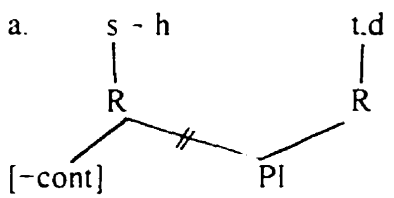
One of the most interesting findings of this study was that /s/ is much less likely to be weakened where it is followed by an oral coronal stop. This phenomenon is primarily observed word-internally; where /s/ is followed by an oral coronal stop across a word boundary, its behaviour is similar to that of an /s/ followed by any other consonantal segment (but see section 3.12 for discussion of this point). Thus I suggest that, word-internally, /s/ shares a place node with /t/ and /d/, as shown in the representation in (2) above. Place sharing occurs with a following obstruent but not with a following nasal or liquid. I suggest that this is because a coda cannot share

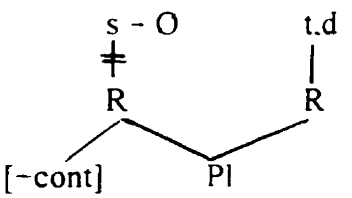
a place node with the following onset unless the coda is equal to or more sonorous than the onset:[45]

(6) a. 

b. 

Where 's' is followed by /t/ or /d/, INALT becomes relevant. The function of this constraint is to prevent disruption of the multiple link, that between R and Pl. Thus, where 's' is realised as [h] or Ø, INALT is violated.

(7) a. 

b. 

The constraints involved are PARSER, NOSL, NOCODA and INALT, all of which (recall from (3)), are unranked with respect to one another. PARSEPL does not play a role, since regardless of whether /s/ is realised as [h] or Ø, the place node is still

45 This is consistent with the observation that in many languages where codas must be more sonorous than onsets (or must be of equal sonority, in the case of geminates), the coda must share place with the following onset.

46 It has been claimed that sonorants, but not obstruents, have a Spontaneous Voice (Piggott 1994) or Sonorant Voice (Rice 1992) node, dominating the features [nasal] and [lateral]

parsed by /t/ or /d/ (cf. (7a,b)). Three sample tableaux are given below. In (8a), INALT, a listener-oriented constraint, is ranked high, meaning that [s] is selected as the optimal output. In (8b) and (8c), NOSL, a speaker-oriented constraint, is ranked highly; as can be seen, either [h] or Ø is selected as the optimal output, depending on the relative ranking of PARSER and NOCODA:

(8) a.

	INALT	PARSER	NOSL	NOCODA
☞ [s]			*	*
[h]	*!			*
O	*!	*		

(8) b.

	NOSL	NOCODA	PARSER	INALT
[s]	*!	*		
[h]		*!		*
☞ O			*	*

(8) c.

	NOSL	PARSER	NOCODA	INALT
[s]	*!		*	
☞ [h]			*	*
O		*!		*

The predicted percentages for the different outputs, together with the actual percentages, are given in table 5.4 below. Once again, the numbers in parentheses are the number of tableaux in which the output was selected as optimal.

	[s]	[h]	Ø
predicted percentage	37.5% (9)	25% (6)	37.5% (9)
actual percentage	45%	35%	25%

Table 5.4 Predicted and actual rates of weakening of /s/ in /st/ clusters

That is, of the twenty-four possible rankings, [s] is predicted to be the output in nine, [h] is predicted to be the output in six, and Ø is predicted to be the output in nine.

Although the predicted percentages are reasonably close to the actual percentages, there is still a discrepancy of up to 12.5% in the case of s being realised as Ø. This situation could be remedied with the introduction of another constraint, although it is not clear from the evidence regarding s-weakening what this constraint should be. I leave this to future research.

5.5 Conclusion

In this chapter I have provided an optimality theoretic account of the distribution of s-weakening given in Chapter 3. Although it is beyond the scope of phonological theory to account completely for the effect of social factors, I believe that the analysis given in this chapter captures most of the facts about the effect of linguistic factors. It was found that the primary linguistic factors influencing s-weakening were position in the syllable, and following phonological environment, where a following oral coronal stop highly disfavours weakening. The analysis captures these facts and offers reasonably accurate predictions of the percentages of different variants expected in different environments.

CHAPTER 6

CONCLUSION

6.1 Summary of Findings

In this thesis I have provided a comprehensive examination of the factors influencing s-weakening in the Spanish spoken in San Miguel, El Salvador, and have offered a preliminary phonological analysis of this phenomenon.

The corpus used in this study consisted of sixteen Spanish speakers native to San Miguel; subjects were evenly distributed according to sex, socioeconomic status and age. Data were collected in interviews conducted by a native speaker of Spanish born and raised in San Miguel and known to the subjects. The purpose of collecting data in this way was to maximise the informality of the speech samples collected. Two hundred and fifty tokens of /s/ were collected from each subject and these were coded according to the factors outlined in section 2.6.

Analysis of the data revealed that a number of factors had an effect on the probability of s-weakening occurring. The factors which had the most influence are summarised below:

Factor Group	Observed Effect
socioeconomic status	Lower class speakers tend to weaken /s/ more than upper class speakers.
sex and level of education	An interaction was observed between these factor groups, although neither was found to be statistically significant on its own. It was observed that men tend to weaken more than women, although working class women delete more than men; it was also observed that, the more educated a speaker, the less likely that s/he will aspirate/delete /s/.
age	It was found that younger speakers tend to delete more than older speakers; age was not found to be significant with regard to weakening.
position in syllable and word	Weakening is favoured in coda position, regardless of whether the segment is word-internal or word-final, and regardless of whether it is resyllabified into onset position or not. Deletion can only take place in coda position, except in the word *se*.
following phonological environment	Weakening is much less likely to take place where the following segment is a coronal stop, and where the segment is word-internal.
position of sentential stress	Weakening is least likely to occur in stressed syllables, slightly more likely where an adjacent syllable is stressed, and most likely where stress does not occur near the segment.
redundancy of plural marking	Where an /s/ marking plurality is redundant, it is more likely to be deleted than where it is non-redundant. Where redundancy is due to plurality being marked in the surface structure, deletion is more likely than where redundancy is due only to plurality being marked elsewhere in the discourse.

Table 6.1 Factors which played the greatest role in s-weakening

In my analysis I adopted the optimality-theoretic approach to variation proposed in Anttila (1995), where it is assumed that groups of constraints can be unranked with

respect to one another. Variation is accounted for by the fact that different rankings of the constraints predict different outputs.

In my analysis, I assumed the six constraints below, where the first constraint dominates the next five. which are unranked with respect to one another:

(1) ONS >> NOCODA, PARSER, PARSEPL, NOSL, INALT

This ranking gave rise to the following predicted percentages of [s], [h] and Ø in different phonological environments, compared here to the actual percentages occurring in my corpus:

CODA	**[s]**	**[h]**	**Ø**
prediction	20.8%	20.8%	58.3%
actual %	15.3%	24%	60.7%
ONSET			
prediction	50%	50%	0%
actual %	66%	33%	1%
FOLLOWING CORONAL			
prediction	37.5%	25%	37.5%
actual %	45%	35%	25%

Table 6.2 Predicted and actual rates of s-weakening in different environments

6.2 Implications

The most significant conclusions that can be drawn from the results given here are as follows:

1. Place node sharing

It seems clear from the results obtained that there is place node sharing between /s/ and a following coronal stop where the sequence is word-internal. This has not been observed before since to my knowledge no previous quantitative study of s-weakening in Spanish has examined phonological factors in as much detail.

2. The structure of the grammar in OT

It has been shown here that it is impossible to account for rates of s-weakening in Spanish where the segment is resyllabified without assuming that the grammar has two components, the lexical component and the post-lexical component, each with its own constraint rankings. This was demonstrated most clearly when discussing the fact that rates of s-weakening in prevocalic coda position are very similar to rates of weakening in other coda positions. Since prevocalic /s/ must be resyllabified into onset position in the post-lexical phonology, it becomes clear that s-weakening must occur earlier than resyllabification, i.e. in the lexical phonology. This is interesting

since, prima facie, s-weakening looks like a fast speech phenomenon, hence like a postlexical phenomenon.

3. The stability of s-weakening

Since it was found that age played a minimal role in s-weakening and that women and speakers with a higher level of education tend to use [s], the prestige variant, more than men and speakers with a lower level of education, it seems that s-weakening is a case of stable variation. This has been the general assumption in the literature.

6.3 Suggestions for future research

Given that the corpus used in this research is small, it would be desirable to attempt to replicate the results obtained here with a larger corpus. This is particularly important with regard to the effect of the social factors, since some of the subjects behaved differently than was predicted. Furthermore, due to the fact that in some cases there was only one subject with a particular social profile, it was impossible to determine if this behaviour was systematic or if it was due to the tendencies of that particular subject. And finally, perhaps most importantly, it is crucial to examine the validity of the constraint ranking proposed here in terms of other phonological processes in Spanish.

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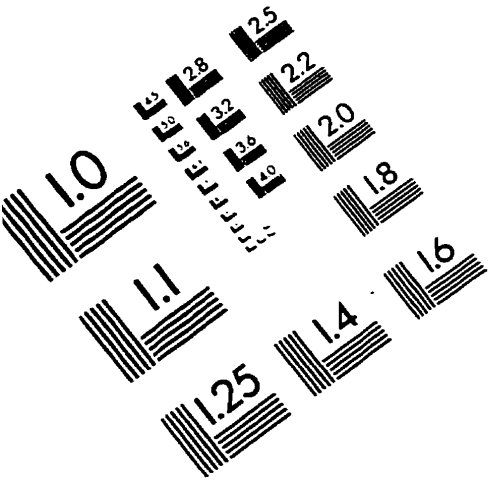

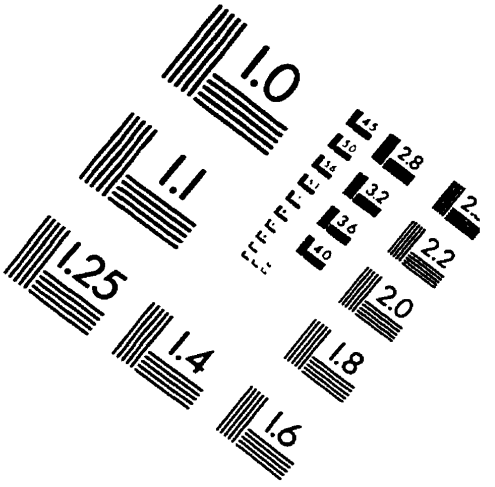

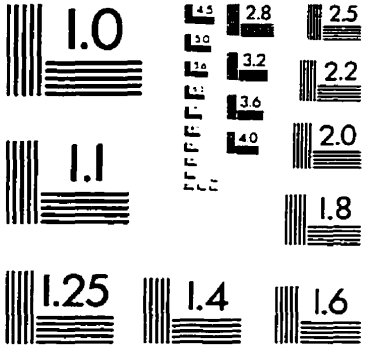

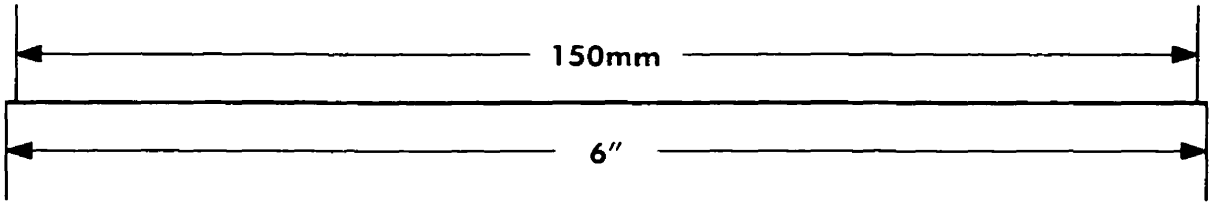

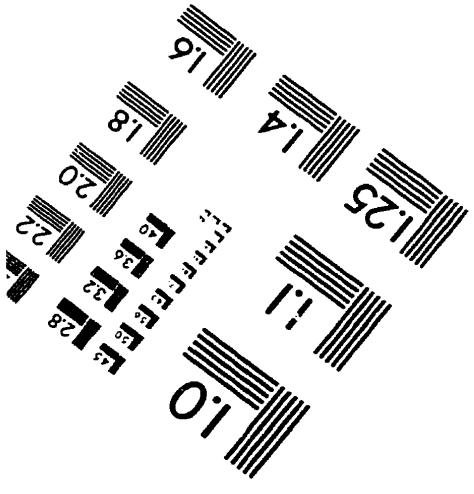

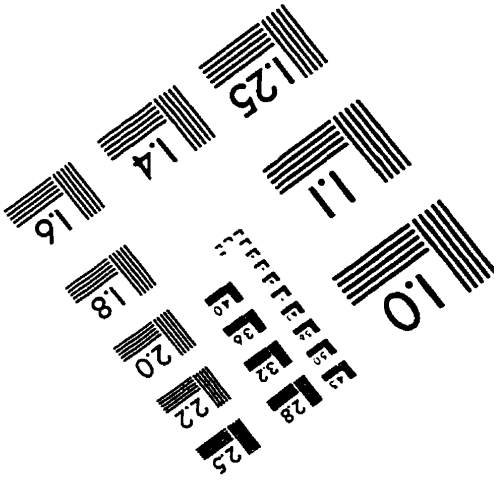

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