CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

CONSTRAINT INTERACTIONS IN SPANISH PHONOTACTICS: AN OPTIMALITY THEORY ANALYSIS OF SYLLABLE-LEVEL PHENOMENA IN THE SPANISH LANGUAGE

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A Ana Eli, quien me hizo ver lo que no veía,
entender lo que no entendía
y poder hacer lo que no podía.

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ABSTRACT

CONSTRAINT INTERACTIONS IN SPANISH PHONOTACTICS:
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This thesis presents an Optimality Theory (OT) investigation of the role of the syllable in Spanish phonology. The explanatory power of the syllable has earned it a central role in phonological theory, and this well-deserved distinction has followed it into OT. In this thesis, we demonstrate how such issues as the well-/ill-formedness of onsets and codas, word- and phrase-level syllabification and 'resyllabification', phonotactically motivated repair processes, as well as several other well-known phenomena such as vowel merger, diphthong formation, glide strengthening, /s/ and nasal debuccalization, nasal and lateral place assimilation, 'depalatalization', and even plural formation follow from constraint interactions within a single, language-specific hierarchy of universal, violable constraints.

In the first half of this thesis (chapters 1 through 3), we set the stage by dividing simple and complex onsets and codas into well formed, ill formed, and unclear/marginal cases. We then present an OT analysis of syllabification, showing how the same constraint interactions that account for the respective well- or ill-formedness of the aforementioned onsets and codas also accounts for the parsing of input strings into syllabified outputs. We go on to expand our constraint hierarchy to demonstrate how not

only the need for phonological repairs, but also the specific repair strategies employed and even the variable application of some repairs, follow from constraint interactions.

The second half of this thesis (chapters 4 through 6) develops a series of case studies. Chapter 4, 'Onset fulfillment', examines such ONSET-motivated phenomena as vowel merger and diphthong formation, discusses the possibility of ONSET-motivated epenthesis, and presents a rather extensive analysis of the underlying status of glides, all within the framework of OT. Chapter 5, 'Coda conditions', presents an OT analysis of coda phenomena, including several patterns of /s/ and nasal debuccalization with varying degrees of opacity as well as place assimilation by nasals and laterals, and concludes by reconsidering 'depalatalization'. In Chapter 6, we touch on the phonology-morphology interface as we present a novel, OT analysis of Spanish plural formation which uses constraint-interactions to eliminate the need for the concatenation of a plural morpheme.

INTRODUCTION

This thesis seeks to provide a comprehensive analysis of a wide range of syllable-level phenomena in Spanish within the framework of Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993a, 1993b).[1] In OT, the language specific, sequentially ordered rules of derivationally based theories are replaced by a set of universal, violable constraints whose language-specific ranking is used to evaluate the relative harmony of surface forms. Throughout this thesis, we will be working to establish a single, unified hierarchy of well-grounded constraints that can be used to account for data pertaining to Spanish phonotactics. The goals of such an analysis are two-fold: first, to gain a better understanding of Spanish phonology at the syllable level, which, in turn, will lead to a better understand of syllable-level phonology in general. As Harris notes, "…in Spanish, we know that it is necessary to refer to syllable structure in order to [account for] … the distribution of nasal consonants, aspiration of /s/, and other well-studied phenomena" (1989: 153). The second goal is to demonstrate, as held by proponents of OT, that a relatively small set of universal constraints in a single, hierarchical ranking, is all that is needed to provide a comprehensive and highly explanatory account of the phonological grammar of a given language.

This thesis is divided into six chapters. Chapter 1 presents a brief overview of Spanish phonotactics, including a summary of well and ill formed syllable constituents, and posits two well-formedness constraints based upon these observations. In chapter 2, we introduce and rank several additional well-formedness constraints as we discuss

[1] In the present study, we have elected to follow Harris (1969 et. seq.) in examining primarily the speech of the educated classes of Mexico City. This is the variety with which we are most familiar and for which the greatest number of native speakers are available to us as consultants. We will, however, place a considerable amount of emphasis on cross-dialectal variation, seeking to demonstrate how such variation follows from slight differences in the relative ranking of the set of universal constraints. The phonemic inventory of the Mexico City dialect, summarized at the end of this section, is representative of most varieties of American Spanish (but see Honsa 1965 for the phonemic inventories and discussion of several others). It is distinguished, most notably, from certain dialects of Peninsular Spanish which include two additional consonantal phonemes: the voiceless interdental fricative /θ/ and the palatal lateral /ʎ/.

word- and phrase-level syllabification. In chapter 3, we ponder the fate of ill formed syllable constituents, showing how the need for, type, and exact site of phonotactic repairs all follow directly from constraint interactions.

The fourth through sixth chapters develop a series of case studies addressing an array of syllable-level phenomena. Chapter 4, 'Onset fulfillment', deals with several well-known processes which, we will argue, are motivated by two varieties of the constraint ONSET. In this chapter, we tackle vowel merger, diphthong formation, the phonemic / non-phonemic status of glides, and the consonantalization of /i/. In chapter 5, entitled 'Coda conditions', we discuss the OT basis for such processes as /s/ aspiration and nasal velarization. Lastly, in chapter 6, we provide a comprehensive review of the literature on Spanish pluralization, and then present and defend a novel, constraint-based analysis of the observed phenomena.

Our analyses assume the following inventory of phonemic consonants.[2]

(1)	Bilabial		Labio-dental		Dental		Alveolar		Alveo-palatal		Palatal		Velar	
Stops	p	B			t̪	D̪							k	G
Fricatives			f				s						x	
Affricates									ʧ					
Nasals	m							n				ɲ		
Laterals								l						
Rhotics								R						

[2] Phonemes whose underlying specification for certain features is unclear and/or controversial, such as the voiced obstruents /B/, /D̪/, and /G/ and the rhotic phoneme(s?) /R/, are represented with capital letters. In the case of the voiced obstruents, both the [+cont] and [-cont] allophones occur as onsets, their value for the feature [continuant] being conditioned on that of the immediately preceding segment. Likewise, recent accounts of the distribution of the tap and trill, e.g. Bradley (2001a, b), have shown their distribution to be conditioned on the segmental context, contrary to previous analyses, e.g. Harris (1983), which attributed their distribution to syllable structure. We will not address these issues here insofar as the phenomena in question are not phonotactically motivated and, therefore, are beyond the scope of this thesis. We refer the interested reader to accounts such as Harris (1969), Lozano (1979), Goldsmith (1981), Branstine (1991), Padgett (1995c), and Baković (1995)—for the lexical representation of the voiced obstruents and the spirantization/fortition debate—and Harris (1983), Lipski (1990), Bonet and Mascaró (1997), and Bradley (2001a, b)—for the underlying status and distribution of the tap and trill. The reader may also note the absence of the voiced palatal fricative (traditionally represented /ɣ/ or /ǰ/). We will argue that its various manifestations, ranging from a glide to a fricative to an affricate, are allophones of the phoneme /i/.

1 BASIC PHONOTACTICS

1.0 Introduction

In a perfect world, it would be possible to classify all conceivable syllable configurations as either well or ill formed in a particular language. In reality, however, it seems that such structures exist along a continuum, ranging from clearly acceptable to clearly unacceptable and leaving a number of frustrating cases in between. Particularly difficult are non-occurring patterns, whose absence, in some cases, may be attributable to historical coincidence rather than their inherent ill-formedness (Pensado 1985).

That being said, for the purposes of this thesis, we will be using the following relatively conservative definition of well-formedness. We will consider as well formed those structures which, in unaffected speech, surface without phonotactic modification and as ill formed those which are consistently "repaired" or "broken up" by processes such as epenthesis, deletion, and/or syllabification (discussed in chapters 2 and 3). We will refrain, for the most part, from speculation with regard to the status of patterns that do not fall into one of these two categories.

This chapter is organized as follows: in section 1.1, we discuss and give examples of the distribution of simple onsets. Section 1.2 covers complex onsets, with particular emphasis of the constraints that underlie their well- or ill-formedness. In section 1.3, we consider the distribution of simple codas and, in section 1.4, the rather marginal status of their complex counterparts. Section 1.5 concludes.

1.1 Simple onsets

In examining the distribution of simple onsets, we find, not surprisingly, that any consonantal segment of the language (see the phonemic inventory presented in the introduction) can occur as a one-segment onset either word-initially or word-internally. Harris (1983) makes a similar observation but then presents only word-internal examples, citing, in his endnotes, the fact that the palatal nasal [ɲ] is very rare in word-initial

position. While this is undoubtedly the case, it seems that the relative infrequency of such examples results not from the inherent ill-formedness of words beginning with this segment, but rather from historical factors. Simply put, if the segment or segments that evolved into a particular phoneme were rare or non-occurring word-initially in the parent language, as was the case with the geminate /nn/ and the clusters /gn/ and /nj/ in Latin, we should not be surprised to find that the resulting segment is likewise rare in the same position in contemporary Spanish (Penny 2002). Note that word-initial [ɲ] is realized in unaffected speech without undergoing any type of phonotactic repair. The following words illustrate the distribution of simple onsets.

(2) Simple onsets

	Initial			Medial		
/p/	pato	pá.t̪o	duck	supe	sú.pe	I knew
/β/	beso	bé.so	kiss	ave	á.βe	bird
/t̪/	taco	t̪á.ko	taco	tipo	t̪í.po	type
/D̪/	dedo	d̪é.ðo	finger	ido	í.ðo	gone
/k/	casa	ká.sa	house	vaca	bá.ka	cow
/ɣ/	gato	gá.t̪o	cat	hago	á.ɣo	I do
/f/	fino	fí.no	fine	jefe	xé.fe	boss
/s/	sólo	só.lo	only	oso	ó.so	bear
/x/	gema	xé.ma	gem	ajo	á.xo	garlic
/ʧ/	chico	ʧí.ko	boy	ocho	ó.ʧo	eight
/m/	mano	má.no	hand	amo	á.mo	I love
/n/	nube	nú.βe	cloud	uno	ú.no	one
/ɲ/	ñu	ɲu	wildebeest	año	á.ɲo	year
/l/	lago	lá.ɣo	lake	palo	pá.lo	stick
/ɾ/	risa	rí.sa	laughter	cara	ká.ɾa	face

We should also note, at this juncture, that we consider glides, in words such as *bueno* [bwe.no] ‘good’ and *fiesta* [fjes.ta] ‘party’, to be part of the nucleus, not the onset. According to Harris (1983), the maximum length of the rime in a well formed Spanish syllable is three segments. As Harris goes on to demonstrate, both on- and off-glides

are calculated in this three segment limit. Núñez Cedeño and Morales-Front arrive at this same conclusion based upon the differential treatment of glides and complex onsets in a Spanish language game know as *jerigonza* (roughly equivalent to Spanish Pig-Latin). Without going into too much detail, in this game, the two consonants of a complex onset act as a single unit whereas glides are treated as separate (1999: 174).

1.2 **Complex onsets**

Unlike some languages, such as Japanese, Spanish allows complex onsets. However, the segmental structure of such syllable-initial consonant clusters is restricted by two important markedness constraints. The first, which we will abbreviate MSD, embodies the familiar minimal sonority distance requirement that many languages impose on complex onsets and/or codas. In the case of Spanish onsets, this minimal distance is 2 on a sonority scale where obstruents have a value of 1, nasals 2, and liquids 3. The second, which we will abbreviate SONSEQ, captures the well-known principle of sonority sequencing. The relevant constraints can be defined as follows.

(3) **MSD-2^{ONS}**

The minimal sonority distance between the two elements of a complex onset is 2.[3]

(4) **SONSEQ**

Onsets must rise in sonority towards the nucleus and codas must fall in sonority from the nucleus.

(adapted from Kenstowicz 1994)

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[3] The use of only MSD-2^{ONS} throughout this thesis is, admittedly, a bit of a simplification. Many languages allow complex onsets with a minimal sonority distance of 1 or even 0 while others do not allow complex onsets at all. Taking these typological facts into consideration, let us posit the existence of an additional constraint—MSD-1^{ONS}—which, depending upon its ranking relative to *COMPLEX^{ONS}, MSD-2^{ONS}, and the relevant faithfulness constraints (which we will abbreviate FAITH for the sake of simplicity) allows for the following possibilities: *COMPLEX^{ONS} » FAITH – no complex onsets allowed; MSD-2^{ONS} » FAITH » *COMPLEX^{ONS} – complex onsets allowed with a minimal sonority distance of 2; MSD-1^{ONS} » FAITH » *COMPLEX^{ONS}, MSD-2^{ONS} – complex onsets allowed with a minimum sonority distance of 1; FAITH » *COMPLEX^{ONS}, MSD-2^{ONS}, MSD-1^{ONS} – complex onsets allowed with no minimal sonority requirement.

The fact that well formed complex onsets in Spanish have a sonority distance of two and respect sonority sequencing, i.e. all consist of an obstruent and a liquid in that order, allows us to conclude that these constraints are undominated in the grammar of Spanish. The fact that obstruent-obstruent, obstruent-nasal, nasal-obstruent, nasal-nasal, nasal-liquid, liquid-obstruent, liquid-nasal, and liquid-liquid clusters are never syllabified as complex onsets follows from this ranking. As we will see in chapter 2, such clusters are generally broken up in the syllabification process. Where this is not possible, such as word-initially, other repair processes are applied, which we will discuss in chapter 3.

That being said, it is important to note that not all obstruent-liquid clusters constitute well formed onsets. Of the twenty logically possible combinations in Spanish (the ten obstruent phonemes—/p/, /B/, /t̪/, /D̪/, /k/, /G/, /f/, /s/, /x/, and /ʧ/—paired with each of the two liquids /l/ and /R/), only twelve—/pl/, /pR/, /Bl/, /BR/, /t̪R/, /D̪R/, /kl/, /kR/, /Gl/, /GR/, /fl/, and /fR/—constitute clearly well formed complex onsets that can and do occur both word-initially and word-medially. The following words illustrate this point.

(5) Well formed complex onsets

	Initial			Medial		
/pl/	playa	plá.ʝa	beach	amplio	ám.pljo	broad
/pR/	primo	prí.mo	cousin	siempre	sjém.pre	always
/Bl/	blusa	blú.sa	blouse	hablo	á.βlo	I speak
/BR/	brazo	brá.so	arm	abre	á.βre	open
/t̪R/	trapo	t̪rá.po	rag	otro	ó.t̪ro	another
/D̪R/	droga	d̪ró.ɣa	drug	pudrir	pu.ðríR	to rot
/kl/	clavo	klá.βo	nail	ancla	áŋ.kla	anchor
/kR/	creo	kré.o	I believe	acróbata	a.kró.βa.t̪a	acrobat
/Gl/	globo	gló.βo	balloon	iglesia	i.ɣlé.sja	church
/GR/	grúa	grú.a	tow truck	mugre	mú.ɣre	filth
/fl/	flojo	fló.xo	lazy	enfriar	eɱ.frjáR	to cool
/fR/	fruta	frú.t̪a	fruit	África	á.fri.ka	Africa

The remaining obstruent-liquid combinations—/t̪l/, /d̪l/, /sl/, /sR/, /xl/, /xR/, /ʧl/, and /ʧR/—present something of a mixed bag. The cluster /t̪l/ is a well formed onset in virtually all dialects of Latin American Spanish, as evidenced by its syllabification in words such as *atlántico* 'Atlantic' [a.t̪lán.t̪i.ko] and *atlas* 'atlas' [á.t̪las]. By contrast in Madrid, the same words are syllabified [aD̪.lán.t̪i.ko] and [áD̪.las], respectively (Núñez Cedeño and Morales-Front 1999). The same may be true of /d̪l/ for some speakers, as evidenced by the pronunciation of Adlai Stevenson's first name as [a.ðlai] (Luis Bonilla, personal communication).

Further difficulties are presented by the clusters /xl/ and /xR/, neither of which occurs in any native Spanish words. Harris claims that they are well formed, noting that they are "…easily pronounceable in nonce forms (in vivid contrast to **sr*, **sl*, **čr*, **čl*)…" (1983: 33). He goes on to say, however, that he knows of only one example: the Russian name *Jruschef* (presumably pronounced [xrus.ʧef]). Pensado (1985) responds to this, saying that while it is true that [xl] and [xɾ] are easily pronounceable as onsets, the name *Jruschef* is generally written *Kruschef* and pronounced with an initial [k]. Morales-Front agrees that [xl] and [xɾ] do not constitute well formed complex onsets in Spanish, discounting the *Jruschef* example on the basis that 1) it is only one word, 2) it is of foreign origin, and 3) it is popularly pronounced [krus.ʧef] (1994: 195).

With regard to the remaining four obstruent-liquid combinations—/ʧl/, /ʧR/, /sl/, and /sR/—it seems clear that they are all ill formed. The unacceptability of the first two likely follows from the presence of an affricate, the limitations of which are well documented but, as yet, poorly understood.

The ill-formedness of the second two is likewise uncontroversial but quite difficult to explain. Unlike other s-clusters, whose ill-formedness can be attributed to undominated MSD-2^{ONS}, the two elements of the onsets *[sl] and *[sɾ] are separated by the required sonority distance of two (c.f. the well formed fricative-liquid onsets [fl] and [fɾ]). Another possibility, given the fact that both *[sl] and *[sɾ] are coronal-coronal sequences, is an analysis in terms of the OCP. As tempting as this seems at first, such

an analysis would ban clearly well formed coronal-coronal onsets such as [d̪ɾ] and [t̪ɾ] as well. A more narrow application of this principle, i.e. *alveolar-alveolar, is likewise implausible given the fact that [s] has a dental articulation in many Latin-American dialects and, moreover, that the dental fricative [θ] of Peninsular Spanish is also banned from complex onsets.

1.3 **Simple codas**

In section 1.1, we saw that any consonantal phoneme of the language can occur as a simple onset in Spanish. When it comes to codas, however, the options are considerably more limited. So much so, as a matter of fact, that some have gone so far as to say that only five consonantal phonemes[4]—/d̪/, /s/, /n/, /l/, and /R/—can occupy this position (Alba 1998, Núñez Cedeño and Morales-Front 1999). As these authors go on to explain, this generalization is not without exceptions. Nevertheless, it is true of the vast majority of Spanish codas. The following data illustrate such codas.

(6) Simple codas

	Medial			Final		
/d̪/				ciudad	sju.ðá(d̪)	city
/s/	mismo	míz.mo	same	mes	mes	month
/n/	tengo	téŋ.go	I have	joven	xó.βen	youth
/l/	alma	ál.ma	soul	mal	mal	evil
/R/	arte	áR.t̪e	art	mar	maR	sea

In this section, we will make some general observations with regard to the skewed distribution of codas in relationship to onsets. The reasons behind this distribution, and the details of the particular allophonic manifestations of codas consonants, will be discussed in greater detail when we consider repair processes in chapter 3 and again when we cover coda conditions in chapter 5.

[4] Six if we include, as Alba does, the dental fricative /θ/, which continues to be used in parts of Spain.

To begin with, obstruents, with the exception of /s/, are relatively rare in word-internal codas. Those that do occur undergo almost complete neutralization of voicing and continuancy (D'Introno et al. 1995). As a result, obstruents in coda position are only phonetically distinguishable by their place of articulation (Quilis 1993).[5] These are represented with capital letters, i.e. [B], [D̪], [G] throughout our analysis.

Word-final obstruents, again with the exception of /s/ and, for largely morphological reasons, /D̪/, are likewise extremely rare and, with few exceptions, are only found in loanwords. Moreover, they are omitted in casual speech in many dialects.

(7) Word-final obstruents

club	klu(B)	nightclub
argot	aR.ɣó(D̪)	slang
vermut	beR.mú(D̪)	vermouth
bibelot	bi.βe.ló(D̪)	figurine
carnet	kaR.né(D̪)	ID card
complot	kom.pló(D̪)	conspiracy
usted	us.t̪é(D̪)	you
verdad	beR.ðá(D̪)	right (tag question)
bistec	bis.t̪é(G)	steak
coñac	ko.ɲá(G)	cognac
reloj	re.ló(G)	watch / clock

Within the realm of sonorants, we find that coda nasals are also subject to neutralization, in this case with respect to their place of articulation. More specifically, a syllable-final nasal either assimilates the place of articulation of the consonant that follows it or, when utterance final or followed by a vowel, surfaces with a default place of articulation. This will be discussed in greater detail in chapter 5.

[5] C.f. Morris (2000) for discussion of the neutralization of coda obstruents in peninsular Spanish.

1.4 **Complex codas**

When it comes to complex codas, the possibilities are even more limited. So much so, in fact, that Hammond considers them to be completely banned word finally: "A hypothetical lexeme such as *placers* not only does not occur in Spanish, it is impossible because Spanish disallows word-final codas consisting of more than one consonant" (2001: 130). While Hammond's observation holds for native Spanish words, there exists a handful of loanwords with final complex codas. However, native speakers' intuitions confirm that such words are phonologically quite exceptional.

As Harris observes, with the exception of a few loanwords of rather limited distribution, all Spanish complex codas, both word-internal and word-final, have /s/ as their second element (1983). It is interesting to note, however, that such clusters are not subject to a minimal sonority distance requirement. That is, we find examples of complex codas of the form liquid-/s/, nasal-/s/, and even obstruent-/s/ in both word-medial and word-final position, as illustrated by the following data.

(8) Complex codas

	Medial			Final		
liquid-/s/	perspicaz	pers.pi.kás	perceptive	vals	bals	waltz
nasal-/s/	monstruo	móns.t̪rwo	monster	Mayans	má.ɟans	(name)
obstruent-/s/	abstracto	aBs.t̪ráG.t̪o	abstract	Félix	fé.liks	Felix

(Harris 1983: 14)

1.5 **Conclusion**

In this chapter, we have laid the groundwork for our analysis of syllable-level phenomena in Spanish by making some basic observations about Spanish phonotactics as well as introducing our first two well-formedness constraints. In the chapters that follow, we will introduce and rank additional constraints that will allow us to account for these and other observations.

2 SYLLABIFICATION

2.0 Introduction

Having covered the fundamentals of Spanish phonotactics in chapter 1, we are now ready to present and define the constraints that account for how words and utterances are syllabified in Spanish. This chapter is organized as follows. Section 2.1 deals with word-internal syllabification, seeking to demonstrate how the patterns we observe in the language follow from the ranking of the above-mentioned constraints, as well as those introduced in chapter 1. In sections 2.2 and 2.3, we introduce a pair of alignment constraints and discuss how their ranking, relative to that of the markedness constraints introduced in section 2.1, sheds light on what is commonly referred to as 'resyllabification' in the traditional Spanish phonology literature.

2.1 Word-internal syllabification

Let us begin our discussion of syllabification with a brief review of the relevant facts. In virtually any text on Spanish phonology, e.g. Quilis and Fernández (1964), Macpherson (1975), Álvarez (1977), Navarro Tomás (1980), Barrutia and Terrell (1982), Quilis (1993), Barrutia and Schwegler (1994), Hammond (2001), one finds a series of observations such as the following:

(9) Traditional observations about Spanish syllabification

a. A single consonant between two vowels is always syllabified with the following vowel, i.e. VCV → V.CV.

b. A word-internal cluster of the form VCCV is syllabified V.CCV if the two consonants can begin a word; otherwise, it is syllabified VC.CV.

c. A word-internal cluster of the form VCCCV is syllabified VC.CCV if the second and third consonants together can begin a word; otherwise, it is syllabified VCC.CV.

The following two data sets illustrate observations (b) and (c), respectively.

(10) Syllabification of VCCV

V.CCV	hablo	á.βlo	I speak
	otro	ó.t̪ro	another
VC.CV	apto	áB.t̪o	suitable
	alto	ál̪.t̪o	tall

(11) Syllabification of VCCCV

VC.CCV	ancla	áŋ.kla	anchor
	amplio	ám.pljo	broad
VCC.CV	perspicaz	pers.pi.kás	shrewd
	perspectiva	pers.peG.tí.βa	perspective

In this chapter, we will see how the foregoing facts follow naturally from constraint interactions within the model first described by Prince and Smolensky (1993) and McCarthy and Prince (1993a) and now referred to as Optimality Theory (henceforth OT). Let us begin with observation (a): an intervocalic consonant is always syllabified with the following vowel, i.e. as an onset rather than as a coda. As the founders of OT point out, the syllabification V.CV of a sequence VCV is universal. Based upon this observation, and the universally unmarked status of CV syllables, Prince and Smolensky posit the following pair of constraints.

(12) **ONSET**

*[$_{\sigma}$ V ('Syllables must have onsets.')

(13) **NO-CODA**

*C $]_{\sigma}$ ('Syllables must not have codas.')

Kager (1999)

As it works out, the mere existence of these two constraints, i.e. regardless of their relative ranking, accounts for the universal syllabification of the sequence VCV as V.CV, as well as the unmarked status of CV syllables in all languages.

In order to account for additional typological possibilities having to do with complex margins, the following constraints are also posited:

(14) ***COMPLEX^{ONS}**

*$[_{\sigma}$ CC ('Onsets are simple.')

(15) ***COMPLEX^{COD}**

*CC $]_{\sigma}$ ('Codas are simple.')

(Kager 1999)

In order to begin working out the relative ranking of these four constraints in Spanish, let us consider observation (b): a word-internal cluster of the form VCCV is syllabified V.CCV if the two consonants can begin a word; otherwise, it is syllabified VC.CV. The first part of this statement implies that complex onsets are preferred over codas, i.e. NO-CODA » *COMPLEX^{ONS}. The second part adds, not surprisingly, that if the sequence CC is not a well formed complex onset, i.e. it violates MSD-2^{ONS} or SONSEQ, it must be broken up into separate syllables. Thus, we come to the following conclusion: MSD-2^{ONS}, SONSEQ » NO-CODA » *COMPLEX^{ONS}. This ranking is illustrated by the following tableaux.

(16)

/otɾo/	MSD-2^{ONS}	SONSEQ	NO-CODA	*COMPLEX^{ONS}
a. ☞ ó.tɾo				*
b. óD.ɾo[6]			*!	

(17)

/aptɾo/	MSD-2^{ONS}	SONSEQ	NO-CODA	*COMPLEX^{ONS}
a. á.ptɾo	*!			*
b. ☞ áB.tɾo			*	

(18)

/altɾo/	MSD-2^{ONS}	SONSEQ	NO-CODA	*COMPLEX^{ONS}
a. á.l tɾo		*!		*
b. ☞ á l.tɾo			*	

Let us conclude our discussion of word-internal syllabification by considering observation (c): a word-internal cluster of the form VCCCV is syllabified VC.CCV if the second and third consonants together can begin a word; otherwise, it is syllabified VCC.CV. This statement is analogous to (b), and implies that complex onsets are preferred over complex codas unless, of course, the resulting complex onset would be ill formed, i.e. *COMPLEX^{COD} »*COMPLEX^{ONS}. Therefore, our developing constraint hierarchy can be expanded as follows.

(19) MSD-2^{ONS}, SONSEQ »*COMPLEX^{COD}, NO-CODA » *COMPLEX^{ONS}

The tableaux below illustrate how the preference for VC.CCV over VCC.CV—observation (c)—as well as the data given to illustrate it, follow from this ranking.

[6] Note how the realization of the obstruent and the rhotic is affected by, and confirms, their syllabification.

(20)

/ankla/	MSD-2^{Ons}	Son Seq	*Complex Cod	No-Coda	*Complex Ons
a. ☞ áŋ.kla				*	*
b. áŋG.la			*!	*	

(21)

/peRspikas/	MSD-2^{Ons}	Son Seq	*Complex Cod	No-Coda	*Complex Ons
a. peR.spi.kás	*!			**	*
b. ☞ pers.pi.kás			*	**	

2.2 **'Resyllabification'**

An additional observation about Spanish syllabification that appears in many texts, e.g. Macpherson (1975), Álvarez (1977), Navarro Tomás (1980), Barrutia and Terrell (1982), Barrutia and Schwegler (1994), Hammond (2001), has to do with the so-called 'resyllabification' of word-final consonants as onsets.[7] As Harris (1983) puts it, if a word that ends in a consonant precedes one that begins with a vowel, the final consonant of the first word is resyllabified and pronounced as if it were the initial consonant of the second. Thus, *tienes alas* 'you have wings' comes to sound like *tiene salas* 'it has rooms'.[8] This does not occur, however, if the second word begins with a consonant—even if the resulting complex onset would be well formed. Hence, *club lindo* 'nice club' is invariably pronounced [klúB.lín.d̪o] despite the fact that [klu.βlín.d̪o], as a hypothetical, monomorphemic word, is phonologically well formed.

Núñez Cedeño and Morales-Front (1999) make a parallel observation, comparing the syllabification of the phrases *chef argentino* [ʧé.faR.xeɲ.ʈí.no] 'Argentinian chef' with that of *chef latino* [ʧéf.la.ʈí.no] 'Latino chef'. What we find, once again, is that

[7] Throughout this section, we will continue to use the traditional term 'resyllabification' to refer to syllabification across word and morpheme boundaries although, as Face (1999) points out, the term is really a misnomer, the result of viewing the phenomenon from a serial-derivational perspective.

[8] Harris also mentions that such resyllabification occurs in all but the most 'hypercareful' pronunciation (1983). We would respond that in the case of such unnatural diction, in which great pains are taken to conserve word boundaries, every word is syllabified as if it were a separate utterance.

resyllabification only takes place when the second word begins with a vowel, regardless of the well-formedness of the resulting complex onset.[9]

Several authors, including Colina (1997b), Hualde (1997), Face (1999), and Núñez Cedeño and Morales-Front (1999), have provided insightful OT accounts of this phenomenon. As the above authors explain in their respective analyses, the observed syllabification reflects the ranking of (ALIGN)MENT,[10] defined below, relative to ONSET and NO-CODA. While the present discussion will parallel previous accounts to a large extent, our analysis will go one step further by positing the involvement of two independently ranked alignment constraints in the grammar of Spanish—one requiring alignment at word boundaries, and another, following Face (1999), requiring alignment between syllables and what he calls 'phonological domains,' which will be defined in section 2.3. As we will demonstrate in this chapter, these constraints are needed to account for the differential behavior of morpheme boundaries and word boundaries with respect to alignment.

Let us begin by defining the first of these constraints, which refers to word boundaries, and discussing its ranking relative to the others we have presented thus far.

(22) **ALIGN(Word)**
Every word boundary must coincide with a syllable boundary.

[9] It is actually very difficult to find clear evidence for this claim insofar as the second word would have to begin with /l/ (since an initial /R/ would be trilled and, thus, could not form part of a complex onset) and the first word, to form a complex onset with the /l/, would ideally have to end in a non-coronal obstruent. However, only unassimilated loanwords such as *club* and *chef* fit this description, and Spanish speakers have a tendency to avoid resyllabifying the final consonants of foreign words, even when the following word begins with a vowel (thus, it is more natural to realize *chef argentino* without resyllabifying the /f/ and using an epenthetic glottal stop to satisfy ONSET, i.e. [ʧéf.ʔaR.xen.tí.no]). Therefore, it is not clear whether resyllabification in a phrase such as *chef latino* is blocked by ALIGN(Word), as is generally claimed, or by the fact that *chef* is foreign and, thus, resists resyllabification (Luis Bonilla, personal communication).

[10] (ALIGN)MENT, in these authors' analyses, is a cover constraint used to represent an entire family of constraints originally posited by McCarthy and Prince (1993b).

As we saw above, resyllabification—a violation of ALIGN(Word)—occurs when the final syllable of one word has a coda—a violation of NO-CODA—and the initial syllable of the following word has no onset—a violation of ONSET. Put another way, resyllabification violates ALIGN(Word) in order to satisfy either ONSET and/or NO-CODA. Hence, we can conclude that the former is dominated by at least one of the latter two, i.e., ONSET » ALIGN(Word) and/or NO-CODA » ALIGN(Word).

As we observed at the beginning of this section, resyllabification does not take place when the initial syllable of the second word already has an onset, regardless of whether the resulting complex onset would be well formed. In other words, when ONSET is already satisfied, and resyllabification—again, a violation of ALIGN(Word)—would serve only to satisfy NO-CODA, the process does not occur. From this, we are able to conclude that ONSET » ALIGN(Word) » NO-CODA. This gives us the following hierarchy.[11]

(23) MSD-2^{ONS}, SONSEQ, ONSET » ALIGN(Word) » NO-CODA » *$COMPLEX^{ONS}$

Evidence consistent with this proposed ranking is reflected in the following tableaux.

(24)

/t̪ienes||alas/	MSD-2^{ONS}	SON SEQ	ONSET	ALIGN (Word)	NO-CODA	*$COMPLEX^{ONS}$
a. t̪jé.nes||.á.las			*!		**	
b. ☞ t̪jé.ne.s||á.las				*	*	

[11] *$COMPLEX^{COD}$ is not included in this hierarchy because we are presently unable to determine its ranking relative to the newly added constraints. This issue will be resolved as we examine more data in chapter 3.

(25)

/kluB||linD̪o/	MSD-2 ONS	SON SEQ	ONSET	ALIGN (Word)	NO-CODA	*COMPLEX ONS
a. ☞ klúB||.lín̪.d̪o					**	*
b. klú.β||lín̪.d̪o				*!	*	**

Thus it turns out that resyllabification in Spanish is motivated not by NO-CODA but by ONSET. In other words, contrary to many traditional grammarians, such as Quilis (1993), who attribute resyllabification to Spanish's "clear tendency" toward open syllables, we come to find out, through an OT analysis, that this phenomenon actually stems from a much stronger 'tendency' in the language—onset fulfillment. Onset fulfillment is so important, in fact, that we will devote all of chapter 4 to its various manifestations. For the time being, let us review the arguments for defining alignment in terms of phonological domain boundaries rather than word boundaries, as well as the evidence in support of doing both.

2.3 Phonological domains and the syllabification of morphologically complex words

Let us begin by defining the term 'phonological domain' as it will be used throughout this paper. According to Face, a phonological domain (PD) is "…a morphological grouping, containing one or more morphemes, which is input to the phonology" (1999: 85). As he explains in his article, there is evidence that, in Spanish, a prefix, like a clitic, constitutes a separate phonological domain from its base word while a base and suffix together act as a single PD. The strongest support for the above distinction comes from so-called aspirating dialects, in which /s/ is 'aspirated', i.e. pronounced [h], when it occurs in the coda, as illustrated by the following words.

(26) Aspiration of /s/ in coda position

a.	tos	[toh]	cough
	mes	[meh]	month
b.	toses	[tó.seh]	coughs
	meses	[mé.seh]	months

(Face 1999)

In some such dialects, /s/ aspiration is opaque in that morpheme final /s/ is realized [h] even when resyllabified as an onset, e.g. *mes azul* [mé.ha.súl] 'blue month' (pronounced [mé.sa.súl] in dialects that lack this phenomenon). This opacity is asymmetrical, however. While it affects prefix-final /s/, as in *deshecho* [d̪e.hé.ʧo] 'undone' (pronounced [d̪e.sé.ʧo] in dialects in which this does not occur) (Colina 1997b), under no circumstances is the morpheme-final /s/ in words such as those given above aspirated in the plural, i.e. *[mé.heh], *[tó.heh]. Hence the conclusion that a prefix is a separate phonological domain from its root whereas a suffix and root together make up a single PD. We will discuss this further in chapter 5.

As we saw in section 2.2, resyllabification of coda consonants across word boundaries does not take place when the second of the two words in question already has an onset, even if the resulting complex onset would be well formed. The same has been observed with regard to resyllabification across phonological domain boundaries, i.e. between prefixes and their roots.[12] The following data illustrate this point.

[12] Hualde (1989) makes remarkably similar observations in an enlightening, pre-OT analysis, mentioning the exceptional behavior of the prefix-root boundary with regard to syllabification as well as how it parallels syllabification across word-boundaries.

(27) No resyllabification across PD boundaries[13]

adrisar	aD̪|.ri.sáR	*a.ð|ɾi.sáR	to right (nautical)
subrayar	suB|.ra.ɟáR	*su.β|ɾa.ɟáR	to underline

(Face 1999)

sublingual	suB|.liŋ.gwál	*su.β|liŋ.gwál	sublingual

(Núñez Cedeño and Morales-Front 1999)

The close parallel between these data and those relating to resyllabification across word boundaries (presented in section 2.2) has led several authors, including Colina (1997b), Face (1999), and Núñez Cedeño and Morales-Front (1999), to use a single alignment constraint in their respective accounts. In our present discussion, this would entail the replacement of ALIGN(Word) with ALIGN(PD). The definition of the latter (given below) closely parallels that of the former.

(28) **ALIGN(PD)**
Every phonological domain boundary must coincide with a syllable boundary.

However, there are data that cast doubt on the accuracy of such a unified analysis and supports the existence and independent ranking of both ALIGN(Word) and ALIGN(PD) in the grammar of Spanish.

Contrary to what the above (somewhat idealized) data might lead us to believe, resyllabification across word-internal PD boundaries is possible in many dialects. Perhaps the clearest evidence of this is the fact that Manuel Seco sees the need to prescriptively correct the "frequent" pronunciation of words such as *subrayar* 'to underline' and *subrogar* 'to subrogate' as [su.βra.ɟáR] and [su.βro.ɣáR] instead of [suB.ra.ɟáR] and [suB.ro.ɣáR], respectively (1986). Word boundaries, on the other hand, are considerably more resistant to this phenomenon such that even speakers who accept resyllabification across PD boundaries unequivocally reject syllabifications such as

[13] Again, the realization of the obstruents and rhotics is affected by, and confirms, their syllabification.

*[ʧé.fló.ko] for *chef loco* [ʧéf.ló.ko] 'crazy chef' and *[klú.βla.t̪í.no] for *club latino* [klúB.la.t̪í.no] 'Latino club' (Luis Bonilla, personal communication).

Given that the variation in question is dialectally (rather than stylistically) based, it can best be represented as a difference in the relative ranking of ALIGN(PD) and NO-CODA in the grammar of each dialect, an option which would not be available if we did not separate ALIGN(PD) from ALIGN(Word). The following tableaux illustrate how this accounts for what we have discussed.

(29) ALIGN(PD) » NO-CODA

/suB|RaiaR/	MSD -2^{ONS}	SON SEQ	ONSET	ALIGN (Word)	ALIGN (PD)	NO-CODA	*COMPLEX$_{ONS}$
a. ☞ suB|.ra.ɟáR						**	
b. su.β|ra.ɟáR					*!	*	*

(30) NO-CODA » ALIGN(PD)

/suB|RaiaR/	MSD -2^{ONS}	SON SEQ	ONSET	ALIGN (Word)	NO-CODA	ALIGN (PD)	*COMPLEX$_{ONS}$
a. suB|.ra.ɟáR					**!		
b. ☞ su.β|ra.ɟáR					*	*	*

2.4 **Conclusion**

In this chapter, we have introduced and ranked several additional markedness constraints, showing how a single, language specific hierarchy, consisting of a relatively small set of universal constraints, can account for the phonotactics and syllabification patterns of an entire human language. In the next chapter, we will expand our developing hierarchy to incorporate a number of faithfulness constraints, enabling us to account for a wide range of phonotactic repair processes.

3 REPAIRS

3.0 Introduction

At this point, we have examined a number of important aspects of Spanish phonotactics and syllabification. Moreover, we have introduced several constraints that govern syllable structure in natural languages and discussed what the observations we have made about Spanish tell us about their relative ranking in that language. In this chapter, we continue our analysis by investigating how ill formed syllables come about, as well as what processes are used to render them compatible with the phonotactic restrictions we have witnessed.

This chapter is divided into three sections. In section 3.1, we introduce the faithfulness constraints that mitigate against epenthesis and deletion and whose relative ranking within our developing hierarchy will determine the type and site of repairs. In section 3.2, we begin to rank these constraints as we examine the strategies used to remedy unacceptable complex onsets. Then, in section 3.3, we provide additional support for the hierarchy established in 3.2 by demonstrating that the same constraints and ranking account for coda repairs as well.

3.1 Faithfulness constraints

In OT terms, when a candidate representing the faithful realization of a particular input fatally violates one or more phonotactic constraints, *eval* may select as optimal a candidate in which one or more output segments have no correspondent in the input, i.e. epenthesis, or in which one or more input segments have no correspondent in the output, i.e. deletion. Naturally, every such deviation incurs a violation of one or more faithfulness constraints. However, if the relevant markedness constraints dominate the relevant faithfulness constraints, an unfaithful candidate can be chosen.

The original constraint mitigating against epenthesis was FILL (Prince and Smolensky 1993). In Correspondence Theory (CT), this has been replaced by DEP(ENDENCE), which can be defined as follows.

(31) **DEP-IO**
Output segments must have input correspondents. ('No epenthesis.')
(Kager 1999)

The anti-deletion counterpart of FILL, in Prince and Smolensky's (1993) model, was PARSE, which, in CT, has been replaced by one or more versions of MAX(IMALITY). We will be using several such constraints in our present analysis. The two most basic MAX constraints—MAX-C-IO and MAX-V-IO—are defined below.

(32) **MAX-C-IO**
Input consonants must have output correspondents. ('No consonant deletion.')

(33) **MAX-V-IO**
Input vowels must have output correspondents. ('No vowel deletion.')

The need to distinguish between these two will become evident in chapter 4.

In the remainder of this chapter, we examine how the ranking of these constraints relative to the constraints we have introduced thus far and those we will introduce later, determines when and how epenthesis or deletion is used.

3.2 **Onset repairs**

As we noted in chapter 1, Spanish does not allow onsets of the form [sC].[14] Moreover, as we saw in chapter 2, when such a combination occurs word-internally, the /s/ is invariably syllabified in the coda rather than the onset, i.e. /VsCV/ → [Vs.CV] and not *[V.sCV]. When an s-cluster occurs word-initially, however, as was quite common in Latin and remains so in English (both of which have made important contributions to the Spanish lexicon), the initial /s/ has nowhere to go. In such instances, an epenthetic vowel, namely [e],[15] provides a nucleus with which the /s/ can form a syllable.

One of the first issues we must address is whether the vowel in question is indeed epenthetic, i.e. does not appear in the lexical entries of the relevant words but rather surfaces as the result of a synchronically productive phonotactic repair process. The epenthetic status of the aforementioned vowel is quite uncontroversial, actually, and is most strongly supported by the consistent appearance of the [e] in loanwords with initial s-clusters, as in the following examples, as well as in the interlanguage of native Spanish speakers learning English, e.g. (Carlisle 1997).

(34) Adaptations of loanwords with initial s-clusters

/s/-obstruent	esquí	es.kí	ski
/s/-nasal	esmoquin	ez.mó.kin	tuxedo (from 'smoking jacket')
/s/-liquid	eslogan	ez.ló.gan	slogan

Previous analyses of this phenomenon, e.g. Harris (1969), have generally posited an epenthesis rule such as the following.

---

[14] According to Hundley (1986), certain dialects spoken in the Peruvian highlands provide exceptions to this generalization. It seems that vowel reduction and elision processes, possibly introduced through the indigenous substrate of the region, allow s-clusters to surface initially. Thus, *esperan* 'they wait' and *está* 'it is', pronounced [es.pé.ran] and [es.tá] in standard dialects, are realized [spé.ran] and [sta], respectively.

[15] According to Lombardi (2002), who mentions Spanish specifically, the use of [e] as an epenthetic vowel is somewhat exceptional in markedness terms, but can probably be attributed to its occurrence in closed syllables.

(35) Traditional rule of [e] epenthesis

Ø → e / # __s[+cons]

(Harris 1969: 141)

Cressey (1978) makes the point that, consistent with the above rule, epenthesis only occurs word-initially, citing data such as the following.

(36) Morphologically complex words derived from {in-} and {t̪Ran-} + /skRiBiR/ *escribir* [es.kri.βíR] 'to write'

inscribir	ins.kri.βíR	*i.nes.kri.βíR	to inscribe
transcribir	t̪rans.kri.βíR	*t̪ra.nes.kri.βíR	to transcribe

(Cressey 1978: 86)

However, as Eddington (1992) demonstrates, Cressey's analysis fails to account for numerous counterexamples, such as the following.

(37) Morphologically complex words showing internal [e] epenthesis

a.	estético[16]	es.t̪é.t̪i.ko		aesthetic
	antiestético	aɲ.t̪jes.t̪é.t̪i.ko	*aɲ.t̪is.t̪é.t̪i.ko	unaesthetic
b.	esperado	es.pe.ɾá.ðo		expected
	inesperado	i.nes.pe.ɾá.ðo	*ins.pe.ɾá.ðo	unexpected
c.	esfera	es.fé.ɾa		sphere
	semiesfera	se.mjes.fé.ɾa	*se.mis.fé.ɾa	semisphere
d.	estrato	es.t̪rá.t̪o		stratum
	superestrato	su.pe.res.t̪rá.t̪o	*su.pers.t̪rá.t̪o	superstratum

(Eddington 1992: 15)

The fact that the same roots occur both with and without the epenthetic [e], leads Eddington to posit the existence of two classes of prefixes in Spanish, which he refers to as *Class I* and *Class II*. Class I prefixes, with which epenthesis does not occur, turn out

[16] The fact that *estético*, unlike the other examples given here, had an initial vocalic element in Latin is irrelevant to the modern speaker. Since no evidence of this remains in the modern surface forms, we argue that the corresponding URs will be likewise identical.

to be largely unproductive and semantically opaque in Modern Spanish. Class II prefixes, by contrast, with which epenthesis does occur, have far more transparent meaning and remain quite productive.

Eddington attributes the differential behavior of class I and class II prefixes to the relative ordering of their affixation in the serial derivation of surface forms. As he explains, the affixation of class I prefixes and the first round of syllabification precede epenthesis, which in turn is followed by the affixation of class II prefixes and a second round of syllabification. This effectively accounts for the non-occurrence of the epenthetic [e] with class I prefixes since, at the time when the epenthesis rule applies, the relevant environment is not present.

In light of the semantic opacity and lack of productivity of the class I prefixes, we will argue that words with these prefixes are not morphologically complex for the average modern speaker. In other words, given the lack of a clear semantic connection between, for example, *transcurrir* [t̪rans.ku.ɾíR] 'to elapse' and *escurrir* [es.ku.ɾíR] 'to drain', we have no reason to believe that the former is (synchronically) derived from the latter. On the other hand, when such a transparent semantic relationship does exist, as in the case of the adjective *antiestético* [aɲ.t̪jes.t̪é.t̪i.ko] 'unaesthetic', for instance, which is clearly the opposite of *estético* [es.t̪é.t̪i.ko] 'aesthetic', we have every reason to believe that the former is synchronically derived from the latter.

As enlightening as the above observation may be, the fact that words containing class II prefixes are synchronically derived does not, in and of itself, explain the presence of what turns out to be a phonologically opaque epenthetic vowel. Put another way, in OT, in which all derivations are parallel rather than serial, we cannot invoke rule ordering to explain the ill-formedness of *[aɲ.t̪i|s.t̪é.t̪i.ko] or the differential behavior of morphologically complex words relative to their simplex counterparts.

In CT, just as constraints can refer to the relationship between outputs and their corresponding inputs, in order to mitigate against deletion, epenthesis, and feature

changing, constraints have been posited that govern the relationship between morphologically related outputs. The relevant constraint, in this case, is MAX-BA.

(38) **MAX-BA**
Every segment in the base has a correspondent in the affixed form.
(Kager 1999)

By ranking this constraint above DEP-IO, which mitigates against the epenthetic [e] because it lacks a correspondent in the input, we can resolve our opacity problem.

Before we can complete our account of onset repairs in Spanish, however, there are a couple of additional issues that need to be discussed. The first, which is relatively minor in comparison with the second, has to do with the site of epenthesis. As Eddington (1992) observes, it seems strange that s-clusters should be broken up by placing an epenthetic vowel before the offending sequence, creating a coda, rather than between the two elements. As he goes on to note, however, "…epenthesis respects the integrity of the morpheme…" (1992: 16). In OT, the tendency of epenthesis and deletion to occur at constituent edges, rather than medially, is captured by the constraint CONTIG-IO, which can be defined as follows.

(39) **CONTIG-IO**
Elements adjacent in the input must be adjacent in the output.
(Gouskova 2001)

The second question that we will need to answer before we can complete this portion of our analysis is why epenthesis, rather than deletion, is used to resolve initial s-clusters. As we will see in section 3.3, coda repair phenomena provide strong evidence that DEP-IO dominates MAX-C-IO in the grammar of Spanish, thus making deletion, rather than epenthesis, the preferred phonotactic repair strategy. However, based upon this ranking we would expect deletion, most likely of the /s/ given the

presence of CONTIG-IO, rather than epenthesis in such cases. This is illustrated by the following tableau, in which /ski/ represents any given word with an initial s-cluster.

(40)

/ski/	MSD-2^{ONS}	SON SEQ	CONTIG-IO	MAX-BA	DEP-IO	MAX-C-IO
a. ski	*!					
b. si			*!			*
c. ☞ ki						*
d. se.kí			*!		*	
e. ☹ es.kí					*!	

This issue is resolved by the undominated constraint of MAXMI.

(41) **MAXMI**
Every morpheme-initial segment in the input has a correspondent in the output.
(Baković 2003)

Incorporating this constraint, our hierarchy is now the following.

(42) MSD-2^{ONS}, SONSEQ, CONTIG-IO, MAX-BA, MAXMI » DEP-IO » MAX-C-IO

As the following tableaux illustrate, the use of epenthesis to repair initial s-clusters, as well as the specific site of epenthesis, now follows directly from constraint interactions. As before, /ski/ represents any given word with an initial s-cluster. Likewise, the prefix {in-}, in the second tableau, represents what could be any productive, semantically transparent prefix.

(43)

/ski/	MSD-2^{Ons}	Son Seq	Contig-IO	Max-BA	Max Mi	Dep-IO	Max-C-IO
a. ski	*!						
b. si			*!				*
c. ki					*!		*
d. se.kí			*!			*	
e. ☞ es.kí						*	

(44)

Input: /in|ski/ Base: [es.kí]	MSD-2^{Ons}	Son Seq	Contig-IO	Max-BA	Max Mi	Dep-IO	Max-C-IO
a. in|s.kí				*!			
b. in|.sí			*!	*!			*
c. in|.kí				*!	*!		*
d. in|.se.kí			*!			*	
e. ☞ i.n|es.kí						*	

Due to a lack of evidence to support their productivity, we have elected not to include diachronic onset repairs, such as the adaptation words with initial [ps], [pn], [mn], and [gn] clusters, e.g. *psicología* [si.ko.lo.xí.a] 'psychology', *neumático* [neu.má.t̪i.ko] 'pneumatic', *mnemónica* [no.mó.ni.ka] 'mnemonic', and *gnóstico* [nós.t̪i.ko] 'Gnostic'.[17]

3.3 **Coda repairs**

In this section, we continue our discussion of phonotactic repair processes by considering codas. In subsection 3.3.1, we discuss the OT basis for the observations we made about word-final obstruents in section 1.3. Then, in subsection 3.3.2, we consider the rather marginal status of complex codas, working to determine the relative ranking of *Complex^{Cod} in the grammar of Spanish.

[17] The existence of the corresponding form *agnóstico* [aG.nós.t̪ i.ko] 'agnostic' has led some authors, e.g. Colina (1997a), to argue that the velar obstruent remains part of the UR synchronically.

3.3.1 *Word-final obstruents*

In section 1.3, we observed that word-final obstruents, with the exception of /s/ and, for morphological reasons, /D̪/, are extremely rare in native Spanish words. We noted, moreover, that such obstruents are dropped in casual speech in many dialects. The following data, first presented in section 1.3 and reproduced here for the reader's convenience, illustrate this point.

(45) Word-final obstruents

club	klu(B)	nightclub
argot	aR.ɣó(D̪)	slang
vermut	beR.mú(D̪)	vermouth
carnet	kaR.né(D̪)	ID card
complot	kom.pló(D̪)	conspiracy
usted	us.t̪é(D̪)	you
verdad	beR.ðá(D̪)	right (tag question)
bistec	bis.t̪é(G)	steak
coñac	ko.ɲá(G)	cognac
reloj	re.ló(G)	watch / clock

This stands in stark contrast to word-final sonorants, which are comparatively quite common and considerably more resistant to deletion.[18]

Carreira (1996), in an analysis of Spanish consonant clusters, and Villafaña (2000), in a discussion of Italian coda phenomena, both mention a universal preference for codas to be occupied by higher-sonority consonants. Villafaña, moreover, goes on to mention a tendency to limit or even prohibit, as in the case of Italian, the presence of obstruents in this position. In her analysis, this inclination is embodied by the constraint NoObstCoda, which we will rename NO-CODA(Obs) and define as follows.

(46) **NO-CODA(Obs)**
Obstruents are banned in syllable codas.

[18] We will provide a more extensive discussion of phenomena involving coda sonorants in chapter 5.

Given that violations of the above constraint are avoided through deletion of the offending obstruent, a violation of MAX-C-IO, we are able to conclude that the former dominates the latter, i.e. NO-CODA(Obs) » MAX-C-IO. The observation that word-internal obstruent codas are unaffected by the above ranking follows from the higher-ranked status of CONTIG-IO. Word-final /s/ is a notable exception in that, as we will discuss in detail in chapter 5, it is often weakened to [h] rather than deleted. As we will see in subsection 3.2.2, this special status also applies to /s/ in complex codas. The exceptional preservation of this segment has led us to posit the following constraint.

(47) **MAX-/s/-IO**
Every /s/ in the input must have a correspondent in the output.[19]

The fact that violations of NO-CODA(Obs) by word-final [s] are not resolved by deletion or epenthesis, i.e. *mes* [mes] 'month' is not realized [me] or [mé.se], leads us to conclude that NO-CODA(Obs) is dominated by DEP-IO, which gives us the following, updated hierarchy.

(48) MSD-2^{ONS}, SONSEQ, CONTIG-IO, MAX-BA, MAXMI, MAX-/s/-IO » DEP-IO » NO-CODA(Obs) » MAX-C-IO

The operation of this constraint ranking is illustrated by the following tableaux.

[19] Note that the above constraint does not require that the output be [s], thus allowing for /s/ aspiration, which we will discuss in chapter 5.

(49)

/kluB/	MSD-2^{ONS}	SONSEQ	CONTIG-IO	MAX-BA	MAXMI	MAX-/s/-IO	DEP-IO	NO-CODA(Obs)	MAX-C-IO
a. kluB								*!	
b. ☞ klu									*
c. klú.βe							*!		

(50)

/apt̪o/	MSD-2^{ONS}	SONSEQ	CONTIG-IO	MAX-BA	MAXMI	MAX-/s/-IO	DEP-IO	NO-CODA(Obs)	MAX-C-IO
a. ☞ áB.t̪o								*	
b. á.pt̪o	*!								
c. á.t̪o			*!						*
d. á.po			*!						*
e. á.pV.t̪o			*!				*		

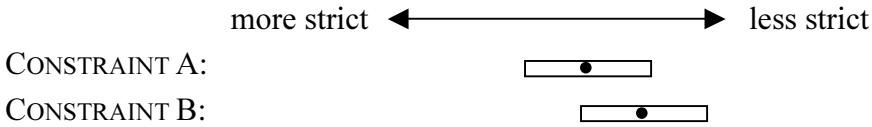
(51)

/mes/	MSD-2^{ONS}	SONSEQ	CONTIG-IO	MAX-BA	MAXMI	MAX-/s/-IO	DEP-IO	NO-CODA(Obs)	MAX-C-IO
a. ☞ mes								*	
b. me						*!			*
c. mé.se							*!		

While our current hierarchy does well to handle the (admittedly rather idealized) data we have presented, the incorporation of a slight modification to OT, proposed by Hayes (2000), can greatly improve our analysis. The claim that Spanish speakers never pronounce word-final obstruents is a rather blatant oversimplification of the facts. In

reality, the realization of such obstruents is dependent upon many factors, register being one of the most important. In other words, while its true that word-final obstruents are often dropped in casual conversation, they tend to be preserved in more formal speech. This observation is perhaps best captured by Hayes' model of gradient well-formedness, which allows constraints to be applied more or less strictly within given ranges. When these overlap, it becomes possible for two or more constraints to change their relative ranking within a given grammar. The following diagram illustrates such a case.

(52)



Let us suppose that the constraints NO-CODA(Obs) and MAX-C-IO exist in such a relationship so that, in more formal registers, MAX-C-IO can dominate NO-CODA(Obs), as illustrated by the following diagram.

(53)

As Hayes puts it, describing a case similar to the one illustrated above, Constraint B is, ordinarily, outranked by Constraint A. However, it is *somewhat possible* for B to outrank A (2000: 91). The exceptional status of the latter state of affairs is reflected by native speakers' intuitions that words with final obstruents are "odd" or "foreign" but not absolutely ill formed. As we will see in the next subsection, a similar analysis can be used to explain the marginal status of complex codas in Spanish.

3.3.2 ***Complex codas***

When we discussed complex codas in section 1.4, we saw that, while syllable-final clusters are marginally permitted in Spanish (word-final complex codas are felt as particularly exceptional by native speakers), virtually all those that occur have /s/ as their second element. As we went on to say, within the limitations of this /Cs/ structure, the initial consonant can be a liquid, a nasal, or even an obstruent. The following words illustrate these options.

(54) Complex codas

	Medial			Final		
liquid-/s/	perspicaz	pers.pi.kás	perceptive	vals	bals	waltz
nasal-/s/	monstruo	móns.t̪ɾwo	monster	Mayans	má.ɟans	(name)
obstruent-/s/	abstracto	aBs.t̪ɾáG.t̪o	abstract	Félix	fé.liks	Felix

(Harris 1983)

In order to rule out the possibility that the absence of complex codas that do not conform to the above-mentioned pattern is simply a historical coincidence rather than a synchronic impossibility, let us consider the fate of complex codas in derived environments.

(55) Complex codas in derived environments

a.	absorber	aB.soR.βéR	to absorb
	absorción	aB.soR.sjón	absorption
	absorto	aB.sóR.t̪o	absorbed
b.	compungir	kom.puŋ.xíR	sadden
	compunción	kom.pun.sjón	sadness
	compungivo	kom.puŋ.xí.βo	saddening
c.	fungir	fuŋ.xíR	to act as
	función	fun.sjón	function
d.	ungir	uŋ.xíR	to anoint
	unción	un.sjón	anointment
e.	esculpir	es.kul.píR	to sculpt
	escultor	es.kul.t̪óR	sculptor
	escultura	es.kul.t̪ú.ɾa	sculpture

(Harris 1969: 141)

As the above data illustrate, root-final consonant clusters, which are allowed when followed by a vowel since the second consonant can be syllabified as an onset, are simplified through deletion of this consonant when followed by a suffix with an initial consonant in order to avoid a fatal violation of *COMPLEX$^{\text{COD}}$.

In his original analysis of these data, Harris posits the following rule.

(56) Harris' cluster simplification rule
[+obstr, -cont] → Ø / [+cons]__[+obstr]
(1969: 141)

In a later analysis, however, he reanalyzes them as an example of what he calls the 'erasure convention'.

(57) Harris' erasure convention
"Segments not incorporated into syllable structure at the end of a derivation are erased" (1983: 35).

The principle advantage of this latter analysis, he points out, is that it can be considered part of universal grammar, a status that a language-specific cluster simplification rule could never hope to attain (Harris 1983).

As it works out, surprisingly little is needed in order to convert the latter analysis into an OT account of this phenomenon. As Harris (quoted above) observes, "segments not incorporated into syllable structure … are erased." In OT terms, a given segment is not incorporated into syllable structure, i.e. *eval* selects as optimal a candidate in which it has no correspondent, if and only if all other candidates, including the faithful candidate, are judged less harmonic. In the case of the above alternations, the inputs contain clusters such as /ʀʙ|s/, /nɢ|s/, and /lp|t̪/. Candidates in which the second and third consonants are syllabified as complex onsets, i.e. [ʀ.βs], [ŋ.gs], or [l.pt̪], all violate undominated MSD-2$^{\text{Ons}}$. On the other hand, candidates in which the first and second consonants are syllabified as complex codas, i.e. [ʀʙ.s], [ŋɢ.s], or [lʙ.t̪], violate *Complex$^{\text{Cod}}$. The fact that the optimal candidate for each input turns out to be one in which a consonant is deleted—a violation of Max-C-IO—allows us to conclude that *Complex$^{\text{Cod}}$ dominates Max-C-IO. Which consonant is deleted is determined by the interaction of Contig-IO, which ensures that the deleted consonant is adjacent to the morpheme boundary, and MaxMi, which bans deletion of morpheme-initial segments.

Before we can incorporate *Complex$^{\text{Cod}}$ into our developing constraint hierarchy, we will need to return once more to the complex codas we presented at the beginning of this subsection. As we have noted before, complex codas that have /s/ as their second element do not undergo any type of repair process. Harris (1969: 142) accounts for the fact that the /s/ is not deleted by stating, in his cluster simplification rule, that the second element is only deleted if it is [-cont]. In our present analysis, this stipulation is replaced by the constraint Max-/s/-IO, which we introduced in subsection 3.3.1. Deleting the first element of such complex codas is likewise out of the question due to the presence of Contig-IO.

Based upon the foregoing observations, we can conclude that *COMPLEX^{COD} is dominated. What remains to be determined, however, is its ranking relative to DEP-IO. To help establish this, consider the following singular/plural alternations.

(58) Singular/plural alternations

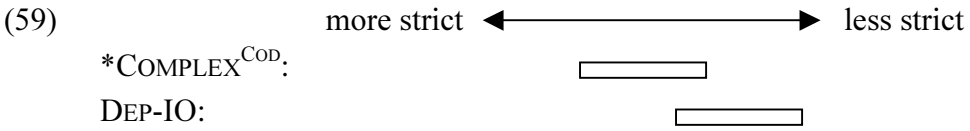
a.	casa	ká.sa	house	casas	ká.sas	houses
	piso	pí.so	floor	pisos	pí.sos	floors
b.	pan	pan	bread	panes	pá.nes	breads
	mal	mal	evil	males	má.les	evils

As we will discuss in considerably more detail when we present our OT analysis of pluralization in chapter 6, the plural morpheme in Spanish is {-s}. When a word ends in a vowel in the singular, as in (a), it acquires a final [s] in the plural. However, when a word ends in a consonant in the singular, as in (b), it acquires a final [es] in the plural.[20] This [e] is epenthetic, and is used to break up the complex coda which would otherwise result from the pluralization process. To put it in OT terms, the optimal candidate for the plural of a word such as those in (b) violates DEP-IO in order to avoid a violation of *COMPLEX^{COD}. This observation leads us to posit the ranking *COMPLEX^{COD} » DEP-IO.

Such a ranking creates something of a problem for word-final complex codas. That is, if *COMPLEX^{COD} dominates DEP-IO, we would expect word-final consonant clusters to be repaired through vowel epenthesis (as we discussed above, deletion is not an option). Thus, we would predict, incorrectly, that *vals* [bals] 'waltz' would surface as [bál.se]. Given the rather marginal status of such structures in Spanish, confirmed not only be their extreme scarcity in the lexicon but also by native speakers' intuitions, we propose the following solution. Let us assume that the constraints *COMPLEX^{COD} and DEP-IO exist in a relationship similar to that shared by NO-CODA(Obs) and MAX-C-IO, which we discussed in subsection 3.2.1. This is illustrated by the following diagram.

[20] These data, and the corresponding generalizations, are representative of the vast majority of Spanish plurals. As we will demonstrate in chapter 6, the exceptions that exist are largely systematic and not at all problematic for our present claims.

(59)



In this case, however, it seems that the variation is not dependent upon register but rather is triggered by a lexical feature specific to certain vocabulary items. Words with the relevant feature, which we will call [+foreign] following previous accounts of loanword phonology, e.g. Wunderlich (1999) and Schulte (2003), are allowed to surface with final [Cs] clusters but are felt as marginal by native speakers. To borrow another piece of Hayes' (2000) proposal, it is only *marginally possible*, in the grammar of Spanish, for DEP-IO to dominate *COMPLEX^{COD}. In the above diagram, this is reflected by the relatively small extent to which the two constraints overlap.

Although seemingly at odds with the facts of Spanish plural formation, such an analysis finds considerable support in this realm as well. There exist a number of [+foreign] words, several of which were given as examples when we discussed the fate of word-final obstruents in subsection 3.3.1, that acquire only a final [s] in the plural despite the fact that they end in a consonant in the singular. The plurals of the relevant examples are given below.

(60) Plurals of [+foreign] words

clubs	kluBs	*klú.βes	nightclubs
argots	aR.ɣóD̪s	*aR.ɣó.t̪es	slangs
vermuts	beR.múD̪s	*beR.mú.t̪es	vermouths
carnets	kaR.néD̪s	*kaR.né.t̪es	ID cards
complots	kom.plóD̪s	*kom.pló.t̪es	conspiracies
clósets	kló.seD̪s	*kló.se.t̪es	closets
coñacs	ko.ɲáGs	*ko.ɲá.kes	cognacs

Contreras (1977) attempts to deal with these data by modifying his epenthesis rule to apply only between voiced consonants and /s/. This fails, however, to account for plurals such as *yens* [ɟʝ̂ens] 'yen' (Japanese currency). Harris, in his (1980) analysis,

posits a separate prosodic template for foreign words. This is not necessary in our present account, however, since the lack of epenthesis in such plurals follows naturally from the exceptional status of [+foreign] words with respect to the relative ranking of *COMPLEX^{COD} and DEP-IO. The implications of these and other claims about plural formation will be discussed in greater detail in chapter 6.

Putting this all together we have the following (nearly complete) hierarchy.[21]

(61) MSD-2^{ONS}, SONSEQ, CONTIG-IO, MAX-BA, MAXMI, MAX-/s/-IO » *COMPLEX^{COD} ↔ DEP-IO » NO-CODA(Obs) ↔ MAX-C-IO

The following tableaux illustrate how this ranking handles the data we have examined in this subsection.

(62)

/skulp|tuRa/	MSD-2^{ONS}	SONSEQ	CONTIG-IO	MAX-BA	MAXMI	MAX-/s/-IO	*COMPLEX^{COD}	DEP-IO	NO-CODA(Obs)	MAX-C-IO
a. skul.p|t̪ú.ɾa	*!*									
b. skulB|.t̪ú.ɾa	*!*						*		*	
c. es.kulB|.t̪ú.ɾa							*!	*	**	
d. es.kul.p|ú.ɾa					*!			*	*	*
e. ☞ es.kul|.t̪ú.ɾa								*	*	*
f. skul|.t̪ú.ɾa	*!									*
g. es.kuB|.t̪ú.ɾa			*!					*	**	*
h. es.kul.pe|.t̪ú.ɾa								**!	*	

[21] The symbol "↔" is used between pairs of constraints whose relative ranking is variable. The order in which the members of such pairs are listed represents their usual ranking.

(63)

/Bals/ [+foreign]	MSD-2^{Ons}	SonSeq	Contig-IO	Max-BA	MaxMi	Max-/s/-IO	Dep-IO	*Complex^{Cod}	No-Coda(Obs)	Max-C-IO
a. ☞ bals								*		
b. bal						*!				*
c. bas			*!							*
d. bá.les			*!				*			
e. bál.se							*!			

As demonstrated below, this same hierarchy can also be used to account for coda simplification in loanwords such as the following.

(64) Loanwords with simplified codas

confort	cóm̩.foR	comfort
estándar	es.tán̪.d̪aR	standard
pipermín	pi.peR.mín	peppermint
yogur	ɟʝo.ɣúR	yogurt

(65)

/st̪anD̪aRD̪/	MSD-2^{Ons}	SonSeq	Contig-IO	Max-BA	MaxMi	Max-/s/-IO	*Complex^{Cod}	Dep-IO	No-Coda(Obs)	Max-C-IO
a. stán̪.d̪aRD̪	*!						*		*	
b. es.tán̪.d̪aRD̪							*!	*	**	
c. ☞ es.tán̪.d̪aR								*	*	*
d. es.tán̪.d̪aD̪			*!					*	**	*
e. es.tán̪.d̪a.reD̪			*!					**	**	
f. es.tán̪.d̪aR.ðe								**!		

Lastly, as promised, we will now incorporate the remaining constraints and present a complete, updated version of our developing hierarchy. Nevertheless, the

basis for some of our rankings will not become evident until later chapters. At this point, we posit the following working hierarchy.[22]

(66) ONSET, MSD-2^{ONS}, SONSEQ, CONTIG-IO, MAX-BA, MAXMI, MAX-/s/-IO, MAX-V-IO » *COMPLEX^{COD} ↔ DEP-IO » ALIGN(Word) » ALIGN(PD) ↔ NO-CODA(Obs) ↔ MAX-C-IO » NO-CODA » *COMPLEX^{ONS}

3.4 **Conclusion**

In this chapter, we have introduced and ranked a number of faithfulness constraints, enabling us to demonstrate how the need for, type, and exact site of phonotactic repairs in Spanish all follow from constraint interactions within a single, unified hierarchy. In the remaining chapters, we develop a series of case studies showing how this same hierarchy, with a few additional constraints, can account for several well-known phenomena in Spanish phonology.

[22] ALIGN(PD) and NO-CODA are separated by the symbol "↔" because, as the reader may recall from our discussion of alignment in chapter 2, their relative ranking varies dialectally.

4 ONSET FULFILLMENT

4.0 Introduction

According to Harris, "The onset is an optional constituent of the syllable in Spanish" (1983: 13). While this may be true at the orthographic level, and perhaps even at the level at which speakers are conscious of their pronunciation, we will see in this chapter that this is not at all the case phonologically. On the contrary, as we will demonstrate, ONSET is absolutely undominated and is satisfied, one way or another, in every utterance without exception. Ironically, it seems the importance of onset fulfillment is equaled only by the extent to which it has been overlooked. Our first clue about its significance came when we analyzed 'resyllabification' in chapter 2 and found that it was, in fact, a manifestation of this universal tendency. In this chapter, we will consider several additional phenomena which, we will argue, are likewise rooted in onset fulfillment.

This chapter is organized as follows. In section 4.1, we examine how the reduction of vowel-vowel sequences into single vowels or diphthongs, both within words and across word boundaries, is used to avoid violations of ONSET. Section 4.2 discusses cases where epenthesis is used to fulfill ONSET. In section 4.3, we take up the issue of the underlying representation of glides, and introduce a stricter version of ONSET to account for the consonantalization of /i/ in certain contexts. Section 4.4 summarizes and refutes additional arguments for the phonemic status of glides in Spanish. In section 4.5, we discuss what is traditionally known as 'depalatalization'. Section 4.6 concludes.

4.1 Vowel merger and diphthong formation

As Navarro Tomás observes in his classic 'Studies in Spanish Phonology', "Spanish has always tried to reduce the occurrence of hiatus…" (1946: 46, 1968: 40). Hiatus, i.e. a sequence of two contiguous vowels in separate syllables, is indeed an undesirable state of affairs insofar as the second syllable of such a sequence would

invariably lack an onset, a violation of the undominated constraint ONSET. In order to avoid this, vowel-vowel sequences are frequently reduced either into a single vowel, if the two vowels are identical, or into a diphthong (or triphthong), if they are not. The following data sets, adapted from Hammond (2001), illustrate these observations.

(67) Vowel merger across word boundaries[23]

otra amiga	ó.tra.mí.ga	another (female) friend
me escapó	mes.ka.pó	he/she/it escaped from me
mi igual	mi.ɣwal	my equal
lo opuesto	lo.pwés.t̪o	the opposite
tu uniforme	tu.ni.fóR.me	your uniform

(68) Diphthong formation across word boundaries

mi edad	mje.ðá(D̪)	my age
se interesa	sein.t̪e.ɾe.sa	he/she is interested
si olvida	sjol.βi.ða	if he/she forgets
sentó y gritó	sen̪.t̪ói.ɣɾi.t̪ó	he/she sat and yelled
mi amigo	mja.mí.ɣo	my friend
la irlandesa	laiR.lan̪.d̪e.sa	the Irishwoman
su edad	swe.ða(D̪)	his/her/its age
se ubica	seu.βi.ka	he/she/it is located
u otro	wo.t̪ro	or another
lo urgente	louR.xén̪.t̪e	the urgent (thing)
su ave	swá.βe	his/her bird
la humedad	lau.me.ðá(D̪)	the humidity / wetness
mi único	mjú.ni.ko	my only
su interés	swin̪.t̪e.rés	his/her interest

[23] An additional possibility not reflected in these data is the merger of two identical vowels into a single long vowel. According to Quilis, although the length of merged vowels (and consonants) can be marginally contrastive in careful speech, merger into a single, short segment is far more common, with any resulting ambiguity being resolved by the context (1993: 377).

(69) Triphthong formation across word boundaries

cambia invitaciones	kám.bjaim.bi.t̪a.sjó.nes	he/she/it changes invitations
inopia humana	i.no.pjau.ma.na	extreme human poverty
estudie irlandés	es.t̪ú.ðjeiR.lan.dés	study Irish
pie ulceroso	pjéul.se.ɾó.so	ulcerous foot
cambió historia	cam.bjóis.t̪o.ɾja	he/she/it changed history
limpió uñones	lim.pjóu.ɲó.nes	he/she/it cleans big-toes
antigua instalación	an.t̪í.ɣwains.t̪a.la.sjón	old installation
antigua unión	an.t̪í.ɣwau.njón	old union
fue imposible	fwéim.po.sí.βle	it was impossible
fue urgente	fwéuR.ɣén.t̪e	it was urgent
antiguo impulso	an.t̪í.ɣwoim.púl.so	old impulse
antiguo ultraje	an.t̪í.ɣwoul.t̪ɾa.xe	old insult

The first of these phenomena—the-realization of an underlying sequence of two identical vowels as a single vowel—does not involve deletion of a vowel, which would incur a fatal violation of undominated MAX-V-IO (discussed in chapter 3), but rather is a case of what Lamontagne and Rice (1995) (cited in Morales-Front and Holt 1997) refer to as 'multiple correspondence', which can be represented autosegmentally as follows.

(70) An autosegmental representation of multiple correspondence

/lo||oD̪io/

[ló.ðjo]

According to the above-cited authors, an output that stands in such a relationship to its input correspondents violates the constraint *MULTIPLE CORRESPONDENCE (*MC), which they define as follows.

(71) ***MULTIPLE CORRESPONDENCE (*MC)**
Element of the input and output must stand in a one-to-one correspondence relationship with each other.

Vowel merger is by no means the only option in such cases. If the two vowels are not identical but at least one is [+high], diphthongization, a violation of NO-DIPH, becomes a possibility. Likewise, even if neither is [+high], diphthongization is still an option, although it violates an additional constraint—ID-IO(high). Yet another possibility would be a consonantal realization of one of the two vowels, a violation of ID-IO(sonorant). The constraints we are referring to can be defined as follows.

(72) **NO-DIPH**
Two moras may not be linked to two vocalic root nodes within a single syllable.
(Rosenthall 1994)

(73) **ID-IO(high)**
If an input segment is [αhigh], then its output correspondent is [αhigh].
(Kager 1999)

(74) **ID-IO(sonorant)**
If an input segment is [αsonorant], then its output correspondent is [αsonorant].

The fact that *eval* selects as optimal a candidate that violates *MC over one in which an epenthetic segment appears between the two vowels, a violation of DEP-IO (and higher-ranked CONTIG-IO as well if morpheme internal), or one in which the two vowels correspond to a diphthong in the output, a violation of NO-DIPH (and ID-IO(high) in the case of an /o||o/ sequence), allows us to conclude that *MC is dominated by DEP-IO but dominates NO-DIPH and/or ID-IO(high). As we will demonstrate in section 4.3, *MC is dominated by ID-IO(high), but dominates NO-DIPH.[24] The following tableau illustrates this ranking.

[24] We incorporate ID-IO(sonorant) in section 4.3.

(75)

/lo||oD̪io/	ONSET	MAX-V-IO	DEP-IO	ID-IO (high)	*MC	NO-DIPH
a. lo.ó.ðjo	*!					
b. l<o>ó.ðjo		*!				
c. lo.ʔó.ðjo			*!			
d. lwó.ðjo				*!		*
e. ☞ ló.ðjo					*	

In the second and third data sets, in which an underlying sequence of two non-identical vowels (one of which is critically unstressed and [+high]) surfaces as a diphthong or triphthong, multiple correspondence is not an option. In this case, *eval* selects a candidate in which the vowel-vowel sequence in question corresponds to a diphthong, a violation of NO-DIPH. This is illustrated by the tableaux below.

(76)

/su||aBe/	ONSET	MAX-V-IO	DEP-IO	ID-IO (high)	*MC	NO-DIPH
a. su.á.βe	*!					
b. sá.βe		*!				
c. su.ʔá.βe			*!			
d. ☞ swá.βe						*

(77)

/pie||ulseRoso/	ONSET	MAX-V-IO	DEP-IO	ID-IO (high)	*MC	NO-DIPH
a. pi.é.ul.se.ró.so	*!*					
b. pjé.ul.se.ró.so	*!					
c. pjél.se.ró.so		*!				
d. pjé.ʔul.se.ró.so			*!			
e. ☞ pjéul.se.ró.so[25]						**

4.2 **ONSET-motivated epenthesis**

As we noted in section 4.1, in order for vowel merger to be used to render a vowel-vowel sequence compatible with ONSET, the two vowels must be identical. Likewise, in order for diphthong formation to occur, one of the vowels must be atonic

[25] For the sake of simplicity, let us tentatively assume that a triphthong incurs two violations of NO-DIPH.

and [+high].[26] In cases where neither of these options is available because the above conditions are not met, an epenthetic segment may be used to provide an onset for an otherwise onsetless syllable.[27, 28] The following data illustrate this point.

(78) A few representative examples of ONSET motivated epenthesis[29]

actúo	ʔaG.t̪ú.wo	I act
esquíe	ʔes.kí.je	ski
oía	ʔo.wí.ja	I/he/she/it heard

The epenthetic segments in the above examples incur violations of DEP-IO and, when morpheme internal, higher-ranked CONTIG-IO as well. The latter of these constraints will have to be demoted since, in our last complete hierarchy, presented at the end of chapter 3, it was still considered undominated. These data indicate that it is dominated by at least ONSET. The following tableau illustrates the selection of the optimal candidate for words such as the ones given above.

[26] Exceptions to this exist in some registers in which a combination of raising and gliding is used to form a diphthong from a sequence of two [-high] vowels. Examples of this include the pronunciation of words such as *poeta* 'poet' and *teatro* 'theater' as [pwé.t̪a] and [t̪já.tro], respectively (Gaona 1951, Bjarkman 1978), an option reportedly available to most speakers (Harris 1989: 152).

[27] While it is true, as we noted in chapter 3, that Spanish generally prefers deletion over epenthesis due to the relatively high ranking of DEP-IO, vowel deletion is never an option, a state of affairs enforced by the undominated status of MAX-V-IO. This same constraint and ranking is used by Lombardi (2003) in a discussion of languages that use epenthesis to avoid hiatus.

[28] While we will not go into much detail here, Lombardi, in a discussion of epenthesis and markedness, notes that many languages that use epenthesis to split up vowel-vowel sequences, do so by inserting a glide that shares some features with one of the vowels. In this way, she adds, some markedness violations can be avoided through feature spreading or multiple correspondence (2003: 9-10). This implies the possibility of gradient violations of DEP-IO, i.e. that epenthesis of a feature sharing glide or a glottal stop constitutes a lesser violation than the insertion of an obstruent—intuitively a very reasonable proposal.

[29] Some authors, e.g. Gaona (1951), Quilis (1993), have claimed the glottal stop is never used in Spanish. Upon careful observation, however, this segment is quite detectable before utterance-initial vowels, (c.f. Baković 1995).

(79)

/oia/	ONSET	MAX-V-IO	CONTIG-IO	DEP-IO	ID-IO (high)	*MC	NO-DIPH
a. o.í.a	*!**						
b. o.í	*!*	*!					
c. ʔo.í.a	*!*			*			
d. ʔo.wí		*!	*	**			
e. ☞ ʔo.wí.ja[30]			*	***			

4.3 **The underlying status of glides**

As we mentioned in the introduction, most traditional phoneme inventories, e.g. Alarcos Llorach (1965), Navarro Tomás (1968), Quilis (1993), Barrutia and Schwegler (1994), include a voiced palatal fricative, often represented with the symbol /ʏ/ or /ǰ/, in addition to the high front vowel /i/.[31] The purportedly phonemic status of this segment in Spanish has generally been based on near-minimal pairs such as the following, adapted from Alarcos Llorach.[32]

(80) Near-minimal pairs with /i/ and /ʏ/

a.	deshielo	dez.ʝé.lo	defrost
	desierto	de.sjéR.t̪o	desert
b.	abyecto	aB.ʝeG.t̪o	lowly
	abierto	a.βjéR.t̪o	open(ed)
c.	inyección	iɲ.ʄʝeG.sjón	injection
	nieve	njé.βe	snow
d.	cónyuge	kóɲ.ʄʝu.xe	spouse
	reniego	re.njé.ʏo	I renounce

(1965: 101)

[30] Since *oía* is a conjugated verb, we assume the presence of at least one morpheme boundary (the exact location of which is irrelevant to our present argument) and, thus, only one violation of CONTIG-IO.

[31] As Bowen and Stockwell note in their analysis of Spanish semivowels (1955, 1956), traditional accounts do not mention the need for a phoneme /w/, which they derive from the vowel /u/. Since we are in agreement on this point, we will not discuss it further.

[32] Saporta (1956) suggests an alternative analysis using underlying syllabification to account for the distribution of the allophones in question. We find this unacceptable, however, because we hold that syllable boundaries are never specified in the lexicon.

If we look only at their segmental structure, these data appear to be legitimate (near-) minimal pairs. Taking into account their morphological and prosodic structure, however, reveals important differences. In this section, we will carefully examine the above words in order to demonstrate that the glide-fricative alternations are not phonemic but allophonic.

Upon closer examination, the first word in each of the pairs in above turns out to be morphologically complex. More specifically, we find that there is a morpheme boundary immediately preceding the voiced palatal obstruent. The second member of each of these sets, on the other hand, has no such internal division.

(81)

a.	dez|.ɟé.lo de.sjéR.t̪o	c.f.	hielo	ʝʃé.lo	ice
b.	aB|.ɟeG.t̪ o a.βjéR.t̪o	c.f.	proyecto	pro|.ɟeG.t̪ o	project
c.	iɲ|.ʝʃeG.sjón njé.βe	c.f.	eyección proyección	e|.ɟeG.sjón pro|.ɟeG.sjón	ejection projection
d.	kóɲ|.ʝʃu.xe re.njé.ɣo	c.f.	yugo	ɟú.ɣo[33]	yoke

As we will demonstrate below, the morpheme-initial /i/ in these words is realized as it is through the interaction of a stricter version of ONSET (which we will define presently) and the ALIGN(MENT) constraints we introduced in chapter 2.

As we have discussed, ONSET bans syllables beginning with a vowel. As we saw in section 4.2, however, a syllable-initial glide satisfies this constraint. We posit an additional constraint, which we refer to as CONSONS, requiring that all syllables begin with a consonantal segment. This constraint can be defined as follows.

[33] It is worth noting that *cónyuge* is popularly pronounced [kóɲ.ʝʃu.x̱e], with a voiced velar fricative in the final syllable, possibly by analogy to [ɟú.x̱o].

(82) **CONSONS**
*[$_{\sigma}$ [-cons]][34] ('Syllables must have consonantal onsets.')

Maintaining the same relative ranking established in previous chapters, we propose to incorporate this constraint, as well as ALIGN(Word) and ALIGN(PD), into the hierarchy we have been developing in this chapter. Since a consonantalized high vowel incurs a violation of ID-IO(sonorant), we can conclude that CONSONS dominates this constraint. Likewise, as will become evident in the following tableaux, CONSONS dominates NO-CODA(Obs), and is dominated by ALIGN(PD). This gives us the following ranking.

(83) ONSET, MAX-V-IO » CONTIG-IO » DEP-IO » ID-IO(high) » ALIGN(Word) » ALIGN(PD) » CONSONS » NO-CODA(Obs) » *MC » ID-IO(sonorant) » NO-DIPH

The workings of the above hierarchy with respect to the data presented at the beginning of this section are demonstrated in the following tableaux.

(84)

/d̪es|ielo/	ONSET	MAX-V-IO	CONTIG-IO	DEP-IO	ID-IO(high)	ALIGN(Word)	ALIGN(PD)	CONSONS	NO-CODA(Obs)	*MC	ID-IO(sonorant)	NO-DIPH
a. des|.i.é.lo	*!*							**	*			
b. de.s|i.é.lo	*!						*	*				
c. des|.jé.lo								*!	*			*
d. de.s|jé.lo							*!					*
e. ☞ dez|.ɟé.lo									*		*	

[34] Following Chomsky and Halle (1968), we use [-cons] to refer to vowels and glides.

(85)

/d̪esiert̪o/	Onset	Max-V-IO	Contig-IO	Dep-IO	Id-IO(high)	Align(Word)	Align(PD)	ConsOns	No-Coda(Obs)	*MC	Id-IO(sonorant)	No-Diph
a. de.si.éR.t̪o	*!											
b. des.jéR.t̪o								*!	*			*
c. ☞ de.sjéR.t̪o												*
d. dez.ɟéR.t̪o									*!	*	*	

The same hierarchy can also be used to account for the consonantalization of high vowels in other words, such as the *leyendo* [le.ɟén̪.d̪o] ‘reading’, *calle* [ká.ɟe] ‘street’, and even *millón* [mi.ɟón] ‘million’ (underlyingly /ii/ in an analysis such as ours) without the need to resort to phonemic glides. The following tableaux illustrate this.

(86)

/le|ienD̪o/	Onset	Max-V-IO	Contig-IO	Dep-IO	Id-IO(high)	Align(Word)	Align(PD)	ConsOns	No-Coda(Obs)	*MC	Id-IO(sonorant)	No-Diph
a. le|.i.én̪.d̪o	*!*											
b. le.|jén̪.d̪o								*!				*
c. le|j.én̪.d̪o	*!											*
d. ☞ le.ɟén̪.d̪o											*	

(87)

/kaie/	Onset	Max-V-IO	Contig-IO	Dep-IO	Id-IO(high)	Align(Word)	Align(PD)	ConsOns	No-Coda(Obs)	*MC	Id-IO(sonorant)	No-Diph
a. ká.i.e	*!*											
b. ká.je								*!				*
c. káj.e	*!											*
d. ☞ ká.ɟe											*	

(88)

/miion/	ONSET	MAX-V-IO	CONTIG-IO	DEP-IO	ID-IO(high)	ALIGN(Word)	ALIGN(PD)	CONSONS	NO-CODA(Obs)	*MC	ID-IO(sonorant)	NO-DIPH
a. mi.i.ón	*!*							**				
b. m<i>i.ón	*!	*!	*					*				
c. mi.ón	*!									*		
d. mjón										*!		*
e. mi.jón								*!				*
f. ☞ mi.ɟón											*	

Note that in candidate (d) of the last of these tableaux, the /ii/ sequence stands in a multiple-correspondence relationship to a glide. As far fetched as this may seem at first, this very pattern is attested in several dialects including Chicano Spanish (see Ross 1980 for discussion). In OT terms, the only different in the grammar of these dialects as compared with that of so-called 'standard' varieties is the relative ranking of *MC and ID-IO(cons).

4.4 **Additional arguments for the phonemic status of glides**

Besides the 'minimal pairs' discussed above, Harris (1969) puts forth three additional arguments in support of positing an underlying distinction between high vowels and glides. The first has to do with a well-known condition on stress assignment in Spanish traditionally referred to as the 'three-syllable window'. The second involves seemingly inexplicable instances of hiatus between atonic high-vowels and adjacent non-high vowels. And the third is based on a peculiar stress pattern in the present tense paradigm of several verbs. Colina (1999) discusses and refutes each of these arguments in an OT analysis of Spanish glides. The original issues and data, as well as Colina's responses, are summarized below.

The so-called 'three-syllable window' captures the common observation that primary stress in Spanish cannot be placed further from the end of a word than the

antepenultimate syllable.[35] In the absence of underlying glides in the phonemic inventory of Spanish, forms like *terapéutiko* [t̪e.ɾa.péu.t̪i.ko] 'therapeutic' and cáustico [káus.t̪i.ko] 'caustic' would not be possible in a serial derivational framework because the stress assignment rules, which would have to precede the glide formation rules, would be unable to place stress on the fourth vowel from the end, as required in these words. Thus the claim that the vocalic elements in question are underlying glides and that stress in these words, consistent with the three-syllable window, is assigned to the third vowel from the end. As Colina (1999) points out, however, this is no longer a problem because, in OT, only surface forms are evaluated and the relevant surface forms do not violate the three-syllable window.

The second argument involves instances of hiatus between atonic high-vowels and adjacent non-high vowels—a combination which, as we saw in section 4.1, usually surfaces as a diphthong. Although Harris (1969) focuses primarily on the near-minimal pair consisting of the verb *piar* 'chirp', pronounced as disyllabic [pi.áR] rather than monosyllabic [pjáR] in the relevant dialects, and the consistently monosyllabic verb *guiar* [gjáR] 'guide', other authors, e.g. Navarro Tomás (1980), Hualde (1999), cite countless others such as the following.

[35] Present participles with two cliticized pronouns, e.g. *dándoselo* [d̪áɲ.d̪o.se.lo] 'giving it to him/her/them', constitute an (easily dismissible and quite unproblematic) exception to this generalization.

(89) Examples of hiatus with unstressed high vowels

Diphthong			Hiatus		
diente	djén.t̪e	tooth	cliente	kli.en̪.t̪e	client
mediante	me.dján.t̪e	by means of	Viana	bi.á.na	(town name)
miel	mjel	honey	riel	ri.él	rail
envidiamos	em.bi.ðjá.mos	we envy	enviamos	em.bi.á.mos	we send
barriendo	ba.rjen.do	sweeping	riendo	ri.én̪.d̪o	laughing
pie	pje	foot	pie	pi.é	I chirped
dio	d̪jo	he/she gave	rio	ri.ó	he/she laughed
viuda	bjú.ða	widow	diurno	d̪i.úR.no	diurnal
cuando	kwán̪.d̪o	when	Rwanda	ru.án̪.d̪a	Rwanda
fuimos	fwí.mos	we went	huimos	u.í.mos	we fled
cuida	kwí.ða	takes care	huida	u.í.ða	flight
cuatro	kwá.t̪ro	four	situado	si.t̪u.á.ðo	placed

Both Navarro Tomás (1980) and Hualde (1999) agree that these data can be best attributed to morphologically and/or etymologically based analogy. Colina (1999) explains them within the framework of Correspondence Theory, using the constraint IDENTσ, which requires that a given segment have the same syllabic role in all surface forms that share a particular relationship. Our only objection is that IDENTσ is said to dominate ONSET, and forms with hiatus purportedly have onsetless syllables. We would respond that even in the absence of diphthong formation between two adjacent vowels, ONSET is never violated. The contrast between *diente* and *cliente*, we would argue, is phonetically [d̪jén.t̪e] and [kli.jén.t̪e], as we explained in section 4.2.

The third and final argument has to do with patterns of stress assignment in the present tense paradigm of certain verbs. As Harris (1969, 1976) points out, Spanish verbs always have penultimate stress in the present indicative. However, there exist a number of near-minimal pairs (cited below), which, although they are consistent with the above-mentioned generalization about penultimate stress, exhibit peculiar vowel-glide alternations.

(90) Stress contrasts in present tense verbs

Glide			Vowel		
acaricia	a.ka.ɾí.sja	caresses	vacía	ba.sí.a	empties
aprecia	a.pɾé.sja	appreciates	rocía	ro.sí.a	sprays
cambia	kám.bja	changes	amplía	am.plí.a	enlarges
afilia	a.fí.lja	affiliates	alía	a.lí.a	allies
licua	lí.kwa	blends[36]	actúa	aG.t̪ú.a	acts

Harris claims that the glides in the words on the left, as well as the corresponding vowels in those on the right, are underlyingly [-syll] and [+syll], respectively. In this way, he is able to account for the above data by positing a stress-assignment rule for the present indicative that places primary stress on the penultimate [+syll] segment. Colina (1999) cites Hualde (1992) (an unpublished manuscript which has proven impossible to obtain) as invalidating such an account, but does not elaborate, so no solid conclusions can be drawn. Moreover, since stress assignment is beyond the scope of this thesis, a complete analysis of the issue is out of the question. It seems, however, that even if the stress pattern of one set of the above verbs (either those with glides or those without) must be lexically specified, we have no reason, in the absence of independent evidence, to think that this should take the form of a phonemic contrast between high vowels and glides. On the contrary, since a stress diacritic is already independently needed to account for minimal pairs such as *sábana* [sá.βa.na] 'sheet' and *sabana* [sa.βá.na] 'grassland' (Harris 1985), it would seem much more reasonable to simply extend its use to the glide-vowel contrasts in the above-cited examples.

4.5 **A brief note on 'diphthongization'**

Before we leave the topic of glides and the controversy surrounding their underlying representation, we would do well to mention one additional issue: the

[36] This verb, as well as the verb *adecua* [a.ðe.kwa] 'adapts', are of particular interest because, as evidenced by Seco's (1986) prescriptive corrections, there exists some variation as to their realization. That is, the 'standard' realization (given above) competes with 'non-standard' [li.kú.a] and [a.ðe.kú.a].

apparently stress-related alternation between simple vowels and diphthongs in certain paradigms. Previous accounts of the relevant data (e.g. Harris 1969, 1974, 1976, 1985, Brame and Bordelois 1973, 1974, García-Bellido 1986, Carreira 1988a, 1990) have generally employed the term 'diphthongization' (not to be confused with the diphthong formation phenomena we examined in section 4.1). The examples below are representative of the most widely discussed alternations.[37]

(91) Examples of 'diphthongization'

a. Verbs

pensamos	pen.sá.mos	we think	piensa	pjén.sa	thinks
contamos	kon̪.t̪á.mos	we count	cuenta	kwén.ta	counts
perdemos	peR.ðé.mos	we lose	pierde	pjér.de	loses
movemos	mo.βé.mos	we move	mueve	mwe.be	moves

b. Other categories

merienda	me.ɾjén̪.d̪a	(n) supper	merendero	me.ɾen̪.d̪e.ɾo	(n) place to eat
viejo	bjé.xo	(adj) old	vejez	be.xés	(n) old age
fuera	fwé.ɾa	(adv) outside	forastero	fo.ɾas.t̪é.ɾo	(n) outsider
nuestro	nwés.t̪ɾo	(det) our	nosotros	no.só.t̪ɾos	(pron) we
siete	sjé.t̪e	(det) seven	setenta	se.t̪en̪.t̪a	(det) seventy

In order to account for these data, Harris (1969, 1974, 1976, 1985) posits a rule that derives diphthongs from underlying simple vowels when these are stressed. As he quickly points out, however, there exist non-alternating varieties of both simple vowels and diphthongs, as the following data illustrate.

[37] Brame and Bordelois (1973, 1974) and García-Bellido (1986) include additional alternations of the form [e] ↔ [i] and [o] ↔ [u] in their respective analyses.

(92) Non-alternating simple vowels and diphthongs

a. Simple vowels

monto	moɲ.t̪o	I mount	montó	moɲ.t̪ó	he/she mounted
pego	pé.ɣo	I hit	pegó	pe.ɣó	he/she hit

b. Diphthongs

dieta	d̪jé.t̪a	diet	dietético	d̪je.t̪é.t̪i.ko	dietary
silueta	si.lwé.t̪a	silhouette	silueteado	si.lwé.t̪a.ðo	silhouetted

In fact, as Harris notes, 'diphthongization' is the exception, not the rule. For that reason, he posits that those vowels that diphthongize under stress are marked lexically with a diacritic. He then goes on, in a (1985) reanalysis, to replace this with the claim that vowels that diphthongize are underlyingly associated with two timing slots, thus resolving an ordering paradox involving stress assignment and diphthongization.

Shuldberg (1984) proposes to combine Harris's diphthongization rule with what he refers to as 'velar epenthesis'. The following data illustrate this.

(93) Examples of 'velar epenthesis'

tiene	t̪jé.ne	has	tengo	t̪éŋ.go	I have
viene	bjé.ne	comes	vengo	béŋ.go	I come

In particular, Shuldberg makes the following claim about the synchronically derived nature of such forms.

> Furthermore, velar epenthesis is clearly an active process, unlike forms which are perhaps correctly treated as suppletion (e.g. *ir*, *voy*, *fue*). In certain dialects, the forms *vaíga*, *creíga*, *haíga*, *huíga* have emerged in place of the standard forms *váya*, *créa*, *háya*, *húya*, respectively. Since these forms cannot be attributed to historical accident, but rather reflect the intuitions of contemporary Spanish speakers, their existence constitutes strong evidence for an active epenthesis rule.

Unfortunately (for Shuldberg's arguments, at least), the very forms he cites as contemporary innovations are cited by Penny (2002) as part of the development of Old

Spanish. Their occurrence in non-standard dialects of Modern Spanish, moreover, is quite well-documented and is traditionally discussed under the heading of 'archaism', that is, the continued use of forms that have been replaced by others in standard varieties.

As for diphthongization itself, Bybee and Pardo's (1981) nonce-probe experiment clearly demonstrates that the alternations in question are strictly lexical. As the above-named authors found in their study, even when presented with nonce forms whose segmental and prosodic structure is analogous to that of real Spanish words that present vowel-diphthong alternations, native speakers overwhelmingly assume that the vowels and diphthongs with which they are presented are non-alternating. These finding strongly suggest that so-called 'diphthongization' is not a synchronically active process but rather an artifact of the historical development of the language.

4.6 **Conclusion**

This concludes our discussion of onset fulfillment in Spanish. In this chapter we have seen, once again, how a relatively small number of well-grounded, universal constraints can account for a wealth of phenomena in a human language. Perhaps even more remarkably, we have witnessed further examples of how slight changes in the relative ranking of these constraints can account for dialectal variation. In the next chapter, we move to the opposite side of the syllable as we consider the importance of coda conditions in Spanish phonotactics and present an OT analysis of the phonological processes that these constraints inspire.

5 CODA CONDITIONS

5.0 Introduction

As we observed in chapter 1, syllable codas are somewhat more restricted than onsets in terms of their phonological shape as well as with respect to which segments are considered well formed constituents. We also mentioned the virtually complete neutralization of otherwise-contrastive features of certain segments in syllable-final position, such as the voicing and continuancy of obstruents and the place of articulation of nasals. In chapter 3, moreover, we saw that there exists a strong tendency towards the deletion of word-final obstruents, with the noteworthy exception of /s/. In fact, coda-based phenomena are the principal basis for the differentiation of Spanish dialects (Chela-Flores 1986). In this chapter, we will expand on our previous observations as we discuss dialectal variation in light of what have been called 'coda conditions' (Prince and Smolensky 1993, Kager 1999).

This chapter is divided into four main parts. In section 5.1, we consider some of the phonetic variability that exists in the realization of syllable-final /s/ in so-called 'non-standard' or 'radical' Spanish dialects, as well as the OT basis for the various manifestations of this phoneme. In section 5.2, we expand on the remarks we made in chapter 1 about the realization of coda nasals, providing more complete data and analysis of nasal assimilation and default articulation. In section 5.3, we discuss the nasal debuccalization process that has traditionally been referred to as 'velarization', showing how it, too, follows from constraint interactions. In section 5.4, we reanalyze what is traditionally known as 'depalatalization' in light of recent theoretical and investigative advancements. Section 5.5 concludes.

5.1 S-aspiration

When we discussed the deletion of word-final obstruents in chapter 3, we noted that /s/ is exceptional in that it is preserved in this context in what are traditionally

referred to as 'standard' dialects. We could simply leave it at that, limiting our discussion to so-called 'conservative' varieties, as does Torreblanca (1978). Such an approach would, however, exclude the varieties spoken by the majority of the world's Spanish speakers (Lipski 1986).

Geographically speaking, s-aspiration, which is generally thought to have originated in southern Spain (Lipski 1985, 1986), is attested "in vast coastal areas of America, in most of Venezuela, the llanos [i.e. 'plains'] of Bolivia, in Paraguay, much of the interior of Argentina, and in the northern New Mexico / southern Colorado dialect region" (Canfield 1981: 11-12). In these dialects, a coda /s/ is often 'aspirated', i.e. realized as [h].[38] The following data illustrate this point.

(94) Aspiration of coda /s/

Medial			Final		
mismo	mih.mo	same	mes	meh	month
mosca	moh.ka	fly	tos	t̪oh	cough

As several authors have already noted, the realization of /s/ as [h], although socially stigmatized (Terrell 1979), is actually quite natural, and is brought about by deleting the oral features of the /s/ while maintaining its laryngeal features (Widdison 1996). Put in more colorful terms, s-aspiration occurs "via autosegmental bleaching of supralaryngeal features" (Lipski 1999: 198). The result is a sizeable increase in sonority—from obstruent to glide according to Chomsky and Halle's (1968) model.

[38] The terms 'radical' and 'conservative' have also been used to refer to those dialects which evidence certain weakening of syllable-final consonants and those that do not, respectively, c.f. Guitart (1997) who claims that variability in the realization of coda consonants in Caribbean Spanish is due to speakers 'uneven control' over 'radical and conservative phonological systems'. Some authors, e.g. Bjarkman (1989) and Chela-Flores (2001), have objected to this distinction, noting that even so-called 'conservative' dialects evidence phonological innovation and change. The foregoing observations notwithstanding, the (admittedly somewhat artificial) distinction between varieties in which the phonetic realization of /s/ and /n/ in codas resembles their realization in onsets, i.e. 'non-aspirating' / 'non-velarizing' dialects and those varieties in which the same consonants exhibit notably different phonetic realizations in syllable-initial versus syllable-final positions, will prove a necessary and useful means of demonstrating how dialectal variation follows from differences in the relative ranking of universal constraints.

This phenomenon is generally considered part of a cross-linguistically attested process of consonant weakening known as 'debuccalization' (Kaisse 1995, Morris 2000, Lavoie 2001, Piñeros 2001). For the sake of descriptive accuracy, we will use the term /s/ debuccalization instead of aspiration from this point on.

5.1.1 *Some typological observations*

Not surprisingly, /s/ debuccalization is subject to a considerable amount of cross-dialectal variation. Kaisse (1998) provides a typology of such varieties in which she identifies four distinct patterns based upon which phonological and morphological environments trigger debuccalization and which do not in each variety.[39] The following chart summarizes her findings.

(95) Patterns of /s/ debuccalization

Position of /s/	Buenos Aires	Chinato	Río Negro	Caribbean
Pre-consonantal, e.g. *disko* /d̪isko/ 'disk'	díh.ko	díh.ko	díh.ko	díh.ko
Utterance-final (pre-pausal), e.g. *dos* /d̪os/ 'two'	dos	doh	doh	doh
Word-final, pre-vocalic, e.g. *dos alas* /d̪os||alas/ 'two wings'	dó.s||á.las	dó.s||á.lah	dó.h||á.lah	dó.h||á.lah
Prefix-final, pre-vocalic, e.g. *deshecho* /d̪es|etʃo/ 'undone'	de.s|é.ʧo	de.s|é.ʧo	de.s|é.ʧo	de.h|é.ʧo

Clearly, with the exception of the Chinato dialect, the debuccalization of the /s/ is phonologically opaque in at least one environment in each of the above varieties. Thus, in addition to providing a phonological explanation for this phenomenon, we are once again faced with the challenge of dealing with opacity in OT. We will demonstrate in the following subsection that this latter objective can be met, as in chapter 3, using output-output constraints. In this case, we will be using Kenstowicz's (1995, 1998)

[39] Not surprisingly, it is rather difficult to define the exact geographical boundaries of each dialect. Fortunately, it is also irrelevant to our present discussion.

BASE-IDENTITY and UNIFORM EXPONENCE, incorporating, in particular, Face's (1999) proposal that the latter of these constraints refer to 'phonological domains', which we introduced in chapter 2.

5.1.2 *An OT analysis*

The first thing we will need to do in order to present an OT account of /s/ debuccalization is to establish which constraint mitigates against [s] in coda position. Several previous OT accounts of this phenomenon, e.g. Peperkamp (1997), Morris (1998, 2000), Lipski (1999), Wiltshire (1999) have posited constraints such as *s]$_\sigma$, which do succeed in banning syllable-final [s] although their universality might prove difficult to establish. Piñeros (2001) takes a more well-grounded approach in that he uses an alignment constraint—Align-C(place)—to require that the place features of every consonant be aligned with the left edge of a syllable. This is, in essence, a coda condition very similar to those posited by Prince and Smolensky (1993) and Kager (1999), among others. This constraint effectively bans all coda consonants with the exception of placeless [h] and [N], allowing Piñeros to present a unified analysis of debuccalization phenomena in the variety he refers to as "Northern Rustic Dominican Spanish", in which these are the only coda consonants that occur.

Approaching debuccalization from a broader typological perspective, however, we find that some dialects, e.g. Argentinian Spanish, debuccalize coda /s/ but not coda nasals. Likewise, many Central American dialects debuccalize coda nasals but not coda /s/. Still others, most notably Caribbean varieties, do both. The lack of a direct correlation between these two types of debuccalization strongly suggests that they stem from independently ranked constraints, making a unified analysis, such as that proposed by Piñeros, impossible. In the present account, we propose to bar [s] from the coda on the basis of its sonority (or rather lack thereof), reserving the Coda Condition for nasal debuccalization.

As we saw in chapter 3, the constraint NO-CODA(Obs) mitigates against the presence of any obstruent in coda position, including [s]. Moreover, the fact that this constraint ordinarily (in unaffected speech) dominates MAX-C-IO was used to explain the frequent deletion of word-final obstruents. As we went on to explain, however, the phoneme /s/, as well as the other obstruents word-internally, cannot be deleted due to the ranking presence of MAX-/s/-IO and CONTIG, respectively. What we did not consider at that time, but will now, is the possibility of feature deletion (debuccalization) as an alternative to segment deletion. As the following tableaux illustrate, deleting the oral features of the /s/ satisfies NO-CODA(Obs) but violates the constraint HAVEPLACE (defined below). We contend that this constraint is ranked between NO-CODA(Obs) and MAX-C-IO in debuccalizing dialects but dominates NO-CODA(Obs) in non-debuccalizing varieties.[40] The following tableaux illustrate these assertions.

(96) **HAVEPLACE**
Every segment must have some *Place*

(Padgett 1995a,b)

(97) Debuccalizing

/kluB/	CONTIG-IO	MAX-/s/-IO	DEP-IO	NO-CODA (Obs)	HAVE PLACE	MAX-C-IO
a. kluB				*!		
b. ☞ klu						*
c. klú.βe			*!			

(98) Debuccalizing

/d̪os/	CONTIG-IO	MAX-/s/-IO	DEP-IO	NO-CODA (Obs)	HAVE PLACE	MAX-C-IO
a. d̪os				*!		
b. d̪o		*!				*
c. d̪ó.se			*!			
d. ☞ d̪oh					*	

[40] According to Terrell (1979), all accounts of /s/ debuccalization have noted that it is not obligatory within debuccalizing dialects but rather is stylistically variable. This strongly suggests that HAVEPLACE and NO-CODA(Obs) are variably ranked in the grammar of these dialects, a relationship analogous to that which we described for NO-CODA(Obs) and MAX-C-IO in chapter 3.

(99) Non-debuccalizing

/kluB/	CONTIG-IO	MAX-/s/-IO	DEP-IO	HAVE PLACE	NO-CODA (Obs)	MAX-C-IO
a. kluB					*!	
b. ☞ klu						*
c. klú.βe			*!			

(100) Non-debuccalizing

/d̪os/	CONTIG-IO	MAX-/s/-IO	DEP-IO	HAVE PLACE	NO-CODA (Obs)	MAX-C-IO
a. ☞ d̪os					*	
b. d̪o		*!				*
c. d̪ó.se			*!			
d. d̪oh				*!		

We can deal with opaque /s/ debuccalization using Kenstowicz's (1995, 1998) BASE-IDENTITY and UNIFORM EXPONENCE, modifying the latter, as suggested by Face (1999), to refer to phonological domains. These constraints can be defined as follows.

(101) **BASE-IDENTITY**
Given an input structure [X Y] output candidates are evaluated for how well they match [X] and [Y] if the latter occur as independent words.
(Kenstowicz 1995)

(102) **UE-PD**
Avoid differences in the realization of a phonological domain.
(adapted from Face 1999)

The following three pairs of tableaux illustrate how the relative ranking of these constraints with respect to NO-CODA(Obs) and HAVEPLACE accounts for the realizations of *dos alas* 'two wings' and *deshecho* 'undone' in Kaisse's Chinato, Río Negro, and Caribbean dialects, respectively. Note that the higher we rank BASE-IDENTITY and UE-PD relative to HAVEPLACE, the more opaque the resulting pattern of debuccalization becomes. The other constraints, none of which incurs any violations, are omitted for the sake of clarity.

(103) Chinato

/ɖos||alas/ Bases: [doh], [alah]	NO-CODA(Obs)	HAVEPLACE	BASE-IDENTITY	UE-PD
a. ɖó.s||á.las	*!		**	**
b. ☞ ɖó.s||á.lah		*	*	*
c. ɖó.||há.lah		**!		

(104) Chinato

/ɖes|etʃo/	NO-CODA(Obs)	HAVEPLACE	BASE-IDENTITY	UE-PD
a. ☞ ɖe.s|e.tʃo				*
b. ɖe.h|e.tʃo		*!		

(105) Río Negro

/ɖos||alas/ Bases: [doh], [alah]	NO-CODA(Obs)	BASE-IDENTITY	HAVEPLACE	UE-PD
a. ɖó.s||á.las	*!	**		**
b. ɖó.s||á.lah		*!	*	*
c. ☞ ɖó.||há.lah			**	

(106) Río Negro

/ɖes|etʃo/	NO-CODA(Obs)	BASE-IDENTITY	HAVEPLACE	UE-PD
a. ☞ ɖe.s|e.tʃo				*
b. ɖe.h|e.tʃo			*!	

(107) Caribbean

/ɖos||alas/ Bases: [doh], [alah]	NO-CODA(Obs)	BASE-IDENTITY	UE-PD	HAVEPLACE
a. ɖó.s||á.las	*!	**	**	
b. ɖó.s||á.lah		*!	*!	*
c. ☞ ɖó.||há.lah				**

(108) Caribbean

/ɖes|etʃo/	NO-CODA(Obs)	BASE-IDENTITY	UE-PD	HAVEPLACE
a. ɖe.s|e.tʃo			*!	
b. ☞ ɖe.h|e.tʃo				*

The Buenos Aires dialect, which is identical to Chinato except for the lack of debuccalization of utterance-final /s/, is absent from our present analysis because, quite frankly, we are unable to explain the lack of debuccalization of utterance-final /s/ in an otherwise debuccalizing variety. The same problem has been noted by others without

any clear explanation as of yet. Terrell (1975) observes that pre-pausal /s/ is debuccalized less often than pre-consonantal /s/ in Cuban Spanish, but can offer no real explanation. Likewise Lipski (1985, 1986, 1999) notes that he is aware of this problem but consistently limits himself to descriptive observation of this particular aspect of the phenomenon. Even Kaisse (1998), who identified the four patterns of debuccalization we have been discussing, admits that this aspect of the distribution is problematic and, in the end, takes the rather unexplanatory approach of positing separate rules to debuccalize pre-consonantal /s/ and, where dialectally appropriate, its pre-pausal counterpart as well. Likewise Wiltshire (1999), who attempts an OT account of Kaisse's patterns of debuccalization, does so using such unexplanatory constraints as *sC, *s]$_{PW}$, and *s|$_{PW}$.

5.2 **Nasal place assimilation and default articulation**

In this section, we continue our discussion of coda-based phenomena by expanding on the observations we made in chapter 1 about the phonetic realization of coda nasals, namely, that the place of articulation of nasals in this position is completely neutralized. As we will explain in this section, such neutralization exists due to two distinct, yet closely related phenomena: place assimilation and default articulation. Following the presentation of data and definition of the relevant phonological contexts for each of the above-mentioned processes, we will account for both under the umbrella of a unified OT analysis.

5.2.1 ***Place assimilation***

As is relatively common across languages (Kenstowicz 1994), in most dialects of Spanish, pre-consonantal nasals assimilate the place of articulation of the following consonant. Thus, the place of articulation of nasals in this position—which is always a syllable coda because, as we saw in chapter 1, nasals are not permitted in branching onsets—is not a contrastive feature, and all nasal allophones that appear in this environment are in complementary distribution. Data such as the following, which have

long been a staple of the Spanish phonology literature, e.g. Stirling (1935), Deferrari (1954), Bolaño de Isla (1956), Alarcos Llorach (1965), Sánchez and Matilla (1974), Guitart and Roy (1980), Alba (1998), illustrate this observation.

(109) Nasal place assimilation

tampoco	t̪am.pó.ko	neither	hombre	óm.bɾe	man
antes	án̪.t̪es	before	hundir	un̪.d̪iR	sink
incredible	iŋ.kɾe.í.βle	incredible	ingrato	iŋ.gɾá.t̪o	ungrateful
enfriar	emŋ.fɾjáR	cool	onza	ón.sa	ounce
ángel	áŋ.xél	angel	ancho	áɲ.ʧo	wide
conmigo	kom.mí.ɣo	with me	gimnasio	xin.ná.sjo	gymnasium[41]
enloquecer	en.lo.ke.séR	drive crazy	honra	ón.ra	honor

A similar phenomenon is observed involving pre-consonantal laterals. However, these only assimilate the place of coronal consonants, as the following data illustrate.

(110) Lateral place assimilation

culpa	kúl.pa	fault	silbar	sil.βáR	whistle
alto	ál̪.t̪o	tall	caldo	kal̪.d̪o	broth
alcohol	al.kól	alcohol	algo	ál.ɣo	something
delfín	del.fín	dolphin	úlcera	úl.se.ɾa	ulcer
álgebra	ál.xe.βɾa	angel	salchicha	saʌ.ʧí.ʧa	sausage
alma	ál.ma	soul	malnutrido	mal.nu.tɾí.ðo	malnourished
alrededor	al.re.ðe.ðóR	around			

5.2.2 *Default articulation*

In the absence of a following consonant to license place, syllable final nasals are realized with a default articulation. In order to demonstrate that this is not simply due to

[41] There is a certain amount of disagreement in the literature with respect to the realization of /nm/ and /mn/ clusters. Some authors, e.g. Barrutia and Schwegler (1994), mention the possibility, at least in careful speech, of pronouncing the two nasals with distinct points of articulation, i.e. [kon.mí.ɣo] and [xim.ná.sjo]. Others, e.g. Macpherson (1975), allow for this type of differentiation only in the case of /nm/ sequences while others, e.g. Hammond (2001), only recognize full assimilation in all registers.

a lack of orthographic variety in this position (the vast majority of word-final nasals are orthographically "n"), Navarro Tomás offers the following data.

(111) Default articulation of word-final nasals

harem	a.ɾén	harem
Abraham	a.βɾán	Abraham
máximum	máɢ.si.mun	maximum
mínimum	mí.ni.mun	minimum
ultimátum	ul̪.t̪i.má.tun	ultimatum

(1980: 88)

Naturally, the presence of an orthographic "m" in the above words does not prove that the final phoneme is underlyingly /m/. However, it appears that word-final neutralization has become lexicalized for most speakers, making it quite difficult to find clear cases of words with place-specified final nasals. Some have claimed that the noun *álbum* [ál.βun] 'album' is such a word, i.e. that it has an underlying final /m/, based upon the realization of the plural *álbumes* [ál.βu.mes] 'albums'. In this case as well, however, the plural [ál.βu.mes] seems to survive only on the basis of prescriptive pressure. The competing realization [ál.βu.nes], with lexicalized neutralization of the nasal, is frowned upon by Manuel Seco (1986), but is considerably more common. As is quite obvious from the following data, orthography (even when backed by prescriptive pressure) is no match for phonotactics.

(112) Phrase-level realizations of *álbum*

álbum pequeño	ál.βum.pe.ké.ɲo	small album
álbum feo	ál.βuŋ.fé.o	ugly album
álbum de fotos	ál.βun̪.d̪e.fó.tos	photo album
álbum caro	ál.βuŋ.ká.ro	expensive album

(D'Introno et. al. 1995)

Other examples of words with neutralized final nasals include loanwords such as *pudín* [pu.ðín] 'pudding' and *bumerán* [bu.me.ɾán] 'boomerang', the latter of which is pluralized *bumeranes* [bu.me.ɾá.nes], lending additional support to our argument that most, if not all, word-final nasals in Spanish are underspecified for place. We will present additional examples of words whose final nasals have traditionally been argued to have some underlying place features when we discuss 'depalatalization' in section 5.4.

5.2.3 *Assimilation and default articulation in OT*

As the data we considered above demonstrate, place of articulation is not a contrastive feature for coda nasals in Spanish. We contend that the observed neutralization is brought about by a constraint Prince and Smolensky (1993) refer to as CODACOND and define as follows.

(113) **CODACOND**
A coda consonant can have only Coronal place or place shared with another consonant.

More recently, this constraint has been reinterpreted in terms of licensing.

(114) **CODA-COND**
*Place]$_\sigma$ ('A coda cannot license place features.')
Kager (1999)

Typologically speaking, if the above markedness constraint dominates the competing faithfulness constraint ID-IO(Place), defined below, the place of articulation of coda nasals is neutralized, as in Spanish and Japanese. If, on the other hand, ID-IO(Place) dominates **CODA-COND**, the place of articulation of coda nasals can be contrastive, as in English and Korean.

(115) **ID-IO(**Place**)**
The specification for place of articulation of an input segment must be preserved in its output correspondent.

Kager (1999)

Moreover, we will argue, following Lombardi (1999) and Baković (2000), that the consistently regressive nature of place assimilation in nasal-consonant clusters, i.e. the fact that it is the nasal that changes its place of articulation and not the following consonant, stems from what Lombardi refers to as 'positional faithfulness'. In the present analysis, this is enforced by the undominated constraint IDONS(PA), which can be defined as follows.

(116) **IDONS(PA)**
The specification for place of articulation of an input segment must be preserved in its output correspondent if the segment in question is parsed as an onset.

Lastly, following Baković (2000), the realization of pre-pausal nasals in non-velarizing dialects can be accounted for by the following markedness constraint, a compact version of Lombardi's (2003) universal hierarchy of place markedness, i.e. *Lab, *Dor » *Cor, both of which mitigate against non-coronal place of articulation.

(117) ***[-COR]**
Do not have a place of articulation other than coronal.

(Adapted from Prince and Smolensky 1993)

The following tableaux illustrate how these constraints account for the neutralization data we presented in the introduction to this section.

(118)

/t̪aNpoko/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. t̪aN.pó.ko		*!		**	
b. t̪an.pó.ko			*!	**	
c. ☞ t̪am.pó.ko				***	
d. t̪an.tó.ko	*!			*	

(119)

/aN.xel/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. áN.xel		*!		*	
b. án.xel			*!	*	
c. ☞ áŋ.xel				**	
d. án.sel	*!				

(120)

/alβuN/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. ál.βum			*	*!	
b. ☞ ál.βun			*		
c. ál.βuN		*!			

With the addition of the undominated constraint LAT/COR (Morris 1998), the same analysis can be extended to lateral place assimilation. The following tableaux illustrate this point.

(121) **LAT/COR**
All laterals are coronal.

(122)

/alt̪o/	IDONS (PA)	LAT/COR	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. ál.t̪o				*!		
b. ☞ ál̪.t̪o						*
c. ál.to	*!					*

(123)

/alGo/	IDONS (PA)	LAT/ COR	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. ☞ ál.ɣo				*		
b. áʟ.go		*!			**	*
c. ál.to	*!					*

5.3 **An OT analysis of nasal 'velarization'**

In so-called 'velarizing' Spanish dialects, which are spoken, according to Canfield, "…in the Caribbean, southeastern Mexico, Central America, Venezuela, except the Andean region, coastal Columbia and Ecuador, and the highlands of Ecuador, Peru, and Bolivia…" (1981: 12), the default articulation of pre-pausal nasals is not coronal, as in the data we discussed in subsection 5.1.1, but rather seems to be dorsal. This phenomenon often co-occurs with /s/ debuccalization, and is subject to much of the same stylistic variability and social stigma (Wireback 1999). As Baković (2000) points out, however, the fact that such nasals are realized as they are by default, i.e. in the absence of an underlyingly specified or assimilated place of articulation, makes this extremely problematic given the presence of the markedness constraint *[-COR]. As we would expect, therefore, "In no dialect is [m] or [ɲ] the default nasal" (Morris 1998: 165).

In our present analysis, we will argue, following Trigo (1988) and Baković (2000), that what is commonly mistaken for a velar nasal is, in reality, a "… debuccalized (placeless) nasal […], which looks and sounds velar due to the articulatorily and perceptually sympathetic relation between velum lowering and linguo-velar contact" (Baković 2000). Put another way, in the absence of any place specification, the only articulatory command received by the vocal tract is something to the effect of "Lower the soft palate." The resulting contact between the soft palatal and dorsum gives the acoustic impression of a dorsal nasal. For the sake of descriptive accuracy, we will replace 'velarization' with the more accurate term 'debuccalization' and represent the debuccalized, placeless nasal with the symbol [N] from this point on.

5.3.1 *A brief typology of nasal debuccalization*

Nasal debuccalization is not nearly as typologically varied as its counterpart involving /s/. In the present analysis, we will discuss two basic patterns that this phenomenon tends follow. The first, which we will refer to as transparent nasal debuccalization, is characterized by debuccalization of pre-pausal nasals only. Pre-consonantal nasals still assimilate the place of articulation of the following consonant, and pre-vocalic nasals are still realized with a default alveolar articulation, just as in non-debuccalizing dialects. The second pattern, which we will call opaque nasal debuccalization, is identical to transparent debuccalization except that word-final, pre-vocalic nasals are debuccalized as well. The following chart, which parallels the one presented in section 5.1, summarizes these observations.[42]

(124) Patterns of nasal debuccalization

Position of nasal	No debuccalization	Transparent debuccalization	Opaque debuccalization
Utterance-final (pre-pausal), e.g. *álbum* /alBuN/ 'album'	ál.bun	ál.buN	ál.buN
Word-final, pre-vocalic, e.g. *en el* /eN||el/ 'in the'	en||el	en||el	eN||el
Pre-consonantal, e.g. *tampoco* /t̪aNpoko/ 'neither'	t̪am.pó.ko	t̪am.pó.ko	t̪am.pó.ko

5.3.2 *An OT analysis*

As the following tableaux illustrate, in OT terms, the different realizations of syllable-final nasals in debuccalizing and non-debuccalizing varieties follows from the relative ranking of CODA-COND and HAVEPLACE.

[42] There do exist varieties in which some pre-consonantal nasals are debuccalized as well. This phenomenon is subject to a considerable amount of variability and never affects the majority of pre-consonantal nasals (Lipski 1986).

(125) Debuccalizing

/alBuN/	IDONS (PA)	CODA-COND	HAVE PLACE	*[-COR]	ID-IO (Place)
a. ál.βum		*!		**	
b. ál.βun		*!		*	
c. ☞ ál.βuN			*	*	

(126) Debuccalizing

/t̪aNpoko/	IDONS (PA)	CODA-COND	HAVE PLACE	*[-COR]	ID-IO (Place)
a. t̪aN.pó.ko			*!	**	
b. t̪an.pó.ko		*!		**	
c. ☞ t̪am.pó.ko				***	
d. t̪an.tó.ko	*!			*	*

(127) Non-debuccalizing

/alBuN/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. ál.βum			*	**!	
b. ☞ ál.βun			*	*	
c. ál.βuN		*!		*	

(128) Non-debuccalizing

/t̪aNpoko/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. t̪aN.pó.ko		*!		**	
b. t̪an.pó.ko			*!	**	
c. ☞ t̪am.pó.ko				***	
d. t̪an.tó.ko	*!			*	*

In order to account for the existence of transparent and opaque debuccalizing varieties, we will need to incorporate the constraint BASE-IDENTITY, as we did in our discussion of opaque /s/ debuccalization in section 5.1. As the following tableaux illustrate, it is the relative ranking of this constraint with respect to HAVEPLACE that accounts for the respective transparency or opacity of the realization of word-final, pre-vocalic nasals in each variety.

(129) Transparent nasal debuccalization

/alBuN/	IDONS (PA)	CODA-COND	HAVE PLACE	BASE-IDENTITY	*[-COR]	ID-IO (Place)
a. ál.βum		*!			**	
b. ál.βun		*!			*	
c. ☞ ál.βuN			*		*	

(130) Transparent nasal debuccalization

/eN||el/ Bases: [eN], [el]	IDONS (PA)	CODA-COND	HAVE PLACE	BASE-IDENTITY	*[-COR]	ID-IO (Place)
a. e.N||el			*!			
b. ☞ e.n||el				*		

(131) Transparent nasal debuccalization

/t̪aNpoko/	IDONS (PA)	CODA-COND	HAVE PLACE	BASE-IDENTITY	*[-COR]	ID-IO (Place)
a. t̪aN.pó.ko			*!		**	
b. t̪an.pó.ko		*!			**	
c. ☞ t̪am.pó.ko					***	
d. t̪an.tó.ko	*!				*	*

(132) Opaque nasal debuccalization

/alBuN/	IDONS (PA)	CODA-COND	BASE-IDENTITY	HAVE PLACE	*[-COR]	ID-IO (Place)
a. ál.βum		*!			**	
b. ál.βun		*!			*	
c. ☞ ál.βuN				*	*	

(133) Opaque nasal debuccalization

/eN||el/ Bases: [eN], [el]	IDONS (PA)	CODA-COND	BASE-IDENTITY	HAVE PLACE	*[-COR]	ID-IO (Place)
a. ☞ e.N||el				*		
b. e.n||el			*!			

(134) Opaque nasal debuccalization

/t̪aNpoko/	IDONS (PA)	CODA-COND	BASE-IDENTITY	HAVE PLACE	*[-COR]	ID-IO (Place)
a. t̪aN.pó.ko				*!	**	
b. t̪an.pó.ko		*!			**	
c. ☞ t̪am.pó.ko					***	
d. t̪an.tó.ko	*!				*	*

5.4 **On 'depalatalization'**

Although Harris himself reportedly no longer subscribes to it, his (1983) analysis of alternations such as those in the following data as being derived by a cyclical rule of 'depalatalization' has become something of a classic in the Spanish phonology literature (Pensado 1997).

(135) Examples of 'depalatalization'[43]

a.	doña	do.ɲa	Missus
	don	don	Mister
	dones	dó.nes	Misters
b.	desdeñar	dez.ðeɲár	disdain (verb)
	desdén	dez.ðén	disdain (singular noun)
	desdenes	dez.ðé.nes	disdains (plural noun)

5.4.1 ***The supposed uniqueness of palatals***

The very existence of a 'depalatalization' rule, separate from a general process of place neutralization affecting syllable-final nasals and laterals, assumes that palatals are different from non-palatals in some crucial way. A common justification for singling out palatals is their purportedly exceptional distribution. It has been noted, for example, that palatal consonants are "systematically absent" from syllable-final position (Carreira 1988b). While this is technically true, closer examination of the set of Spanish palatal consonants reveals that it is also irrelevant. The inventory varies by dialect, but all varieties include the alveopalatal affricate /ʧ/ and the palatal nasal /ɲ/.[44] Let us consider each of these in turn.

As we explained in chapter 1, no syllable-final affricates occur in native Spanish words. This is, however, most likely due to historical factors (Pensado 1985) rather

[43] Traditional analyses also include alternations involving the palatal lateral [ʎ] and its alveolar counterpart in words such as *doncella* 'maiden' and *doncel* 'page'. Since the alternation in question is of extremely limited distribution and is not critical to the analysis here, these data are not considered.

[44] Despite its extremely limited geographical distribution, the palatal lateral /ʎ/ is often included in traditional analyses due to the prestige associated with some of the dialects in which it appears.

than synchronic constraint interactions, as evidence by the fact that they are remarkably easy for native Spanish speakers to pronounce in this position, in both loans and nonce words (Luis Bonilla, personal communication).

As for the absence of palatal nasals in coda position, this is no more remarkable than the corresponding absence of labial nasals in the same environment—both can be attributed to the constraint-based limitations on coda consonants that we have been discussing throughout this chapter. However, while Carreira (1988b) notes that syllable-final palatal nasals can appear through assimilation to a following palatal consonant, she fails to point out that syllable-final labial nasals are only possible when formed by the same process. Thus, in the list of words she uses to support her claim that only palatal phonemes are banned from syllable codas, she gives *mimbre* [mim.bɾe] 'wicker'—a clear case of nasal assimilation—as an example of syllable-final [m].

5.4.2 *An OT analysis: take one*

Baković (1997) attempts to capture the relationship between words such as *desdeñar* and *desdén* in an OT framework. His analysis uses the following four constraints: *ɲ]$_{\sigma}$, FAITH-PL, *n, and IDENT-PL. The first of these, *ɲ]$_{\sigma}$, points to the marked status of syllable-final palatal nasals, a state of affairs we have sought to capture with CODA-COND, a constraint grounded in the marked status of codas that license place. The next constraint, FAITH-PL, is essentially equivalent to our ID-IO(Place). The third constraint in Baković's account, *n, implies that the alveolar nasal, regardless of its syllable position or segmental context, is somehow marked. However, considering the unmarked status of coronal place across languages, it seems difficult to find any grounding for such a constraint. Moreover, while it incurs a number of violations, its presence does not affect the selection of the optimal candidate in any of the tableaux presented. The opposite constraint, *[-COR], suggested by Prince and Smolensky (1993) and used in Baković (2000), seems far more valid. The fourth constraint, IDENT-PL, is an output-output constraint requiring that the segments in a derived form

(such as a plural) have the same place features as the corresponding segments in the surface realization of the corresponding base, provided that the base is a free morpheme. This constraint is used to handle what Baković refers to as 'overapplication', i.e. opacity, of depalatalization in the plural.

The first tableau is meant to show why the input /d̪esd̪eɲ/, traditionally assumed to have a final palatal nasal underlyingly, surfaces with a final alveolar nasal.

(136) Nasal Depalatalization: *ɲ]$_\sigma$ » FAITH-PL » *n

/d̪esd̪eɲ/	*ɲ]$_\sigma$	FAITH-PL	*n
a. d̪ez.ðéɲ	*!		
b. ☞ d̪ez.ðén		*	*

Notably absent, however, are candidates such as [dez.ðém], whose ill-formedness simply does not follow from Baković's hierarchy. As the following tableau demonstrates, if [dez.ðém] were included as a candidate in the above tableau, it would be selected, incorrectly, as optimal.

(137) Nasal Depalatalization 2: final [m]

/d̪esd̪eɲ/	*ɲ]$_\sigma$	FAITH-PL	*n
a. d̪ez.ðéɲ	*!		
b.☹ d̪ez.ðén		*	*!
c, ☞ d̪ez.ðém		*	

The next tableau attempts to account for what Baković sees as phonologically opaque depalatalization in the plural.

(138) Overapplication of Nasal Depalatalization: IDENT-PL » FAITH-PL

/d̪esd̪eɲ+es/	*ɲ]$_\sigma$	IDENT-PL	FAITH-PL	*n
a. d̪ez.ðé.ɲes		*!		
b. ☞ d̪ez.ðé.nes			*	*

While this does accomplish the goal of deriving an alveolar nasal in the plural, it does so on the basis that the realization of the nasal in question is required, by an

output-output identity constraint that Baković refers to as IDENT-PL, to match its realization in the corresponding singular. As we discussed in chapter 5, in many dialects of Spanish, syllable-final nasals are debuccalized. In these varieties, the final segment of the singular *desdén* is realized as a placeless nasal glide, that is, the word is pronounced [d̪ez.ðéN]. If Baković's analysis were correct, we would expect this same placeless nasal to surface in the plural in these dialects, i.e. [d̪ez.ðé.Nes]. However, the nasal in question is alveolar in the plural in all varieties. Clearly something is wrong. As we will argue below, the problem lies in the very notion of 'depalatalization'.

5.4.3 *An OT analysis: take two*

Pensado (1997), based upon the results of a nonce-probe experiment designed to determine whether Spanish speakers derive the noun *desdén* and the verb *desdeñar* from a common root /desdeɲ/, concludes that they do not and points out, moreover, that there is really no evidence that depalatalization is or ever was a productive rule. As the following tableaux illustrate, 'depalatalization' is nothing more and nothing less than a manifestation of nasal place neutralization.

(139) Non-debuccalizing

/d̪esd̪eN/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. d̪ez.ðéN		*!			
b. d̪ez.ðém			*	*!	
c. ☞ d̪ez.ðén			*		
d. d̪ez.ðéɲ			*	*!	

(140) Non-debuccalizing

/d̪esdeN|es/	IDONS (PA)	HAVE PLACE	CODA-COND	*[-COR]	ID-IO (Place)
a. d̪ez.ðé.Nes		*!			
b. d̪ez.ðé.mes				*!	
c. ☞ d̪ez.ðé.nes					
d. d̪ez.ðé.ɲes				*!	

(141) Debuccalizing

/d̪esd̪eN/	IDONS (PA)	CODA-COND	HAVE PLACE	*[-COR]	ID-IO (Place)
a. ☞ d̪ez.ðéN			*		
b. d̪ez.ðém		*!		*	
c. d̪ez.ðén		*!			
d. d̪ez.ðéɲ		*!		*	

(142) Debuccalizing

/d̪esd̪eN|es/	IDONS (PA)	CODA-COND	HAVE PLACE	*[-COR]	ID-IO (Place)
a. d̪ez.ðé.Nes			*!		
b. d̪ez.ðé.mes				*!	
c. ☞ d̪ez.ðé.nes					
d. d̪ez.ðé.ɲes				*!	

5.5 **Conclusion**

In this chapter, we have demonstrated not only that an OT analysis can account for dialectal variation, but also that such variation can be captured in the form of (often very slight) differences in the relative ranking of a small set of universal constraints. Moreover, we have seen additional examples of how phonological opacity can be handled in OT using output-output constraints such as Kenstowicz's (1995) BASE-IDENTITY and UNIFORM EXPONENCE. Last but not least, invoking and developing this framework has allowed us to revisit traditional analyses in light of recent theoretical and investigative developments. In the next chapter, we will present the last of our case studies: an OT analysis of Spanish plural formation.

6 AN OT ANALYSIS OF SPANISH PLURAL FORMATION

6.0 Introduction

Over the course of the last several decades, three competing theories of Spanish plural formation—apocope (Foley 1967, Harris 1969, 1970, Cressey 1978), epenthesis (Saltarelli 1970, Contreras 1977, Piera 1982), and the so-called 'nonconcatenative' solution (Harris 1980, Núñez Cedeño 1989)—have been presented, attacked, and defended in the literature. In this chapter, we begin by reviewing the literature on Spanish pluralization. We then present a novel, constraint-based analysis which, we argue, succeeds where others have failed. Avoiding many of the problems that have plagued previous analyses, it provides a more eloquent and explanatory account of the relevant data.

This chapter is organized as follows. In section 6.1, we lay the groundwork for our discussion by reviewing the relevant data. Section 6.2 summarizes prior accounts, highlighting the strengths and weaknesses of each one. In section 6.3, we present and defend our OT analysis of Spanish pluralization. Section 6.4 concludes.

6.1 The data

In Spanish, the surface forms of plural nouns and adjectives exhibit systematic differences with respect to their singular counterparts. The following data summarize these differences as they are observed in standard dialects.[45]

[45] Even within the scope of what can be considered 'standard' dialects, there are many words for which more than one plural form is acceptable. Some authors, notably Otero (1971) and Piera (1982), have argued for the exclusion of certain data on the basis that they are unproductive and/or unnatural, i.e. the result of prescriptive pressure rather than a generative reality.

(143) A form whose singular ends in a vowel acquires a final [s][46] in the plural.[47]

Singular			Plural		
casa	ká.sa	house	casas	ká.sas	houses
llave	ɟ͡ʝá.βe	key	llaves	ɟ͡ʝá.βes	keys
taxi	t̪áG.si	taxi	taxis	t̪áG.sis	taxis
libro	lí.βro	book	libros	lí.βros	books
tribu	t̪ɾí.βu	tribe	tribus	t̪ɾí.βus	tribes

(144) A form whose singular ends in a consonant other than [s], or ends in [s] but is monosyllabic or has final stress, acquires a final [es] in the plural.[48]

Singular			Plural		
ciudad	sju.ðá(D̪)	city	ciudades	sju.ðá.ðes	cities
avión	a.βjón	airplane	aviones	a.βjó.nes	airplanes
ángel	áŋ.xel	angel	ángeles	áŋ.xe.les	angels
actor	aG.t̪óR	actor	actores	aG.t̪ó.res	actors
as	as	ace	ases	á.ses	aces
mes	mes	month	meses	mé.ses	months
japonés	xa.po.nés	Japanese	japoneses	xa.po.né.ses	Japanese
país	pa.ís	country	países	pa.í.ses	countries

[46] The plural marker is realized [h] in debuccalizing varieties, as we will discuss in section 6.3.

[47] There exists a certain amount of variation in the case of bases that end in stressed vowels—particularly stressed high vowels. Thus, the plurals of forms such as *colibrí* [ko.li.βɾí] 'hummingbird' and tabú [t̪a.βú] 'taboo', for example, can be pronounced either [ko.li.βɾís] or [ko.li.βɾí.es] and [t̪a.βús] or [t̪a.βú.es], respectively. Similarly, the plurals of words that end in a vowel followed by /i/ generally acquire a final [es] in the plural, e.g. the plurals of *ley* [lei] 'law' and *rey* [rei] 'king' are pronounced [lé.ɟ͡ʝes] and [ré.ɟ͡ʝes], respectively. The productivity of both of these pluralization processes has been questioned, however, on the basis of native speakers' intuitions, dialectal variation, and the failure of the 'rules' in question to apply to recent loanwords (Otero 1971, Piera 1982).

[48] The plural form of some compounds may present an exception to this generalization. The plural of the noun *ciempiés* [sjem.pjés] 'centipede', for example, is invariable in standard Spanish, a fact which is generally explained on the basis that the second element of the compound—*pies* 'feet'—is already plural. Nonetheless, the plural *ciempieses* [sjem.pjé.ses] is attested in some varieties.

(145) A form whose singular ends in [s], is polysyllabic, and does not have final stress has an invariable plural.[49]

Singular			Plural		
lunes	lú.nes	Monday	lunes	lú.nes	Mondays
virus	bí.rus	virus	virus	bí.rus	viruses
análisis	a.ná.li.sis	analysis	análisis	a.ná.li.sis	analyses
tesis	té.sis	thesis	tesis	té.sis	theses

6.2 **Previous accounts**

In traditional grammars, e.g. those of the Royal Academy of the Spanish Language, Spanish pluralization has been regarded as a concatenative process in which one of three plural morphemes—{*-s*}, {*-es*}, or Ø—is attached to the right edge of the singular form of a noun or adjective as part of its derivation. According to such accounts, which of these morphemes is used is determined by the phonological shape of the corresponding singular, as summarized in section 6.1 above. Beginning with Foley (1967), generative linguists have looked for a way to derive the relevant surface forms from a single plural morpheme using a combination of independently motivated, rule-governed processes. These efforts, summarized below, have centered around essentially three major theoretical viewpoints: apocope, epenthesis, and nonconcatenative morphology.

6.2.1 ***Apocope***

In response to Saporta's (1965) attempt to present a generative 'rule' of Spanish plural formation (more a summary of the data than an actual generative rule), Foley

[49] As Piera (1982) points out, there are about three words in general use which, in dialects that lack a phonemic distinction between /s/ and /θ/, provide exceptions to this last generalization: *lápiz* [lá.pis] 'pencil', *cáliz* [ká.lis] 'chalice', and *alférez* [al.fé.res] 'second lieutenant', whose plurals are [lá.pi.ses], [ká.li.ses], and [al.fé.re.ses], respectively. Otero (1971: 112-113) argues, using these and other examples, that the above-mentioned distinction still exists underlyingly in these dialects. Harris, on the other hand, makes it quite clear that, while he is open to the possibility that the segments in question may have some distinctive representation in the lexicon, he sees no evidence that they are underlyingly /θ/ (1969: 205). For the sake of our present analysis, we will simply consider these forms exceptional. Not surprisingly, the above nouns have regular, i.e. invariable, plurals in some dialects (Saporta 1965).

(1967) published an account based on apocope. The central argument of Foley's proposal is that there is no need to posit three allomorphs of the plural morpheme if we simply recognize the interaction of three fundamental phonological processes in the grammar of Spanish: contraction, shortening, and apocope. Foley formulates these as follows.

(146) Contraction:
[X][Y] → [X, +long] where X is not different from Y

(147) Shortening:
[ ] → [-long]

(148) Apocope
e → Ø / V(C)__#

Given these rules, Foley argues, pluralization is a simple matter of adding {-s} to the singular. In the case of words with invariable plurals that end in [s] in the singular, such as those listed in the third data set in section 6.1, the first two rules see to it that the resulting [ss] sequence is reduced to a single, short [s]. To account for words that acquire a final [es] in the plural, such as those whose singulars end in a consonant other than [s] or whose singulars end in [s] but are monosyllabic or have final stress, examples of which appear in the second data set in section 6.1, as well as those whose singulars end in a stressed vowel, such as *carmesí* [kaR.me.sí] 'scarlet' and *tisú* [t̪i.sú] 'tissue', whose plurals, according to Foley's data, are pronounced [kaR.me.sí.es] and [t̪i.sú.es], respectively, Foley posits the presence of an abstract final /e/ in the underlying representation which surfaces in the plural but, in the singular, is deleted by his apocope rule. All other nouns and adjectives simply acquire a final [s] in the plural and, therefore, are entirely unproblematic.

As Foley (1967) and Harris (1969, 1970) point out, besides streamlining the description of Spanish pluralization, positing an abstract final /e/ in the underlying representation of words that acquire a final [es] in the plural also simplifies stress assignment in that a far greater number of words can be said to have unmarked, i.e. antepenultimate, stress (assuming that stress assignment precedes apocope). Thus, positing a UR of /Rasone/ for the word *razón* [ra.són] 'reason', for example, is said to explain not only why its plural is pronounced [ra.só.nes] but also why its singular form has final stress. Lastly, the presence of an abstract final /e/ makes it possible to attribute a number of otherwise inexplicable k → s alternations to velar softening. Thus, the assibilation of the /k/ in *vocal* [Bo.kál] 'vocal' in *voz* [Bos] 'voice' is explained by the fact that the latter is underlyingly /Boke/.

Unfortunately, apocope as an analysis, was found to have some very serious drawbacks which ultimately led to its demise in the late 1970s. In addition to the sizeable lexical burden entailed by adding a final /e/ to all nouns and adjectives with {-es} plurals (a segment which must then be deleted in the singular), the very presence of an apocope rule in the grammar of Spanish (reproduced below for the reader's convenience), implies that no word should exist with a final [e].

(149) Apocope
e → Ø / V(C)__#

With relatively little effort, however, we can encounter a disconcertingly large number of counterexamples, including, rather ironically, *apócope* [a.pó.ko.pe] 'apocope'.

(150) A few examples of words with final [e]

a.	índice	íⁿ.ⁿdi.se	index
	apéndice	a.péⁿ.ⁿdi.se	appendix
b.	hombre	óm.bre	man
	alegre	a.lé.ɣre	merry
c.	come	kó.me	he/she/it eats
	comiste	ko.mís.t̪e	you ate
d.	torre	t̪ó.re	tower
	calle	ká.ʝe	street
e.	ele	é.le	'l' (the letter)
	ene	é.ne	'n' (the letter)

In his original analysis, Foley (1967) mentions several such examples and immediately begins to enumerate exceptions such as the following. Apocope only applies to what he calls 'native' Spanish words and not more recent Latin borrowings, e.g. in words like those in (a). Furthermore, it does not apply when the /e/ is preceded by two contiguous consonants, e.g. in words like those in (b). It does not apply, moreover, to conjugated verbs, e.g. the forms in (c). Nor does it apply following geminates (which, he argues, are underlying in the words in (d). However, even if we accept all these seemingly rather ad-hoc additions to the original apocope rule, as Otero points out, the failure of apocope to apply to the names of letters, e.g. those in (e), proves far more difficult to explain away (1971).

Faced with the above-mentioned inconsistencies, which were compounded by additional objections related to depalatalization, and weakened by a reformulation of stress assignment rules in a way that did not require an underlying final /e/ to regularize word-final stress (see Contreras 1977), apocope quietly passed away. As Harris later wrote, "Helen Contreras (1977) has recently observed that the most detailed Apocope analysis, namely that of Harris (1969), is empirically wrong in a crucial way. […] Suffice it to say here that I see no motivation for attempting to rescue this type of analysis" (1980: 17). The alternative that Contreras (1977), following Saltarelli (1970) proposed was an analysis based upon epenthesis. Harris, however, never actually accepted the

epenthesis analysis and went on to propose a new account based on 'nonconcatenative' morphology, which we will discuss in subsection 6.2.3.

6.2.2 *Epenthesis*

In response to Foley's apocope theory, Saltarelli (1970) proposed an alternative hypothesis based on epenthesis. This approach seeks to extend the familiar rule of [e] prothesis, i.e. Ø → e / #__sC, seen in countless examples such as /sposo/ → [es.pó.so] 'spouse' and /spaɲol/ → [es.pa.ɲól] 'Spanish', to word-final s-clusters formed as a result of the concatenation of the plural morpheme, i.e. {-s}, to the right edge of singular nouns and adjectives. Saltarelli notes that, in order to account for plurals such as *carmesíes* [kar.me.sí.es] 'scarlet' and *tisúes* [t̪i.sú.es] 'tissues', the environment triggering [e] epenthesis to break up word-final s-clusters has to be modified to include an /s/ following a stressed vowel. Unfortunately, this has the undesired result of producing plurals such as *[pa.pá.es] 'parents / fathers' and *[ma.má.es] 'mothers'. Furthermore, although forms such as *[ka.fé.es] and *[pjé.es] are taken care of by the contraction and shortening rules posited in Foley's analysis, Saltarelli admits that he has no way of preventing his rule from producing *[lú.ne.ses] and *[a.ná.li.si.ses] as the plurals of *lunes* [lú.nes] 'Monday' and *análisis* [a.ná.li.sis] 'analysis', respectively, whose plurals are invariable.

In additional to the problems pointed out by Saltarelli himself, Harris (1970) makes a strong case for the fact that the epenthesis rule that applies to initial s-clusters cannot be extended to final s-clusters in order to account for {-es} plurals. As Harris explains, epenthesis with initial s-clusters is entirely without exceptions and is quite difficult for Spanish speakers to overcome when learning English. Final s-clusters, on the other hand, are at least marginally possible in Spanish, as evidenced by singulars and plurals such as the following, whose exceptional nature was discussed in chapter 3.

(151) Words with final s-clusters

a.	vals	bals	waltz
	tórax	tó.ɾaGs	thorax
	bíceps	bí.seBs	biceps
b.	clubs	kluBs	nightclubs
	fracs	fraGs	tuxedos
	carnets	kaR.néD̪s	I.D. cards

Contreras (1977) tries to resolve some of these problems by positing a separate epenthesis rule for word-final s-clusters and modifying the environment in which it applies to exclude any /s/ following a voiceless stop. As we pointed out in chapter 3, however, this fails to account for plurals such as *yens* [ɟ͡ʝens] 'yen' (Japanese currency). We will discuss these issues further when we present our OT analysis in section 6.3.

6.2.3 *The 'nonconcatenative' solution*

In light of the shortcomings of both apocope and epenthesis, Harris (1980) proposed an entirely new analysis of Spanish plural formation based on nonconcatenative morphology. As Harris explains, unlike traditional morphology, which involves the concatenation of affixes to roots, nonconcatenative morphology uses prosodic templates which are filled in by existing and, if necessary, epenthetic material.

In the case of Spanish plurals, Harris claims that nouns and adjectives with invariable plurals, e.g. *dosis* [d̪ó.sis] 'dose', are morphologically complex, i.e. that *dosis* is underlyingly bimorphemic /D̪os|is/ (c.f. *dosificar* [d̪o.si.fi.káR] 'to dose', *[d̪o.si.si.fi.káR]) and that their final morpheme is of the form Vs, the same as that required by the plural template. Nouns and adjectives with variable plurals, on the other hand, e.g. *lápiz* [lá.pis] 'pencil' → *lápices* [lá.pi.ses] 'pencils', are monomorphemic (c.f. *lapicero* [la.pi.sé.ɾo] 'pen', *[la.pé.ɾo]). This seems plausible, assuming it can be shown to be true of plurals throughout the language.

Unfortunately, as Piera (1982) demonstrates, there exist both morphologically complex forms ending in Vs with variable plurals and monomorphemic forms with

invariable plurals. Examples of the former include the deadjectival noun *idiotez* [i.d̪jo.t̪és] 'idiotic thing / act', which is pluralized [i.d̪jo.t̪é.ses] (c.f. *idiota* [i.djó.ta] 'idiot'), as well as countless adjectives of nationality such as *francés* [fran.sés] 'French', which is pluralized [fran.sé.ses] (c.f. *Francia* [frán.sja] 'France'). Examples of the latter include monomorphemic proper names such as *Marcos* [máR.kos] and *Dimas* [dí.mas], which have invariable plurals.

6.3 **An OT analysis**

As for prior OT analyses of Spanish pluralization, it seems there is very little precedent. Probably the most closely related article is Morales-Front and Holt's (1997) analysis of plural formation in Portuguese. As it works out, the facts are remarkably similar and, with a few minor adjustments, many of the same arguments can be applied to Spanish. In addition to a few language-specific adaptations, some general theoretical modifications will be suggested which may well be applicable to future analyses of Portuguese.

6.3.1 ***The data***

As Piera (1982) points out, a major problem with previous accounts of Spanish plural formation has been the absence of a distinction between the plurals that result from synchronically productive morphological processes, and those that are merely artifacts of historical development that have been promoted and maintained by prescriptive pressure and/or the media. In the absence of such an understanding, many previous analyses have resorted to overly complex, ad-hoc devices, attempting to provide a unified account of data stemming from both of these sources. For the purposes of our present discussion, the following data (largely reproduced from section 6.1), which are representative of the vast majority of Spanish plurals, will be considered to exemplify productive pluralization.

(152) A form whose singular ends in a vowel and acquires a final [s] in the plural.

Singular			Plural		
casa	ká.sa	house	casas	ká.sas	houses
llave	ɟʝ̞á.βe	key	llaves	ɟʝ̞á.βes	keys
taxi	t̪áG.si	taxi	taxis	t̪áG.sis	taxis
libro	lí.βro	book	libros	lí.βros	books
tribu	t̪rí.βu	tribe	tribus	t̪rí.βus	tribes

(153) A form whose singular ends in a consonant other than [s], or ends in [s] but is monosyllabic or has final stress, and acquires a final [es] in the plural.

Singular			Plural		
ciudad	sju.ðá(D̪)	city	ciudades	sju.ðá.ðes	cities
avión	a.βjón	airplane	aviones	a.βjó.nes	airplanes
ángel	áŋ.xel	angel	ángeles	áŋ.xe.les	angels
actor	aG.t̪óR	actor	actores	aG.t̪ó.ɾes	actors
as	as	ace	ases	á.ses	aces
mes	mes	month	meses	mé.ses	months
japonés	xa.po.nés	Japanese	japoneses	xa.po.né.ses	Japanese
país	pa.ís	country	países	pa.í.ses	countries

(154) A form whose singular ends in [s], is polysyllabic, and does not have final stress, and has an invariable plural.

Singular			Plural		
lunes	lú.nes	Monday	lunes	lú.nes	Mondays
virus	bí.ɾus	virus	virus	bí.ɾus	viruses
análisis	a.ná.li.sis	analysis	análisis	a.ná.li.sis	analyses
tesis	té.sis	thesis	tesis	té.sis	theses

Moreover, as we began to discuss in chapter 3, even the following phonologically rather marginal but nonetheless productive forms will find a place in our analysis.

(155) The plural of a form whose final syllable has a complex coda.

Singular			Plural		
vals	bals	waltz	valses	bál.ses	waltzes
bíceps	bí.seBs	biceps	bíceps	bí.seBs	biceps
tórax	tó.ɾaGs	thorax	tórax	tó.ɾaGs	thoraxes

(156) The plural of an unassimilated loanword that ends in a consonant and yet acquires a final [s] rather than [es] in the plural.

Singular			Plural		
club	klu(B)	nightclub	clubs	kluBs	nightclubs
frac	fra(G)	tuxedo	fracs	fraGs	tuxedos
carnet	kaR.né(D̪)	I.D. card	carnets	kaR.néD̪s	I.D. cards

Finally, the following plurals, treated as regular in some analyses despite the fact that they show a considerable amount of variability across and even within dialects and seem to have survived only on the basis of prescriptive pressure (Piera 1982), will be considered exceptional in the present account.

(157) The plural of a form ending in a stressed vowel that acquires [es] in the plural.[50]

Singular			Plural		
sofá	so.fá	sofa	sofaes	so.fá.es	sofas
colibrí	ko.li.βrí	hummingbird	colibríes	ko.li.βrí.es	hummingbirds
rondó	ron.d̪ó	rondo	rondoes	ron.d̪ó.es	rondos
tabú	t̪a.βú	taboo	tabúes	t̪a.βú.es	taboos

(158) Plurals of forms ending in [s], without final stress, that acquire [es] in the plural. (The following is practically an exhaustive list.)

Singular			Plural		
lápiz	lá.pis	pencil	lápices	lá.pi.ses	pencils
cáliz	ká.lis	chalice	cálices	ká.li.ses	chalices
alférez	al.fé.res	2nd lieutenant	alféreces	al.fé.re.ses	2nd lieutenants

(159) The so-called 'stress shifting' plurals (see Harris 1983: 131-135 for discussion). Again, there exist perhaps six such words in general use.

Singular			Plural		
régimen	ré.xi.men	regimen	regímenes	re.xí.me.nes	regimens
ómicron	ó.mi.kron	omicron	omicrónes	o.mi.kró.nes	omicrons
carácter	ka.ráG.t̪er	character	caractéres	ka.raG.t̪é.res	characters

[50] We argue, following Piera (1982) that only the competing plurals in [s], i.e., [so.fás], [ko.li.βrís], [ron̪.d̪ós], and [t̪a.βús], remain synchronically productive.

6.3.2 *The analysis*

Following Morales-Front and Holt (1997), let us assume that there exists a constraint, or perhaps an entire family of constraints, defining the obligatory surface manifestation of the plural morpheme, and quite possibly, that of other morphemes as well. In the aforementioned analysis, this constraint, which the authors label MORPH(OLOGY), is defined as follows.

(160) **MORPH**
The plural morpheme is /s/ and is realized at the end of the word.

As we will demonstrate following a brief review of the above-referenced analysis, a more appropriate constraint, at least for the formation of plurals in Spanish, is what we will call PLURAL(IZATION). This constraint is defined as follows.

(161) **PLURAL**
A noun or adjective with the feature [+plural] must end in a segment that corresponds to the phoneme /s/.[51]

In Morales-Front and Holt's account of Portuguese pluralization, all plurals are formed by first concatenating the plural morpheme—/s/—to the singular form. In an unmarked case, i.e. that of a form that ends in a vowel in the singular, this is all that is needed to derive the correct surface form. In the case of a form whose singular ends in a consonant other than [s], moreover, *eval* selects as optimal a candidate in which the complex coda contained in the faithful candidate is broken up through epenthesis. According to the authors, this occurs as a result of certain Portuguese phonotactic constraints, represented by the cover constraint SYLL, which dominate the anti-epenthesis constraint DEP-IO. Their analysis, up to this point, seems to work well enough and is

[51] The fact that this constraint requires a word-final plural marker that 'corresponds to the phoneme /s/', rather than 'is' [s] allows for debuccalization of the plural morpheme where dialectally appropriate.

compatible with the corresponding Spanish data, which we introduced and discussed earlier in this chapter.

Continuing with Morales-Front and Holt's analysis, the authors note that the plural of a Portuguese word whose singular ends in [s] and does not have final stress is invariable. As the reader may recall from our earlier discussion, this exactly parallels what we have observed in Spanish. The authors account for these facts using a series of constraints roughly equivalent to the contraction and shortening rules we discussed earlier in this chapter. These constraints see to it that the resulting /ss/ sequence surfaces in a form phonetically indistinguishable from the single, short [s] of the singular. In this last aspect of the analysis, we believe we may be able to offer a more elegant alternative by taking full advantage of the potential of a constraint-based theory. For the purposes of our present discussion, however, we will limit ourselves to applying these innovations to Spanish.

Assuming, as we did at the outset of our analysis, that there exists a constraint PLURAL requiring that Spanish nouns and adjectives with the feature [+plural] to end in a segment that corresponds to the phoneme /s/, and assuming, moreover, that this constraint dominates the anti-epenthesis constraint DEP-IO, as it does in Morales-Front and Holt's analysis of Portuguese, we see absolutely no reason, in a constraint-based theory in which lower ranked constraints may be minimally violated in order to satisfy their higher-ranking counterparts, to posit the concatenation of /s/ or any other type of plural morpheme. As the following tableaux illustrate, the correct surface forms follow directly from constraint interactions without the need for concatenation of a plural morpheme.

(162)

/kasa/ [+plural]	PLURAL	MAX-V-IO	*COMPLEX COD	DEP-IO	MAX-C-IO
a. ká.sa	*!				
b. kas		*!			
c. ☞ ká.sas				*	

(163)

/anxel/ [+plural]	PLURAL	MAX-V-IO	*COMPLEX COD	DEP-IO	MAX-C-IO
a. áŋ.xel	*!				
b. áŋ.xels			*!	*	
c. ☞ áŋ.xe.les				**	
d. áŋ.xes[52]	*!				

(164)

/t̪esis/ [+plural]	PLURAL	MAX-V-IO	*COMPLEX COD	DEP-IO	MAX-C-IO
a. ☞ té.sis					
b. tes		*!			*
c. té.si.ses				*!*	

Returning once more to Morales-Front and Holt's analysis, the plural of a Portuguese word whose singular ends in [s] and is monosyllabic or has final stress acquires a final [es] in the plural. Again, this observation exactly parallels the corresponding Spanish data. As the authors go on to explain, the concatenation of the plural morpheme does not affect stress assignment and, therefore, the plural /s/ is arguably never associated with a mora, a state of affairs enforced by the undominated presence of a constraint they call *MORA-PL(URAL), which we will define as follows.

(165) ***MORA-PL**

The final segment of a noun or adjective with the feature [+plural] must not be underlyingly associated with a mora.

In their analysis, the reduction, into a single, short [s], of the /ss/ sequence resulting from the concatenation of the plural morpheme to a word whose singular already ends in /s/ incurs a violation of this constraint if the /s/ of the singular is associated with a mora, that is, if the singular form of the word is monosyllabic or has

[52] This candidate violates PLURAL because its final [s] corresponds to an underlying /l/ rather than /s/.

final stress. As a result, *eval* selects a candidate in which the final /s/ of the singular is separated from the plural /s/ by an epenthetic vowel.

We propose to use this same constraint to account for the pluralization of Spanish nouns and adjectives whose singular ends in [s], but in a slightly different way. Instead of blocking the merger of an underlying /ss/ sequence into a single, short [s]—a formality necessitated by Morales-Front and Holt's claim that the plural morpheme is indiscriminately concatenated to every base regardless of its segmental structure—we posit that *MORA-PL determines whether *eval* will select a candidate with no epenthetic material, i.e. an invariable plural, or one in which an epenthetic [es] is used to satisfy PLURAL in the following way. If the final /s/ of the singular is not associated with a mora, i.e. the base in question is polysyllabic and does not have final stress, it satisfies both PLURAL and *MORA-PL and, therefore, an invariable plural is optimal. If, on the other hand, the final /s/ of the singular is underlyingly associated with a mora, i.e. the base in question is either monosyllabic or has final stress, its use as a plural marker would violate *MORA-PL, so *eval* selects a candidate with a final epenthetic [es]. The following tableaux illustrate this point.

(166)

/mes/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX$_{COD}$	DEP-IO	MAX-C-IO
a. mes			*!			
b. mess				*!	*	
c. ☞ mé.ses					**	

(167)

/xapones/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX$_{COD}$	DEP-IO	MAX-C-IO
a. xa.po.nés			*!			
b. xa.po.néss				*!	*	
c. ☞ xa.po.né.ses					**	

(168)

/t̪esis/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX$_{COD}$	DEP-IO	MAX-C-IO
a. ☞ té.sis						
b. tes		*!				*
c. té.si.ses					*!*	

This analysis works equally well for debuccalizing dialects, as illustrated in the tableaux below, in which we have incorporated NO-CODA(Obs) and HAVEPLACE in the ranking established in chapter 5.

(169) Debuccalizing

/kasa/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX^{COD}	DEP-IO	NO-CODA(Obs)	HAVEPLACE	MAX-C-IO
a. ká.sa	*!			*				
b. kas		*!				*		
c. kah		*!					*	
d. ká.sas					*	*!		
e. ☞ ká.sah					*		*	

(170) Debuccalizing

/anxel/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX^{COD}	DEP-IO	NO-CODA(Obs)	HAVEPLACE	MAX-C-IO
a. áŋ.xel	*!							
b. áŋ.xels				*!	*	*		
c. áŋ.xe.les					**	*!		
d. ☞ áŋ.xe.leh					**		*	
e. áŋ.xes	*!					*		

(171) Debuccalizing

/tesis/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX^{COD}	DEP-IO	NO-CODA(Obs)	HAVEPLACE	MAX-C-IO
a. té.sis						*!		
b. ☞ té.sih							*	
c. tes		*!				*		*
d. teh		*!					*	*

(172) Debuccalizing

/mes/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX^{COD}	DEP-IO	NO-CODA(Obs)	HAVEPLACE	MAX-C-IO
a. mes			*!			*		
b. meh			*!				*	
c. mess				*!	*	*		
d. mé.ses					**	*!		
e. ☞ mé.seh					**		*	

(173) Debuccalizing

/xapones/ [+plural]	PLURAL	MAX-V-IO	MORA-PL	*COMPLEX^{COD}	DEP-IO	NO-CODA(Obs)	HAVEPLACE	MAX-C-IO
a. ☞ xa.po.nés			*!			*		
b. xa.po.néh			*!				*	
c. xa.po.néss				*!	*	*		
d. xa.po.né.ses					**	*!		
e. xa.po.né.seh					**		*	

At this point in our analysis, only one example of what we have considered productive pluralization remains to be discussed. The plurals in this last group come from essentially two sources: they are either (a) very late Latin borrowings which have

undergone little or no phonotactic modification or (b) recent loanwords that also have yet to be fully phonologically assimilated into Spanish. The common link between them, as we discussed in chapter 3, is the feature [+foreign], which is justified on the basis of the exceptional phonological shape of their singular and/or plural forms, and consistent native-speaker judgments about their rather marginal status as members of the Spanish lexicon. However, as we explained in chapter 3, these words are in no way exempt from the phonotactic constraints we have been discussing throughout this thesis. On the contrary, they are evaluated identically with the exception of a single change in the constraint hierarchy: for these words, *COMPLEX^{COD}, which normally dominates DEP-IO, is instead dominated by it. As a result, these words are allowed to surface with word-final complex codas provided, of course, that the second member is [s]. The two data sets in which such examples were presented are repeated below for the reader's convenience.

(174)

Singular			Plural		
vals	bals	waltz	valses	bál.ses	waltzes
bíceps	bí.seBs	biceps	bíceps	bí.seBs	biceps
tórax	t̪ó.raGs	thorax	tórax	t̪ó.raGs	thoraxes

(175)

Singular			Plural		
club	klu(B)	nightclub	clubs	kluBs	nightclubs
frac	fra(G)	tuxedo	fracs	fraGs	tuxedos
carnet	kar.né(D̪)	I.D. card	carnets	kar.néD̪s	I.D. cards

The evaluation of the optimal singular and plural forms of a few representative examples is illustrated by the following tableaux.[53]

[53] Three additional constraints—CONTIG-IO, MAX-/s/-IO, and NO-CODA(OBS)—are included in this last set of tableaux because they play a deciding role in the selection of the optimal candidates.

(176)

/Bals/	CONTIG-IO	MAX-/s/-IO	PLURAL	MAX-V-IO	MORA-PL	DEP-IO	*COMPLEX^{COD}	NO-CODA(Obs)	MAX-C-IO
a. ☞ bals							*	*	
b. bal		*!							*
c. bas	*!							*	*
d. bá.les	*!					*		*	
e. bál.se						*!			
f. bál.ses						*!*		*	

(177)

/Bals/ [+plural]	CONTIG-IO	MAX-/s/-IO	PLURAL	MAX-V-IO	MORA-PL	DEP-IO	*COMPLEX^{COD}	NO-CODA(Obs)	MAX-C-IO
a. bals					*!		*	*	
b. bal		*!	*!						*
c. bas	*!				*!			*	*
d. bá.les	*!					*		*	
e. bál.se			*!			*			
f. ☞ bál.ses						**		*	

(178)

/Biseps/	CONTIG-IO	MAX-/s/-IO	PLURAL	MAX-V-IO	MORA-PL	DEP-IO	*COMPLEX^{COD}	NO-CODA(Obs)	MAX-C-IO
a. ☞ bí.seBs							*	**	
b. bí.seB		*!						*	*
c. bí.ses	*!							*	*
d. bí.se.pes	*!					*		*	
e. bí.seB.se						*!		*	

(179)

/Biseps/ [+plural]	CONTIG-IO	MAX-/s/-IO	PLURAL	MAX-V-IO	MORA-PL	DEP-IO	*COMPLEX^{COD}	NO-CODA(Obs)	MAX-C-IO
a. ☞ bí.seBs							*	**	
b. bí.seB		*!	*!					*	*
c. bí.ses	*!							*	*
d. bí.se.pes	*!					*		*	
e. bí.seB.se			*!			*		*	
f. bí.seB.ses						*!*		**	

(180)

/kluB/	CONTIG-IO	MAX-/s/-IO	PLURAL	MAX-V-IO	MORA-PL	DEP-IO	*COMPLEX^{COD}	NO-CODA(Obs)	MAX-C-IO
a. ☞ kluB[54]								*	
b. ☞ klu									*
c. klú.βe						*!			

(181)

/kluB/ [+plural]	CONTIG-IO	MAX-/s/-IO	PLURAL	MAX-V-IO	MORA-PL	DEP-IO	*COMPLEX^{COD}	NO-CODA(Obs)	MAX-C-IO
a. kluB			*!					*	
b. klus[55]			*!		*!			*	
c. ☞ kluBs						*	*	**	
d. klú.βes						**!		*	
e. klúB.ses						**!		**	

[54] As we noted in chapter 3, both [kluB] and [klu] are possible due to the variable ranking of NO-CODA(OBS) relative to MAX-C-IO.

[55] While it is true that the plural [klus] has also been documented, this is arguably the plural of the more completely assimilated noun /klu/, in which the deletion of the final obstruent has become lexicalized. As was the case with the plural [áŋ.xes], [klus] is eliminated as a candidate because its final [s] corresponds to an underlying /B/, a violation of undominated PLURAL.

6.4 **Conclusion**

This concludes our investigation of Spanish plural formation. As we have demonstrated, a constraint-based analysis can provide a more eloquent and explanatory account of the data than was possible in previous theoretical frameworks by eliminating the need for the concatenation of the plural morpheme in invariable plurals. Moreover, it does away with the need to posit a separate rule of pluralization for unassimilated loanwords or exclude these data as irregular insofar as their having a [Cs] plural follows from the same constraint ranking that allows such words to have a [Cs] singular (as we discussed in chapter 3).

This is, likewise, the conclusion of our thesis. As was our goal from the outset, we have investigated a considerable variety of phonotactically related phenomena in Spanish and have demonstrated how each and every one of these follows from constraint interactions within a single, unified hierarchy of universal constraints. We hope to have contributed to a better understanding of Spanish phonotactics which will, in turn, lead to a better understanding of syllable-level phonology in general.

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