Iberian Spirantization as a Syllable Contact Process

MARÍA M. CARREIRA
Department of Romance Languages and Literatures
California State University

This paper examines Spanish spirantization as a syllable contact phenomenon subject to the Syllable Preference Laws proposed by Murray and Venneman (1987). It proposes a rule that assigns the feature [+continuant] to a voiced obstruent, provided that a minimum sonority distance is maintained between the obstruent as a spirant and a preceding rhyme. Otherwise, the obstruent receives the specification [-continuant]. The minimum sonority difference between an onset and a preceding segment is subject to dialectal and stylistic variation, ranging from a distance of two, in spirantizing dialects, to a distance of seven, in dialects that show a preference for stops. This approach allows us to explain the range of variation inherent in Spanish spirantization as well as the right-environment conditions of Portuguese and Catalan spirantization.

I. Introduction

Spirantization in Spanish, the alternation between voiced obstruent stops and continuants, has been the subject of countless papers and discussions. Most analyses have accepted the facts in (1) as complete and representative of this phenomenon.

(1) The distribution of voiced obstruents in Spanish:

Stops [b, d, g]

N___	banda, hombre, tango
l ___ (only for /D/)	caldo, celda
After a pause	barco, diente, gato

Continuants [b, d, g]

V(G) ____	ca[β]ra, ca[δ]a, o[γ]o
r ____	ar[β]ol, par[δ]o, car[γ]o
l ____ (for /B/ and /G/)	al[β]a, al[γ]o
In syllable-final position	a[γ]nóstico, laú[δ], o[β]tuso

Based on these data, most analyses have represented the stop/spirant alternation as the result of a process of assimilation involving the feature continuant. However, a closer look at the dialectal variation in Spanish spirantization and in other Romance languages and Basque, reveals that the data in (1) represent one of many possible manifestations of this phenomenon. In fact, only two environments are consistent across all dialects in yielding a stop: after a nasal consonant and [d] after [l]. All other phonological contexts are subject to a tremendous range of dialectal variation. Accounting for this range of variation, as well as for the invariant environments, is the principal goal of the present analysis and is what sets it apart from previous work on spirantization.

II. Previous analyses

By an large, assimilation analyses of spiratization in Generative phonology fall into three categories: 1) those that allow assimilation of [-continuant] to take place between homorganic consonant clusters, 2) those that spread [+continuant] between nonhomorganic clusters, and 3) those that allow both values of this feature to spread.

Analyses of the first type, such as Lozano (1976) and Hualde (1988) assume that [l], like nasals, bears the feature value [-continuant]. This feature value may appear on a following voiced obstruent by assimilation when the obstruent and the preceding consonant are homorganic. It follows that post-nasal voiced obstruents and [d] in the sequence [ld] will be [-continuant], since such clusters are homorganic. Voiced obstruents in nonhomorganic clusters such as [lb] and [lg], as well as those that are not part of a consonant cluster, receive the default specification [+continuant]. The assimilation rules in both analyses are summarized below.

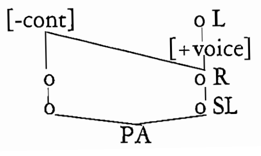
(2) Lozano (1976: 107)

$$[+\text{obstr}, +\text{voice}] - \left\{ \begin{array}{l} [-\text{cont}] \; / \left\{ \begin{array}{l} \left[-\text{round}\right] \\ \left[\begin{array}{l} -\text{obstr} \\ -\text{cont} \\ \text{p. art} \end{array}\right] \\ \left[\underline{\quad}\$C\right] \end{array} \right\} \quad (\#) \quad \left[\ \overline{\quad}\ \text{p. art}\right] \\ \\ [+\text{cont}] \end{array} \right.$$

= pause; p. art = point of articulation features
$= syllable boundary

Hualde (1988: 175)

Condition on spreading: homorganicity
Argument: [-cont]
Assumption: /l/ is [-continuant]
Default: [+voice, -sonorant] - [+cont]



The problem with analyses such as these, however, is that in some dialects of Spanish it is indeed possible to get non-homorganic consonant clusters that are [-continuant] (as in 3a). Moreover, it is also possible for [b] and [g] to surface as [-continuant] following continuants like [r] and [l] (as in 3b). Clearly, homorganicity is not a necessary or sufficient condition for adjacent consonants to agree on the value [-continuant].[1]

(3) a)	u[nd]edo	'a finger'	(Lozano 1979: 72)
	ané[kd]dota	'anecdote'	(Harris 1984: 150)
	a[bd]omen	'abdomen'	
	ami[gd]alas	'tonsils'	
b)	a[rb]ol	'tree'	(Malmberg 1965: 63, 70, 77)
	ve[rd]e	'green'	
	a[lg]o	'something'	

Harris (1984) posits a rule that spreads the feature value [+continuant]. Since this analysis assumes that [l] is [+continuant], it must explain why, in dialects represented by the data in (1), the lateral spreads its continuancy to [b] and [g], as in *arbol* 'tree' and *algo* 'something', but not to [d] (e.g. **caldo*).

Harris' solution to this problem invokes the Adjacency Identity Constraint, more recently known as Geminate Inalterability. According to Harris, this principle blocks the rule of continuancy assimilation from applying to homorganic clusters such as nasal-obstruent clusters and [ld].

(4) Harris (1984)
Restriction on spreading: Adjacency Identity Constraint
Argument: [+cont]
Assumption: [l] is [+cont]
Default: [+voice, -sonorant] -> [-cont]
[ ] [+obstr, +voice]
(+cont)

However, as Martinez-Gil (1992) points out, features that are not shared by adjacent consonants fall outside the scope of Geminate Inalterability. This is evidenced in Spanish by the fact that voicing assimilation applies between homorganic /sd/, yielding a voiced sibilant as in *de[z]de* 'since'. Crucially, if Geminate Inalterability can only block a phonological rule from altering the place node of homorganic clusters, it cannot account for the failure of [+continuant] to spread to the voiced obstruents in clusters such as [mb], [nd], [ld], etc.

Mascaró's (1984) solution to the problem presented by the lateral involves a rule of continuancy assimilation that spreads either value of the feature continuant to a voiced obstruent. For example, [s] spreads the feature [+continuant] to a following voiced obstruent, while [m] spreads [-continuant] to such a segment. The segment

(1) In Catalan, a language with a similar stop/spirant alternation as Spanish, stops always occur after nasals, even if the nasal is not homorganic with the stop. For an analysis of Catalan spirantization see *infra*.

[l] is able to spread both values of this feature because "...the narrowing of the vocal tract characteristic of laterals counts as blocked for the region where laterals are articulated, but as unblocked for other regions, just as nasals are fricatives in the nasal cavity but stops in the oral cavity." (p. 292). This means that for purposes of the continuancy assimilation rule, laterals are [-continuant] before coronals and [+continuant] elsewhere.

However, as Hualde (1988) observes, this solution suffers from circular reasoning since in order to know the continuancy value of [d] we must first determine whether or not [d] is preceded by an [l]. But in order know the continuancy value of [l] we must determine whether or not a [d] follows.

A second drawback of this solution is its inability to extend to Basque, a language with the same stop/spirant distribution as that assumed for Spanish by most analyses of spirantization.

(5) Basque spirantization (Mascaró 1984; 288-289)

a.	#____	[beso]	'arm'
b.	N ___	[isango]	'will be'
c.	ld	[saldi]	'fear'
d.	[-cons]____	[eγo]	'south'
e.	{r,r}____	[erβi]	'hare'
f.	l {b,g}____	[alβoa]	'the side'
g.	[-son, +cont] ___	[ezβay]	'doubt'

Hualde (1988) presents strong evidence in favor of the non-continuant status of Basque [l] in the presence of coronals and non-coronals alike. Since Mascaró's solution hinges on the dual nature of the lateral with respect continuancy, this solution cannot apply to Basque.

A review of the literature on dialectal variation reveals yet a more serious challenge to this, as well as other assimilation analyses of spirantization. Canfield (1981: 5) states:

> In the stream of speech of Colombia (except Nariño), El Salvador, Honduras, and Nicaragua, the occlusive allophone of the consonants /b/, /d/, and /g/, is heard after any consonant or semivowel... Lacayo (1954) noted the same consistency in Nicaragua, as I did (Canfield 1962b) during six months of teaching at the Instituto Caro y Cuervo, Bogotá, with trips to many parts of the country... Resnick (1976) rightly points out that nonstandard occlusive pronunciations are common in many regions others than those noted, but it has been my observation that, although recordings reveal occlusives where not expected in some speakers from Ecuador, Bolivia, Guatemala and Costa Rica, they do not show the consistent pattern of the four countries indicated... Many nonstandard occlusives are heard in the Caribbean area....The phrase "se ve muy verde esta tarde" is heard as [se be mwi bérde esta tárde], "Margarita ha dicho algo" is [margaríta a díco álgo], and "El buey volvió" becomes [el bwéj bolbjó].

Similar observations are also made by Malmberg (1965) and Castillo and Bond (1972). Sabino and Perisinotto (1975) note as well that in Mexico City Spanish /b/ and /g/ are frequently occlusive after /l/ and /r/, and /d/ is also often a stop after /s/.

Resnick's (1975) extensive analysis of Spanish dialects documents occlusive voiced obstruents after fricative consonants and occlusive [b] and [g] after [l] in dialects as varied as those of Costa Rica; Jalisco, Mexico; Cuba, Puerto Rico, Colombia, Ecuador and Argentina.

Amastae (1986) reports a high incidence of stops after these and other consonants in Colombian, Mexican, and Mexican-American Spanish. According to his data, the only environment showing across-the-board consistency with respect to continuancy is the post-nasal context and the [ld] sequence. The former context invariably yields a stop, while the former nearly always results in a stop.[2]

(6) Amastae (1986: 4) Percentage of fricatives

	(b)	(d)	(g)
Colombian Spanish			
V___V	77	98	42
G___	15	45	34
r___	8	24	18
l___	2	0	14
N___	0	0	0
s___	6	1	5
b,d,g___	-	1	6
Mexican Spanish			
V__V	63	98	50
G___	49	72	40
r___	30	83	21
l___	30	2	25
N__	0	0	0
s__	34	29	7
b,d,g___	-	5	1
Mexican-American Spanish			
V___V	47	99	37
G___	55	70	25
r___	30	91	14
l___	23	3	11
N__	0	0	0
s__	32	17	3
b,d,g__	-	13	4

These facts raise a number of questions for analyses of spirantization based on assimilation of continuancy: If vowels and glides bear the same specification for the feature [continuant] why are spirants more likely to occur after a vowel than after a glide? Why do /b/ and /g/ show inconsistent behavior with respect to continuancy after /l/ and /r/? And why is /d/ sometimes a stop after /s/? How is it possible, according to Amastae's data, for the second of two contiguous obstruents in words like *amigdalas* 'tonsils' and *subgobernador* 'subgovernor' to surface as a stop? Clearly, none of the analyses considered above can answer these in a satisfactory manner.

(2) Though these environments appear to be the most resistant to spirantization across all dialects, Hammond (1976) and Murillo (1978) both report cases of spirants in post-nasal position.

Amastae suggests a syllable-based analysis that makes use of two rules that apply in the order given below. First, a variable rule of resyllabification (7a) associates a voiced obstruent in syllable-initial position to a preceding rhyme, creating an ambisyllabic segment. Second, a rule of continuancy assignment (7b) makes voiced obstruents in the rhyme [+continuant] and those in syllable initial position [-continuant]. These rules and sample derivations are given below.

(7) Amastae (1986: 5, 6)

a. Associate a $\begin{bmatrix} \text{+obstr} \\ \text{+voice} \\ \text{+SI} \end{bmatrix}$ segment to a preceding rhyme

(variably, under certain conditions)

b. $[\text{+obstr, +voice}] \rightarrow \begin{Bmatrix} [\text{-cont}] \ / \ \begin{bmatrix} \text{—} \\ \text{+SI} \\ \text{-SF} \end{bmatrix} \\ [\text{+cont}] \ / \ \begin{bmatrix} \text{—} \\ \text{+SF} \end{bmatrix} \end{Bmatrix}$

c. 

Though Amastae's analysis presents the advantage of having a mechanism for dealing with dialectal variation, it suffers from two important flaws. First, it imposes a syllabification that is unattested in Spanish and highly marked in UG. For example, in order to account for the continuant pronunciation of the voiced obstruent in a word like *alba* 'sunrise', we would have to allow the segment [b] to resyllabify into the preceding rhyme, [alb.a].

The second problem with this analysis is that it fails to explain some of the questions raised by the very data it presents. Why are post-nasal [b,d,g] always [-continuant] while these same consonants are subject to a great deal of variability in continuancy following other consonants? Why is does the cluster [ld] obligatorily yield a stop while the other lateral-obstruent sequences do not? If the continuancy value of a voiced obstruent is a function of its position within the syllable, why does resyllabification freely apply to *algo* and *alba* creating the environment for [+continuant] assignment, while it never applies to *caldo*?

In fact, since [l] and [d] share point of articulation features, a coda with both these consonants should be less marked than one with either [lb] or [lg]. We would expect, therefore, for resyllabification, and hence spirantization, to be more common in [ld] clusters than in [lb] and [lg]. Similarly, given that nasal-obstruents clusters are never subject to spirantization, we would have to conclude that such clusters may never undergo resyllabification, perhaps due to sonority restrictions on the composition of the coda in Spanish. If that is the case, however, how do we explain the possibility of spirants in words like *ami[ɣ]dalas* 'tonsils' and *ad[β]iento* 'advent'? The codas created by resyllabification of both these words (ie. [a.migd.a.la], [adb.ien.to]) are more marked than those created in [amb.os] and [cand.e.la].

Despite these problems, I believe that Amastae is correct in suggesting that the stop/spirant alternations of Spanish are triggered by principles of syllable structure rather than by continuancy assimilation. In the next section I will argue that the Syllable Contact Law (Murray and Venneman 1983) and other syllable preference laws, regulate the stop/fricative alternations of Spanish.

III. Spirantization as a Syllable Contact Process

Murray (1987) and Murray and Venneman (1983) present a number of syllable preference laws that provide an evaluation measure of the markedness of any tautosyllabic consonant cluster. The Syllable Contact Law is as follows:

> (8) The preference for a syllabic structure A$B, where A and B are marginal segments and a and b are the consonantal strength values of A and B respectively, increases with the value of b minus a. (Murray and Vennemann 1983: 520)

The term "consonantal strength" establishes a hierarchical arrangement of segments that is the inverse of the sonority scale: the higher the consonantal strength index, the lower the sonority value of a segment.

The Syllable Contact Law has an important corollary which states that "the tendency for a syllabic structure A$B to change, where A and B are marginal segments and a and b are the Consonantal Strength values of A and B respectively, increases with the value of a minus b." (p. 520)

The development of the future form of the verb *venir* illustrates these principles at work. The form that resulted from syncope of the pretonic vowel was unacceptable because /r/ was not strong enough to begin a syllable after /n/. Though metathesis and assimilation were attempted, the solution that was ultimately settled on consisted of inserting an epenthetic obstruent between the nasal and the liquid. This is the solution that resulted in the greatest sonority difference between the rhyme and onset. This is illustrated below:

(9) Menéndez-Pidal (1980: 323)

venira >	venrá	>	verná	(metathesis)
	(syncope)	>	verrá	(assimilation)
		>	**vendrá**	(epenthesis)

A number of important proposals have been advanced regarding the role of the sonority hierarchy in Spanish syllable structure (see Harris 1989, Selkirk 1984 Murray 1987, and Hooper 1976). Based on these, I will assume the following sonority scale for Spanish sounds:

(10)

	Index	
weak	10	vowels
	9	glides
	7	r
	6	l
	5	nasals
	4	voiced continuants
	3	voiceless continuants
	2	voiced stops
strong	1	voiceless stops
-	sonority	+
affricates	**stops**	**continuants**

Following previous work done in Spanish as well as in other languages, I will also assume that within a given sonority class there can be sonority differences based on point of articulation (cf. Selkirk 1984, Brackel 1983, Ladefoged 1982, Steriade 1982).[3] In English, for example, Ladefoged (1982: 222) presents evidence for the following partial sonority ranking, where coronals are deemed to be higher in sonority: a> æ> ɛ> I> u> i> l> n> m> z> v> s> s> d> t> k. For Spanish, Hooper (1976) Murray and Vennemann (1983) argue that in Spanish coronals, and in particular dentals, are weaker or more sonorous than other segments. In support of this claim they point out that [d] is the only voiced obstruent in Spanish that occurs in morpheme-final and word-final position, and it is the most commonly deleted consonant in intervocalic position. /d/ and /t/ are also the only obstruents that do not form a complex onset with /l/. I will assume, therefore, that [d] is more sonorous than the other voiced obstruents, [b,g].

The stronger an onset consonant is, the more freely it can co-exist with rhyme consonants and still meet the minimum sonority distance of two. If coronals are weaker than other consonants then we expect to find more noncoronal voiced spirants than coronal ones in post-consonantal position. That is, we expect more clusters of the type [Cβ] and [Cγ] than of the type [Cδ]. This is because the consonants that constitute the former two clusters maintain a higher sonority difference than those of the latter.

The facts bear out this prediction. Tató (1981) reports on the observation made by Jorge Guitart that in certain dialects of Costa Rica there is a contrast between lar[γ]o and ver[d]e. With few exceptions, in Amastae's data /d/ is more often a stop in onset position than the other voiced obstruents. Similarly, Sabino and Persinotto note that in Mexican Spanish [b] and [g] surface as continuants after [s], while [d] tends to be a stop in this environment.

Spanish employs a number of repair strategies that raise the consonantal strength value of onsets that do not meet the desired sonority profile of coda-onset sequences.

(3) Clements (1991) and Rice (1992) reject the notion that point of articulation features play a role in computing the sonority index of a segment. Unfortunately, these proposals do not appear to explain the full range of behavior of [d] and [t] in Spanish and for this reason I will not consider them here.

For example, syllable-initial /y/ may surface as an affricate after a consonant or pause. In other environments it appears as a continuant, with varying degrees of friction. This process is subject to differences in register, rate of speech and dialect.[4]

(11)	yeso	'gypsum'	[en+yesar]	'to put in a cast'
			[de yeso]	'of plaster'
	yacer	'to lie'	[ad+yacente]	'next to'
			[un hombre yace]	'a man is lying'

It is striking that this repair strategy results in an alternation similar, in some respects, to that of voiced obstruents. Following a consonant, an affricate results, while in intervocalic position we obtain a fricative. This suggests that the process illustrated above and the spirant/stop alternation might be regulated by the same principles.

Let us pursue this line of thought and assume that there is a default rule (12) that assigns the value [+continuant] to voiced consonants (except nasals) provided that the resulting segment meets the appropriate sonority specifications for its context. Let us also make the assumption that Spanish requires a minimum sonority distance of two between a rhyme and a following onset. This is formalized below.

(12) Continuancy Assignment:
Given A$B, where B is [+voice, -nasal]
a) B -> [+continuant] if the sonority value of A minus the sonority value of the resulting spirant is greater than or equal to two.
b) Otherwise: B -> [-continuant]

Let us consider how this rule affects voiced obstruents in post-nasal position. Since the difference between the sonority index of nasals (5) and voiced spirants (4) is less than two, Continuancy Assignment will mark voiced obstruents after nasals as [-continuant]. This is shown below.

13) Sonority difference	5 - 4 = 1	5- 2 = 3
	*am βos	am bos
	[+continuant]	[-continuant]

We have claimed that within a sonority category coronals are more sonorous than other segments. It follows that [d] will have a higher sonority index than [b] and [g]. The exact value of the sonority index of [d] is not crucial to the issue at hand, what matters is that the sonority value of continuant [d] will be greater than four, the index of the other voiced continuants. The difference then, between the sonority index of [l] and that of [d] will be less than two. Therefore, [d] will be assigned the specification [-continuant] when it follows the segment [l̪]. In this same environ-

(4) Strengthening of syllable initial [y] often results in an affricate. I will assume that, as is the case with spirantization, this operation involves inserting the feature [-continuant]. The fact that [y] surfaces as an affricate while the voiced obstruents surface as a stop is a property of the mechanics of the insertion operation that I will not pursue here.

ment, the other voiced obstruents may be [+continuant], because the sonority difference is exactly two, the minimum distance required by Continuancy Assignment.

How do we explain the high incidence of voiced stops in words like *alba* and *algo* in Canfield's and Amastae's data? The Syllable Contact Law and its corollary stipulate that the likelihood of obtaining a continuant in onset position goes down as the difference between the sonority index of the rhyme and the onset decreases, or in this case, as the difference approaches a value of two. It follows that the voiced obstruent in consonant sequences which bear a sonority difference of two, (such as [lb] and [lg]) will exhibit a tendency, rather than an absolute requirement, to surface as stops. By the same logic, we predict that consonant sequences with a greater sonority difference than two will be more likely to undergo spirantization than [lb] and [lg]. That is, we predict that the greater the sonority value of the coda consonant preceding the voiced obstruent, the more likely it is that a spirant will follow. Conversely, the lower the sonority value of the preceding coda, the higher the probability of obtaining a stop.

Amastae's data provide confirmation of this. Notice that for many voiced obstruents in onset position, the percentage of continuants does down in proportion to the difference in sonority between a rhyme and a following onset. Thus, as we scan Amastae's columns from top to bottom, we find a decrease in the number of fricatives, just as the sonority value of the consonant column decreases from top to bottom. For example, in Colombian Spanish there are more velar spirants after glides (34%) than after [r] (18%) and the number of bilabial spirants after [r] (18%) is higher than that after [l] (14%). The latter, in turn, exceeds the percentage of velar fricatives after [s] (5%).

A related prediction of our analysis is that the probability of obtaining a spirant in the cluster [ld] is greater than in post-nasal position, since the lateral and [d] maintain a greater distance in sonority than the segments [nd]. This prediction is borne out in Amastae's data. Notice that in Mexican-American Spanish and in Mexican Spanish the [ld] clusters yields a spirant in 3% and 2% of the cases, respectively, while [nd] never yields a fricative in either dialect.

Canfield (1981) mentions the existence of dialects where spirants are allowed only in post-vocalic position. For these regions we would restrict the difference between A and B in the Continuancy Assignment Rule to be a number greater than seven. This represents the maximum possible value of A minus B which still maintains a stop/spirant alternation.

Voiced obstruents following a pause require a special explanation since it is not readily apparent how Continuancy Assignment will supply a value to these segments. One possibility is to consider the sonority value of a pause to be "0". If this value is inserted into the Continuancy Assignment Rule as the "a" part of the equation, the result will be a negative number. The obstruent will therefore not quality for [+continuant] assignment.

An alternative, less mechanical, analysis of this is provided by the Syllable Onset Law. This law claims that "A syllable structure \$CV\$ is more preferred the greater the consonantal strength value of C." (Murray 1987: 120). This means that other things being equal, a stop makes a better onset than a continuant.

It is interesting that Navarro Tomás (1965) reports that in Castilian Spanish it is possible to obtain oclusives in intervocalic position in emphatic speech. Amastae (1986) also reports that onset oclusives are more frequent in stressed syllables. These facts suggest that onsets in phonetically salient positions are particularly susceptible to the Syllable Onset Law.

On the other hand, in syllable final position, we expect the opposite situation to hold, namely, continuants should be favored. This prediction is borne out by the facts. All dialects, to a greater or lesser degree, show a preference for spirants in syllable-final position.

Finally, let us consider what happens to voiced-obstruent sequences in a word like *amígdalas* 'tonsils'. Our analysis predicts that the segment [g] will be [+continuant] while [d] will be [-continuant], as these are the specifications that maximize the difference in sonority between the rhyme and onset. Amastae's data bear out this prediction. Almost all of syllable-initial voiced obstruents in this environment are indeed [-continuant].

But what about the so called "standard dialects" where both members of a voiced obstruent sequence are claimed to be [+continuant]?[5] And what about the few cases in Amastae's data of sequences of [-continuant] segments?

As far as I have been able to ascertain, the overwhelming majority of obstruent sequences in Spanish are separated by a morpheme boundary as in *ad+[b]erso* 'adverse' and *sub+desarrollo* 'undervelopment'. In fact, I know of only two popular lexical items for which this is not the case: *amígdalas, Magdalena*, and two very unusual first names: *Midgalia*, *Obdulia.*[6] This is significant for two reasons. First, given the relative abundance of heteromorphemic voiced-obstruent clusters and the rarity of such clusters in tautomorphemic environments, we must conclude that the assertion that in standard dialects such clusters are [+continuant] is based by and large on the examination of heteromorphemic clusters. It is altogether possible, therefore, that such an assertion may only apply to heterosyllabic consonant sequences. This is significant because the conditions that govern syllabic wellformedness across morpheme boundaries are often more lax than those that apply to morpheme-internal sequences. This means that the concept of minimal sonority distance might not be as rigidly constrained across morpheme boundaries. This being the case, it should not surprise us to find consonant sequences that do not meet the minimum sonority distance profile across morpheme boundaries. However, even if upon closer inspection we were to find that tautomorphemic clusters of voiced obstruents are indeed [+continuant], our analysis would not be invalidated. In Spanish, syllable-final obstruents are often drastically reduced, when they are not deleted (cf. Martínez-Gil

(5) I am using the term "standard dialect" in a rather nonstandard way to denote those dialects which have been observed to follow the pattern of spirantization presented in 1). These dialects are primarily found in Spain.

(6) In fact, these names are so unusual that most of the speakers I consulted had never heard of them.

(1991). It is altogether possible, therefore, that this reduction results in a higher sonority index for the syllable-final obstruent. This being the case, the sonority difference between a reduced obstruent coda and a following voiced obstruent might reach or exceed the minimum value of two required for assigning the specification [+continuant].[7]

It is crucial to remember that Syllable Preference Laws express universal tendencies rather than strict requirements for syllabic well-formedness. These tendencies can be overridden by factors such as register, rate of speech, and the type of word under consideration (ie. whether it is a "learned" or a "popular" word). When applied to the phenomenon of Spanish spirantization, however, these laws allow a range of variation and set up an implicational hierarchy of spirantization environments that is consistent with the dialectal data available.

These laws also allow for an insightful analysis of spirantization in Catalan and Portuguese. As is the case in Spanish, spirantization in these languages is conditioned by the left environment.[8] However, spirantization in these languages may require a right environment as well, depending on the dialect. Tató (1981) states:

> The Portuguese spirantization rules, (however), tend to be more restricted and more variable than the Spanish ones. For one thing, they always require a right environment, which either excludes all consonants, in the more conservative dialects, or excludes only the noncontinuant consonants, in more progressive dialects; thus, for instance, such words as *pedra* 'stone' and *objecto* 'object' would have stop [d] and [b] in the former case, but spirant [δ] and [β] in the latter (e.g. Lisbon [pεδr] and [ɔβbzεtu].

In Catalan, an obstruent consonant after [b,d,g] blocks spirantization of these consonants, as does [r], following a morpheme or word boundary. In addition, according to Tató, for more conservative speakers spirantization applies only before vowels and /r/, while for others, it applies optionally also before the remaining obstruents, continuant and noncontinuant.

14) Wheeler (1979: 316-320)

____ [+obstruent]		____ {+, #} [r]	
object	[ubʒktə]	subratllar	[subreλλá]
'object'		'to underline'	
dotze	[dódzə]	ha posat rodes	[apɔzadrɔdes]
twelve'		has put wheels on	
Tató (1981: 75)			
biblia	['biβliə]/['bibliə]	examen	[əγ'zamen]
'bible'		'exam'	[əg'zamen]

Since right-environment conditions present a near mirror image of the left-envi-

(7) Guitart (1976) reports that in Cuban Spanish liquids assimilate to the following consonant, yielding a series of geminate stops, as in *organizer* [ogganizar] and *ser bueno* [sebbueno]. Similarly, in Catalan gemination always results in [-continuant] clusters. I have no explanation for this phenomenon at the current time.

(8) The left-environment conditions in these languages vary in ways similar to Spanish.

ronment variations that occur in Spanish they too are readily accountable in terms of the Syllable Preference Laws. The Syllable Margin Law reflects a universal preference for consonants that form a complex coda to maintain a certain sonority distance. Right environment conditions on spirantization in dialects of Portuguese and Catalan reflect language-specific restrictions on such distance. Dialects that allow spirantization before a noncontinuant consonant impose a minimum difference of four between elements a and b in the equation, while those that restrict the right environment to continuants impose a lower bound of three.

(15) The Syllable Margin Law
The preference for a syllabic structure $AB, where a and b are the consonantal strength values of A and B respectively, increases with the value of a minus b. (Murray and Vennemann 1982: 323)

Crucially, right-environment conditions in Portuguese and Catalan provide confirmation of the hypothesis defended in this paper that spirantization is a process governed by Syllable Preference Laws and not by assimilation of continuancy. These laws provide a unified account of left and right environment conditions on spirantization without added arbitrary stipulations for the latter. An assimilation account of these conditions, on the other hand, would have to stipulate that the spreading of the feature continuant from a preceding segment onto the voiced obstruent is contigent upon the nature of the segment following the obstruent. In the dialects of Portuguese where obstruents in complex onsets do not undergo spirantization, the assimilation rule would have to be blocked even when a continuant segment follows, as in *pedra*. Stipulating that complex onsets consisting of continuant segments are disallowed in Portuguese is not an option since such clusters do indeed exist (ie. *frio* 'cold').

In fact, as we have seen, an approach based on continuancy assimilation is not even able to handle one of the most significant properties of spirantization in Spanish, namely, its range of variation. The present analysis, on the other hand, not only accounts for the full dialectal spectrum of this phenomenon in Spanish but it also expalins the seemingly unrelated right environment conditions of Portuguese and Catalan. It does so by one surprisingly simple and elegant rule: assign [+continuant] to voiced obstruents subject to the Syllable Preference Laws and language-specific sonority requirements. The Syllable Preference Laws are part of Universal Grammar and are seen to operate in Spanish independently of spirantization. The language-specific stipulation that coronal segments are less sonorous than other segments of the same class which crucially accounts for the noncontinuant status of [d] after [l] has been part of the analysis of the phonology of other languages such as Ancient Greek, English, and Klamath (Steriade 1982, Ladefoged 1982, Levin 1985). This claim finds supports internal to Spanish in the distribution of [d].

All in all, the present analysis of spirantization provides a number of significant advantages over previous analyses at minimal cost.

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