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SIBILANT VOICING IN HIGHLAND ECUADORIAN SPANISH

(Vozeamento da sibilante no Espanhol equatoriano do Alto)*

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ABSTRACT

Dispersion Theory formalizes the structuralist notion of systemic contrast within a constraint-based phonological framework (DT; FLEMMING, 1995, 2002; NÍ CHIOSÁIN & PADGETT, 2001; PADGETT, 2003a,b,c). Bradley & Delforge (in press) propose a DT analysis of sibilant voicing patterns throughout the history of Spanish, from the loss of medieval voiced sibilants through their reemergence in several contemporary dialects. Phonetic effects in sibilant voicing are adequately explained by a distinction between obstruents that are phonologically specified for [±voice] and targetless, neutral obstruents that undergo gradient voicing by phonetic interpolation (ERNESTUS, 2003, STERIADE, 1997, 1999). It is possible to incorporate a non-contrastive phonetic category because in DT, systemic constraints govern the well-formedness of phonological contrasts. The present study focuses in greater detail on sibilant voicing in the Spanish of highland Ecuador and takes into account some additional observations by Robinson (1979) that have not been addressed in the DT approach thus far. First, regional variation in the voicing of prefix-final /s/ is shown to depend on whether prefixes are incorporated in the lexical phonology, where devoicing is favored, or in the postlexical phonology, where voicing serves to distinguish morpheme-final sibilants from morpheme-initial ones in phrasal intervocalic contexts. Second, native speaker intuitions regarding the lack of resyllabification of morpheme-final prevocalic [z] are actually predicted by a theory which acknowledges the role of systemic contrast in the postlexical phonology.

Keywords: Ecuadorian Spanish; sibilant voicing; phonetic underspecification; Dispersion Theory; contrast; perceptual distinctiveness; neutralization; resyllabification.

RESUMO

A Teoria da Dispersão formaliza a noção estruturalista do contraste sistêmico dentro de estrutura fonológica baseada em restrição (DT; FLEMMING, 1995, 2002; NÍ CHIOSÁIN & PADGETT, 2001; PADGETT, 2003a,b,c). Bradley & Delforge (no prelo) propõem uma análise DT dos padrões de vozeamento da sibilante ao longo da história do Espanhol, da perda das sibilantes medievais vozeadas a partir de seu reaparecimento em vários dialetos

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contemporâneos. Os efeitos fonéticos no vozeamento das sibilantes é adequadamente explicado por uma distinção entre os obstruintes que são fonologicamente especificados por [±voz] e targetless, obstruintes neutros que sofrem vozeamento gradiente por interpolação fonética (ERNESTUS, 2003; STERIADE, 1997, 1999). É possível incorporar uma categoria fonética não-contrastiva, porque, na DT, restrições sistêmicas governam a boa-formação dos contraste fonológicos. O presente estudo focaliza o vozeamento da sibilante no Espanhol do Alto Equador e leva em conta algumas observações adicionais de Robinson (1979) que não foram contempladas até aqui na abordagem DT. Primeiro, a variação regional no vozeamento do /s/ em final de prefixo é mostrado como dependente, se prefixos são incorporados na fonologia lexical, onde o desvozeamento é favorecido, ou, na fonologia pós-lexical, onde o vozeamento serve para distinguir as sibilantes em final de morfema daquelas em início de morfema nos contextos intervocálicos frasais. Segundo, as intuições do falante nativo com relação à falta de ressilabificação do [z] pré-vocálico em final de morfema são realmente previstas por uma teoria que reconhece o papel do contraste sistêmico na fonologia pós-lexical.

Palavras-chave: Espanhol equatoriano; vozeamento da sibilantes; subespecificação fonética; Teoria da Dispersão; distintividade perceptual; neutralização; ressilabificação.

1 INTRODUCTION

The notion of *systemic contrast* plays a key role in structuralist accounts of sound change, especially in the work of Martinet (1952, 1955, 1964). More recently, Dispersion Theory (henceforth, DT; FLEMMING, 1995, 2002) integrates the functionalist principles of Adaptive Dispersion Theory (LINDBLOM, 1986, 1990) into Optimality Theory (henceforth, OT; PRINCE & SMOLENSKY, 1993, 2004) and has been subsequently developed in different directions by Ní Chiosáin & Padgett (2001), Padgett (2003a,b,c), and Sanders (2002, 2003). Recent work in DT has sought to explain historical developments involving changes in the place of articulation of sibilant consonants in several languages (BAKER, 2003 on early modern Spanish, ITÔ & MESTER, in press, on Japanese, and PADGETT & ZYGIS, 2003 on Polish and Russian). These works have made Martinet's structuralist ideas more explicit by appealing to systemic constraints that require surface contrasts to be maintained and kept perceptually distinct.

Following the version of DT developed by Padgett (2003a,b,c), which assumes input-output mappings and a division between lexical and postlexical rankings, Bradley & Delforge (in press) analyze the historical loss of sibilant voicing contrasts in medieval Spanish, as well as synchronic variation in /s/-voicing observed across contemporary varieties. In conservative dialects that maintain /s/ in the syllable rhyme, gradient and variable voicing assimilation is the norm before voiced consonants. In addition to this pattern, highland Ecuadorian Spanish (henceforth, HES) shows routine voicing of word-final prevocalic /s/, e.g., *lo*[z] *otros* "the others" (LIPSKI, 1989, ROBINSON, 1979, TOSCANO MATEUS, 1953). The proposed analysis makes a three-way representational distinction between obstruents that are phonologically specified as plus or minus [voice] and those that are neutral, or phonetically targetless, with respect to this feature (ERNESTUS, 2003, STERIADE, 1997, 1999). Gradient and variable voicing effects observed in preconsonantal contexts are explained by the interpolation of adjacent glottal activity through the constriction period of sibilants marked as neutral by the grammar. The extension of voicing to word-final prevocalic position in HES is analyzed as the postlexical demotion of a constraint requiring syllable-initial [s] below a systemic constraint against contrast neutralization. The reranking allows voicing to signal the final versus initial status of edge-adjacent sibilants that become intervocalic when words are combined to form phrases, as in *ha*[z] *ido* "you have gone" versus *ha* [s]*ido* "s/he has been". In conservative dialects that do not rerank the constraints postlexically, these two phrases are homophonous, with voiceless sibilants appearing in both.

This paper revisits the DT analysis of sibilant voicing in HES and considers the implications of some additional observations by Robinson (1979) not taken into account thus far. First, there is regional variation in HES with respect to the voicing of prefix-final /s/. The Cuenca subdialect of the southern highlands shows voicing in this context, yielding minimal pairs such as *de*[z]*alar* "to remove the wings" (cf. *alas* "wings") versus *de*[s]*alar* "to remove salt" (cf. *sal* "salt"). In the northern capital Quito, prefix-final /s/ does not undergo voicing. Second, there is some evidence to suggest that native speakers of HES perceive a syllable boundary between morpheme-final voiced sibilants and the following vowel. This contrasts with other conservative Spanish varieties, which resyllabify prevocalic [s] as the onset of following syllable. I show how this observation actually confirms a prediction made by the DT approach, as pointed out by Padgett (2003c). If a language has processes capable of distinguishing codas and onsets, then resyllabification across morpheme boundaries may or may not apply, depending on the ranking of neutralization avoidance with markedness constraints. Following Colina (2002), I propose that dialects may differ as to whether prefixes are incorporated in the lexical or postlexical phonology. Postlexical prefixation gives rise to prefix-final sibilant voicing in Cuenca, while lexical prefixation produces voiceless prefix-final sibilants in Quito.

This paper is organized as follows. Section 2 documents the basic patterns of sibilant voicing in HES. Section 3 reviews the DT analysis proposed by Bradley & Delforge (in press). Section 4 compares the analysis with theoretical alternatives, both constraint- and rule-based. Section 5 considers additional observations about prefix-final /s/ and about the failure of resyllabification, showing how they can be accommodated within a DT approach. Section 6 summarizes and concludes.

2 SIBILANT VOICING PATTERNS IN HIGHLAND ECUADORIAN SPANISH

Intervocalic sibilant voicing contrasts developed in the variety of Late Latin spoken on the Iberian Peninsula as a result of assimilatory and weakening processes occurring in dialects throughout the Western Romance area. While the other major modern Romance languages preserved the segments produced by these innovations, distinctively voiced sibilants began to merge with their voiceless counterparts in Old Castile during the early Middle Ages. Devoicing spread southward over a period of several hundred years, finally eliminating voiced sibilants from the speech of all areas under Castilian control by the 1580s. Since the loss of distinctively voiced sibilants from early modern Castilian Spanish, voicing has never recovered its status as a lexically contrastive feature for intervocalic sibilants in any modern variety. Descriptions of conservative dialects of modern Spanish generally indicate that /s/, the sole sibilant survivor of early modern changes in place of articulation, exhibits phonetically gradient and variable voicing in syllable-final position preceding a voiced consonant (HARRIS, 1969, PP.29,40, HOOPER, 1972, P.530, HUALDE, 1989, P.33, MARTÍNEZ-GIL, 1991, P.549, NAVARRO TOMÁS, 1977, P.86, ZAMORA MUNNÉ & GUITART, 1982, P.66).

HES may be characterized as conservative in that syllable-final /s/ is normally retained as a sibilant, in contrast to the more radical trend toward aspiration and/or deletion prevalent along the coastal regions of Ecuador (ARGÜELLO, 1978, LIPSKI, 1994). In addition to the gradient preconsonantal voicing observed in other conservative varieties of Spanish, HES also exhibits routine voicing of word-final prevocalic /s/, as well as the occasional voicing of word-final /s/ before hesitation pauses. In what follows, I draw primarily upon data from Lipski (1989) to illustrate the overall pattern of sibilant voicing in HES (also see ARGÜELLO, 1978, MOYA, 1981, ROBINSON, 1979, and TOSCANO MATEUS, 1953).

The examples in (1a) show that only [s] appears in word-medial and word-initial intervocalic contexts. In (1b), variable and gradient voicing occurs in coda position before a following voiced consonant both within and across words.[1] In (1c), voiceless [s] appears before voiceless consonants.

(1)	a.	kasa		*kaza	*casa*	"house"
		no se		*no ze	*no sé*	"I don't know"
	b.	des^{z}ðe	~	dezðe	*desde*	"since"
		las^{z} βakas	~	laz βakas	*las vacas*	"the cows"
	c.	este			*este*	"this"
		las kasas			*las casas*	"the houses"

Thus far, HES resembles other conservative varieties of modern Spanish. There are two important differences, however. As originally noted by Robinson (1979, p.141) and subsequently confirmed by Lipski (1989, p.54), voicing can affect word-

[1] The transcriptions employed by Lipski (1989) are not narrow enough to indicate the gradiency of sibilant voicing before voiced consonants, denoted here as [s^{z} ~ z]. However, Lipski does describe preconsonantal voicing as variable and gradient, both within and across words.

final sibilants before hesitation pauses in HES. In (2a), the speaker pauses to complete a thought or access a lexical item and then continues the utterance. Prepausal [z] may occur even if the sentence is not actually completed, as in (2b). The example in (2c) shows that [z] appears even before true pauses (i.e., following a descending, phrase-final intonational contour), although this occurs less frequently.

(2)	a.	*de lo*[z] … *comerciantes*	"of the … business owners"
		todos lo[z] … *profesionales*	"all the … professionals"
	b.	*es, digamo*[z] …	"it's, let's say …"
		yo tenía pue[z] …	"I had then …"
	c.	*lo suficientemente capa*[z].	"sufficiently capable"

Finally, the data in (3) show that word-final prevocalic sibilants routinely surface as [z] before a following vowel-initial word.

(3)	loz otɾos	*los otros*	"the others"
	ez el	*es él*	"it's he"
	pwez en	*pues en*	"well, in"
	eɾez un	*eres un*	"you are (a)n"

Lipski (1989, pp.53-54) describes voicing in this context as very stable, noting that it is independent of both speech rate and style and occurs even in very slow, emphatic speech. A comparison of the intervocalic sibilants in (1a) with those in (3) shows that voicing applies only at the word boundary, apparently as a signal of the sibilant's word-final status. In fact, word-final prevocalic voicing can serve to maintain a surface contrast between underlyingly distinct phrases:

(4)	az iðo	*has ido*	"you have gone"
	a siðo	*ha sido*	"s/he, it has been"

As both Lipski and Robinson make clear, native speakers do perceive a difference between phrases such as those in (4). In other conservative Spanish varieties, the word-final prevocalic sibilants in (3) and (4) are realized as voiceless, which in the latter case renders the two phrases homophonous.

3 PHONETIC UNDERSPECIFICATION AND SYSTEMIC CONTRAST

This section reviews the DT analysis of Bradley & Delforge (in press) as it pertains to the pattern of sibilant voicing observed in present-day HES. (For more detailed discussion and analysis of Old Spanish sibilant devoicing as well as additional cases of sibilant voicing in modern Peninsular dialects, see BRADLEY & DELFORGE, in press.) Section 3.1 outlines some basic assumptions regarding the phonological representation of sibilant voicing and explains how these representations are evaluated by systemic and non-systemic constraints in DT. Section 3.2 presents the analysis of sibilant voicing patterns.

3.1 Representations and constraints

The analysis assumes the conventional distinction between categorical and gradient sound patterns. Categorical patterns reflect the realization of phonologically specified articulatory and perceptual targets, and gradient effects arise through phonetic interpolation among adjacent targets (COHN, 1990, KEATING, 1988, 1990, LIBERMAN & PIERREHUMBERT, 1984, among others). Furthermore, a distinction is made between phonologically contrastive obstruents, specified as either [+voice] or [–voice], and neutral obstruents, which are [0voice] (ERNESTUS, 2003, STERIADE, 1997, 1999). Distinctively voiced obstruents require specific articulatory gestures to ensure perception of their phonological category (KIRCHNER, 1998, WESTBURY & KEATING, 1986). For instance, phonologically voiceless obstruents between vowels require an active glottal abduction gesture to prevent the passive voicing that is typical of intervocalic position. Similarly, to counteract the natural tendency toward utterance-initial and utterance-final devoicing due to changes in transglottal pressure, phonologically voiced obstruents require some type of voicing-enabling gesture, such as intercostal contraction or oral cavity expansion. On the other hand, no articulatory gestures are made in order to realize neutral obstruents as voiced or voiceless because they need not be perceived as belonging to either category. “[N]eutralized obstruents are, in Keating’s (1990) terms, *targetless with respect to voicing:* they assume the laryngeal posture of a neighboring sound” (STERIADE, 1997, P.22). Gradient voicing effects are expected in such cases, due to the interpolation of glottal activity from the surrounding context through the constriction period of the [0voice] obstruent. This approach is commonly referred to as *phonetic underspecification*, which expresses the idea that phonology may not assign a specification to some segmental features (i.e., featural underspecification persists into the phonetics).

For purposes of illustration, Figure 1 contrasts the realization of a neutral sibilant, represented typographically as [S], between a vowel and a voiced consonant (a) with that of phonologically voiceless [s] between two vowels (b). In both examples, solid horizontal lines denote glottal targets that correspond to phonologically specified [voice] features, and dotted lines show interpolation between targets. Since neutral [S] has no specified target, glottal vibration during the sibilant constriction period is determined by gradient interpolation between the preceding vowel and the following voiced consonant. As the dotted lines in (a) show, there is a range of possible trajectories that interpolation may follow. The realization of neutral [S] depends on phonetic factors such as sibilant duration and intensity, stress, adjacency to major prosodic boundaries, speech register, and speaking rate. Sibilants whose duration extends beyond certain durational thresholds tend to passively devoice for aerodynamic reasons, and voiceless fricatives are typically longer than voiced ones (KIRCHNER, 1998, PP.163,236, WIDDISON, 1997). Therefore, shorter constriction durations increase the probability of complete voicing throughout neutral [S], whereas longer durations favor gradient degrees of voicelessness. In contrast to the phonetically variable [S], the intervocalic [s] in (b) has a target for voicelessness because it is phonologically specified as [–voice]. Interpolation from the first vowel to the sibilant and from the sibilant to the second vowel produces transitional glottal vibration at the margins of the sibilant constriction.[2]

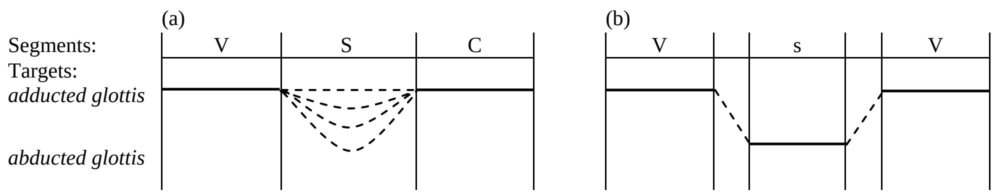


Figure 1: Variable and gradient sibilant voicing as interpolation between phonetic targets

While phonetic underspecification allows for an adequate description of voicing in neutral sibilants, it says nothing about why sibilants undergo voicing neutralization. Are sibilants neutral because they lack [voice] specifications, or do they lack [voice] specifications because they are neutral? The circularity is resolved by the fact that *the grammar* determines the surface distribution of sibilant voicing contrasts. In DT, the phonological grammar consists of ranked and violable constraints, some of which require surface contrasts to be maintained and kept perceptually distinct. Contrast is a systemic notion requiring the evaluation not of isolated forms but of the larger system of contrasts in which those forms exist. Consider the idealized forms shown in (5), which show [–voice], [0voice], and [+voice] sibilants occurring in different contexts, namely intervocalic (5a), postpausal (5b), prepausal (5c), and preconsonantal (5d).

[2] Following Cohn (1990), Keating (1988, 1990), and others, Ernestus (2003) adopts the conventional view that the output of phonology serves as the input to the phonetic component. The phonological features [+voice] and [–voice] are then mapped to phonetic targets that are subsequently hooked up through interpolation. The analysis proposed by Bradley & Delforge (in press) involves systemic constraints that evaluate the perceptual distinctiveness of sibilant voicing in different contexts, including those that exhibit neutral [S]. Since these constraints are part of the phonological grammar, and since the gradient phonetic voicing of [S] must be present in the component where these constraints are operative, interpolation between targets cannot be relegated to low-level phonetic implementation. Kirchner (1998) and Steriade (1997, 1999), among others, eschew the derivational phonology-phonetics mapping in favor of a unified model that allows implementational factors to interact directly with the rest of the grammar. The analysis of Bradley & Delforge (in press) assumes the unified model.

(5)	a.	VsV	VSV	VzV	c.	Vs	VS	Vz
	b.	sV	SV	zV	d.	VsC	VSC	VzC

These forms constitute a ‘mini-language’ of twelve idealized words, collectively representing all that is relevant to the analysis of sibilant voicing patterns. For example, it does not matter what the flanking vowels are in (5a) nor what other segments might lie beyond the immediately adjacent vowels. The idealized word VsV corresponds to actual words such as *ca*[s]*a* “house”, *pe*[s]*o* “weight, coin”, etc. On the other hand, VSC in (5d) corresponds to actual words such as *e*[s]*te* “this” and *de*[s^z]*de* ~ *de*[z]*de* “since”, where gradient voicing in the latter stems from interpolation, as in Figure 1.

OT’s tenet of Richness of The Base (PRINCE & SMOLENSKY, 1993, 2004) forbids placing any language-specific restrictions on input representations, which means that all of the idealized words in (5) must be considered as possible inputs.[3] In the version of DT assumed here, the standard markedness and faithfulness constraints of OT work together with systemic constraints on contrast to determine which input-output mappings are optimal. The analysis incorporates the following faithfulness constraints:

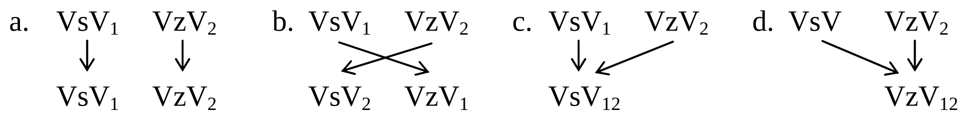
(6)	a.	IDENTSIB(voice)	Corresponding input and output sibilants are identical in [voice].
	b.	*MERGE	No output word has multiple input correspondents.

It is typically assumed that contrast in OT is guaranteed by input-output correspondence constraints, such as the one in (6a), which enforce similarity between single inputs and their corresponding outputs. *MERGE in (6b) extends this notion of faithfulness to *sets* of input-output mappings. The constraint is reminiscent of UNIFORMITY (MCCARTHY & PRINCE, 1995), which disfavors the coalescence of two input segments into one output segment. However, *MERGE applies to whole words.

Putting aside the form VSV for the moment, consider the mappings in (7), where subscripts are used to identify the individual words VsV and VzV from (5a).

[3] Note that candidate idealization in DT is a kind of tactical constraint on Richness of The Base and on GEN, the component of the OT model that maps inputs to outputs. If it turns out that other properties of a form (e.g., stress, vocalic distinctions, etc.) are relevant to a given analysis, then the idealization can easily be expanded to include them. While any generative phonological analysis necessarily abstracts away from irrelevant detail, DT simply makes the abstraction explicit in the form of idealized words. See Ní Chiosáin & Padgett (2001) and Padgett (2003a,b,c) for further discussion.

(7)



The fully faithful mapping in (7a) satisfies IDENTSIB(voice), because corresponding input and output sibilants have the same voicing specification, and *MERGE, because each output word has a single corresponding input. (7b) shows that IDENTSIB(voice) is necessary in addition to *MERGE in order to rule out switches of input voicing values. Since a surface contrast between words is maintained, *MERGE alone cannot rule out the mapping in (7b). Finally, (7c,d) violate both IDENTSIB(voice), because one input sibilant in each case changes its voicing value in the output, and *MERGE, because the output words have multiple corresponding inputs.

DT also incorporates systemic markedness constraints that require a minimal degree of perceptual distinctiveness among contrasting words along some phonetic dimension. It is well known that perceptibility of a given contrast varies as a function of the number of perceptual cues available in different phonetic contexts (see STERIADE, 1997, 1999, among others). As Widdison (1997) notes, the presence of glottal tone during the constriction period of a sibilant is in itself an unreliable cue to sibilant voicing contrast because voiced sibilants are often passively devoiced for aerodynamic reasons (see also KIRCHNER, 1998, P.163). Evidence from acoustic studies, summarized in Table 1, suggests a number of other cues that are relevant to the categorization of sibilants as phonologically voiceless or voiced. Internal cues reside during the period of oral constriction of the sibilant, whereas transitional cues are spread across the external context in which the sibilant appears.

Cue type	Perceptual cue	Sources
Internal	1. Degree of glottal tone 2. Duration of sibilant noise 3. Intensity of sibilant noise	Cole & Cooper (1975), Denes (1955), Haggard (1978), Massaro & Cohen (1977), Smith (1997), Widdison (1995, 1996, 1997)
Transitional	1. F1 transitions at V-C and C-V boundaries 2. Voice Onset Time 3. F0 of following vowel 4. Duration of preceding vowel	Chen (1970), Jongman (1989), Massaro & Cohen (1977), Stevens et al. (1992)

Table 1: Perceptual cues to phonological sibilant voicing contrast

Sibilant voicing contrasts are perceptually most distinct in intervocalic position because the flanking vowels provide an optimal acoustic backdrop against which to perceive the beginning, medial, and end portions of sibilant noise, thereby favoring both the internal and transitional cues. In fact, the contrast between voiced and voiceless sibilants in medieval Spanish was limited to intervocalic position.[4] In

[4] Voiced and voiceless sibilants did not contrast word-initially in medieval Spanish, as the vast majority of everyday vocabulary items contained only voiceless sibilants in this position. /z/ never occurred word-initially, while only a limited number of learned words and borrowings from Arabic and Gallo-Romance began with either /d^z/ or /ʒ/ (ALARCOS LLORACH, 1988, PENNY, 1993).

contrast, only one vowel is adjacent to sibilants appearing next to a word boundary or consonant, which reduces the number of transitional cues and renders the contrast less perceptible. The superiority of intervocalic position can be captured formally in DT by the systemic markedness constraint in (8):

(8) SPACE$_{SV}$ Potential minimal pairs differing in sibilant voicing differ at least as much as [s] and [z] do between vowels.

'Potential minimal pairs' are defined as any two words from the set in (5) that are identical except for one segment, such as VsV – VzV, VS – Vz, etc. SPACE$_{SV}$ requires that a sibilant voicing contrast be at least as perceptually distinct as it is when the relevant segments appear in intervocalic position, which offers the maximum number of perceptual cues.

How do systemic constraints on perceptual distinctiveness evaluate neutral [S], given that it lacks any articulatory/perceptual target for voicing? If interpolation favors substantial glottal adduction throughout the sibilant constriction in VSV, then we would expect this form to resemble an intervocalic sibilant that is phonologically specified as [+voice]. However, VSV and VzV may still differ with respect to perceptual cues other than glottal tone, such as intensity of sibilant noise, duration of the preceding vowel, etc. (see Table 1). The contrast between VsV and VzV is maximally dispersed, whereas the contrasts between VsV and VSV and between VSV and VzV fail to achieve the same degree of perceptual distinctiveness.[5]

The evaluation of surface forms by systemic markedness is illustrated in Tableau 1. Candidates (a), (b), and (c) violate SPACE$_{SV}$ because they contain suboptimal contrasts. Note that candidate (a) incurs two violations, one for the VsV – VSV contrast and another for VSV – VzV. Candidate (d) does have a perceptually sufficient intervocalic contrast, while candidate (e) vacuously satisfies SPACE$_{SV}$ because there is no potential minimal pair to evaluate. Finally, candidates (f) and (g) show that a contrast between [s] and [z] is not perceptually distinctive enough in word-initial and preconsonantal contexts, respectively, due to the reduced number of transitional cues available in these positions. Both candidates violate SPACE$_{SV}$, which requires sibilant voicing contrasts to be at least as perceptible as it is in the cue-rich intervocalic context.

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[5] Thanks to Jaye Padgett (personal communication) for discussion on this point.

			SPACE_{SV}
a. VsV	VSV	VzV	*!*
b. VsV	VSV		*!
c.	VSV	VzV	*!
d. VsV		VzV	
e. VsV			
f. sV		zV	*!
g. VsC		VzC	*!

Tableau 1: Evaluation of potential minimal pairs by systemic markedness

In addition to systemic markedness, the analysis incorporates two non-systemic markedness constraints, one positional and the other context-free:

(9) a. $_{\sigma}$[s — A sibilant in syllable-initial position is [–voice].
b. *[αvoice] — No obstruent has a [voice]-feature.

(9a) requires any sibilant appearing in onset position in the output to be voiceless. This constraint achieves a type of positional augmentation in the sense of Smith (2002), who shows that languages sometimes neutralize contrasts even in phonologically strong positions. When this happens, the outcome of neutralization always involves a perceptual augmentation whereby some perceptually enhancing element occupies the phonologically strong position. Due to their typically longer duration and higher noise intensity, voiceless sibilants are more perceptually salient than their voiced counterparts (SMITH, 1997, WIDDISON, 1997). Also, syllable-initial position has been well documented as phonologically strong (see BECKMAN, 1997, 1998).[6] Given the ternary sibilant voicing distinction, it is not feasible to think of sibilant devoicing as a particular instantiation of a more general markedness constraint banning obstruents that are [+voice]. Such a constraint fails to rule out syllable-initial neutral [S], which could be phonetically voiced in highly sonorous environments due to interpolation.

Finally, the constraint in (9b) encodes the articulatory markedness of sibilants that are phonologically specified as either [+voice] or [–voice]. These sibilants require specific articulatory gestures to ensure the perception of their phonological category, and such gestures presumably involve some degree of effort cost. In contrast, neutral sibilants have no specified target for glottal adduction or abduction, and the glottis is free to take positions required for the realizations of surrounding segments. Whereas [s] and [z] each violate (9b), neutral [S] satisfies the constraint.

[6] In his analysis of Catalan rhotics, Padgett (2003c) proposes a similar positional augmentation constraint requiring a syllable-initial rhotic to be a strong trill, and Bradley (in press) takes the same approach for Dominican Spanish. Both of these constraints might be reformulated in terms of SPACE constraints in DT, but I do not pursue this at present.

3.2 Analysis of sibilant voicing patterns

Tableau 2 illustrates the analysis of word-medial intervocalic sibilants in conservative dialects of modern Spanish, including HES. The input includes the words VsV, VSV, and VzV, taken from the set in (5a), in which all three types of sibilant appear between vowels. Since VSV does not form a sufficient contrast with either VsV or VzV, high-ranking SPACE$_{SV}$ rules out the fully faithful candidate (a) and the insufficiently dispersed contrast in (b). (To save space, I omit candidates like (a) and (b) from subsequent tableaux.) The ranking of $_{\sigma}$[s above *MERGE neutralizes the input contrast in favor of the voiceless sibilant in (e). This analysis captures the generalization that in modern Spanish, words cannot be contrastive based on a difference between intervocalic voiceless and voiced sibilants because a [–voice] sibilant is required in this context.

VsV$_1$ VSV$_2$ VzV$_3$	SPACE$_{SV}$	$_{\sigma}$[s	*MERGE	*[αvoice]	IDENTSIB(voice)
a. VsV$_1$ VSV$_2$ VzV$_3$	*!*	**		**	
b. VsV$_1$ VSV$_{23}$	*!	*	*	*	*
c. VsV$_{12}$ VzV$_3$		*!	*	**	*
d. VsV$_1$ VzV$_{23}$		*!	*	**	*
☞ e. VsV$_{123}$			**	*	**
f. VSV$_{123}$		*!	**		**
g. VzV$_{123}$		*!	**	*	**

Tableau 2: Word-medial intervocalic sibilants are [–voice]

Consider the analysis of word-initial position, shown in Tableau 3. Since SPACE$_{SV}$ requires a sibilant voicing contrast to be at least as distinct as [s] and [z] are between vowels, candidates (a) and (b) are ruled out because they attempt the contrast in a less perceptible non-intervocalic context. Candidates (d) and (e) are ruled out by $_{\sigma}$[s, which optimizes the phonologically voiceless sibilant in (c). Recall from the discussion of phonetic underspecification above that obstruents naturally tend to devoice at utterance edges due to the equalization of transglottal pressure. If neutral [S] adopts the least marked laryngeal setting as a function of phonetic context, the word-initial [S] in candidate (d) would be realized as phonetically voiceless after pause, yielding a result that is virtually identical to the phonologically voiceless [s] in candidate (c). As we will see below, however, evidence from the phrasal behavior of sibilants in HES actually requires a phonologically voiceless [s] in word-initial position.

sV$_1$ SV$_2$ zV$_3$	SPACE$_{SV}$	$_{\sigma}$[s	*MERGE	*[αvoice]	IDENTSIB(voice)
a. sV$_{12}$ zV$_3$	*!	*	*	**	*
b. sV$_1$ zV$_{23}$	*!	*	*	**	*
☞ c. sV$_{123}$			**	*	**
d. SV$_{123}$		*!	**		**
e. zV$_{123}$		*!	**	*	**

Tableau 3: Word-initial sibilants are [–voice]

The analysis of preconsonantal sibilants is given in Tableau 4. For reasons by now familiar, candidates (a) and (b) are ruled out by SPACE$_{SV}$. Since the sibilants in (c-e) are not syllable-initial, $_{\sigma}$[s is irrelevant. These candidates tie on *MERGE, and lower-ranked *[αvoice] favors neutral [S] in (d) over sibilants with a phonological specification for voicing in (c) and (e). As explained in Figure 1 and the surrounding discussion, preconsonantal [S] is subject to gradient voicing as a function of interpolation from the phonetic context, as in *de*[s^{z}]*de* ~ *de*[z]*de* “since”.

	VsC_1 VSC_2 VzC_3	SPACE$_{SV}$	$_{\sigma}$[s	*MERGE	*[αvoice]	IDENTSIB(voice)
	a. VsC_{12} VzC_3	*!		*	**	*
	b. VsC_1 VzC_{23}	*!		*	**	*
	c. VsC_{123}			**	*!	**
☞	d. VSC_{123}			**		**
	e. VzC_{123}			**	*!	**

Tableau 4: Preconsonantal sibilants are [0voice]

In analyzing the phrasal behavior of word-final sibilants, Bradley & Delforge (in press) assume a distinction between lexical and postlexical phonological levels in OT. The division has been amply motivated by Itô & Mester (2001), Kiparsky (1998), McCarthy & Prince (1993), and Padgett (2003a,c), among others. As illustrated in Figure 2, Richness of The Base holds of inputs to the *lexical* phonology, while the input to the *postlexical* phonology is necessarily the output of the lexical phonology.

ROTB → Input → GEN → EVAL → Output - - Lexical Phonology

→ Input → GEN → EVAL → Output Postlexical Phonology

Figure 2: Lexical and postlexical phonologies in OT

Given the ranking already established above, the optimal lexical output for word-final position is VS (compare the optimal candidate (d), VSC, in Tableau 4). An analysis of word-final preconsonantal voicing assimilation requires us to consider /VS|C/ as input to the postlexical component, where the vertical line denotes a word boundary. On the default assumption that the constraint ranking established for the lexical level also holds at the postlexical level, the outcome for word-final preconsonantal sibilants is the same as for word-internal ones shown in Tableau 4, with phonetic voicing assimilation occurring as a function of the following consonant, among other factors. This is the case of conservative Spanish varieties outside of highland Ecuador, e.g., *la*[s^{z}] *vacas* ~ *la*[z] *vacas* “the cows”.

Now, a crucial observation with respect to sibilant voicing in HES is that the process is variable and gradient before voiced consonants, while voicing in word-final prevocalic position is categorical, independent of speech rate and style, and contrastive with respect to phrases (LIPSKI 1989). This strongly suggests that voicing in the former case is phonetic, arising through gradient interpolation of glottal activity through the constriction period of phonetically targetless [S], while voicing in the latter presumably reflects a phonological [+voice] specification. Consider first the prevocalic context. When a word-final sibilant appears before a vowel-initial word, this sequence forms a potential phrasal minimal pair with a word-initial sibilant appearing after a vowel-final word, e.g., *has ido* "you have gone" versus *ha sido* "s/he, it has been" in (4). As shown above, the lexical phonology generates VS and sV as outputs, which then serve as inputs to the postlexical phonology. The voicing of word-final [S] in HES can be explained on the assumption that this variety has come to demote $_{\sigma}$[s postlexically, thereby loosening the requirement that all syllable-initial sibilants be [–voice].

Tableau 5 illustrates the postlexical evaluation of word-final and word-initial sibilants when they become intervocalic at the phrasal level, VS|V and V|sV. In Spanish, word-final consonants resyllabify as the onset of a following vowel-initial word (HARRIS, 1983, PP.43-44; although see Section 5.1 for further discussion). Postlexical resyllabification is achieved by the high-ranking constraint ONSET, not shown in the tableau. The contrast in (a) incurs a violation of SPACE_{SV} and is eliminated. *MERGE prevents neutralization in candidates (b) and (c), respectively. Since HES lacks word-initial voiced sibilants, there is no input V|zV to the postlexical phonology. Input VS|V can now map onto that space in (d) and, in fact, is compelled to do so by the postlexical ranking. This analysis accounts for the fact that speakers of HES are able to perceive a contrast between underlyingly distinct phrases.[7]

$VS\|V_1$	$V\|sV_2$	SPACE_{SV}	*MERGE	$_{\sigma}$[s	*[αvoice]	IDENTSIB(voice)
a. VSV_1	VsV_2	*!		*	*	
b. VSV_{12}			*!	*		*
c.	VsV_{12}		*!		*	*
☞ d. VzV_1	VsV_2			*	**	*

Tableau 5: Phrasal intervocalic contrast maintained via word-final /s/-voicing

It is important to understand what it means for a candidate like (d) in Tableau 5 to be optimal. This idealized pair expresses the generalization that in HES, phrases can be distinguished based on a difference between word-final [z] and word-initial [s]. Just as the notion of minimal pair admits accidental gaps in the lexicon, the same is true for outputs of the postlexical phonology. For example, the phrase *ha*[z] *ido* "you have gone" forms a minimal pair with *ha* [s]*ido* "s/he, it has been", but *mi*[z] *abuelos* "my grandparents" forms no minimal pair with **mi* [s]*abuelos* because *sabuelos* is not an actual word in Spanish. However, this does not mean that the intervocalic sibilant in *mis abuelos* is immune from voicing in HES. The goal of any generative analysis is to account for possible phonological forms, whether they be words or phrases. The use of idealized candidates in DT, such as VzV and VsV, makes this assumption explicit.

[7] Padgett (2003c) proposes a similar explanation in DT for the prohibition against word-final prevocalic trills in Catalan, e.g., *ma*[ɾ] *està* versus **ma*[r] *està* "sea is". The tap is required in this position in order to maintain a sufficient contrast with word-initial intervocalic trills, e.g., *mà* [r]*està* "hand remained".

The postlexical /S/→[z] mapping in Tableau 5 is required in order to maintain a contrast between phrases and to satisfy the perceptual requirements of SPACE_{SV}. Note that in other conservative Spanish varieties that do not demote $_{\sigma}$[s below *MERGE postlexically, the phrasal inputs /VS|V/ and /V|sV/ neutralize to [VsV] in the output. This accounts for the homophony of *ha*[s] *ido* and *ha* [s]*ido* in these dialects.

Since $_{\sigma}$[s is irrelevant to sibilants in coda position, the postlexical demotion of this constraint in HES does not affect the outcome of word-final preconsonantal [S], which is subject to phonetic voicing as expected. On a theoretical level, the appeal to [0voice] sibilants is attractive in that there is no need for an additional phonological constraint to account for the regressive voicing assimilation in conservative Spanish varieties (e.g., AGREE(voice); see LOMBARDI, 1999, among others). Rather, gradient voicing assimilation follows "for free" as the result of phonetic interpolation between adjacent glottal targets. The phonetic underspecification approach to sibilant voicing is motivated on a purely descriptive level by the fact that most descriptions of regressive voicing in contemporary Spanish highlight its style-dependent, gradient, and variable nature—all of which are hallmark characteristics of a phonetic process.[8] Furthermore, the voicing of sibilants before pauses in HES runs counter to the expectations of universal markedness, whereby phonologically voiceless obstruents are overwhelmingly preferred in this context in many languages. In contrast, the possibility of occasional spontaneous voicing before hesitation pauses is actually predicted in an analysis that assumes phonetic underspecification. In a form such as VS, phonetically targetless [S] may be voiced on some occasions due to the carryover of glottal adduction from the preceding vowel, regardless of what follows the sibilant. Otherwise, the equalization of transglottal pressure in utterance-final position ensures a voiceless sibilant realization.

A potential criticism of the DT analysis is that the possibility of neutral /S/ along with phonologically specified /s/ and /z/ introduces a universally non-contrastive phonetic category into the phonology. Such a move goes against the conventional Jakobsonian view of distinctive feature theory, in which the phonology can entertain only those phonetic distinctions that are contrastive in at least one of the world's languages. While a ternary underlying distinction in [voice] is clearly an anathema within the standard generative treatment of contrastiveness, no such problem arises under a systemic view of contrast. This is because DT regulates the well-formedness of contrasts directly via interacting constraints in the grammar. As we have seen, SPACE_{SV} ensures that an input distinction between /S/ and either /s/ or /z/ cannot

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[8] See Martínez-Gil (2003) and the references cited therein for several recent analyses in OT that treat gradient, partial voicing assimilation in Spanish obstruents as phonological. Interestingly, Martínez-Gil (2003, p.57) acknowledges that "[f]rom our present perspective, however, it appears that such attempts may have been premature or misconceived: I do not know of any compelling evidence suggesting that partial voicing assimilation is a phonological property, and not simply a fact of phonetic implementation. In fact, most available descriptions clearly indicate that the process is gradient, and thus typical of phonetic phenomena."

survive in the output for perceptual reasons. As a result, it is possible to incorporate extra phonetic detail into the phonology *without overpredicting the range of possible contrasts*.[9]

4 COMPARISON WITH THEORETICAL ALTERNATIVES

4.1 Accounts without phonetic underspecification or systemic constraints

How does the DT analysis compare to a more conventional OT approach that assumes neither the [0voice] category nor systemic constraints on contrast? The absence of lexical sibilant voicing contrast in modern Spanish might be accounted for by the ranking of a markedness constraint against voiced stridents above faithfulness to underlying voicing values. However, such an approach fails to account for word-final prevocalic voicing in HES. Consider an alternative analysis of the *ha*[z] *ido* versus *ha* [s]*ido* contrast, shown in Tableau 6. Here, the analysis assumes the markedness constraint *[+strident, +voice], as well as a positional faithfulness constraint IDENTSIB(voice/V_V), which reflects the privileged status of intervocalic position with respect to obstruent voicing contrast. If the neutral [S] category is unavailable to the phonology, then [s] is predicted both word-finally and word-initially in the lexical output. The approach fails postlexically, however, since the fully faithful candidate (a) is chosen incorrectly over (b). This suggests that it is not only sufficient but *necessary* to combine the ternary voicing distinction with the systemic approach of DT.

		Vs|V	V|sV	*[+strident, +voice]	IDENTSIB(voice/V_V)
☞	a.	VsV	VsV		
	b.	VzV	VsV	*!	*

Tableau 6: Standard input-output faithfulness fails postlexically

Neutralization avoidance is also necessary in addition to systemic markedness. Compare Tableau 5 above with Tableau 7, in which positional faithfulness replaces *MERGE. While SPACE_{SV} successfully eliminates candidate (a), the remaining candidates all tie on input-output faithfulness, leaving $_{\sigma}$[s to decide incorrectly in favor of (c). IDENTSIB(voice/V_V) cannot distinguish among the mappings in (b), (c), and (d), but *MERGE in Tableau 5 does just that by favoring the non-neutralizing

[9] However, what rules out a theoretically possible grammar in which *MERGE dominates SPACE_{SV}, which would seem to overpredict a three-way surface contrast among the three sibilant categories? Ultimately, it will be necessary to decompose SPACE_{SV} into a universal subhierarchy of constraints, each enforcing a different degree of perceptual distinctiveness as a function of the number of perceptual cues available across various phonetic contexts. The fact that neutral [S] is universally non-contrastive implies that the most stringent SPACE_{SV} constraint should be placed in GEN in OT, meaning that surface contrasts between [S] and either [s] or [z] can never be generated in any language (see BRADLEY & DELFORGE, in press).

candidate (d). Neutralization avoidance is successful in this case because of its asymmetrical relationship to non-systemic faithfulness. That is, a violation of *MERGE entails a violation of IDENT, but not vice-versa (see the discussion surrounding (7b)). The postlexical mapping of VS|V to VzV in (d) violates input-output faithfulness, but since there is no input V|zV, due to the absence of word-initial /z/ lexically, the mapping in (d) is non-neutralizing.[10]

		$VS\vert V_1$	$V\vert sV_2$	SPACE_{sv}	IDENTSIB(voice/V_V)	$_{\sigma}[s$	*[αvoice]
	a.	VSV_1	VsV_2	*!		*	*
	b.	VSV_{12}			*	*!	
☞	c.		VsV_{12}		*		*
	d.	VzV_1	VsV_2		*	*!	**

Tableau 7: A DT approach without *MERGE fails postlexically

4.2 A previous rule-based account

Lipski (1989) proposes a derivational analysis of word-final prevocalic /s/-voicing in HES in which empty C-slots play a crucial role as the phonological representation of Word Boundary. The early postcyclic rule of *Word Delimitation* (10) inserts the unattached slot after a word-final consonant. *Voicing Assignment* (11) then assigns [+voice] to underspecified /s/ before any consonantal slot on the skeletal tier, whether or not the slot is attached to a feature matrix. The combined effect of the application of these two rules is that at the output of the lexical phonological component, all instances of word-final and word-medial preconsonantal sibilants are phonologically voiced.

(1) *Word Delimitation*

```
Ø → C /  σ
        / \
           R
           |     |
           C  #  __
```

[10] This analysis works for Spanish but may turn out to be problematic for other languages that have word-initial voiced sibilants. Word-final prevocalic voicing would be neutralizing in this case, since the postlexical inputs VS|V and V|zV would both map to output VzV.

(2) *Voicing Assignment*

```
     σ
    / \
   R
   |     |
   C     C
   |     |
  /s/  […] → [z]
```

While these rules succeed in voicing all instances of coda /s/ at the lexical level, some additional rules are necessary in order to handle the entire range of data. First, the unattached C-slot must be eliminated prior to postlexical *Resyllabification*, since an intervening slot would impede movement of a coda consonant to the onset of the following vowel-initial word. For now I refer simply to *Word Boundary Deletion* as a postcyclic lexical rule that applies after *Voicing Assignment*. Second, two postlexical rules are needed in order to devoice [z] before voiceless consonants and in utterance-final position. For present purposes, I assume that *Preconsonantal Devoicing* spreads the Laryngeal node of an onset consonant to the preceding coda [z]. In addition, *Utterance-final Devoicing* is a variable and gradient process motivated by the rapid decay of phonation in this context. The occasional voicing of word-final /s/ before hesitation pauses can be understood as the failure of final devoicing to apply in this context.

The sample derivations in Figure 3 show how the above rules and assumptions capture the behavior of preconsonantal sibilants in HES. After all instances of preconsonantal /s/ are voiced in the lexical component, postlexical devoicing rules change [z] back to [s] before voiceless consonants and in utterance-final position. (Note: Double vertical lines denote the utterance boundary.)

	/este/	/las kasas/	/las βakas/
Lexical			
Syllabification	es.te	las.ka.sas	las.βa.kas
Word Delimitation	es.teC	lasCka.sasC	lasCβa.kasC
Voicing Assignment	ez̲.teC	laz̲Cka.saz̲C	laz̲Cβa.kaz̲C
Word Boundary Deletion	ez.te	laz.ka.saz	laz.βa.kaz
Postlexical			
Resyllabification	—	—	—
Preconsonantal Devoicing	es̲.te	las̲.ka.saz‖	—
Utterance-final Devoicing	—	las.ka.sas̲‖	laz.βa.kas̲‖
	[es.te]	[las.ka.sas‖]	[laz.βa.kas‖]

Figure 3: Derivations illustrating regressive voicing assimilation

The derivations in Figure 4 account for the routine voicing of word-final prevocalic sibilants and the occasional appearance of [z] before hesitation pauses. The derivation of [e.zel] demonstrates the importance of *Word Boundary Deletion*, which allows *Resyllabification* to apply unhindered. The surface form [di.ga.moz] retains the voiced word-final sibilant because hesitation pauses are distinct from true utterance boundaries, making *Utterance-final Devoicing* irrelevant.

	/es el/	/digamos/
Lexical		
Syllabification	es.el	di.ga.mos
Word Delimitation	esCelC	di.ga.mosC
Voicing Assignment	ezCelC	di.ga.mozC
Word Boundary Deletion	ez.el	di.ga.moz
Postlexical		
Resyllabification	e.zel	—
Preconsonantal Devoicing	—	—
Utterance-final Devoicing	—	—
	[e.zel]	[di.ga.moz]

Figure 4: Derivations illustrating word-final prepausal and prevocalic sibilant voicing

There are some remaining problems with the derivational account outlined above. First, since the rule of *Voicing Assignment* affects any instance of preconsonantal /s/, it necessarily generates intermediate derivational forms that are unattested in the output, such as *[ez.te] “this” and *[laz.ka.sas] “the houses”. To avoid such forms, the analysis must rely upon low-level devoicing rules, whose sole purpose is to undo the effects that *Voicing Assignment* originally brought about. Such derivations fail to reflect the simplicity of the observation that neither the underlying or surface form contains a voiced sibilant in the relevant contexts. Second, since the account assumes a binary distinction between voiced and voiceless sibilants as well as a lexical rule assigning the specification [+voice], it fails to capture the variable and gradient nature of sibilant voicing before voiced consonants in HES, e.g., *la*[s^{z}] *vacas* ~ *la*[z] *vacas* “the cows”. Finally, the exact status of *Word Boundary Deletion* remains unclear, since its only apparent motivation is that word-final consonants do in fact undergo resyllabification before vowel-initial words in connected speech (although see Section 5.1 for more discussion of the syllabification facts).

The DT analysis reviewed in Section 4 avoids all of these problems. Since no rule of preconsonantal voicing is assumed, otherwise non-occurring forms such as *[ez.te] and *[laz.ka.sas] are not required and never generated. As argued in the discussion surrounding Tableau 4, the DT account ensures neutral [S] in preconsonantal contexts, which is subject to variable and gradient phonetic voicing via interpolation, as a function of the following consonant, among other factors. Since unattached C-slots are not posited as the phonological representation of word boundary, complications in the interaction of the empty slot with postlexical *Resyllabification* are also avoided. In the

DT account, high-ranking ONSET in the postlexical phonology forces resyllabification of word-final sibilants. The postlexical demotion of $_{\sigma}$[s below *MERGE allows voicing to signal the word-final status of the resyllabified sibilant.

5 ACCOUNTING FOR ADDITIONAL OBSERVATIONS ABOUT SIBILANT VOICING IN HES

Robinson (1979) further argues that in the Cuenca subdialect spoken in the southern highlands, the /s/ of the prefix *des-* is voiced when the following stem begins with a vowel. When his informants first read the unfamiliar *desalar* "to remove salt" and *desalar* "to remove the wings" from a word list that he used to collect his data, they pronounced both items as [desalaɾ]. After being made aware of the meanings of both words, they pronounced *de-salar* with a voiceless [s] and *des-alar* with [z]. When asked if there was any difference in the way that these two words are pronounced, they replied that *des-alar* contains a pause after the /s/ while *de-salar* does not. Robinson suggests that since no tokens of *des-alar* actually contained a pause, his informants most likely perceived the [z] at the end of prefixes (and words) as /s/ followed by a syllable boundary. In contrast to the informants from Cuenca, those from the northern capital Quito limit voicing to word-final prevocalic /s/, pronouncing both *de-salar* and *des-alar* with a voiceless sibilant.

Lipski (1989, p.51) reports that prefix-final /s/ voicing is infrequent in his corpus, arguing against "the conclusion that the Cuenca dialect systematically voices morpheme-final prevocalic /s/" and suggesting instead that "[t]he most logical conclusion is lexicalization of a handful of items." However, the fact that Robinson (1979) was able to elicit productive prefix-final sibilant voicing through the use of neologisms argues against Lipski's lexicalization hypothesis. Furthermore, Lipski (1989) does not address the failure of final [z] to resyllabify before vowels. As shown by the review in Section 4, the DT analysis of Bradley & Delforge (in press) does not attempt to account for differences in prefix-final voicing in HES, nor does it explain the intuition of Robinson's informants that prevocalic [z] remains in coda position. In what follows, I show how the analysis can be extended to cover both of these observations, beginning with the syllabification facts.

5.1 Failure of resyllabification before vowels

Most phonologists agree that syllabification in itself is not contrastive, given that no language permits a tautomorphemic contrast between *pa.ta* versus *pat.a* or *pa.kla* versus *pak.la*. McCarthy (2003) argues that faithfulness is not sensitive to input syllabification and that syllable structure in output forms is determined entirely by markedness interaction. However, banning input-output faithfulness to syllabification is insufficient in versions of DT that assume the neutralization avoidance constraint *MERGE. If in some language *MERGE dominates syllable structure constraints, then input morphemes differing solely in the syllabification of intervocalic consonants would be contrastive in the output:

	V.CV$_1$	VC.V$_2$	*MERGE	ONSET
☞	a. V.CV$_1$	VC.V$_2$		*
	b. V.CV$_{12}$		*!	
	c.	VC.V$_{12}$	*!	*

Tableau 8: Overgeneration of contrast based on syllabification

Padgett (2003c, p.15) argues that forms differing solely in syllabification are perceptually too similar to contrast: "impossible contrasts are the result of impossible perceptual distinctions, the jurisdiction of SPACE constraints. From this perspective, the problem is one of markedness, not faithfulness." In DT, universally imperceptible contrasts can be ruled out by placing the relevant SPACE constraints in GEN, making them inviolable.[11] This means that the contrast in candidate (a) of Tableau 8 is universally ill-formed. As shown in Tableau 9, neutralization is unavoidable, with surface syllabification determined by markedness constraints, such as ONSET.

	V.CV$_1$	VC.V$_2$	*MERGE	ONSET
☞	a. V.CV$_{12}$		*	
	b.	VC.V$_{12}$	*	*!

Tableau 9: Obligatory neutralization of syllabification-based contrast

While morphemes do not contrast in syllabification alone, forms that differ in morphological or syntactic structure can show different syllabifications. Consider the contrast between English phrases such as *key pawn* [k^{h}i.p^{h}ɔn] and *keep on* [k^{h}ip.ɔn], which differ in the onset versus coda association of intervocalic /p/. Crucially, these phrases also show another difference, namely aspiration of the word-initial voiceless stop. The word-level distribution of aspiration is completely allophonic in English, with onset [p^h] in *pawn* versus coda [p] in *keep*. Postlexically, however, aspiration serves to distinguish the two phrases by signaling the initial versus final status of edge-adjacent /p/. Conventional OT accounts might invoke a constraint aligning syllable and word boundaries to explain why word-final /p/ does not resyllabify. As Padgett (2003c, p.17) points out, acknowledging the role of contrast in postlexical syllabification makes an interesting prediction:

> in the absence of processes capable of perceptually distinguishing onsets and codas, resyllabification across word boundaries *must* occur. (If there is such a process, then resyllabification may or may not occur, depending on the ranking of ONSET with respect to *MERGE and the relevant markedness constraints.)

[11] It is possible that such inviolable SPACE constraints simply reflect the limits of the human perceptual apparatus, whereas only rankable and violable SPACE constraints are truly linguistic/grammatical.

I argue that this prediction finds partial confirmation in the failure of morpheme-final prevocalic [z] to resyllabify in HES, as observed by Robinson (1979). The analysis originally illustrated in Tableau 5 assumes a postlexical ranking in which ONSET ranks high while $_{\sigma}$[s is demoted below *MERGE. The intuitions of Robinson's informants suggest the opposite, namely that $_{\sigma}$[s remains high-ranking while ONSET is demoted below *MERGE. Consider the postlexical evaluation shown in Tableau 10. SPACE_{SV} rules out the insufficient contrast in (a), and (d) is eliminated due to the voiced sibilant in onset position. The optimal candidate (b) shows that it is more important to preserve the contrast between phrases than to resyllabify word-final voiceless [s] as an onset to the following vowel. In other conservative Spanish varieties, ONSET remains dominant postlexically, and candidate (c) is chosen instead.

	$VS\|V_1$	$V\|sV_2$	SPACE_{SV}	$_{\sigma}$[s	*MERGE	ONSET	*[αvoice]	IDENTSIB(voice)
a.	$VS.V_1$	$V.sV_2$	*!			*	*	
☞ b.	$Vz.V_1$	$V.sV_2$				*	**	*
c.		$V.sV_{12}$			*!		*	*
d.	$V.zV_1$	$V.sV_2$		*!			**	*

Tableau 10: Word-final prevocalic [z] fails to resyllabify in HES

5.2 Regional variation in prefix-final sibilant voicing

Following Bermúdez-Otero (1999, 2003, forthcoming) and Kiparsky (1998, 2000, 2003), I further distinguish between stem and word levels in the lexical phonology. As shown in Figure 5, Richness of The Base holds of inputs to the stem level, while the output of the stem level serves as input to the word level. In turn, the output of the word level becomes the input to the postlexical phonology (recall Figure 2 above).

ROTB → Input → GEN → EVAL → Output - - ┐ Stem Level

└ → Input → GEN → EVAL → Output Word Level

Figure 5: Stem and word levels in the lexical phonology

Consider again the example of *de-salar* "to remove salt" and *des-alar* "to remove the wings". On the assumption that ROTB is relevant to prefixes as well as stems, the ranking of *MERGE below SPACE_{SV}, $_{\sigma}$[s, and ONSET at the stem level selects [salaɾ] and [deS] as optimal outputs for the stem *salar* "to salt" and the prefix *des-* (compare Tableau 3 and Tableau 4, respectively).

In an analysis of dialectal variation involving aspiration of prefix-final /s/, Colina (2002) proposes that dialects may differ as to whether prefixation takes place in the lexical or postlexical phonology. I propose a similar approach to the variation in prefix-final sibilant voicing in HES. In the Quito subdialect, prefixes are incorporated at the word level of the lexical phonology, where the constraint ranking neutralizes the contrast between voiced and voiceless intervocalic sibilants in favor of the later. More specifically, inputs to the word level include the stem-level outputs [alaɾ] and [salaɾ], along with the prefixes [deS] and [de], respectively. The same constraint ranking in force at the stem level effectively neutralizes the contrast between word-level inputs, as shown by the mapping in candidate (c) of Tableau 11. This accounts for the homophony of *de-salar* and *des-alar* in the Quito dialect.

	deS-alaɾ$_1$	de-salaɾ$_2$	SPACE$_{SV}$	$_\sigma$[s	ONSET	*MERGE	*[αvoice]	IDENTSIB(voice)
	a. deS.alaɾ$_1$	de.salaɾ$_2$	*!		*		*	
	b. dez.alaɾ$_1$	de.salaɾ$_2$			*!		**	*
☞	c.	de.salaɾ$_{12}$				*	*	*
	d. de.zalaɾ$_1$	de.salaɾ$_2$		*!			**	*

Tableau 11: Lexical incorporation of prefixes at the word level prohibits sibilant voicing in the Quito subdialect of HES

In contrast, the Cuenca subdialect incorporates prefixes postlexically. As seen in Tableau 12, inputs to the postlexical phonology combine the lexical (word level) outputs of the prefixes [deS] and [de] attached to their bases [alaɾ] and [salaɾ], respectively. The demotion of ONSET below *MERGE at this level allows prefix-final [z] to remain in coda position before the following vowel in (b). Since prefixation takes place postlexically in the Cuenca variety, prefix-final prevocalic sibilants show the same behavior as word-final prevocalic ones in candidate (b) of Tableau 10. The same constraint ranking favors coda [z] before vowels in both cases.

	deS-alaɾ$_1$	de-salaɾ$_2$	SPACE$_{SV}$	$_\sigma$[s	*MERGE	ONSET	*[αvoice]	IDENTSIB(voice)
	a. deS.alaɾ$_1$	de.salaɾ$_2$	*!			*	*	
☞	b. dez.alaɾ$_1$	de.salaɾ$_2$				*	**	*
	c.	de.salaɾ$_{12}$			*!		*	*
	d. de.zalaɾ$_1$	de.salaɾ$_2$		*!			**	*

Tableau 12: Postlexical incorporation of prefixes generates sibilant voicing in the Cuenca subdialect of HES

6 CONCLUSION

We have seen that a ternary distinction in obstruent [voice] provides a descriptively adequate distinction between phonological and phonetic sibilant voicing in conservative varieties of modern Spanish. In line with other recent applications of DT to both diachronic and synchronic phenomena, the analysis of sibilant voicing in HES shows that a non-contrastive phonetic category can be incorporated into the phonology, so long as the well-formedness of surface contrasts is regulated directly by the grammar. Furthermore, we have seen that a DT approach easily accommodates additional observations by Robinson (1979) regarding prefix-final sibilant voicing as well as native speaker intuitions about the syllabification of morpheme-final prevocalic [z]. As I have shown in this paper, variation involving prefixes can be explained in a model that distinguishes between stem and word levels in the lexical phonology, with the additional assumption that dialects may incorporate prefixes either lexically, at the word level, or postlexically. The failure of [z] to resyllabify across morpheme boundaries is actually predicted by a theory which acknowledges the role of systemic contrast in the postlexical phonology.

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