

A sociophonetic investigation of dialect features in Highland Ecuadorian Spanish

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1. Introduction

1.1 Phenomenon of interest

Spanish sibilants have long been of interest to linguists since the development of these sounds traces history from medieval Spanish to the dialects of Spanish spoken today. While medieval Spanish had a phonemic voicing distinction in the set of six sibilants, including /s/ and /z/ (Penny 1991), this distinction has since been lost in modern Spanish in favor of the voiceless phoneme. According to the standard phonological rules of Spanish, /s/ only voices to [z] when it is followed by a voiced consonant (Morgan 2010), as in *mismo* [miz.mo] ‘same’. However, a different process whereby /s/ voices in some intervocalic contexts has been noted in a few modern dialects. Intervocalic /s/ voicing can be described as the categorical or variable realization of /s/ as [z] when it is between vowels in word-initial (*la sonrisa* ‘the smile’), medial (*casa* ‘house’) or final position (*los otros* ‘the others’). For instance, in the example in (1), while the /s/ in *los otros* is produced with [s] in most modern dialects of Spanish, [z] is present in this case for dialects with intervocalic /s/ voicing.

(1) Standard: *los otros* ‘the others’ [lo.so.tros]

Dialect with /s/ voicing: *los otros* ‘the others’ [lo.zo.tros]

Past studies have shown intervocalic /s/ voicing to be a feature of the Spanish of Highland Ecuador (Robinson 1979, Lipski 1989, Calle 2010, Chappell 2011, Strycharczuk 2012), Catalonia (McKinnon 2012, Davidson 2014), Madrid (Torreira & Ernestus 2012), and Central Spain (Torreblanca 1986). The factors that have been found to influence this feature vary greatly between the dialects studied. The present study focuses on intervocalic /s/ voicing in the Spanish of Loja, Ecuador, and the linguistic and social factors that influence voicing in this dialect.

1.2 Previous studies

I will first give an overview of non-Ecuadorian dialects where intervocalic /s/ voicing has been attested and then focus on what has been documented for the dialect of interest. Looking at Catalan-Spanish bilinguals, McKinnon (2012) and Davidson (2014) both find variable voicing in word-final /s/, while word-medial /s/ is rarely voiced. For Madrid Spanish, Torreira & Ernestus (2012) examine a corpus of 52 speakers and find some voicing in all positions, but more so word-finally. They classify intervocalic /s/ voicing in this dialect as a reduction process since it is dependent on factors such as stress and speech rate. For Central Spain, Torreblanca (1986) details that he has heard voicing of intervocalic /s/ due to articulatory relaxation in Toledo, Ávila, and Cáceres. A. García (2013) also looks at the production of intervocalic /s/ for 15 speakers originally from Bogotá, but concludes that intervocalic voicing is not a feature of this dialect since the rates of voicing are very low.

Now turning to Ecuador, the reports of intervocalic /s/ voicing go back to the first studies of Ecuadorian Spanish. All descriptions of this feature agree that it is characteristic of Highland Ecuadorian Spanish (HES), while not being found in the Coastal dialects of Ecuador. Toscano Mateus (1953) provides the first documentation, stating: “La s final de palabra (aspirada en la

Costa), cuando precede a una palabra que comienza por vocal, se pronuncia sonora en Quito y la Sierra (*loz hombres*, como en francés *les homes*)” [The *s* at the end of the word (aspirated on the Coast), when it comes before a word that starts with a vowel, it is voiced in Quito and the Highlands (*loz hombres*, like in French *les homes*)](79). While he makes no mention of the precise location within the Highlands in this general statement, the author goes on to specify that /s/ is also voiced sporadically in prefixes such as *deshilar* ‘to unravel’ [dez-ilar] and *deshherbar* ‘to weed’ [dez-erβar] in Cuencano Spanish, which is spoken in the central area of Highland Ecuador.

This early report was not confirmed empirically until many years later. Robinson (1979) interviewed two male speakers in each of the highland provinces and provides impressionistic evidence that leads him to conclude there are three major HES dialect regions according to the realization of intervocalic /s/. For the Northern-Central highlands (including Quito), he claims there is categorical voicing in word-final position. In Cuenca (South-Central highlands), /s/ voices in this same context as well as before prefixal morpheme boundaries, such as those mentioned previously. Finally, he claims that intervocalic /s/ is never voiced in the southern-most province of Loja and the northern-most province of Carchi. These findings were later supported by other impressionistic studies of Quiteño Spanish (Lipski 1989) and Cuencano Spanish (Calle 2010), as well as the general description of Ecuadorian Spanish in Aguirre (2000).

More modern, acoustic studies have called into question the categorical nature of this phenomenon. Concerning Quiteño Spanish, Chappell (2011) and Strycharczuk (2012) both find that voicing of intervocalic /s/ may not be completely categorical, at least for some speakers. Chappell (2011) shows that the voiced variant is found in 91% of cases of word-final /s/, while

only occurring sporadically in word-medial and initial contexts. She concludes that voicing of /s/ at a word boundary is not as categorical as Robinson (1979) and Lipski (1989) had predicted. Inspecting individual differences more closely, Strycharczuk (2012) shows two patterns of voicing in Quiteño Spanish: some speakers voice intervocalic /s/ gradiently, while others voice categorically, but optionally, that is they produce fully voiced tokens in certain contexts. Previous studies have shown that both linguistic and social factors condition the realization of intervocalic /s/. Most important for the present study are those that examine subdialects of HES. In these studies, the factors that seem to be most important are position within a word and speech rate. However, while Quiteño and Cuencano Spanish have been documented, it remains to be seen if intervocalic /s/ voicing is characteristic of the Spanish of Loja, which is the southernmost province in the Ecuadorian Highlands. Although Robinson (1979) states that his two Lojano speakers do not voice, Chappell (2011) provides anecdotal evidence of voicing from an interview with one male Lojano. Given the gap in the previous literature for Loja, the research questions for the present study are two-fold. First, is there some degree of intervocalic /s/ voicing present in the Spanish spoken in Loja, Ecuador? Second, which linguistic and social factors influence intervocalic /s/ voicing in this dialect?

2. Data and Methods

2.1 Participants

In order to get at the research questions just mentioned I interviewed thirty-one native speakers of Lojano Spanish. These participants were recruited using the “Friend of a Friend” technique (Milroy 1980). Most of the participants come from middle class and upper middle class families. While the vast majority of the participants were born in Loja, all were required

minimally to have lived in Loja the majority of their life. The few participants who were not born there had moved to Loja before the age of two. The participants are evenly balanced for gender and represent a variety of ages.

2.2 The Interview Schedule and Token Extraction

Each interview lasted between one and two hours and consisted of five tasks. All interviews were digitally recorded on a Zoom H2 Handy Portable Stereo Recorder. The interviews are part of a larger project on Lojano Spanish and thus the present analysis is only concerned with one of the five tasks. In this task, the questionnaire, the participants were asked a series of background questions about themselves, in addition to questions about the city of Loja and how it has changed during their lifetime. The complete analysis of the full dataset can be found in García (2015).

For each participant, sixty tokens were extracted from the questionnaire period. Where possible, these tokens were taken from the participants' answer to the question, "What is the city of Loja like?" This portion was chosen because it was the last question in the questionnaire period, and thus the participants had already become relatively comfortable with the interview situation and the interviewer. Of these sixty tokens, there were twenty in each of the three relevant word positions: word-medial (*casa* 'house'), word-final (*has ido* 'you have gone') and word-initial (*ha sido* 'it has been'). Some tokens had to be excluded from the analysis due to pauses, unstressed vowel reduction, and poor recording quality or background noise. In total, 1,387 tokens of intervocalic /s/ were analyzed.

2.3 Acoustic Analysis

Upon extracting the tokens for analysis, each was submitted to a series of acoustic measures using the spectrograms and waveforms of each token in WaveSurfer (Sjölander & Beskow 2010). Studies on /s/ in Spanish, and on sibilants more generally, have used many different acoustic and articulatory measures of voicing for these sounds. Fricative duration and some measure of the amount of voicing are the two most widely used in studies on /s/. Chappell (2011) and Torreira & Ernestus (2012) both classify glottal vibrations as uninterrupted versus interrupted voicing by examining the voicing bar and Praat pitch tracking. Like auditory analysis, this method necessarily forces intervocalic /s/ voicing to be considered categorically even if it might actually be gradient in nature. Voicing duration, percent voicing and percent frames voiced have been used in order to quantify /s/ voicing. Percent voicing, also called voicing ratio, is calculated by measuring the fricative duration and voicing duration, and then dividing the latter by the former. Strycharczuk (2012) uses both voicing duration and percent voicing, and percent voicing has also been used by McKinnon (2012), Davidson (2014), and A. García (2013). In these studies, as well as in Campos-Astorkiza (2014) on pre-consonantal /s/, voicing duration is judged as the portion of the fricative that exhibits periodicity in the waveform and a voicing bar in the spectrogram. Modern technology also offers an instrumental method of measuring percent voicing – one can use the “voicing report” feature in Praat to determine the percent of frames voiced in a given token of /s/. Gradoville (2011) provides an evaluation of many instrumental measurements of voicing and concludes that the pulse-based analysis offered by the Praat voicing report is the most reliable *instrumental* measurement of fricative voicing in Spanish. Since he mentions that at times Praat can be fooled by phantom pulses that are not

really indicative of voicing, I believe that overall the best acoustic measure of glottal vibrations is to calculate percent voicing by hand.

Accordingly, the dependent measure I use here is percent voicing. To calculate percent voicing, I first measured the duration of the fricative in each instance of intervocalic /s/. Since all of the tokens were intervocalic, I judged the beginning of the fricative by the disappearance of the formant structure of the preceding vowel and the transition in the waveform. Similarly, the end of the fricative was judged by the onset of the formant structure of the following vowel and a change in the waveform caused by the transition from the fricative to the vowel. I then measured the duration of voicing of each token. For the tokens that were not fully voiced, I took a measurement of the voicing at the beginning of the fricative and added that to the voicing at the end of the fricative in order to obtain the total voicing. Voicing was judged using two cues: periodicity of the waveform and the presence of a voicing bar in the spectrogram. Finally, I divided the total voicing by the total duration of the fricative to get the percent voicing. Any tokens that were unclear in terms of total duration or duration of voicing were checked with another phonetician.

The following figure serves to exemplify how the acoustic analysis was done. Figure 1 includes the synchronized waveform and spectrogram showing the production of the last three segments in the word *proceso* ‘process’ from a female speaker (F10). The segment of interest is the /s/, which appears in the middle of the figure. This token is 88 milliseconds long and 27% voiced. At the beginning and the end of the fricative (signaled with red boxes), we can see a small portion of periodic wave, which is accompanied by a voicing bar.

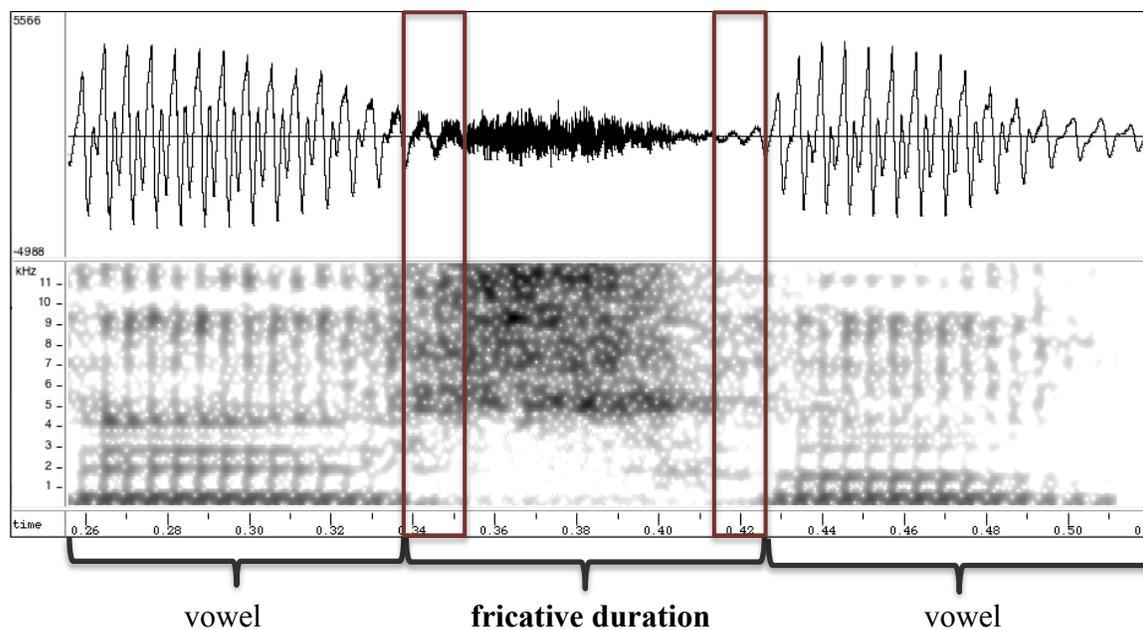


Figure 1: Production of *proceso* ‘process’ from participant F10 – 27% voiced

2.4 Independent Variables

The independent linguistic factors taken into consideration are: position within a word, preceding vowel, following vowel, stress, and local speech rate. Position within a word is coded as word-final, word-medial, or word-initial. A recent study has called into question whether word-final prevocalic /s/ undergoes resyllabification in HES (Robinson 2012). Thus, in order to avoid having to decide whether word-final /s/ is part of the preceding or following syllable, the factor “stress” is coded according to the stress of the preceding and following vowels, producing the following options: unstressed-unstressed (*los abuelos* ‘the grandparents’), unstressed-stressed (*las águilas* ‘the eagles’), stressed-unstressed (*autobús azul* ‘blue bus’), and stressed-stressed (*manatíes únicos* ‘unique manatees’). Preceding and following vowel are coded as the vowel that immediately precedes or follows the /s/ in question, with the following options: [i], [e], [a], [o], or [u]. In the case of diphthongs, the glide closest to the /s/ was coded as its nuclear vowel equivalent. Thus, in a token such as *la suegra* ‘the mother-in-law’, the following vowel would be

coded as [u]. Similarly, for a token such as *béisbol* ‘baseball’, the preceding vowel would be coded as [i].

The local speech rate for each token was measured in syllables per second, combining the techniques of File-Muriel and Brown (2011) and Kendall (2009). File-Muriel and Brown (2011) calculate the local speech rate as the phonemes per second in the three word sequence surrounding a token of /s/, that is, including the word before and after the target word. According to Kendall’s (2009) review of speech rate, most scholars prefer to use syllables per second. Thus, I measured syllables per second of the three-word sequence. To do this, I first took the duration of the sequence from the word before the target word to the word after the target word, for example, *todos los amigos* ‘all of the friends’. If there was a pause before or after the target word, then this sequence consisted of only two words instead of three. I then divided the number of syllables in this sequence by the duration in seconds to get the local speech rate at the time of the token. Position within a word, preceding vowel, following vowel, and stress are categorical, while local speech rate is a continuous variable. The two social factors considered here are age and gender (male or female) of participant. Age is considered as a continuous factor.

2.5 *Quantitative Analysis*

Previous studies have varied greatly in their treatment of percent voicing. Strycharczuk (2012) and A. García (2013) choose to keep percent voicing as a continuous dependent variable. One problem with this method of analysis is that percent voicing does not usually exhibit a normal distribution, which violates the assumptions of linear regression, as well as other statistical tests. Those studies that have employed a non-continuous analysis have defined different category breaks. While the binary analysis presented in Schmidt & Willis (2011) and

that of Davidson (2014) both compare “majority” voiced versus voiceless tokens, Campos-Astorkiza (2014) and McKinnon (2012) use a tripartite categorization: voiceless (0-20%), partially voiced (20-90%) and fully voiced (90-100%). The question of what categories to use is a difficult one since it can often time seem arbitrary. Campos-Astorkiza (2014) justifies her three categories by showing that the majority of tokens of /s/ before a voiceless consonant are less than 20% voiced.

Given the inconsistencies among previous studies as well as the distribution of my data, I consider percent voicing as both a continuous and categorical dependent variable. However, in this paper, I will only present the results of the categorical analysis. Figure 2 shows a histogram of the distribution of percent voicing in my data. While there is a somewhat normal (although skewed) distribution of tokens below 90% voicing, there is a clear break between these tokens and fully voiced tokens. In fact, there were no tokens between 90 and 99% voicing. Following Campos-Astorkiza (2014), tokens are classified according to three categories: unvoiced (0-20%), partially voiced (20-90%), and fully voiced (100%). I use ordinal logistic regression (also known as proportional odds modeling) to look at the distribution of these three voicing categories. Ordinal logistic regression assumes that there is a structure to the categories, that is, that the three categories are hierarchically ordered: voiceless < partially voiced < fully voiced. This analysis improves upon previous methodologies because it does not employ statistical methods that force variation into binary categories. Mixed effects models using the independent variables described previously and speakers as a random effect were fit to the data, using the *clmm2* (Christensen 2015) function in *R* (*R* Core Team 2014). Interactions between independent variables were included where relevant and no significant interactions were found. Selection of variables was done following a stepwise procedure and nested models were compared using *ANOVA*.

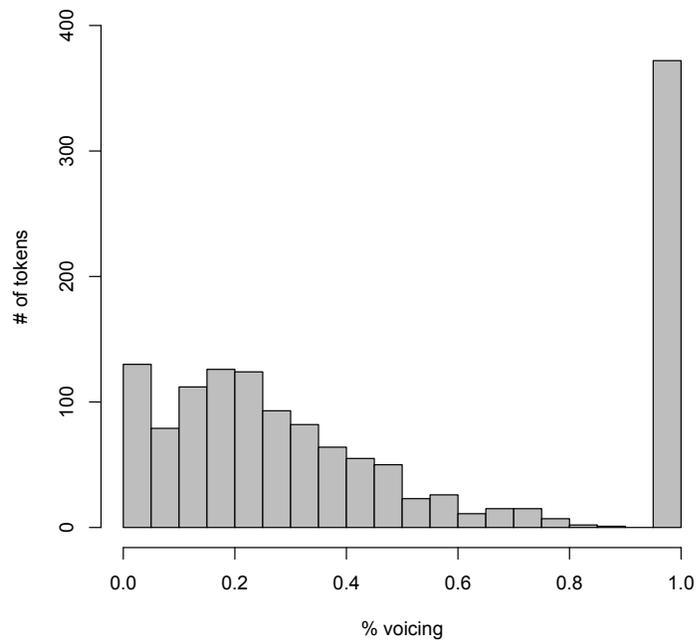


Figure 2: Histogram of percent voicing (N=1,387)

3. Results

3.1 Overall Results

Before examining the effect of individual factors on this feature, it is important to look at the overall patterns. Table 1 shows the mean percent voicing by position within a word. What is first most evident from this table is that there is an effect of word position. The rates of voicing are higher in word-final and initial position than word-medially, with word-final position showing the highest rate of all positions. Crucially, voicing rates do not reach 100% in any given word position.

Word-Medial	Word-Initial	Word-Final	Overall
40.7	45.9	50.5	45.7

Table 1: Means for percent voicing by word position

The overall patterns are further illuminated once we consider the voicing categories. Table 2 shows the overall distribution of tokens in each voicing category. As a reminder, the categories used are: unvoiced (0-20%), partially voiced (20-90%), and fully voiced (100%). While the majority of tokens are unvoiced or partially voiced, over one-fourth of the tokens are fully voiced, which is notable considering normative pronunciation rules would predict no voicing in this context. It is already clear that the general pattern seen here for Lojano Spanish is vastly different than the results upheld by previous studies of HES.

Unvoiced	Partially Voiced	Voiced	Total
447 (32.2%)	568 (41.0%)	372 (26.8%)	1,387

Table 2: Distribution of tokens by voicing category

3.2 Results – statistical analysis

The best model for the categorical analysis of the interview data with voicing category as the dependent variable includes the following factors as main effects: gender, age, speech rate, word position, stress, and following vowel. In addition to these main effects, there is a significant random effect of speaker. Preceding vowel is not selected as a significant independent predictor.

The results of this model are seen in Table 3. As mentioned in section 2.5, ordinal logistic regression calculates the odds of being in progressively higher category, assuming there is a hierarchical order to the categories: unvoiced < partially voiced < fully voiced. The model first calculates the odds of being in the unvoiced category as compared to partially/fully voiced, and then calculates the odds of being in the partially voiced category as compared to fully voiced. Thus, the estimates in the first column of Table 3 are a combination of these two proportional odds calculations, with positive numbers indicating increased odds of being in a significantly

higher category, whether that be in the category jump from unvoiced to partially voiced, or from partially to fully voiced. On the other hand, negative estimates indicate increased odds of being in a significantly *lower* category, again either in the category jump from fully to partially voiced, or from partially voiced to unvoiced. The second column shows the standard error (*SE*), the third the *z*-value, and the last column shows the relative *p*-value. The reference level for categorical predictors is listed in parentheses after the name of the independent variable.

	Estimate	<i>SE</i>	<i>z</i> value	<i>p</i> -value
Gender (reference level is Female)				
Male	1.09	0.34	3.22	<0.01
Age	-0.04	0.01	-3.12	<0.01
Speech Rate	0.25	0.03	7.95	<0.01
Position (reference level is Word Medial)				
Word Initial	0.32	0.15	2.15	<0.04
Word Final	0.52	0.16	3.34	<0.01
Stress (reference level is Unstressed-Unstressed)				
Stressed-Unstressed	-0.09	0.16	-0.56	0.57
Unstressed-Stressed	-0.49	0.14	-3.43	<0.01
Stressed-Stressed	-0.50	0.27	-1.87	0.06
Following (reference level is [a])				
[o]	0.12	0.21	0.58	0.57
[e]	-0.08	0.17	-0.46	0.64
[i]	-0.46	0.16	-2.83	<0.01
[u]	-0.60	0.24	-2.53	<0.02

Table 3: Results for best ordinal model (N=1387)

Both social factors considered, gender and age, are significant in this analysis. The positive estimate for gender in Table 3 demonstrates that being male increases the odds of producing a significantly higher voicing category. That is, male participants voice significantly more than female participants. On the other hand, as a participant's age increases, the odds of being in a higher category decrease, indicating more voicing by younger participants than older

participants. While there is not a significant interaction between age and gender, looking at the intersection of these two independent variables can provide a broader picture of the voicing patterns. Figure 3 shows the percentage of each voicing category by age for the male participants (left) and the female participants (right). This figure shows that the patterns for both males and females are actually quite similar, although the percentages overall for males are higher. As age increases (from left to right in each graph), the proportion of unvoiced tokens (gray bars) increases, while the proportion of voiced tokens (blue bars) decreases. Thus, the range of highest to lowest percentage of voiced tokens is as follows: Youngest Male, Middle Male, Youngest Female, Oldest Male, Middle Female, and finally Oldest Female.

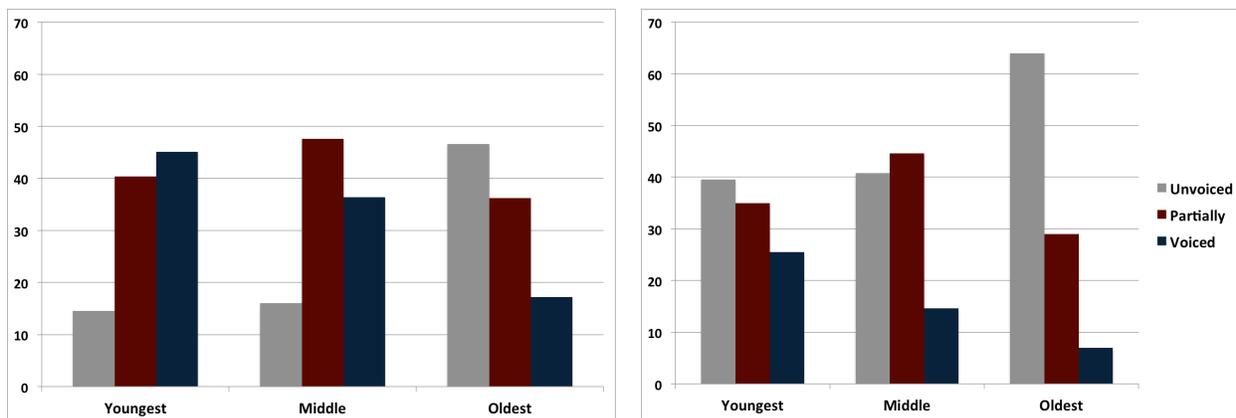


Figure 3: Percentage of unvoiced, partially, and fully voiced tokens by generation and gender; male participants (left, N=750), female participants (right, N=637)

The next effect evident in Table 3 is that of speech rate. The positive estimate for this factor indicates that as speech rate increases, the odds of being in a higher voicing category increase. Thus, as participants speak faster, voicing of intervocalic /s/ increases. For position within the word, Table 3 shows that the odds of being in a higher voicing category increase in initial and final position, when compared to medial position. The odds are highest in final position,

although there is no significant difference between final and initial position. Figure 4 shows the relative proportion of tokens by word position. Here it becomes clear that the effect of word position in the statistical model is being driven principally by the fully voiced tokens. While the ratio of partially voiced tokens is quite similar between the three positions, the ratio of fully voiced tokens steadily increases from medial (22.6%), to initial (26.4%), to final position (32.2%).

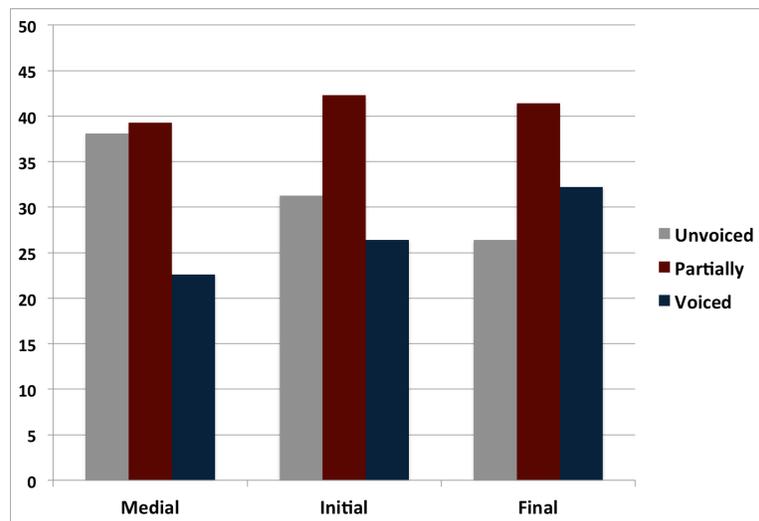


Figure 4: Percentage of unvoiced, partially, and fully voiced tokens by position (N=1,387)

In regards to stress, the odds of being in a higher voicing category increase significantly in unstressed-unstressed as compared to unstressed-stressed; however, the comparison between unstressed-unstressed and the other two stress patterns is not significant. In fact, stressed-stressed is not significantly different than any other stress pattern, which may be due to the small number of tokens in this category (N=73). On the other hand, releveling shows significantly higher voicing in stressed-unstressed than in unstressed-stressed. Therefore, the overall pattern of highest to lowest voicing is as follows: unstressed-unstressed > stressed-unstressed > unstressed-

stressed > stressed-stressed. This result shows that the stress of both preceding and following vowel seems to matter, which validates coding stress in this way.

For following vowel, Table 3 shows significantly lower odds of voicing for [i, u] than for [a, e, o]. Interestingly, this pattern follows the natural classes of vowels, whereby there is more voicing when /s/ is followed by a non-high vowel ([a, e, o]) than when it is followed by a high vowel ([i, u]). The exact ordering of following vowel from lowest to highest voicing is: [u] < [i] < [o] < [e] < [a]. However, there is no significant difference between [u] and [i], or between [o], [e], and [a]. Curiously, there is also no significant difference between [i] and [o], showing that these two vowels are on the periphery of their respective vowel classes in terms of voicing.

4. Discussion and Conclusions

4.1 *Categorical or gradient?*

As was seen in section 1.2, one of the central debates in the literature on intervocalic /s/ voicing has been whether it is a categorical or gradient phenomenon. The earliest studies (Robinson 1979, Lipski 1989) uphold that intervocalic /s/ voices categorically exclusively in word-final position in Quiteño and Cuencano Spanish. Nevertheless, Chappell (2011) demonstrates that while there are very high rates of voicing in word-final position for Quiteño Spanish (91% voiced tokens), it is not accurate to say that this is an entirely categorical phenomenon because if it were, word-final intervocalic /s/ should be voiced 100% of the time. Furthermore, Strycharczuk (2012) finds that while some of her Quiteño participants voice word-final /s/ categorically, others do not.

The results presented here clearly suggest that intervocalic /s/ voicing in Lojano Spanish is both *gradient* and *variable*. In the first regard, there is no evidence for two distinct voicing

categories (0% and 100% voiced). Instead, we see the full range of percent voicing, with tokens all along the cline of 0% to 100% voiced, as evidenced by the histogram in Figure 2. The only exception to this is that there are no tokens between 90% and 99% voiced. Therefore, intervocalic /s/ voicing in this dialect is definitively a gradient phenomenon, which matches what has been found for pre-consonantal /s/ voicing assimilation (Campos-Astorkiza 2014). In the second regard, there is a lot more variation in the production of intervocalic /s/ in terms of position and other factors for Lojano Spanish. While past studies found that voicing is almost entirely limited to word-final position, voicing in Lojano Spanish occurs in all three positions, although to different degrees. Voicing in this dialect is also dependent on speech rate and stress, which Lipski (1989) claims is not the case for Quiteño Spanish. Overall, the fact that so many factors were shown to be significant in the present analysis confirms the variable nature of this feature, and additionally shows that a complex interplay of social and linguistic factors condition this variation.

4.2 Speech Rate, Stress, and Following Vowel

The results for speech rate, stress, and following vowel are best understood when considered together. As a reminder, there is more voicing at higher speech rates, when /s/ is in between unstressed vowels, and when /s/ is followed by a non-high vowel ([a, e, o]). The positive correlation between voicing and speech rate is not surprising since several other studies have also found higher rates of voicing as speech rate increases (File-Muriel & Brown 2011, File-Muriel 2012, Torreira & Ernestus 2012, A. García 2013). For stress, Davidson (2014) corroborates the results seen here since he also finds more voicing between unstressed syllables. Finally, the results for vowel are different from what previous studies have found. Torreira & Ernestus

(2012) find no effect of either preceding or following vowel. Chappell (2011), on the other hand, shows that voicing is favored when /s/ is preceded by a low vowel ([a]) as compared to a mid or high vowel ([e, o, i, u]). In Lojano Spanish, voicing is conditioned by the following vowel instead of the preceding vowel.

The results of these three factors suggest that intervocalic /s/ voicing in Lojano Spanish can be considered a reduction process, which is supported by a gestural analysis (Browman and Goldstein 1989). As speech rate increases, there is more gestural overlap between /s/ and the surrounding vowels. If the two vowels surrounding the /s/ are unstressed, this gestural overlap is even greater. Additionally, given the closer constriction of high vowels compared to non-high vowels (Koenig et al. 2011), voicing is more difficult before a high vowel because voicing of /s/ requires relatively lower pressure inside the mouth. The gestural overlap between /s/ and the surrounding vowels counteracts the aerodynamic requirements that disprefer voiced fricatives (Stevens et al. 1992) and the interaction of these two opposing forces results in the gradient voicing of /s/. In this sense, intervocalic /s/ voicing mirrors other intervocalic reduction processes in Spanish, such as the voicing of intervocalic voiceless stops (Hualde et al. 2011) and /f/ (Blecua & Rost 2013).

4.3 Position within a word

As mentioned in section 4.1, most previous studies have found intervocalic /s/ voicing to occur exclusively or at higher rates in word-final position (Robinson 1979, Torreblanca 1986, Lipski 1989, Calle 2010, Chappell 2011, McKinnon 2012, Strycharczuk 2012, Torreira & Ernestus 2012, Davidson 2014). The only exception to this is the findings of A. Garcia (2013). In her investigation of Bogotano Spanish, she finds more voicing in word-medial intervocalic /s/

than in word-final position, although overall she concludes that voicing is not a feature of this dialect since the rates of voicing in any position are quite low. The issue with comparing previous studies to the present study is that many of these studies, including A. Garcia (2013), do not consider word-initial intervocalic /s/, and so we do not know what happens with word-initial /s/ in these dialects. Nonetheless, a few studies have invoked incipient phonologization to explain the higher rates of voicing in certain word positions (cf. Torreira & Ernestus 2012). The idea is that as intervocalic /s/ voicing becomes a phonological process, as opposed to a phonetic reduction process, it is going to affect a given /s/ differently based on where it falls in the word.

For Lojano Spanish, more voiced tokens are found in word-final and word-initial position, as compared to word-medial position. Thus, it seems to be an effect of whether the /s/ is within the word (medial position) or between two words (initial and final position). However, the effect of position does not seem to be as strong in Lojano Spanish as in other dialects since even word-medial intervocalic /s/ is fully voiced almost one-fourth of the time. If this feature is indeed entering into Lojano Spanish, which will be discussed in the next section, it is possible that the effect of position might be even stronger in the future as intervocalic /s/ voicing becomes limited to certain positions. What is most interesting is that a purely reduction analysis would predict no effect of position, or if anything would predict more voicing word-medially where gestures are more coordinated. Therefore, the effect of word position in Lojano Spanish is evidence that intervocalic /s/ voicing is more complicated than a simple reduction analysis can account for.

4.4 Age and Gender

Among previous studies of intervocalic /s/, only one has considered age as an independent variable. Calle (2010) finds that younger Quiteños do not voice as much as older ones and

concludes that perhaps this is indicative of a change in progress in Quiteño Spanish. However, since she only interviewed six participants from Quito, there are only two participants per age group, and so the strength of this conclusion must be questioned. For gender, while most previous studies have not found this factor to be important (Chappell 2011, Strycharczuk 2012, Torreira & Ernestus 2012), McKinnon (2012) finds that Catalan-Spanish bilingual females slightly favor voicing, while their male counterparts slightly disfavor voicing.

As seen in section 3.2, in the present study, tokens of intervocalic /s/ produced by male participants are more likely to be in a higher voicing category than those produced by female participants. Additionally, younger participants are more likely to produce voiced tokens than older participants. Like the results for word position, the significant effects of age and gender point to a more complex analysis. First, the inverse relationship between age and voicing suggests that this feature may be coming in to Lojano Spanish from neighboring dialects. Usually when new linguistic features are adopted by a community, it is the youngest generations who will be the first group to show high rates of adoption, and from there the feature diffuses throughout the community as time progresses. This is the pattern that we see with intervocalic /s/ voicing in Lojano Spanish; however, this conclusion remains tentative given the number of speakers in the dataset. Bailey (2002) warns that any conclusions made based on comparing age groups are only warranted for adult participants in large, representative samples. Thus, the effect of age should be corroborated in the future by a larger sample of Lojanos, although the pattern seen here is already quite suggestive and is also supported by social changes in Loja. While it was once very difficult to traverse the roads between Loja and other neighboring cities, and indeed Loja was not connected by highway at all to other highland cities until the mid-twentieth century (Toscano Mateus 1953: 15), that is no longer the case due to the rapid improvement of

highways in this region. Lojanos can now travel much more freely and easily than in the past, which has increased overall communication between Lojanos and their neighbors in Cuenca and Quito, priming their dialect for linguistic change.

For gender, it is important to consider all potential factors that might cause male Lojanos to produce more voiced tokens than their female counterparts. File-Muriel et al. (2012) state that men are more likely to voice intervocalic /s/ because on average their vocal chords are thicker than women's vocal chords, which would make it more difficult to turn "off" voicing for the /s/ and then turn voicing back "on" for the subsequent vowel in a vowel-/s/-vowel sequence. On the other hand, voicing could be a gendered practice that male Lojanos learn and emulate. Foulkes & Docherty (2006) alert that it is often very difficult to separate the effect of non-learned, non-arbitrary factors, such as vocal tract characteristics, from the effect of arbitrary, learned behaviors. Additionally, it could be possible that male Lojanos voice more because on average they have higher speech rates, but in this case the effect of gender is independent of speech rate. Regardless of whether voicing is physiological or learned, the fact that male Lojanos voice more creates the situation where voicing could be socially associated with male speech. Finally, the intersection of age and gender exhibits a pattern that is indicative of a particular kind of change in progress. The fact that it is the younger males who are leading the voicing suggests that the inception of voicing is a "change from below" (Cheshire 2002), that is, that it is below the level of consciousness. This matches my own experience in the community since Lojanos do not seem to be readily aware of this feature and do not explicitly comment on it. Consequently, it is likely that intervocalic /s/ voicing will diffuse through Lojano Spanish before most of the speakers themselves are consciously aware of this change.

4.5 Conclusion

In contrast to what previous studies have found, intervocalic /s/ voicing in Lojano Spanish is both a gradient and variable phenomenon, and this dialect exhibits much more variation in terms of this particular feature than other varieties of Highland Ecuadorian Spanish. On the surface, it looks like intervocalic /s/ voicing is akin to other intervocalic reduction processes; however, careful examination of conditioning factors illuminates a more complex analysis. While the results for speech rate, stress, and following vowel can be understood under a gestural reduction account, it is not possible to explain the results for word position, age, and gender under this same account. Instead, it appears that there is a complex interplay of phonetic, phonological, and social factors that condition voicing in this dialect. Finally, there is evidence that the realization of intervocalic /s/ represents linguistic change in the community of Loja, which is being led by young male Lojanos. Future studies should look at the social associations of intervocalic /s/ voicing in this community to see whether perception matches the production patterns found here. Only time will tell whether this feature diffuses entirely in the community and becomes part of the regional Lojano identity.

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