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Intervocalic /s/ Voicing in Andean Spanish: Problematizing the Assessment of Contact-induced Change

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1. Introduction

This study seeks to empirically explore the confluence of internal (or endogenous) and external (or contact) motivations underpinning the variable production of the voiceless alveolar fricative, /s/, in select varieties of Spanish in contact with Quechua. Though the realization of Spanish /s/ as voiced [z] in intervocalic contexts (e.g. *los años* ‘the years’ [lo.zá.nos]) appears often in impressionistic and dialectological surveys (cf. Canfield, 1962; Montes Giraldo, 1984; Navarro Tomás, 1962; Obaid, 1973; Robinson, 1979; Torreblanca, 1986) as a feature of Andean Spanish, its possible status as a contact-induced innovation arisen from Quechua is seldom discussed, much less explored with empirical phonetic data. Moreover, in light of a more recent body of experimental studies attesting Spanish intervocalic /s/ voicing as a product of endogenous lenition in multiple varieties of monolingual (or non-contact) varieties (cf. Ernestus & Torreira, 2012; Hualde & Prieto, 2014; Schmidt & Willis, 2011), the need for cross-dialectal comparison between contact and non-contact Spanish varieties is increasingly important. By examining specific linguistic contexts that mediate intervocalic /s/ production by a diverse group of Spanish-Quechua bilinguals stratified for language dominance from Quito and Latacunga, Ecuador and Lima, Peru, we discuss how the complex interplay between endogeneity and language contact highlights the need for a more gradient, less categorical approach (along the lines of Thomason [2008]) to the empirical classification of contact-induced change.

This paper is structured as follows: section 2 consists of a review of intervocalic /s/ voicing in contact and non-contact varieties of Spanish, additionally detailing specific claims concerning the status of this phenomenon as contact-induced in Spanish varieties in contact with Quechua. Section 3 discusses our research questions and hypotheses with respect to the analysis of intervocalic /s/ voicing as contact-induced. Section 4 details the experimental methodology and test instruments. Section 5 discusses data analysis techniques and results from data collection. Section 6 offers a discussion of the results of the present study. Lastly, we conclude in section 7 by offering directions for future study.

2. Alveolar Fricative Production in Spanish

Though the most widely studied consonantal phoneme of Spanish, the variable production of the voiceless alveolar fricative /s/ is most often investigated with respect to its aspiration and/or total elision (Chappell, 2016, p. 361). Its variable voicing, on the other hand, has received considerably less attention in dialectological and experimental studies alike. A normative description of /s/ voicing is as follows: in Spanish varieties that do not exhibit aspiration or deletion of /s/ in pre-consonantal positions, such as Mexican Spanish and North-Central Peninsular Spanish, two allophones of /s/, namely voiceless [s] and voiced [z], are found in complimentary distribution via regressive assimilation of voicing to the following consonantal segment. Before voiced (semi)consonants, /s/ is

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realized as [z] (e.g. *rasgo* [ráz.ɣo] ‘feature’; *mis hierbas* [miz.jér.βas] ‘my herbs’), whereas in all other contexts, /s/ is realized as [s] (e.g. *rasco* [rás.ko] ‘I scratch’; *casa* [ká.sa] ‘house’; *mis amigos* [mi.sa.mí.ɣos] ‘my friends’) (Hualde, 2014, p. 154-155; Hualde, Olarrea, Escobar, & Travis, 2010, p. 74; Navarro Tomás, 1918, p. 83; Morgan, 2010, p. 248; Teschner, 1996, p. 102-103). Accordingly, Spanish productions of [z] outside of the context of a following voiced (semi)consonant (e.g. the intervocalic context, in particular) are prescriptively disallowed:

“La s sonora aparece únicamente, en nuestra lengua, en posición final de sílaba, precediendo inmediatamente a otra consonante sonora; en cualquier otra posición su presencia es anormal y esporádica [The voiced /s/ in our language appears solely in syllable-final position immediately preceding another voiced consonant; in any other position its presence is abnormal and sporadic]”
(Navarro Tomás, 1918, p. 83).

The prescriptive treatment of [s] and [z] allophony as absolute (i.e., only [z] before voiced [semi]consonants, only [s] in all other contexts) has recently been questioned, however, in light of experimental research using more refined acoustic analyses. In particular, instances of fully voiceless [s], partially voiced [s̠], and fully voiced [z] were all found to occur, in varying frequency, in each of the contexts of a following vowel, a following voiceless consonant, and a following voiced consonant in Northern-Central Peninsular Spanish (cf. Campos-Astorkiza, 2014), Mexico City Spanish (cf. Schmidt & Willis, 2011), Highland Colombian Spanish (cf. García, 2013), Quito Spanish (cf. Strycharczuk, van’t Veer, Bruil, & Linke, 2014), and in the speech of a group of (presumably monolingual or Spanish-dominant) speakers from Madrid, Valencia, and Galicia (cf. Clegg & Strong, 1992). Although Clegg and Strong (1992, p. 32) declare “There is no question as to the existence of the phenomena of sporadic voicing of /s/ in all positions and extensive voicing in some speech communities” (see also Cepeda, 1990; Obaid, 1973, p. 63; Teschner, 1996, p. 150; Torreblanca, 1978; 1986), the aforementioned studies attesting to a lack of voicing before voiced consonants in several Spanish varieties merits a broader generalization, namely that Spanish /s/ voicing is highly variable, as well as gradient.

The treatment of Spanish /s/ voicing as a gradient phenomenon is supported by cross-linguistic research evidencing the gradiently voiced or voiceless quality of alveolar fricatives, prepalatal fricatives, the fricative portion of prepalatal affricates, as well as other /s/ lenition phenomena (e.g. aspiration, elision), in Portuguese (cf. Jesus & Shadle, 2003), English (cf. Stevens, Blumstein, Glicksman, Burton, & Kurowski, 1992), Catalan (cf. Carrera-Sabaté, 2009), Italian and Dutch (cf. Rivas, 2006), and several varieties of Spanish including Caleño Spanish (cf. File-Muriel & Brown, 2011), Argentinean Spanish (cf. Gradoville, 2011; Rohena-Madrado, 2011), and Madrid Spanish (cf. Torreira & Ernestus, 2012). Along this line of research, fricative voicing assimilation is modeled within gestural phonology (cf. Browman & Goldstein, 1989; 1991) as a product of the relative timing and coordination of opposing (or conflicting) laryngeal gestures necessary to restrict or permit voicing during the fricative segment in conjunction with adjacent segments. In particular, the conflicting laryngeal gestures for [s] (vocal fold abduction) and a following voiced consonant (vocal fold adduction) can give rise to gestural blending (cf. Browman & Goldstein, 1989; 1991), resulting in a single vocal fold adduction gesture that extends fully into the /s/ segment, yielding [z] (Campos-Astorkiza, 2014, p. 19; Hualde, 2014, p. 107). Fricative voicing before a voiced (semi)consonant or vowel can therefore be understood as a lenition phenomenon, in that the conflicting glottal gestures for [s] and the following voiced segment are gradiently reduced to a single glottal gesture.

2.1. Accounts of Intervocalic /s/ Voicing as Endogeny in Non-Contact Varieties of Spanish

An account for Spanish intervocalic [z] as a language-internal, structural product of articulatory weakening and gestural coordination mechanisms is precisely what has been posited for monolingual varieties of Spanish as an extension of voicing assimilation in the context of a following voiced consonant within gestural phonology (cf. Browman & Goldstein, 1989; 1991; Hualde, 2014, p. 106-107; Hualde & Prieto, 2014; Torreira & Ernestus, 2012). More specifically, in a sequence of vowel + /s/ + vowel (hereby VsV), the laryngeal gesture for the voiceless fricative (vocal fold abduction)

conflicts with that of each of the adjacent voiced vowels (vocal fold adduction). Particularly in fast speech, if the magnitude of the vocal fold abduction for voiceless /s/ is undershot, and/or if the laryngeal gesture for /s/ is encroached upon by vocal fold adduction gestures of each of the neighboring vocalic segments, this can result in uninterrupted voicing throughout the entire sequence, yielding intervocalic voiced [z].

This account of Spanish intervocalic fricative voicing is corroborated by acoustic analyses of both conversational (cf. Hualde & Prieto, 2014) and hyper-casual¹ (cf. Torreira & Ernestus, 2012) speech from monolingual Madrid Spanish speakers. A more modest frequency of fully (or uninterruptedly) voiced [z] occurring in just over 8% of all intervocalic /s/ tokens was found in conversational Madrid speech (cf. Hualde & Prieto, 2014, p. 116), whereas Torreira and Ernestus (2012, p. 136, 138) reported that 34% of all intervocalic /s/ tokens showed full (or uninterrupted) voicing in hyper-casual speech, and were additionally sensitive to the speech rate (favoring more voicing with faster speech rates). For Mexico City Spanish, Schmidt and Willis (2011, p. 7) found that intervocalic voiced [z] productions comprised 9% of all intervocalic /s/ tokens recorded from conversational speech, nearly identically mirroring the frequency found in the equivalent speech style in Madrid Spanish (cf. Hualde & Prieto, 2014).

Accordingly, the wider generalization that these data support is that Spanish intervocalic /s/ voicing is a natural phenomenon, favored in faster and more casual speech styles, that is likely to be observed sporadically in any Spanish variety (notwithstanding aspiration, elision, or other lenition phenomena involving /s/), independent of contact with other languages. Impressionistic observations of sporadic intervocalic /s/ voicing in a rather diverse group of other Spanish varieties stand as further support for this claim, including the Spanish of Mexico (Monterrey, Guadalajara, Mexico City), Costa Rica (San José), El Salvador, Panama, Colombia, Ecuador, and Spain (provinces of Cáceres, Badajoz, Avila, Madrid, Toledo, Albacete, Murcia, Alicante, Huelva, Castellón, Navarra, Extremadura, Salamanca, Valencia, Cordoba, as well as the Canary Islands) (Obaid, 1973, p. 63-64; Torreblanca, 1978, p. 501 and references within). Furthermore, Hualde and Prieto (2014, p. 111) note that the voicing (and even devoicing) of intervocalic fricatives is a “natural, unremarkable phenomenon[on],” evidenced time and time again in the evolution of several Romance varieties, fully accounted for by lenition and articulatory mechanisms.² Torreblanca (1986) even posits that the intervocalic /s/ voicing observable in the province of Toledo, Spain may stand as a phonetic archaism from Medieval Spanish, constituting yet another appeal to strictly language-internal motivations behind this phenomenon. Moreover, prevocalic word-final fricative voicing is attested cross-linguistically as a relatively natural linguistic feature in languages such as Polish, West-Flemish, Breton, and Slovak (Strycharczuk & Simon, 2013, p. 564).

In summary, the aforementioned evidence of intervocalic fricative voicing in multiple monolingual Spanish varieties, particularly as mediated by speech rate, offers support to an account of intervocalic [z] production as an innovation that may arise in any and all Spanish varieties completely independently of contact with other languages, accounted for by strictly language-internal mechanisms of lenition within gestural phonology (cf. Browman & Goldstein, 1989; 1991) that are grounded in linguistic (and phonetic) universals.

2.2. Accounts of Intervocalic /s/ Voicing as Contact-induced in Contact Varieties of Spanish

Aside from Spanish varieties in contact with Quechua, there are two contact situations that have received considerable attention with respect to language contact as the source for Spanish intervocalic /s/ voicing, namely Spanish in contact with Catalan and Spanish in contact with English. Regarding the former, Catalan features an intervocalic voiced alveolar fricative as a contrastive phoneme /z/ in word-

¹ Participants were unaware that they were being recorded. This was accomplished by covering up, with tape, lights and other visual indications of recording equipment being turned on, placing unplugged cables by outlets to trick participants into believing recording equipment devices were not plugged in, and by using a confederate who left the room after being informed that a microphone was defective and that recording could not take place until a new microphone was procured (Torreira & Ernestus, 2010, p. 2982-2983).

² Hualde and Prieto (2014, p. 111) point to the diachronic evolution of words like ‘house’ from Latin to Spanish (Latin /kása/ > Old Spanish /káza/ > Modern Spanish /kása/) as evidence of the inherent naturalness of both voicing and devoicing in intervocalic position.

initial and word-medial positions (e.g. *zel* ‘zeal’ [zél]; *pesar* ‘to weigh’ [pə.zá]), and as the result of anticipatory assimilation to a following voiced vowel in word-final position (e.g. *gos estrany* [gó.zəs.tráɲ] ‘strange dog’) (Hualde, 1992, p. 371-372, 393-394; Prieto, 2004, p. 208, 216; Recasens, 2014, p. 239-240; Wheeler, 2005, p. 147-149, 162). Claims for the direct L1-transfer (or imposition [cf. Van Coetsem, 2000]) of intervocalic [z] by Catalan-dominant bilinguals into Spanish are abundant (cf. Casanovas Català, 1995; Hualde, 2014, p. 155; Wesch, 1997, p. 298; Vann, 2001, p. 124), with intervocalic fricative voicing being touted as one of the most hallmark features of the Spanish of Catalans (Casanovas Català, 1995, p. 56-57). A recent empirical study by Davidson (2014; 2015) revealed that Spanish intervocalic /s/ voicing is strongly mediated by Catalan-dominance and cognate status, with the most Catalan-dominant speakers voicing nearly categorically even in read speech and particularly with Spanish words whose Catalan cognate contains [z], making Spanish in contact with Catalan the only Spanish variety, to our knowledge, to exhibit systematic if not categorical /s/ voicing in explicitly careful speech conditions.

With respect to Spanish in contact with English, the majority of research concerning intervocalic fricative production focuses on classroom second language acquisition, that is, English speakers learning Spanish in the United States. As American English features intervocalic /z/ (cf. Goldstein, 2001; Jongman, 1989; Maddieson, 1984; Schmidt, 2014; among many others), another relatively straightforward opportunity for L1-transfer is available. Aside from empirical studies that attest [z] in the Spanish of L1-English classroom learners (cf. Menke & Face, 2012; Schmidt, 2008), the voicing of intervocalic /s/ in Spanish in English-Spanish cognates (e.g. *presidente* ‘president’) is referenced in explicit instruction in several Spanish phonetic textbooks for U.S. students (cf. Hualde, 2005; 2014; Hualde et al., 2010; Morgan, 2010), and Teschner (1996) even devotes an entire subchapter to this L2-speech feature.

In summary, Spanish intervocalic [z] is a well-attested feature in Spanish varieties in contact with Catalan and English. Language dominance (favoring greater voicing with greater dominance in Catalan or English) and cognate effects often facilitate the treatment of this Spanish phenomenon as an L2-speech error in these varieties, which ultimately foregrounds its potential status as a contact-induced feature.

2.3. Sources for Intervocalic /s/ Voicing in Spanish Varieties in Contact with Quechua

The final contact variety of Spanish with abundant evidence of intervocalic /s/ voicing (cf. Bradley, 2005; Chappell, 2011; Colina, 2009; Córdoba, 1996, p. 191-192; García, 2015; Hualde, 2014, p. 155; Lipski, 1989; Montes Giraldo, 1984; Navarro Tomás, 1962, p. 81; Obaid, 1973, p. 63; Robinson, 1979; Strycharczuk et al., 2014; Toscano Mateus, 1953, p. 79; Torreblanca, 1986, p. 68), and the focus of the rest of this paper, is Spanish in contact with Quechua. Curiously, the only research of which we are aware that includes even a minor discussion of whether or not contact with Quechuan varieties may have played a role (as the source language) in the development of Spanish intervocalic [z] is Córdoba (1996), Lipski (1989), and Toscano Mateus (1953). All acknowledge (the latter two albeit in footnotes) that the Quechua spoken in Highland Ecuador (henceforth referred to as Kichwa) indeed exhibits a phonemic voicing distinction between voiceless /s/ and voiced /z/, at least word-medially (Córdoba, 1996, p. 192; Lipski, 1989, p. 52; Toscano Mateus, 1953, p. 23). In particular, Córdoba (1996, p. 192) and Toscano Mateus (1953, p. 23, 78) posit that select Spanish borrowings from Kichwa, such as *puzu* ‘gray-haired,’ *puzun* ‘belly,’ and *jizi* ‘beaming’ are realized with [z], suggestive of a voiced alveolar fricative phoneme in Kichwa. However, Lipski (1989, p. 52) proposes (without explicit reference to any actual Kichwa data) that prevocalic word-final voicing never occurs in Kichwa, such that the phonemic voicing contrast between /s/ and /z/ may not exist word-finally. This lack of Kichwa [z] in word-final prevocalic contexts is what Lipski (1989, p. 50-52) uses to disavow an account of contact-induced change, given that he characterizes his Spanish data from Highland Ecuador as exhibiting intervocalic [z] exclusively in the word-final prevocalic position. Indeed, several studies impressionistically describe the /s/ voicing observed in Highland Ecuador Spanish as exclusive to word-final prevocalic contexts (cf. Robinson, 1979, p. 137-138; Strycharczuk et al., 2014, p. 3; Toscano Mateus, 1953, p. 79). Notably however, Chappell (2011, p. 60) provided an

empirical analysis of conversational speech from 5 speakers from Quito, Ecuador, wherein the distribution of voiced intervocalic [z] tokens was far from categorical. Of the 120 observations of intervocalic [z] (comprising only 30% of all intervocalic /s/ productions), 76% occurred in word-final prevocalic contexts, 9% occurred in word-medial contexts, and the remaining 15% occurred word-initially. Accordingly, without any empirical data from Quechua (or in the case of these aforementioned Highland Ecuador studies, Kichwa in particular), it seems premature to draw a strong conclusion regarding any absolute lack of prevocalic word-final voicing.

Beyond the general lack of empirical work concerning intervocalic /s/ voicing in Spanish varieties in contact with Quechua, an additional complication for the assessment of intervocalic /s/ as contact-induced lies in the claim put forth by Robinson (1979, p. 138), namely that intervocalic [z] is an archaism left from the Spanish colonizers of Latin America, in whose Spanish the Medieval Spanish voicing contrast between /s/ and /z/ was still active. Loanwords from Spanish into Kichwa that preserve the /z/ from Colonial Spanish form the basis for this account, including *cazarana* (Spanish *casarse*) ‘to get married’ and *cazuna* (Spanish *hacer caso*) ‘to pay attention’ (Robinson, 1979, p. 138; Toscano Mateus, 1953, p. 23, 78). This account has been subject to criticism, however, by Torreblanca (1986, p. 68) and Montes Giraldo (1984, p. 221-227), who note that the sporadic production of intervocalic [z] outside of prevocalic word-final contexts, and additionally the systematic voicing of /s/ to [z] prefix-finally (e.g. *desalar* ‘to de-wing’) in the Ecuadorian sub-dialect of Cuenca (cf. Bradley, 2005; Córdoba, 1996, p. 191; Lipski, 1989, p. 5; Robinson, 1979, p. 137-138; Toscano Mateus, 1953, p. 79) are difficult to account for if intervocalic [z] were an archaism not subject to any other motivations. Instead, they posit Highland Ecuadorian Spanish intervocalic [z] as an independent innovation resulting from language-internal tendencies of articulatory weakening (Montes Giraldo, 1984; Torreblanca, 1986, p. 69; see also Torreblanca, 1978, p. 501), which is further supported by the finding of a sensitivity to speech rate (favoring greater voicing degrees in faster speech) in Quito Spanish (cf. Strycharczuk et al., 2014, p. 24, 34), Colombian Spanish (cf. García, 2013, p. 82-84), and Lojano Spanish (cf. García, 2015, p. 154-155).

In summary, though the presence of intervocalic /s/ voicing in Spanish varieties in contact with Quechuan varieties is uncontested, a lack of sufficient empirical, quantitative research makes it difficult to make generalizations regarding the linguistic contexts in which it occurs and its frequency in either of Spanish or Quechua. Moreover, given that the Medieval Spanish of the 1500s may have still exhibited an intervocalic phonemic contrast between /s/ and /z/, the attestation of intervocalic [z] in modern Spanish varieties in contact with Quechua may simply be the remains of a relic feature preserved over time. Strikingly, to our knowledge, not a single empirical study has been conducted that specifically examines the possible role of Quechuan language dominance in mediating intervocalic /s/ voicing. Given these current gaps in empirical research, the present study attempts to identify and quantify specific linguistic and social factors mediating the variable production of Spanish intervocalic /s/ in select Andean Spanish varieties, across various profiles of bilinguals, so as to provide a more refined dataset with which to make cross-dialectal comparisons with non-contact varieties, and ultimately from which to draw clearer conclusions concerning the assessment of contact-induced change.

3. Research Questions for the Empirical Classification of Contact Innovations

In order to best contribute to the debate over the status of intervocalic /s/ voicing in Andean Spanish as either a product of language-internal, endogenous change or contact-induced change, this study puts forth the following two main research questions:

RQ1) What linguistic contexts favor greater degrees of /s/ voicing and how are these contexts linked to structurally-based properties of phonetic lenition?

RQ2) What is the role, if any, of Spanish-Quechua bilingualism in mediating intervocalic /s/ production?

Our analysis of linguistic and social factors underpinning variation in intervocalic /s/ voicing is

guided by a set of recent frameworks within variationist sociolinguistics and contact linguistics that set forth empirical criteria for the classification of contact-induced change. In particular, we reference a set of five parameters of contact-induced change as detailed by Thomason (2001, p. 93-94), Mougeon, Nadasdi, and Rehner (2005, p. 103-104), Poplack and Levey (2010, p. 398), Levey, Groulx, and Roy (2013, p. 230), and Poplack, Zentz, and Dion (2012, p. 204):

P1: The source language (Quechua) exhibits a parallel feature (intervocalic /s/ voicing) to that being adopted in the recipient language (Spanish), attested before contact exclusively in the source language.

P2: Use of the feature in the recipient language is mediated by bilingualism in the source and recipient languages.

P3: Other contact varieties of the recipient language exhibit a parallel feature.

P4: Non-contact varieties of the recipient language do not exhibit a parallel feature.

P5: No language-internal (endogenous) motivations can account for the feature being adopted in the recipient language.

What immediately surfaces regarding the present case of Andean Spanish intervocalic /s/ voicing in light of these five parameters of contact-induced change is that the case in favor of contact as the sole or even primary source of innovation is difficult if not impossible to establish. To begin with, P4 and P5 cannot be met on the grounds of the abundance of impressionistic and empirical (socio)phonetic work cited previously in section 2, which convincingly demonstrates that intervocalic /s/ voicing is sporadically if not systematically found in perhaps all varieties of Spanish, appearing in more spontaneous and casual speech registers as a product of articulatory gestural lenition. The diachronic evolution of Spanish (see Hualde and Prieto [2014, p. 110-111] or Penny [2002, p. 72-84] for an overview), among other Romance varieties, further emphasizes the inherently structural nature of obstruent voicing (and devoicing) in intervocalic contexts. Regarding P1, the status of voiced intervocalic /z/ in Quechua is somewhat nebulous, with some (cf. Córdoba, 1996; Lipski, 1989; Toscano Mateus, 1953) claiming its productive existence at least in Highland Ecuadorian Spanish in select linguistic contexts, and others (cf. Robinson, 1979) claiming that it is a non-productive phoneme in fact transferred from Medieval Spanish to Quechua.³ The lack of clear consensus concerning the evolution of Quechua's phonemic inventory prior to and even since contact with Spanish renders this parameter relatively weak in its ability to bolster a contact-based account of modern /s/ voicing trends. As previously stated, we are unaware of any empirical studies that have sought to investigate whether or not intervocalic /s/ production is mediated by bilingual language dominance, leaving us unable to make any assertions regarding P2. Lastly then, the sole parameter for which there does seem to be sufficient evidence favoring an the consideration of contact-induced change for Andean Spanish varieties is P3, in that both impressionistic and empirical studies (refer back to section 2.2 for specific sources) on Spanish in contact with each of Catalan and English have attested systematic productions of Spanish intervocalic [z].

The interpretation of these parameters as applied to the present study, that is, a preliminary analysis of Andean Spanish intervocalic /s/ voicing, is that the “burden of the proof” (Poplack & Levey, 2010, p. 412) in favor of a contact account is far from met. Indeed, Poplack and Levey (2010) emphasize the all too frequent faux pas that linguists commit by presuming contact-induced change when focusing on P1 at the expense of P5: “...potential candidates turn out... not to be contact-induced, but rather cases of garden-variety inherent variability firmly rooted in the internal structure of the language” (p. 395). Without satisfying all five parameters of contact-induced change, the claim for contact-induced change falls short, suggesting a kind of “all or nothing” approach to contact-induced change. The most frequent and prominently applied label to cases of potential contact-induced change that do not meet all five contact-induced change parameters is that first put forth in the work of Silva-Corvalán (1986; 1994) for a set of morphosyntactic features of Los Angeles Spanish, namely that of

³ Likely a reflection of its relatively weak linguistic vitality (to be elaborated further in section 4.2) and subsequent lack of openly available resources, additional reports concerning the existence of /z/ in select Quechua varieties are often anecdotal in nature (cf. García, 2015, p. 44-45) and limited to specific sub-dialects.

“natural change accelerated by contact.” Based on the aforementioned analyses of P1, P4, and P5, alongside the lack of any prior finding indicative of intervocalic /s/ voicing as mediated by Spanish-Quechua language dominance, we predict that the present investigation will not find any link to speaker language dominance, further in line with an assessment of /s/ voicing as an endogenous change accelerated in a setting of language contact.

4. Experimental Methodology

4.1. Linguistic Factors

The present investigation incorporates a set of two linguistic factors, namely syllable stress and word position. Their inclusion is motivated both by their use in prior investigations of intervocalic /s/ voicing across contact and non-contact varieties of Spanish, and by their direct connection with the treatment of /s/ voicing as a phonetic product of articulatory lenition.

With respect to syllable stress, two levels are established: surrounding vowels unstressed (e.g. *amigas animadas* ‘lively female friends’ [asa]; *las abejas* ‘the bees’ [asa]; *carta sin nombre* ‘letter without a name’ [asi]) and surrounding vowels (minimally one, that is, both whenever possible⁴) stressed (e.g. *mamá^s altas* ‘tall mothers’ [ásá]; *las águilas* ‘the eagles’ [ásá]; *está sin dinero* ‘s/he is without money’ [ási]). Since Spanish has no determiners ending in /s/ that exhibit final-syllable stress, these tokens, alongside (unstressed) prepositions (e.g. *sin* ‘without,’ *sobre* ‘on,’ *tras* ‘after’), are the only tokens belonging to the “stressed” group that feature a single adjacent stressed vowel as opposed to two. The conditioning of stress, on a theoretical ground, invokes the concept of local hyper-articulation for stressed syllables, or the notion that the speaker may reduce otherwise expected effects of gestural overlap with a neighboring segment across stressed syllables, since these kinds of syllables have longer durations in Spanish (Hualde, 2005, p. 244; 2014, p. 251) and allow the speaker to better time articulatory gestures independently of one another (cf. Browman & Goldstein, 1989; 1991). More concretely, this would suggest that tokens with stressed surrounding vowels, such as *mamá^s altas*, would be the most resistant to /s/ voicing as an effect of the greater opportunity (across stressed syllables) for the successful coordination of vocal fold abduction for voiceless [s] relative to the vocal fold adduction gestures of the surrounding (voiced) vowel segments. Intervocalic /s/ voicing in Madrid Spanish (cf. Torreira & Ernestus, 2012), Barcelona Spanish (cf. Davidson, 2014; 2015), and Loja Spanish (cf. García, 2015) is favored across unstressed syllable sequences, and we accordingly predict that unstressed sequences will favor greater voicing degrees in Andean Spanish as well, in alignment with the analysis of /s/ voicing as a lenition phenomenon.

With respect to (intervocalic) word position, two levels are established: word-initial (e.g. *la salas* ‘you salt it’) and word-final (e.g. *las alas* ‘the wings’). The decision to exclude word-medial /s/ tokens (e.g. *pasa* ‘raisin’ [ása]) was made in order to facilitate the full crossing of linguistic factors, since vowels surrounding word-medial /s/ in Spanish are most frequently oppositely stressed (i.e., unstressed tokens such as *pasajero* ‘passenger’ [asa] are comparatively fewer in number).⁵ The conditioning of word position is related to general phonetic properties of lenition, in which processes of articulatory weakening are heightened in word-final position relative to word-initial position (cf. Browman & Goldstein, 1989; 1991; File-Muriel, 2007). Intervocalic /s/ voicing in Mexico City Spanish (cf. Schmidt & Willis, 2011), Madrid Spanish (cf. Hualde & Prieto, 2014; Torreira & Ernestus, 2012), Quito Spanish (cf. Chappell, 2011; Strycharczuk et al., 2014), and Barcelona Spanish (cf. Davidson,

⁴ The question of a possible differential stress effect based on the vowel preceding vs. following /s/ may merit future study. Chappell (2011), Campos-Astorkiza (2014), and Davidson (2015) found no difference in stress effect with respect to which vowel (preceding or following /s/) carried stress, whereas García (2015) and Chappell and García (2017) only observed a stress effect with respect to the vowel following /s/. Torreira and Ernestus (2012) consider stress effects of a following vowel to the exclusion of any possible effects of preceding vowel stress, and Hualde and Prieto (2014) and Schmidt and Willis (2012) do not consider stress effects at all. As the vast majority of tokens in the present study have adjacent vowels that are uniformly stressed or unstressed, we circumvent this possible differential effect.

⁵ Moreover, it should be noted that significant differences in the degree of intervocalic fricative voicing conditioned across word-initial vs. word-medial intervocalic contexts were not found in Madrid Spanish (cf. Torreira & Ernestus, 2012, p. 137-138) nor Quito Spanish (cf. Chappell, 2011, p. 61).

2014; 2015) is favored in word-final contexts relative to word-initial ones, and we accordingly predict that word-final contexts will favor greater voicing degrees in Andean Spanish as well, in alignment with the analysis of /s/ voicing as a lenition phenomenon.⁶

4.2. *Social Factors and Subject Population*

As the research concerned with Quechua as a source for intervocalic /s/ voicing (cf. Córdoba, 1996; Lipski, 1989; Toscano Mateus, 1953) focuses on the Spanish of Highland Ecuador, which has additionally been explored in recent empirical work (cf. Bradley, 2005; Chappell, 2011; Strycharczuk et al., 2014), the data from the present study primarily concern the Spanish of Quito and Latacunga, Ecuador. Though Spanish is a co-official language alongside Kichwa in Ecuador, Kichwa remains an endangered language in a context of historical asymmetric bilingualism, discrimination, and physical isolation. Speakers of Quechuan varieties across Peru, Bolivia, and Ecuador have, since the mid-18th century, been increasingly marginalized in Spanish-speaking societies that encouraged rapid assimilation to Hispanic culture and an abandonment of the Quechuan language and culture (Hornberger & King, 2001, p. 166-167). Von Gleich (1992, p. 59) reports a decrease in the number of Quechua monolinguals in Peru from 31% in 1940 to just 11% in 1982, with parallel trends in favor of Spanish monolingualism evidenced in Bolivia and Ecuador. Associations of rurality and low education unfortunately persist with respect to Quechua speakers, many of whom have historically been relegated to more isolated communities outside of the urban centers of each country (Hornberger & King, 2001, p. 168-171). The considerable hegemony of Spanish over Quechua in social, political, and educational settings makes the Spanish-Quechua contact situation quite distinct from those of minority languages in Spain, which enjoy considerably greater degrees of linguistic capital, political power, and truly widespread bilingualism (cf. Fishman, 2001; Montrul, 2013).

Given the predominance of Spanish-dominant speakers living in Quito, participants from Ecuador were recruited in Quito (primarily Spanish-dominant speakers) and Latacunga (primarily Quechua-dominant), a smaller city roughly 90km south of Quito. Participants were between the ages of 18 and 30, permitting an analysis of “modern” Ecuadorian Spanish via the speech of a single generation of young female and male adults. Additionally, a smaller subset of data collection took place in Lima, Peru, an analogous urban capital (primarily Spanish-dominant speakers) with Quito that nonetheless represents a coastal or non-highland variety of Andean Spanish, in contrast with that of Highland Ecuador. Accordingly, the inclusion of both Peruvian and Ecuadorian speech data facilitates a dialectological confirmation of whether or not intervocalic /s/ voicing is indeed a generalized Andean Spanish phenomenon, or instead one that is more characteristic of highland varieties.

As will be further detailed in section 4.3, the 25 speakers that participated in the present study were grouped according to profiles of language use, rather than by any formal assessment of language competence. Table 1, below, displays the general distribution of speakers recruited in this study according to residence, family language profile (home language, native language, and parents’ native language), and reported weekly usage of Spanish and Quechua/Kichwa with family and friends. Notably, all participants hailing from Spanish households reported nearly zero usage of a Quechuan variety, whereas Latacunga speakers from Kichwa speaking households in fact use Spanish and Kichwa nearly in a 50:50 ratio (and predominantly Spanish with friends), corroborating Haboud’s (1996, p. 175) claim that the indigenous household has transformed from an exclusively Quechua space to a bilingual one in which Spanish is increasingly used.

Table 1 Subject Population According to Residence and Bilingual Profile

Insert Table 1 Approximately Here

In this study we place all speakers along a single continuum of Quechuan variety dominance, whereby those from Latacunga report considerable use of and exposure to Kichwa, and the remaining

⁶ This hypothesis is additionally supported by a parallel effect attested for /s/ aspiration (cf. File-Muriel & Brown, 2011), an analogous phenomenon of fricative lenition.

speakers (from Quito and Lima) report comparatively minimal use of and exposure to a Quechuan variety. Various frameworks of language acquisition and psycholinguistics (see Montrul [2013, p. 7-8] for a brief overview) may classify these latter speakers as Spanish monolinguals, and even the speakers themselves may self-identify as monolingual. Ultimately, the labels of monolingual and bilingual are not inherently objective, reflecting a confluence of possible social, ideological, and linguistic characteristics. Crucially, there is no discrete threshold of language competence, use, or exposure at which point a hypothetical and idealized monolingual speaker becomes definitively bilingual. Accordingly, we instead treat all speakers in a multilingual community along a continuum of multilingualism, wherein even speakers that (for all intents and purposes) live in a single language can be loci of language contact, fully subject to linguistic and social influence from the speakers and languages that surround them.⁷

4.3. Test Instruments

This study utilized three test instruments. The first is a socio-demographic questionnaire containing 22 questions used to screen participants according to the social criteria outlined previously in section 4.2. Its purpose was to gather language histories of participants in order to facilitate their groupings according to the bilingual profile groups that appear in table 1.

The second test instrument employed in this investigation is a Spanish elicited production task (formal recorded reading). Participants were asked to read aloud a series of 80 target phrases (2-3 words each) with intervocalic /s/ stratified according to stress and word position (20 items per cell: stressed-word-final; stressed-word-initial; unstressed-word-final; unstressed-word-initial). These target items alternated with a set of 80 distractor phrases that did not contain /s/. With respect to the 80 intervocalic /s/ tokens, it should be noted that all are surrounded by two low central /a/ vowels with the sole exception of target /s/ items that incorporate the unstressed prepositions *sin* ‘without’ and *sobre* ‘on,’ whose intervocalic /s/ segments are adjacent to only one /a/ vowel. The motivation to minimally vary the quality of vowel surrounding /s/ tokens stems from a related /s/-lenition study by File-Muriel and Brown (2011) that found a significant effect of surrounding vowel height on the lenition of /s/ to [h] and [Ø]. The selection of /a/ as the vowel to most often surround /s/ stems from Quilis (1981, p. 235), who notes that of all the Spanish vowels, /a/ is the one that exerts the least influence on the frequency of the energy produced during an /s/ segment. Beyond its use for ensuring an equal number of intervocalic /s/ tokens across the aforementioned linguistic factor cells is produced by each participant, this task serves to gather formal or careful speech so as to assess the degree to which intervocalic /s/ voicing exists outside of more spontaneous (and lenition-prone) registers, which presently has only been attested in high (even categorical) frequencies in Spanish in contact with Catalan (cf. Davidson, 2014; 2015).

The third and final test instrument is a standard sociolinguistic interview (cf. Labov, 2001) lasting 15 to 25 minutes, designed to elicit less careful speech that better approximates spontaneous, casual speech. Participants were asked to discuss colloquial topics including food preferences, vacation stories, daily routines, etc.

4.4. Data Collection Methods

Each participant was recorded individually during one experimental session lasting approximately 40 minutes. Participants were recorded using an SE50 Samson head-mounted condenser microphone and an H4n Zoom digital recorder in private, quiet spaces, including empty classrooms at the *Pontificia Universidad Católica del Ecuador* and *Pontificia Universidad Católica del Perú*, home living rooms, and recording studios in a public radio station in Latacunga. Audio data were converted into wav files to be analyzed using Praat. Subjects received the equivalent of 5 dollars for their participation.

⁷ Refer to Erker (2017) and references therein for additional applications of dismissing the labeling of (and therefore the separation of) discrete language varieties.

5. Data Analysis Methods and Results

5.1. Data Coding

Several methods of analyzing (de)voicing phenomena in fricatives can be found in the phonetics and phonology literature, including the percentage of the fricative segment's duration that is voiced (which relates to spectral properties of the segment and can be computed manually or by using Praat's voice report function, which uses a pulse-based algorithm), harmonicity, intensity, and center of gravity (all of which relate to the segment's energy properties), and duration (which relates to temporal properties of the segment). Gradoville (2011) offers a brief explanation of the theory behind each measurement and sources in the literature for each. As Gradoville (2011) addresses, few attempts to weigh or compare the validity of a particular measurement type against another have ever been made, and thus his research aims to objectively determine which method(s) is/are most valid for the study of fricative (de)voicing phenomena. We have chosen to measure intervocalic /s/ voicing in terms of the percentage of each segment's voiced duration, which, aside from being corroborated by Gradoville (2011) as a valid measure of fricative voicing, has been used to examine /s/ voicing assimilation in Mexican Spanish (cf. Schmidt & Willis, 2011), Madrid Spanish (cf. Hualde & Prieto, 2014; Torreira & Ernestus, 2012), North-Central Peninsular Spanish (cf. Campos-Astorkiza, 2014), and Barcelona Spanish (cf. Davidson, 2014; 2015), facilitating more transparent comparisons of the present Andean Spanish data with these Spanish varieties.

In order to calculate voicing durations for each intervocalic fricative segment, fricative boundary segmentation was performed manually by marking left and right boundaries for each segment by using both the waveform and spectrogram to find the zero-intercept in the waveform closest to the first and last signs of aperiodic noise (cf. Campos-Astorkiza, 2014, p. 21; File-Muriel & Brown, 2011, p. 227-228; Rohena-Madrado, 2011, p. 31-33; Schmidt & Willis, 2011, p. 6). Once intervocalic fricatives were segmented, exact voicing durations were measured as portions of each fricative segment that exhibited a fundamental frequency (that is, a pitch track), a voice bar at the bottom of the spectrogram, and glottal pulses (cf. Campos-Astorkiza, 2014, p. 21; Gradoville, 2011; Hualde, 2014, p. 48-53; Rohena-Madrado, 2011, p. 31-33; Schmidt & Willis, 2011, p. 6; Torreira & Ernestus, 2012). Note that voicing duration measurements were calculated only after adjusting the Praat spectrogram viewing window to be exactly twice the size of the /s/ segment and centered on the /s/ segment, as the F0 contour in the spectrogram is calculated with respect to the segments in the visible window.⁸ Example spectrograms respectively illustrating a more voiced and less voiced realization of Spanish intervocalic /s/ produced by different speakers are shown below as figures 1 and 2.

Figure 1 Male Higher Kichwa Dominance Speaker Production of *las hachas* 'the axes' (100% voiced)

Insert Figure 1 Approximately Here

Figure 2 Female Lesser Kichwa Dominance Speaker Production of *comía sin parar* 'I ate without stopping' (11% voiced)

Insert Figure 2 Approximately Here

5.2. Total Counts of Collected Token Data

The formal speech elicitation task (phrase-list reading) yielded a total of 2000 Spanish intervocalic /s/ tokens. Those (relatively few) tokens with notable speaker disfluencies (such as pauses disrupting VsV sequences in items like *explorarás áreas* 'you will explore areas') were discarded from analysis, leaving 1964 tokens (roughly 78 tokens per speaker) for subsequent statistical analysis. Regarding the casual Spanish /s/ data from the sociolinguistic interview, efforts were made to obtain a dataset that

⁸ Note that our choice to pursue this manual measuring of the duration of F0 track (as accompanied by glottal pulses and the voice bar) as opposed to using Praat's voicing report function was motivated by the random probability for error in relying on the voice report function, whose pulse-based algorithm occasionally reports invalid percentages of locally unvoiced frames that do not match the spectral activity shown in the spectrogram (Gradoville, 2011, p. 69-71).

would be maximally balanced and comparable with the formal speech data. Accordingly, each speaker contributed a total of precisely 56 casual Spanish /s/ tokens, perfectly balanced across the factors of word position and stress. This was the highest number of intervocalic /s/ tokens produced by all speakers that offered the most parallel distribution of linguistic factor contexts as compared with the /s/ tokens elicited from the formal speech task, permitting a more valid comparison of /s/ production across the two speech styles, crucially independently of the two linguistic factor contexts. With the addition of these 1400 casual Spanish intervocalic /s/ tokens, the total amount of Spanish /s/ tokens available for statistical analysis was 3364 (which equates to roughly 134 tokens per speaker).

5.3. Results – Overall Distribution of Voicing Percentages for Intervocalic /s/

In order to better visualize the kinds of voicing degrees that characterize the variation in Andean Spanish intervocalic /s/ production, all productions of Spanish intervocalic /s/ from all speakers were binned according to voicing degree. Figure 3, below, illustrates that the majority of Spanish intervocalic /s/ productions exhibited voicing degrees toward the outer ends of the voicing spectrum, constituting relatively unvoiced segments with voicing durations of 0% to 30% or nearly completely voiced segments with voicing durations of 90% to 100%. Accordingly, less extreme /s/ productions (or those without nearly complete voicelessness or complete voicing) were produced least frequently, or with the least consistency.⁹

Figure 3 Distribution of Voicing Degrees of Intervocalic /s/ Productions in Andean Spanish

Insert Figure 3 Approximately Here

Figure 3 reveals that intervocalic fricative productive in Andean Spanish is predominantly comprised of more extreme degrees of voicelessness or voicing. This considerably skewed level of dispersion in voicing degrees accordingly permits a considerable degree of variation in average voicing duration, which in the following subsection we seek to link to specific linguistic and social factors through the use of inferential statistical analyses.

5.4. Results – Linguistic and Social Factors Conditioning Andean Spanish /s/ Voicing

A mixed-effects linear regression was performed in R using the percentage of voiced segment duration as the dependent variable, testing for fixed effects of two linguistic factors (word position [initial vs. final] and stress [stressed vs. unstressed]) and three social factors (bilingual profile group [Latacunga Higher Kichwa Dominance vs. Quito Lesser Kichwa Dominance vs. Lima Lesser Quechua Dominance], gender [male vs. female], and style [formal vs. casual]). Interaction terms between bilingual profile group and each of all the other independent variables were included in order to assess whether or not any of the effects varied significantly according to the different bilingual profile groups. Individual speaker was included as a random effect in the model.

The results of the linear mixed-effects regression appear below in table 2 (note that positive β coefficients indicate greater voicing degrees compared to the intercept). The ANOVA table generated from the mixed-effects model returned significant main effects of bilingual profile group ($F[2,22] = 15.62, p < .0001$), style ($F[1,2793] = 131.96, p < .0001$), word position ($F[1,2793] = 1243.84, p < .0001$), and stress ($F[1,2793] = 62.58, p < .0001$). Additionally, two significant interaction effects were found,

⁹ Gradoville (2011, p. 64) notes that “[d]uration, although strictly speaking not a measurement of voicing *per se*, may correlate with fricative voicing.” The negative correlation between voicing degree and length of fricative segment is a frequently attested finding across several languages (cf. Rivas, 2006; Schmidt & Willis, 2011; Stevens et al., 1992; Torreira & Ernestus, 2012). We have performed a statistical correlation on our data that confirm this finding for Andean Spanish: a two-tail Pearson’s correlation test revealed that as /s/ segment duration increased, the percentage of that segment’s duration that was voiced decreased ($r[3364] = -.49628, p < .0001$). To give a point of reference, whereas the mean duration of intervocalic /s/ segments with 0-10% voicing durations was approximately 89 milliseconds, the mean duration of Spanish /s/ segments with 90-100% voicing durations was 50 milliseconds, constituting a difference of 39 milliseconds. Future investigations may consider analyzing the duration of adjacent vocalic segments in addition to /s/ in order to determine if processes of compensatory lengthening or shortening of adjacent vowels play any role in Spanish fricative voicing phenomena.

namely between bilingual language profile group and each of style ($F[2,2793] = 5.53, p=.004$) and word position ($F[2,2793] = 87.88, p<.0001$). Given the complex nature of this model, we shall elaborate on each of these findings separately, offering additional information (and post-hoc analyses) as necessary for each finding.

Table 2 Summary of Mixed-Effects Linear Regression Model Fitted to Andean Spanish Fricatives

Insert Table 2 Approximately Here

With respect to the effect of bilingual profile group, post-hoc analyses (with Bonferroni correction [α level = 0.0167]) revealed that voicing degrees for intervocalic /s/ were distinct across each of the three groups, following a hierarchy of language dominance with greatest voicing degrees for Latacunga speakers of higher Kichwa dominance, following by Quito speakers of lesser Kichwa dominance, and lastly Lima speakers of lesser Quechua dominance (for each, $p<.0001$). This hierarchy directly implicates contact with Quechua in the status of Andean Spanish intervocalic /s/ voicing, and moreover demonstrates that voicing degrees for more Spanish-dominant speakers vary considerably by region, with greater voicing in Quito than Lima. Figure 4 offers a clear visualization of this relationship between intervocalic /s/ production and language profile.

Figure 4 Effect of Bilingual Profile Group on Andean Spanish Intervocalic /s/ Voicing

Insert Figure 4 Approximately Here

With respect to the aforementioned main effect of style, intervocalic /s/-voicing was stronger in casual speech (i.e., casual interviews) than formal speech (i.e., phrase-list readings). In light of the significant interaction effect between style and bilingual profile group, post-hoc analyses (with Bonferroni correction [α level = 0.0167]) were conducted specifically to test for whether or not the style effect was absent in any one of the bilingual profile groups or in a different direction than that of the main effect.¹⁰ The post-hoc tests revealed that the style effect was in fact present in all three bilingual profile groups (for all, $p<.0001$), in the same direction (favoring greater voicing in casual speech), though the magnitude of the style effect was greater for the Lima lesser Quechua dominance group than the other two. As more casual speech is more conducive to lenition effects (due to faster speech rates in combination with less pressure to use variants more representative of prescriptive norms), this finding is consistent with the analysis of /s/ voicing as a product of articulatory lenition. Figure 5 visualizes the style effect for each of the bilingual profile groups.

Figure 5 Effect of Style on Andean Spanish Intervocalic /s/ Voicing

Insert Figure 5 Approximately Here

With respect to the aforementioned main effect of stress, intervocalic /s/-voicing was stronger across unstressed VsV sequences than stressed ones. The lack of significant interaction effect between stress and bilingual profile group reveals that the stress effect was in fact present in all three bilingual profile groups, in the same direction (favoring greater voicing across unstressed sequences) and with comparable magnitude. As lenition effects in Spanish are more resisted across stressed syllables, this finding is consistent with the analysis of /s/ voicing as a product of articulatory lenition. Figure 6 displays the stress effect for each of the bilingual profile groups.

Figure 6 Effect of Stress on Andean Spanish Intervocalic /s/ Voicing

Insert Figure 6 Approximately Here

¹⁰ Post-hoc analyses were necessary in order to confirm whether or not the interaction effect reflected a lack of style effect altogether in any of the three speaker groups, a difference in the direction of effect for any of the groups, or if instead it was merely reflective of some kind of asymmetry of magnitude of effect across groups.

Lastly, with respect to the aforementioned main effect of word position, intervocalic /s/-voicing was stronger in prevocalic word-final intervocalic contexts than word-initial intervocalic contexts. In light of the significant interaction effect between word position and bilingual profile group, post-hoc analyses (with Bonferroni correction [α level = 0.0167]) were conducted specifically to test for whether or not the word position effect was absent in any one of the bilingual profile groups or in a different direction than that of the main effect. The post-hoc tests revealed that the word position effect was in fact present in all three bilingual profile groups (for all, $p < .0001$) in the same direction (favoring greater voicing word-finally), though the magnitude of the word position effect was hierarchically ordered across groups, with the strongest effect for the Latacunga higher Kichwa dominance group, followed by the Quito lesser Kichwa dominance group, and lastly (weakest) for the Lima lesser Quechua dominance group. As the word-final position is more prone to lenition effects, this finding is consistent with the analysis of /s/ voicing as a product of articulatory lenition. Figure 7 displays the word effect for each of the bilingual profile groups.

Figure 7 Effect of Word Position on Andean Spanish Intervocalic /s/ Voicing

Insert Figure 7 Approximately Here

In summary, the results of gradient phonetic analysis indicate that although all speakers are sensitive to linguistic conditioning effects of word position and stress, favoring greater voicing degrees in word-final and unstressed contexts, overall voicing degrees are hierarchically conditioned according to bilingual profile group, with greater dominance in Quechua conditioning stronger voicing degrees. Speakers with lesser Kichwa/Quechua dominance are additionally distinguished by region, whereby Highland Ecuadorian speakers show stronger voicing degrees than Lima speakers. Moreover, all speakers produce significantly greater voicing in casual speech relative to formal speech. Given the bimodal distribution of voicing degrees shown in figure 3, these social and linguistic factor effects on voicing degrees can be understood as a combination of influences on speakers' individual distributions or proportions of extremely voiced or extremely unvoiced realizations of intervocalic /s/.

6. Discussion

6.1. Linguistic and Social Factors Constraining Andean Spanish Intervocalic /s/ Voicing

Returning to the two principal research questions posed in section 3, the set of linguistic and social factors underpinning variation in intervocalic /s/ production in Andean Spanish reveals necessary insights into the possible status of /s/ voicing as a contact phenomenon. The two linguistic factors investigated, namely word position and stress, are both directly linked to structural or endogenous accounts of lenition (cf. Browman & Goldstein, 1989; 1991; File-Muriel, 2007) and accordingly have been previously used to account for sporadic intervocalic /s/ voicing attested in non-contact varieties of Spanish, including Madrid Spanish (cf. Hualde & Prieto, 2014; Torreira & Ernestus, 2012), Mexico City Spanish (cf. Schmidt & Willis, 2011), and San José Spanish (cf. Chappell & García, 2017). For our Andean Spanish data, all speaker groups exhibited sensitivities to these linguistic constraints, presenting greater voicing degrees in word-final and unstressed contexts. Moreover, voicing degrees were constrained by style, with stronger voicing being favored by less careful, more spontaneous speech. Together, these effects present a strong case for an account of Andean Spanish /s/ voicing as phonetic lenition, that is, “garden-variety inherent variability firmly rooted in the internal structure of the language” (Poplack & Levey, 2010, p. 395).

Curiously, however, the magnitude of the word position effect was hierarchical across language dominance groups, with Latacunga higher Kichwa dominance speakers showing significantly greater voicing degree differences for word-final (relatively to word-initial) /s/ tokens in comparison to lesser Quechuan variety dominance groups. While the direction of effect is accountable by processes of phonetic lenition, this hierarchical conditioning by language dominance group is harder to account for endogenously. Davidson (2015, p. 138-139) observed a parallel hierarchical conditioning of word-position effects on intervocalic /s/ voicing in the Spanish of Catalan-Spanish bilinguals (whereby speakers most dominant in Catalan showed the greatest favoring of voicing in word-final contexts),

and appealed to contact effects with Catalan in Barcelona Spanish, since Catalan alveolar fricatives systematically voice in word-final intervocalic contexts as a consequence of a phonemic voicing neutralization absent in word-initial contexts. It is tempting to hypothesize that perhaps Kichwa in fact exhibits a similar phonemic voicing distribution, providing a convenient, parallel account of the present Highland Ecuadorian data by means of contact with Kichwa. However, without actual empirical data from Kichwa, and especially given the lack of consensus regarding the Quechuan phonological inventory, it would be premature to rely on this line of conjecture in order to inform the analysis of our data. Still, the significant conditioning of voicing degrees by bilingual profile groups, with stronger voicing being favored by greater dominance in Kichwa, provides a strong indication of contact playing a role in Highland Ecuadorian Spanish intervocalic /s/ voicing.

Lastly, it is also important to note that generalized characterizations of Andean Spanish with respect to intervocalic /s/ voicing are unwarranted by the results of this study, which demonstrates that the voicing patterns of Lima speakers of greater Spanish dominance differ significantly from those of similarly Spanish-dominant speakers in Quito.¹¹ From our data, increased degrees of intervocalic /s/ voicing appear more characteristic of Highland Ecuadorian Spanish and likely other Highland Andean varieties, as opposed to coastal varieties such as that of Lima, Peru.

6.2. Considerations for the Empirical Classification of Highland Ecuadorian /s/ Voicing

We now return to the analysis of intervocalic /s/ voicing as potentially contact-induced, focusing on Highland Ecuadorian Spanish due to the predominance of /s/ voicing in the Highland Ecuadorian data relative to the Lima data, and additionally since the subset of Lima data collected does not include variation in Quechua-Spanish dominance. In order to evaluate the status of this feature, we revisit five parameters of contact-induced change as they are outlined in Thomason (2001, p. 93-94), Mougeon et al. (2005, p. 103-104), Poplack and Levey (2010, p. 398), Levey et al. (2013, p. 230), and Poplack et al. (2012, p. 204):

P1: The source language exhibits a parallel feature to that being adopted in the recipient language, attested before contact exclusively in the source language.

P2: Use of the feature in the recipient language is mediated by bilingualism in the source and recipient languages.

P3: Other contact varieties of the recipient language exhibit a parallel feature.

P4: Non-contact varieties of the recipient language do not exhibit a parallel feature.

P5: No language-internal (endogenous) motivations can account for the feature being adopted in the recipient language.

As previously discussed in section 3, P1 is difficult to meet, given the relative lack of consensus when it comes to the historical evolution of the Kichwa phonological system. Nonetheless our present data do meet the criteria specified by P2, interpretable inasmuch as source language speakers (our Latacunga group) are presumed to be the agents of change, leading in the active use of greater degrees of /s/ voicing and, by extension, at some point past or present leading in the adoption of [z]. The lack of significant voicing degree stratification by gender may signify a lack of change in progress with respect to any active adoption of greater voicing degrees presently, but given this study's modest sample size and the lack of apparent time analysis with multiple age groups, it would be premature to make a claim either way. As for P3, the Barcelona Spanish data provided by Davidson (2015) show

¹¹ It is logical to ask why Lima voicing patterns would be distinct from those of Quito when speakers share a higher dominance in Spanish. One answer could be that the phonological inventory of Peruvian Quechua is distinct from that of Kichwa with respect to fricative phonemes, as contact with distinct source varieties can yield distinct outcomes in the recipient language. Though investigation into this possibility falls outside our present scope, it is important to note the connection with the famed actuation problem (cf. Weinreich, Labov, & Herzog, 1968, p. 102). Structural changes that take place in Highland Ecuadorian Spanish, for example, are not necessarily expected to take place at the same time (or ever) in other Spanish varieties, nor even in other languages with a parallel structure.

strikingly parallel voicing patterns according to word position and language dominance group, but given the abundance of evidence of intervocalic /s/ voicing in non-contact varieties discussed in section 3, the success of meeting P3 is somewhat overshadowed by the gross failure to meet P4. Finally, when it comes to P5, we found increases in voicing degrees across unstressed VsV sequences, in word-final contexts, and in less careful speech, consistent with an account of /s/ voicing as phonetic lenition.

Having failed to meet P1, P3, and P5, it would be likely appropriate to conclude that intervocalic /s/ voicing in Highland Ecuadorian Spanish is a case of natural change accelerated by language contact, that is, not in fact full-fledged contact-induced change. We believe that the failure to satisfy P4 and P5 is the most problematic evidence for an account appealing to language contact, since P5 establishes a theoretical structural basis for the emergence of the feature in question, and P4 effectively offers actual examples of the manifestation of said structural link in real-world varieties. Indeed, in a hypothetical scenario of a linguistic phenomenon meeting all parameters except P5, the case for contact-induced change would still be disputable, not meeting the full burden of proof. This effectively means that on the basis of a linguistic description of a particular feature alone (i.e., that a given feature can be associated with some linguistic universal or otherwise deemed “natural”), without any information regarding the languages or varieties in question, it is already possible, under such a contact-induced change framework, to considerably weaken if not rule out altogether the classification of said feature as contact-induced. Indeed, the term “contact-induced” seems to be reserved for those phenomena that can be accounted for by language contact and language contact alone.

This kind of scrutiny causes cases of bona fide contact-induced change to be, first and foremost, elusively rare (Poplack & Levey, 2010, p. 410). Contact-induced change between long-term related languages or under-documented languages becomes inherently problematic, since satisfying P1 requires accurate socio-historical data to situate the precise moment of contact between two languages (already an abstraction for population and social network dynamics) and additionally to prove the presence of the feature in question in one language alongside its absence in the other (i.e., the classic “evidence of absence” problem). Unsurprisingly, the one grammatical domain that is grossly over-represented when it comes to uncontested applications of the label “contact-induced change” is the lexicon (via lexical borrowing), leaving “natural change accelerated by contact” as an almost de facto term for all other potential contact phenomena.

In sum, while the classification of Highland Ecuadorian Spanish intervocalic /s/ voicing as “natural change accelerated by contact” may satisfy those who subscribe to an application of the 5 contact-induced change parameters in such stringent terms, we consider the treatment of “contact-induced” as synonymous with “motivated exclusively by language contact” to be unjustifiably restrictive. Why must a particular linguistic innovation originate exclusively from endogenous or language contact motivations, instead of a confluence of both? Moreover, what proof is there of any substantive difference in the mechanisms of *propagation* or *fixation* (cf. Croft, 2000) of a linguistic feature in a multilingual community based on if the feature arises exclusively out of endogeneity or language contact? In the absence of such evidence, following Romaine (1995), we opt for an alternative approach to the empirical classification of contact-induced change that instead of assuming a singular, default endogenous source for linguistic innovation, assumes an interplay between language-internal and language-external factors in a feature’s *innovation* (cf. Croft, 2000). Thomason’s (2008, p. 47) definition for contact-induced change aligns much more closely with this less restrictive approach to language variation and change in multilingual communities: “Contact is a source of linguistic change if it is less likely that a given change would have occurred outside a specific contact situation.” Effectively, this criterion for contact-induced change allows meeting any one of the five aforementioned parameters to warrant a classification of “contact-induced.” It furthermore eliminates the opposition between the terms “contact-induced change” and “natural change accelerated by contact,” the original distinction between which was based on a particular feature being exclusively motivated by language contact or not, which we posit as a false dichotomy that disregards the notion of multiple causation (cf. Thomason & Kauffman, 1988, p. 57; Thomason, 2008, p. 49-50) and the principle of multiple causes (cf. Young & Bayley, 1996) that are so widely accepted in language variation and change theory.

Accordingly, a revised account of intervocalic /s/ voicing in Highland Ecuadorian Spanish, based

on the data presented in this study, recognizes the roles of both phonetic lenition (operationalized in terms of voicing degree sensitivity to style, word position, and stress) and language contact (operationalized in terms of the magnitude of /s/ voicing in comparison to non-contact varieties as well as the hierarchy of /s/ voicing by Kichwa dominance) in the production of this contact feature.

7. Conclusion

The present study has sought to contextualize select linguistic and social factors underpinning the linguistic variation in intervocalic /s/ production in Andean Spanish in a discussion of contact-induced change. We have highlighted multiple sources for the innovation of intervocalic [z] and gradient degrees of /s/ voicing, including language contact with Kichwa and phonetic lenition bolstered in the context of unstressed VsV sequences and in word-final position, which constrain /s/ production in tandem in Highland Ecuadorian Spanish. We have also discussed what we believe are significant complications with such a cautionary approach (cf. Poplack & Levey, 2010) to contact-induced change that places emphasis on the discrete separation (or teasing apart) of structural and contact motivations for linguistic innovation, and have detailed a less restrictive approach (cf. Romaine, 1995; Thomason, 2008) that does not presume endogenous accounts to be a default in language contact settings.

Future investigations into Andean Spanish intervocalic /s/ voicing would benefit, first and foremost, from an exhaustive look into the phonological inventory of Quechuan varieties from modern synchronic data from Spanish-Quechua bilinguals across Peru, Bolivia, and Ecuador, as the distribution and variation of intervocalic fricatives will better inform our present analyses of Spanish variation in the Andean region. The inclusion of cognate status as an independent variable would also be a fruitful means of further assessing the path of actuation for increased voicing degrees in Andean Spanish. Moreover, an increase in sample size, taking into account speakers of wider age ranges, will permit a fuller apparent time analysis to more concretely ground the presently observed variation in terms of possible change over time.

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