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Towards Modeling Second Dialect Speech Learning: The Production of Bogota [s] in Ciudad Bolivar by Speakers of Three Different Varieties of Colombian Spanish

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Abstract: This study investigates the second dialect production of Bogota Spanish /s/ in coda position by speakers of three different varieties of Colombian Spanish, who have been in contact in Ciudad Bolivar, a community located in Bogota, Colombia. The study has three aims. First, it will examine the role of phonetic distance in the acquisition of /s/ production. Second, it will determine the linguistic factors that constrain the realization of /s/ sound by the speakers of the three varieties studied. Third, it will look into the role of extralinguistic factors in the production of /s/. A total of 2322 tokens extracted from sociolinguistic interviews with 50 participants were acoustically analyzed in PRAAT. Statistical analyses were conducted using GoldVarb. The results showed the highest rate of [s] was produced by the speakers of the Eastern Andean variety, followed by the Western Andean, and then by the Coastal variety, suggesting that first dialect phonological processes may affect the acquisition of second dialect sounds. Consistent with previous studies that have examined /s/ variation and change, the linguistic factors position in the word, following segment, and syllable stress were also predictors of /s/ in second dialect production. The extralinguistic factors of age of arrival, age, and gender also had a significant effect on /s/ production in this study. Implications are discussed for models of second dialect speech learning.

Keywords: speech learning; Second Dialect Acquisition; sociophonetics; language contact; dialectology; Spanish; Colombia

1. Introduction

Second Dialect (D2) speech increasingly arouses interest due to the mechanisms that are involved in this process (e.g., Siegel 2010; Babel 2011; Nielsen 2011). One of the most frequent questions asked is whether acquiring a D2 variety is equivalent to the process of acquiring second language speech (L2). Moreover, researchers are interested in whether the linguistic and/or extralinguistic factors that constrain language variation and change also affect D2 acquisition. Although a number of theoretical models of L2 acquisition have been developed for L2 speech learning (e.g., Brown 1998; Flege 1995; Best and Tyler 2007; Colantoni and Steele 2008), we currently do not have a model of D2 speech learning.

The first objective of this study is to investigate whether proximity/similarity between a first dialect (D1) sound and a D2 sound would make learning a D2 sound easier or more difficult. There is currently no consensus on this in the literature (e.g., Siegel 2010; Escure 1997). In particular, we will be investigating whether the Speech Learning Model (SLM) Flege (1995) applies to the acquisition of

a phonological variant of a second dialect (D2) in the same way that it applies to the acquisition of L2 sounds. The SLM puts forth that the degree of difficulty of acquisition of an L2 segment depends on the degree of acoustic distance between the first language (L1) sounds and L2 sounds. That is, the larger the acoustic distance between the L1 and L2 sounds, the lower the chances of 'equivalence classification' and the easier it would be to acquire the L2 sound. In other words, this model predicts that 'new' sounds can be acquired and 'old' sounds are not problematic but that 'similar' sounds are difficult. We will examine the production of the voiceless predorso-alveolar sibilant [s] that is typical of Bogota speech in Colombia by speakers of three D1 varieties of Colombian Spanish (Eastern Andean, Coastal, and Western Andean) who had migrated to, and then lived in, Ciudad Bolivar for five years. Ciudad Bolivar is a neighbourhood where migrants from various parts of Colombia live together, and it is located in South West Bogota. Whereas /s/ production in coda position is the same in both the Eastern Andean variety of Colombian Spanish and Bogota Spanish, it is different in the Costal and Western Varieties. In the Coastal variety, /s/ tends to be aspirated (e.g., <buenos> ['bwe.noh] 'good') or deleted (e.g., <todos> ['to.ðo] 'all'), and in the Western varieties it is typically produced as a voiceless apical sibilant [s̺] (e.g., <dos > [do s̺] 'two'). Therefore [s] would be an 'old' sound for the speakers of the Eastern Andean variety, a 'new' sound for the speakers of the Coastal variety, and a 'similar' sound for the speakers of the Western Andean variety. These differences allow us to test the role of acoustic distance between the D1 and D2 sounds in a dialect contact situation. Because the SLM does not outline how acoustic distance is measured, in this paper, we have relied on our intuition to predict which sounds would be similar.

The second objective of this study is to investigate whether linguistic and extralinguistic factors condition the acquisition of [s] in Ciudad Bolivar. It is well-known that both linguistic and extralinguistic factors constrain language variation (Labov 1972; Rodríguez Cadena 2004; De Weinberg 1973; Cedergren 1978; Poplack 1980; Mazzaro 2003, 2011; Tararova 2012). A body of literature on D2 acquisition has also provided evidence for the role of both linguistic and extralinguistic factors in D2 speech learning. Some of these factors include age of arrival (e.g., Kerswill and Williams 1994; Rys 2007; Siegel 2010; Tagliamonte and Molfenter 2007; Trudgill 1986; Bortoni-Ricardo 1985; Chambers 1992; Munro et al. 1999; Nycz 2015), age (e.g., Munro et al. 1999; Nycz 2015), gender (e.g., Holmquist 2011; Foreman 2003; Rys 2007; Ruiz-Peña et al. 2015), and education (e.g., Tagliamonte and Molfenter 2007; Chambers 1992).

A number of studies, such as Harris (1983), Penny (2000), and Lipski (1999), among others, have also provided evidence for the role of linguistic factors in the phonological process of aspiration and deletion of /s/ in Spanish. Some of these factors include position in the word, previous and following segment, and stress (see the diachronic weakening pathway for /s/ proposed by Lipski (1999) in File-Muriel and Orozco (2012, p. 92). That extralinguistic factors would also constrain variation in Colombian Spanish has been proposed by File-Muriel and Orozco (2012). However, we are not aware of any previous studies that have examined the role of linguistic and extralinguistic factors on the D2 speech learning of /s/. Therefore, the study of these factors merits investigation.

With respect to the effects of linguistic factors, we are interested in the following: (a) position (Becerra 1985; Lafford 1986; Rodríguez Cadena 2004; Brown and Brown 2012; Brown and Cacoullos 2002; Terrell 1986; File-Muriel 2010; Poplack 1980; Samper Padilla and Cabrera 1995; Brown 2009a, 2009b; Orozco 2018), (b) previous and following segment (Becerra 1985; Lafford 1986; Rodríguez Cadena 2004), (c) number of syllables (Tejada Giráldez 2012; Alba 1990; Samper Padilla and Cabrera 1995), and (d) stress (Becerra 1985; Lafford 1986; Rodríguez Cadena 2004). As for extralinguistic factors, we will examine the effect of: (a) age (Lenneberg 1967; López Morales 1989; Rodríguez Cadena 2004; Terrell 1981; Ramírez and Almira 2011; Cedergren 1978; Villena Ponsoda 2012), (b) gender (Labov 1972; Holmquist 2011; Rodríguez Cadena 2004; De Weinberg 1973; Cedergren 1978; Poplack 1980; Foreman 2003; Rys 2007; Ruiz-Peña et al. 2015), (c) level of education (Labov 1972; Terrell 1981; Rodríguez Cadena 2004; Tagliamonte and Molfenter 2007; Chambers 1992), (d) socio-economic status (Labov 1972, 2000; Díaz-Campos 2014; López Morales 1989; Becerra 1985; Lafford 1986), and (e) age of arrival (AoA)

(Kerswill and Williams 1994; Rys 2007; Siegel 2010; Tagliamonte and Molfenter 2007; Trudgill 1986; Bortoni-Ricardo 1985; Chambers 1992; Munro et al. 1999; Nycz 2015).

1.1. Literature Review

1.1.1. /s/ Variation in Spanish

Several authors consider /s/ to be the sound that determines dialect division in Spanish (e.g., Zamora and Guitart 1982; Lipski 1996; Montes 2000). Others have also used /s/ as a criterion in the identification of varieties to identify dialect divisions between the main standard varieties of Spanish (peninsular and American variety), or to identify dialect divisions between countries (e.g., Ureña 1921; Honsa 1975; Flórez 1963, cited by Lipski 1996, p. 21). Crucially, different varieties of Spanish exhibit a different degree of /s/ weakening. /s/ weakening refers to a phonological process, where /s/ is aspirated and produced as [h] (e.g., <costa> ['koh.ta] 'coastal'), or deleted (e.g., <niños> ['ni.ɲo] 'children') (e.g., Tejada Giráldez 2012; Alba 1990; Samper Padilla and Cabrera 1995; Brown and Brown 2012; Brown and Cacoullos 2002; Terrell 1986; File-Muriel 2010; Poplack 1980; Brown 2009a, 2009b; Orozco 2018; Becerra 1985; Lafford 1986; Rodríguez Cadena 2004).

1.1.2. /s/ Variation in Colombian Spanish

Colombian Spanish is made up of a set of regional varieties that are different in terms of pronunciation, intonation, and vocabulary. Officially, Colombia has two macro-dialect regions, the Coastal and the Andean varieties. Each one has separate sub-dialects. The coastal variety is divided into the Pacific and Atlantic varieties and the Andean variety is divided into the Eastern and the Western Andean varieties. The Bogota variety belongs to the Eastern Andean region but is considered the standard Colombian variety (Montes 1984). One of the most notable differences between the regions is /s/ realization in coda position.

In Colombian Spanish, like the other varieties of Latin American Spanish, the distinction between alveolar /s/ and the interdental /θ/ is neutralized to [s]. In most of the Colombian territory, /s/ in coda position is produced as a voiceless predorso-alveolar sibilant [s]. However, in the Western varieties, especially in Antioquia region, the /s/ sound is produced as a voiceless apical sibilant [s̺] (e.g., <dos> [dos̺] 'two') and in the Coastal variety, it is aspirated (e.g., <costa> ['koh.ta] 'coastal') or deleted (e.g., <niños> ['ni.ɲo] 'children' (Izquierdo and Utrilla 2002, p. 68; NGLEFF 2011, p. 191). Montes (2000), proposed that the /s/ sound in Colombia constitutes a binary variation where /s/ is retained in the Eastern and Western Andean regions, but aspirated and deleted in the Coastal regions. According to Orozco (2018, p. 6), while in the Eastern and Western Andean varieties the consistent articulation of /s/ as a sibilant constitutes a prestige marker, /s/ deletion in the Coastal region enjoys covert prestige. Moreover, it is essential to mention that in Colombia, there are marked attitudes towards the different varieties spoken in the country. Duarte (2005), in his study on the attitudes of Bogota residents towards the dialects of Colombian Spanish, examined the attitudes of 52 Bogota speakers—men, and women between 38 and 60 years old, of low and high socioeconomic status—had towards their own variety and the other varieties of Colombian Spanish. His results showed that the participants attributed qualifiers to the different varieties. For example, the Bogota variety received qualifications such as "neutral," "suitable for diplomatic and international relations," "easy to understand," and "cultured." On the other hand, the coastal variety received qualifications such as "relaxed," "frank," "uneducated," and "difficult to understand." The Paisa variety was considered "very pleasant," and "synonymous with vigor." Similarly, other studies (e.g., Caicedo 1992; Chamorro and López 2020) have reported results with the same trends regarding attitudes to the different Colombian dialectal varieties. In Colombia, the way of speaking constitutes an accentuated mark of cultural identity.

The following sections will provide an overview of the classification of Colombian dialect regions regarding /s/ realization.

Bogota Variety

Bogota Spanish is spoken in the capital district and is considered the standard variety of Colombia (Flórez 1973; Montes 1984; NGLEFF 2011). It is characterized by the fact that its speakers maintain the /s/ sound and articulate it as a voiceless predorso-alveolar sibilant [s], in word-medial and word-final positions. Such [s] realization in these phonetic contexts also constitutes a prestige marker (Flórez 1963; Lipski 1996; Montes 1984; Pacheco 2011). However, in a syllable onset at the beginning of the word (e.g., <señora> [se.'ɲo.ɾa] 'lady') and in intervocalic position (e.g., <nosotros> [no.'so.tros] 'us') /s/ is aspirated and sometimes deleted (e.g., <señora> [he.'ɲo.ɾa] 'lady' <nosotros> [no.'o.tɾos] 'us'). Aspiration and deletion occur more frequently in spontaneous speech (Brown and Brown 2012; Flórez 1973; Montes 1984).

Coastal Variety

The coastal variety refers to the variety that is spoken in the Caribbean and Pacific area of Colombia. The coastal variety is characterized by the fact that aspiration and deletion tend to occur in a post-vocalic coda position (e.g., <las casas> [lah 'ka. sah] 'the houses' or <las casas> [la 'ka. sa] 'the houses') (Montes 1984; Lafford 1986; Canfield 1988).

Eastern Andean Variety

The Eastern Andean variety is spoken in the provinces of the central area of the country, specifically in the provinces of Cundinamarca, Boyaca, Santander, Tolima, Huila. Normally, /s/ is maintained in coda position (e.g., <bosque> ['bos.ke] 'forest' and <manos> [ma.nos] 'hands') but it is aspirated (e.g., <nosotros> [no.'ho.tros] 'us') or deleted (e.g., <señora> [e.'ɲo.ɾa] 'lady') in onset position (Brown and Brown 2012; Flórez 1973; Montes 1984), a pronunciation which is "unique in the Spanish-speaking world" according to Lipski (1984, p. 209).

Western Andean Variety

The Western Andean variety, also known as the "paisa" variety, is spoken in the Central Western area of Colombia in the provinces of Antioquia, Caldas, and Cauca. /s/ is realized as a voiceless apical alveolar sibilant [s̺] in coda position, e.g., <bosque> ['bos̺.ke] 'forest', <manos> [ma.nos̺] 'hands'. (Montes 1984; Canfield 1988). The Western Andean variety is recognized as the second most prestigious variety in Colombia after the Bogota variety, according to Londoño, Estupiñán, and Idárraga (Londoño et al. 2012) and Bernal, Munévar, and Barajas (Bernal et al. 2014).

1.1.3. The Effect of Linguistic and Extra-Linguistic Factors on /s/ Variation and D2 Acquisition

The effects of several linguistic factors have been studied with respect to /s/ variation such as position in the word (e.g., Becerra 1985; Lafford 1986; Rodríguez Cadena 2004; Terrell 1986; Poplack 1980; Tejada Giráldez 2012; Alba 1990; Samper Padilla and Cabrera 1995; Brown 2009a, 2009b), following segment (e.g., Becerra 1985; Lafford 1986; Rodríguez Cadena 2004), number of syllables (Tejada Giráldez 2012; Alba 1990; Samper Padilla and Cabrera 1995), and stress (Becerra 1985; Lafford 1986; Rodríguez Cadena 2004; Orozco 2018). Although most studies have shown that these factors constrain /s/ variation, there has not always been consensus. For example, studies on the realization of /s/ in coda position in Cartagena Spanish (e.g., Becerra 1985; Lafford 1986), Barranquilla Spanish (e.g., Rodríguez Cadena 2004), and Colombian Caribbean Spanish (e.g., Orozco 2018) have reported a higher rate of /s/ aspiration in word-medial position than in word-final position, and a higher rate of /s/ deletion in word-final position than in word-medial position. However, Samper Padilla and Cabrera (1995) and Terrell (1981) have found a higher rate of /s/ deletion in word-medial coda position than in word-final position in the Spanish of las Palmas de Gran Canaria, Puerto Rico, and the Dominican Republic.

With respect to the preceding and following segment for /s/ realization, Terrell (1981) found that Dominican Republic Spanish speakers reduce /s/ when it is preceded by a voiced consonant. Likewise,

Brown and Cacoullos (2002), and Rodríguez Cadena (2004), in their study of Cali and Barranquilla Spanish, found that /s/ is retained when it is preceded by a vowel and aspirated when preceded by consonant. Regarding the effect of stress, Alba (1982), Poplack (1980) and Rodríguez Cadena (2004) found that stressed syllables favor /s/ retention, while unstressed ones favor weakening in Dominican Republic and Puerto Rican varieties. Regarding the effect of the number of syllables, Alba (1990) concluded that in Dominican Santiago Spanish, /s/ is deleted in long words more than in short ones. Samper Padilla and Cabrera (1995) in their study of Las Palmas de Gran Canaria formal Spanish, concluded that /s/ is retained as a sibilant or aspirated variant in monosyllabic words, while it is deleted in those with more than two syllables. Likewise, Tejada Giráldez (2012), in her study of Granada Spanish, found that in word-final position, /s/ is maintained in monosyllabic words, and that there was a high tendency for deletion in polysyllabic ones.

Regarding extralinguistic factors affecting /s/ variation, previous studies have reported that speakers with a working-class background favor /s/ weakening, while those from middle-class background favor its retention (e.g., Díaz-Campos 2014; López Morales 1989; Becerra 1985; Lafford 1986). Another factor that plays a role is gender; women have been reported to have a lower rate of weakening of /s/ and to favor the retention of this sound when the weakening is stigmatized (e.g., Rodríguez Cadena 2004; De Weinberg 1973). However, men favor /s/ weakening. Age has also been shown to be a factor that conditions /s/ variation. Cedergren (1978), Poplack (1980), and Terrell (1981) concluded that older participants exhibit a lower rate of /s/ weakening than younger participants. Level of education has also been shown to be a significant factor; Rodríguez Cadena (2004) and Terrell (1981) found that in Cartagena and Santo Domingo Spanish, level of education significantly affected /s/ variation, as a higher of level of education favored /s/ retention.

Likewise, Mazzaro (2003) reported in his study on /s/ deletion in Corrientes Argentinian Spanish that speakers of lower socioeconomic classes favored the use of the stigmatized variant (deletion) while those of higher classes favored the more prestigious variant, [s], in the Spanish dialect of Corrientes Argentina. Moreover, Alba (1982) found that the most relevant factor in /s/ variation in Dominican Spanish was level of education. In effect, the rate of /s/ deletion rises significantly as the level of schooling decreases. Alba (1982) also found that women tended to favor more /s/ realization, while men tended to favor /s/ deletion.

Extralinguistic factors have also been analyzed in variationist and D2 studies. Esparza and Mazzaro (2018) in their study of /s/ variation and speech accommodation of Veracruzanos newcomers in Ciudad Juárez, found that the linguistic factor position in the syllable and extralinguistic factors such as gender and education affected the speech of Veracruzanos in their D2, while the length of residence was not significant.

Speakers with higher levels of education tend to maintain the standard variants of their language (e.g., Labov 1972; Tagliamonte and Molfenter 2007; Chambers 1992). As for the effect of socio-economic background, speakers with higher socioeconomic status favor standard variants, while speakers with lower status favor non-standard ones (e.g., Labov 1972, 2000). With respect to the effect of gender, women tend to adhere to the standard and more prestigious variants of their language (e.g., Labov 1972). In terms of acquisition of D2, women have also favored the acquisition of standard variants of their D2 (e.g., Holmquist 2011; Foreman 2003; Rys 2007; Ruiz-Peña et al. 2015).

Age of acquisition (AoA) has received a good deal of attention, especially in D2 acquisition studies (e.g., Bortoni-Ricardo 1985; Tagliamonte and Molfenter 2007; Trudgill 1981) and L2 studies (e.g., Berthele 2002; Bortoni-Ricardo 1985; Chambers 1992; Foreman 2003; Ivars 1994; Kerswill and Williams 1994; Payne 1976; Rys 2007). It has been shown that younger age is linked to greater acquisition of D2 and L2 features, but several ages have been proposed as the cut-off point for attaining native-like patterns in D2: 5 years (Tagliamonte and Molfenter 2007), 8 years (Payne 1976) and 13 years (Chambers 1992). In their study on D1 Canadian English-speakers acquiring D2 British English, Tagliamonte and Molfenter (2007) found that three children with an AoA of 2 to 4 achieved a D2 native-like level of proficiency and that two of them reached a 95% rate of use of the D2 phonetic variants. Likewise, Trudgill (1981), in his

study of two British English D1 children learning the Australian D2 variety found that the participants (a boy and a girl) who had moved from southern England to Australia at the age of seven were able to produce the majority of the 15 phonetic and phonological variables analyzed, and both were perceived as native Australian speakers. Bortoni-Ricardo (1985), in her study of D1 rural Caipira dialect speakers of Brazilian Portuguese acquiring the D2 standard urban dialect, found that participants who had migrated from a rural area (D1) to and urban one (D2) under the age of thirteen made use of the D2 variants in 79% of occurrences, while those over 18 years only made 44% of usage of D2 variants. Chambers (1992) refers to a pioneering study on the acquisition of D2 conducted by Sibata (1958) in which about 500 interviews conducted in 1949 are analyzed for children sent from Tokyo and Yokohama to the Shirakawa region, to escape the bombings during the Second World War. Children who arrived before age 7 appear to have acquired the Shirakawa dialect, while those who arrived at age 14 or older kept their D1 dialect completely. However, this does not mean that adult participants cannot achieve a successful acquisition of an D2. Munro, Derwing and Flege (Munro et al. 1999) studied the perception of the difference in pronunciation of the diphthong /aj/ in adults with D1 Canadian English living in Alabama, where a monophthongal pronunciation of this vowel is common. The authors concluded that Canadian adults in a large percentage acquired this variant of the Alabama variety.

Considering the findings summarized above, we chose age 7 as the cut-off age for AoA in this study, grouping speakers into two categories: those who came to Ciudad Bolivar before the age of 7, and those who came after. According to Chambers (1992, p. 689), "a person 7 or under will acquire native-like usage of D2, a person over 14 almost will not make it and between those ages people will vary". In addition, we made this distinction because in Colombia, although children attend pre-school education, they are formally exposed to the standard dialect in the school setting at 7 years.

Tagliamonte and Molfenter (2007) conducted a six-year longitudinal study on t-voicing in Canadian English D1 children living in the D2 area of York, England. The results showed variability in the degree of acquisition of the D2 variants, but the authors emphasized the difficulty of discerning whether the variability in degree of acquisition was due to social causes (interaction with the D2 community) or factors related to the child's development (age and language faculties).

In the current study, we examine the effect of linguistic and extralinguistic factors that have been studied in relation to /s/ variation and in relation to D2 acquisition. It is plausible that the factors previously studied in variationist and D2 studies would also play a role in the D2 production of /s/ in Ciudad Bolivar in Bogota. Whereas the description of linguistic factors (e.g., position in the word, the following segment, number of syllables, and stress) is straightforward, this is not the case for all of the extralinguistic factors. For example, the socio-economic status levels used in the current study correspond to those of the classification that the city of Bogota has used in all 1922 neighborhoods. In this city, six levels of socio-economic stratification are identified (1 very low, 2 low, 3 medium-low, 4 medium, 5 medium-high, and 6 high), based on the type of housing in which the citizens reside. Residents classified as levels 1, 2, and 3 are those with the lowest income, and they benefit from subsidies and pay less for public services. Residents in level 4 are those with a modest income and do not benefit from subsidies but are not required to pay a premium for public services. Residents in levels 5 and 6 are those with higher incomes, and do not benefit from subsidies and must pay a premium for public services (DANE 2018). The participants in this study self-identified as belonging to levels 1 and 2, which correspond to very low and low socio-economic backgrounds.

The other extralinguistic factors that we will study here are gender, level of education, and age. While in each society the effects of these factors exhibit in a particular way, it is beyond the scope of this paper to comment in detail on the particularities of these social groups within Colombia compare them to other societies.

1.2. Research Questions

The research questions in this study are as follows:

1. Does the degree of similarity between a D2 sound and its nearest D1 sound determine the rate of production of the D2 sound (i.e., [s]) by the speakers of the three different D1 varieties of Colombia (Eastern Andean, Coastal, and Western Andean varieties), who have moved to Ciudad Bolivar and lived in contact with each other and with speakers of Bogota Spanish in Ciudad Bolivar?
2. Is there an effect of linguistic factors?
3. Is there an effect of extralinguistic factors?

1.3. Hypotheses

It is well known in the L2 literature that equivalence classification is an important mechanism that can explain L2 speech learning. However, we do not know whether this mechanism also plays a role in D2 speech learning. Therefore, in the current study, we will test both the predictions of the SLM and the effect of linguistic and extralinguistic factors that are typically studied in a variationist study. The hypotheses in this study are as follows:

Hypothesis 1 (H1). *Since phonetic/acoustic distance modulates the degree of equivalence classification between an L1 sound and an L2 sound in L2 speech learning (Flege 1995), we predict that the degree of acoustic distance between the D2 sound and its nearest D1 sound will also play a role and determine whether equivalence classification will take place or not. In particular, we predict that (i) The voiceless predorso-alveolar sibilant [s] in coda position will be an 'old' sound for Eastern Andean region speakers because they previously produced it in their D1 variety and therefore it will not be problematic for this group of speakers; (ii) The voiceless predorso-alveolar sibilant [s] will be a 'new' or 'old' sound for Coastal speakers because they tend to aspirate or delete it in their D1, so it will not be problematic for this group of speakers either; (iii) The voiceless predorso-alveolar [s] will be a 'similar' sound for the Western Andean region speakers because they realize it as a voiceless apical alveolar sibilant [s̺]. Therefore, [s] will be a difficult sound for the latter group of speakers. In all, the voiceless predorso-alveolar sibilant [s] will be produced at a higher rate by speakers of the Eastern Andean and Coastal varieties, followed by speakers of the Western Andean region variety*).

Hypothesis 2 (H2). *[s] production in coda position by the speakers from the Eastern Andean, Coastal, and Western Andean zones will follow the same patterns observed in previous studies on /s/ in Spanish. In particular, the following is predicted*:

(i) There will be an effect of word position. Specifically, /s/ will be produced at a higher rate in the word-medial than in the word-final coda position (Becerra 1985; Lafford 1986; Rodríguez Cadena 2004);

(ii) There will be an effect of the following segment. In particular, /s/ will be produced at a higher rate in word-final coda position before a vowel than before a consonant (Cedergren 1978; Lipski 1984; File-Muriel 2007; Terrell 1981; Brown and Cacoullos 2002; Rodríguez Cadena 2004);

(iii) There will be an effect of number of syllables. Namely, /s/ will be produced at a higher rate in monosyllabic words than in disyllabic, trisyllabic, and polysyllabic words (Tejada Giráldez 2012; Alba 1990; Samper Padilla and Cabrera 1995);

(iv) There will be an effect of stress. That is, /s/ will be produced at a higher rate in stressed syllables than in unstressed syllables (Brown 2004; Rodríguez Cadena 2004; File-Muriel 2007; Brown and Cacoullos 2002; Orozco 2018).

Hypothesis 3 (H3). *Extralinguistic factors will constrain [s] production. Specifically, the following results are predicted*:

(i) There will be an effect of age of arrival. Namely, participants who moved from the Eastern Andean, Coastal, and Western Andean zones to Ciudad Bolivar at an earlier age will favor [s] production (Kerswill and Williams 1994; Rys 2007; Siegel 2010; Tagliamonte and Molfenter 2007; Trudgill 1981; Bortoni-Ricardo 1985; Chambers 1992; Munro et al. 1999; Nycz 2015);

(ii) *There will be an effect of education. Specifically, all participants who have moved from the Eastern Andean, Coastal, and Western Andean zones to Ciudad Bolivar and have a higher level of education will favor [s] production. (Labov 1972; Terrell 1981; Rodríguez Cadena 2004; Tagliamonte and Molfenter 2007; Chambers 1992);*

(iii) *There will be an effect of socioeconomic background. In particular, participants who moved from the Eastern Andean, Coastal, and Western Andean zones to Ciudad Bolivar and have the lowest socioeconomic status will exhibit a lower rate of [s] production (Labov 1972, 2000; Becerra 1985; Lafford 1986);*

(iv) *There will be an effect of age. Specifically, participants who moved from the Eastern Andean, Coastal, and Western Andean zones to Ciudad Bolivar and are younger will favor [s] production. (Lenneberg 1967; López Morales 1983; Rodríguez Cadena 2004; Terrell 1981; Ramírez and Almira 2011; Cedergren 1978);*

(v) *There will be an effect of gender. Namely, female participants who moved from the Eastern Andean, Coastal, and Western Andean zones to Ciudad Bolivar will favor [s] production (Labov 1972; Holmquist 2011; Rodríguez Cadena 2004; De Weinberg 1973; Cedergren 1978; Poplack 1980; Foreman 2003; Rys 2007; Ruiz-Peña et al. 2015).*

2. Materials and Methods

2.1. Participants

Participants consisted of 17 native speakers of the Eastern Andean variety of Colombian Spanish, 20 native speakers of the Coastal varieties of Colombian Spanish, and 13 native speakers of Western Andean Colombian Spanish who had lived in Ciudad Bolivar in Bogota Colombia for more than five years. Altogether, there were 31 females and 19 males aged between 15 and 68 years (mean age 36 years). Their level of education ranged from primary school to college. They had self-identified as members of the lower middle class (socioeconomic status 1 and 2).

2.2. Data

The corpus analyzed in this study was taken from the Atlas Sociolingüístico y Etnográfico de Colombia en Espacios de restablecimiento Poblacional (ASLEC-EURP) project, owned by the Caro and Cuervo Institute of Bogota Colombia. This corpus was gathered according to the technical and ethical protocols required in the collection of data for sociolinguistic studies and was carried out by a team of professional researchers with experience in studies on language and linguistics. All participants gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Grupo de Investigación Lingüística del Instituto Caro y Cuervo code COL0093818.

The ASLEC EURP corpus contains approximately 30 hours of recordings of speech of men and women of different ages, belonging to the Eastern Andean (Cundiboyacense), Atlantic and Pacific (Costeño), Western Andean (Antioqueño) and Llanero dialect varieties. This database also provides socio-demographic data such as age, gender, region of origin, length of residence in Ciudad Bolivar, occupation, address, socioeconomic status, and marital status.

2.3. Data Analysis

Three minutes of recording were selected from participants' conversations, starting ten minutes into the interview conducted by the Caro y Cuervo Institute researchers. After the speech sample was selected, the orthographic transcripts were extracted to indicate each /s/ realization produced by the speakers. Between 80 to 130 tokens were produced per individual. A total of 2322 tokens with /s/ in coda position were analyzed both auditorily and acoustically in Praat (Boersma and Weenink 2016) by one of the authors, who is a female native speaker of Colombian Spanish and has training in acoustic analysis. The analysis resulted in 1548 (66.7%) voiceless predorso-alveolar sibilants [s], 426 (18.3%)

aspirations [h], 276 (11.9%) deletions [∅], 27 (1.2%) voiceless apico-alveolar sibilants [s̻] and 45 (1.9%) voiced predorso-alveolar sibilants [z].

In order to analyze the linguistic factors that conditioned the realization of /s/ in the speech of this group of participants, the linguistic variables corresponding to each of the occurrences of /s/ were identified. First, position in the word was looked at to see if [s] occurred in (a) word-medial coda position (e.g., <fresco> ['fɾɛs.ko] 'fresh') or (b) word-final coda position (e.g., <lejos> ['le.xos] 'far').

Similarly, the following segments were classified into the following categories: (a) voiced consonant (e.g., <nos vinimos> ['noz.βi.'ni.mos] 'we came'), (b) voiceless consonant (e.g., <constructor> [kons.tɾuk.'toɾ] 'builder'), (c) high vowel (e.g., <mis hijos> [mis 'i.xos] 'my children'), (d) low vowel (e.g., <mis amigos> [mis a.'mi.ɣos] 'my friends"), and (e) pause, (e.g., entonces (pause) mis abuelos vivían en Troncoso [en.ton.ses' mis.a.βwe.'li.toz β.i'βi.an en troŋ.'ko.so] '*then ... (pause) my grandparents lived there in Troncoso*').

As for the number of syllables in the word, this was categorized into the following sub-categories: (a) monosyllabic (e.g., <los> ['los] 'the'), (b) disyllabic (e.g., <manos> ['ma.nos] 'hands'), (c) trisyllabic (e.g., <misterio> [mis.'te. rjo] 'mystery'), and (d) polysyllabic (e.g., <descansando> [dɛs.kan.'san.do] 'taking a break').

Finally, stress was divided into (a) stressed (e.g., <papás> [pa.'pas] 'dads'), (b) unstressed (e.g., <niños> ['ni.ños] 'children'). This information, in addition to the variant of /s/ pronounced was coded in a Praat tier.

To determine the effect of extralinguistic factors, tokens of /s/ were coded for participant information. The first factor considered was the participants' age at the time they arrived in Ciudad Bolivar. Two categories were identified: (a) older than seven years old and (b) younger than seven years old. The second factor analyzed was the level of education, with three categories: (a) primary, (b) secondary, and (c) technical. The third factor was age at the time of the interview: (a) between 15 and 26, (b) between 27 and 45, and (c) between 46 and 68. The fourth factor was gender: (a) female and (b) male. The fifth factor analyzed was socioeconomic status: (a) status 1 and (b) status 2, as described above.

Statistical analysis of variable realization of [s] in coda position was conducted using Goldvarb 3.0b9 for Mac (Sankoff et al. 2005). The logistic regression on the "binomial up & down" function (Rand and Sankoff 1990, pp. 24–27) of this multivariate analysis software for language variation research allowed us to determine which linguistic and extralinguistic factors had a significant conditioning effect on the variable.

3. Results

A total of 2322 tokens with /s/ in the coda position were analyzed by a native speaker of Colombian Spanish. Tokens are classified according to their realization in Tables 1 and 2.

Table 1. /s/ realization in coda position by Colombian speakers in Ciudad Bolivar, Bogotá.

Position		Type of Production					Total	%
		[s]	[∅]	[h]	[s̻]	[z]		
Final	N	1004	262	329	26	38	1659	71.4
	%	60.5	15.8	19.8	1.6	2.3		
Medial	N	544	14	97	1	7	663	28.6
	%	82.1	2.1	14.6	0.2	1.1		
TOTAL	N	1548	276	426	27	45	2322	
	%	66.7	11.9	18.3	1.2	1.9		

Table 2. Summary of linguistic and extra-linguistic factors favoring the 5 variants of /s/.

Linguistic and Extralinguistic Factors	Variants				
	[s]	[h]	[∅]	[S̲]	[z]
Following segment	Weight	Weight	Weight	Weight	Weight
Pause	0.769	0.130	0.444	[ ]	0.441
Vc	0.675	0.487	0.342	[ ]	0.360
Hv	0.641	0.353	0.139	[ ]	0.882
Lv	0.466	0.451	0.575	[ ]	0.814
Vdc	0.148	0.796	0.781	[ ]	0.478
Range	62	67	64		52
Region of origin					
Eastern Andean	0.646	0.371	0.455	0.224	0.300
Western Andean	0.614	0.435	0.351	0.776	0.751
Coastal	0.299	0.659	0.634	0.599	0.528
Range	35	29	28	55	45
Number of syllables					
Trisyllabic	0.636	0.360	[ ]	[ ]	[ ]
Polysyllabic	0.560	0.462	[ ]	[ ]	[ ]
Disyllabic	0.513	0.503	[ ]	[ ]	[ ]
Monosyllabic	0.365	0.614	[ ]	[ ]	[ ]
Range	27	25			
Age					
15–25	0.623	0.399	[ ]	0.417	0.343
26–45	0.493	0.529	[ ]	0.277	0.650
46–68	0.402	0.559	[ ]	0.771	0.488
Range	22	16		50	31
Syllable Stress					
Stressed	0.610	0.417	0.540	[ ]	[ ]
Unstressed	0.422	0.559	0.443	[ ]	[ ]
Range	19	14	9		
Age of Arrival					
Under 7	0.651	[ ]	0.324	[ ]	[ ]
Older than 7	0.474	[ ]	0.531	[ ]	[ ]
Range	17		21		
Word position					
Medial	0.620	[ ]	0.251	0.159	[ ]
Final	0.451	[ ]	0.607	0.660	[ ]
Range	0.169	[ ]	36	50	[ ]
Gender					
Female	0.544	[ ]	[ ]	[ ]	0.302
Male	0.428	[ ]	[ ]	[ ]	0.800
Range	12				50
Socioeconomic status					
Level 1	[ ]	[ ]	[ ]	[ ]	[ ]
Level 2	[ ]	[ ]	[ ]	[ ]	[ ]
Education					
Secondary school	[ ]	[ ]	0.446	0.247	[ ]
Primary school	[ ]	[ ]	0.610	0.729	[ ]
Technical	[ ]	[ ]	0.474	0.820	[ ]
Range			16	57	

Vc = voiceless consonant, Lv = low vowel, Hv = high vowel, Vdc = voiced consonant [ ] = the analysis did not reveal significant effects among these factors and [s].

Table 1 shows that in word final position there were five different realizations of /s/, namely, a voiceless predorso-alveolar sibilant [s] (60.5%), aspirated [h] (19.8%), deleted [∅] (15.8%), voiced predorso-alveolar sibilant [z] (2.3%), and voiceless apico-alveolar sibilant [s̻] (1.6%). In word medial position, /s/ was realized as a voiceless predorso-alveolar sibilant [s] (82.1%), aspirated /h/ (14.6%), deleted [∅] (2.1%), voiced predorso-alveolar sibilant [z] (1.1%), and voiceless apico-alveolar [s̻] (0.2%).

Figures 1 and 2 show that the percentage of production of the different variants of /s/ by the speakers of the three different D1 varieties are different between word-medial and word-final position. In all, there was a word-medial vs. word-final asymmetry, where the former was characterized by a higher rate of [s] production but the latter by more variation including a higher rate of aspiration and deletion. Moreover, the speakers of the East Andean variety exhibited a higher rate of [s] production, followed by the speakers of the West Andean variety, and then by the speakers of the Coastal variety. The rate of production of the different variants of /s/ in the East and West Andean varieties were similar.

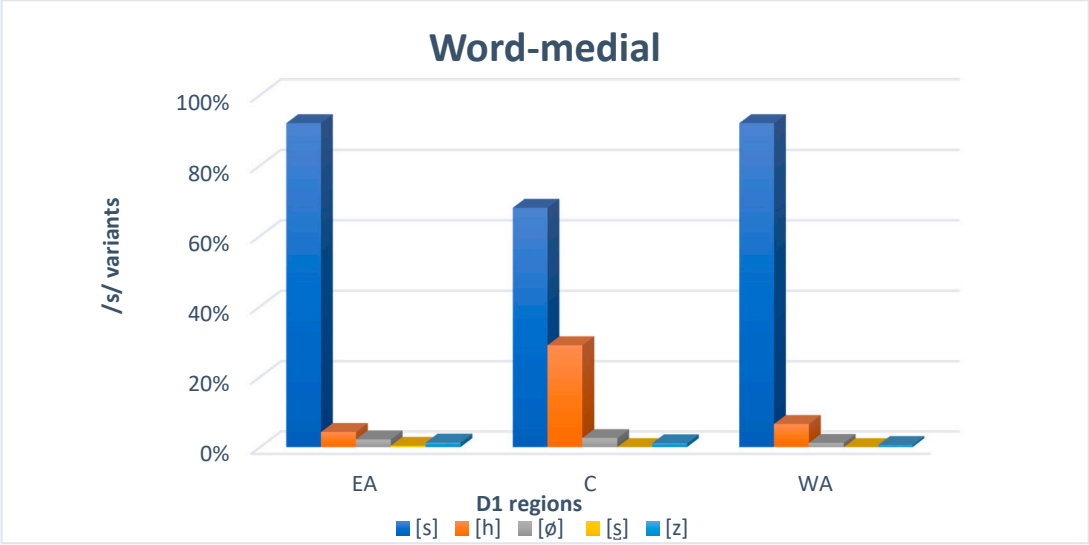

Figure 1. Percentages of /s/ production in word-medial position by region in contact in Ciudad Bolivar. Note: EA = Eastern Andean, C = Coastal, WA = Western Andean.

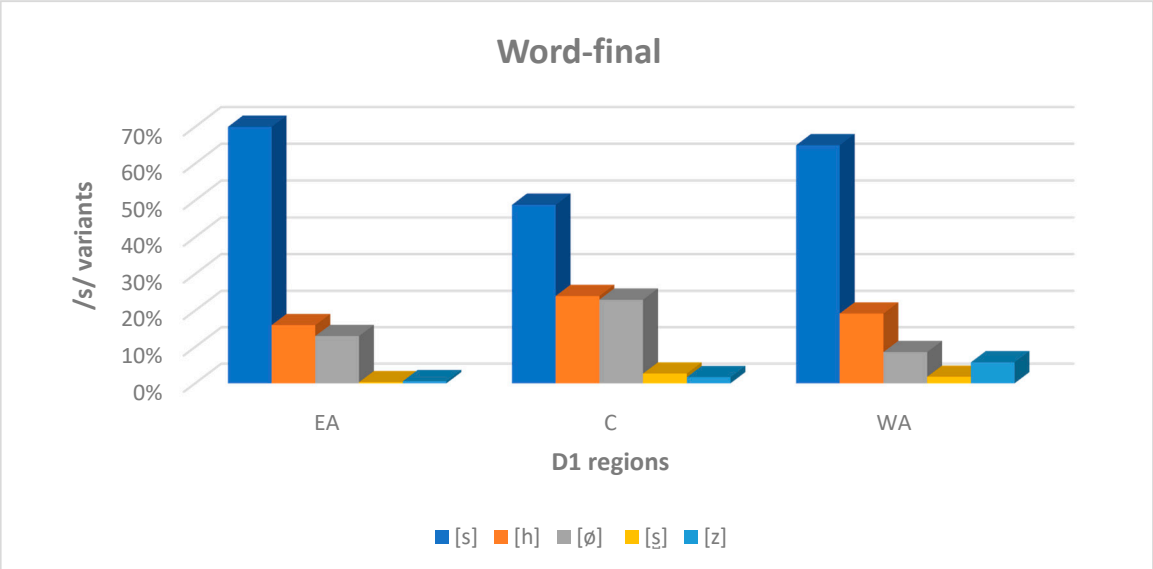

Figure 2. Percentages of /s/ production in word-final position by region in contact in Ciudad Bolivar. Note: EA = Eastern Andean, C = Coastal, WA = Western Andean.

Appendix A shows the rest of the results for percentages of production by position for the effect of each of the linguistic and extralinguistic factors examined in this (see Tables A1–A14).

Binomial Up & Down Analyses

This section presents the results of the GoldVarb logistic regression analysis which determined the statistical significance of the independent variables (factor groups) in predicting the dependent variable (realization of /s/). A factor weight greater than 0.5 indicates that the factor favors the application value (in this study [s], [h], [∅], [s̪], and [z]), while a factor weight less than 0.5 indicates that the factor disfavors it. The range of the factor group is calculated by subtracting the maximum factor weight of the factor group from the minimum factor weight.

Table 2 demonstrates that that [s] production was significantly favored by the following 7 linguistic factors: following segment as pause (0.769), voiceless consonant (0.675), high vowels (0.646), trisyllabic words (0.636), polysyllabic words (0.560), by stressed syllables (0.610), and word-medial position (0.620). It is disfavored by low vowels (0.466), voiced consonants (0.148), monosyllabic words (0.365), unstressed syllables (0.422), and word-final position (0.451). Regarding the region of origin, [s] production was favored by speakers from the Eastern Andean region (0.646) and the Western Andean region (0.614) and disfavored by the speakers of the Coastal region (0.299). In addition, [s] production was favored by the group of younger speakers (15–25) (0.623) and disfavored by the oldest ones (46–68) (0.402). Moreover, the extralinguistic factor of age of arrival was significant because the group of speakers who came to the D2 area when they were less than 7 years old favored [s] production (0.651), while those older than 7 disfavored it (0.474). Finally, females (0.544) favored [s] production while males (0.428) disfavored it. Previous segment, socioeconomic status, and level of education did not show any significant effect on [s] production.

The results analyzed so far show evidence that the rate of [s] production in the dialectal contact situation varies among the three groups examined. However, to obtain a more holistic image of what is happening in this dialect contact situation, the linguistic and extralinguistic factors analyzed above were also analyzed for the other realizations evinced in the data, namely aspirated [h], deletion [∅], voiceless apico-alveolar sibilant [s̪], and voiced predorso-alveolar sibilant [z].

Table 2 also reveals that the aspirated [h] variant was favored by the following linguistic factors: a voiced consonant (0.796), monosyllabic words (0.614), and unstressed syllables (0.559), while it is disfavored by voiceless consonants (0.487), low vowels (0.451), high vowels (0.353), and pauses (0.130). It is also favored by speakers of the Coastal variety (0.659), the older (46–68) population (0.559), and the middle-aged group (27–45) (0.529). Factors such as education, age of arrival, gender, socio-economic status, and word position did not show any significant effect on the production of aspirated realization [h].

Table 2 shows that deletion was favored by the linguistic factors of final position (0.607) following segment voiced consonant (0.781), low vowels (0.575), and unstressed syllables (0.540), while it was disfavored by pauses (0.444), voiceless consonants (0.342), and high vowels (0.139). It was also favored by the speakers of the Coastal variety (0.634), those who arrived after the age of 7 (0.531), and those with the lowest level of education, namely primary school (0.610). It was disfavored by the speakers of the Eastern Andean variety (0.455) Western Andean variety (0.351), those who had arrived below the age of 7 (0.324), and technical (0.474) and secondary school (0.446) level of education. Factors such as syllable stress, age, gender, socio-economic status, and word size did not show any significant effect on /s/ deletion.

Table 2 also demonstrates that voiceless apical [s̪] was favored by linguistic factors such as word final position (0.660) and disfavored by the medial word position (0.159). Regarding the extralinguistic factors, it was favored by speakers with technical level of education (0.820) and for those with primary school (0.729) and disfavored by speakers with secondary school level of education. Two groups of speakers favored this realization, speakers of the Western Andean variety (0.776) and the speakers of the Coastal variety (0.559). The group of speakers from the Eastern Andean region disfavored

realization (0.224). Likewise, older speakers (46–68) favored it (0.771), while the those aged between 26–45 disfavored it (0.277). The rest of the linguistic and extralinguistic factors examined did not show any significant effect on the use of this variant.

Finally, Table 2 shows that variant [z] was favored by linguistic factors as following segment high vowels (0.882) and low vowels (0.814) and is disfavored by voiced consonants (0.478) and voiceless (0.441) consonants and by a following pause (0.360). Two groups of speakers favored /z/, the speakers of the Western Andean variety (0.751) and the speakers of the Coastal variety (0.528), while the speakers of the Eastern Andean disfavored it (0.300). /z/ was also favored by male speakers (0.800) and disfavored by female speakers (0.302). The group of middle-aged speakers (26–45) favored it, while the older group (46–68) (0.488) and the younger group (15–25) (0.343) disfavored it. The rest of linguistic and extralinguistic factors studied did not show any significant effect on the use of this variant.

4. Discussion

Three questions were examined in this article. The first was whether the degree of similarity between a D2 sound and its nearest D1 sound determines the rate of production of the D2 sound by the speakers of the three different D1 varieties of Colombia (Eastern Andean, Coastal, and Western Andean varieties), who had moved to Ciudad Bolivar and lived in contact with each other and with speakers of Bogota Spanish in Ciudad Bolivar. Taking into account the differences between D1 and D2 varieties regarding /s/ realization (Montes 1984; Flórez 1973; NGLEFF 2011) and based on the SLM (Flege 1995), H1 predicted that for the speakers of the Eastern Andean variety, the [s] sound would be an old sound, and therefore, it would not be problematic; for the speakers of the Coastal variety, it was predicted that [s] would either be a new sound or an old sound because these speakers tend to aspirate or delete /s/ in their D1. For the Western Andean region speakers, it was predicted that [s] would be a similar sound because they typically realize /s/ as voiceless apico-alveolar sibilant in their D1. This was based on the assumption that acoustic distance between /s/ and [s̺] was small and therefore, that the speakers of the West Andean variety would map [s] onto [s̺] and not acquire it. In all, it was predicted that the voiceless predorso-alveolar sibilant [s] would be favored by the speakers of the Eastern Andean variety, followed by the speakers of the Coastal variety and then by the speakers of the Western Andean variety.

The results partially supported our first hypothesis, since speakers from the Eastern Andean region favored voiceless predorso-alveolar sibilant [s] over other variants, as can be seen in Table 2. This is consistent with Montes (1984) and NGLEFF (2011), who report that the speakers of the Eastern Andean variety who maintain [s] in coda position favored the production of [s] (0.646), while the speakers of the Coastal variety (0.299) slightly favored [s] production when compared to the speakers of the Western Andean variety (0.614). This said, the speakers of this variety also exhibited some influence from other varieties of Spanish, namely the Coastal and Western Andean varieties, because they produced different rates of different variants such as deleted /s/ (10.1), [h] (12.9), [s̺] (0.4), and [z] (0.8). However, being a speaker of the Eastern Andean variety was not a significant predictor of these other variants [h] (0.371), deletion (0.455), [s̺] (0.224) and [z] (0.300), respectively).

The influence observed from the Western Andean varieties might be in part due to the fact that in Colombia, the speech of speakers from the Western Andean region has gained high prestige (Londoño et al. 2012; Bernal et al. 2014). This prestige may be due to the fact that a genre of television series known as "narconovelas" has gained popularity in the country. These series mostly revolve around the "paisa" culture and are viewed on platforms such as Netflix and HBO.

Based on the SLM (1995) we had predicted that the speakers of the Coastal variety would acquire [s] production in D2 speech learning because for them [s] would be a new or old sound since they tend to aspirate or delete it in their D1. However, the results show that the speakers of the Coastal variety had a lower rate of production of this sound in comparison with the speakers of the other two varieties. That the /s/ realization of these speakers was characterized by aspiration and deletion is consistent with the description of /s/ realization by the speakers of the Eastern Andean variety by

Montes (1984) and NGLEFF (2011). Despite the fact that the Coastal variety in Colombia is stigmatized because of aspiration and deletion (Orozco 2018; Flórez 1963; Lipski 1996; Montes 1984; Pacheco 2011), the speakers of this variety do not exhibit a high rate of [s] production like the speakers of the Andean varieties. This could be due to the fact that regardless of the stigmatization of their speech within the country, the Coastal variety enjoys covert prestige within the speech community. Orozco (2004) argues that Coastal speakers disdain the Bogota variety and the results obtained in this study can be interpreted as reflecting Coastal speakers' rejection of its predominant [s] variant. This suggests that attitudes need to be considered in an explanation of the interaction between different uses of the language and the construction of social identities in intercultural relations.

A different way to explain the results of the Coastal speakers could be that because the SLM makes predictions based on the assumption that a sound in the L2 may only be linked to another sound in the L1. That is, it does not consider phonological processes and allophonic variation. In this case, the speakers continue to aspirate and delete /s/ in their D2, suggesting that D1 phonological processes are transferred in to the D2 and/or that a D2 sound may be linked to more than one sound in the D1 in the same position. Therefore, in the future, the possibility of transfer of D1 phonological processes and/or the effect of allophonic variation needs to be considered in modeling D2 speech acquisition.

H1 also stated that speakers from the Western Andean region would not favor the production of the [s] variant because of the similarity between [s] and [s̪], the most frequent realization of the variable in their D1. The results (see Table 2 revealed that production of [s̪] is higher for the speakers of the Western Andean variety (0.776) than for the speakers of the Coastal (0.599) and Eastern Andean (0.224) varieties, which are consistent with the dialectal classification of the regions by Montes (1984) and NGLEFF (2011, p. 199). However, as shown in Table 3, the Western Andean region speakers also favored the production of [s] (0.614), which was not predicted by our first hypothesis. Their percentage realization of the various variants was as follows: [s] (72.6%), deletion (6.4%), [h] (15.5%), [s̪] (1.2), and [z] (4.3). Favoring [s] production by this group of speakers could be because the acoustic difference between [s̪] and [s] may not actually be as small as it had been predicted, and therefore, the speakers may indeed be able to perceive the difference between the D1 and the D2 and therefore learn to produce the [s]. Future studies need to determine the degree of similarity between [s] and [s̪] by conducting a perception test and further investigate the role of similarity between a D1 and D2 sounds in D2 speech learning. Foreman (2003) studied the acquisition of D2 Australian English vowels by speakers of North American English and found that the vowels that were phonetically closer to those of their variety were more readily acquired than the feature of non-rhoticity (see Chambers 1992).

Table 3. Summary of the region factor weights for occurrence of /s/ variants, taken from the Up & Down analysis Table 2.

Region of Origin	[s]	[h]	[∅]	[s̪]	[z]
Eastern Andean	0.646	0.371	0.455	0.224	0.300
Coastal	0.299	0.659	0.634	0.599	0.528
Western Andean	0.614	0.435	0.351	0.776	0.751

It is also worth mentioning that similarly to the speakers of the East Andean variety, in this dialectal contact situation, the Western Andean group of speakers was a significant predictor of [z] (0.751) realization but not [h] (0.435) and deletion (0.351). Therefore, it appears that they may have been somewhat influenced by contact with the speakers of the Coastal variety, although not significantly. Another possibility is that some variation in /s/ realization may have preexisted in the speech of the Western Andean variety, although the literature does not support this idea. This warrants a more exhaustive study of /s/ variation in the varieties studied in this study.

The second question was related to which linguistic factors constrain /s/ realization in coda position in the group of speakers from the three D1 varieties. Hypothesis 2 predicted that /s/ realization would pattern in a way consistent with what had previously been reported regarding /s/ weakening in Spanish.

The results indeed indicated a positional asymmetry, where [s] occurred more frequently in word-medial position than in word-final position, which is consistent with the results of previous studies regarding /s/ realization in Cartagena and Barranquilla (Becerra 1985; Lafford 1986; Rodríguez Cadena 2004). These results also support Lindblom's theory of sound change and variation, which asserts that the word-final position is more vulnerable to change because it is not information bearing/salient and is therefore prone to hypo-articulation. Positional asymmetries have previously been reported in L2 speech learning studies (see Colantoni and Steele 2006; Rafat 2011). The role of universal phonetic factors has also been examined in D2 and L2 speech learning (Varona et al. 2018) and heritage speech as well (Rafat and Stevenson 2018).

The results also revealed that [s] is retained when the following segment is a voiceless consonant, a high vowel and when it occurs in a stressed syllable (see Table 2), but /s/ weakening occurs in the opposite contexts such as a voiced consonant, a low vowel, and an unstressed syllable (see Table 2). In addition, aspirations [h] and deletions are more frequent in final-word position when the following segment is a voiced consonant, a low vowel, and when it occurs in an unstressed syllable. These results are consistent with the results of previous studies such as those on Cartagena Spanish (Becerra 1985; Rodríguez Cadena 2004), Santo Domingo Spanish (Terrell 1981), Puerto Rican Spanish (Alba 1982; Poplack 1980), Cali Spanish (Brown and Cacoullos 2002; Brown and Brown 2012; File-Muriel and Brown 2010).

Finally, while the results of this study showed that /s/ is maintained in polysyllabic words and weakened in monosyllabic ones, Alba (1990); Samper Padilla and Cabrera (1995) in their studies on Dominican Santiago and Las Palmas de Gran Canaria Spanish found the opposite. The effect of number of syllables will have to be further investigated in future studies.

We also investigated the effect of extralinguistic factors to see whether they would modulate the rate of [s] production by the three groups of D1 speakers. It was predicted that extralinguistic factors would affect the degree of acquisition of [s] by the speakers from the three D1 varieties studied. Specifically, it was predicted that the [s] variant would be favored by (a) participants who had arrived in Ciudad Bolivar in Bogota before the age of 7 (Kerswill and Williams 1994; Rys 2007; Siegel 2010; Tagliamonte and Molfenter 2007; Trudgill 1986; Bortoni-Ricardo 1985; Chambers 1992; Munro et al. 1999), (b) by those with the highest level of education (Labov 1972; Terrell 1981; Rodríguez Cadena 2004; Tagliamonte and Molfenter 2007; Chambers 1992), (c) by those with the highest socioeconomic status (Labov 1972, 2000; Díaz-Campos 2014; López Morales 1989; Becerra 1985; Lafford 1986), (d) by the youngest group (Lenneberg 1967; López Morales 1989; Rodríguez Cadena 2004; Terrell 1981; Ramírez and Almira 2011; Cedergren 1978; Villena Ponsoda 2012), and (e) by the female participants (Labov 1972; Holmquist 2011; Rodríguez Cadena 2004; De Weinberg 1973; Cedergren 1978; Poplack 1980; Foreman 2003; Rys 2007; Ruiz-Peña et al. 2015).

Our hypothesis regarding the age of arrival was supported for the speakers of the Coastal and Western Andean varieties, where the /s/ realization is different from /s/ that occurs in zone D2 (see Table 3). These results are consistent with D2 acquisition studies (Kerswill and Williams 1994; Rys 2007; Siegel 2010; Tagliamonte and Molfenter 2007; Trudgill 1986; Bortoni-Ricardo 1985; Chambers 1992; Munro et al. 1999; Nycz 2015) where they reported that age of arrival in zone D2 was a significant factor in the acquisition of phonological features of a D2 dialect. This factor has also been extensively analyzed in studies of L2 acquisition, where it has been also shown to significantly affect L2 speech learning (Abrahamsson 2012; Baker 2010; Johnson and Newport 1989; Major 2014). Age of arrival was not a significant factor for the speakers of the Eastern Andean region, possibly because [s] is an "old" sound in this variety.

Regarding the effect of the level of education, the results of the present study did not support our prediction that those with a higher level of education would favor [s] production. We propose this is due to the fact that the speakers had a relatively homogenous level of education, according to participant self-reports. In retrospect, it might have been a better idea to have classified the speakers based on the number of the years of education completed rather than the degree of education (primary

school, secondary school, technical). However, it is worth mentioning that although we have not looked at interaction/cross-tabulations in this study, we noted that the speakers of the Coastal and Western Andean varieties with higher levels of education (secondary and technical) favored the production of the [s] variant, both in word-medial and word-final position. It is important to remember that [s], in addition to being the most frequent sound in zone D2, is also the most prestigious variant since it is the Colombian Spanish standard variant. These results are consistent with previous studies in which has also been shown that the level of education was a significant factor when measuring the preference of speakers for certain variants, especially those attributed to the standard language or those with high social prestige (Labov 1972; Terrell 1981; Rodríguez Cadena 2004; Tagliamonte and Molfenter 2007; Chambers 1992). As for the speakers of the Eastern Andean region, those with a higher level of education had a higher rate of [s] in the word-medial position only. This is consistent with the overall results of the study in which the production of [s] is favored more in word-medial position than in word-final position. Future studies should consider investigating interactions between region of origin, level of education, and position in the word.

With respect to the age of speakers, the results supported the hypothesis, since the younger group of participants favor [s] production. The results are consistent with previous studies of both L2 acquisition (Lenneberg 1967) and variationist studies (Labov 1994; López Morales 1989; Rodríguez Cadena 2004; Terrell 1981; Ramírez and Almira 2011; Cedergren 1978; Villena Ponsoda 2012), in which age has been observed as a marker in the apparent-time linguistic change hypothesis, where according to Labov (1972), linguistic change is frequently the result of innovations in younger speakers.

With respect to gender, the results support our prediction, since female speakers of the Coastal and Eastern Andean varieties favor [s] production in coda position, both in word-medial and word-final position. These results are consistent with previous studies of both variationist (Labov 1972; Rodríguez Cadena 2004; De Weinberg 1973; Cedergren 1978; Poplack 1980) and D2 acquisition studies (Foreman 2003; Rys 2007; Holmquist 2011; Ruiz-Peña et al. 2015), in which women have also been found to favor the production of standard variants. However, the results of this study showed that not all the observed groups had the same results, because unlike the other two groups, in the Western Andean variety, it was the male speakers who favored [s] production, compared to the female participants of the same variety, who conserved their D1 variant. One possible explanation for this phenomenon could be that women are aware of the prestige that the Western Andean variety enjoys, both locally in Ciudad Bolivar and nationally in Colombia, and therefore are conserving their variety. The difference observed in the Western Andean group with respect to the behavior of women could also be due to the fact that "gender does not have a uniform effect on the linguistic behavior of the community in general," and "gender differences in socio-linguistic behavior materialize differently in different contexts." (Orozco 2018, p. 130 citing Eckert 1989, p. 247; James 1996, p. 119).

Finally, regarding the socio-economic status factor, the results of the present study did not support our prediction that those with a higher socio-economic background would favor [s] production. We propose this is due to the fact that the speakers came from a relatively homogenous socioeconomic group, according to participant self-reports. All participants had self-identified as belonging to level status 1 or 2.

Implications for Models of D2 Speech Learning

Although the field of D2 speech learning is growing (Esparza and Mazzaro 2018; Foreman 2003; Rys 2007; Holmquist 2011; Ruiz-Peña et al. 2015; Siegel 2010), currently we do not have a model of D2 speech learning. Some of the previous studies as well as the current study have relied on the SLM; however, as we have seen here, D2 speech learning is a complex phenomenon in which several linguistic and extra-linguistic factors may play a role. Based on the data in this study it is not immediately clear whether the SLM can explain D2 speech learning. This is partly because we do not know whether the assumption that the acoustic distance between [s̪] and [s] is small. The effect of the degree of acoustic distance between a D2 and its nearest D1 sound on equivalence

classification in D2 speech learning certainly merits further investigation. Moreover, given that there was evidence to suggest that a variationist approach can explain some of the D2 acquisition patterns, we recommend that future models consider both linguistic and extralinguistic factors. Moreover, because our findings are consistent with those reported in variationist studies regarding factors affecting language variation and change, we also suggest that universal phonetic principles such as positional salience that determine sound change be incorporated into future models. Moreover, it is crucial that the role of D1 phonological processes be considered in modeling D2 speech learning.

5. Conclusions

The present study makes a novel contribution to our understanding of D2 speech learning of Spanish by showing various linguistic and extralinguistic factors that may constrain the production of [s] in a contact situation. The results for the rate of production of the D2 variant [s] in coda position differs between the speakers of the Eastern Andean, Coastal, and Western Andean varieties that have been in contact in Ciudad Bolivar in Bogota, Colombia. Specifically, it was found that the speakers of the Eastern Andean variety favor the production of [s] the most, followed by the speakers of the Western Andean variety and then the speakers of the Coastal variety. The latter group tends to exhibit aspiration and deletion. Aspiration and deletion were also evident in the productions of the speakers of the Eastern and Western Andean varieties at a lower rate and mainly in the word-final coda position, suggesting that speakers exhibited some degree of influence from different varieties in contact.

We tested the SLM, but the prediction of this model did not always hold for the contact situation we studied. We have proposed that future perception tests and future models of D2 speech learning consider the effect of D1 phonological processes and/or variants as well as linguistic and extra-linguistic factors that were tested in this study.

Finally, we have drawn parallels with previous sociolinguistic studies and specifically variationist studies on /s/ as well as L2 acquisition studies. Doing so, we have made a new contribution to the field of D2 speech learning, by showing that some of the factors that may influence language variation and change as well as L2 acquisition also affect D2 speech learning.

In addition, although the main goal of the study was not to investigate sound change in a dialect contact situation, the results of this research suggest that dialectal contact is a factor that promotes linguistic change in Bogota Spanish as stated (Montes 1984). These results also suggest that /s/ variation is a complex phenomenon since both linguistic and extralinguistic factors are involved.

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Appendix A

Table A1. The effect of the following segment: percentages of production by position.

	Word Medial					Word Final				
	[s]	**[ø]**	**[h]**	**[S͡]**	**[z]**	**[s]**	**[Ø]**	**[h]**	**[S͡]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
Vc	85.4	1.2	12.6	0.2	0.7	75	7.1	15.6	1.4	0.9
Vdc	39.2	13.7	41.2	0	5.9	32	27.8	38.9	0.5	0.7
Lv	100	0	0	0	0	64.8	14.2	13	1.8	6.1
Hv	100	0	0	0	0	77.3	2.3	9.1	3.4	8
P	NA	NA	NA	NA	NA	82.5	10.5	3.5	1.8	1.8
Es	NA	NA	NA	NA	NA	82.4	11	1.9	4.6	0

Vc = voiceless consonant, Vdc = voiced consonant, Lv = low vowel, Hv = high vowel, P = pause, Es = end of sentence, NA = not applicable.

Table A2. The effect of the previous segment: percentages of production by position.

	Word Medial					Word Final				
	[s]	**[ø]**	**[h]**	**[S͡]**	**[z]**	**[s]**	**[Ø]**	**[h]**	**[S͡]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
Lv.	84	1	14	0	1	60	16	20	2	2
Hv.	69	7	20	1	3	65	13	18	0	4
Vc.	85	0	15	0	0	NA	NA	NA	NA	NA

Lv = low vowel, Hv = high vowel, Vc = voiceless consonant, NA = not applicable.

Table A3. The effect of the stress syllable: percentages of production by position.

	Word Medial					Word Final				
	[s]	**[ø]**	**[h]**	**[S͡]**	**[z]**	**[s]**	**[Ø]**	**[h]**	**[S͡]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
Stressed	83	1.3	15	0.2	0.9	60	14	22	1.3	2.9
Unstressed	81	4	14	0	1.5	61	18	18	1.8	1.8

Table A4. The effect of number of syllables: percentage of production by position.

	Word Medial					Word Final				
	[s]	**[ø]**	**[h]**	**[S͡]**	**[z]**	**[s]**	**[Ø]**	**[h]**	**[S͡]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
1	0	0	0	0	0	58.7	13.9	23	1.4	3
2	79.7	2.8	16.4	0.3	0.8	59.7	16.7	20	2.1	1.5
3	90.1	1.4	7.1	0	1.4	64	16.9	15.7	1.2	2.3
4	73	1.1	24.7	0	1.1	65.2	21.4	10.7	1.8	0.9

1 = one syllable, 2 = two syllables, 3 = three syllables, 4 = four syllables.

Table A5. The effect of the level of education: percentages of production by region and word medial position.

	Primary School					**Secondary School**					**Technical**				
	[s] %	**[ø]** %	**[h]** %	**[ʂ]** %	**[z]** %	**[s]** %	**[ø]** %	**[h]** %	**[ʂ]** %	**[z]** %	**[s]** %	**[ø]** %	**[h]** %	**[ʂ]** %	**[z]** %
EA	80.2	2.3	7.8	1.2	8.6	93	1.3	3.9	0	1.7	95.6	0	0.6	0	3.8
C	74.9	1.6	15.7	4.7	3.1	88.4	1	8.6	0	2	82.7	0.5	12.7	1	3
WA	79.2	0	0	5.7	15.1	84.9	0.8	3.7	1.9	8.8	NA	NA	NA	NA	NA

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A6. The effect of the level of education: percentages of production by region and word final position.

	Primary School					**Secondary School**					**Technical**				
	[s] %	**[ø]** %	**[h]** %	**[ʂ]** %	**[z]** %	**[s]** %	**[ø]** %	**[h]** %	**[ʂ]** %	**[z]** %	**[s]** %	**[ø]** %	**[h]** %	**[ʂ]** %	**[z]** %
EA	74	11.5	12.8	0.9	0.9	67.2	14.3	17.8	0	0.8	68.1	12.6	19.3	0	0
C	40.7	38.1	18	2.6	0.5	52.9	15	30.3	0.4	1.5	51.9	18.8	19.9	6.1	3.3
WA	63.2	1.5	20.6	7.4	7.4	65	10	19	0.6	5.4	NA	NA	NA	NA	NA

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A7. The effect of gender: percentages of production by region and word-medial position.

	Female					**Male**				
	[s]	**[ø]**	**[h]**	**[ʂ]**	**[z]**	**[s]**	**[ø]**	**[h]**	**[ʂ]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
EA	92	1.7	5.3	0.2	0.5	82	0.9	3.5	0.9	13
C	90	1.5	8.1	0.2	0.5	74	0.4	17	3.5	5.6
WA	94	0.8	2.6	2.3	0	68	0.6	4.3	2.4	25

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A8. The effect of the gender: percentages of production by region and word-final position.

	Female					**Male**				
	[s]	**[ø]**	**[h]**	**[ʂ]**	**[z]**	**[s]**	**[ø]**	**[h]**	**[ʂ]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
EA	69	12	18	0.5	0.2	73	14	12	0. 0	1.5
C	54	21	24	1.3	0.5	42	26	24	4.7	3.5
WA	72	5.2	20	0.9	1.3	54	13	18	3. 0	12

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A9. The effect of age of arrival: percentages of production by region and word-medial position.

	Under 7 Years					**Older Than 7 Years**				
	[s]	**[∅]**	**[h]**	**[ʂ]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[ʂ]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
EA	95.8	0	2.8	0	1.4	90	3.1	5	0.6	1.2
C	92.3	0	7.7	0	0	65	2.9	30.8	0	1.2
WA	100	0	0	0	0	90.7	1.3	7.3	0	0.7

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A10. The effect of age of arrival: percentages of production by region and word-final position.

	Under 7 Years					**Older Than 7 Years**				
	[s]	**[∅]**	**[h]**	**[ʂ]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[ʂ]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
EA	68.2	14	17.8	0	0	70.4	12.8	15.6	0.4	0.8
C	75	4.4	20.6	0	0	45.7	25.1	24.3	3	1.9
WA	78.6	0	17.9	3.6	0	63.6	9.2	19.3	1.6	6.2

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A11. The effect of socio-economic status: percentages of production by region and word-medial position.

	Level 1					**Level 2**				
	[s]	**[∅]**	**[h]**	**[ʂ]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[ʂ]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
EA	88	1	5.5	0.6	4.9	90	2.6	2	0	5.3
C	82	1	12	1.7	2.7	84	1	11	1.4	2.4
WA	84	0.9	7.1	1.6	5.9	88	1.4	7.0	0.8	3.2

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A12. The effect of socio-economic status: percentages of production by region and word-final position.

	Level 1					**Level 2**				
	[s]	**[∅]**	**/h/**	**[ʂ]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[ʂ]**	**[z]**
	%	%	%	%	%	%	%	%	%	%
EA	71	14	15	0.4	0.6	68	9.9	21	0	0.7
C	46	26	23	2.6	2.6	53	19	25	2.7	0.4
WA	62	9.5	20	1.7	6.6	79	1.9	1.7	1.9	0.0

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A13. The effect of age of participant: percentages of production by region and word medial position.

	15–25					**26–45**					**46–68**				
	[s]	**[∅]**	**[h]**	**[s̪]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[s̪]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[s̪]**	**[z]**
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
EA	97	1	1	0	1	87.9	2.5	5.4	0.4	3.8	86.2	0.7	5.3	0.7	7.2
C	91.5	1.2	6.4	0.3	0.6	79.8	1	3.4	0	15.8	74.9	0.4	16.3	4.4	4
WA	93.5	0.9	3.7	0.9	0.9	76.1	1.5	17.2	0	5.2	83.2	0	2.5	7.6	6.7

EA = Eastern Andean, C = Coastal, WA = Western Andean.

Table A14. The effect of age of participant: percentages of production by region and word final position.

	15–25					**26–45**					**46–68**				
	[s]	**[∅]**	**[h]**	**[s̪]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[s̪]**	**[z]**	**[s]**	**[∅]**	**[h]**	**[s̪]**	**[z]**
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
EA	79.6	6.1	14.3	0	0.	71.5	9.9	17.8	0	0.8	65.1	18	15.5	0.7	0.7
C	56.5	17.6	24.3	1	0.6	62.9	8.6	20.3	0.5	7.6	35.4	30.1	25.4	6.7	2.4
WA	71.8	12.9	11.8	0	3.5	53.3	23.8	19.7	0.	3.3	62.4	5.1	23.1	5.1	4.3

EA = Eastern Andean, C = Coastal, WA = Western Andean.

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