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Spanish X Revisited

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1. Introduction

In its May 1947 issue, *Hispania* published a short article entitled "Two Rules in Need of Revision" (Shultee and Torrez), which ignited a debate over the pronunciation of the Spanish "letter," or grapheme, *x*.¹ In their article, Shultee and Torrez presented the results of an informal experiment from which they concluded that the Spanish rule of pronunciation that prescribes [s] for *x* before a consonant does not hold for speakers of Latin American varieties of Spanish, and that these speakers instead tend to pronounce *x* as [ks] in this position. In a letter to the editor of *Hispania*, Dwight Bolinger ("That X Again") entered the debate over *x* with a defense of Shultee and Torrez's conclusions, following up a few years later with a major article entitled "Evidence on X" in which he refuted the claim, made by the highly-regarded Spanish philologist Tomás Navarro, that Spanish *x* before a consonant is pronounced [ks] only in "casos muy marcados de dicción culta y enfática" and that in "la conversación corriente, la *x* ante consonante se pronuncia como una simple *s*" (*Manual* 140).

In support of his argument, Bolinger presented the results of a survey based on data elicited from 219 questionnaires that asked speakers throughout Latin America how they pronounced certain words containing *x*, as well as what they considered the "correct" or standard pronunciation of these words to be. Bolinger concluded that the norm, or prestige variant, for *x* among educated Latin American speakers of Spanish is [ks], regardless of environment. Navarro quickly rejected these findings on the grounds that Bolinger's methodology was inappropriate for this type of linguistic investigation: Questionnaires that elicit linguistic information directly from informants are notoriously unreliable, because there is often a discrepancy between what informants actually say and what they think they say or what they think they should say ("Investigación" 330).

The present study revisits the pronunciation of Spanish *x* using modern laboratory techniques and sociolinguistic methods. An acoustic analysis of recorded speech samples from 20 native speakers of peninsular and Latin American varieties of Spanish is performed in order to identify the phonetic variants of *x* and their distribution. The data are then examined within the

framework of variationist theory, which claims that linguistic variability is conditioned not random. Through multivariate analysis, it is possible to create a probabilistic model of variation that indicates what factors exert the greatest influence on the occurrence of a linguistic variable (Cedergren and Sankoff). The factors evaluated here to determine what effect, if any, they have on the phonetic realization of *x* include the linguistic factors of phonetic environment and stress and the social factors of origin, sex, age, speech style, and amount of exposure to English. Due to the limited number of subjects used and the paucity of the speech sample analyzed, the study's findings should be construed as merely suggestive rather than conclusive.

2. Spanish *X*

Much of the confusion over *x* no doubt stems from the Real Academia's attempts to reform the Spanish orthographic system beginning in the 18th century. These reforms culminated in the eighth edition of the Academia's *Ortografía*, which largely represents the system in use today (except for some minor adjustments having to do mostly with accentuation). Basing itself on etymological criteria, the Academia opted to use orthographic *j* in words that until then had been spelled with *x*—that is, words containing either an intervocalic Latin *x*, or else a prevocalic Latin or Arabic sibilant—but whose pronunciation had shifted from a voiceless prepalatal fricative [ç] (similar to the *sh* in the English word *she*) to a voiceless velar fricative [x] by the end of the 17th century: *ejemplo* < *exemplo* < Lat. *exemplu*; *jeringa* < *xeringa* < Lat. *seringa*; *jarabe* < *xarabe* < Ar. *saih*, etc.² Orthographic *x*, again for etymological reasons, would be reserved for learned words incorporated into Spanish from Classical Latin and be pronounced [ks] or [gs]: *examen*, *exigir*, *excelente*, *exposición*, etc. (Lapesa 423). In popular words, the Spanish descendant of Latin *x* had long since reduced from [ks] to [s] before a consonant and was often spelled with *s*: *escapar* < VL **excappare*; *escurrir* < Lat. *excurrere*; *estender* < Lat. *extendere* (respelled *extender*). Despite their official spelling, many speakers continued to pronounce words containing preconsonantal *x* with [s] instead of the prescribed [ks] of the Academia. This confusion in some cases produced hypercorrect forms, in spelling and pronunciation, such as *extricto* and *extrangular* (Lenz 149-50).

This state of affairs has led to a lack of consistency in the treatment of *x* that is still evident today in dictionaries and instructional materials. Lunn, for example, states that "*x* is usually realized as [ks]" (*Pronunciación*: "Ortografía"). The *Diccionario Salamanca de la lengua española* describes *x* as representing "un sonido doble compuesto de *k* o de *g* sonora y de *s*" (1670). Teschner says that "cuando *x* va delante de cualquier consonante se pronuncia /s/ en la mayoría de los dialectos [. . .] mientras que *x* delante de vocal = /ks/" (5). The 18th edition of the Academia's *Diccionario de la lengua española* states

that *x* "sólo se emplea con el valor de *ks* o *gs*; como en *axioma*, *excelente* (1352). However, beginning with its 19th edition in 1970, the *Diccionario* adds that "ante consonante suele reducirse a *s*" (1357).

3. Methodology

The data for the present study consist of recorded speech samples containing words spelled with *x* taken from 20 native speaker instructors of Spanish at the University of Southern California in Los Angeles. The subjects included 10 *distinción*³ speakers from Spain (4 males, 3 females) and 13 speakers originally from Chile, Colombia, Costa Rica, Cuba, El Salvador, Mexico, and Peru (6 males, 7 females). The subjects ranged in age from 25 to 49 years. They had varying lengths of residency in the United States, ranging from 2 to more than 15 years. Although all subjects were proficient in English, they unanimously claimed Spanish as their dominant language.

The subjects were recorded performing different speech tasks in order to elicit different "styles" in the Labovian sense of amount of attention paid to speech (Labov 79-99). An informal conversation with each subject was intended to elicit a "casual style" of speech; however, these unrecorded conversations did not produce sufficient examples of *x* for analysis and were therefore excluded from the study. The reading aloud of a lengthy passage of Spanish text that included 20 words spelled with the grapheme *x* in intervocalic and preconsonantal position was used to elicit a relatively formal "reading style" of speech.^{4,5} A less formal "careful style" of speech was obtained by having subjects describe, as completely and as quickly as possible, the characters and events shown in a ten-minute silent video segment excerpted from the film *Papillon*, in which an escaped convict (Steve McQueen) is seen fleeing from authorities in a South American jungle. Whereas the reading task rendered a total of 400 tokens (20 tokens per subject), the narrative task produced a total of only 19 tokens due to the open-ended and uncontrolled nature of the task.⁶ The data were digitized for acoustic analysis using the computer software program *Speech Analyzer* (Summer Institute of Linguistics). After its waveform and spectrogram were examined, each token was transcribed and coded for quantitative analysis by the author, a near-native speaker of Spanish with training in phonetics. The reliability of the coding was confirmed by generating a second set of waveforms and spectrograms for 10 randomly selected tokens from the original corpus. The coding of this second set of data closely agreed with the original (95%).

Once the data had been initially coded, they were then prepared as input for variable rule analysis as performed by the GOLDVARB 2001 statistical program (Robinson, Lawrence, and Tagliamonte). Using multiple regression, GOLDVARB determines what social and linguistic factors significantly influence the occurrence of a certain form and calculates, in terms of probabilistic

weights, the degree to which a factor contributes to the application of a particular variable rule. Factors with weights above .50 are said to favor, or promote, the occurrence of a variant, while weights below .50 are interpreted as disfavoring it. In this case, the dependent linguistic variable was coded for the phonetic variants that corresponded to Spanish *x* (see section 4.1). The independent linguistic variables considered were phonetic environment and stress. The independent social variables included subjects' origin, in terms of Latin America versus Spain, sex, age, speech style, and amount of contact with English as determined by length of residency in the United States. The factor group of phonetic environment was coded for the occurrence of the grapheme *x* between vowels (*existían*, *próximo*) and before at least one consonant (*texto*, *extracto*). Stress was coded as tonic in those words in which at least the first segment of /ks/ was in the coda of a stressed syllable in the underlying structure (*éxito* /ék-si-to/, *texto* /téks-to) and atonic when it was not (*existían* /ek-sis-tí-an/, *expresaron* /eks-pre-sá-ron/). The factor groups of origin and sex were coded as appropriate. Age was coded in terms of two factors: under 35 years and 35 years and over. Style related to formality of the speech task, with the reading passage coded as a formal reading style and the narration coded as a relatively less formal careful style. Finally, amount of contact with English was coded in terms of how long subjects had lived in the United States: under 5 years and 5 years or more.

4. Results and Discussion

Table 1 lists the variants of Spanish *x* that were identified by acoustic analysis and shows their distribution by phonetic context for all speakers. The individual variants are classified into 2 major types: a series of two-segment variants consisting of 6 subtypes; and a group of single-segment variants containing 3 subtypes, including phonetic zero (cf. Duque 71). The general criteria employed in the classification of subtypes were as follows:

Two-segment subtypes.

[ks] (voiceless velar stop + voiceless coronal sibilant): This type shows the presence in the spectrogram of a voiceless closure interval, or "silent gap," which identifies the segment as [k]. The silent gap is often accompanied by a vertical spike in the acoustic signal, which corresponds to the release of the articulators during consonant stop production. Following [k] is a period of turbulence or frication identifiable as [s].

[k̥s] (partially voiced velar stop + voiceless coronal sibilant): This type reveals a spectral pattern similar to that of [ks], with the exception of the presence of a low intensity fundamental frequency at the base of the spectrogram, which is indicative of vocal chord vibration and which extends no

further than halfway through the first segment. The period of intense frication following [k̥] corresponds to [s].

[gs] (voiced velar stop + voiceless coronal sibilant): This type is characterized by a silent gap, but with the presence of a fundamental frequency extending beyond the midway point of the stop closure. The following turbulence is recognizable as the fricative [s].

[ɣs] (voiced velar fricative + voiceless coronal sibilant): This type reveals a period of frication accompanied by a low intensity harmonic that extends more than halfway through the segment. Following the voiced segment [ɣ] is a zone of voiceless turbulence identified as [s].

[x̥s] (partially voiced velar fricative + voiceless coronal sibilant): This type shows a spectrogram similar to that for [ɣs]; however, the fundamental frequency apparent in [ɣ] disappears before reaching the midpoint of the segment. The following period of frication is identified as the segment [s].

[xs] (voiceless velar fricative + voiceless coronal sibilant): This type is characterized by a period of low intensity frication identified as [x]. Following this segment is a period of more intense turbulence recognizable as [s].

One-segment subtypes.

[s] (voiceless coronal sibilant): This single segment presents a period of relatively intense frication identified as [s].

[h] (voiceless aspirated glottal fricative): This type shows a brief period of low intensity turbulence corresponding to [h].

[Ø] (phonetic zero): More properly the absence of a segment, this type is devoid of any phonation in the acoustic signal.

Table 1 indicates that three of the subtypes overall account for 77.3% of the data: [ks] (41.5%), [k̥s] (18.4%), and [s] (17.4%). The other variants do not play a much lower frequency, ranging from 7.2% for [ɣs] to 0.5% for [Ø]. Overall, the two-segment type variants account for 80.9% of the data compared to 19.1% for the single-segment types. The subtype [ks] is the most frequent of the two-segment variants, while [s] is the most frequent of the single-segment variants.

Between vowels, two-segment variants occur with a frequency of 82.4% and the subtype [ks] shows the highest frequency at 35.1%. Of the one-segment variants, only [s] occurs in this environment, with a frequency of 17.5%. Before a consonant, the subjects produce the two-segment type with a frequency of 79.7%. Again, the subtype [ks] occurs most frequently at 46%. Single-segment variants occur with a frequency of 19.8% in this environment, with [s] being the most frequent at 17.3%.

Table 2 shows the distribution of *x* variants by phonetic context for speakers from Spain versus Latin America. Between vowels, the Spaniards pronounce two-segment variants at a rate of 72.1% and produce the single-segment variant [s] with a frequency of 27.9%. Before a consonant, the Spaniards produce two-segment variants with a frequency of 75.3% compared to the one-segment variants, which show a frequency of 24.7%. The Latin Americans reveal a slightly higher rate than the Spaniards for two-segment variants in both intervocalic and preconsonantal position: 88.1% and 82.2%, respectively. At the same time, the Latin Americans show lower frequencies of 11.8% and 17.7% for the one-segment variants in intervocalic and preconsonantal position, respectively. For both groups of speakers, [ks] is the most frequent two-segment variant, while [s] is the most frequent single-segment variant.

These data seem to support Bolinger's contention that *x* is frequently realized as [ks] among educated Latin Americans, regardless of phonetic environment. For the Spaniards too, [ks] occurs in both phonetic contexts and is the most frequent variant in preconsonantal position (37.6%). This finding provides some evidence against Navarro's description of [ks] as occurring before a consonant only "en casos muy marcados de dicción culta y enfática" (*Manual* 140). The data for the present study were obtained through the use of verbal tasks that elicited two different speech styles: a formal reading style (text reading task) and a less formal careful style (video narration task). While both of these styles are obviously more formal—in the sense that subjects are required to attend more to form than to meaning—than, say, spontaneous conversation, they are, nevertheless, examples of real speech, which would typically form part of a normal person's stylistic repertoire, and not the type of affected or pedantic speech to which Navarro seems to refer above.

Intervocalic *x* has never generated the controversy that preconsonantal *x* has, there being a general consensus that *x* is pronounced [ks], [gs], or [ʁs] between vowels. Navarro, a Spaniard, considers [s] for intervocalic *x* to be vulgar; however, he does accept [s] as correct in *exacto*, *auxilio*, and *auxiliar* (*Manual* 141). Surprisingly, the Spaniards produce [s] for intervocalic *x* at a higher rate, 27.9%, than any other individual variant (although the combined frequency of the two-segment type variants is much higher at 72.1%). The high frequency of [s] for *x* between vowels in the speech of the Spaniards can likely be attributed to the presence in the data of Navarro's "exceptional" words: the derived form *exactamente* and *auxilio* and *auxiliar*. Of the 8 occurrences of *exactamente* produced by the Spaniards, 7, or 85.5%, are pronounced with [s]; *auxilio* and *auxiliar* occur once each and are both pronounced with [s]. By comparison, only 4, or 26.7%, of the 15 occurrences of *exactamente* are articulated with [s] by the Latin Americans.⁷

4.1 Variable Rule Model for *X*

Variable rule analysis as performed by GOLDFARB 2001 allows the dependent variable—the linguistic variable under investigation—to contain more than two factors. The analysis presented here examines the variability in the pronunciation of *x* in terms of the two major types of variants identified above: the dependent variable consists of one factor, /ks/, which represents the two-segment subtypes [ks], [k̥s], [gs], [ʁs], [x̥s], and [xs], and another factor, /s/, which represents the one-segment subtypes [s], [h], and [Ø] (deletion).

A variable rule model for the application of the pronunciation of *x* as /ks/ is presented in Table 3. The independent factor groups of stress, speech style, origin (Spain versus Latin America), and sex were found to correlate significantly with the application of *x* as /ks/. The factor groups of phonetic environment, age, and length of residency in the United States were eliminated by the step-up/step-down function in GOLDFARB for not contributing significantly to the variation in the data.

The factor group that exerts the greatest influence on *x*, according to the size of the range of its factors, is stress (cf. Broce and Torres-Cacoullous 347–48). Whereas a stressed syllable strongly favors the realization of *x* as /ks/ (.93), an unstressed syllable does not (.36).

The grapheme *x* is unique among the letters of the Spanish alphabet in representing two sounds, the consonant sequence /k + s/. Between vowels, these segments form part of separate syllables, with /k/ in the coda of the preceding syllable and /s/ in the onset of the following syllable: *éxito* /ék-si-to/, *próximo* /prók-si-mo/. Before a consonant or consonant cluster, both elements are contained in the coda: *texto* /téks-to/, *extrema* /eks-tré-ma/.

Throughout its history, the Spanish language has been particularly susceptible to processes generally known as "weakening" in which consonants in syllable-final position are either reduced or else eliminated altogether. Hooper suggests that these processes may be motivated by constraints on the structure of the Spanish syllable in which open syllables of the type consonant + vowel (CV) are preferred. On this view, consonants and consonant clusters are weakened and/or simplified to conform to, or at least approximate, the preferred CV pattern of Spanish, especially in casual speech.

In the case of *x* = /ks/, the voiceless velar stop will tend to weaken in the coda of a syllable, producing two-segment variants such as [k̥s], [gs], [x̥s], [xs], and [ʁs], or else be dropped completely.⁸ Between vowels, the weakened velars represent approximations toward the optimal CV syllable, which is achieved in extreme cases when this segment is deleted entirely: *taxi* [ták-si] > [táx-si] > [tá-si].⁹ Before a consonant, weakened velars likewise attempt to approximate the preferred CV pattern by reducing the syllable-final consonant cluster: *texto* [téks-to] > [téʁs-to] > [tés-to]. The sibilant itself is susceptible to

weakening in syllable-final position and may be aspirated, [téh-to], or deleted altogether, [té-to] (thus achieving the optimal CV pattern), especially in those Andalusian and Latin American dialects that are particularly prone to weakening processes (see Cedergren; Terrell).

In the present study, it appears that tonic stress may reduce, to some extent, the weakening of /k/. The greater articulatory energy and tension associated with a stressed vocalic nucleus may affect adjacent consonants by making them more resistant to weakening and may account for the finding here that /ks/ is highly favored when the first segment is included in the coda of a stressed syllable (cf. Quilis and Fernandez 128; Hwu 5-6).

The factor group of style also has a significant effect on the pronunciation of *x*, with the formal reading style slightly favoring the /ks/ pronunciation (.52) and the careful narration style disfavoring it (.19). According to Labov, speakers tend to produce more standard variants as speech style becomes more formal (113-14). In the present study, the subjects as a whole increase their use of two-segment variants from 47.4% in the less formal careful style to 82.5% in the more formal reading style. The subtype [ks] is not only the most frequently occurring variant in the more formal style for both the Spaniards and the Latin Americans (32.9% and 47.3%, respectively) but also shows the greatest *increase* in frequency for both groups of speakers in the shift toward the more formal reading style (16.2% and 16.5%, respectively). This finding suggests that both Spaniards and Latin Americans may view [ks] as the standard, or prestige, pronunciation of *x*. Bolinger claims that this prestige may be the result of the influence of the schools, which, especially in Latin America, have taught the "correct" pronunciation of the letter *x* to be [ks] ("Evidence on *X*" 59). This association between orthography and pronunciation likely accounts for the favoring effect of the reading task, and the disfavoring effect of the video narration task, on the application of *x* as /ks/.

The independent variable of origin, in terms of Spain versus Latin America, is also statistically significant. Whereas the Latin Americans favor the pronunciation of *x* as /ks/ (.56), the Spaniards do not (.39). One possible explanation for this result, again, may lie in the schools. According to Bolinger, the "revitalization of [ks]" in Latin America is owed to the power of the schools and their drive for correctness ("Evidence on *X*" 59). He suggests that the campaign for what is perceived as correct is stronger in Latin America than in Spain. As evidence, Bolinger cites Angel Rosenblat (276-77), who gives the re-establishment of the participle suffix *-ado* as [-ádo] (pronounced [-áo] by educated speakers in central and northern Spain) and the labiodental pronunciation of *v* as examples of the Latin American obsession with the correctness of the written word and the struggle against vulgarism. In the present study, the finding that the Latin Americans are more likely than the Spaniards to pronounce /ks/ as a two-segment variant may be the possible result of this emphasis on

"correct" speech in Latin America in general and the insistence in the school on the pronunciation of *x* as [ks] in particular.

The independent factor group that has the least influence on *x*, according to its range, is sex. While females favor /ks/ (.57), males do not (.43). The studies that have included sex as a sociolinguistic variable generally agree that women tend to produce more standard linguistic variants than do men of the same social group in the same linguistic circumstances (for a summary, see Silva-Corvalán 96-99). The females in the present investigation show a higher frequency of the two-segment type variants than the males in the less formal narration style (63.6% vs. 25%) as well as in the more formal reading style (86.5% vs. 78.5%). At the same time, the females produce single-segment variants at a much lower rate than do the males in both the less formal style (36.4% vs. 75%) and in the more formal style (13.5% vs. 21.5%). This suggests that the female speakers may consider the two-segment type pronunciation—specifically the subtype [ks], which they produce at nearly twice the rate of the next most frequent variant, [k̥s]—to be the standard, or prestige, pronunciation of *x*.

5. Summary and Conclusions

This investigation has shown that it is feasible to examine the variability in the pronunciation of *x* using modern acoustic analysis techniques and sociolinguistic methods. As noted at the beginning of this paper, the limited number of subjects and the small sample size require that the findings of this investigation be reported as suggestive rather than conclusive. Nevertheless, the findings revealed here seem to support Bolinger's claim that [ks] constitute the standard variant among educated Latin Americans, at least in more formal contexts. The relatively high frequency of [ks] in the speech data of the Spaniards suggests that this variant may hold a certain amount of prestige for some of these speakers as well, especially in formal speech. Finally, multivariate analysis has shown that sociolinguistic factors such as stress, style, origin, and sex may play a significant role in the realization of *x* as a two-segment variant of /ks/.

Any future investigation of this topic would do well to rectify the shortcomings of the present paper. For example, a much larger data base could include many more speakers from countries and regions in addition to those represented here. Such a corpus could also include informants from different social classes and, crucially, contain examples of casual speech as well as more formal speech styles.

As for the practical implications of this study for instructors of Spanish as a second language, it makes sense to teach [ks] for *x*, at least at the beginning and intermediate levels, because this pronunciation is acceptable to native speakers and corresponds to a value of *x* with which English speakers are already familiar. Students at more advanced levels who come into contact with different varieties of native speech as the result of study and travel abroad can

experiment with their pronunciation of Spanish *x*, but will always have the default variant [ks] on which to fall back if needed. This advice, originally offered by Bolinger over fifty years ago, ("That *X* Again" 449-50) remains valid today.

NOTES

¹ Authors contributing to this debate include Bolinger, "That *X* Again," "Evidence on *X*," "Puristic Anti-Purism"; Navarro, "Investigación"; and Predmore, "*X* Before Another Consonant," "One More Look."

² The abbreviations used in this paper are as follows: Ar. = Arabic; Lat. = Latin; VL = Vulgar Latin. The symbol * (asterisk) denotes a reconstructed form.

³ That is, they distinguished between the phonemes /θ/ and /s/.

⁴ A word list task, designed to elicit an extremely "formal style," was not used here because it was believed that the subjects would identify *x* as the target of the investigation and therefore modify their pronunciation.

⁵ This (slightly abridged) passage consisted of a series of paragraphs extracted from Christopher Hitchen's *Juicio a Kissinger* and included the following words: *extracto*, *ex secretario*, *expresaron*, *exterior*, *expedientes*, *extrema*, *éxito*, *texto*, *excelente*, *expansivo*, *exactamente*, *reflexión*, *excéntrica*, *exquisitas*, *extra*, *exhibiendo*, *aproximadamente*, *sexistas*, *próximo*, *existían*.

⁶ The following words (with their number of occurrences in parentheses) were produced in the video narration task: *extraño* (4), *aproximan* (3), *exactamente* (3), *auxiliar* (1), *auxilio* (1), *exiliados* (1), *existe* (1), *exótico* (1), *explicar* (1), *extenuado* (1), *extranjero* (1), and *extraña* (1).

⁷ *Auxilio* and *auxiliar* do not occur in the Latin American speech data.

⁸ Hooper proposes a consonantal strength hierarchy based on degree of sonority, degree of opening, and other evidence in which the following classes of sounds are ranked in order from strongest to weakest: voiceless stops, voiced stops/voiceless fricatives, voiced fricatives, nasals, liquids, glides. For further discussion, see Hooper (195-226).

⁹ That is, CVc, where "c" represents a weakened consonant, is more optimal than CVC because the former is closer to the preferred CV structure than the latter.

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Table 1. Distribution of X Variants by Phonetic Context for All Speakers

Variant	n	%	%V_V	%_C
[ks]	174	41.5	35.1	46.0
[k̠s]	77	18.4	21.6	16.1
[gs]	27	6.4	9.4	4.4
[ɾs]	30	7.2	10.5	4.8
[χs]	20	4.8	2.9	6.0
[xs]	11	2.6	2.9	2.4
(Subtotal)	(339)	(80.9)	(82.4)	(79.7)
[s]	73	17.4	17.5	17.3
[h]	5	1.2	0.0	1.7
[Ø]	2	0.5	0.0	0.8
(Subtotal)	(80)	(19.1)	(17.5)	(19.8)

Total N = 419,

Table 2. Distribution of X Variants by Phonetic Context for Spanish and Latin American Speakers

Variant	Spain %V_V	Spain %_C	L.A. %V_V	L.A. %_C
[ks]	24.6	37.6	40.9	50.3
[k̠s]	19.7	14.1	22.7	17.2
[gs]	9.8	4.7	9.1	4.3
[ɾs]	9.8	7.1	10.9	3.7
[χs]	4.9	7.1	1.8	5.5
[xs]	3.3	4.7	2.7	1.2
(Subtotal)	(72.1)	(75.3)	(88.1)	(82.2)
[s]	27.9	23.5	11.8	14.1
[h]	0.0	1.2	0.0	2.4
[Ø]	0.0	0.0	0.0	1.2
(Subtotal)	(27.9)	(24.7)	(11.8)	(17.7)

Table 3. Variable Rule Model for Pronunciation of X as /ks/

Factor Group	Factor	Prob. Weight	Range
Stress	Stressed	.93	57
	Unstressed	.36	
Style	Formal (Reading)	.52	33
	Careful (Narration)	.19	
Origin	Latin America	.56	17
	Spain	.39	
Sex	Female	.57	14
	Male	.43	

N = 419; convergence at iteration 6; input prob. = .87; df = 4; $\chi^2 = 3.59$;
 $\chi^2/\text{cell} = .30$; log likelihood = -179.09; p = .031

Note. The factor groups listed were found to be significant at the $p < .05$ level determined by the step-up/step-down function of GOLDVARB. Probability weight indicates contribution of factor to the occurrence of x as /k̠s/