

## Explaining Variation and Change in Spanish Peripheral Fricatives

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### Abstract

The variation between labial and velar fricatives ([f] > [x], e.g. [x]uego *fuego* ‘fire’, [x]umar *fumar* ‘to smoke’) frequently occurs in disparate Spanish dialects (from Argentina, Chile, Colombia, Ecuador, El Salvador, New Mexico, among others) (Quilis 1993) and it is found in first language acquisition (Eblen 1982 and Greenlee 1992). The change [f] > [x] or [x] > [f] has also been observed in other languages such as English, Diola, Chinese, Tuareg, Hausa, among others (Foulkes 1997). Although the variation between [f] and [x] is so common cross-linguistically, there is no adequate understanding of the linguistic and social motivations that affect it. Using the variationist sociolinguistics framework (Labov 1972 and Weinreich, Labov & Herzog 1968), this study analyzes the variation of such fricatives in the speech of 25 native speakers of Corrientes (Argentine) Spanish. Results indicate that two main factors affect [f] > [x] variation in Spanish: i) phonetic context and ii) literacy (or lack of formal education).

### 1. Introduction

The labiodental fricative [f] alternates with the velar or glottal fricative [x, h] when followed by the diphthongs [we, wi]<sup>1</sup> and, in much less frequency, when followed by the vowel [u]. For instance, a word such as *fuerza* ‘strength’ is variably realized as [x]uerza. This feature is associated with rural speech (Quilis 1993) and it is often used in jokes to portray the speech of country people. This fact suggests some degree of social awareness of this phenomenon in the general public.

The variation between [f] and [x]<sup>2</sup> (henceforth labio/velar alternation) is a non-standard, yet widespread phenomenon found in the Spanish dialects of different countries such as Argentina, Chile, Colombia, El Salvador,

Ecuador, Mexico, New Mexico, Peru, among others (Cid Uribe & Céspedes Morales 2012, Kovacci 1987, Parodi & Santa Ana 1997, Penny 2000 and Quilis 1993, just to name a few). Although this variation has been studied within historical linguistics (Lloyd 1987 and Penny 1991) and often cited as a common feature of rural speech, no study has conducted a synchronic sociolinguistic analysis to understand the internal (linguistic) and external (social) factors that affect this variable. The aim of this study is to fill in this gap by providing quantitative evidence of the phenomenon in one speech community and by providing information about the factors that influence its occurrence.

Given the cross-linguistic nature of this phenomenon, which appears in languages such as English, Diola, Chinese, and Tuareg, among others (Foulkes 1997), this study will shed light on universal aspects of speech variation and how it shapes phonological systems.

In *El atlas lingüístico y antropológico de la Argentina*<sup>3</sup> ‘The Linguistic and Anthropological Atlas of Argentina’ (Kovacci 1987, p.16) very briefly mentions the labio/velar alternation in the section devoted to common phonetic/phonological processes found in Corrientes Spanish: *Cambios consonánticos: f > j. Ejemplo: si yo juera un tipo ‘f > j. Example: ‘If I were a guy’.* The same Atlas lists labio/velar alternation as a non-standard feature in the speech of Entre Ríos, San Juan, Mendoza and Río Negro, which are provinces located in different geographical regions of the country. The provinces that were not listed in the atlas were either not analyzed or their phonetic/phonological description was not provided. Abadía de Quant (2000, p.105) also mentions the labio/velar alternation as a characteristic feature of ‘low class’ Spanish at the Northeast of Argentina: *En posición inicial de sílaba, seguida de diptongo /ue/, la velarización es propia del isoclecto bajo y muy ocasional en el medio.* ‘In syllable initial position followed by the diphthong /ue/, the velarization of /f/ is characteristic of lower-class speech and very occasionally of middle-class speech’. It is interesting that Abadía de Quant’s study mentions ‘social class’ as a relevant social factor that affects the occurrence of labio/velar alternation, while the present study refers to ‘literacy’ or the influence of orthography as a relevant factor. People with low level of formal education, especially those who are non-literate, will have a lower income and will belong to the ‘low class’. As it will be explained later in this section, there are linguistic motivations to believe that is actually orthography / literacy and not social class the relevant factor that affects this perceptually driven variation. In addition, social class is a much wider term that encompasses education, economic position or income, and prestige, while literacy/education is more restricted and can be more easily measured.

Concerning potential sound changes that have a perceptual motivation, Ohala (1989) stated that in normal speech situations, listeners are able to factor out potential distortions due to coarticulatory effects and environmental noise. However, in circumstances which involve inexperienced listeners (e.g. children or non-native speakers), they are unable to normalize the ambiguous signal, which is then taken at face value. Thus, what was distorted signal is interpreted as the target pronunciation. Given that there is so much variation in speech, we should find many more sound changes than we actually do in the normal development of languages. However, since listeners have many cues to clarify ambiguous signals—other speakers’ pronunciation, listeners’ reactions to speakers’ attempts at pronunciation, and, in literate cultures, spelling—then the diffusion of variation is blocked (Ohala 1989).

According to Ohala (1989), sounds that are acoustically or perceptually similar, are good candidates for sound variation and change. Mazzaro (2011) presented acoustic and perceptual analyses of /f/ and /x/ showing that they are acoustically and perceptually similar in the context of [u] and [w]. Acoustically similar fricatives can become ambiguous, thus likely to be confused. For instance, a literate speaker who hears *afuera* ‘outside’ with an ambiguous fricative sound knows that the intended fricative was a labial /f/ because s/he has heard it pronounced clearly other times and has – at some point in the past - seen the spelling of such word. A non-literate person, however, who hears such ambiguous fricative sound may perceive it as a variation of a single phoneme category. That is, a phoneme such as /f/ may have two contextual allophones: [x] found in the context of back/round vocoids and [f] in the context of non-back/round vocoids. Since these allophonic realizations belong to the same phoneme (say /f/) in non-literate speakers, more variability (or labio/velar alternation) is expected to be found in this group<sup>5</sup>. As Ohala stated (1989), it could be possible to ascertain that orthography can help disambiguate confusing sounds. In fact, it could be possible that orthography helps establish different phonemes that would otherwise be merged in one category due to their perceptual similarity.

As stated earlier, the shift from /f/ > /h/ or /x/ is not unique to Spanish, but is well attested in many languages worldwide (e.g., Diola, Chinese, Tuareg, Muskogee, South Lappish, Tahitian, SePedi, Songhai, Koiari, Nubian, Hausa). In all these languages, this shift operates mainly when followed by the high back rounded vowel /u/ (Foulkes 1997). Following Ohala’s (1989) theory of sound change, Foulkes (1997) demonstrated that the sequences /fu/ > /hu/ are acoustically similar and, thus, prone to be confused. In other words, “the [fu] > [hu] change is one for which the listener, and not the speaker, is primarily responsible” (Foulkes, 1997, p.271). Although this study is able to identify the phonetic motivation for this common sound change, it does not address the social factors that affect

the spread of this perceptual phenomenon in the speech community. As Foulkes (1997) stated that a complete understanding of the phenomenon cannot be achieved without analyzing how it spreads through the speech community. That is, it is important to supplement experimental data with naturalistic sociolinguistic data. The present study is meant to fill in this gap by analyzing the social and linguistic factors that affect the diffusion of the labio/velar alternation. The analysis is based on the variationist sociolinguistic framework as developed by Labov and associates (Labov 1972 and Weinreich, Labov & Herzog 1968). Furthermore, the study of this phenomenon can help elucidate the diachronic process that affected /f/ in Old Spanish where we only know the end result and can hypothesize about the stages that lead to that point, as explained in section 2.

## 2. Diachronic development of /f/ variation

The earliest written record of this variation in Argentine Spanish dates back to 1872, in the epic poems by the Argentine writer José Hernández ‘*El Gaucho Martín Fierro*’. The gaucho, Martín Fierro, is a cowboy with a low level of literacy. As the following six-line stanza shows, his speech presents cases of labio/velar alternation. For instance, the gaucho uses *junción* instead of *función* ‘show’ (Hernández 1967, p.18).

<i>Aquello no era trabajo,</i>	You couldn't call that work,
<i>Más bien era una <b>j</b>unción,</i>	it was more like a party -
<i>Y después de un <b>g</b>üén tirón</i>	and after a good throw,
<i>En que uno se daba maña,</i>	when you'd managed it skillfully,
<i>Pa darle un trago de caña</i>	the boss used to call you over
<i>Solía llamarlo el patrón.</i>	for a swig of raw liquor.

(Bilingual Edition by Ward [C. E. Ward 1967, p.25])

However, the historical record of the shift affecting /f/ is much older than this evidence found in Argentine Spanish; it goes back to the origins of Castilian from Latin. During this period, most Latin <f> disappeared from the spelling of words. The process by which Latin /f/ came to be eliminated from most popular Spanish words has been subject to intense debate. Discussion has been polarized between those who adhere to the substratum influence

(exercised by Basque) and those that try to find intra-language explanations. Those who appeal to the contact hypothesis claim that the shift from /f/ to /h/ took place when Basque speakers, who did not have that sound in their native language, replaced /f/ with a familiar sound in their native language as they became bilinguals (Penny 1991). The intra-language hypothesis states that /f/ became /h/ through a process of dissimilation whereby /f/ lost its [labial] feature when followed by the round vowels /o/ and /u/. This process was later generalized to other syllabic vowels. With time, /h/ was dropped from pronunciation, so words such as [f]arina ‘flour’ became [h]arina and later Øarina (Lloyd 1987). According to the historical accounts, the /f/ that was followed by a glide, such as /w/ in *fuerte* ‘strong’, or a consonant, such as /t/ in *frío* ‘cold’ was not affected by the change. It is interesting to note that in Old Spanish /f/ survived before the glide /w/ in <ue> <ui>, which is the context most conducive to variation in Corrientes Spanish, as well as most other Spanish dialects (Foulkes 1997 and Quilis 1993). Nevertheless, the fact that /f/ has previously undergone changes in Spanish highlights a certain level of instability under which this fricative has existed throughout its diachronic development.

Given these historical accounts, it could be possible to argue that non-standard [x] is a phonologization of an older pronunciation, not an evolution from [fwe]. However, the evidence that labio/velar alternations are present in first language acquisition (Eblen, 1982 and Greenlee 1992) and that the relevant sounds are confused in perception (Mazzaro 2011) clearly suggests that these phenomena cannot be just a relic from Old Spanish.

Likewise, and given that the labio/velar alternation is commonly found in the rural speech of most of Hispanic America, I argue that its origin cannot be related to language contact between Spanish and Guaraní<sup>6</sup>. While Guaraní lacks [f], this could account for those speakers that have the variation in words such as *fuego* ‘fire’. However, the fact that the same speakers are able to use standard [f] in other phonetic contexts (e.g., followed by /a/, /e/, /i/, etc.) weakens the substratum hypothesis.

### 3. Method

The data comes from sociolinguistic interviews with twenty-five subjects from the town of Caá Catí (4007 inhabitants, INDEC census 2001), 100 km south of Corrientes city, the capital of the province of Corrientes, Argentina (map in Appendix 1). An important reason for choosing Caá Catí as the location for this study has to do with the rather low level of formal education of some of its residents. The city has only two primary schools and two

secondary schools; students who want to pursue a college<sup>7</sup> or university degree will have to leave town. Those who remain in Caá Catí have either secondary or primary education. Yet, there are some people who remain illiterate or have less than six years of schooling. Since I hypothesize that formal education or, rather, the lack of it, favors the spread of the labio/velar alternation, it was necessary to test this hypothesis on a population that would have an important number of semi-illiterate or illiterate speakers.

From the twenty-five subjects who participated in this study, thirteen were female and twelve were male (see Table 1). The sociolinguistic interviews lasted around an hour to an hour and a half, and were used to record instances of /f/ and /x/ in natural speech. The interviews started by asking subjects about their background including: age, level of formal education, how long they have lived in the community, how often they travelled, where (what neighborhood) they lived, and some information about their family background. This information was later used to classify subjects. The rest of the interview involved topics such as: hobbies, work, social activities, special celebrations and holidays, dating, etc. The tokens elicited from these interviews were statistically analyzed to gather information regarding the overall frequency of the labio/velar alternation, in which specific phonetic contexts it occurs, and what social factors affect its occurrence.

Participants were recruited using the ‘friend-of-a-friend’ (Milroy 1987) sampling technique. This technique consists in having a group of contacts that serve as initial link to approach prospective participants. The subjects that participated in the study were paid volunteers who had no history of speech or hearing disorders. They were born in Caá Catí and lived there for most of their lives. Those who were absent from Caá Catí for more than five years did not participate in the study. This was done to prevent obtaining speech samples that have been influenced by other varieties of Spanish and, thus, introducing another variable. Children were excluded from the study because they have not completed the acquisition of the language and their education remained in progress. At the beginning of the session, subjects were informed of the nature of the study and that their participation was voluntary<sup>8</sup>.

Given that formal education is one of the factors being tested, participants were divided into two groups: those with six years of primary school and beyond (henceforth Sixth Grade Plus<sup>9</sup> or 6G+), and those with no schooling or with incomplete primary school (henceforth Six Grade Minus or 6G-). Three age groups were arbitrarily devised: young (15-30), adults (31-65), and older (66+).

Age/Sex	6G+		6G-	
	Females	Males	Females	Males
Young	3	4	1	2
Adult	3	3	2	1
Older	1	1	3	1
<b>Total 25</b>	7	8	6	4

**Table 1. Distribution of Participants according to Social Categories: Age, Sex and Literacy.**

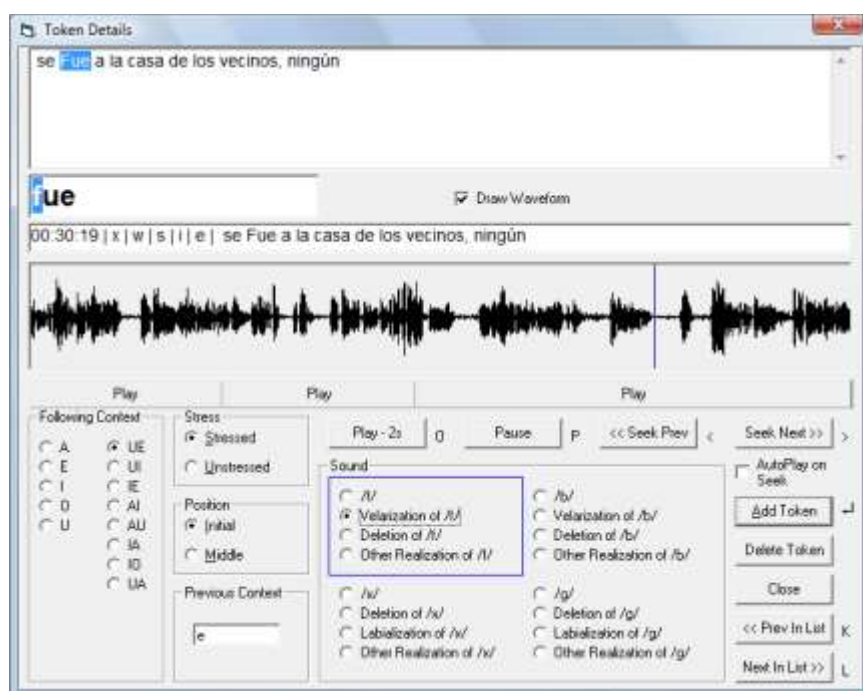
As Table 1 shows, participants are unevenly distributed across the social categories considered. For instance, there are fewer 6G- subjects participating in the study. It was easier to find older people with low levels of education than it was to find young participants with low levels of education. This is because the possibilities of education are now better than in the past and, in addition, there is a greater awareness of the importance of education for forging a better future.

To make participants feel more comfortable, sociolinguists prefer to collect their data at a place of the participant's own choosing, such as their home. However, the sociolinguistic interviews were followed by a perception experiment (reported in Mazzaro 2011) which needed a place with low background noise; therefore, the sessions were carried out in a house rented for the purpose of the study. A computer and recording equipment were set in the living room of the house, which created a friendlier environment than the one found in a typical speech laboratory. To reduce the effect of the "observer's paradox", tokens during the first 15 minutes of the interview were discarded. The house was not sound proof, but it was located on a rather quiet road.

All the recordings were done with an M-Audio Microtrack 24/96 professional 2-channel mobile digital recorder and an AT831-SP Audio Technica unidirectional lapel microphone placed at approximately 23cm from the speakers' mouths. Materials were recorded in mono at a sampling rate of 44.1 kHz and 16bit resolution and transferred to a CD-R as .wav files for analysis.

#### 4. Analysis

The interviews were transcribed into standard orthography and the tokens containing all the phonetic variants of /f/ were extracted. The token extraction was done using Nat (Lazzari 2009), a custom-made program that handles both the audio and transcribed version of the interviews. Both the audio file and the transcribed text file are open in Nat and synchronized. The software automatically detects the relevant tokens from the transcriptions of the interviews, and assigns values for each of the independent factors considered (e.g., following and previous context, stress). When the program finds a token in the text file, it can automatically play the corresponding audio. The value for the dependent variable (realization of the sound) was manually selected. For instance, for each <f> found in the text, [f], [x] or Ø were selected according to how it was realized by the speaker (see Figure 1). The tokens from the interviews were analyzed auditorily by the author. Since they are both nonstandard variants, [x] and [h] were grouped under [x]. Ambiguous tokens from the interviews were analyzed with two other native speakers of Argentine Spanish and if consensus was not reached, such tokens would be classified as ‘other’ and not considered in subsequent analysis (N=47). While it would have been ideal to include additional inter-judge evaluations to support further the author’s own auditory impressions, time and budget constraints dictated that this be done only for ambiguous tokens.



**Figure 1.** Analysis of tokens from the sociolinguistic interviews using Nat.



The phoneme /f/ and its variants are listed below together with a sample token extracted from the interviews:

(1) Voiceless labial fricative [f] (standard variant)

121 0:54:58 *Y él [f]alleció cuando mis tíos eran chicos todavía.*

121 0:54:58 And he passed away when my uncles were still young.

(2) Voiceless velar fricative [x]

116 0:33:06 *Yo le dije a la señora del ingeniero para ir a[x]uera*

116 0:33:06 I told the engineer's wife that we go outside

(3) Deletion

128 0:02:14 *No, proØesor de boxeo era.*

128 0:02:14 No, he was a boxing coach.

Since /x/ was almost categorically realized as [x], it was excluded from the analysis.

(4) 114 0:46:50 *[...] el pueblo es muy reli[x]ioso, viste. Yo creo que la iglesia, como debe pasar en muchos lugares, viste, influye mucho con sus fiestas, fiestas patronales. Eso para la [x]ente es lo máximo. Tenés que comprarte ropa para (asistir a) las fiestas patronales, así es mi vie[x]a.*

114 0:46:50 [...] this town is very religious, you know. As it happens in many places, I believe that the church influences people a lot with its festivities, religious festivities. For people that is the most important thing. You have to buy yourself new clothes to go to the religious festivities. My mom does that.

All relevant tokens were extracted and saved in an Excel document. The tokens and their contexts were then assigned codes to be later analyzed in Goldvarb X (Sankoff, Tagliamonte & Smith 2005), a logistic regression analysis application for Windows that estimates the percentages and probabilities of occurrence of a particular variant form for each contextual factor specified.

The social factors hypothesized to influence the occurrence of each variant are Age, Literacy and Sex (i.e., Gender). Regarding the influence of age on the realization of the labio/velar alternation, its higher occurrence in the younger age group as compared to the adult and the older groups would suggest a change in progress. The study of

different age groups to determine whether a particular linguistic phenomenon is a case of language change is related to the ‘apparent-time hypothesis’. This hypothesis states that speech differences between people of different ages is an indication of how language changed from the time when their linguistic abilities were being formed.

With regard to literacy, research shows that during literacy acquisition, the correspondence between phoneme and grapheme become tightly interconnected such that they could be considered as two faces of the same coin (Frost & Ziegler 2007). Phonological awareness, that is the capacity to consciously manipulate phonemes, is also dependent on literacy (Carroll, Snowling, Hulme & Stevenson 2003 and Port 2007, 2008). If the onset of literacy shapes the perceptual system with hearers establishing a correspondence between grapheme and sound, then it is expected that literate speakers will have less variation (i.e., a lower frequency of labio/velar alternation) in their speech. Since there is a certain social awareness attached to labio/velar alternation, it would be possible that children at school are corrected when they say *me [x]ui* ‘I went’ instead of *me [f]ui*. This increases the likelihood that speakers with more years of education will have less labio/velar alternation in their speech.

Concerning the linguistic differentiation of men and women, Labov (1990) proposed two principles that summarize the results of many decades of sociolinguistic research. Principle I states that for stable sociolinguistic variables, men show a higher frequency of nonstandard forms than women. Principle II, argues that in the majority of linguistic changes, women use a higher frequency of the incoming forms than men. Principles I and II show two distinct kinds of differences between men and women. In the stable situations women appear to be more conservative and favor variants with overt social prestige, whereas men do the reverse. But in unstable linguistic situations, it is men who show a more conservative character and women who use more nonstandard forms.

Following Principles I and II, if labio/velar alternation is a case of stable sociolinguistic variation, then overall percentages should show that women use the non-standard form less frequently than men. However, if there is a change in progress, then women should favor the use of the non-standard form more than men. The fact that the labio/velar alternation has lingered in speech for so long, seems to suggest that it is a case of stable variation, at least in rural areas. In larger urban centers where people have more and better possibilities of education and upward social mobility, the situation may be quite different.

With regards to the internal (linguistic) factors, preliminary studies of the labio/velar alternation in fricatives (Mazzaro 2005) show that it is constrained by following back round vowels [o] and [u] and the glide [w]. As stated

earlier, I propose that [f] and [x] in the context of [w] and [u] are acoustically similar and likely to be confused. Perceptual similarity in these contexts is expected to lead to more variation in production.

The influence of stress has been observed on a variety of phonological processes such as /s/ deletion in Spanish (Cedergren 1973, Ma and Herasimchuk 1968 and Poplack 1980, among others) and lenition of voiced stops (Cole, Hualde, & Iskarous 1999, Ortega-Llebaría 2004 and Colantoni & Marinescu 2010). There are no previous studies on how stress influences the labio/velar alternation in Spanish. In general, stressed syllables are more prominent than unstressed ones due to the combination of pitch, vowel duration and greater intensity in the former (Hayward 2000). Since increased prominence yields perceptual saliency, less variation is expected to occur in stressed syllables, while increased variation will occur in unstressed ones.

The articulation of segments is also influenced by their position in relation to a constituent boundary (Fougeron 1999). At different prosodic levels (syllable, word or higher levels), it has been noted that the articulation of segments is different in initial, medial or final position within a constituent. Thus, the position of /f/ in the word was considered; that is, word initial versus word medial.

The following list summarizes the external and internal factors considered in the analysis:

#### **External (social) factors**

##### Age

- Young (18-33)
- Adults (34-65)
- Older (66- )

##### Literacy

- Literates (primary complete and beyond)
- Illiterates or Semiliterates (no schooling or primary incomplete)

##### Sex

- Female
- Male

#### **Internal (linguistic) factors**

##### Following context

- Vowels [a], [e], [i], [o], [u]
- Diphthongs [we], [wi]

##### Stress

- Stressed
- Unstressed

##### Position

- Initial
- Medial

## 5. Results

The overall distribution of /f/ variants in Caá Catí Spanish is presented in Table 2.

[f]		[x]		Ø	
%	N	%	N	%	N
85.5	1732	10.8	218	3.8	76
Total N		2026			

**Table 2. Overall distribution of /f/ variants in Caá Catí Spanish.**

Table 2 shows that [f] has the highest percentage of use (85.5%), followed by [x] (10.8%) and Ø (3.8%). The distribution of [f], [x] and Ø across the linguistic and social factor groups considered in the analysis is shown in Table 3.

Factor groups	[f]		[x]		Ø	
	%	N	%	N	%	N
<b>Preceding Context</b>						
Liquids (/l/ and /r/)	88.6	132	8.7	13	2.7	4
[h] <sup>10</sup>	90.7	147	8	13	1.2	2
Nasals (/n/ and /m/)	93.5	202	1.4	3	5.1	11
Pause	92.2	71	6.5	5	1.3	1
[j]	92.6	50	3.7	2	3.7	2
[a]	88	317	7	25	0.5	18
[e]	75.2	431	21.3	122	3.5	20
[o]	84.6	219	10.4	27	5	13
[i]	92.2	153	4.8	8	3	5
[u]	100	10	0	0	0	0
<b>Following context</b>						
[a]	96.7	351	0.6	2	2.8	10
[e]	94.1	368	0.3	1	5.6	22
[i]	94.8	346	1.4	5	3.8	14
[o]	93.3	167	0	0	6.7	12

[u]	71.3	102	26.6	38	2.1	3
[w]	68	398	29.4	172	2.6	15
Stress						
Stressed	81.5	936	15.8	181	2.7	31
Unstressed	90.7	796	4.2	37	5.1	45
Position in the word						
Initial	82.8	1193	14	201	3.2	46
Medial	92	539	2.9	17	5.1	30
Total N	2026					

**Table 3. Distribution of /f/ variants by internal linguistic factors: Preceding and Following Contexts, Stress and Position in the Word.**

Table 3 shows that the occurrence of [x] is localized to following [w] (29.4%, N=172) and [u] (26.6%, N=38). A following [e] yielded 5.6% (N=22) of Ø, which mostly come from the words *profesor* ‘professor’, *profesora* ‘professor (female form)’ and *profesores* ‘professors’.

Preceding Context presents one interesting case, which is the high percentage of [x] (21.3%) found before [e]. An examination of the tokens shows that 102 out of the 122 tokens involve the preterit of the verb ‘to be’: *me fui* ‘I went’ (N=48), *se fue* ‘s/he went’ (N=48) and *se fueron* ‘they went’ (N=6). Similarly, there is a high rate of [x] preceded by [l] (N=13, 8.7%) which come from the word *fuego* ‘fire’ and *fulano* ‘so and so’ preceded by the determiner (*el fuego* and *el fulano*).

This poses an uncertainty on whether the alternation is due to the preceding context or the following context. A study by Foulkes (1997) argued that a following round vocoid will lower the center of gravity of the spectrum of [f], making it more similar to [x]. However, there are no studies (as far as I am aware of) about the effect of a preceding [e] or [l] on the following fricative. Although this would merit further investigation, from an acoustical and articulatory point of view, it seems more plausible to affirm that it is the following context that affects the fricative.

A preceding [o] is the one other context that presents a high percentage of [x] (N=27, 10.4%). A closer examination of the tokens does not show any specific sequence of words that may be favoring labio/velar alternation in this context, as it was the case with [e]. Thus, the effect of preceding [o] on labio/velar alternation needs further investigation.

Regarding the influence of Stress, more cases of [x] were found in Stressed and Initial Position in the word. The tendency of [x] to occur in initial and stressed position is shown on Table 4, where the two factors are cross-tabulated.

		stressed		unstressed		Total
		N	%	N	%	N
Initial	[f]	730	79	463	90	1193
	[x]	167	18	34	7	201
	∅	26	3	20	4	46
Medial	[f]	206	92	333	92	539
	[x]	14	6	3	1	17
	∅	5	2	25	7	30
Total N		2026				

**Table 4. Influence of Stress and Position on the occurrence of [x].**

The cross-tabulation indicates that 18% of [x] occurs in stressed initial position, while all the other environments show an almost categorical occurrence of [f]. The higher frequency of labio/velar alternation in stressed position seems to contradict what was previously hypothesized - that less variation is expected to occur in stressed syllables. However, a closer examination of the tokens (see Table 5) revealed that all of them where following context was [w] corresponded to stressed syllables. In other words, there were no unstressed tokens with following [w], which is the context where most of the alternation was detected. Because including these tokens to assess the effect of stress would result in very unbalanced data, it makes more sense to analyze the effect of stress in other contexts. When analyzing the tokens with [u] as following context, the second largest group where alternation occurs, there are 88 cases of occurrences in unstressed syllables and 55 in stressed syllables, resulting in more balanced data to compare. The results showed that labio/velar alternation occurred in 35% of these tokens in unstressed position vs. 13% in stressed position. This would indicate that the alternation is mainly influenced by following context, but when the following context admits being both in stressed and unstressed syllables, it occurs more frequently in unstressed syllables. This confirms my initial hypothesis.

		[a]		[e]		[i]		[o]		[u]		[w]		Total
		N	%	N	%	N	%	N	%	N	%	N	%	N
<b>Stressed</b>	[f]	253	96	253	93	169	93	67	93	54	61	0	--	796
	[x]	1	0	1	0	4	2	0	0	31	35	0	--	37
	∅	10	4	18	7	9	5	5	7	3	3	0	--	45
<b>Unstressed</b>	[f]	98	99	115	97	177	97	100	93	48	89	398	68	936
	[x]	1	1	0	0	1	1	0	0	7	13	172	29	181
	∅	0	0	4	3	5	3	7	7	0	0	15	3	31
Total N														2026

**Table 5. Cross tabulation of Stress vs. Following Context.**

Concerning the influence of social factors on labio/velar alternation, as hypothesized, there is a higher percentage in non-literate speakers (28%) than in literate speakers (3%). Conversely, the rate of the standard variant in literate speakers is higher (94.1%) than in non-literate ones (66.2%). Although the percentage of [f] in non-literate speakers is still relatively high, these occurrences appear mostly when the following context is [a], [e], [i] and [o], as shown in Table 6.

		[a]		[e]		[i]		[o]		[u]		[w]		Total
		N	%	N	%	N	%	N	%	N	%	N	%	N
<b>6G +</b>	[f]	253	97	242	96	282	96	121	97	90	89	328	90	1316
	[x]	0	0	1	0	0	0	0	0	9	9	32	9	42
	∅	8	3	10	4	12	4	4	3	2	2	4	1	40
<b>6G -</b>	[f]	98	96	126	91	64	90	46	85	12	26	70	32	416
	[x]	2	2	0	0	5	7	0	0	29	69	140	63	176
	∅	2	2	12	9	2	3	8	15	1	2	11	5	36
Total N														2026

**Table 6. Cross tabulation of Education vs. Following Context.**

These trends seem to confirm the negative effect of literacy in the diffusion of this variation, as well as the hypothesis of non-literate speakers having two different context dependent allophones for the same phoneme.

Table 7 presents the results of the influence of Literacy, Sex and Age on the realization of /f/ variants.

Factor groups	[f]		[x]		Ø	
	%	N	%	N	%	N
<b>Education</b>						
6G+	94.1	1316	3	42	2.9	40
6G-	66.2	416	28	176	5.7	36
<b>Sex</b>						
Female	84.2	861	11.9	122	3.8	39
Male	86.8	871	9.6	96	3.7	37
<b>Age</b>						
Young	90.5	478	6.4	34	3	16
Adult	92.1	860	5.1	48	2.8	26
Old	69.9	394	24.1	136	6	34
Total N	2026					

**Table 7. Distribution of /f/ variants by external linguistic factors: Literacy, Sex and Age.**

More cases of [x] are found in female (11.9%, N=122) than male (9.6%, N=96) speakers, which seems to go against Principle I, (Labov, 1990), which states that males use more nonstandard forms than females of the same social class<sup>11</sup>. However, when Education is cross-tabulated with Sex (see Table 8), it is male speakers with low levels of formal education who present a higher use of the non-standard variant (56%, N= 82) vs. female speakers with 6G- (20%, N=94).

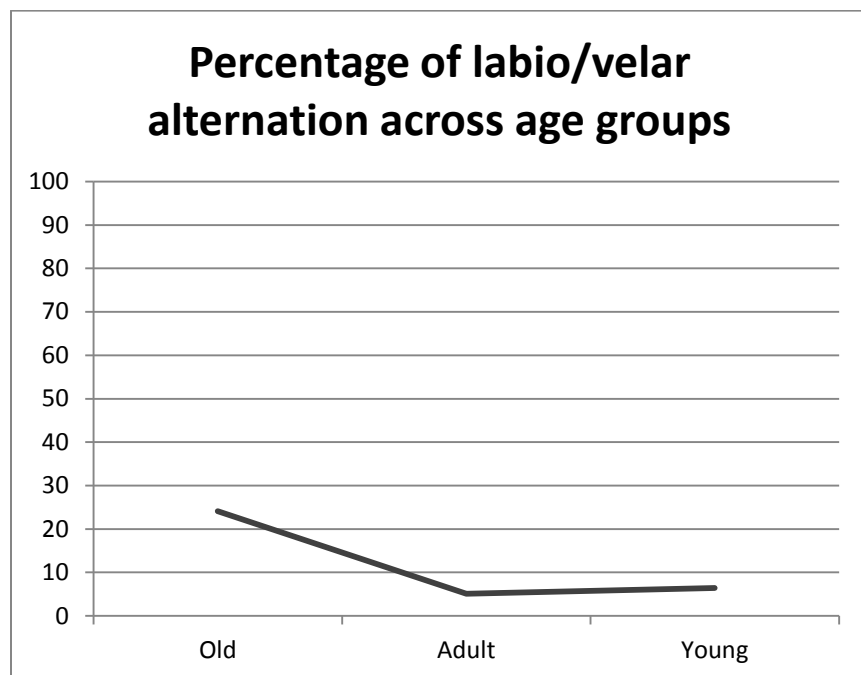
		Female		Male		Total N
		N	%	N	%	
6G+	[f]	505	94	811	95	1316
	[x]	28	5	14	2	42
	Ø	7	1	33	4	140
6G-	[f]	356	74	60	41	416



[x]	94	20	82	56	176
∅	32	7	4	3	36
Total N	2026				

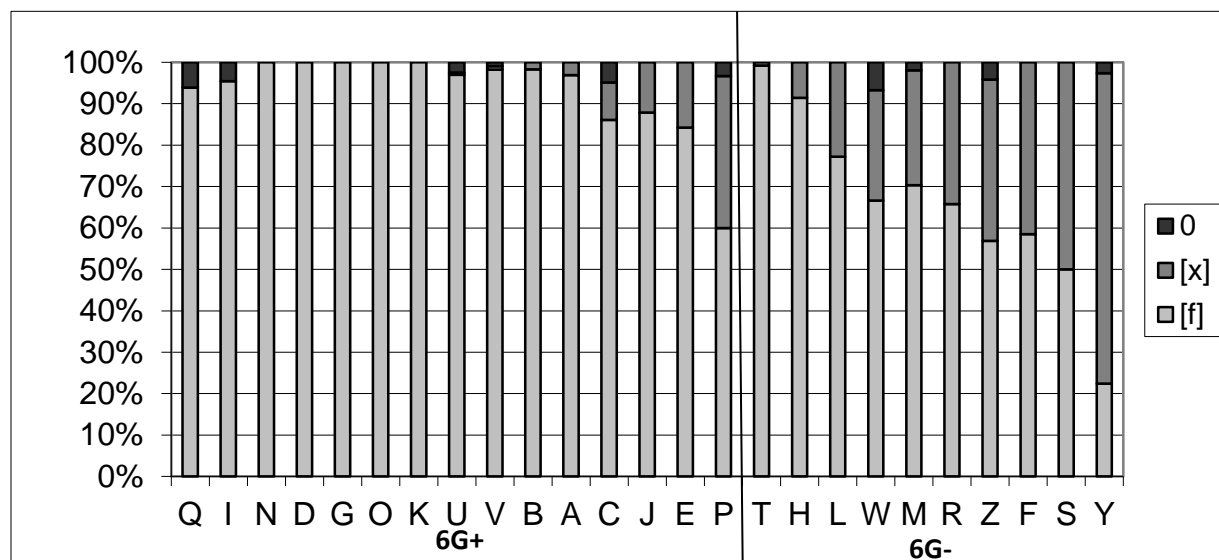
**Table 8. Cross-tabulation of /f/ variants by Education and Sex.**

Concerning the influence of Age on the occurrence of /f/ variants, Older speakers have the highest percentage of [x] (24.1%, N=136), followed by Younger speakers (6.4%, N=34) and Adults (5.1%, N=48). It is interesting to note the marked difference between the performance of Older speakers vs. Younger and Adults, which seems to suggest a receding use of the [x] variant down the age scale.



**Figure 2. Percentage of nonstandard [x] in Young, Adult and Older speakers.**

Individually, most speakers conform to the expected pattern considering their education levels. This can be seen in Figure 3, by comparing the proportions of [x] across speakers with 6G+ (left, from Q to P<sup>12</sup>), as opposed to speakers with 6G- (right, from T to Y).<sup>13</sup>



**Figure 3. Distribution of [f], [x] and Ø across individual speakers.**

However, Figure 3 shows that two speakers (P and T) do not completely behave as the rest of the speakers in their respective groups. Speaker T, Juana<sup>14</sup>, has an abnormally low percentage of [x] considering her low level of formal education. During the interview, she expressed that she liked to read, that she read a lot and that she learned a lot by reading. She also mentioned that she was often chosen in her church to read passages of the Bible and would sometimes write poems. Therefore, while she only attended school until 4<sup>th</sup> grade, her level of literacy was very high.

Speaker P, Sofía, has a very high percentage of [x] despite the fact that she was attending her last year of secondary school. Contrary to Juana, Sofía stated that she did not like to read, and that her grades in Language were low. Also, her family was mostly illiterate. It is likely that her input of non-standard forms was high during her formative years and, although she had access to education later on, her speech reflects that of her close environment. In addition, her overall behavior during the interview was closer to that of the non-literate speakers, limiting her speech mostly to answering questions, as if being insecure about her speaking abilities<sup>15</sup>. Being outliers, these two speakers were removed from subsequent analyses.

This paragraph summarizes the factors that were considered and excluded from the multivariate analysis of labio/velar alternation. There is an almost categorical occurrence of [x] in initial and stressed syllables. Given that Goldvarb is used to handle variable data, these almost categorical contexts were removed from the multivariate analysis. Another important, yet not surprising observation is that [x] is localized to following [w] and [u]. Since the other following contexts (a, e, i, o) did not show much variation across contexts, they were collapsed in subsequent analyses. This means that the analysis presented below involves the glide [w] and the vowel [u] vs. the rest of the vowels. Concerning Preceding Context, the patterns previously observed seem to suggest that high rates of [x] after [e] and [l] were only due their combination with the preterit of the verb 'to be' and the word *fuego*, which are known to strongly favor the labio/velar alternation. Given this strong interaction between preceding and following contexts, preceding context was removed from the run. Finally, Ø was also excluded from the analysis, since it only contained 18 tokens.

After all these exclusions, 923 tokens were entered into the logistic regression analysis. Table 9 presents the results of the multivariate analysis of non-standard [x]. Factors are ordered by probability value, starting with the highest.

		[x]		
Input		0.038		
Log Likelihood		-229.039		
Total N		923		
FG1: Following context	Prob.	%	N	
Glide [w]	.84	28.9	158	
Vowel [u]	.71	14	7	
Vowels [a, e, i, o]	.05	0.6	2	
Range 81				
FG2: Education	Prob.	%	N	
6G-	.88	44.2	317	
6G+	.26	4.5	606	
Range 62				
FG3: Age	Prob.	%	N	
Older	.69	40.4	113	
Adult	.34	7.4	32	
Younger	.56	10.4	22	
Range 35				
FG4: Sex	Prob.	%	N	
Male	.62	20.1	477	
Female	.39	15.9	446	
Range 23				

**Table 9. Variable rule analysis of factors contributing to the probability of [x].**

Following Segment is the strongest constraint on the probability of occurrence of labio/velar alternation (range 81), with the glide [w] and the vowel [u] favoring the realization of [x] (.98 and .71, respectively) and the rest of the vowels disfavoring it (.05). All the social factor groups were selected as significant by the multivariate analysis,

Literacy being the strongest constraint on labio/velar alternation. Subjects with 6G- [x] (.88), while those with 6G+ disfavor it (.26). The next social factor that strongly affects the labio/velar alternation is Age; the Older generation favors [x] (.69) followed by the Younger generation (.56) and Adults, who disfavor its use (.34). The probabilities and the percentages of use of the nonstandard variant by age group show that the clearest division is between Older speakers vs. Adults and Younger speaker.

The decrease of [x] in Adults and Younger speakers suggests that the use of labio/velar alternation is gradually receding with time, which may be due to the improved possibilities of education in later generations. This gives more strength to the importance of literacy in preventing the spreading of [x]. The third factor selected as significant by the multivariate analysis is Sex, with Male speakers favoring the use of [x] (.62) and females disfavoring it (.39). This finding is not surprising, since women tend to use standard linguistic forms more often than men in most cases of stable variation and change in progress studied by quantitative means in the past several decades (Labov 2001). In the case of rural vs. urban communities, previous studies have found that “the abandonment of traditional rural dialects is normally led by women” (Labov 2001, p.274).

To sum up, the results presented reveal that Following Context significantly influences the occurrence of [x]. Specifically, [x] mainly occurs when followed by [w] and [u]. The social factors that strongly influence the realization of the nonstandard variant are Literacy, Age and Sex. Subjects with higher formal education (6G+) disfavor the use of [x] while those with lower formal education (6G-) favor its use. The analysis of Age shows that Older speakers use [x] more frequently than Younger speakers and Adults. Finally, Male speakers have higher probabilities of use of the nonstandard variant than women.

The next section will discuss the implications of these results for historical linguistics and the future of this variation in present day Spanish.

## **6. Discussion and Conclusion**

The labio/velar alternation is a characteristic feature of rural speech encountered in many disparate Spanish dialects. One obvious question is how this linguistic feature comes to be so widespread. How is it that labio/velar alternation can be found in two distant places such as rural New Mexico and Argentina? The only clear answer is that it appears naturally as a result of the way we process speech. As demonstrated by perceptual experiments

(Mazzaro, 2011) involving the fricatives [x] and [f] in nonsense words, these sounds become perceptually similar in certain phonetic environments, specifically following [w] and [u], which are the exact same environments where the variation occurs. Unless the labio/velar alternation is ‘suppressed’ at some point in the way to acquiring standard adult pronunciation, it will propagate freely to all layers of society. As demonstrated by this study, one of the suppressing forces of labio/velar alternation is formal education.

The literature reviewed (Abadía de Quant 2000 and Kovacci 1987) suggested that labio/velar alternation happens mainly in the context of the glide [w] in Corrientes Spanish. However, the present study reveals that it frequently occurs in the context of [u] as well. Donegan (1993) stated that when variables are context sensitive, they do not change the phonological system, because the speaker can attribute the variants to their occurrence in particular contexts. In the present case, the speakers who have nonstandard [x] in their speech produce [f] in all other vocalic contexts (a, e, i, o). It is possible that these speakers associate [x] to some lexical forms that contain the relevant sound sequences, yet this variation does not necessarily change the phoneme inventory of such speakers—only their lexical representations.

Looking at [f] ~ [x] alternation from a traditional phonological point of view helps to explain why the alternation is so strongly conditioned by the following context [u] and [w]. If we decompose the sounds /f/ and /x/ into their featural elements ( $\pm$  labial,  $\pm$  continuant,  $\pm$  dorsal) the only constant is continuant. However, when these consonants are followed by either /u/ or /w/ they have the same features: /fu/ and /fw/ are [labial, dorsal] and /xu/ and /xw/ are [+labial, +dorsal]. Having the same phonological features, it is not surprising that these sequences participate in a contextually driven alternation. One question that remains to be asked is: if the feature [+labial] is relevant to trigger the labio/velar alternation, then why does the alternation not happen with /o/? That is, why is it that we do not frequently find /fo/ > /xo/? I believe that the answer to this question has to do with the degree of rounding of the vocalic segment. While both /u/ and /o/ are [+round], the lip rounding required for /u/ is more pronounced or closed than the one for /o/. This closed lip rounding maybe necessary for the alternation to take place. In Mazzaro (2011) I proposed that it is easier to account for the labio/velar alternation from an acoustic (phonetic) point of view. Specifically, I argued that the lip rounding of a following [u] and [w] lower the centre of gravity<sup>16</sup> of [x] making it acoustically similar to [f]. This acoustic similarity leads to more confusion in perception and more variation in production. Because the rounding of [o] is more open, it does not lower the centre of gravity of [x] enough to make it acoustically similar to [f]. Thus, the alternation is not triggered in this context.

It is interesting to note that the labial/velar dynamic also affects Spanish stops, where we find alternations such as *abuela* > *agüela/awela* ‘grandmother’ and *aguja* > *abuja* ‘needle’. Similarly to the labio/velar alternation affecting fricatives, the alternation affecting stops is very common in most Spanish dialects (Quilis 1993) and it appears in children speech (Diez-Itza, Martínez, Cantora, Justicia & Bosch 2001). However, as opposed to the [f] > [x] alternation, the alternation affecting stops does not carry the same ‘rural speech’ stigma that the alternation affecting fricatives does. To confirm this, a sociolinguistic study was conducted in the same speech community (Mazzaro 2010). The results of this study showed that the phenomenon was not restricted to non-literate speakers such as the labio/velar alternation affecting fricatives, but that it was found in both literate and illiterate groups of all ages. These results, explained in more detail in Mazzaro (2011), suggested that the alternation affecting stops was a case of a stable sociolinguistic variation.

One of the most important aspects of variationist sociolinguistics is that it allows the researcher to understand diachronic change by studying synchronic variation. With regards to the historical evolution of /f/ in the development of Castilian from Latin, where we only know the end result and can only hypothesize about the stages that lead to that change, Penny (1991) offered two possible explanations to account for the disappearance of /f/ in Old Spanish, one being the substratum influence (exercised by Basque) and the other one an intra-language hypothesis which stated that /f/ became /h/ through a process of dissimilation. Although the substratum hypothesis may have played a role in the /f/ > /h/ change, the present synchronic analysis suggests that some other external force such as lack of literacy could have played a role in its diffusion. The sound change in Old Spanish is similar to the present day variation in that it involves the fricative /f/ and in that it is context sensitive, yet there are important differences between both. First, the synchronic variation under study mainly involves the fricatives [f] and [x], while the diachronic change involved [f] and [h]. Second, the contexts that influence the labio/velar alternation in present day Spanish are the glide [w] and the round high vowel [u]. The /f/ > /h/ > Ø change in Old Spanish occurred before syllabic vowels including /a/, which is quite rare in the dialect of Spanish under study. A following [w], which is the one that favors labio/velar alternation the most, did not participate in the diachronic change. That is, words such as *fuerte* ‘strong’ were realized with initial [f] not [h] or Ø. These important differences suggest that the intra-linguistic motivations that gave rise to the diachronic change in Old Spanish and the ones that give rise to the synchronic variation may not be the same. As suggested by Penny (1991), the process that affected Old Spanish /f/ was one of dissimilation, whereby /f/ lost its labial feature when followed by labial vowels such as [o] and [u]. This process was

later extended to other syllabic vowels. In the case of present day Spanish where the alternation involves [f] and [x] in the context of [w] and [u], the variation is motivated by the perceptual and acoustic similarity between [f] and [x] (Mazzaro 2011). Those speakers who have no access to the written word to disambiguate the signal are more susceptible to the variation.

One question that remains to be answered is whether the labio/velar alternation is a case of a well-established sociolinguistic variable or whether it is a change in progress in Corrientes Spanish. The present analysis seems to suggest that this stigmatized feature is receding with time. As stated earlier, this could be due to the combination of two factors: there is an overall higher level of formal education in the younger population, and there is a high degree of stigma attached to [x].

The present study demonstrates how social dynamics can determine the course of a given natural linguistic tendency such as the labio/velar alternation of fricatives and stops. Although both alternations are equally phonologically (or phonetically) motivated, the social dynamics affecting them are different and, so are their outcomes. While fricative alternation is stigmatized and strongly associated to rural speech, stop alternation is not associated to rural speech and it does not have such high social stigma. The latter shows signs of being a stable sociolinguistic variable (Mazzaro 2010), while the former is receding in time, as shown by the present sociolinguistic study.

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### **Notes**

1 For simplicity, I will refer to [w] when I talk about the diphthongs [we, wi].



- 2 IPA symbols are used throughout when giving phonological and phonetic examples. Orthographic equivalents are given in angled brackets <>, Spanish words in italics, and glosses in inverted commas. References are made to ‘labial’ fricatives, as a cover term for labiodentals.
- 3 Spanish names and terms are given in italics; while their translations are placed immediately after between single quotes. All translations are the authors’.
- 4 At this point, I am not concerned with whether the phoneme category to which [f] and [x] are assigned is /f/ or /x/. The important point is that both [f] and [x] may be allophonic variants of the same phonemic category in non-literate speakers.
- 5 As Ohala stated (1989), it is possible that perceptually driven variation could be blocked by various sources. For instance, speakers could have heard the word containing the ambiguous sound clearly pronounced before, or they could have been corrected at some point in the past. However, this study is only testing the influence of literacy on the variation.
- 6 Guaraní is an aboriginal language spoken in Paraguay, the northeast of Argentina and the south of Brazil. In Paraguay and in the province of Corrientes, Guaraní has the status of an official language. In Corrientes, Guaraní is mainly used by people living in rural areas.
- 7 In Argentina, primary school (ages 6-12) and secondary school (ages 12-17) are obligatory and state supported. Initial education, for children who are 45 days old and up until 5 years, is optional. Post-secondary education (college or university) are also optional.
- 8 This fieldwork followed standard procedures for research protocols.
- 9 Capital letters are used for sociolinguistic factors.
- 10 Note that in Corrientes Spanish syllable final /s/ is realized mainly as [h] (Mazzaro 2003).
- 11 There is no analysis of social class in this study, thus it may be difficult to apply this principle directly to this population.
- 12 Single letters have been used for speakers because Goldvarb only accepts one character to identify each factor.
- 13 The letters used to identify subjects were assigned randomly.
- 14 All speaker names are pseudonyms.
- 15 I am aware that this assertion is speculative and that more research should have been conducted to determine her literacy level.
- 16 Center of gravity is the frequency that divides the spectrum into two portions of the same energy (Jongman, Wayland & Wong, 2000).

## Appendix

### Map of Argentina



Adapted from Rojas, Andres. *Provincia de Corrientes (Argentina)*, February 21, 2010 via Wikipedia, Creative Commons Attribution-Share Alike. <[http://es.wikipedia.org/wiki/Archivo:Provincia\\_de\\_Corrientes\\_\(Argentina\).svg](http://es.wikipedia.org/wiki/Archivo:Provincia_de_Corrientes_(Argentina).svg)>

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