

# Measuring Rates and Constraints of Word-Final Nasal Velarization in Dialect Contact

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## 1. Introduction

The variable realization of word-final nasal as a velar is a well-known cross-dialectal, allophonic distinction in Spanish. The feature enjoys a remarkable diffusion and is present in many areas of the Spanish-speaking world, even though it is perhaps more intimately associated with the varieties of the Caribbean where the phenomenon has been well-documented and analyzed (Wireback 1999; Darias Concepción, Ruisánchez, and Dohotaru 1997; López Morales 1981). In neighboring Central American varieties, nasals are just as prone to alternate phonetically in word-final position, displaying the same tendency to velarize as their coastal neighbors (Lipski 1994, 1987; Canfield 1981, 1960). Lipski (1987:62) points out that the allophonic differences present in word-final nasal offer a useful phonological variable in measuring dialectological diversity, both regional and social. Even though an analysis of word final velarization in different varieties is an unquestionable necessity in clarifying the phonological and social behavior of the phenomenon, I am not concerned here with a cross dialectal comparison. More accurately, I am interested in the impact that dialect contact wields on the rates of velarization across communities that share a historical connection, as presented by the case of the Central American migration to more economically and socially sound environments during times of internal warfare and economic despair.

The long years of domestic conflict in the midst of the Cold War Era brought about a countrywide exodus that saw close to one in four Salvadorans seeking refuge in neighboring countries and as far away as Canada, Europe and Australia, but primarily in the United States. The generalized claims for social justice in turn triggered long years of sustained social upheaval, met with a tenacious and unyielding resistance that only served to fuel the Salvadoran Diaspora. From the initial escalations of tension and in its aftermaths, rural communities often paid a much heavier toll in human casualties and material losses than more urbanized centers, and in turn expelled greater numbers of displaced Salvadoran peasants into exile. The Salvadoran flight resulted in somewhat stable settlements abroad where expatriates and their progeny stanchly sought to recreate and maintain some type of ties with local communities of origin. At the same time, an eventual consequence of transnational population movement is the contact between languages, and in the case of Spanish, between dialects. This deployment and relocation of Salvadorans to major American metropolitan areas has made it possible to study processes of cultural and linguistic change, as those tackled here, that can be attributed to dialect contact.

Poplack and Tagliamonte (2001) showed that linguistic structures in the speech of historically related communities dispersed through time and space, as in the case of the African American Diaspora to new-found latitudes in Africa and the Americas, can be analyzed to determine whether they share identical grammars or not. Word-final nasal variation among Salvadoran communities in place and in the Diaspora affords the opportunity to carry on a similar comparison. The present study provides a statistical analysis of the linguistic and social factors that seem to constrain the choice of a velarized or non-velarized word-final nasal in a situation of dialect contact. In particular, I consider the effect that community adherence and the ethnic background of the interviewer may have on the variation. I additionally undertake the in-depth study of the linguistics patterns outlined by the multivariable analyses in the following sections by looking at the relative frequencies of the co-variations present in the data.

## 2. Methodology

To explore quantitatively the variable patterning of word final nasal, I employ a multivariate analysis approach that examines the rates and conditioning of word-final nasal velarization among two Salvadoran communities in Houston, as they interact with a Mexican and a Salvadoran interviewer, and compare their rates of velarization to speaker data from San Sebastián, El Salvador, used as the baseline. In hopes of exploring statistically the degree to which processes of accommodation and leveling are incorporated into the linguistic repertoires of the transnational communities, patterns of word-final nasal production are weighed against internal and external factors that seem to have an effect on individual production and ultimately on that of the group.

The linguistic and social factors that drive the choice between a velarized and a non-velarized variant are explored through a series of GoldVarb multivariate, binomial up and down statistical analyses (Rand & Sankoff 2001) that establish the significance that each independent variable group exerts on the linguistic variation under consideration, as well as the relative weight for each factor within each factor group selected as significant. Three linguistic variables are explored: syllable stress, preceding segment, and following segment; along with three social variables: ethnicity of interviewer, age of arrival, and place of residence in Houston or El Salvador.

## 3. Corpora

I delve into the variable realization of word-final nasals in three Salvadoran corpora, somewhat defined by the physical space and the informants' profile. I refer to the first set as the San Sebastián Corpus (SSC), named after the small, semi-rural Salvadoran community where the data was collected. It consists of close to 36 hours of recorded interviews, eight of which are used as a control group in this analysis. The two sets of Houston data are named after the area of town where the interviews were conducted. One is the Segundo Barrio Corpus (SBC), named after a neighborhood in eastern Houston where Hispanics make up 90% of the population: an overwhelming 80% are Mexican or Mexican American, and close to 8% are of Central American origin, mostly Salvadorans (Hispanic Databook of U.S. Cities and Counties 1994:458). Participants in the SBC come from different areas of El Salvador, a fact that mirrors population trends in the *barrio*: the departments of Sonsonate, San Miguel, La Unión, La Paz, Morazán, and, Chalatenango are represented in the sample. This particular corpus consists of 20 hours of interviews, but only the first eight were considered in the analysis.

The other is the Holly Spring Corpus (HSC), compiled in a community located in the profoundly ethnically-diverse western part of the city. The area flaunts a more assorted composition, but the Salvadoran presence here makes up an important part of the Hispanic population, even though Anglos, African Americans, and Asian Americans (Chinese, Vietnamese, and Indians) are also present in the general population. Hispanics make up only 12% of the overall population in the Holly Spring area, and the Hispanic population itself is conformed as follows: Mexicans comprise 47%, a much smaller proportion than in the Segundo Barrio area; Central Americans 22%, the second largest group; South Americans 16%; Cubans 5%; Puerto Ricans 2%; and other Hispanics the remaining 8% (Hispanic Databook of U.S. Cities and Counties 1994:459). Overall, the Holly Spring area boasts one of the largest concentrations of Salvadorans in the city, but precautions were taken to ensure that all the participants in the HSC are working class Batanecos (from San Sebastián) or have parents that were born in San Sebastián. The participants also live in one of two large apartment complexes located across each other on opposite sides of the same street. The Corpus is composed of close to 18 hours of sociolinguistic interviews. In order to compare variational patterns, ten speakers from Holly Spring were first interviewed by the author of this paper a speaker of Mexican Spanish (From now on the speech of these speakers is distinguished here as HSM); eight of the same informants were later interviewed by a Salvadoran member of the community (Distinguished here as HSS).<sup>1</sup>

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<sup>1</sup> For a more detailed account of the Segundo Barrio or Holly Spring Corpora or area, see (Hernández 2009).

#### 4. Word Final Nasal Variability

After fast-forwarding the first five minutes of each interview in our corpora, every word-final nasal was extracted from ten-minute speech samples. This provided a total of 2,140 instances. From this total, 253 tokens were excluded from the analyses because they occurred in phonologically conditioned assimilatory contexts, as in the following examples where the nasal precedes a velar phoneme that brings about a regressive velarization: *allá e[ŋ] Guatemala...* ‘there in Guatemala’, *si so[ŋ]cuatro días...* ‘but they’re four days’, *los dos bichos anda[ŋ] juntos* ‘the two boys are together’, and *a Puerto Limó[ŋ] jui dos veces* ‘I went twice to Puerto Limon’. I additionally excluded *san* because it consistently occurred in initial position in constructions that name topographical features and places and accompanied the proper names of saints, as in *San Salvador*, *San Alejo*, and *San Vicente*, indicating that these should be thought of as single lexical units. Close to 12% of all tokens were barred from the codification, amounting to a figure of only 253 instances of velar assimilation.

Variable nasal velarization was possible in the following contexts, and all of them were considered in the codification process: preceding a pause: *cuántos días juero[ŋ #]* ‘how many days were there’, *esa noche la dejaro[n #]* ‘that night they left her’; in intervocalic position: *mataro[ŋ] a este señor* ‘they killed this man’, *empezó la persecusió[n] a la gente* ‘the persecution against the people started’; before a non-velar consonant segment: *los pueblos fuero[ŋ] los que sufriero[ŋ] más* ‘the towns were the ones that suffered the most’, *mal hablados, habla[n] feo no habla[n] muy...* ‘foul-mouthed, their speech is ugly they don’t speak very..’, *no nadie[n] de mi familia* ‘nobody in my family’, *había[n] veces que* ‘there were times that’. Of the 1,887 instances considered, the SSC supplied 430 tokens, the SBC 476, and the HSC 411 with a Salvadoran interviewer (HSS) and 570 with a Mexican interviewer (HSM).

#### 5. Findings

Table 1 shows that of the 1,887 tokens considered, word-final nasals were velarized in 13% of its occurrences. Contrary to findings in Puerto Rico by López Morales (1981:109), and showing the wide cross-dialectal variation present in word-final nasal velarization, the full reduction of the nasal was not found in any of the three Salvadoran corpora considered here. It is a possibility also pointed out by D’Introno and Sosa (1988) in the Spanish of Caracas, Venezuela and by Lipski (1987:61) in Honduran Spanish: *y a veces el proceso llega al extremo de elidir la consonante nasal, dejando sólo una vocal nazalisada* ‘an extreme end-result of the process leads to the deletion of the consonant, leaving only a velarized nasal’. Nor did I find word-internal velarization, as that found in Cuban Radio broadcasting by Wireback (1999:297). The combined results from the three Salvadoran corpora used here differ in relative frequency from those shown by Wireback (1999:297), who finds a 24% velarization rate for word-final nasal velarization in Cuban radio broadcasting and Darias Concepción, Ruisánchez, and Dohotaru (1997) who find 24%. However, rates of word-final nasal velarization distribution in the SSC alone (23%) closely match the Cuban results. López Morales (1981:109) finds a 27% of word-final nasal velarization in Puerto Rican data, a slightly higher figure than in the two previous cases, while Lipski (1987:63) reports much higher velarization and deletion rates of word-final nasal among three socioeconomic groups in Tegucigalpa, Honduras. An initial analysis of the three corpora confirms that word-final nasal has a somewhat moderate rate of velarization in the combined Salvadoran data.

*Table 1. Word-final nasal velarization rates in SS, HS, and SB*

Velar		Non-velar	
N	%	N	%
244	13%	1,643	87%

In Table 2, four distinct independent rule analyses show the factors contributing to the probability that the velarized variant will be chosen in word final position.<sup>2</sup> The same effect is compared in San Sebastián, Holly Spring with a Salvadoran and a Mexican interviewer, and in Segundo Barrio. The probabilistic weight of each factor within those groups chosen as significant contributors to the selection of a velarized variant is shown in the first column. The relative frequencies are shown in the second column, while the overall velarized occurrences are shown in the third column. Groups showing a positive correlation with word-final nasal velarization include syllable stress, preceding segment (except in SB, shown as a knock out), following segment, and age of arrival (except in the HSC with a Salvadoran interviewer, and in the SSC where it was not considered).

The ensuing array shows that while probabilistic weights and frequencies vary across communities, they are neatly patterned across the different data groups. The following segment factorial group can best exemplify this systematic trend. All data sets show the same vertical decline: pause reveals the highest probabilistic weight and frequency, followed by a vowel, and a consonant, respectfully. If we compare frequencies across data sets, a somewhat orderly horizontal drift is also evidenced. Here, pause displays a higher relative frequency in San Sebastián, but the rates experience a steady left to right drop. The speech community and the ethnicity of the interviewer are crucial factors in determining the rates and constraints of the variation in this situation of contact. The results do not reveal a uniformed dispersion of dialect features among these ethnically analogous speech communities in situations of contact. Instead, a diffused acquisition and manipulation of the patterns in the contact variety –overtly receptive to community ascription and interlocutor– are suggested by the orderly drift previously mentioned. Despite the distinct social conditions that characterize each one of the Salvadoran populations at hand, it is evident by the results in Table 2 that they essentially share one common linguistic system that prompts word-final nasal variation.

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2

- **San Sebastián Group:**  $p < 0.000$ ; Log likelihood = -170.495; Chi-Square/cell = 1.5866; did not control for *age of arrival* in San Sebastián Group
- **Holly Spring - Salvadoran Interviewer Group:**  $p < 0.000$ ; Log likelihood = -171.623; Chi-square/cell = 1.2161; factor group not selected as significant: *age of arrival*.
- **Holly Spring - Mexican Interviewer Group:**  $p < 0.000$ ; Log likelihood = -107.853; Chi-square/cell = 0.6538; factor group not selected as significant: *syllable stress*.
- **Segundo Barrio – Mexican Interviewer Group:**  $p < 0.008$ ; Log likelihood = -39.826; chi-square/cell = 2.5337; factor group not considered in multivariate analysis: *preceding segment*.

Table 2. Results of the Variable Rule Analysis of the contribution of factors selected as significant to the selection of velar over non-velar nasal.

VELARIZATION OF WORD FINAL NASAL IN FOUR SALVADORAN GROUPS												
San Sebastián (SS)			Holly Spring (HS)				Segundo Barrio (SB)					
	Prob.	%	N	Prob.	%	N	Prob.	%	N	Prob.	%	N
				Salvadoran Interviewer (HPS)	Mexican Interviewer (HSM)	Mexican Interviewer (HSM)						
Syllable stress												
Stressed	0.70	43%	32	0.77	54%	39	0.68	17%	12	0.87	10%	6
Unstressed	0.66	35%	45	0.54	23%	34	0.55	10%	20	0.75	4%	6
Monosyllabic	0.34	9%	20	0.36	9%	18	0.31	4%	11	0.26	0.4%	1
		Range 36			Range 41			Range 37			Range 61	
Preceding segment												
O	0.74	41%	48	0.70	39%	45	0.72	16%	28	-	9%	13
A	0.55	30%	34	0.47	22%	27	0.41	4%	6	-	K.O.	-
Other	0.32	8%	15	0.38	11%	19	0.38	3%	9	-	K.O.	-
		Range 42			Range 32			Range 34				
Following segment												
Pause	0.81	56%	40	0.75	49%	35	0.82	21%	20	0.84	10%	8
Vowel	0.53	22%	29	0.56	26%	29	0.74	10%	18	0.67	2%	4
Consonant	0.37	12%	28	0.39	12%	27	0.24	2%	5	0.25	0.4%	1
		Range 44			Range 36			Range 58			Range 59	
Age of arrival												
15 years <	-	-	-	[ ]	23%	77	0.75	13%	39	0.81	5%	12
14 years >	-	-	-	[ ]	18%	14	0.22	2%	4	0.22	0.4%	1
								Range 53			Range 59	

### 5.1. Syllable stress, grammatical type, and morphological adscription constraint

Syllable stress can be a faithful predictor of phonological variation as shown by Brown (2005a), Medina-Rivera (1999), and Lipski (1995). In the SS, HSS, HSM, and SB, syllable stress turned out to be a significant contributor of word-final nasal velarization. The constraint hierarchy within each data group remained unaltered across the board, with stressed syllables showing the most favorable environment (0.70, 0.77, 0.68, and 0.87), followed by unstressed ones (0.66, 0.54, 0.55, and 0.75), and with monosyllabic words highly disfavoring velarization (0.34, 0.36, 0.31, and 0.26). Constraint hierarchies can be best explained once the underlying patterns of variability are systematically examined. Let us begin by looking at the close association between syllable stress, grammatical type, and word ending in hopes of clarifying the distribution of word-final nasal velarization in this section.

In the data, velarized instances of word-final nasals were largely found in nouns, verbs, and prepositions. Therefore, all other word type categories were grouped together. Nouns in the data included instances such as *a poner orden en los pueblos* 'to bring order to the towns', *esa sección todavía no* 'that section has not yet', *en vuelo de avió[ŋ]* 'by air flight', *la gente creó una imagen de ellos* 'people created an image of them', *en San Sebastián* 'in San Sebastián'. Verbs can be represented by *sólo me recargaban el trabajo* 'they would just overload me with work', *y me han puesto prótesis* 'and they have put a prosthesis on me', *soldados que están en los cuarteles* 'soldiers that are in their barracks', *eh... son americanos* 'uhm... they're Americans', and *aquí naciero[ŋ] tres* 'three were born here'. The prepositions *en* 'in' and *con* 'with' predominated in the data, and can be exemplified by *en mi high school en... los años que...* 'in my high school in... the years that...', *cuando ella vino co[ŋ] él* 'when she came with him'. This information is summarized in Table 3.

Table 3. Word-final velar nasal distribution by syllable stress and word type in SS, HS, and SB.

	N	%		N	%		N	%
Stressed			Unstressed			Monosyllabic		
noun	70	79%	verb	104	99%	Preposition	31	62%
other	19	21%	other	1	1%	Other	19	38%

Once all word-final velar nasals are considered, we can see in Table 3 that there is a strong association between syllable stress and word type: 79% of all velarized instances of word-final nasals in stressed syllable occur in nouns, while 99% in unstressed syllable turn up in verbs. In monosyllabic contexts, 62% of all velarized nasals crop up in two prepositions: *en* 'in' and *con* 'with'. These strong correlations are particularly straight forward: the relative emphasis of a large percentage of nouns in the data (81%) lies on their very last syllable. Word-final nasals in the data occur in nouns with tonic final syllable, such as *y ese mazapá[ŋ]* 'and that mazapan', *el galletín me lo comí yo* 'I ate the cookie', and *veníamos del cantón...* 'we were coming from the village'. Word-final nasals occur in an even higher relative frequency in verbs with greater prominence on the second syllable (96%), as in *que meneyan los molinos* 'that make mills turn', *y empezaro[ŋ] a atacar* 'and they began to attack', and *se me iban los clientes* 'clients would leave'. In addition, the data show that an overwhelming 80% of all velarized instances of word-final nasal occurs in polysyllabic items. Thus, the discussion in the following paragraphs focuses on the way in which velarization in polysyllabic lexical items correlate closely with stress and word ending.

Phonological analysis has to a great extent explored the systemic relations that subsist between the phonological and the morphological categories of grammar that seem to go beyond mere phonological conditioning (e.g. assimilation). In this line of work, early studies dealing with the weakening of phonological segments brought about a debate that either sought a functional effect that apparently triggered greater retention rates of fully fledged variants (e.g. Terrell 1975; Kiparsky 1972) or denied it (Poplack 1980). In contexts where specific morphological meaning was conveyed, higher retention of full variants was argued, such as in nominal plural or third person singular for /s/. Some more recent works on syllable or word-final /s/ weakening (Brown 2005a, 2005b) and intervocalic /d/ weakening (Blas Arroyo 2006) have turned to exploring the effect that frequency exerts on the variation, following more general postulates set forth by Bybee (2003; 2001) and Bybee and Hopper (2001)

Postulating or pursuing a functional hypothesis that bolsters non-velar retention is not a viable option. Primarily, velarization in the Salvadoran data involves nasal alteration due to a change in the place of articulation, accompanied by full loss of a phonological segment, rather than involving weakening. In addition, the velar / non-velar contrast does not always constitute a functional phonomorphological distinction in Spanish that may hinder the variation in detriment of the innovative allophone. Instead, in this section I will argue that nasal velarization seems closely tied to suffixation and repetitive word-final patterns that appear to gain strength through their frequency of use, skewing the choice in the direction of the velar variant in those more widespread paradigmatic configurations that seem to enjoy higher frequencies of use.

Word-final nasals occur in environments with a high degree of reoccurrence in which stress, word category, and ending have fused into binding amalgamates. Some of these associations, exemplified by nouns and verbs, are schematized below.

FULL FLEDGED MORPH		SEGMENT AT END OF MORPH		END OF LEXEME
<b>NOUNS:</b>				
<u>Stressed</u>	(diminutive) <i>galletín</i> 'cookie'  <i>calcetín</i> 'sock'	(common feminine noun ending) <i>corrupción</i> 'corruption' <i>situación</i> 'situation' <i>producción</i> 'production'		(in lexemes) <i>ladrón</i> 'thief'  <i>patrón</i> 'boss'  <i>mazapán</i> <i>Sebastián</i>
<u>Unstressed</u>				(in lexemes) <i>imagen</i> 'image' <i>virgen</i> 'virgin' <i>origen</i> 'origin'
<b>VERBS:</b>				
<u>Stressed</u>	(Present) <i>están</i> 'they are'			
<u>Unstressed</u>	(Present: ind/subj.) <i>hablan</i> 'they talk'  <i>quieren</i> 'they want'  <i>coman</i> 'that they eat'	(Imperfect) <i>trabajaban</i> 'they worked' <i>macetiaban</i> 'they planted' <i>ponían</i> 'they put'  <i>eran</i> 'they were'	(Preterit) <i>aventaron</i> 'they pushed' <i>dispararon</i> 'they shot' <i>vinieron</i> 'they came'  <i>fueron</i> 'they went'	

Figure 1. Syllable stress, grammatical type, and morphological adscription in word-final nasals.

Word-final nasal suffixation in Spanish spans the entire range from an individual and autonomous morpheme (e.g. *comen*) to a discrete and identifiable unit at the end of a morpheme (e.g. *galletín*, *corrupción*, *trabajaban*, *aventaron*) to a phoneme at the end of fairly general patterns found primarily in nouns (e.g. *ladrón*, *mazapán*, *imagen*). In word-final nasal nouns, *-ción*, a common ending that is used to derive a noun from a verb, is a fairly productive derivative category. Lexemes that end in *-ón*, which is also reminiscent of an augmentative, are somewhat common. These lexemes form a common cluster with nouns ending in *-ción*. Diminutives in *-in*, mostly lexified uses in actual speech, are the least productive noun category in the data. In word-final nasal verbs, the past tense categories (Imperfect and Preterit) enjoy high frequencies of use; but the Present follows closely. Perhaps, the fact that verb endings are inflective, rather than derivative, makes their comparative overall frequencies of use less strikingly different than in nouns.

Overall, the dense interconnection revealed by syllable stress and word ending plays an important role in conditioning word-final nasal velarization. As Table 4 clearly shows, velarization frequencies for stressed endings are consistently higher in comparison to their unstressed counterparts: *-ón* reached 42% in contrast to 25% for *-on*; *-án* 35% and *-an* 12%; *-én* 19% and *-en* 14%; while *-ín / ún* and *-in / un* displayed no velarization.

Table 4. Word-final nasal distribution by syllable stress and word ending in SS, HS, and SB.

	N	%	N	%	N	%	N	%
Stressed endings:								
	<i>-ón</i>		<i>-án</i>		<i>-én</i>		<i>-ín/-ún</i>	
Velar	53	<b>42%</b>	20	<b>35%</b>	14	<b>19%</b>	-	-
NonVel	74	58%	37	65%	59	81%	18	100%
Unstressed endings:								
	<i>-on</i>		<i>-an</i>		<i>-en</i>		<i>-in/-un</i>	
Velar	51	<b>25%</b>	41	<b>12%</b>	15	<b>14%</b>	-	-
NonVel	154	75%	291	88%	93	86%	4	100%

Token frequency, or the actual instantiation of a particular item in written or speech corpora (Bybee 2003:604), and type frequency, understood here as total number of items co-occurring within a specific ending (cf. to Bybee 2003:605), can assist in explaining the strong correlation between stress, ending, and choice of word-final nasal. First, with the exception of *-in/un* and *-ín/-ún* endings, which do not participate in the variation, unstressed endings have greater token frequencies than their stressed counterparts: 205 instances of *-on* compared to 127 *-ón*; 332 *-an* to 57 *-án*; 108 *-en* to 73 *-én*. This clearly shows that by looking at token frequency alone, word-final nasal variation cannot be completely understood, since unstressed endings also have lower rates of velarization. Second, in addition to a high token frequency, unstressed endings have higher types of lexical items than their corresponding unstressed ones: 79 lexical items in *-on* compared to 50 in *-ón* ending; 140 in *-an* to 8 in *-án*; 42 in *-en* to 4 in *-én*. This is partly explained by the fact that unstressed endings are part of inflective verb morphemes and can thus co-occur with a greater number of different lexical items, as previously explained. This productivity cannot be matched by the derivational processes in stressed noun endings, even *-ón/-ción* which are themselves quite productive.

Unstressed endings seem to have a strong mental representation, merely because of their high repetition in speech (cf. Bybee 2001). However, the grammatical categories that materialize under each ending varies (as seen partially in Figure 1): words ending in *-ón* are all nouns, while *-on* includes mostly verbs in the Preterit (*-ron*) accompanied by a few nouns (e.g. Houston); words ending in *-án* are nouns and the verb *están* 'they are', while *-an* includes the Present (indicative and subjunctive forms) and the Imperfect (*-ían* and *-aban*); *-én* includes nouns (e.g. Belén) as well as *también* 'also' and *recién* 'recently', while *-en* includes the Present (indicative and subjunctive forms), nouns (e.g. *imagen* 'image' and *virgen* 'virgin'), and pronouns (e.g. *alguien* 'someone' and *nadien* 'no one'). There is clearly more grammatical and lexical uniformity in stressed endings in comparison to unstressed ones, which could have an effect on the variation by actually making the mental representation of stressed endings stronger than that of unstressed. The same uniformity can help explain higher velarization rates vertically and horizontally in Table 4, for instance between *-ón* and *-án* ending, but also between *-ón* and *-on*, and so on.

Individual token frequency also seems to be an important factor of change in word-final nasal velarization. Two important points can be made. First, unstressed endings show high overall token frequencies and display high type frequencies as well. However, they do not reveal a proportionally equal number of high frequency items. Second, velarization rates of stressed high frequency items is overall higher than for unstressed. For instance, there were 4 *-ón* items (*situación* 'situation', *avión* 'airplane', *cantón* 'rural community', and *migración* 'immigration') that occurred 10 or more times in the data. These items accounted for 34% of the total *-ón* ending velarization. In comparison, there were only 3 *-on* items (*dejaron* 'they left', *fueron* 'they went', and Houston) that occurred 10 times or more, and they accounted for only 14% of the total *-on* velarization. There is a more drastic difference



between the next set of endings. Only 2 *-án* items (*están* 'they are' and *Sebastián*) occurred 10 or more times in the data. However, these two items accounted for 75% of the total *-án* velarization rate. In contrast, there were 3 high frequency *-an* items (*eran* 'they were', *estaban* 'they were', and *habían* 'there were') that accounted for 27% of the total velarization rate. Finally, only one *-én* item occurred more than 10 times in the data (*también* 'also'), accounting for 64% of the total *-én* velarization rate. Similarly, there was one *-en* item (*tienen* 'they have') that occurred more than 10 times in the data, but accounted for only 13% of the total *-en* velarization rate. The strength of type frequency, as in the case of unstressed endings, points to the absolute importance of repetition in the expansion of phonological innovation, but type frequency seems to be greatly surpassed by the strength of the high frequency of individual lexical items.

In the variant production of word-final nasal, results showed that syllable stress favored velarization. However, lack of stress also favored the retention of the alveolar or homorganic variant. This in itself is interesting because lack of articulatory tension often operates as a vigorous boost in cases of phonological lenition, suggesting that the interrelation of other constraints, such as frequency and phonological environment, discussed in the following sections, seem to exert their own pressure on the variation.

## 5.2. Preceding segment constraint

The preceding segment constraint often looks at the effect that an adjacent phoneme may have on the production of a target variant. In the case of word-final nasal, I look at the articulatory effect that a previous vowel exerts on the production of a following word-final nasal. Table 5 presents the total distribution of velarized and non-velarized word-final nasals in the three corpora. The highest rate of velarization occurred when the preceding segment was an /o/, oscillating around 25%, and 15% when preceded by /a/. Rates of velarization were much lower in the two other contexts: the average velarization is 6% when preceded by /e/ and a mere 2% when preceded by /i/ and /u/.

Table 5. *Word-final nasal distribution by preceding segment in SS, HS, and SB.*

	Velarized nasals		Non-Velarized nasals	
	N	%	N	%
Preceding segment:				
/o/	134	25%	411	75%
/a/	67	15%	406	85%
/e/	40	6%	640	94%
/i/ ~ /u/	4	2%	186	98%

Clearly, in the Salvadoran data, the preceding segment constraint also contributed a statistical significance to the choice of word-final nasal in SS, HSS, and HSM. In this phonological environment, velarization in the SBC occurred only after /o/, producing a knockout, meaning that it did not show the preceding context variability present in the other corpora. The factor group in question was not considered in that particular multivariate analysis, but the tangible repercussions of this finding are discussed below. In SS, HSS, and HSM, where the factor group was significant, the velarized variant was strongly favored by a prior /o/ at 0.74, 0.70, and 0.72 respectively. It was moderately favored by a prior /a/ at 0.55 in SS, and moderately disfavored at 0.47 in HPS and 0.41 in HSM by the same vowel. Finally, velarization was seriously disfavored by the remaining vowels (/e/, /i/, and /u/) at 0.32, 0.38, and 0.38, in that order. The variation here shows the same variable pattern that I have discussed in previous sections: velarization rates and weights differ across the groups being considered, but they are always higher and stronger for /o/ and decrease in frequency and strength for /a/ and other vowels respectively. The same steady drop is corroborated as we go through the SSC data, the HSC, and finally to the SBC, where speakers only velarized a few word-final nasals that came after /o/.

An important matter related to the velarization of word-final nasal, one that may be partly explained by the results shown here, is whether the process can be attributed to phonological lenition? Lenition is often explained in terms of less articulatory effort, and is often achieved when a phone acquires a more relaxed stricture in its production (Lass 1984:177). More often, it involves the relaxation of air stricture in the manner of articulation of a phoneme through changes that go in one particular direction. As pointed by Lass (1984:177), in lenition "each step to the right increases the permeability of the vocal tract to airflow". A simplified rendering of lenition in mode involves going from a stop to a fricative, and finally to phonological zero or deletion. While manner is perhaps the most common type of lenition, voiceless to voiced is considered an important part of the process, since voiced sounds tend to be produced with a lesser degree of stricture than their voiceless counterparts (Lass 1984:177). Voicing often precedes any relaxation of consonantal airflow obstruction, as has been the case of several lenition processes in the Romance family of languages (For a detailed discussion on lenition of bilabial, dental, and velar stops, c.f. Penny 1993:76-7).

Word-final nasal velarization cannot be easily placed within one of the proposed channels of lenition; it does not involve a reduction in the mode of obstruction, nor does it involve relaxation through voicing. Instead, preceding segment constraint suggests that word-final nasal velarization is in fact a case of point of articulation simplification. The concept of "ease of articulation", which involves reduction in the amount of independent phones in a string has been proposed by Lass (1984:199) in discussing assimilation. While word-final nasal velarization does not cut down on the number of contiguous autonomous gesticulations in a sequence, it seems to involve simplification by reducing the amount of effort within the oral cavity. More specifically, velarization cuts down on the articulatory energy that it takes to produce the initial vowel and subsequent nasal in the sequence.

The distribution in Table 5 clearly suggests that the two front vowels, /i/ and /e/, highly inhibit velarization. However, /i/ seems to inhibit velarization because of an additional articulatory characteristic, one that it also shares with /u/. Producing an alveolar nasal requires an apical articulation in which the tip of the tongue is placed against the alveolar region of the oral cavity, while a velar nasal is produced when the post-dorsal part of the tongue comes in contact with the velum. Therefore, the two types of sounds are produced in opposite extremes of the oral cavity when opposite sides of the tongue come in contact with the upper ridge of the mouth. Being a back vowel, /o/ is clearly in an environment that is highly conducive to velarization. Similarly, /u/ is another vowel that we would expect to be prone to conducting velarization; it is also articulated in a high, posterior position of the oral cavity, and thus closer to the velar region. However, /u/, along with /i/, is also a vowel produced with a great amount of closure. In nasal articulation, closure seems to make the production of an alveolar more likely because it is easier to bring the tip of the tongue in contact with the alveolar region. At the same time, closure seems to prevent the post-dorsal part of the tongue from reaching the velar region. In addition, /u/ is produced with a slight curvature and with the apical region of the tongue pointing up, while /o/ is produced with a slight curvature of the apical region pointing downwards, naturally bringing the post-dorsal part of the tongue closer to the velum. Overall, a greater degree of aperture in the production of /o/ and /a/ seems to facilitate word-final nasal velarization, while greater closure in /u/, /i/, and even /e/ seems to inhibit it. This is schematized as follows, where a word-final nasal is more likely to be velarized when it is preceded by a vowel with a greater degree of aperture:  $N > [ɨ] / V [+greater\ degree\ of\ aperture] \_ \#$ .

A knockout in the SBC that favors /o/ as the sole vowel in preceding contexts is perhaps symptomatic of what could be the initial and optimum milieu for word-final nasal velarization. This is obviously the environment most resistant to eradication of word-final nasal velarization. Being that these are the last context in which word-final nasal velarization survives in a variety that is in contact with another that does not, suggests that the process could have begun here in velarizing varieties. Results simply show a reversal of the whole process.

### 5.3. Following segment constraint

The effect of the following segment is also corroborated by the results of the variable rule analyses in the Salvadoran data. In SS, HSS, HSM, and SB where the factor group had a significant effect on the variation, the velarized variant was strongly favored by a following pause (0.81, 0.75, 0.82, and 0.84). A following vowel moderately favored velarization in SS and HSS (0.55 and 0.56), but more strongly favored it in HSM and SS (0.74 and 0.67). Consistently, velarization was seriously disfavored by a subsequent consonant SS, HSS, HSM, and SB (0.37, 0.39, 0.24, and 0.25).

Word-final nasal velarization seems closely tied to the path of least articulatory resistance, as is clearly demonstrated by the factors in this group: a following pause strongly favored word-final nasal velarization, followed by a subsequent vowel, which also showed a positive correlation in bringing about velarization, and it is moderately disfavored by a following consonant. The in-situ velarization rate by following segment in the San Sebastián data are as follows: 56% before a pause, 22% before a vowel, and 12% before a consonant segment. These results are in line with those by previous studies, which have reported that a following pause is the subsequent factor most conducive to word-final nasal velarization, followed by a vowel, and a consonant respectively. López Morales (1981:109) finds a 69% word-final nasal velarization after pause, 27% after vowel, and only 13% after a consonant in Puerto Rican data. In the Cuban city of Pinar del Río, Darías Concepción, Ruisánchez Regalado and Dohotaru (1997:294) observe a 44% velarization rate in word-final nasal before a pause (*posición final absoluta* 'absolute final position') and 39% before the combined sum of a coming vowel and consonant (*posición límite de palabra* 'word-boundary position'). A following pause is clearly the most propitious environment for word-final nasal velarization in this and in other varieties. As evident by the total rate of word-final velarization in the three Salvadoran corpora shown in Table 6, word-final velarization occurred 32% before a pause, 13% before a vowel, and 6% before a consonant. In utterance-final position, the tongue is clearly under less substantial stress because no articulatory pressure is felt from the phonological anticipation required in the production of a following sound segment.

Table 6. *Word-final nasal velarization rates by following segment in SS, HS, and SB.*

Pause		Vowel		Consonant	
N	%	N	%	N	%
103/314	32%	80/603	13%	61/970	6%

In addition, following context constraints seem tied to other system-internal pressures. For instance, word type distribution in utterance-final contexts in opposition to the distribution found in utterance-internal contexts may undoubtedly have an effect on the choice of word-final nasal. A quick look at word types in utterance-final position shows that nouns are more likely to occur before a pause (39%), compared to verbs (16%), adverbs (13%), adjectives (8%), and prepositions (7%). I made the argument in the previous sections that certain endings (*-ón / -on*), more commonly associated with nouns and verbs, show higher rates of word-final nasal velarization. The same is true of preceding segment association: /o/ and /a/ showing a greater effect on velarization, and being more often associated to noun (*avión* 'airplane') and verb endings (*fuleron* 'they went' and *trabajaban* 'they used to work').

Table 7 shows the distribution of word-final nasals by following vowel segment. We see that high and posterior vowel segments articulated higher and further back in the oral cavity exhibit lower rates of velarization. This is contrary to inferred expectations since velarization does not occur when the following vowel segments are produced closer to the velar region. In fact, following posterior segments, /o/ and /u/, are the least conducive to velarization, 0% and 5% respectively. Articulatory distance seems to gradually increase the rates of a preceding word-final nasal velarization. Word-final nasal shows a 9% velarization rate before /i/, which is high and anterior. There is a higher velarization rate when a word-final nasal is followed by a mid-anterior /e/, 13% of all occurrences. It is the following maximum distance (/a/) that conduces to the highest rate of word-final nasal velarization (20%). The articulation of a velar nasal seems to require a gliding effect that is easily achieved by going from the velum to the anterior and lower ends of the oral cavity. In turn, a higher degree of aperture facilitates velar nasalization.

Table 7. *Word-final nasal velarization rates by following vowel segment in SS, HS, and SB.*

	/a/		/e/		/i/		/u/		/o/	
	N	%	N	%	N	%	N	%	N	%
Velar	33	<b>20%</b>	37	<b>13%</b>	7	<b>9%</b>	3	5%	-	-
Non-velar	136	80%	238	87%	67	91%	53	95%	29	100%

A word-final nasal is less likely to velarize when followed by a consonant, showing a stronger resistance to velarization. One way in which a following consonant offers resistance is through word-final nasal assimilation to a following consonant, as in *so[m] pobres* 'they're poor', where word-final nasal /n/ assimilates to the point of the following bilabial /p/: /n/ > [m]. The fact that assimilation is in itself an articulatory simplification, may deter somewhat the need for word-final nasal velarization. In any case, pinpointing the path of least resistance is no easy task, but point and manner of articulation shed some light.

Table 8. *Word-final nasal velarization rates by point of articulation of following consonant segment in SS, HS, and SB.*

	[+alv]		[+bil]		[+den]		[+pal]		[+lab]		[+pos vel]	
	N	%	N	%	N	%	N	%	N	%	N	%
Velar	35	<b>9%</b>	21	<b>6%</b>	5	<b>3%</b>	-	-	-	-	-	-
Non-velar	369	91%	311	94%	179	97%	27	100%	18	100%	5	100%

Table 8 shows that a following [+palatal] and [+post velar] consonant segment, sounds produced in close proximity to the velar region, completely deter word-final nasal velarization. Once again, the articulation of a velar nasal seems to require a gliding effect that is easier to achieve by going from the velum to the frontal region of the oral cavity. In the case of the following [+labial], assimilation is obviously the best alternative. The remaining consonant segments are all articulated far away from the velum, but one characteristic may further help explain the higher rate of word-final velarization in [+alveolar] at 9% in comparison to [+bilabial] at 6% and [+dental] at 3%. While a following [+bilabial] and [+dental] are contexts conducive to a prior word-final nasal assimilation, a following [+alveolar] is not. The only simplification possible in this context, as shown by the slightly higher frequency in Table 8, is the velarization of the nasal.

Table 9. *Word-final nasal velarization rates by manner of articulation of following consonant segment in SS, HS, and SB.*

	[+nas]		[+liquid]		[+fri]		[+occl]		[+afri]	
	N	%	N	%	N	%	N	%	N	%
Velar	15	<b>10%</b>	24	<b>9%</b>	6	<b>4%</b>	16	<b>4%</b>	-	-
Non-velar	133	90%	233	91%	158	96%	381	96%	4	100%

Table 9 helps clarify further. Word-final nasals velarized in slightly higher frequencies before a following nasal (10%). The fact that the two segments share manner of articulation seemed to aid velarization. This in turn may explain the higher frequencies of word-final nasal velarization before [+alveolar] and [+bilabial] segments in the previous table, since /n/ is [+alveolar] and /m/ is [+bilabial], while /ɲ/ is [+palatal], but rarely occurs word-initially. Table 9 shows that greater articulatory obstruction of the following consonant segment meant a reduction in the velarization rates of the preceding word-final nasal: 9% for [+liquids (laterals and thrilled)], 4% for [+fricative] and [+occlusive]. Once again, [+fricative] and [+africate] contained most of the [+palatal] and [+post velar] segments discussed above.

Results showed that word-final nasal velarization increased as articulatory resistance of the following segment decreased. A following pause offers the slightest degree of resistance because there is no pressure to assimilate to a subsequent point or mode. In following vowel contexts, distance of vowel articulation and aperture of oral cavity seem to determine the rate of velarization of a previous nasal. In following consonant contexts, the point and manner of articulation seemed to play a determining role: velarization rates slightly increased after an [+ alveolars] and after [+nasals] and [+liquids].

#### 5.4. Age of arrival

Chambers (1992) considers the acquisition of phonological traits in a situation of dialects in contact. In his study, he shows that Canadian youngsters of diverse age groups living in England acquire target phonological traits of the local variety at differing rates. Subsequent studies have also sought the effect of age of arrival on variation, which has turned out to be an important factor in determining the variant distribution in situations of dialect contact. More recently, studies by Aaron and Hernández (2007) and Hernández (2002, 2009) have claimed age or arrival-graded distribution of the syntactic and phonological variants in the speech of Salvadorans in situations of dialects in contact. The current results also demonstrate that statistically age of arrival is a highly influential factorial group in the choice of word-final nasals among Salvadoran speakers in Houston. Table 2 shows that the correlation between age of arrival and word-final nasal variation is not due to chance in these communities. Instead, there is a clear correlation between an older age of arrival of the individuals and word-final nasal velarization. In HSM, velarization was strongly favored at 0.75 among individuals arriving at age 15 or older and in SB at 0.81 by the same group of individuals. The difference was not significant in HSS, showing that while age of arrival is fundamental in favoring or disfavoring velarization in Salvadoran and Mexican interchanges, it is overruled by in-group exchanges. I begin the following section by taking a closer look at three social factors that seem to be dependable predictors of word-final nasal variation in the present situation of contact: community, ethnicity and age of arrival.

##### 5.4.1. The importance of community

One underlying question has been at the heart of our discussion: How does one community behave in regards to other analogous communities undergoing contact? That is, does change affect historically-related communities undergoing similar processes of contact equally? The question has been partly answered in the previous discussion, but one particular finding stands out: the gradual grading of the variation according to the community association of the speakers. Table 10 shows that velarization is treated differently in the three Salvadoran communities under consideration: 23% in San Sebastián, the in-situ community; 14% in Holly Spring; and only 3% in Segundo Barrio. Differences between the two Houston communities can be explained by the amount of exposure to speakers of Mexican Spanish and by the strength of the interethnic networks.

Table 10 *Word-final nasal velarization rates in three Salvadoran communities: SS, HS, and SB.*

	San Sebastián		Holly Spring		Segundo Barrio	
	N	%	N	%	N	%
velar	97	<b>23%</b>	134	<b>14%</b>	13	3%
non-velar	333	77%	847	86%	463	97%

### 5.4.2. Interlocutor sensitivity

In-group vs. out-group interaction proved valuable in explaining the variation. Table 10 shows that the velarization rates of word-final nasals peaked at 22% when Salvadorans interacted with a Salvadoran interviewer and plummeted to a 5% low with a Mexican interviewer. These results suggest that word-final nasal variation is highly sensitive to interethnic (or intercommunity) speech styles, in line with previous studies (e.g. Hernández 2009, 2002; Lipski 2008; Parodi 2004; Woods and Rivera-Mills 2009) which have already suggested that Salvadoran speakers in the United States in contact with other Spanish-speaking peers —Mexicans in particular— tend to accommodate to a speech closer to that of their interlocutors. Work in progress by Maldonado (2009) suggests that this accommodation process may begin even as Salvadorans are traveling through Mexico on their way to the United States. In part, the idea is that Salvadorans may accommodate in order to integrate into the Hispanic community or to avoid being judged by fellow Hispanics (Hernández 2009: 591).

*Table 11 Word-final nasal velarization rates by ethnicity of interviewer in two Salvadoran communities: HS, and SB.*

	Salvadoran interviewer		Mexican interviewer	
	N	%	N	%
velar	91	<b>22%</b>	56	<b>5%</b>
non-velar	320	78%	991	95%

### 5.4.3. Age of arrival grading in contact

In situations of contact, age of arrival has been bestowed a fundamental role in bringing about language change (e.g. Williams and Kerswill 1997; Kerswill 1994, 1995, 1996; Chambers 1992 for dialect contact; Silva-Corvalán 1994 for language contact). More often, studies have suggested that linguistic patterns are strongly set in older speakers that move to a new area of dialect contact, while younger speakers show greater linguistic malleability. Predominantly, studies have explored the acquisition of new variants by speakers moving to a new dialect zone; in the Houston situation, I have instead explored a case in which the speakers reduce the frequency of use of a particular feature: word-final nasal velarization.

*Table 12 Word-final nasal velarization rates by age of arrival of interviewer in two Salvadoran communities: HS, and SB.*

	14 years and younger		15 years and older	
	N	%	N	%
velar	19	<b>3%</b>	128	<b>15%</b>
non-velar	573	97%	737	85%

In the Houston data, higher rates of modification among younger arrivals hint at a longer exposure to the contact variety. Perhaps, the exposure also begins at a more critical, formative period, as suggested in some of the studies previously mentioned. In the Houston case, Hernández (2009: 608) suggests that "younger arrivals may also experience more pressure from younger peers, who tend to be more critical and direct in their scorn and disapproval of Salvadoran speech". There is also a more intimate exposure, and in most cases a subtle, yet critical, assessment from institutionalized sources, such as school, suggesting that institutions are at least partly responsible for the modification of speech patterns among younger Salvadoran arrivals.

## 6. Conclusions

The use of a multivariate analysis that compared the general linguistic patterns in each community confirmed that, despite a decrease in the frequency of use of the velar variant in the two Houston communities, the probabilistic weights that favored a velar realization in word-final position align neatly across the groups under review. As a general tendency, frequency and statistical analyses results showed that while velarization rates differ across communities, the constraints are uniformly maintained. Salvadoran speakers in Houston have lower frequencies of word-final nasal velarization than in San Sebastián, but that much lower frequencies of velarization occur in Mexican-Salvadoran exchanges in Houston when compared to more intimate Salvadoran-Salvadoran exchanges. The analyses confirm that the grammar of historically related communities may remain practically alike, even when the speech of these communities has undergone a profound and sudden linguistic change brought about by contact. Results also showed that the variation is extremely sensitive to social factors such as community ascription, ethnicity of interlocutor, and age of arrival of the speakers. These are dimensions that merit more research in dialect contact situations since they may help explain phenomena of language change under situations of intense dialect or language contact.

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