The Dissertation Committee for Adriano Mario Trovato Certifies that this is the approved version of the following dissertation:

A Sociophonetic Analysis of Contact Spanish in the United States: Labiodentalization and Labial Consonant Variation

Committee:

Almeida Jacqueline Toribio, Supervisor

Barbara E. Bullock, Co-Supervisor

Whitney Chappell

Sandro Sessarego

A Sociophonetic Analysis of Contact Spanish in the United States: Labiodentalization and Labial Consonant Variation

by

Adriano Mario Trovato

Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

December 2017

A Sociophonetic Analysis of Contact Spanish in the United States:

Labiodentalization and Labial Consonant Variation

Adriano Mario Trovato, PhD
The University of Texas at Austin, 2017

Supervisor: Almeida Jacqueline Toribio; Co-Supervisor: Barbara E. Bullock

The term labiodentalization is used in this dissertation to describe the linguistic phenomenon consisting in the realization of /b/, which generally corresponds to the voiced bilabial segments [b] and [β] in Standard varieties of Spanish, as the labiodental fricative consonant [v]. The main goal of this dissertation is to analyze the effects of language contact on labiodentalization of the phoneme /b/ and labial consonant variation in Texas Spanish, with special emphasis on orthography and its influence on bilingual phonology. This project analyzes labial consonant variation in the Spanish of El Paso, Texas, from the perspectives of contact and variationist sociolinguistics. Specifically, it examines (i) if Spanish speakers from El Paso produce an auditorily perceptible distinction between [v] and [β] or [b] as discrete categories; (ii) if they make an acoustically measurable distinction between these categories; and (iii) which sociolinguistic factors condition the use of and the distribution of [v] in the speech community. In pursuing these questions, a hybrid experimental approach that includes auditory and acoustic analyses for a production study is employed. Results reveal that bilingual speakers from El Paso, Texas make an auditorily perceptible distinction between the voiced bilabial and labiodental segments. Moreover, this distinction is correlated with the linguistic variables of consonant orthography and within-word position, while the most relevant social factors in relation to labiodentalization are English writing proficiency level, Spanish writing competence, and gender. Lastly, the best acoustic predictors for labial variation in the dialect examined are relative intensity and duration.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

The main goal of this dissertation is to analyze the effects of language contact on labiodentalization of the phoneme /b/ and labial consonant variation in Texas Spanish, with special emphasis on orthography and its influence on bilingual phonology. The term labiodentalization is used in this dissertation to describe the linguistic phenomenon consisting in the realization of /b/, which generally corresponds to the voiced bilabial segments [b] and [β] in standard varieties of Spanish, as the labiodental fricative consonant [v]. The present study attempts to document and examine the presence of labiodentalization in the speech of Spanish speakers in the El Paso area, its phonetic characteristics, as well as the correlation between the production of [v] and sociolinguistic factors.

In order to more fully understand the development of linguistic varieties, both diachronic and synchronic perspectives are required. This is especially true in bilingual contexts, where the contact between two languages, and, in some instances, the effects of dual literacy, can lead to the emergence of unique linguistic features. In this dissertation project, I examine a specific case of phonetic variation in U.S. Spanish to illustrate the broader phenomena of linguistic change in multilingual speech communities. This study represents an attempt to demonstrate that the dialects of Spanish spoken in the United States do not constitute a monolithic entity, and, moreover, that their unique characteristics cannot be attributed solely to the influence of English. Instead, U.S. varieties of Spanish are distinguished for the simultaneous and intertwined presence of conservative and

innovative features. Furthermore, in the case of speech communities situated along the Mexican border, not only language contact but also dialect contact between different varieties of Spanish must be taken into account in assessing the development of regional lects.

1.1 LABIODENTALIZATION IN SPANISH

Of interest for this project are labiodentalization, labial consonant variation in contact Spanish, and its social perception. Prescriptivist accounts of Spanish hold that the voiced labial phoneme /b/ has only two allophonic realizations, [b] and [β], that appear in complementary distribution, with the stop in contexts of major closure, i.e., in utterance-initial position or following a nasal, as in (1a); and the approximant presenting in all other contexts, as in (1b) (Hualde, 2009). Note that the phoneme /b/ corresponds to both <b> and <v> graphemes.

(1) Allophones of /b/

a. Bilabial occlusive allophone [b]

cien voces [sjẽm.'bo.ses] ‘one hundred voices’

cien bolas [sjẽm.'bo.las] ‘one hundred balls’

vamos ['ba.mos] ‘let’s go’

bailemos [baj.'le.mos] ‘let’s dance’

b. Bilabial approximant allophone [β]

la voz [la.'βos] ‘the voice’

el viejo [el.'βje.xo] ‘the old man’

la boda [la.'βo.ða] ‘the wedding’

el barco [el.'βaɾ.ko] ‘the ship’

However, there is also attested, in some varieties, a third allophone: the labiodental [v] (Vergara & Pérez, 2013), as in (2).

(2) Labiodental allophone [v]

la voz [la.'vos] ‘the voice’

cien voces [sjẽɱ.'vo.ses] ‘one hundred voices’

vamos ['va.mos] ‘let’s go’

el viejo [el.'vje.xo] ‘the old man’

el barco [el.'vaɾ.ko] ‘the boat’

la boda [la.'vo.ða] ‘the wedding’

The labiodentalization of the voiced labial phoneme /b/, i.e., its realization as [v], is considered a salient feature in specific regional varieties of the Spanish-speaking world, and it is commonly considered a phonological trait characterizing the speech of some bilinguals and heritage speakers of Spanish in the United States. In fact, language textbooks regularly signal this as a potential problem area for Spanish learners, stigmatizing the realization of /b/ as [v] as a non-native-like pronunciation to be avoided, particularly for words that feature the grapheme <v> (Stevens, 2000).

Hispanist scholars have interpreted the emergence of [v] either as a consequence of language contact with indigenous or European languages (Lipski, 1994; Hualde, 2009) or as an archaism inherited from Old Spanish and preserved in some dialects (Torres

Cacoullos & Ferreira, 2000; Moreno Fernández, 2005). The contact account holds that labiodentalization appears in Spanish dialects that are exposed to one or more languages whose phonemic repertoires feature the voiced labiodental phone /v/. The realization of [v] in the Spanish of some border regions in South America (e.g. the *español fronterizo* in Uruguay), where the influence of the Portuguese language is very prominent (Carvalho, 2006), presents one such example.[1] Other researchers suggest that labiodental segment [v] in modern varieties of Spanish is an archaic feature. The Archaism Theory, formulated by Alonso (1967) and supported by Penny (2000) among others, claims that the phonemic contrast between /b/ and /v/ that was present in Spanish until the fifteenth century, and later neutralized in most dialects, has been somehow preserved in particularly conservative varieties. For instance, Torres Cacoullos & Ferreira (2000) have attributed the existence of the labiodental allophone [v] in New Mexican Spanish to a case of archaism maintained especially in high-frequency words such as *ver* 'to see' [vɛɾ].

1.2 Present Study: Motivations and Contributions

The overarching goal of this project is to contribute to on-going scholarly discourse on Spanish voiced labial consonants variation, to findings of language contact leading to convergence in U.S. Spanish, and to sociolinguistic theories surrounding sound change; as well as connect these conversations. Specifically, this dissertation analyzes labial

[1]In Standard Portuguese, /b/ and /v/ constitute two different and contrastive phonemes, represented orthographically by the graphemes <b> and <v> respectively. An example is the minimal pair *bela* ['be.la] 'beautiful' vs. *vela* ['ve.la] 'sail'.

consonant variation in a dialect that presents the possibility of disentangling the contact versus archaism explanations: the Spanish of El Paso, Texas. This area is not only an emblematic border city, defined by Achugar & Pessoa (2009) as one of the most bilingual contexts in the world—and indeed, today 72.6% of the population speaks languages other than English at home (www.census.gov[2])—but it is also one of the oldest Traditional Spanish settlements in the United States (Engstrand, 1996). In addition to archaisms and the effects of long-standing contact with English in the Southwest, novel linguistic traits are constantly introduced into El Paso Spanish via contemporary Mexican Spanish, due to the continuous transnational movements across the border.

As an example of the variation observable in El Paso Spanish, consider the following speaker 's', from *The Spanish in Texas Corpus Project* (Bullock & Toribio, 2013; Toribio & Bullock, 2016):

(3) >>s: Pensé yo que i[**v**]a a aca[**v**]ar la escuela… [...]

>>i: ¿Hubo algún maestro o maestros que hayan tenido influencia particularmente fuerte en tu vida?

>>s: *Um... I guess* todos fueron **[b]**uenos maestros. Del que me recuerdo más sería en High School, Mister Rodríguez, porque él sí me hacía *push*, mucho a que compitiera, que hiciera *extra, extra curricular activities* y todo eso. *So*, yo diría que él, un **[b]**uen maestro.

>>i: ¿Cómo conociste a tu esposo?

[2] Census accessed in November 2016.

>>s: ¡Guau! Ahí en la ... la **[v]**oda de su hermano, porque se casó con mi amiga, ahí es donde nos conocimos, y ahí es donde comenzamos a hacernos no**[v]**ios.

>>i: ¿Cómo supiste que era la persona correcta?

>>s: *I don't*...pues, quién sabe, *I guess*, este...luego luego cuando lo **[v]**i, sí me gustó, pero yo pensa**[β]**a que él estaba casado, pero *I guess* comenzamos a platicar y todo y desde el principio tenemos mucho...muchas cosas en *common, so yeah*.

>>s: I thought I would have finished school… [...]

>>i: Was there any teacher that had a particularly strong influence on your life?

>>s: Um... I guess all were good teachers. The one that I remember the most would be in High School, Mister Rodríguez, because he did push me, a lot, to compete, to do extra, extra curricular activities and all that. So, I would say him, a good teacher.

>>i: How did you meet your husband?

>>s: Wow! There at... his brother's wedding, because he got married to my friend, we met there, and from then we started to see each other.

>>i: How did you know that he was the right person?

>>s: I don't... well, who knows, I guess, um...right away when I saw him, I did like him, but I thought that he was married, but I guess we

started talking and all and from the beginning we have much... many things in common, so yeah.'

As shown, speaker 's' employs both Spanish and English and variously realizes the Spanish labial as [b], [β], and [v]. While similar examples are readily observable in the everyday speech of Texas Spanish speakers and often anecdotally referenced in the literature, to date, academic research has provided little empirical evidence on issues surrounding this linguistic phenomenon, its perception, and the social meanings associated with it. Previous literature about labiodentalization in U.S. Spanish has focused uniquely on the effects of word frequency on the phonetic realizations of /b/ (Torres Cacoullos & Ferreira, 2000; Takawaki, 2012), without considering the influence of language contact with English, nor any sociolinguistic factor. This project aims to provide such evidence by analyzing the linguistic and social factors that affect the production and perception of labial consonants in the Spanish of El Paso; these include orthography, stress position, cognate status, and individual speaker characteristics such as gender, age, and literacy level in both English and Spanish.

In addition, previous studies on labiodentalization, including research on monolingual varieties of Spanish, like the Chilean dialect spoken in Concepción (Vergara, 2009), employ merely impressionistic methods to differentiate between bilabial and labiodental consonants, since they never include any acoustic measurement in their analyses. The present dissertation offers a valuable contribution to the fields of sociolinguistics and phonetics by combining both auditory and acoustic analyses in its

methodologies. More details about these procedures and the experimental design utilized will be provided in the following chapters.

In brief, the project analyzes labial consonant variation in the Spanish of El Paso, Texas, from the perspectives of language contact and variationist sociolinguistics. Specifically, it examines (i) if Spanish speakers from El Paso produce an auditorily perceptible distinction between [v] and [β] or [b] as discrete categories; (ii) if they make an acoustically measurable distinction between these categories; and (iii) which sociolinguistic factors condition the use of and the distribution of [v] in the speech community. In pursuing these questions, I utilize methods drawn from both laboratory phonology and sociophonetics, using a hybrid experimental approach that includes auditory and acoustic analyses for speech production.

Sociophonetics can be defined as the field of linguistics that combines methodologies drawn from sociolinguistics and phonetics together in an interdisciplinary way. A concise description of the main goals of sociophonetics is offered by Foulkes *et al*. (2010: 704): "to identify and ultimately explain the sources, loci, parameters and communicative functions of socially-structured variation in speech, account for how socially-structured variation in the sound system is learned, stored cognitively, subjectively evaluated and processed in speaking and listening." Among the first sociophonetic studies that used acoustic analyses to examine linguistic variation, one of the most exemplary is the research conducted by Labov *et al*. (1972) on the vowel shift affecting American and British English, which are, even today, the most studied varieties in this field.

It has been only more recently that the sociophonetic method has been applied to Romance languages, in Spanish most extensively. The main focus of Hispanic sociophonetics has been consonantal variation, with particular emphasis on the phoneme /s/, especially in syllable-final position. Pertinent examples are the studies carried out by Mack (2010) on the correlations between coda /s/ and perceived sexual orientation in Puerto Rican Spanish, Chappell (2016) on the social perception of intervocalic /s/ voicing in Costa Rica, and Schmidt (2013) on weakened-/s/ perceptions across different dialects.

Because one of the main objectives of this dissertation is to examine the effects of English phonology and orthography on Texas Spanish, the present investigation is also a contribution to contact linguistics. Within this field, some instances of previous research about Spanish in contact with other languages deserve to be mentioned for their relevance to the present project. For example, a study conducted by Amengual (2012) examined the correlation between cognates and voice onset times (VOTs) of voiceless stops in the speech of Spanish-English bilinguals, showing that cross-linguistic lexical similarity favors convergence. His results demonstrated that Spanish consonants were realized with longer VOTs in words with quasi-homophonous equivalents in English compared to items that did not present cognate status between English and Spanish lexicons. Another study that inspired this research is the investigation realized by Brown and Harper (2009) about the effects of English phonology and orthography on a variety of U.S. Spanish, the contact dialect spoken in New Mexico. These scholars established a direct correlation between lower rates of coda /s/ reduction and Spanish lexical items whose English translations featured a word-final /s/ in the speech of bilinguals. Furthermore, they corroborated their

results using a control group composed of Spanish speakers from Chihuahua, Mexico, the geographically closest monolingual speech community to New Mexico, whose members did not produce any systematic differences in /s/ reduction in relation with cognate status.

The present project attempts to offer a valuable contribution to the fields of language contact, (variationist) sociolinguistics, and phonetics briefly discussed above, offering new insights and implications on topics like Spanish in the United States, the effects of literacy and orthography on speech production, and the effects of bilingualism and crosslinguistic processes on phonology. The following section illustrates more in detail the structure of this dissertation and the content of its chapters.

1.3 DISSERTATION STRUCTURE

The present dissertation comprises a total of six chapters. Chapter 2 illustrates the phonological voiced labial repertoire of Spanish, the general characteristics of the phoneme /b/, its allophonic realizations in Standard varieties of this language, and the diachronic evolution of oral labial consonants from attested dialects of Old Spanish to the present. Previous literature on labiodentalization will be discussed as well, with reference to current attestations of [v] in both monolingual and contact varieties of Spanish. Additionally a description of the phonetic features of labial consonants will be provided, including the acoustic measures that can be employed to determine the differences between bilabial and labiodental segments.

Chapter 3 is dedicated to language contact, first presenting general theories and approaches about this topic, then illustrating its phonetic and phonological outcomes as described in previous linguistic literature, and finally analyzing the historical presence of Spanish and English in Texas, from the first European settlements until the present day, and their contemporary status. This chapter will include archival and census data as well as other socio-demographic information concerning the current situation of Spanish speakers living in Texas, such as their distribution, background, education, and socioeconomic standing. Special attention will be dedicated to the state of Spanish, taking into consideration not only its linguistic characteristics, but also its social prestige, its relation with English as a majority language, and ideologies and attitudes that surround it. Furthermore, the review will narrow from Texas in general to a city in particular: El Paso. The history and the current state of the speech community chosen for this study will be discussed in detail, highlighting specifically the sociolinguistic features that make this area a unique context ideal for sociophonetic analysis on regional variation and language contact.

Chapter 4 introduces the sociolinguistic factors that were used as independent variables in this project to test the correlations between labiodentalization in Texas Spanish and individual, speaker-related features. These sociolinguistic traits will be discussed in relationship to previous literature so as to motivate and explain their inclusion in the experimental design of the current study. Predictions and hypotheses about the effects of these social variables on the production of the labial consonants examined will be formulated as well.

Chapter 5 will be dedicated to a production study, an auditory and an acoustic analysis conducted with the participation of 30 Spanish speakers from El Paso. For this study, a reading task and a picture-naming task are employed in order to document and understand voiced consonant variation in the dialect examined and which sociolinguistic factors are related to this phenomenon. After describing the experimental designs and methods utilized, the results will be presented and interpreted in the last portions of this section.

Finally, Chapter 6 revisits the research questions formulated for this study and the findings on the production of voiced labial consonants in Texas Spanish. This concluding section summarizes the contributions offered in the experiments conducted, comparing and connecting the various findings within a wider overarching discussion. In addition, the conclusion includes possible limitations of the present study as well as ideas for follow-up studies, future related research, and larger implications of the current dissertation.

Chapter 2: Phonology and Phonetics of Spanish Labial Consonants

2.1 Spanish Labial Phonological Repertoire

Since the object of study is the presence of a voiced fricative labiodental allophone in Texas Spanish, a brief description of labial consonants in the contemporary Spanish phonological repertoire is necessary. Consistent with phonology reference handbooks (e.g., Morgan, 2010), two bilabial oral phonemes can be identified in Spanish: voiceless /p/, and voiced /b/.[3] However, while the bilabial voiceless /p/ is usually realized as a stop [p], its voiced counterpart can be produced as two different allophones: bilabial stop [b], in utterance-initial and post-nasal position, or fricative/approximant [β], the latter with the broader distribution in any other phonological environment (e.g. intervocalically). In this dissertation, the terms lenition and non-lenition contexts will be used in reference to these complementary phonological environments where one of the two bilabial allophones of /b/ is expected to appear, the approximant [β] and the plosive [b] respectively. As for labiodental oral phonemes, contemporary Spanish features a voiceless fricative sound /f/, but allegedly lacks the voiced counterpart /v/, which is present in other Romance languages (e.g. Italian and French) and, more importantly for the present project, English.

[3]Using the classification bilabial oral phonemes, a clear distinction between oral and nasal phonemes is deliberately created. This study will not deal with labial nasal allophones like the bilabial [m] and the labiodental [ɱ].

Hualde (2009) claims that a voiced labiodental fricative allophone [v] is actually produced as a consequence of assimilation that causes the labiodental fricative [f] to be voiced when followed by a voiced consonant, similarly to what happens to other voiceless phonemes in Spanish (e.g., the word *mismo* 'same' ['mis.mo] can be realized as ['miz.mo] due to voice assimilation of [s] followed by [m]). The one and only example the author provides is the word *afgano* ('Afghan'), which could be realized either as [af.'ɣa.no], with a voiceless fricative, or as [av.'ɣa.no] through voice assimilation. Since [f] + voiced consonant clusters are extremely rare in Spanish, *afgano* is one of the very few contexts in which the voiced labiodental fricative allophone [v] occurs.[4] Moreover, this type of assimilation does not occur systematically; it is directly related to geographical, stylistic, individual, register, and speech rate differences to mention a just few of the possible factors that condition its application (Campos-Astorkiza, 2010). Another example of the possible production of a voiced labiodental fricative [v] is the case of emphatic pronunciation of the segment /b/. For instance, sometimes speakers produce an exclamation such as *¡Qué bello*! 'How lovely!' highlighting and emphasizing the labial consonant as a stylistic and pragmatic resource, resulting in something similar to: [ke.'ve.jo]. According to Barrutia & Schwegler (1994), in modern Spanish the difference between *b* and *v* should be exclusively orthographic, not phonetic, and much less phonemic. This is the reason why the

[4]Since [f] usually does not occur word-finally in Spanish, the sequence does not arise word-internally nor in sandhi contexts. The only exceptions are some loan words such as *chef* 'chef' [tʃef] or *rosbif* 'roastbeef' [ros.'βif].

hypothesized emergence of the voiced labiodental fricative [v] would represent a relevant and non-negligible case of variation in Hispanic phonology.

Excluding the exceptional and very limited contexts and uses mentioned above, it can be stated that the voiced labiodental fricative segment [v] is very rare in the contemporary phonological repertoire of general Spanish. However, as this study will examine the possible effects of language contact on the emergence of [v] in Texas Spanish, it must be noted that in English /b/ and /v/ are contrastive phonemes that correspond to semi-transparent orthographies: the two graphemes <b> and <v> (4a). In contrast, in modern Spanish the relation between graphemes and labial phones is much more opaque and even problematic in some cases (4b).

(4) a. bat [bæt]

vat [væt]

b. *baya* ['ba.ja] ‘berry’

vaya ['ba.ja] ‘go’ (3rd person singular formal command)

Simply observing the names commonly used to refer to the letters of the alphabet in Spanish, the ambiguity of the correspondence between orthography and pronunciation is evident. While other languages characterized by a biunivocal relationship between spelling and labial phonemes, e.g. English and Italian, employ the phonetic-based terms [bi] and [vi] for designating the graphemes <b> and <v> respectively, the *Diccionario de la Lengua Española* (Real Academia Española, 2016) attests the disambiguating denominations *be* ‘b’, *be alta* literally ‘tall b’, *be larga* ‘long b’, and *be grande* ‘big b’ for the letter <b>, and

the names *uve* ‘v’, *ve baja* ‘low v’, *ve chica* ‘small v’, and *ve corta* ‘short v’ for the letter <v>. Moreover, the prescriptive institution Real Academia Española (RAE) adds:

(5) *Los hispanohablantes que utilizan el nombre ve suelen acompañarlo de los adjetivos corta, chica, chiquita, pequeña o baja, para poder distinguir en la lengua oral el nombre de esta letra del de la letra b (be), que se pronuncia exactamente igual.*

*‘*The Spanish speakers that use the name *ve* (v) usually add the adjectives short, small, little, or low, to distinguish in the oral use the name of this letter from the one of the letter b, which is pronounced exactly in the same way*’.*

Alternatively, Spanish speakers rely on their interlocutors’ orthographic knowledge of basic lexical items (such as animals or city names) and adopt locutions like *be de Barcelona* ‘b as in Barcelona’ versus *ve de Valencia* ‘v as in Valencia’, or *be de burro* literally ‘b as in donkey’ versus *ve de vaca* ‘v as in cow’.

Unsurprisingly, this mismatch between orthography and standard pronunciation in contemporary Spanish often causes confusion, misunderstandings, and numerous instances of misspelling among both L1 and L2 speakers. In fact, various manuals, grammars, and language learning resources warn readers about these ambiguities and frequent orthographic mistakes, listing common homophonous words or phrases. A clear example is the section dedicated by the Real Academia Española to the expressions *haber/a ver* [a.'βeɾ] ‘to have/let’s see’, which, according to the source, share identical phonetic realizations, but need to be differentiated in written texts.

Nevertheless, these are not the only consequences caused by this linguistic ambiguity of which Spanish speakers sometimes take advantage to produce wordplays and other creative uses of their orthographic system. For instance, it is frequent among Dominican urban singers to release songs with titles that feature non-conventional spellings, utilizing instead literary devices that intend to recreate the phonetic features of their dialect. An illustrative case is the hip-hop artist Milka La Más Dura, whose musical repertoire includes tracks characterized by non-prescriptive titles that, maybe marking identity, localness, and covert prestige, include examples of coda [s] deletion (*No Te Confunda* cf. the standard orthography *no te confundas*), truncation (*Papi Que Bueno Tu Ta* cf. *papi que bueno tú estás*), or more pertinent to this study labial consonant variation: *Te Vote*. The content of the song and its videoclip clearly allude to the expression *te boté* [te.βo.'te] 'I dumped you' and to the verb *botar* 'to dump', not to its homophonous *votar* 'to vote'. This stylistic freedom, possibly employed as an emphatic strategy, is a clear indication of the merely orthographic and arbitrary distinction between <b> and <v> in most Spanish varieties that do not feature labiodentalization in a systematic way.

2.2 Labial Consonants from Old Spanish to Modern Spanish

The linguistic situation described above, in terms of the attestation of labial oral consonants, is likely accurate for the majority of the contemporary Spanish-speaking world, except for some particular contexts, such as Chile, Paraguay, Uruguay, and Venezuela, which will be discussed in the following sections. From a diachronic

perspective, however, it is a well-known fact that the Spanish phonetic repertoire has experienced a significant series of changes and transformations. Although there is some debate about the history of Spanish consonants, scholars such as Martínez-Gil (1998) support the bilabial/labiodental contrast theory formulated by Amado Alonso (1967). According to Amado Alonso, Old Spanish used to feature two contrastive phonemes —a voiced bilabial one, /b/, and a voiced labiodental fricative, /v/. The contrast between /b/ and /v/, inherited directly from Latin, was also reflected in the Old Castilian orthographic system, which included both a <b> and a <v> as graphemes. This assumption provides an etymological explanation for the current presence of two different graphemes —<b> and <v>— in the contemporary Spanish orthographic repertoire. A slightly different version is offered by Penny (2000), who asserts that, until the fifteenth century, the presence in Old Spanish of two graphemes indicates that they were in fact contrastive phonemes. However, while the grapheme <b> corresponded to a voiced bilabial plosive [b], according to Penny, the grapheme <v> reflected a voiced fricative that varied in point of articulation across dialects. It was realized as a bilabial fricative in the northern areas of the Iberian Peninsula and in Gascony, but in the southern half of Spain, it was a labiodental consonant. Today, a labiodental phoneme /v/ survives in some varieties of Catalan (Wheeler, 2005).

From a synchronic point of view, previous studies have attested the presence of a voiced labiodental fricative allophone [v] in some varieties of contemporary Spanish, due to the persistence of archaic traits, as in the so called “Traditional Spanish” dialects of the Southwest. Among them, the study conducted by Torres Cacoullos & Ferreira (2000) in New Mexico, where the most emblematic instance of Traditional Spanish varieties in the

United States are spoken, deserves mention. These researchers noticed the emergence of the labiodental phone among Spanish speakers living in the Northern regions of New Mexico, especially in high frequency words. Factors such as lexical frequency and the hypothetical existence of a voiced labiodental phoneme /v/ in Old Spanish led the researchers towards the formulation of a theory based on persistence of archaisms. In their view, speakers learn common and recurrent words as whole and non-decomposable units, which are then transmitted transgenerationally through the years and even centuries. This Archaism Hypothesis justifies this example of linguistic variation as the result of the survival of certain archaic lexicalized forms in some specific geographical areas, while [b] and [v] eventually merged elsewhere in the Spanish-speaking world.

Despite the appeal of the Archaism Hypothesis, to claim that the main factor determining the conservation of old forms is word frequency can be problematic. In fact, although high frequency items are more resistant to analogical change because of the Entrenchment Effect (Langacker, 1987), it is also true that such units undergo articulatory-based variation more rapidly than low frequency words and structures (Bybee, 2002). These types of linguistic phenomena can be easily observed in the data gathered by Bullock and Toribio (2013), where phonological processes like lenition and deletion are salient for common words and high-frequency morphemes such as the imperfect tense endings *–aba*, e.g., *cantábamos* ‘we sang’ [kãn̪.'ta.βa.mos]→[kãn̪.'ta.mos], or the past participle ending *-ado,* e.g., *hablado* ‘spoken’ [a.'βla.ðo]→[a.'βla.o], just to mention some instances, one of which even includes the oral voiced labial phoneme /b/.

An example of a modern variety that has kept the archaic [v] is *judeoespañol* or *sefardí* Spanish (Hualde, 2009), a dialect spoken by the descendants of the Jewish community that lived in the Iberian Peninsula between the fifteenth and seventeenth centuries. One of the most characteristic phonological features of this variety is the use of the voiced labiodental fricative /v/ as a phoneme. As the examples below show, Judeo-Spanish preserves the /b/ versus /v/ contrast word-initially; while in post-vocalic word-medial position, the neutralization in favor of /v/ is systematic (Carrasco, Hualde, & Simonet, 2012).

(6) a. *está*[v]*amos* 'we were' (*cf. está*[β]*amos)*

b. [b]*oca* 'mouth'

c. [v]*aca* 'cow' *(cf.* [b]*aca)*

Therefore, a possible historical explanation for the presence of [v] in some Spanish varieties is that labiodental fricative realizations reflect an earlier stage of the lenition process of Latin intervocalic /b/, which led to the merger of such bilabial segments with /v/ in all Romance languages (Herman, 2000). As a consequence, the proposition that [v] was preserved as an archaism in specific dialects, while general Spanish further evolved towards approximant realizations [β], is a hypothesis that cannot be excluded. A similar interpretation of labiodentalization as an archaism is offered by Hoyos Piñas (2003), who attested instances of the allophone [v] for /b/ in Extremadura, Spain, regardless of word orthography, but only in utterance-initial position.

Another instance of labiodentalization in contemporary varieties is Chilean Spanish. Various studies, among them the investigations conducted by Sadowsky (2010),

Vergara (2011), and Vergara & Pérez (2013), confirmed that the labiodental fricative [v] is the most common allophonic realization of the labial phoneme /b/ attested in the region of Concepción, Chile. This research not only confirmed the existence of a voiced labiodental consonant in monolingual Spanish,[5] but it also showed that, in the community they analyzed, speakers use [v] in free distribution along with [b] and [β]. Additionally, their findings indicated that in Chilean Spanish labiodentalization is not affected by orthography, and it emerges equally in spontaneous and careful speech. The following videoclip, an excerpt from the Chilean television channel *Telenoche*, is a clear example of the labiodentalizing variety spoken in this country:

(7) *Este sistema* [**v**]*a a lograr e*[**v**]*itar* [...] "This system will manage to avoid…"

Even impressionistically, the utterance reproduced above (accessible at https://www.youtube.com/watch?v=Kg22qes1LlI, beginning at 0:58 minutes) clearly features a voiced labiodental fricative consonant [v] in naturalistic speech and confirms what researchers observed in more controlled contexts.

Unfortunately, no empirical research has yet been conducted yet on the perception or social meanings of labiodentalization in Chile or in other monolingual varieties of Spanish. The only exception is the sociolinguistic investigation conducted by Romero, Guerreiro, and Alviárez (2008) in Venezuela, a production study that showed that the occurrence of the voiced labiodental fricative is higher among female and upper-class

[5] It is also important to notice that none of the main indigenous languages spoken in Chile, like Mapuche, Quechua, or Aymara, feature the labiodental phoneme [v] in their phonological inventory. (Sadowsky *et al*. 2013)

speakers and it might be interpreted as a mark of femininity and higher social status. These findings clearly indicate that labiodentalization is a phenomenon present in monolingual varieties of Spanish and that sociolinguistic factors affect its use and distribution.

2.3 Labiodentalization in Modern Contact Varieties

Another fundamental factor that must be considered in taking account of the presence of a voiced labiodental segment is language contact. When two or more languages are used in the same geographical space, contact varieties (of Spanish in our case) can arise, especially if a bilingual group of speakers exists. Varieties of Spanish featuring original and contact-derived linguistic features have been observed in many regions presenting the characteristics described above. For example, in Catalonia, a bilingual area in Spain where both Spanish and Catalan are widely spoken, particular phonological phenomena related to language contact can be identified. Among these is the usage of [v], which Catalan does feature in its phonetic repertoire, for words that include the grapheme <v> (e.g. [v]*aca* 'cow', [v]*amos* 'we go', etc.) in regions such as Valencia, Baleares, and Campo de Tarragona (Hualde, 2009). Analogously, the presence of the Judeo-Spanish phoneme /v/ mentioned previously, according to Harris (1994), may be explained in contemporary varieties not just as a remnant of medieval speech, but also as a result of language contact with the Balkan languages, other Romance languages (especially French), and even English.

Instances of contact-induced labiodentalization can be found in Latin America too, where Spanish is in contact with Portuguese, a Romance language that preserved the contrast between /b/ and /v/ and that features a clear-cut distribution between the two graphemes <b> and <v>. In Uruguay, labiodental realization of /b/ is considered a stereotype of the border Spanish of Rivera, as reported by the informant in (8a), and is highly stigmatized, as articulated in (8b) (Carvalho, 2006: 89).

(8) a. *Es diferente, es distinto. La pronunciación de ciertos sonidos, la /s/, la /v/ que el montevideano no pronuncia para nada, y nosotros sí. Vas a Montevideo y en seguida te dicen, ¿Sos de Rivera?*

'It is different. The pronunciation of certain sounds, the /s/, the /v/ that the Montevidean does not pronounce at all, and we do. You go to Montevideo and immediately they tell you, Are you from Rivera?'

b. *Ahora trato, lógico, de corregirme, porque como todos se ríen, viste, sobre todo la gente del sur, que dicen que los riverenses acentuamos las eses y las uves, entonces cuando uno va a hablar, trato de decir Ri[β]era, incluso cuando estoy acá, pues antes no me daba cuenta que decía Ri[v]era, nosotro[s], vo[s]*.

'Now I try, of course, to correct myself, because they make fun of me, you saw, especially Southern people, they say that we Riverans stress the Ss and the Vs, so when you are going to talk, I try to say *Ri*[β]*era*, even when I am here, whereas before I was not conscious that I used to say *Ri*[v]*era*, *nosotro*[s], *vo*[s].'

Contact along the border that separates Paraguay from Brazil has led to the emergence of several contact varieties, known as *fronterizas*, where the realization of [v] is very common (Cassano, 1972). Lipski (1994), too, proposes language contact as a factor for labial variation in Paraguayan Spanish; however, instead of influence from Portuguese, he points to the possible effects of *guaraní,* the indigenous substratum in that region.

The presence of [v] in Mexican Spanish cannot be attributed to contact with indigenous languages like Nahuatl, for example, since these do not feature a voiced labiodental fricative phoneme /v/ in their phonological repertoires. However, the geographical proximity of Mexico to the United States and the constant sociopolitical and cultural relations between these countries could explain the presence of [v] in Northern Mexican Spanish, as proposed by Takawaki (2012). In addition, not only does the English language feature a voiced labiodental fricative phoneme /v/ and the grapheme <v>, but it also features a great number of cognates that include orthographic <v>. Furthermore, these pairs of quasi-homophonic and quasi-homographic words are very common as well (e. g. *televisión*/television or *universidad*/university). As Takawaki and others have shown (see e.g., Ziegler & Ferrand, 1998), the effects of orthography, and as a consequence, of literacy, can have bearing on speech production and perception; hence the emphasis on spelling and orthographic representations as a conditioning factor in the present study.

Unfortunately, literature about U.S. Spanish phonology is quite limited, and even more exiguous are the empirical studies about the social perception of its distinctive traits, such as labial consonant variation. Lipski (2008), in his detailed linguistic atlas *Varieties of Spanish in the United States,* mentions labiodentalization only in one instance, once

again describing the phonological features of New Mexican Spanish. Nevertheless, an analysis published by Moreno Fernández (2005) states that in Texas Spanish a great number of archaic features from Old Spanish can still be observed today, including the presence of the voiced labiodental fricative [v] that this study focuses on. However, despite the bilingualism of the southern United States, and the predominance of the English language in Texas, the potential influence of language contact is not discussed in that work.

Yet, there is no doubt that Texas Spanish is today a contact variety, due to the social, linguistic, geographical, and institutional characteristics of this region. Additionally, while labiodentalization is still an understudied phenomenon, previous literature has shown evidence of other outcomes of language contact in Texas and U.S. Spanish, such as the use and frequency of overt subject pronouns in Houston (Baumel-Schreffler, 1995), or vowel raising and deletion in heritage Spanish in the United States (Alba, 2006; Ronquest, 2012). The presence and distribution of the labiodental segment [v] in El Paso Spanish has been explored only in a pilot study conducted by the present author (Trovato, 2017) drawing on linguistic data contained in the corpus *The Spanish in Texas Corpus Project* (Bullock & Toribio, 2013; Toribio & Bullock, 2016), a collection of semi-structured video interviews gathered by scholars from the University of Texas at Austin.

The methodologies, procedures, and analyses employed for this previous investigation served as a preliminary version of the present research methods. A very important finding that emerged from this pilot experiment was that labiodentalization occurred more within words containing the grapheme <v>, while bilabial realizations corresponded in most cases to the spelling <b> in the analyzed data. Nevertheless, since

the presence of the labiodental consonant [v] in El Paso Spanish has not been empirically attested yet by any other scholarly study and, considering the uniqueness of this speech community, this phenomenon might potentially be explained as an archaism, a result of dialect contact (with New Mexican Spanish), a consequence of language contact with English, or a combination of these factors.

2.4 PHONETICS OF VOICED LABIAL CONSONANTS

2.4.1 Articulatory Phonetics of Voiced Labial Consonants

From the perspective of articulatory phonetics, the voiced consonants analyzed in this dissertation might correspond to three manners of articulation: stops (or plosives), fricatives, and approximants. According to phonetics manuals (Ladefoged & Johnson, 2010), oral stops are produced with a complete closure of the articulators that occurs when the airstream is obstructed in the oral cavity and the nasal tract is blocked off by the rise of the soft palate. Fricatives involve the close approximation of two articulators, for example upper and lower lips in the case of bilabials or upper teeth and lower lip for labiodentals, so that the airstream is partially obstructed and, as a result, turbulent airflow is produced. Similarly, approximants are realized when one articulator is close to another, but for this manner of articulation, the vocal tract is not narrowed to the extent that leads to the production of a turbulent airstream (Rogers, 2000).

In terms of place of articulation, labiodentalization represents a variation involving bilabial and labiodental realizations of voiced consonants. The main difference between these two categories resides in the articulators used to create an obstruction to the airflow:

the lower lip raised in order to touch the upper front teeth for labiodentals, or the two lips coming together for bilabials (Ball & Rahilly, 1999). Strevens (1960) states that the main difference between bilabial and labiodental fricatives (or approximants in the case of [β] in Spanish) is that, while bilabials are produced with constriction at the lips with a long narrow slit between them, labiodentals are produced with the upper teeth close to the inner surface of the lower lip. During the articulation of [v], the air-stream passes between the teeth and the lower lip, as well as through the interstices between the upper teeth, with a narrow opening between the upper teeth and the lower lips.

2.4.2 Acoustic Phonetics of Voiced Labial Consonants

Because bilabial stops like [b] are articulated at the lips without any appreciable portion of the vocal tract in front of the constriction, the formant frequencies are low and these plosives typically feature a concentration of energy in the lower frequencies (500-1,500 Hz) (Stevens, 1998). Moreover, formant transitions, the acoustic consequences of articulatory movement between stops and adjacent vowels, can also provide cues about consonants and their place of articulation. Since bilabial stops are characterized by low F1 during the constriction (about 200 Hz) and low-frequency energy during the release, F2 and F3 transitions usually rise from the low-frequency burst of [b] toward the formant frequencies of the following vowel (Reetz & Jongman, 2011).

For obstruents, as with oral stops and fricatives, the length of the vocal tract in front of the constriction offers cues to place of articulation, thus plosives and fricatives with the

same place of articulation, such as [b] and [β], share certain acoustic properties. Approximants are difficult to identify on waveforms and spectrograms because they show a defined formant structure during their articulation without any clear transition between the consonant and the following vowel (Colantoni & Marinescu, 2010). Sometimes the change in intensity at CV transition can be used as an indicator, but the intensity difference is not always a viable parameter for the identification of approximants due to their vowel-like nature (Jongman *et al*., 2000). In general, fricatives show different spectral shapes according to the size and form of the oral cavity in front of the constriction: The longer the cavity, the more defined the consonant spectrum will result. According to Jongman *et al*. (1998), labiodental fricatives, like [v], display a relatively flat spectrum with no clearly dominating peak in any specific frequency region and with a spectral peak frequency close to 8,000 Hz. In the same study, the authors showed that English [v] features an average frication duration of 123 ms and a noise amplitude of 59.4 dB.

The acoustic differences between labiodental and bilabial fricatives are still understudied, partly due to the proximity of these places of articulation, but also because this contrast is rare in the world's languages (Ladefoged, 1990). A survey conducted by Maddieson (1984) revealed that only five of the 317 languages examined featured a contrast between bilabial and labiodental voiced fricatives. The best-known language containing the contrast [β] versus [v] is the Kwa language Ewe spoken in Ghana. A valuable contribution was offered by Pindziak (2012), who analyzed [β] and [v] segments in 9 languages in his study about labial fricatives and approximants. His data revealed that frication noise is noticeable through the midpoint of [v], while during the articulation of

[β] noise was not apparent at all. Additionally, the duration of [β] was substantially shorter than that of [v], especially in intervocalic position, which represents the most common phonological environment for the emergence of [β] in Spanish.

2.4.3 Acoustic Measures

The main acoustic measures analyzed in this project to document labiodentalization and labial segment variation are relative intensity, center of gravity (COG henceforth), and duration of the oral voiced consonants. The inclusion of acoustic measurements like intensity and center of gravity for labial consonants is novel in the study of Spanish phonetics and phonology. While the literature on the analysis of sibilant and nasal segments in various Spanish dialects abounds, the studies that examine labial fricative-like phones such as [v] and [β] are rare and usually based on auditory judgments only (Romero *et al*., 2008; Vergara, 2011).

Relative intensity (or intensity difference) corresponds to the difference in decibels between the target consonant and the following segment. This measurement was chosen because, according to Carrasco *et al*. (2012), labial consonants that are distinguished by manner and point of articulation differ in their relative intensity. More specifically, the more open the constriction, the smaller the difference in intensity with respect to the following vowel. Thus, the labiodental fricative phones [v] were expected to feature greater intensity difference with the following vowel than the bilabial approximant segments [β] and smaller relative intensity values compared to bilabial stops [b].

This acoustic measure has been used in Romance phonetics and it has been proven to be an effective method to determine the different degrees of constriction of voiced labial consonants (Carrasco, 2008; Colantoni & Marinescu, 2010). For example, Hualde *et al*. (2010) utilized intensity difference to compare the obstruction levels of intervocalic /b/ in two dialects of Catalan: Majorcan and the Central variety of this language. The authors claim that, while Central Catalan does not display constriction differences for /b/ based on orthographic representations (<b> and <v>), Majorcan Catalan does in order to maintain a clear phonemic contrast between /b/ and /v/. More specifically, <b> segments are realized as stops [b] (even in intervocalic position) with greater constriction and higher intensity difference than <v> segments. A similar methodology was employed in a study conducted by Hualde *et al*. (2011) to analyze the constriction and lenition rates of Spanish consonants produced by speakers from Majorca, Spain.

Center of gravity is defined by Erker (2010: 13) as "the weighted average calculated with the equation COG – $\Sigma fI/\Sigma I$ where *I* is the amplitude in decibels and *f* the frequency in Hertz of the spectral components" and according to the same author is an efficient "way of identifying the frequency at which sonic energy is maximally concentrated." In terms of center of gravity, Strevens (1960) includes both [β] and [v] within the "Front Group". From his study of amplitude cross-sections, the researcher concluded that the sequence /β v ð/ shows an increasing weighting of the upper end of the frequency spectrum, along with an increasing upper limit of frequency as one moves back in place of articulation. As a result, [β] usually displays the lowest center of gravity, followed by [v] with an intermediate center of gravity, and then [ð] with the highest center of gravity in the group.

In this project, COG was not employed for consonants in initial and postnasal position, since the possible realization of bilabial plosives could have affected the results. To my knowledge, COG has not been used to measure differences between bilabial and labiodental fricatives in previous studies. It has been utilized to analyze other classes of consonants by many researchers, such as Tabain *et al.* (2016), who were able to determine the different places of articulation of nasal consonants in three Central Australian languages by examining their COG values. Their results showed that bilabials feature significantly lower center of gravity than all the other consonants.

In the field of Hispanic linguistics, Mazzaro (2011) conducted a study that included COG as an acoustic property to predict the place of articulation of labial and velar fricatives in Argentine Spanish. According to the author, center of gravity is the acoustic measure that yields the best discrimination rates for fricative place of articulation across all vocalic contexts. Moreover, her data suggested that labiodentals, as opposed to other fricatives, can be easily recognized by their friction portion alone because the percept of [v] is not highly influenced by the vocalic context, which means that the center of gravity of [v] remains more stable across vocalic contexts.

Duration has been exploited as an acoustic variable in previous studies on Spanish phonology as a parameter to measure phonetic lenition versus consonant retention, especially for coda or word-final segments (Gerfen, 2002). An acoustic feature like duration can be useful to examine subsegmental variation and quantify temporal properties (Erker, 2010). Since [b] and [β]/[v] should correspond to different manners of articulation, respectively stops and fricatives, differences in duration are expected to emerge from

acoustic analysis with the duration of [v] expected to be longer than that of [β] following Pindziak (2012).

2.5 RESEARCH QUESTIONS

Considering the historical development and the current situation of the voiced labial consonant repertoire in Spanish, some research questions arise and they assume even more relevance in a unique and understudied contact context like El Paso, Texas. The questions posed in the dissertation research concern the presence, significance, and distribution of [v] in the speech of Spanish speakers in Texas, taking into account diachronic developments and language contact effects. More specifically, the dissertation addresses four research questions, listed below:

RQ1: Do the bilingual speakers from El Paso, Texas produce a sound perceived to be [v] for what is traditionally Spanish /b/?

RQ2: Are there acoustic differences between sounds perceived as [v] vs. bilabials [β] or [b]?

RQ3: What linguistic factors condition the use and distribution of [v] versus [β] or [b]?

RQ4: What speaker-related and sociolinguistic factors condition the use and distribution of [v] versus [β] or [b]?

My hypotheses will be discussed in more detail in Chapter 4, in relation to all the factors and variables included in the present research, but in general I expect speakers from

El Paso, Texas to produce a sound perceived to be [v] for what is traditionally Spanish /b/. Moreover, consonants perceived as labiodentalized are expected to be distinguishable from sound perceived as bilabial by one or more of the acoustic measures of duration, relative intensity and center of gravity.

I expect linguistic factors to be correlated with the use and distribution of labiodental consonants. Based on pilot findings, I predict orthography to have considerable effects on labial variation, as a direct consequence of language contact and convergence between Spanish and English. However, sociolinguistic factors, such as gender and education language, are expected to have an even stronger impact on labiodentalization because, as I will demonstrate in the following chapters, the linguistic phenomenon examined is driven mainly by social conditions and is externally motivated. The research questions will be explored through a study that intends to analyze the elicited production of voiced labial consonants among Spanish speakers.

Chapter 3: Language Contact in El Paso

Since the objective of this study is to document and examine a specific sociophonetic feature of the contact variety of Spanish spoken in El Paso, this chapter will describe the previous theoretical approaches to language contact, its most common phonetic and phonological outcomes, and the historical presence of Spanish and English in Texas. This analysis starts with a larger scope, the state of Texas in general, to subsequently narrow down to the El Paso area in particular and the sociodemographic status of the speakers living in the region that is the object of this research. The current situation of advanced bilingualism will be presented, illustrating in detail the past and the present of the speech community chosen for this investigation, as well as the sociolinguistic characteristics that constitute conditions ideal for sociophonetic analysis on language contact and regional variation.

3.1 Language Contact

This dissertation is conceptually framed within a linguistic theory of contact-induced variation and change. Although the study of language contact was already an interest of historical linguists in the nineteenth century, the modern beginnings of this field are usually dated to the pioneering works of authors like Weinreich (1953) and Haugen (1953). Contact linguistics was defined by Thomason (2001) as the field that studies language contact, interpreted as the linguistic and social phenomenon by which speakers

of different languages or different dialects of the same language interact with one another, leading to a transfer of linguistic features.

Traditionally, authors like Winford (2005) classify contact-induced linguistic changes into two general categories: "borrowing" and "interference" by a primary language (L1) on another language (L2). Linguistic literature has also referred to interference using alternative terms, such as "substratum influence" and "transfer" to describe, sometimes inconsistently, both the processes and the outcomes of these contact phenomena. Winford's approach is based, in turn, on VanCoetsem's (1988) classification of transfer types: borrowing under recipient language (RL) agentivity and "imposition" under source or donor language (SL) agentivity. It must be noted that, for VanCoetsem, all instances of crosslinguistic influence follow the same direction of transfer from the SL to the RL, while the agent of the transfer is either the RL speaker (for borrowing) or the SL speaker (in the case of imposition). In this framework, is is important to note that the same agents can adopt either type of agentivity; hence, the same contact context can present different transfer results.

VanCoetsem describes borrowing as a contact-induced phenomenon where the recipient language speaker is the agent, for example in the case of a Spanish speaker using English words while speaking Spanish. Conversely, in imposition, agentivity resides in the source language speaker, as in the case of an English speaker using their English phonological and articulatory habits while speaking Spanish. As specified in VanCoetsem (1995), this distinction is inherently based on the psycholinguistic notion of language

dominance, illustrated in terms of bilingual speakers' fluency and proficiency, rather than of language acquisition order or nativeness.

The two types of agentivity, originally formulated for the contexts of creole formation and second language acquisition (SLA), might not be directly applicable to the specific situation of El Paso, Texas, where bilingualism is widespread, and the two languages involved, Spanish and English, are often acquired simultaneously by the members of this speech community. The metadata gathered for this study show that while some speakers self-reported a certain extent of language dominance in either Spanish or English, many others assessed their bilingualism as balanced or symmetrical. Thus, it might be difficult to differentiate between the two types of agentivity with respect to labiodentalization in highly bilingual El Paso.

Nevertheless, the labels "borrowing" and "imposition" can be useful heuristics to better interpret the type of variation examined in this study, thus they will be used in the following sections of the present research to categorize the nature of labiodentalization in Texas Spanish in combination with additional theories that can complement and support them. The concept of agentivity can be used to understand the direction of a linguistic change, e.g. which language is more influential and is causing variation in the structure of another in a contact situation. Winford and VanCoetsem note that while borrowing usually involves lexical and, occasionally, structural changes, SL agentivity and imposition mainly concern grammatical and phonological features. In addition, imposition usually produces, via an underlying adaptation mechanism, more marked innovations on the recipient language than borrowing does. The labial consonant variation of the current study is

expected to fall within the latter category, imposition, since labiodentalized realizations involve phonetic and, as I will discuss in the following chapters, possibly deeper phonological processes that increase structural markedness.

Another relevant issue that has often emerged throughout the existing literature on linguistic variation is the debate about the sources of change in language and the distinction between internally- and externally-motivated innovations. According to Hickey (2012), changes that can be traced back to structural considerations independently of sociolinguistic factors can be categorized as internally-motivated, while variation that seems to be activated and led by social considerations can be classified as externally-motivated. Moreover, the latter type of community or society-driven change is generally more common on the level of sounds (Trudgill, 1986).

Of course, the effect of how speakers interact socially within a community on the more abstract level of linguistic structure is complex (Dorian, 1993). For this reason, the binary division into internal versus external motivations might be too reductive, thus these labels should not be interpreted as the poles of a mutually exclusive dichotomy, but rather as two different and potentially co-occurring causes for linguistic variation. In fact, the instances of convergence that often arise in language contact scenarios can be both internally and externally motivated (Myers-Scotton, 2002), or sometimes a change can be triggered by either one of these factors and then propagated by the other and vice versa. A slightly different position is the one taken by King *et al.* (2011), who advocate for the combined action of internal and external factors in linguistic change, but assign a

prerequisite role to language-internal causes that first need to be in place in order for external forces to play a major influence on any case of innovation.

Other researchers, such as Poplack (1997), promote a strict view on language change, arguing that closer scrutiny of contact claims reveals the conceptual, analytical, and methodological inadequacy of purported external motivations for linguistic variation. Poplack states that presumably contact-induced change may instead be viewed as the product of internal evolution, accusing the existing contact literature of lacking scientific rigor and of offering spurious results based on scant speaker samples, participants of unspecified bilingual proficiencies, and non-contextualized or unnatural data. In studies conducted on French-English bilinguals in Canada, Poplack *et al.* (2012) demonstrate that much of the putative contact-induced variation is better explained as internally-motivated or, even, long-standing variation.

Moreover, Poplack and Levey (2010) emphasize the difference between two different concepts: change and variability. While variability, understood as the possibility of expressing the same idea in alternate ways, is an inherent characteristic of human speech and a prerequisite condition for linguistic change, it is not synonymous with it. Instead, change itself is defined as a qualitative or quantitative difference between a linguistic outcome and an earlier stage. According to these authors, scholars should discard the instances of variability that may be mistaken for change and consider language-internal rationales before justifying a contact explanation.

Mougeon *et al.* (2005) present a methodological approach that can be applied to establish whether a specific instance of variation attested in a minority language is the

product of linguistic contact by weighing the role of inter-systemic factors, such as borrowing and imposition, and intra-systemic processes, like analogical regularization. The authors formulated a four-step methodology that can be summarized as follows: 1) determining if the change observed in language A has an equivalent in language B; 2) taking into account the presence of internally-motivated processes, for example overgeneralization of a feature or analogy; 3) considering other varieties of language A and if they feature the innovation examined or not, including both monolingual and contact dialects, as well as the interlanguage of L2 learners of language A; and 4) analyzing the distribution of the innovative variant and its correlation with the levels of contact and bilingualism within the speech-community studied.

The need for more rigorous and reliable methods for the field of contact linguistics has also been emphasized by Jarvis (2000), who advocates for a unified framework for the analysis of cross-linguistic transfer. Additionally, he suggests that numerous insights on language contact can be obtained by examining the influence of the L1 in the interlanguage performance of bilingual speakers. In subsequent work, Jarvis and Pavlenko (2008) argue that in order to claim an instance of linguistic transfer, three types of evidence are required. The first kind is "intralinguistic homogeneity," that is, the extent at which speakers of the same L1 behave uniformly when employing the L2. Conversely, the second type is "intergroup heterogeneity" that is the extent to which speakers of different L1s behave in a dissimilar way when using the L2). Finally, the third kind is "crosslinguistic performance congruity", which is the speakers' use of L2 features that corresponds to their use of those features in the L1.

Based on the aforementioned works of Mougeon *et al*. (2005), Jarvis and Pavlenko (2008), and Jarvis (2000), Treffers-Daller (2011) offers a corpus-linguistic approach to transfer aimed to distinguish between internal and external motivations for linguistic variation and change. The method employs the frequency of a certain feature across different spoken and written corpora to establish whether that linguistic characteristic is internally-motivated or a consequence of language contact. This methodology, used by the author to examine some grammatical collocations in Brussels French, proved to be particularly useful to identify instances of covert transfer and contact-induced phenomena that are more quantitative than qualitative in nature.

Mougeon *et al.*'s theoretical tool will be used in the present study to better interpret the nature of labiodentalization in Texas Spanish and to identify the crucial factors behind it in relation to the concepts of internal and external motivation as formulated by Myers-Scotton. These methods can be useful to confirm language contact as the main cause of labiodentalization in El Paso Spanish, while the notions of borrowing, imposition, and RL/SL agentivity theorized by VanCoetsem will be employed to interpret the results of the current study and determine the typology of linguistic change that labial variation represents.

3.2 Phonetic and Phonological Outcomes of Language Contact

Since the main goal of this study is the analysis of labial consonant variation in El Paso, this section will try to briefly summarize the most common outcomes of language

contact on phonetics and phonology. According to many scholars (e.g., Lleó, 2002; Siemund, 2008), the phonoprosodic domain is the most permeable area of language, showing crosslinguistic influence at the segmental, metrical, and prosodic level. This vulnerability has been shown to be related to both internal and external factors, such as markedness, complexity, and frequency of certain features, including language dominance and input typology or quantity.

The concept of markedness, as formulated by Jakobson (1941), refers to the fact that some entities can be considered marked because they presuppose other unmarked ones in a typological, acquisition, and diachronic sense. In order for a marked feature to typologically exist in a language, a corresponding unmarked entity must necessarily be present in that same system; thus, diachronically, marked items are developed after unmarked ones, and, unmarked features are acquired before their marked counterparts. Markedness is directly associated with frequency, as unmarked characteristics are more commonly featured in world languages than marked ones, as in the case of certain sounds that appear more often than others in phonological repertoires across different languages. The frequency of a feature is also correlated to its strength, in the sense that a sound with a higher number of occurrences is stronger than one with a reduced range. Lastly, the psycholinguistic notion of complexity is linked to allophony and allomorphy, so, for example, a phoneme that includes more than one phone is considered a complex category that will also be more difficult to attain during language acquisition processes than a simplex one (Siemund, 2008).

One of the main outcomes of language contact is convergence, a phenomenon that entails the reduction of the perceived distance between two or more linguistic systems and the increase of their structural similarity (Bullock & Gerfen, 2004). Although lexical borrowing is probably the most easily recognizable type, convergence processes occur at the phonetic and phonological levels as well. Related to convergence is the concept of phonological integration, particularly frequent for loan words that are well established into a recipient language. Stable borrowings often undergo a series of phonological mechanisms that have the function to integrate the phonemes of the donor language into the receiving grammar, such as deletion, sound substitutions, or epenthesis (Bullock, 2009).

Phonetic changes, are frequently attested at the subsegmental level. For example, Hazan & Boulakia (1993) studied consonant voice onset time (VOT) variations in the speech and perception of French-English bilinguals, while Flege *et al*. (2003) conducted an investigation on the interaction of multilingual speakers' vocalic subsystems analyzing the English mid vowel /eˈ/ and its Italian equivalent /e/ in Canada. These authors and many others showed that contact-induced phenomena not only exist at a categorical, phonological level, but that also more fine-grained phonetic changes are produced when two or more languages coexist in the same speech community. This is relevant for the current research because labiodentalization in Spanish has likely not acquired a contrastive value yet, representing an allophonic variation for most speakers rather than a completely independent phonemic category.

One of the most studied consequences of phonetic and phonological convergence in linguistic literature is the merger, defined by Hickey (2004) as the collapse of a phonemic

distinction by one systemic sound becoming identical with another. A characteristic of this phenomenon is that, whenever a merger is not only phonologically, but also phonetically established, the former distinctiveness of the original sounds involved is impossible to restore by later generations of speakers (Garde's Principle), unless they are exposed to different varieties of the same language where the merger has not occurred (Labov, 1994). Near-mergers are said to occur when a speaker consistently produces an articulatory difference between items of two sets but cannot perceive this distinction auditorily (Labov, 1994).

While mergers and near-mergers are not exclusively products of contact-induced processes—in fact, internally motivated sound changes of these types are attested diachronically for many languages (e.g. the famous merger of MEAT and MEET, as well as other vocalic shifts in English); the reversal of these phenomena, the so-called "demergers", are caused by external factors, such as dialect or language contact. An example of demerger triggered by dialect contact is illustrated by Trudgill *et al*. (2002), who analyzed the merger of the labial phonemes /v/ and /w/ to [β] in the VET and WET lexical sets happened in Southern British English in the 19th century; and its subsequent unmerging originated by the exposure with other varieties. Furthermore, demergers, interpreted as transfer outcomes taking place in contact situations, are more likely to happen if they lead to distinctions previously unavailable in a linguistic system, or if they assume the function of dissociation or accommodation among different social groups.

Lastly, the opposite of a merger is a phonemic split, which occurs when one phonological category becomes two (Nycz, 2013). Splits are less frequent than mergers,

since this latter type of processes usually tends to spread at the expenses of distinctions (Herzog's Principle) (Herzog, 1965; Labov, 1994). Nevertheless, splits and mergers share one common outcome from a phonological point of view: they both are typologies of sound variation that involve a change in the number of contrastive units within a language. This implication is particularly interesting because it invites us to speculate on the kind and extent of knowledge that individual speakers and speech communities have about the sounds of their languages.

Linguistic literature on contact varieties of Spanish has been prolific during the last decades, from both a theoretical and methodological perspective. Penny (2000), for example, published a thorough volume on language variation and change in Spanish that offers valuable applications of pre-existing theories and approaches to Hispano-Romance dialects. This author uses contact-based models, e.g. dialect levelling, to explain diachronically the evolution of the Spanish phonological system throughout the centuries until the present day. Very relevant for the current study is his interpretation of the merger between /v/ and /β/ in Old Spanish, justified by Penny as a simplifying or economical solution to the variation present among the labial consonant systems of different coexisting dialects in the Iberian Peninsula.

The concepts related to contact-induced phonetic changes described above will be employed in the conclusive chapters of this dissertation to understand the nature of labiodentalization in El Paso Spanish. In particular, the ideas of demerger and split are especially relevant for the current investigation. From a diachronic point of view, the presence of [v] in the dialect examined could be interpreted as an instance of demerger,

where the distinct labial sounds of Old Spanish, previously merged, are differentiated once again because of language contact with English. From a synchronic perspective, instead, it can be claimed that linguistic convergence has led to a case of a split, since labiodentalization corresponds to the fragmentation of the phoneme /b/ from the two possible allophones of standard Spanish ([b] and [β]) to three or more different phonetic realizations.

3.3 THE HISTORY OF SPANISH AND ENGLISH IN TEXAS

In order to understand and interpret language contact and its outcomes in El Paso, it is important to retrace the history of Spanish and English in this region. The presence of Spanish in the area that is now known as Texas dates back to the 1690s, when it was claimed by Spain as one of the *Provincias Internas de Nueva España* (New Spain), a region historically defined also as Spanish Texas. Compared to other American regions, Texas was not formally colonized at first, and until the official settlement of San Antonio in 1716, the presence of Spain was limited to sporadic missions and religious incursions with the aim of converting the native populations to Catholicism (Weber, 1992). The first linguistic varieties originally introduced in the Southwest by the Spanish conquerors are usually referred to as "Colonial Spanish" in historical linguistic literature (Silva-Corvalán, 2004).

Texas remained occupied by the Spanish army for decades, but starting in 1810, the Mexican War of Independence sought the emancipation of the regions of New Spain situated north of the Isthmus of Panama. The result of this conflict was the Treaty of

Córdoba (1821), which declared the independence of Mexico from Spain and the passage of Texas to the newly established Mexican Empire. During this period, the first numerous group of English-speaking settlers, led by Stephen F. Austin, known as the Old Three Hundred, decided to reside in Texas after participating in the Mexican War of Independence against Spain (Long, 2016). This is when the language contact between Spanish and English starts.

Imitating the example of Austin and his followers, groups of additional settlers from the United States started to colonize Texas, occupying land and bringing their social and linguistic practices. These anglophone immigrants, also known by the name of *Empresarios* or *Texians*, soon established a conflictive relationship with the Mexican authorities; this animosity caused the beginning of the Texas Revolution that represents the first step of the political division of Texas from the rest of Mexico. After the Texas Revolution (1835-1836) and the Mexican-American War (1846-1848), Texas was politically separated from Mexico, becoming first an independent republic, and later the 28th state of the United States of America (Hardin, 1994).

The land claimed by the short-lived Republic of Texas did not correspond exactly to the boundaries that were eventually recognized and currently compose modern-day Texas. As shown in Figure 1, the territories north of the Nueces River were not part of the Republic of Texas, while this included several areas that nowadays are under the jurisdiction of other states, such as New Mexico, Oklahoma, Colorado, and Kansas.

Figure 1: Map of the Republic of Texas, 1836–1845. The outlines of the contemporary US states are superimposed on the originally claimed territories (Source: http://www.historical-us-maps.com CC BY-SA 3.0)

According to Lipski (2008), in these territories there are still communities that descend from original settlers who never relocated since the times of the Spanish colony, proceeding through the independence of Mexico, and finally the annexation of Texas to the US. Because of these numerous political adjustments, many Spanish speakers changed countries and nationalities without even moving, as reflected in the traditional saying "they didn't cross the border; the border crossed them." As a result, the Spanish spoken in

Northern Mexico and the varieties present in Texas and in the rest of the Southwest regions of the US are considered to constitute a smooth dialectal continuum.

The differences between rural and urban areas, various regional traits, as well as the constant inner and international migratory movements are only a few of the many causes for the tremendous level of linguistic variation and structural complexity that characterize Texas Spanish. As a consequence of diverse political and economic reasons, such as the Mexican Revolution (1910-1920), labor shortage in the US, and periods of severe recession, Texas, and in particular its border areas, have always been characterized, and still are, by continuous migratory fluxes, sometimes temporary, more long-lasting in other instances (Richardson *et al*., 2005). Immigration related to these and other international events caused, according to Silva-Corvalán (2004: 208-209), a "re-Hispanization of the Spanish borderlands" and, subsequently, dialect contact between Traditional Southwest Spanish and other varieties, mostly from Central and South America.

3.4 Spanish and Language Contact in Contemporary Texas

The ever-changing population composition, irregular migration patterns, underrepresentation in census counts, and the presence of some undocumented residents make the demographic analysis of Spanish speakers in Texas challenging and inevitably approximate. Despite these limitations, the presence of Spanish speakers is growing in most Texan urban areas, and, according to the data published by the Pew Research Center,

in 2014 the state of Texas was ranked second in the United States in terms of total number of Hispanic residents, and first for percentage of Latino population. Moreover, since the first census that offered data on the Hispanic population, realized in 1960, Latinos have increased from 6.3 million to 55.3 million by 2014 in the US (Figure 2), and the U.S. Census Bureau (2014) estimates that it is projected to grow to 119 million by 2060. However, this trend might be affected by the recent political events and Donald Trump's ascendance to the presidency.

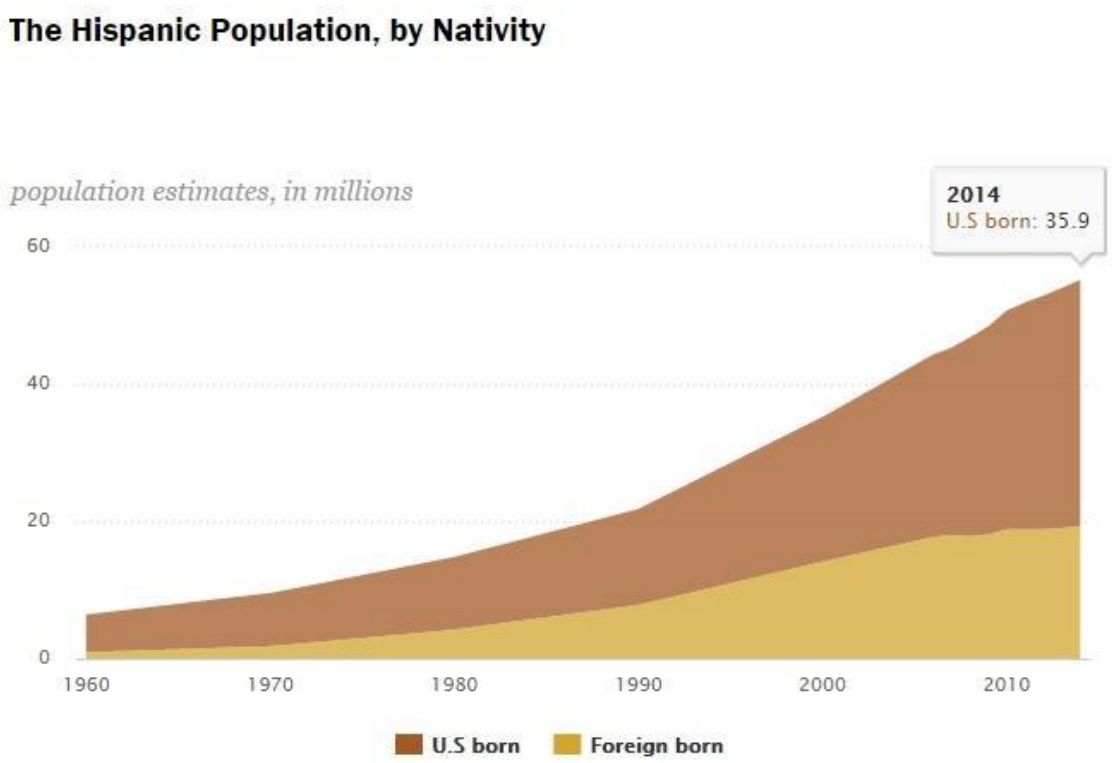

Figure 2: The Hispanic population in the U.S., by nativity, from 1960 to 2014. (Source: http://www.pewresearch.org)

These reports suggest a long-lived and strong presence of Spanish language in this country, whose transmission and structure is conditioned by the contact with English and the influence of other varieties spoken by foreign-born Spanish speakers.

The data released in 2014 by the Pew Research Center, as illustrated in the following chart (Table 1), include some specifics about the state of Texas and its Hispanic population: specifically, 87% of the Latino/a population is of Mexican origin or heritage.

Table 1: Texas Hispanic population and national origin (2014). (Source: http://www.pewresearch.org)

		U.S. rank
Total Hispanic population in Texas	10,405,000	2
Hispanics as percent of state population	39%	3
Hispanics as percent of U.S. Hispanic population	18.8%	2
U.S.-born Hispanics (percent of Hispanics)	70%	20
Foreign-born Hispanics (percent of Hispanics)	30%	32
Mexican origin (percent of Hispanics)	87%	3
Non-Mexican origin (percent of Hispanics)	13%	45

Another relevant statistic about the linguistic portrait of Texas is that only 24% of the population speaks English only at home, while the rest (76%) stated that they speak a language other than English in their households. Moreover, in the Southwest, only 27% of people who self-reported to speak Spanish at home do not know English well or at all, suggesting that in most cases Texas Spanish is a contact variety at the level of individual speakers, as well as from a bigger societal perspective.

Despite the very high rates of bilingualism in Texas, the array of linguistic literature on Spanish and English in contact in this state is still somehow limited, especially if compared to the amount of similar studies conducted in other US regions, such as California, Florida, or the Northeast. Valuable contributions on this topic have been offered by authors like Silva-Corvalán (2004), as a part of her linguistic analysis of the Southwest; C. Hickey (2012) and Anderson-Mejías (2005), in their investigations on language use and attitudes in southern Texas; and Amastae (1982), who examined language shift and maintenance in the Lower Rio Grande Valley. Nevertheless, so far scholars have focused mostly on the sociohistorical and pragmatic aspects of Spanish in contact with English in Texas, while the phonological and phonetic characteristics of the varieties spoken by bilinguals living in this state are still understudied.

3.5 El Paso: Past and Present

Having described the historical and current linguistic landscape of Texas in general, this section will focus on the specific region analyzed in this study: the El Paso area, the westernmost county of the state, situated east of the Mexican border. The name El Paso is the short form for *El Paso del Norte*, 'The Pass of the North', because in this zone the Rio Grande river creates a pass through the mountains. According to the U.S. census[6], El Paso is, with a population of 800,647 inhabitants, the sixth-most populous city in Texas and the 19th-most populous city in the country. Additionally, El Paso, together with two cities

[6] U.S. census data accessed November 2016 (www.census.gov).

across the state borders, Ciudad Juárez, Mexico and Las Cruces, New Mexico, constitutes an international metropolitan area.

El Paso del Norte was founded in 1659 by Fray García de San Francisco and other Spanish Franciscan friars at a mountain pass as a settlement for agriculture and religion-related activities. Most of its territory was located south of the Rio Grande river, areas that today are part of the state of Chihuahua, Mexico. Politically it was part of New Mexico, Spain: this is when the historical presence of the Spanish language began in this area. The land corresponding to present-day El Paso remained mostly undeveloped during the period of Spanish control due to natural obstacles, such as the water of the river and the numerous sand dunes, as well as constant instability and conflicts between the Spaniards and European-descent colonizers and the armies of native tribes like the Apache and Comanche (Metz, 1993).

El Paso del Norte was never directly involved during the Mexican War of Independence, but when the Spaniards were defeated in 1821, the city passed to Mexico along with the other territories of New Spain, as a part of the state of Chihuahua. Similarly, as this region was not considered part of Texas, it was not overtly affected by the Texas Revolution (1836). However, after the Treaty of Guadalupe Hidalgo, the settlements situated north of the Rio Grande officially became American dominions, while the districts of Old El Paso del Norte on the other side of the river remained Mexican possessions and currently constitute part of Ciudad Juárez, Chihuahua. Only years later did the Compromise of 1850 draw the boundary that separates Texas from New Mexico and was El Paso County established in March of the same year (Timmons, 1990).

Although a scattered group of Anglophones was already residing in El Paso since the early 1800s, the presence of the English language started to become stronger starting in 1836 when Anglo when American settler families arrived in significant numbers. The proportions of the Anglo-American population increased constantly until 1910, the year of the beginning of the Mexican Revolution, which attracted a massive flux of refugees to the fast-developing El Paso area. Among the newcomers were middle-class intellectuals, clerics, and businessmen; as a result, numerous Spanish-language newspapers, schools, and theaters appeared in town, modifying its social and linguistic landscape once again (Timmons, 2010).

During the twentieth century, different socio-economical circumstances impacted the demographics of El Paso. Specifically, many middle-class white Americans departed to find better jobs in other parts of the country, while at the same time, local entrepreneurs and companies started hiring cheaper Mexican labor. Between 1931 and 1934, the city witnessed a major influx of Mexicans and Mexican-Americans expelled from other parts of the United States. The Work Projects Administration and the Civilian Conservation Corps tried to help the numerous, unemployed newcomers, hiring them to do work on public infrastructure, roads, and buildings, such as the famous Scenic Drive. Immigration from the other side of the border was also fostered by the Bracero Program (1942-1956), which attempted to replace the losses of the diminishing white community (De León, 1993). As a consequence of this series of movements, by 1965 Hispanics represented a majority again in El Paso and the situation has not changed today: As shown in Table 2, Hispanics constitute 81% of the county population according to the 2014 census estimate.

Table 2: El Paso County Hispanic population and national origin (2014). (Source: http://www.pewresearch.org)

	1990	2000	2014
Hispanic population Rank	411,619 10	531,654 14	676,926 14
Total county population	591,610	679,622	833,487
Hispanics as percent of county population Rank	69.6% 27	78% 18	81% 17
		Change from 1990	**Change from 2000**
Hispanic population change Rank		120,035 18	145,272 22
Percent change in Hispanic population Rank		29% 2,651	27% 2,835

Another important event was the election, in 1957, of Raymond Telles, the city's first Hispanic mayor, which, along with the general cultural change flourishing during the 1960s in the United States, represented the beginning of the demand for civil rights amongst the Latino population in El Paso. Especially under the leadership of the League of United Latin American Citizens (LULAC) and Veterans groups, remarkable achievements were obtained during the 1960s and the 1970s, offering more and better educational opportunities for Mexican American youth in the El Paso County. Those years were also characterized by the consolidation of transborder networks and international crossings due to the economic boom and the increasing development of the maquiladora textile industry in Ciudad Juárez.

The situation changed dramatically in the 1990s, when the local economy was affected by international competition and the negative consequences of the infamous drug wars in Chihuahua affected the social habits of Mexican-American families both in Texas and Mexico. El Paso is greatly sensitive to changes in the Mexican economy and the

regulation of cross-border traffic; for example, the increasingly restrictive border controls after September 11th 2001 and the Mexican peso devaluation in 1994 were felt strongly in El Paso (Timmons, 2010). Because of the delicate conditions in Ciudad Juárez, for years, and in certain cases to the present day, many people residing in El Paso limited or ceased completely their once regular visits to Mexico, including business meetings, family reunions, and recreational activities on the other side of the border, now considered unsafe.

The historical and social circumstances described above make clear that El Paso has been and is still today a unique context characterized by language contact between Spanish and English, the influence of various Hispanic dialects, and a constant movement of speakers from different regions, such as New Mexico, Texas, and Mexico. This incredible linguistic richness and complexity renders the El Paso area into the ideal environment for sociolinguistic research and it offers great potential for investigations on bilingualism and language variation. Nevertheless, the linguistic literature dedicated to the study of El Paso Spanish and its speakers is extremely limited.

Among the few contributions available about El Paso, some studies deserve mention, such as the research conducted by Velázquez (2009, 2013) on discourse analysis, linguistic ideologies, and language transmission in this region; or the investigations carried out by Achugar (2008) and Achugar & Pessoa (2009), who examined language attitudes towards Spanish and English, as well as the power play existing between these two languages and their speakers in the academic context of The University of Texas at El Paso. The current study represents an attempt to document and analyze the sociophonetic variation present

in the dialect of Spanish spoken in El Paso, based on a quantitative study dedicated to the production and perception of voiced labial consonants in this speech community.

Chapter 4: Sociolinguistic Variables and Hypotheses

4.1 INTRODUCTION

As mentioned previously, the overarching goal of this project is to contribute to the on-going scholarly discourses on Spanish voiced labial consonants variation, Spanish in contact in the United States, and sociolinguistic theories surrounding convergence and sound change. More specifically, this dissertation analyzes labial consonant variation in a dialect that presents the possibility of disentangling the contact versus archaism explanations: the Spanish of El Paso, Texas. In view of the numerous gaps in the literature about labial variation in Spanish, the relative newness of the field of bilingual sociophonetics, and the very limited number of studies on Texas Spanish, further research on such issues in contact varieties is necessary.

Every investigation on Spanish labiodentalization carried out so far has employed auditory methods based on naturalistic rater perception; this dissertation, in contrast, includes both impressionistic analysis and acoustic measurements. Within the field of sociophonetics, it is argued that the use of a subsegmental approach that includes continuous acoustic variables can yield a better understanding of phonological variation and a more accurate description of the various factors conditioning sociolinguistic phenomena far beyond the superficial and incomplete information deducible from discrete segmental categories (Hay & Drager, 2007), often constructed or imposed arbitrarily by researchers.

In response to the absence of previous empirical studies on Texas Spanish, the present project employs laboratory phonology methodologies through two analyses conducted with participants from El Paso, Texas, to examine if they produce an auditorily perceptible and acoustically measurable distinction between [v] and [β] or [b] as discrete categories. Additionally, this inquiry takes into account the linguistic factors (phonological context, orthography, stress, lexical frequency) and the speaker-related sociolinguistic variables (e.g. age, gender, education level and type, language proficiency in Spanish and English) that condition the use of labiodental [v] versus bilabial [b] and [β]. While the specifics of the production study, as well as its procedures, materials, and results will be illustrated in Chapter 5, the following sections are dedicated to the sociolinguistic variables included in the present investigation and to the research hypotheses formulated in relation to them. Such variables were used to weigh the possibility that the production of [v] can be attributed to the persistence of this segment as an archaism, as proposed by Torres Cacoullos & Ferreira (2000), as opposed to an outcome of language contact phenomena arising from English influence, as well as to determine the motivation, either external or internal, for the case of linguistic change examined.

4.2 Research Questions and Hypotheses

The hypotheses presented in this chapter will relate to the research questions formulated previously (Chapter 2):

RQ1: Do the bilingual speakers from El Paso, Texas produce a sound perceived to be [v] for what is traditionally Spanish /b/?

Hypothesis: Based on pilot research (Trovato, 2017), it is hypothesized that currently bilingual speakers from El Paso, Texas produce a sound perceived to be [v] for what is /b/ in standard Spanish.

RQ2: Are there acoustic differences between sounds perceived as [v] vs. either of the bilabials [β] or [b]?

Hypothesis: Based on a pilot study on labiodentalization in El Paso, Texas (Trovato, 2017) and previous linguistic literature (Carrasco *et al*., 2012; Carrasco, 2008; Colantoni & Marinescu, 2010; Hualde *et al*., 2010; Mazzaro, 2011; Gerfen, 2002; Pindziak, 2012), I predict significant acoustic differences in one or more acoustic parameter (duration, relative intensity or COG)

RQ3: What linguistic factors condition the use and distribution of [v] versus either [β] or [b]?

Hypothesis: Based on previous linguistic studies of labiodentalization in Spanish (Stevens, 2000; Torres Cacoullos & Ferreira, 2000; Sadowsky, 2010; Vergara, 2011; Takawaki, 2012; Trovato, 2017), I expect the linguistic factors of orthography, within-word position, and cognate status to be strong predictors for the use and distribution of labiodental consonants. Among these variables, I predict orthography to have considerable effects on labial variation;is hypothesized that cognate status will affect labiodentalization rates, corresponding to higher frequencies of [v] in lexical items featuring the

grapheme <v> in both English and Spanish. I expect labiodentalized consonants to be more common in word-medial position, showing that the case of variation examined is contact-induced, rather than an articulatory strengthening phenomenon. Based on the results from previous studies (Eddington, 2011; Gonzalez, 2014; Trovato, 2017), it is hypothesized that labiodentalization in Texas Spanish will be favored in stressed syllables, whereas bilabial allophones will appear more likely in atonic environments. Based on the results from other investigations on labiodentalization (Romero *et al.*, 2008; Sadowsky, 2010; Vergara, 2011), my hypotheses about the effects of adjacent phonemes on labial consonants in Texas Spanish are the following: higher occurrence of stops [b] after nasal consonants; more frequent presence of fricatives/approximants between vowels; back rounded vowels /u/ and /o/, as well as the glide /w/ promoting the use of the allophone [β]; and the vocalic phonemes /a, i, e/ favoring the labiodental fricative [v]. Based on the results from previous studies on labiodentalization in Spanish (Torres Cacoullos & Ferreira, 2000; Takawaki, 2012), it is hypothesized that high-frequency words will be more likely to be pronounced with the labiodental fricative [v].

RQ4: What speaker-related and sociolinguistic factors condition the use and distribution of [v] versus either [β] or [b]?

Hypothesis: sociolinguistic factors, such as gender and education type, are expected to have an impact on labiodentalization Based on previous sociolinguistic studies of labiodentalization in Spanish (Torres Cacoullos &

Ferreira, 2000; Romero *et al*., 2008; Stevens, 2000; Trovato, 2017), I expect the speaker-related factors of gender, age, and language proficiency to be strong predictors for the use and distribution of labiodental consonants. Following the trend found in these investigations of women leading this change, it is hypothesized that female speakers will produce more labiodentalized consonants than male participants. I also predict that younger speakers will produce more labiodentalized consonants than older generations, indicating an apparent-time change in progress, rather than an archaic feature. Also based on the results from these studies, I expect a correlation between higher English writing/reading skills and more frequent use of the labiodental allophone [v] as a consequence of language contact and convergence. At the same time, I anticipate a correlation between higher Spanish writing/reading skills and more instances of labiodentalization as well, as an effect of the orthographic distinction between <b> and <v> of written Spanish. Based on previous sociolinguistic studies on labiodentalization (Cartagena, 2002; Vergara & Pérez, 2013; Torres Cacoullos & Ferreira, 2000; Takawaki, 2012; Vergara, 2011), I expect more educated speakers to produce higher rates of [v], in order to show faithfulness to the Spanish orthographic system. Moreover, I hypothesize a greater use of labiodental allophones among participants who received their formal education in English because it can be assumed that these informants have been exposed more intensely to English phonology and orthography.

In this chapter, I will present the linguistic variables and the social factors included in the experimental design of this dissertation, illustrating how they might affect the production of Spanish voiced labial consonants. The internal and external factors employed in the present project will be justified and discussed in relationship to previous sociolinguistic literature. Additionally, I will formulate hypotheses about the influence and effects of variables on labiodentalization in El Paso, Texas.

4.3 LINGUISTIC VARIABLES

Linguistic or internal variables are relevant for the present study because they can provide information about the state, distribution, and direction of a change, revealing, for example, what intra-systemic factors predict or promote the occurrence of labiodentalization in Texas Spanish. Among the linguistic variables that will be presented and discussed in the following sections, some of them, such as orthography and cognate status, are particularly important, as these factors can be interpreted as predictors of language contact and convergence between Spanish and English.

4.3.1 Orthography

Spelling is a relevant linguistic variable in the current study because of the conservative nature of Spanish orthography and the presence of distinctive phonemes corresponding to <b> and <v> in English. Nevertheless, the relationship between

orthography and labial consonant pronunciation in previous literature is rather controversial. Many authors have stated that labiodentalization appears mostly in reading styles and non-spontaneous speech, often as a consequence of hypercorrection (Cartagena, 2002), a phenomenon typical in speakers who want to distinguish phonetically the graphemes <b> and <v> in an artificial way (Menéndez Pidal, 1977).

However, Sadowsky (2010) showed that in Chilean Spanish there is no correlation between graphemes and phonetic realizations of /b/: in his study both <b> and <v> corresponded to [v] in most instances. These findings were confirmed by Vergara and Pérez (2013), who conducted a study on speakers of the same monolingual dialect of Spanish and obtained very similar results. Additionally, Vergara (2011) demonstrated that labiodentalization in Chile is not related to orthography by studying pre-literate speakers only, young children aged between 4 and 5 years, who produced /b/ as [v] in most of their utterances.

When analyzing the variety of Spanish spoken in New Mexico, Torres Cacoullos and Ferreira (2000) found that orthography affected labial variation, with the grapheme <v> favoring labiodental pronunciations, but only for low-frequency words, whereas more common lexical items were not influenced by spelling. Another study of labiodentalization carried out by Stevens (2000) among Spanish-English bilinguals in the U.S. revealed a categorical relationship between [v] and the grapheme <b>: the labiodental allophone was never pronounced for words spelled with orthographic <b>, while <v> items featured both bilabials and labiodentals at nearly the same rate.

In Texas Spanish, I expected to observe a correlation between graphemes and labial pronunciations, with <b> favoring bilabial realizations and <v> increasing the occurrence of labiodentalization, because of the effects of English orthography and phonology.

4.3.2 Cognate Status

The variable cognate status refers to phonetic and orthographic similarity of words between the Spanish and English lexicons. For instance, the Spanish word "*valor*" would be considered as a cognate in this research because it resembles its English equivalent "value" and it has an cross-lingual homonym in English "valor", while the word "*ver*" would not (since its translation would be "to see"). Cognate status has been interpreted as a predictor of phonetic outcomes in contact. In his study of voice onset time among Spanish-English bilinguals, Amengual (2011) showed that cognate status significantly promotes cross-linguistic convergence and affects significantly speakers' consonant pronunciation. Amengual (2016) indicated that cognate status has an effect on both the phonetic production and processing of vocalic sound contrasts among bilingual speakers.

As for literature on labiodentalization in particular, Torres Cacoullos and Ferreira (2000) found that cognates featuring <v> in Spanish and English favored labiodental pronunciations, but only for low-frequency words, whereas more common lexical items were not influenced by this variable. In Texas Spanish, I expect cognate status to affect labiodentalization rates; more specifically I predict higher probability of of [v] in lexical items featuring the grapheme <v> both in English and Spanish.

4.3.3 Stress

Previous literature on Spanish labiodentalization has not included stress as an internal variable, but it can provide us with information about the distribution and direction that characterize the instance of linguistic variation examined in the current research. For example, stress patterns might suggest whether labiodentalization behaves as an articulatory strengthening mechanism employed by speakers (e.g. more labiodental realization in stressed syllables) or not. It can be deduced that this factor might affect the production of voiced labial consonants by examining the findings from other studies about phonetic variation in general. In fact, a mention can be found in a study conducted by Eddington (2011) on voiced approximants in Spanish, in which the author concluded that [β] is less lenited when this consonant falls between two stressed syllables. Additionally, González (2014) carried out an investigation on voiced obstruents in Peninsular Spanish, which revealed that frication is more frequent in stressed syllables than in unstressed syllables. The researcher suggested that in stressed syllables a higher subglottal pressure produces higher airflow across the glottis, favoring frication. These findings lead me towards the prediction that, in general, labiodentalization in Texas Spanish might be favored in stressed syllables, whereas bilabial allophones are expected to appear more likely in atonic environments.

4.3.4 Adjacent Phonemes

Linguistic literature has shown that the preceding and following phonetic context can affect significantly both the realization and perception of consonants in multiple ways, but in this section I will focus on the main effects of adjacent segments on labiodentalization and labial variation. Sadowsky (2010) found that in Chilean Spanish /b/ is more likely to be realized as [b] after a nasal stop, a pause or in utterance-initial position (#__); as [β] after the voiced velar plosive /g/; while the allophone [v] is the most common one between vowels and after liquid consonants, the voiceless alveolar sibilant /s/, the voiced dental /d/, and the voiced bilabial /b/.

Vergara (2011) partially confirmed these data, with slight variations: In her results absolute initial position favored the appearance of the allophone [v] and not [b], while liquid consonants were followed by either [v] or [β] with equal frequency. The same author showed that the preceding vowel has an effect on the pronunciation of /b/: [v] is overall the most frequent allophone in postvocalic position, but while /e, i, a, o/ highly favor the appearance of labiodental realizations, /u/ can be followed by either [v] or [β] with similar rates. Postvocalic environments, along with the fricative /s/, were also significantly correlated with labiodentalization in Takawaki's (2012) investigation of labial variation in New Mexican Spanish.

As for following segment, both Vergara and Takawaki's studies suggest that [v] is the most common allophone before liquids, vowels, nasals, and the approximant /j/. On the other hand, the glide /w/ seems to favor bilabial realizations, probably due to an articulation assimilation process, and the voiceless fricative /s/ is usually preceded by [b]. The

allophone [v] predominates also before vowels, although its frequency decreases when the following phoneme is /u/, often preceded by [β]. The latter result is partially confirmed by Romero *et al*. (2008), whose findings suggest that labiodentalization is more frequent when /b/ is followed by /a, e, i/ and disfavored when the consonant precedes the rounded back vowels /i/ and /u/.

Considering all these findings, my predictions about Texas Spanish are the following: higher occurrence of stops [b] after nasal consonants; more frequent presence of fricatives/approximants between vowels; back rounded vowels /u/ and /o/, as well as the glide /w/ promoting the use of the allophone [β]; and the vocalic phonemes /a, i, e/ favoring the labiodental fricative [v]. However, I do not expect these internal variables to have a strong effect on labiodentalization, since my hypothesis is that labial variation in El Paso Spanish is a consequence of language contact (i.e., affected by English orthographic conventions).

4.3.5 Within-Word Consonant Position

The target consonant position within a word, which can be either initial or medial, can indicate whether labiodentalization is a phenomenon affecting the labial phoneme /b/ in its entirety, or only some of its allophonic realizations. As described in the previous chapters, labial phones in standard Spanish are characterized by complementary distribution, so consonant position can point to a given allophone (either [b] or [β] in most varieties).

The variable of position has been tested in previous linguistic literature. For instance, Romero *et al*. (2008) showed that labiodentalization is more likely to occur in word-initial position in Venezuelan Spanish as a consonant strengthening mechanism. This claim was corroborated by Hoyos Piñas (2013), who stated that the realization of the phoneme /b/ as [v] occurs almost exclusively in absolute initial position and very rarely word-medially in the dialect of Cáceres, Spain. An investigation realized by Eddington (2011) of voiced approximants in Spanish indicated that [β] exhibits more constriction in word-initial than in word-internal position: although greater obstruction might correspond to more fricative-like articulations, this does not necessarily translates into the labiodentalization of /b/.

From examining the correlation between postvocalic environments and labiodentalization, it can be deduced that in many varieties of Spanish [v] occurs more frequently in word-medial position (Sadowsky, 2010; Vergara, 2011; Takawaki, 2012). As a consequence, I expect labiodentalization in Texas Spanish to be correlated with medial position as well. The opposite, more instances of [v] in word-initial position, would suggest that labiodentalization is an articulatory strengthening process or an emphatic strategy.

4.3.6 Lexical Frequency

Lexical frequency might reveal important information about the nature of labiodentalization in Spanish. Torres Cacoullos and Ferreira (2000) interpreted this

phenomenon as an archaism on the basis that the labiodental allophone [v] was more common in high-frequency words in New Mexican Spanish. In her study on this variety, Takawaki (2012) found that high-frequency words (the author mentions the lexical items *ver* 'to see', *novio* 'boyfriend', *vez* 'time', and *vivir* 'to live' as examples) were more likely to be pronounced with the labiodental fricative [v].

A different theory of word frequency in general was formulated by Bybee (2002), who examined the rates of /t, d/ deletion in American English to argue that the frequency with which lexical items are utilized in the contexts for change will affect how readily the word undergoes a change in progress. In this dissertation, lexical frequency was calculated using the frequency dictionary of Spanish created by Davies (2008) and assigning numerical values to each token: following the author's criteria, high-frequency words corresponded to low values, while less common terms were associated with higher numbers. Based on the results from the studies on labiodentalization mentioned above (Torres Cacoullos & Ferreira, 2000; Takawaki, 2012), it is hypothesized that high-frequency words will be more likely to be pronounced with the labiodental fricative [v].

4.4 SOCIAL VARIABLES

Social or speaker-related variables have been used extensively in quantitative studies of language variation since Labov (1966) established sociolinguistic methodologies with his famous investigation conducted in New York's Lower East Side. Subsequent literature has employed the Labovian social variables enriching the field of linguistics with

frameworks and methods from other disciplines, such as anthropology and sociology (Meyerhoff, 1994). Social factors are relevant for the present study because they can provide information about the state, distribution, and meanings of variation, showing, for example, what extra-systemic factors predict or promote the occurrence of labiodentalization in Texas Spanish. The canonical speaker-related variables of age, gender, education level, and language proficiency will be presented and discussed in the following sections, along with hypotheses and predictions on how they correlate with labial consonant variation in the speech community examined in the current study.

4.4.1 Age

Age as a sociolinguistic variable provides information about what generational groups produce a particular phonetic variant; this can indicate whether a linguistic feature reflects a change in progress or a stabilized characteristic within a speech community. The only mention about age effects in the literature on labiodentalization is offered by Torres Cacoullos and Ferreira (2000), who found that the younger speakers have the lowest labiodentalization frequency overall in New Mexican Spanish. That is why the authors categorized the presence of the voiced labiodental allophone [v] in this dialect as a remnant from Old Spanish rather than an innovative phonetic trait.

In the present research about Spanish in El Paso, Texas, I predict labiodentalization to be a change in progress. I expect to find the following age differences: more labiodental

realizations among younger speakers, reflecting that voiced labial variation is a linguistic change still in progress.

4.4.2 Gender

Few investigations dedicated to Spanish voiced labial variation have provide evidence about gender effects, or differences in consonant production between males and females. Nevertheless, this variable can offer insights about the socio-indexical meanings associated to a linguistic feature and reveal if a given variant is used by speakers to build their social identity, define their role within a group, or indicate their belonging to a speech-community. Romero *et al*. (2008) interpreted labiodentalization as a mark of femininity in Venezuelan Spanish because in their study on voiced labial variation female participants produced significantly more labiodental consonants than their male counterparts. Stevens (2000) drew a similar conclusion after analyzing the speech of Spanish-English bilinguals living in California and observing that women favored the realization of the labiodental and male speakers disfavored it.

Previous sociolinguistic literature suggests that women generally tend to mark a greater distinction between phonetic pairs (Pépiot, 2013), which, within the current study, might be reflected in a more clear-cut differentiation between labiodental and bilabial consonants among women than among men. According to Simpson (2009), this phenomenon could be explained by cultural and sociophonetic factors and it supports the concept that women would try to achieve a more intelligible speech than their male

counterparts. Furthermore, women often tend to remain loyal to standard and prestige forms, in the current study represented by etymological orthography and by English conventions. Stevens (2000) explicitly stated that it is possible that [v] may hold a certain amount of prestige or at least be viewed as a neutral, non-stigmatized feature in Spanish. Additionally, the observed phenomenon can also be considered an instance of linguistic change in progress, typically led by female speakers (Labov, 2001; Cameron, 2003). For all these reasons, I expected female speakers of El Paso Spanish to produce more labiodentalized consonants than male participants.

4.4.3 Education Level and Language

Education level and formal education language are two separate, but interconnected sociolinguistic variables. Previous literature states that labiodentalization occurs as a direct consequence of formal education (Cartagena, 2002) and it is a phenomenon observable especially in the speech of teachers and other professionals that work in the field of communications. Vergara and Pérez (2013) claim that the distinction between voiced bilabials and labiodentals is encouraged by the education system in many Spanish-speaking regions as a learning strategy to improve and facilitate students' writing proficiency. Torres Cacoullos and Ferreira (2000) found that speakers who studied Spanish at the university level present a significantly lower labiodentalization frequency in New Mexico. Their explanation for this result is that labiodental realizations are often censured or taught to be foreign in formal Spanish-language classes. Takawaki (2012) indicated that participants'

education level is significant in predicting the realization of /b/ as the labiodental fricative [v], with educated speakers producing more labiodental allophones, while the non-educated informants do not. However, it is not clear whether these highly educated speakers in her study had received their formal education in Spanish or English, nor if they had studied Spanish at the university level.

In terms of literacy and its effects on labial consonant variation, valuable contributions have been offered by Vergara (2011); her study involving Chilean children demonstrated that labiodentalization occurs also among illiterate speakers and, as confirmed by her results, [v] is indeed the most frequent allophone of /b/ in this particular variety of Spanish.Vergara (2013) included both literate and unlettered participants whose performance yielded similar results, suggesting that labiodentalization is not correlated with informants' literacy level in Chilean Spanish.

In El Paso Spanish I expected more educated speakers to produce higher rates of labiodentalization, in order to show faithfulness to the orthography of the word. Moreover I hypothesized a greater use of the allophone [v] among participants who received their formal education in English because it can be assumed that these informants have been exposed more intensely to English phoneme to grapheme mappings.

4.4.4 Language Proficiency

In this dissertation, four separate factors were included as individual variables to examine the effects of language proficiency and dominance on labiodentalization in Texas

Spanish: 1) Spanish Writing ability, 2) Spanish Reading ability, 3) English Writing ability and 4) English Reading ability. These speaker characteristics are potentially intertwined with the variables described in the previous section, formal education level and language, as well as with a key linguistic variable, orthography.

The only previous study on labiodentalization that mentions language dominance was Stevens (2000), because his experiment design involved both native and non-native speakers of Spanish. According to this author's results, whether an informant was a native Spanish speaker or not was significant, with non-natives more likely to produce labiodentals than natives, potentially due to the influence of the English L1 phonological system on Spanish as an L2 pronunciation.

The linguistic profile of the bilinguals involved in the current research is different from that of Stevens (2000) and the distinction between native and non-native speakers is not relevant as all participants are native speakers of Spanish. However, I expect language proficiency and dominance levels, as measured by reading and writing ability, to affect the labiodentalization rates during the present analyses. More specifically, I predict a correlation between higher English writing/reading skills and more frequent use of the labiodental allophone [v] as a consequence of language contact and convergence. I anticipate that this effect will carry over to Spanish where higher Spanish writing/reading skills will also lead to more instances of labiodentalization, as an effect of the orthographic distinction between <b> and <v> of written Spanish.

Following the conventions of previous sociolinguistic literature, and because of their relevance for the current investigation, all the linguistic and social variables described

in this section will be included in the analyses part of this project. The following chapter, dedicated to the production study, will present summaries of the variables utilized for each experiment, as well as their reference levels, and additional details about their effects on labial consonant variation in the examined datasets.

Chapter 5: Production Study

5.1 Introduction

This chapter is dedicated to a production study conducted with the participation of Spanish speakers from El Paso during 2016. For this investigation, a reading task and a picture-naming task were employed in order to document and study voiced consonant variation in the dialect spoken in West Texas and which sociolinguistic factors are related to this phenomenon. The data gathered through these experiments were examined using two analyses, one auditory and one acoustic. After describing in detail the experimental designs and methods utilized, the results will be presented and interpreted.

5.2 Auditory Analysis

The first part of the production study consists of an auditory analysis based on aural discrimination of voiced labial consonants produced by Spanish speakers from El Paso, Texas. The methods employed for this study are described in detail in the following section.

5.2.1 Auditory Analysis: Methods

5.2.1.1 Auditory Analysis: Participants

Thirty bilingual speakers, 15 males and 15 females, equally distributed in three age groups (20-30, 30-40, and 41+ years old) participated in this study. All were second-

generation Spanish-English speakers living in the U.S. who had spent most of their life in the El Paso area. Informants participated in this study on a voluntary basis, without receiving any kind of compensation. They were recruited through snowball sampling of "friends of friends" (Milroy, 1980) and relatives of friends from the researcher's informal and academic networks. The experiment took place between the summer and the winter of 2016. Table 3 summarizes participants' characteristics by age and gender.

Table 3: Speakers (N = 30) by age and gender.

Age by Gender	**Men (*n* = 15)**	**Women (*n* = 15)**
20-30	5	5
30-40	5	5
>40	5	5

5.2.1.2 Auditory Analysis: Tasks

Before starting the actual data elicitation tasks, informants answered some basic sociolinguistic questions (see Appendix C) to obtain metadata about their age, education level, and type of school attended (English-only or bilingual programs). Additionally, they provided a self-assessment of language proficiency, rating on a Likert scale from a minimum of 1 to a maximum of 5 points their skills in Spanish writing, Spanish reading, English writing, and English reading. They then completed two separate tasks. A reading task presents orthographic stimuli directly to the participants and a picture naming task elicits pronunciations without an orthographic prompt.

The first task for data elicitation was a reading test featuring words that include the graphemes <b> and <v>. This type of task has been already used in previous research on labiodentalization in Spanish, often in combination with other methodologies and procedures. Takawaki (2012), for instance, used two reading tasks, a word list and a paragraph, while Stevens (2000) employed a word list as the first stage of his investigation on labial variation among bilinguals in California, finding lower rates of labiodental realizations in the careful reading task than in more informal styles.

Similar results emerged from another study on labiodentalization, carried out by Vergara and Pérez (2013) among young speakers (aged 12-14) in Chile, that utilized both a word list and a semi-directed interview. They showed that, although [v] was the most frequent allophone for both tasks, its occurrence was higher during the less formal test, while the reading stage favored the production of bilabial allophones. Sadowsky (2010) included only a list of lexemes featuring the phoneme /b/ in his experimental design on Chilean Spanish, and Vergara (2013) employed both a word list and a picture-naming task. Vergara used different groups of participants in Chile for each experiment, so her results cannot provide us with information about the effects of these different methodologies on labiodentalization among individuals; however, her methodology is followed here.

For the present task, participants completed the experiment in a quiet environment, an office without windows, while the researcher was present, in case they needed further explanations or experienced technical issues. Informants read aloud 120 stimuli presented in a pseudo-random order, one at the time, at their own pace, without time constraints, on a computer screen. Speakers were informed that they could repeat a word if they wanted.

Items were read in isolation so as to elicit potential plosive realizations for word-initial labial consonants. The investigator never asked participants to produce a particular realization for voiced labial consonants nor asked if they were capable of producing any of these phones, but rather provided them with the experimental materials and asked if they would be able to perform the task. All speakers were able to complete the word list task. Each informant completed the task in approximately ten minutes. Their productions were recorded on a laptop using the software Audacity (Audacity Team, 2016) and a desk microphone. The sample rate was 48 kHz, bit rate 16-bit, frequency response 20 Hz - 20 kHz, max SPL 120 dB (THD: 0.5% 1 kHz). The second production task consists of a picture-naming test administered to the same 30 speakers, under similar circumstances, after the reading task. Between the reading task and the picture-naming test, the researcher asked participants if they needed a recess or some water, to make sure they were physically able to complete the study in normal conditions. The stimuli for the picture-naming test were presented on a computer screen in a pseudo-random order, one at the time, without time constraints. In order to complete this task, participants were asked to describe aloud what they were shown, mostly pictures of everyday objects or animals, giving the name of the item in isolation, producing utterances like *vaso* [‘ba.so] ‘glass’, with bare nouns without determiners. The following images in Figure 3 are examples of the items that participants were asked to name.

Figure 3: Some examples of images used to elicit words including the voiced labial phoneme /b/. The expected answers were, from left to right: llave ['ja.βe] *'key',* vaca ['ba.ka] *'cow', and* botella [bo.'te.ja] *'bottle'.*

There is a tradition of linguistic research based on picture-naming tasks aimed at investigating semantic retrieval and phonological mapping processes, often including comparisons between visual naming and word reading (D'Amico *et al*., 2001). Many investigations on labiodentalization in Spanish have employed this methodology, especially when involving illiterate participants, like in the studies conducted in Chile among children (Vergara, 2010, 2011, 2013). The previous literature on voiced labial consonant variation suggests that during picture-naming tests speakers tend to produce more labiodental allophones of /b/ than they do while performing other tasks, like word-list reading.

In the current study, each informant employed approximately ten minutes to complete this second task. Participants were recorded on a laptop using the same

specifications as described above. As before, the investigator never asked participants to produce a particular realization for voiced labial consonants.

5.2.1.3 Auditory Analysis: Materials and Procedures

There were a total of 120 stimuli for the reading task, 40 target Spanish words containing either the <b> or <v> graphemes, balanced between grapheme and position: 10 initial <b> words, 10 initial <v> words, 10 medial <b> words, and 10 medial <v> words (see Appendix A). The distribution of the vowels following the labial consonants, the phonemes /a, e, i , o, u/, was also balanced for the two possible orthographic realizations of /b/ (<b> and <v>) and across within-word positions (initial or medial). The target consonants in this task were onsets of stressed or unstressed syllables, in order to examine the effects of syllable stress. The experimental design also included 80 distractors, real and nonce words that did not feature any of the target spellings. Some examples of the tokens employed follow, and a complete list with all the tokens used in this test can be found in Appendix A.

(9) a. *boca* ['bo.ka] ‘mouth’, an example of a target word featuring the grapheme <b> in initial position

b. *vino* ['bi.no] ‘wine’, an example of a target word featuring the grapheme <v> in initial position

c. *caballo* [ka.'βa.jo] ‘horse’, an example of a target word featuring the grapheme <b> in intervocalic position

d. *lavar* [la.'βaɾ] ‘to wash’, an example of a target word featuring the grapheme <v> in intervocalic position

e. *chica* ['ʧi.ka] ‘girl’, an example of a distractor real word not featuring the grapheme <b> nor <v>

f. *chota* ['ʧo.ta], an example of a distractor pseudo-word not featuring the grapheme <b> nor <v>

The stimuli used during the second task, the picture-naming test, were 100 items, 50 target items, where the target labial consonants were either in initial or intervocalic position, in stressed or unstressed syllables, plus 50 distractors. As for the reading task, tokens were symmetrically balanced for orthography and position of the target labial consonants. A complete list of all the words expected to be elicited in this test can be found in Appendix B.

(10)a. *burro* ['bu.ro] ‘donkey’, an example of a target word featuring the grapheme <b> in initial position

b. *vena* ['be.na] ‘vein’, an example of a target word featuring the grapheme <v> in initial position

c. *caballo* [ka.'βa.jo] ‘horse’, an example of a target word featuring the grapheme <b> in intervocalic position

d. *avión* [a.'βjon] ‘plane’, an example of a target word featuring the grapheme <v> in intervocalic position

e. *leche* ['le.ʧe] ‘milk’, an example of a distractor word not featuring the grapheme <b> nor <v>

The linguistic (token-specific) variables included for analysis in the study were: *orthography*, either <v> or <b> spelling; *position*, of the labial consonant, either word-initial or intervocalic; *following vowel*; *stress*, of the syllable including the target consonant, either stressed or unstressed; *cognate status*, between English and Spanish lexicons; and *word frequency*. The latter variable was calculated using the frequency dictionary of Spanish created by Davies (2008) and assigning numerical values to each token: following the author's criteria, high-frequency words corresponded to low values, while less common terms were associated with higher numbers. *Task* type, either reading task or picture-naming task, was also a variable used for this study.

Table 4: All the variables used and their levels, organized by type.

Variable	**Levels**	**Type**
Gender	Male, Female	Speaker-related
Age	Year of birth	Speaker-related
Education Language	English, Spanish, Bilingual	Speaker-related
Education Level	High school, College, Master, PhD	Speaker-related
Spanish Writing	1-5	Speaker-related
Spanish Reading	1-5	Speaker-related
English Writing	1-5	Speaker-related
English Reading	1-5	Speaker-related
Orthography	<b>, <v>	Token-related
Within-word Position	Initial, Intervocalic	Token-related
Following Vowel	/a/, /e/, /i/, /o/, /u/	Token-related
Syllable Stress	Stressed, Unstressed	Token-related
Word Frequency	1-7000	Token-related
Cognate Status	Cognate, Non-cognate	Token-related
Task	Reading Task, Picture Naming Task	Task-related

The auditory analysis was conducted using rater perception based on naturalistic aural methods. Two reviewers, phonologically trained native speakers of Spanish, listened through a headset in a quiet environment to all the recorded target tokens extracted from the experimental data (90 target consonants per speaker: 40 from the reading task and 50 from the picture-naming test). The raters were native Spanish speakers living in Texas, bilinguals, but not belonging to the El Paso speech community. They focused in particular on the point of articulation of the oral labial consonant sounds in the utterances produced by the participants. The raters reviewed independently, choosing one of two segmental categories labeled as "bilabial" or "labiodental" for each token. In case of interrater disagreement, the researcher intervened adding a third judgment as a sort of tiebreaker, instead of discarding those tokens and preventing the loss of valuable data.

5.2.1.4 Auditory Analysis: Statistical Models

The lme4 (Bates *et al*., 2016) and languageR packages (Baayen, 2013) of the programming language R (R Core Team, 2017) were used for analysis. A stepwise variable selection using logistic regressions with decreasing AIC was employed, considering as the binomial dependent variable whether the consonant was perceived as either a bilabial (baseline) or a labiodental. Token-specific linguistic predictor factors included orthography (<b> or <v>); lexical frequency (high/low) cognate status in relation to English lexicon (yes/no); following phoneme; syllable stress (yes/no); and whether the consonant fell in

word-initial or intervocalic position. Task type (reading list or picture-naming test) was also considered as an independent variable.

The speaker-related sociolinguistic variables included gender, age, Spanish reading proficiency level (1-5), Spanish writing competence (1-5), English reading proficiency level (1-5), English writing competence (1-5), highest level of formal education achieved, and which language was predominant in their formal education (English-only or bilingual). The possible interactions between the independent variables were also part of the stepwise variable selection. Speaker was modeled as a random effect. The factors that were chosen via the variable selection, but showed no significance during the logistic regression, were gradually eliminated from the model, one at the time, starting from the one with the highest p-value, until all variables included were statistically significant and the best model was fitted. The function "cor" in *R* was used to test and avoid undesired effects of multicollinearity and covariance between the different variables included in the statistical models.

5.2.2 Auditory Analysis: Results

Auditory analysis of bilabial vs. labiodental articulation showed that from a total of 2,326 voiced labial tokens, 1,566 (67%) consonants were realized as bilabials by the speakers, while 760 (33%) were realized as labiodentals according to rater perception judgments. A contingency table illustrating the number of labiodentalization occurrences in various conditions is shown in Table 5.

Table 5: Contingency table of labiodentalization occurrences.

n = 3513	**Labiodentalization occurs**	**Labiodentalization does not occur**	**Total**
Full Corpus	760	1566	2326
Orthography <*b*>	18	1154	1172
Orthography <*v*>	742	412	1154
Position *Initial*	313	873	1186
Position *Medial*	447	693	1140
Gender *Male*	336	821	1157
Gender *Female*	424	745	1169
English Writing Level 1	14	63	77
English Writing Level 2	37	121	158
English Writing Level 3	29	126	155
English Writing Level 4	274	503	777
English Writing Level 5	406	753	1159
Spanish Writing Level 1	33	30	63
Spanish Writing Level 2	50	92	142
Spanish Writing Level 3	252	412	664
Spanish Writing Level 4	183	452	635
Spanish Writing Level 5	242	580	822

A logistic regression (Table 6) indicated what linguistic and sociolinguistic factors were significantly correlated with perception of labiodentalization. These relevant variables are discussed below.

Table 6: Regression.

AIC	**BIC**	**LogLik**	**Deviance**	**Df.Resid**	
1449.6	1495.6	-716.8	1433.6	2318	
Random Effects:	**Variance**	**Std.Dev.**	**AUDITORY ANALYSIS**		
Speaker (Intercept)	0.658	0.811			
Number of obs: 2326, groups: Speaker, 30					
Fixed Effects:	**Estimate**	**Std. Error**	**z Value**	***p* Value**	**Odds Ratio (Lower, Upper CI)**
(Intercept)	-4.494	0.428	-10.486	< 0.001 ***	
Orthography <*v*> (ref. <*b*>)	5.000	0.387	12.909	< 0.001 ***	103.596 (53.617, 232.366)
English Writing Proficiency	0.434	0.162	2.672	0.007 **	1.502 (1.324, 1.708)
Spanish Writing Proficiency	-0.453	0.162	-2.787	0.005 **	0.678 (0.594, 0.772)
Gender *Male* (ref. *Female*)	-0.735	0.327	-2.243	0.024 *	0.521 (0.404, 0.669)
Position *Medial* (ref. *Initial*)	0.371	0.485	0.765	0.444	1.400 (0.547, 3.700)
Orthography <*v*>*Position *Medial*	1.448	0.309	4.676	2.92e-06 ***	3.562 (1.979, 6.512)

The main factor showing statistical relevance was orthography ($p < 0.001$), followed by gender, English writing proficiency level, and Spanish writing proficiency level. There was a main effect for the factor orthography, such that consonants corresponding to the spelling <v> were 103 times more likely to be labiodentalized than the reference spelling <b>. This means that orthography significantly affects the point of articulation variation, with <v> spellings favoring the production of voiced labial consonants as labiodental fricatives [v]. Another statistically significant variable was gender ($p = 0.024$): female speakers produced more labiodental consonants than their male counterparts. Men were 47.9% less likely to produce labiodentalized consonants than women (baseline).

The factor English writing proficiency level was significant as well ($p = 0.007$): according to rater perception judgments, the speakers who self-reported higher English writing ability scores were 50.2% more likely to produce labiodental consonants for an increment of 1. Moreover, statistical analysis revealed that speakers' writing proficiency in Spanish was also a significant variable ($p = 0.005$): the results indicated that the higher the self-reported level of Spanish writing skills, the less frequent labiodentalization was in the analyzed dataset. According to rater perception judgments, the speakers who self-reported lower Spanish writing ability scores were 32.1% less likely to produce labiodental consonants for an increment of 1.

Finally, these main effects were further clarified by an interaction between two variables, consonant orthography and within-word position, which was statistically significant ($p = 2.92e\text{-}06$). Labiodentalization was perceived more frequently for labials

corresponding to the grapheme <v> in intervocalic position than in initial position, such that the word *llave* 'key' is likely to be realized as ['ja.ve]. This is visualized in Figure 4.

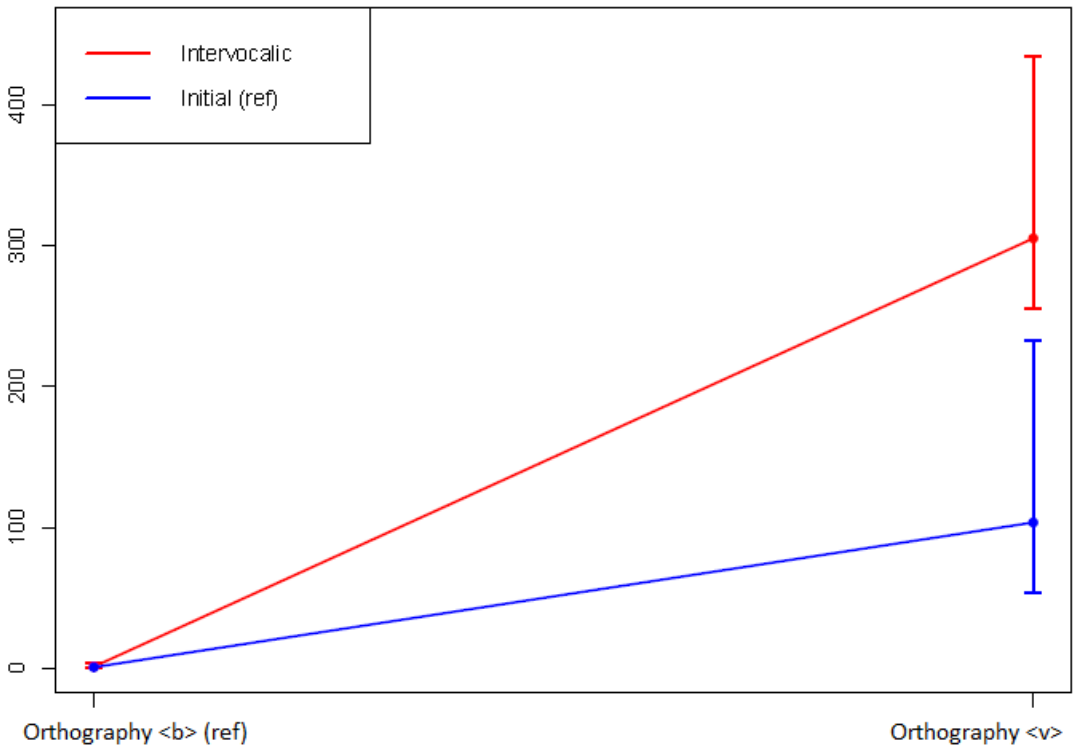

Figure 4: Odds ratios of labiodentalization occurrence by orthography.

As shown, the difference between the occurrence of labiodentalization for the grapheme <v> and for the grapheme <b> is more pronounced in medial than in word-initial position, as is evidenced by the variable difference in the odds ratios for each category.

5.2.3 Auditory Analysis: Discussion

According to the auditory analysis, labiodentalization is attested in the variety of Spanish spoken in El Paso, Texas, since 33% of the total tokens analyzed were perceived

as voiced labiodental consonants by raters. The sociolinguistic factors showing statistical relevance were orthography, gender, English writing proficiency level, and Spanish writing proficiency level. More specifically, labiodentalization was much more frequent for segments corresponding to the grapheme <v> and more likely to occur in the speech of female speakers, and among participants with higher English writing and lower Spanish writing proficiency levels.

The effects of orthography on labial consonant variation were predicted in the previous chapters, so these findings offer an additional confirmation to the hypotheses formulated. The influence of spelling on labial consonant variation is clarified by the interaction between consonant orthography and within-word position, demonstrating that the perception of labiodentalization is significantly more pronounced for consonants represented by the spelling <v> in intervocalic position than in word-initial position. The approximant or lenited manner of articulation of intervocalic labial phones in Spanish can be a limitation for an auditory method of analysis because raters' subjective judgments could be affected by the similarity of the [v] and [β]. Nevertheless, this finding is potentially informative about linguistic variation: The results suggest that this kind of variation begins in intervocalic contexts.

As expected, higher English writing proficiency levels favored labiodentalization, while the opposite pattern was true for Spanish writing ability level, where higher self-reported scores corresponded to fewer instances of labiodental consonants, which contradicts the hypotheses formulated. These findings can be explained in light of VanCoetsem's and Winford's theories on contact-induced changes: If borrowing is a

process attributable to recipient language agentivity, while imposition is caused by source language agentivity, then labiodentalization in Texas Spanish can be classified as an instance of imposition, since labial variation in El Paso is favored by higher levels of English (the SL) and impeded by greater ability in Spanish (the RL). It is also possible that labiodentalized variants were first introduced as the result of imposition and then conventionalized, at the community level, by following generations of speakers (Sessarego, 2013), following a pattern defined by Dubois & Horvath (1999) as "recycling".

An analogous reasoning can be applied to the significance of the variable "orthography", which can be understood as the imposition of English phonological habits on the recipient language, Spanish, due to the direct correspondence between the grapheme <v> and the pronunciation [v] in the SL. Finally, another speaker-related variable, gender, was shown to be significantly correlated with the perception of labiodentalization in the dataset analyzed; females produced more labiodental fricatives [v] than their male counterparts. This result constitutes a hint that there is social meaning to this linguistic variation, potentially providing support for previous findings that labiodentalization is a marker of femininity in other varieties of Spanish (Romero *et al*., 2008).

5.3 ACOUSTIC ANALYSIS

The second part of this study consists of an acoustic analysis based on three phonetic measurements used to analyze the voiced labial consonants produced by the

Spanish speakers from El Paso, Texas sampled here. The methods employed for this study are discussed in detail in the following section.

5.3.1 Acoustic Analysis: Methods

5.3.1.1 Acoustic Analysis: Materials and Procedures

In order to obtain more accurate and reliable quantitative data, acoustic measurements were used in the second stage of this study. Speech analysis was conducted using Praat V. 5.3.23 (Boersma & Weenink, 2012). The coding scheme allowed for annotations on separate tiers: orthographic representations, phonological realizations as labeled by the auditory analysis of the reviewers, and the segments adjacent to the target consonants. The online tool *FASE: Forced Alignment System for Español* (Wilbanks, 2016) was used to facilitate the text to speech alignment process. Each textgrid labial boundary in Praat assigned by FASE was hand-corrected to assure that the target consonants were properly aligned.

The continuous measures analyzed were relative intensity, center of gravity, and duration of the oral voiced labial consonants, so as to document in detail the voiced bilabial-labiodental variation. The choice of these acoustic properties was motivated in relationship to previous literature in Chapter 2, which includes also detailed descriptions of intensity difference, COG, duration, their measurements, and the expected acoustic differences between the three allophones of /b/ examined.

More specifically, for the measurements, labial segments were isolated, excluding the previous and the following phones. Whenever possible, a sudden drop in intensity was used as the indicator of the consonant interval's onset and a rise in intensity indicated its offset into a vocalic segment. Relative intensity was measured in decibels using a methodology similar to the one employed by Hölterhoff & Reetz (2007): Utilizing the intensity display in Praat, the minimum intensity curve within the duration of the labial consonant and the maximum during the following segment were marked manually. Finally, intensity difference was calculated by subtracting the intensity minimum during /b/ from the intensity maximum in the portion corresponding to the following segment. Center of gravity was measured semi-automatically using a Praat script developed by Hinrichs *et al*. (2015) with a COG weighting value set to a power of 2.0 as default. Another script, created by Henning Reetz (2009), that computes the whole length of each selected segment, was used to measure consonant duration in ms. Table 7 illustrates the acoustic variables considered.

Table 7: Acoustic variables

Variable	**Levels**	**Type**
Duration	Numerical (in ms)	Acoustic Analysis
Relative Intensity	Numerical (in dB)	Acoustic Analysis
Center of Gravity	Numerical (in Hz)	Acoustic Analysis

5.3.1.2 Acoustic Analysis: Statistical Models

Models were fitted using the programming language *R version 3.0.2* (R Core Team, 2017) using the lme4 package (Bates *et al*., 2016) to test correlations between perceived point of articulation and the acoustic properties of voiced labial consonants and between orthography and the acoustic properties. The results from the auditory analysis informed us that the linguistic factors "orthography" and "position" are the best predictors for perception of labiodentalization, so two logistic regressions were employed: speaker was used as a random effect, while the three acoustic measurements (duration, COG, and relative intensity) and position (initial or medial) were the independent variables. In the first regression, perceived point of articulation was the dependent variable, whereas in the second model, orthography was used as the dependent variable. The factors that showed no significance during the logistic regressions, were gradually eliminated from the models, one at the time, starting from the one with the highest p-value, until all variables included were statistically significant and the best models were fitted.

5.3.2 Acoustic Analysis: Results

In this section, the results for the acoustic analysis will be presented and interpreted. A contingency table illustrating the mean values of the three acoustic measures in various conditions is shown in Table 8.

Table 8: Contingency table of the mean values of the acoustic measures. I = initial position, M = medial position.

Tokens	**Duration (ms)**	**COG (Hz)**	**Relative Intensity (dB)**
Perceived as *Bilabial* - I	85.610		25.054
Perceived as *Labiodental* - I	90.880		25.704
Perceived as *Bilabial* - M	62.702	285.253	7.426
Perceived as *Labiodental* - M	62.874	290.536	7.766
Orthography <*b*> - I	83.473		24.950
Orthography <*v*> - I	90.776		25.521
Orthography <*b*> - M	62.855	302.273	7.628
Orthography <*v*> - M	62.926	304.669	7.793

A logistic regression showed that perceived point of articulation is significantly correlated with relative intensity ($p = 0.017$) and consonant position ($p = 7.08e\text{-}08$). The interaction between duration and consonant position was statistically significant as well ($p = 0.028$). Center of gravity was not statistically significant in this model.

Table 9: Regression.

AIC	**BIC**	**LogLik**	**Deviance**	**Df.Resid**	
2822.7	2857.2	-1405.3	2810.7	2320	
Random Effects:	**Variance**	**Std.Dev.**	**ACOUSTIC ANALYSIS Point of Articulation**		
Speaker (Intercept)	0.2997	0.5474			
Number of obs: 2326, groups: Speaker, 30					
Fixed Effects:	**Estimate**	**Std. Error**	**z Value**	***p* Value**	**Odds Ratio (Lower, Upper CI)**
(Intercept)	-1.331	0.149	-8.909	< 0.001 ***	
Duration	0.111	0.058	1.927	0.054 .	1.109 (0.993, 1.237)
Position *Medial* (ref. *Initial*)	1.011	0.187	5.389	7.08e-08 ***	2.407 (1.716, 3.393)
Relative Intensity	0.239	0.100	2.384	0.017 *	1.184 (0.991, 1.415)
Duration*Position *Medial*	-0.289	0.132	-2.195	0.028 *	0.814 (0.637, 1.038)

In this model, there was a main effect for the factor position, such that intervocalic consonants were 1.4 times more likely to be perceived as labiodentalized than labials in the reference initial position. These main effects are clarified by an interaction between two variables, duration and within-word position, which was statistically significant ($p = 0.028$). This means that for a unit increment of duration, when the consonant is in medial position segments are 18.6% less likely to be perceived as labiodentalized. Another statistically significant main effect was relative intensity ($p = 0.017$): for an increment of 1 in intensity difference, consonants were 18.4% more likely to be perceived as labiodentalized.

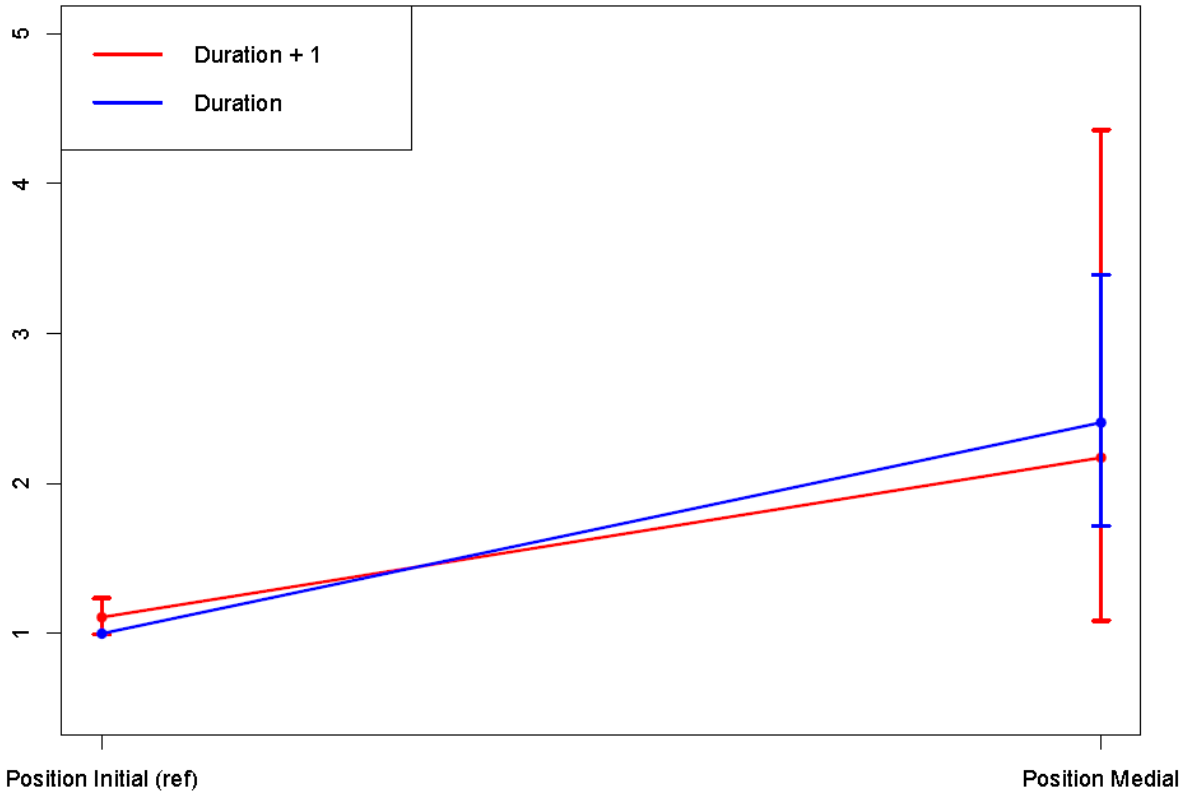

Figure 5: Odds ratios of labiodentalization occurrence by duration (for unit increase) per consonant within-word position.

As shown in Figure 5, the perception of labiodentalization is more pronounced in word-medial than in word-initial position, but as duration increases, this effect gets weaker, as is evidenced by the negative estimate of the interaction term.

The second logistic regression showed that orthography is significantly correlated with duration ($p = 0.000$). The interaction between duration and consonant position was statistically significant ($p = 0.043$). Center of gravity and relative intensity were not statistically significant in this model.

Table 10: Regression.

AIC	**BIC**	**LogLik**	**Deviance**	**Df.Resid**	
3220.5	3249.3	-1605.3	3210.5	2321	
Random Effects:	**Variance**	**Std.Dev.**	**ACOUSTIC ANALYSIS Orthography**		
Speaker (Intercept)	0	0			
Number of obs: 2326, groups: Speaker, 30					
Fixed Effects:	**Estimate**	**Std. Error**	**z Value**	***p* Value**	**Odds Ratio (Lower, Upper CI)**
(Intercept)	-0.133	0.061	-2.176	0.029 *	
Duration	0.174	0.051	3.387	< 0.001 ***	1.191 (1.077, 1.319)
Position *Medial* (ref. *Initial*)	0.147	0.095	1.546	0.122	1.159 (0.961, 1.396)
Duration*Position *Medial*	-0.238	0.117	-2.023	0.043 *	0.788 (0.625, 0.992)

In this model, there was a main effect for the factor duration ($p < 0.001$): consonants with longer duration were 19.1% more likely to be associated with the spelling <v> for each 1 unit increment of duration. This main effect was further clarified by an interaction between two variables, duration and within-word position, which was statistically significant ($p = 0.043$). This means that the difference in duration between <b> and <v> segments was particularly significant for consonants in initial position.

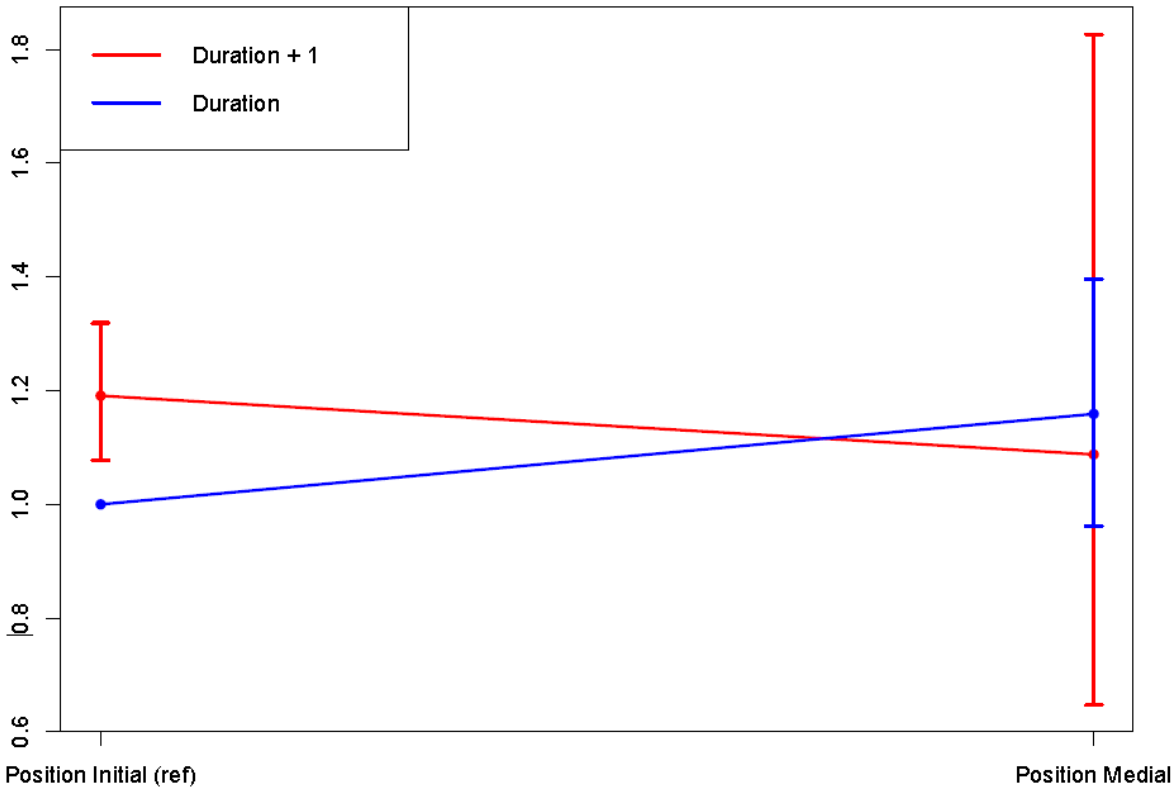

Figure 6: Odds ratios of orthography by duration (for unit increase) per consonant within-word position.

As shown in Figure 6, the correlation between orthography and duration is more pronounced in word-initial than in medial position, as is evidenced by the variable difference in the odds ratios for each category.

5.3.3 Acoustic Analysis: Discussion

According to the acoustic analysis, in both word-initial and medial position, consonants labeled by raters as bilabials are, on average, shorter in duration and feature smaller relative intensity than segments categorized as labiodentals. Additionally, in intervocalic contexts, consonants perceived as bilabials are associated, on average, to lower center of gravity values than tokens classified as labiodentals. Moreover, orthography follows a similar pattern: in fact, in both initial and intervocalic position, consonants corresponding to the grapheme <b> are, on average, shorter in duration and feature smaller relative intensity than segments associated to the spelling <v>. In medial contexts, <b> segments are associated, on average, to lower center of gravity values than <v> tokens.

Statistical analysis showed a significant correlation between point of articulation and relative intensity, indicating that labiodentalization is strongly associated with higher intensity difference, while bilabial consonants feature lower values for this acoustic property. Results also revealed a significant correlation between consonant position and point of articulation: labials in medial position were more likely to be perceived as labiodental than segments in word-initial contexts, especially those corresponding to the grapheme <v>. These effects were better clarified by the interaction between two variables, duration and position, which was also statistically significant in both models fitted. This means that duration is the acoustic measurement that can be more reliably used to

differentiate between bilabial and labiodental consonants in the dialect of Spanish examined in this study, especially in word-initial position.

However, we must remember that labiodentalization in Spanish could be characterized by a more complex, multilayered kind of variation, acting simultaneously on more than one phonetic dimension. It cannot be excluded that the phenomenon examined operates on two different, but interconnected continua: on the one hand, along a gradient scale of places of articulation, having entirely bilabial and completely labiodentalized realizations as its extremes; while, on the other hand, showing scalar differences in terms of manner of articulation, from total occlusion to full frication, and including a wide range of intermediate approximant variants. This non-linear complexity makes labiodentalization in El Paso Spanish a feature difficult to circumscribe or quantify.

Finally, additional phonetic cues necessary to differentiate between bilabial and labiodental phones might not reside within the boundary of the consonants themselves, but they could be embedded in the acoustic transitions from and to the target labial sounds and the adjacent vowels. Ohala & Ohala (2001), for example, conducted a study among Hindi speakers, whose language possesses a complex set of voiced obstruents with five different place distinctions, and they demonstrated that VC transitions affect significantly the perception of point of articulation. The same can be potentially true for labials in Texas Spanish, especially because the contrast between bilabial and labiodental consonants is based on a particularly subtle place distinction.

5.4 STUDY CONCLUSIONS

Comparing the results from the auditory and acoustic analyses of the production study, some general conclusions about labial consonant variation in the dialect of Spanish spoken in El Paso can be drawn. According to auditory analyses, labiodentalization occurs in the speech data obtained during the reading and picture-naming task. These findings provide an affirmative answer to the first research question (RQ1) in that bilingual speakers from El Paso, Texas do produce a sound perceived to be [v] for what is traditionally Spanish /b/. Therefore, at least for the variety of Spanish examined, the general phonetic repertoire should be reconsidered and, as I will discuss later in the following section of this dissertation, this implies repercussions at the phonological level as well.

The results also showed that two variables can help us answer the second research question (RQ2), which focuses on the acoustic properties that can be utilized to predict systematically labial consonant variation. The data obtained during the production study seem to suggest a trend of slight acoustic differences between sounds perceived as [v] vs. bilabials [β] or [b]: On average, bilabials feature shorter duration, lower center of gravity, and smaller intensity difference than labiodentals. However, the correlation between center of gravity and perceived point of articulation was not statistically significant for the dataset analyzed. Nevertheless, the results indicate that the most adequate measurements to acoustically differentiate between the various realizations of /b/ auditorily in El Paso Spanish are relative intensity and, especially in initial position, duration.

RQ3 inquired about the linguistic factors that condition the use of [v] versus [β] or [b]. Orthography was overwhelmingly the most relevant variable affecting the realization

of voiced labial consonants, where the grapheme <v>, whether the letter was prompted in the reading task or not as in the picture-naming test, favored labiodental articulations. More specifically, while tokens featuring the spelling <b> presented very little variation, corresponding most of the time to bilabial realizations ([b] or [β]), words containing the grapheme <v> showed more alternation between different points of articulation. In fact, the majority of <v> segments were pronounced as labiodentals, according to raters.

The significant interaction between consonant orthography and within-word position suggests that the perception of labiodentalization is correlated to consonants represented by the spelling <v> in intervocalic position rather than word-initially. On the one hand, the approximant or lenited manner of articulation of intervocalic labial phones in Spanish can be a limitation for a naturalistic method of analysis because raters' auditory judgments could be affected by the similarity of [v] and [β]. On the other hand, these results can be explained by the perceptual resemblance of bilabials in medial position and labiodentals, because they both share a frication component. Since [β] is likely perceptually closer to [v] than [b] is, it is probable that linguistic convergence is favored in these phonological contexts rather than word-initially. Finally, another research question, RQ4, inquired what speaker-related and sociolinguistic factors conditioned the use of [v] versus [β] or [b]. Three sociolinguistic variables were also correlated to labiodentalization: English writing proficiency level; Spanish writing ability level, and gender. As expected, higher English writing proficiency favored labiodentalization, while higher self-reported scores for Spanish writing corresponded to fewer instances of labiodental consonants. The contribution of English writing competence, along with the linguistic variable

"orthography", suggests that labiodentalization in Spanish is externally -induced, favored by the direct correspondence between the grapheme <v> and the phone [v] in English and intensified by bilingual speakers' phonological habit or educational experiences.

Lastly, females produced more labiodental fricatives [v] than their male counterparts did. These results indicate that there is social meaning attached to the linguistic variation examined in this study, confirming previous findings about labiodentalization as a social marker in other varieties of Spanish (Romero *et al*., 2008). While it is possible that women in El Paso employ labiodentalized consonants as a manifestation of their gender identity, we cannot exclude the conventional Labovian trend that designates female speakers as the vanguard social group responsible for the start and initial spread of linguistic change, especially when variation aligns towards a prestigious variety or language (Labov, 2001).

Chapter 6: Discussion and Conclusions

6.1 Introduction

In this chapter, I will summarize the main findings for each analysis, connecting the specific results to the larger discussion of what conditions the production of labiodentalization among Spanish speakers in El Paso, Texas, as well as delineating the general implications and contributions offered by this dissertation.

6.2 Goals of the Research Revisited

The main goal of this dissertation was to analyze the effects of language contact on labiodentalization of the phoneme /b/ and labial consonant variation in Texas Spanish, with special emphasis on orthography and its influence on bilingual phonology. This project analyzed labial consonant variation in the Spanish of El Paso, from the perspectives of language contact. Specifically, it examined (i) if Spanish speakers from El Paso produced an auditorily perceptible as well as acoustically measurable distinction between [v] and [β] or [b] as discrete categories; and (ii) if they produced this contrast, which sociolinguistic factors conditioned these uses and distributions in the speech community. In pursuing these questions, a production study with auditory and acoustic analyses was employed.

6.3 SUMMARY OF RESULTS AND DISCUSSION

The first stage of the study was an auditory analysis aimed to examine the production of Spanish speakers in El Paso, Texas that included two tasks, a reading and a picture-naming test. The results for this analysis showed that labiodentalization occurs in the speech community examined, with 33% of the total amount of target tokens realized as a labiodental fricative [v] according to raters' evaluations. Moreover, labial variation was significantly correlated with linguistic and social factors: orthography, speaker gender, English writing proficiency level, Spanish writing ability, and the interaction between consonant position and spelling. Considering the results from this production study, some general conclusions about labiodentalization can be drawn.

Confirming the data presented in Romero *et al*. (2008) and Steven (2000), women produced more labiodental fricatives [v] than their male counterparts, a finding that, according to previous literature on sociolinguistics, could be explained by two opposite forces that usually characterize linguistic variation (Labov, 2001; Cameron, 2003). On the one hand, the tendency could arise as a result of female speakers conforming more to the prestigious and standard varieties of language, in this case represented by English or written Spanish (Stevens, 2000), and, on the other hand, this could be an instance of linguistic change in progress, which are typically led by women who tend to be more innovative than men. However, there is no evidence that labiodentalization is a change in progress in Texas Spanish because the variable "age" did not show any significant variation patterns in apparent time in the data gathered. Instead, I interpret labiodentalization as an instance of a stable contact-induced variant, produced largely by

women, who are generally more affected by the influence of the dominant language and the prescriptions of the orthographic norm (Blas Arroyo, 2012).

According to previous sociolinguistic literature, females usually tend to mark a greater distinction between phonetic pairs (Pépiot, 2013), such as a more clear-cut differentiation between labiodental and bilabial consonants in the present study. This phenomenon could be explained by cultural and sociophonetic factors and it supports the theory that women try to achieve a more intelligible speech than their male counterparts for identity and professional reasons (Simpson, 2009). Nevertheless, in order to fully corroborate the claims formulated by Romero *et al*. (2008) and Stevens (2000) that labiodentalization in Spanish marks gender, further research, including socio-indexical and perception studies, is needed. There is not enough evidence to conclude that labiodentalization is a marker of femininity per se in the variety of Spanish spoken in El Paso.

As expected, higher English writing proficiency levels favored labiodentalization, while the opposite pattern was true for Spanish writing ability level, where higher self-reported scores corresponded to fewer instances of labiodental consonants. The correlation between English writing competence and labiodentalization is not surprising, and it can be interpreted as the influence of English phonology to orthography mapping for the speakers who declared they possess a written dominance of English. The effects for strong Spanish writing proficiency can be traced back to the formal education methodologies often used in language classrooms. Assuming that higher levels of written ability for Spanish generally correspond to institutionalized instruction for this

language, either as an L1 or as an L2, we can attribute these results to the weight of prescriptivist education. Hickey (2012) refers to sociolinguistic censure and prescriptivism in terms of forces that have a deterring influence on variation and change, frequently characterized by trying to repeal processes that are already in progress. Prescriptivism can exclude variation from specific forms and registers of language, prevent a change from going to full completion, or even lead to an entirely static outcome by stopping a linguistic development altogether. Conversely, as Silva-Corvalán (1994/2000) inferred from the studies she conducted among the Mexican American population living in Los Angeles, certain extralinguistic factors that characterize many varieties of U.S. Spanish, such as the absence of normative pressures, restrictions in domains, and positive attitudes toward the dominant language, favor changes in bilinguals' speech.

The others social variables included in this study, age and education level, did not show any statistical significance, so no additional information could be obtained directly from these speaker-related characteristics. As for the linguistic factors correlated to labial consonant variation, the variable "consonant position" informs us that labiodental realizations occurred more frequently in medial than in word-initial position. This phenomenon can be motivated by the fact that fricative or approximant variants such as [v] and [β] usually surfaces in medial position, consistent with lenition. .

It is possible that these results can be explained by the perceptual resemblance of bilabials in medial position and labiodentals, because they both share a frication component. Since [β] is perceptually closer to [v] than [b] is, it is probable that linguistic convergence is favored in these phonological contexts rather than word-initially. Under

this scenario, labiodentalization represents an instance of contact-induced change; namely the transfer of the English consonant [v] into the Spanish system, promoted by the structural congruence of the two languages' labial categories. Conversely, the fact that instances of [v] are less frequent in word-initial position, suggests that labiodentalization is not a pragmatic strategy employed by speakers for emphasis.

Finally, the variable that contributed most to the manifestation of [v] was orthography with very high rates of correlation between labiodental fricative segments [v] and the grapheme <v>. This result, as anticipated in my working hypotheses, can be considered an instance of language contact with English, which features a twofold phonological and orthographic contrast between /b/ and /v/ and their respective written representations, <b> and <v>. Additionally, it can be observed that while tokens corresponding to the orthography <b> were realized mostly as bilabials, segments associated with the spelling <v> exhibited more variation. The other linguistic variables, cognate status, stress, adjacent phonemes, and lexical frequency, did not show any statistical significance, so these internal characteristics could not explicitly yield any additional insight for the present research.

Overall, it can be concluded that in the variety of Spanish spoken in El Paso, Texas a) labiodentalization is an attested phenomenon; b) the pronunciation [v] is more common than both [b] and [β] when /b/ corresponds to the grapheme <v>; c) [v] is a variant of the phoneme /b/, since it does not map categorically to <v>; d) [v], in relation to the other allophones [b] and [β], does not present a clear-cut instance of complementary distribution, nor free variation, but its emergence is highly conditioned by orthography; e)

labiodentalization is a result of language contact with English. The latter conclusion (e), already discussed previously throughout this dissertation, will be justified further in the following section.

As mentioned above in c), [v] in Texas Spanish should be considered an allophone of the phoneme /b/, because it does not map consistently to <v> in the results for the production study. However, if instead of considering the whole dataset we examine the realizations of the individual speakers separately, simple post-hoc observations reveal that for at least six participants, <v> segments were always pronounced as [v] and for them the correspondence between <b> and bilabial consonants was categorical as well. This means that some speakers recategorized voiced labiodental and bilabial consonants as two distinct and contrastive phonemes, /v/ and /b/, unvaryingly corresponding to the orthographic representations <v> and <b> respectively. The phonemic inventory of these speakers reflects a more advanced stage of the linguistic change still in progress for the rest of the participants.

Applying VanCoetsem's (1995) and Winford's (2005) theories on linguistic transfer to the case of variation examined in this study, it can be deduced that labiodentalization in Texas Spanish is an instance of imposition, a phenomenon attributable to source language agentivity. In support of the notion that this variation is externally-induced, I will utilize the four-step model proposed by Mougeon *et al*.'s (2005) to interpret the insights emerged during the current analyses. Recall that this methodology suggests that to establish the motivation of a change researchers should: 1) determine if the change observed in language A has an equivalent in language B; 2) take into account the presence

of internally-motivated processes, for example overgeneralization of a feature or analogy; 3) consider other varieties of language A and if they feature the innovation examined or not, including both monolingual and contact dialects, as well as the interlanguage of L2 learners of language A; and 4) analyze the distribution of the innovative variant and its correlation with the levels of contact and bilingualism within the speech-community studied.

Applying this method to the current study proves instructive. First, labiodentalization, as observed in El Paso Spanish (language A), has an equivalent in English (language B); more precisely, in the latter language, the sound [v] has a phonemic status and it is almost categorically, although not exclusively, associated to the grapheme <v>. Second, labiodentalization in Spanish cannot be justified as an internally-motivated process, for example, the overgeneralization of a feature or analogy. This phenomenon does not occur for other consonants, such as the voiceless labial phone [p] → [f], nor can the increased frication and constriction level observed in the shift from [β] to [v] can be explained as an analogical extension of the general trend in Spanish towards lenition for voiced obstruents in medial position. On the contrary, some scholars, like Romero *et al*. (2008), categorize the [v] pronunciation of /b/ as an instance of articulatory strengthening or *refuerzo*.

Third, as illustrated in Chapter 2, other varieties of language A feature the innovation examined, some monolingual Spanish but especially dialects exposed to contact with different languages like English, Portuguese, Catalan, etcetera. Similarly, the same feature can be easily recognized in the interlanguage of L2 learners of Spanish when their

mother tongue presents [v] in its phonological repertoire, e.g. native speakers of English, Italian, or French acquiring Spanish as a second language. And fourth, as the sociolinguistic factors included in this study showed, the distribution of the innovative variant is directly correlated with the levels of contact, bilingualism, and proficiency in language B (English) within the speech community examined. All these reasons together suggest that labiodentalization in Texas Spanish is more plausibly attributable to externally-motivated, contact-induced changes, rather than to intra-systemic processes.

While the theories formulated by scholars like Silva-Corvalán (1994, 2000) argue that convergence accelerates and favors changes that were already inherent in a language in contact, the current data suggest that the case of labiodentalization in El Paso Spanish is lacking internal motivation. Although voiced labial consonants have historically undergone several developments in Spanish, and even cross-linguistically we can observe various outcomes for these obstruents from Latin to modern Romance languages, a conclusion of the present study is that bilingual phonologies are permeable to interlinguistic convergence where they are acoustically and perceptually variable and where cross-linguistic similarities between the SL and RL already exist (Bullock & Gerfen, 2004).

Using the concepts provided by previous literature on language contact and its phonological outcomes (Labov, 1994; Hickey, 2004), the case of labiodentalization documented in El Paso can be classified as an instance of partial demerger. As the distinction between /b/ and /v/ attested in Old Spanish was lost in most varieties presently spoken, including Mexican dialects (merger), the appearance of a labiodental pronunciation, distinctive among some speakers, represent a reversal of this phenomenon

(demerger). As Trudgill *et al*. (2002) observed for labial consonants in southern British English, and in line with Garde's Principle, the phonological unmerging was made possible because of external factors.

In Texas Spanish, the demerger appears to be caused by the exposure to another language, English, and possibly to contact with Traditional New Mexican Spanish, where the original merger of bilabial and labiodental obstruents was never completely finalized. If instead of using a diachronic perspective, we adopt a synchronic point of view, it can be claimed that linguistic convergence has led to a split, but the final result is analogous: the fragmentation of the phoneme /b/ from the two possible allophones of standard Spanish ([b] and [β]) to three or more different phonetic realizations. This makes labiodentalization a very interesting case of variation because splits and demergers are rarely attested in linguistic literature (Herzog's Principle), especially when they involve the whole speech community, beyond the level of the individual speaker (Labov, 2010). Lastly, the intrinsic nature of splits itself constitutes evidence that labial variation in Texas Spanish is a contact-induced phenomenon, as the reversal of a merger can arguably occur only if speakers are exposed to a situation of language or dialect contact (Labov, 1994).

The production study discussed above provided important evidence to determine the nature of labiodentalization in Texas Spanish. In addition to the reasons mentioned previously, leading to the conclusion that the case of labial consonant variation analyzed is attributable to language contact, two variables included in the current methodology indicated that the possibility of an archaism should be refuted. In fact, neither age nor lexical frequency displayed any significance in correlation to labiodentalization. Apparent

time and generational differences could have suggested the persistence of an archaic feature from Old Spanish in the speech of older speakers, but it was not the case in the present data, which feature labiodental productions for participants of all ages without any statistically significant correlation between informants' year of birth and pronunciation.

As for lexical frequency, this variable was used by Torres Cacoullos and Ferreira (2000) as their main argument to support the hypothesis of [v] as an archaism in New Mexican Spanish, because, according to them, labiodentalization was more common within high-frequency lexical items. Since word-frequency was not correlated to labial consonant variation in the present research, along with all the other rationales discussed previously, it can be established that labiodental realizations in El Paso Spanish are a result of language contact with English and not an archaic trait inherited from old varieties of Spanish and maintained through the centuries thanks to the Entrenchment Effect (Langacker, 1987). Besides, explicitly for these purposes, the experimental design of the production study included, among the tokens used, some words related to modern technologies, such as *televisión* "television", *automóvil* "automobile", *avión* "airplane", and *videojuego* "videogame". Post-hoc counts reveal that out of 138 tokens, 98 items (71%) were pronounced with labiodentalization, which, considering the relative novelty of these technological objects, cannot be ascribed to an archaism.

Having established the nature and motivation of the linguistic variation examined in El Paso, we can compare it to the other attested cases of labiodentalization in modern varieties of Spanish. In this respect, Texas Spanish differs from the dialects spoken in New Mexico and Extremadura, Spain, where, according to previous literature (Torres Cacoullos

& Ferreira, 2000; Hoyos Piñas, 2003), labiodental realizations represent an archaism, a theory that has been refuted for the present study. El Paso Spanish is also different from monolingual varieties, such as Chilean dialects, in which labiodentalization occurs without a correlation with orthographic representations (Sadowsky, 2010; Vergara, 2011; Vergara & Pérez, 2013), or Venezuelan Spanish among other varieties where speakers employ labiodental fricatives as an articulatory mechanism of *refuerzo* or strengthening (Romero *et al*., 2008).

Labiodentalization in Texas Spanish is a phenomenon similar to the instances of variation attested in contexts characterized by language contact, such as Catalonia, Spain (Hualde, 2009), Uruguay (Carvalho, 2006), and Paraguay (Cassano, 1972). Contrary to these varieties, labiodentalization in El Paso is a consequence of the contact between Spanish and a non-Romance language, English. These comparisons are useful to draw a broader conclusion: Contact-induced and bilingual traits are not exceptional or rare. On the contrary, instances of linguistic convergence like the one analyzed in this investigation are encountered within other speech communities across the Spanish-speaking world.

This dissertation contributes to the Romance sociolinguistics literature by examining the variation of /b/ in Spanish using instrumental measures. The results for the acoustic analysis yielded some generalizable conclusions, since two of the three phonetic measurements utilized predicted or were correlated consistently to labial consonant variation. Duration can be used as a reliable measure to differentiate acoustically between [v] and [b] or [β], especially in word-initial environments as a parameter to effectively discriminate between [b] and [v]. Lastly, center of gravity did not offer patterns consistent

enough to trace generalizable deductions. Further research would allow us to establish what properties best define and measure the differences between labial segments in El Paso Spanish. An acoustic analysis of the segments and transitions surrounding the labial phones could reveal relevant details at the subsegmental level.

Finally, the emergence of potentially phonemic voiced labiodental consonants implies consequences on Spanish phonology, at least for the variety examined. As mentioned above, it is possible that El Paso Spanish speakers produce more than one type of voiced labial continuant consonant, including a labiodental fricative [v], a labiodental approximant [ʋ], and the bilabial approximant [β]. El Paso speakers, especially those who recategorized the voiced labiodental consonant as a phoneme separate from /b/, e.g. /v/, might have potentially allophones of this new phoneme by analogy with its bilabial counterpart /b/. More evidence is needed but it can be plausibly hypothesized that voiced labiodentals in El Paso Spanish are realized as different allophones ruled by the phonological constraints and distributions that describe the complementary distribution of other voiced consonants in Spanish in that more lenited, approximant-like labiodental consonants might surface in medial position, in complementary distribution with other realizations in initial and postnasal environments. Table 11 illustrates the phonological classification speculated.

Table 11: A possible schematization of voiced labial phonemes, their allophones, and distributions in El Paso Spanish.

Phoneme	**Allophone in initial and postnasal position**	**Lenited allophone**
Bilabial /b/	[b]	[β]
Labiodental /v/	[v]	[ʋ]

A consequence of the phonemic contrast proposed above would be the presence of new minimal pairs in the Texas Spanish lexicon, such as *voto/boto* 'I vote/I throw out', *cavo/cabo* 'concave/ending', or *vello/bello* 'hair/beautiful'.

Moreover, as often happens when a phonetic innovation appears in a language, labiodentalization in Spanish would not represent simply the introduction of an isolated new variant, but it would also involve a readjustment of other elements belonging to the same interrelated phonological system. The entrance of voiced labiodental consonants in the Spanish phonetic repertoire affects most especially the segments adjacent to said obstruents, for example, the preceding and following vowels, which can turn out to be altered in length and quality. Another epiphenomenon connected with the emergence of labiodentalized fricatives and approximants is the rearrangement of nasal stops. Although variation and exceptions exist, in general Spanish, nasal consonants assimilate in point of articulation to the following obstruent both word-internally and across word boundaries (Kochetov & Colantoni, 2011). As a consequence of labiodentalization, in Texas Spanish, the labiodental nasal allophone [ɱ], whose distribution in standard dialects is usually limited in proximity of the voiceless labiodental fricative [f] (e.g. *un faro* [uɱ.'fa.ɾo], 'a

lighthouse'), extends its dominion to new phonological contexts, to the detriment of the bilabial nasal stop [m] (cfr. *un voto* [um.'bo.to] → [uɱ.'vo.to], 'a vote').

From a social perspective, informal conversations held with participants after the completion of the production-study tasks revealed that most Spanish speakers from El Paso, Texas are not aware of labiodentalization and make no overt comment on it. Following the traditional definitions proposed by Labov (1972) for categorizing sociolinguistic variables, based on his three-way differentiation between *social stereotypes*, *markers*, and *indicators*, it can be concluded that the linguistic variation object of the present research should be classified as the latter type.

From a semantic and phonological perspective, labiodentalization possesses a disambiguating functionality. In fact, whether speakers consciously employ this variant with such compensatory purpose or not, by differentiating [v] from [b] and [β], they eliminate an ambiguity inherent to Spanish orthography and phonology. The confusion based on the opaque association of two different graphemes, <b> and <v>, with one single phoneme, /b/, ceases to exist when the labiodentalized pronunciation [v] is categorically correlated to the spelling <v>. In labiodentalizing varieties, the numerous instances of homophony present in Spanish lexicon (such as *boto* versus *voto* ['bo.to] 'I throw out' versus 'I vote') are converted into minimal pairs with unambiguous meanings and distinct pronunciations corresponding to separate orthographic representation. The same simplification occurs with many other expressions, operating across word boundaries, and reducing the misunderstandings that may arise from homophonous utterances like *lavaba* 'I washed' versus *la baba* 'the drool', both pronounced as [la.'βa.βa] in non-labializing

varieties of Spanish. Additionally, labiodental consonants are visually salient, so the disambiguating effects of labiodentalization are also reinforced gesturally by its clearly observable articulation.

Finally, the present research offers pedagogical implications that should lead to a reconsideration of the treatment that the phonetic variant [v] receives in formal education settings and within Spanish as a second language materials. In fact, grammars, dictionaries, and textbooks utilized in the teaching of Spanish as an L2 typically make no mention of the labiodental pronunciation of the phoneme /b/ or they proscribe it altogether as a non-native feature to be avoided by learners (Stevens, 2000). However, the literature review and the current results illustrated throughout this dissertation attest the presence of the labiodental allophone [v] in many Spanish-speaking communities, including the El Paso area, therefore ignoring or stigmatizing this pronunciation in the classroom represents a misconception that does not reflect actual native usage. As a consequence, educators should account for variation in their curricula and lesson plans, describing the allophones of Spanish /b/ in terms of tendencies and underlining the significant effects of orthography on these phonetic realizations.

Appendices

APPENDIX A

List of all tokens used for the reading task, grouped by orthography and position of the target labial consonant, and alphabetically ordered.

<b> in initial position:

balón [ba.'lõn] ‘balloon’

bato ['ba.to] ‘guy’

belén [be.'lẽn] ‘nativity scene’

beso ['be.so] ‘kiss’

bicho ['bi.tʃo] ‘critter’

bicicleta [bi.si.'kle.ta] ‘bicycle’

bote ['bo.te] ‘jar’

botella [bo.'te.ja] ‘bottle’

búho ['bu.o] ‘owl’

buñuelo [bu.'ɲwe.lo] ‘fritter’

<b> in medial position:

abogado [a.βo.'ɣa.ðo] ‘lawyer’

abono [a.'βo.no] ‘fertilizer’

aburro [a.'βu.ro] ‘I bore’

caballo [ka.'βa.jo] ‘horse’

cabello [ka.'βe.jo] ‘hair’

hábil ['a.βil] ‘skilled’

libertad [li.βeɾ.'tað] ‘liberty’

libido [li.'βi.ðo] ‘libido’

lóbulo ['lo.βu.lo] ‘earlobe’

sábana ['sa.βã.na] ‘sheet’

<v> in initial position:

varón [ba.'rõn] ‘male’

vaso ['ba.so] ‘glass’

velo ['be.lo] ‘veil’

veneno [be.'nẽ.no] ‘poison’

videojuego [bi.ðe.o.'xwe.ɣo] ‘videogame’

vino ['bi.no] ‘wine’

volar [bo.'laɾ] ‘to fly’

voto ['bo.to] ‘vote’

vudú [bu.'ðu] ‘voodoo’

vulgo ['bul.ɣo] ‘masses’

<v> in medial position:

automóvil [aw.to.'mo.βil] ‘car’

avena [a.'βe.na] ‘oatmeal’

aventura [a.βẽn̪.'tu.ɾa] ‘adventure’

avulsión [a.βul.'sjõn] ‘erosion’

cavo ['ka.βo] ‘concave’

evito [e.'βi.to] ‘I avoid’

lava ['la.βa] ‘lava’

lavar [la.'βaɾ] ‘to wash’

pavura [pa.'βu.ɾa] ‘fear’

revoco [re.'βo.ko] ‘I revoke’

Distractors:

agua ['a.ɣwa] ‘water’

califico [ka.li.'fi.ko] ‘I grade’

cielo ['sje.lo] ‘sky’

conejo [ko.'ne.xo] ‘rabbit’

correr [ko.'reɾ] ‘to run’

dama ['da.ma] ‘lady’

doméstico [do.'mes.ti.ko] ‘domestic’

felicidad [fe.li.si.'ðað] ‘joy’

flor [floɾ] ‘flower’

frijol [fɾi.'xol] ‘bean’

frino ['fɾi.no] nonce-word

frona ['fɾo.na] nonce-word

frontera [frõn̪.'te.ɾa] ‘border’

fuego ['fwe.ɣo] ‘fire’

fuera ['fwe.ɾa] ‘outside’

galma ['gal.ma] nonce-word

gato ['ga.to] ‘cat’

guantes ['gwãn̪.tes] ‘gloves’

hardón [aɾ.'ðõn] nonce-word

hierro ['je.ro] ‘iron’

hulla ['u.ja] ‘coal’

jarrón [xa.'rõn] ‘vase’

jato ['xa.to] nonce-word

juego ['xwe.ɣo] ‘game’

jumo ['xu.mo] nonce-word

lago ['la.ɣo] ‘lake’

limpio ['lĩm.pjo] ‘clean’

llamar [ja.'maɾ] ‘to call’

llasa ['ja.sa] nonce-word

lleno ['je.no] ‘full’

llinca ['jĩŋ.ka] nonce-word

maguera [ma.'ɣe.ɾa] nonce-word

margarita [maɾ.ɣa.'ɾi.ta] ‘daisy’

martida [maɾ.'ti.ða] nonce-word

medida [me.'ði.ða] ‘measure’

mesa ['me.sa] ‘table’

metal [me.'tal] ‘metal’

nitigar [ni.ti.'ɣaɾ] nonce-word

nurra ['nu.ra] nonce-word

ofrego [o.'fɾe.ɣo] nonce-word

onicar [o.ni.'kaɾ] nonce-word

oro ['o.ɾo] ‘gold’

oso ['o.so] ‘bear’

pájaro ['pa.xa.ɾo] ‘bird’

paloma [pa.'lo.ma] ‘dove’

pantalones [pãn̪.ta.'lo.nes] ‘pants’

perro ['pe.ro] ‘dog’

piga ['pi.ɣa] nonce-word

plata ['pla.ta] ‘money’

prela ['pɾe.la] nonce-word

prota ['pɾo.ta] nonce-word

purma ['puɾ.ma] nonce-word

querro ['ke.ro] nonce-word

quinda ['kĩn̪.da] nonce-word

rempo ['rẽm.po] nonce-word

rindilla [rĩn̪.'di.ja] nonce-word

rosal [ro.'sal] ‘rose bush’

rufa ['ru.fa] nonce-word

safina [sa.'fi.na] nonce-word

sama ['sa.ma] nonce-word

sello ['se.jo] ‘stamp’

serpiente [seɾ.'pjẽn̪.te] ‘snake’

tierra ['tje.ra] ‘ground’

tlacoche [tla.'ko.tʃe] nonce-word

tortilla [toɾ.'ti.ja] ‘tortilla’

zonca ['sõŋ.ka] nonce-word

zutar [su.'taɾ] nonce-word

APPENDIX B

List of all expected to be elicited words for the picture-naming task, grouped by orthography and position of the target labial consonant, and alphabetically ordered.

<b> in initial position:

banco ['bãŋ.ko] ‘bank’

bandera [bãn̪.'de.ɾa] ‘flag’

barco ['baɾ.ko] ‘boat’

bellota [be.'jo.ta] ‘acorn’

beso ['be.so] ‘kiss’

biblia ['bi.βlja] ‘bible’

bicicleta [bi.si.'kle.ta] ‘bicycle’

bigote [bi.'ɣo.te] ‘moustache’

bolso ['bol.so] ‘bag’

bomba ['bom.ba] ‘bomb’

botella [bo.'te.ja] ‘bottle’

bufanda [bu.'fãn̪.da] ‘scarf’

burro ['bu.ro] ‘donkey’

<b> in medial position:

abanico [a.βa.'ni.ko] ‘fan’

abeja [a.'βe.xa] ‘bee’

abuela [a.'βwe.la] ‘grandmother’

caballo [ka.'βa.jo] ‘horse’

cabina [ka.'βi.na] ‘booth’

calabaza [ka.la.'βa.sa] ‘pumpkin’

cebolla [se.'βo.ja] ‘onion’

cubo ['ku.βo] ‘cube’

jabón [xa.'βõn] ‘soap’

laberinto [la.βe.'ɾĩn̪.to] ‘maze’

rubí [ru.'βi] ‘ruby’

tiburón [ti.βu.'ɾõn] ‘shark’

<v> in initial position:

vaca ['ba.ka] ‘cow’

varita [ba.'ɾi.ta] ‘wand’

vaso ['ba.so] ‘glass’

vela ['be.la] ‘candle’

veneno [be.'nẽ.no] ‘poison’

videojuego [bi.ðe.o.'xwe.ɣo] ‘videogame’

vino ['bi.no] ‘wine’

violín [bjo.'lĩn] ‘violin’

volcán [bol.'kãn] ‘volcano’

vóleibol ['bo.lej.βol] ‘volleyball’

volumen [bo.'lu.mẽn] ‘volume’

vudú [bu.'ðu] ‘voodoo’

vuelo ['bwe.lo] ‘flight’

<v> in medial position:

avena [a.'βe.na] ‘oatmeal’

avión [a.'βjõn] ‘airplane’

caviar [ka.'βjaɾ] ‘caviar’

huevo ['we.βo] ‘egg’

llave ['ja.βe] ‘key’

lluvia ['ju.βja] ‘rain’

navaja [na.'βa.xa] ‘razor’

Navidad [na.βi.'ðað] ‘Christmas’

pavo ['pa.βo] ‘turkey’

revista [re.'βis.ta] ‘magazine’

televisión [te.le.βi.'sjõn] ‘television’

uva ['u.βa] ‘grape’

Distractors:

cangrejo [kãŋ.'gɾe.xo] ‘crab’

carro ['ka.ro] ‘car’

casa ['ka.sa] ‘house’

chile ['tʃi.le] ‘chili’

chorizo [tʃo.'ɾi.so] ‘chorizo’

corona [ko.'ɾo.na] ‘crown’

cuchillo [ku.'tʃi.jo] ‘knife’

ducha ['du.tʃa] ‘shower’

ejotes [e.'xo.tes] ‘green beans’

estrella [es.'tɾe.ja] ‘star’

flor [floɾ] ‘flower’

galleta [ga.'je.ta] ‘cookie’

gallina [ga.'ji.na] ‘hen’

gallo ['ga.jo] ‘rooster’

gancho ['gãnʲ.tʃo] ‘hook’

gato ['ga.to] ‘cat’

hiena ['je.na] ‘hyena’

lámpara ['lãm.pa.ɾa] ‘lamp’

lápiz ['la.pis] ‘pencil’

leche ['le.tʃe] ‘milk’

león [le.'õn] ‘lion’

llama ['ja.ma] ‘llama’

luna ['lu.na] ‘moon’

mano ['mã.no] ‘hand’

manzana [mãn.'sa.na] ‘apple’

mesa ['me.sa] ‘table’

mochila [mo.'tʃi.la] ‘backpack’

olla ['o.ja] ‘pot’

oso ['o.so] ‘bear’

pato ['pa.to] ‘duck’

perro ['pe.ro] ‘dog’

pizarra [pi.'sa.ra] ‘blackboard’

pluma ['plu.ma] ‘pen’

pollo ['po.jo] ‘chicken’

queso ['ke.so] ‘cheese’

ratón [ra.'tõn] ‘mouse’

rey [rej] ‘king’

sandía [sãn̪.'di.a] ‘watermelon’

serpiente [seɾ.'pjẽn̪.te] ‘snake’

silla ['si.ja] ‘chair’

sol [sol] ‘sun’

taza ['ta.sa] ‘cup’

teléfono [te.'le.fo.no] ‘telephone’

tenedor [te.ne.'ðoɾ] ‘fork’

tigre ['ti.ɣɾe] ‘tiger’

tlacuache [tla.'kwa.tʃe] ‘possum’

toalla [to.'a.ja] ‘towel’

tomate [to.'ma.te] ‘tomato’

tortilla [toɾ.'ti.ja] ‘tortilla’

zanahoria [sa.na.'o.ɾja] ‘carrot’

zapato [sa.'pa.to] ‘shoe’

APPENDIX C

Preliminary questions used to obtain sociolinguistic information from the participants in the production study.

1) What year were you born in?

2) What education level have you completed? High school, college, master's, etc.

3) What type of school did you attend? Would you say that you received your formal education mostly in English, mostly in Spanish, or in bilingual programs/schools?

4) How would you rate your Spanish writing proficiency level on a scale from a minimum of 1 and a maximum of 5?

5) How would you rate your Spanish reading proficiency level on a scale from a minimum of 1 and a maximum of 5?

6) How would you rate your English writing proficiency level on a scale from a minimum of 1 and a maximum of 5?

7) How would you rate your English writing proficiency level on a scale from a minimum of 1 and a maximum of 5?

References

Achugar, M. (2008). Counter-Hegemonic Language Practices and Ideologies: Creating a New Space and Value for Spanish in Southwest Texas. *Spanish in Context*, 5(1), pp. 1–19.

Achugar, M. & Pessoa, S. (2009). Power and Place: Language Attitudes towards Spanish in a Bilingual Academic Community in Southwest Texas. *Spanish in Context*, 6, pp. 199–223.

Alba, M. C. (2006). Accounting for Variability in the Production of Spanish Vowel Sequences. In Sagarra, N. & Toribio, A.J. (eds.), *Selected Proceedings of the 9th Hispanic Linguistics Symposium* (pp. 273-285). Somerville, MA: Cascadilla Proceedings Project.

Alfaraz, G. (2000). *Sound Change in a Regional Variety of Cuban Spanish*. Doctoral Dissertation, Michigan State University.

Alonso, A. (1967). *De la Pronunciación Medieval a la Moderna en Español*, vol. I. Madrid: Gredos.

Amastae, J. (1982). Language Shift and Maintenance in the Lower Rio Grande Valley of Southern Texas. In F. Barkin, E. Brandt, & J. Ornstein-Galicia (eds.), *Bilingualism and Language Contact: Spanish, English, and Native American Languages*. New York: Teachers College Press.

Amengual, M. (2012). Interlingual Influence in Bilingual Speech: Cognate Status Effect in a Continuum of Bilingualism. *Bilingualism: Language and Cognition*, 15(3), 517-530.

Amengual, M. (2016). Cross-Linguistic Influence in the Bilingual Mental Lexicon: Evidence of Cognate Effects in the Phonetic Production and Processing of a Vowel Contrast. *Frontiers in Psychology*, vol. 7.

Anderson-Mejías, P. (2005). Generation and Language Use in the Lower Rio Grande Valley of Texas. *Southwest Journal of Linguistics*, 24, pp. 1-12.

Audacity Team (2016). *Audacity 2.1.2 . A Free Audio Editor and Recorder.* Copyright by Dominic Mazzoni.

Baayen, R. H. (2013). *languageR: Data Sets and Functions with "Analyzing Linguistic Data: A Practical Introduction to Statistics"*. https://cran.r-project.org/package=languageR

Baker, P. (2009). *Contemporary Corpus Linguistics.* London: Continuum.

Ball, M. J. & Rahilly, J. (1999). *Phonetics: the Science of Speech*. London, UK: Arnold.

Barrutia, R. & Schwegler, A. (1994). *Fonética y Fonología Españolas*. 2nd edition. New York: Wiley.

Bates, D., Maechler, M., Bolker, B., Walker, S., Haubo Bojesen Christensen, R., Singmann, H., Dai, B., Grothendieck, G., & Green, P. (2016). *lme4: Linear Mixed-Effects Models Using 'Eigen' and S4*. https://cran.r-project.org/package=lme4

Baumel-Schreffler, S. (1995). *Mexican Spanish in Houston, Texas: A Study of Language Contact and Its Effects on Overt Subject Pronouns*. Doctoral Dissertation. University of Florida.

Blas Arroyo, J. L. (2012). *Sociolingüística del Español. Desarrollos y Perspectivas en el Estudio de la Lengua Española en Contexto Social*. Madrid, Spain: Ediciones Cátedra.

Boersma, P. & Weenink, D. (2012). *Praat: Doing phonetics by computer. V. 5.3.23*. Amsterdam. http://www.praat.org

Boomershine, A., Hall, K., Hume, E., & Johnson, K. (2008). The Impact of Allophony Vs. Contrast on Speech Perception. In Peter Avery, Elan Dresher, & Keren Rice (eds.) *Phonological Contrast: Perception and Acquisition*, pp. 146–72. The Hague, Netherlands: Mouton de Gruyter.

Brown, E. L. & Harper, D. (2009). Phonological Evidence of Interlingual Exemplar Connections. *Studies in Hispanic and Lusophone Linguistics*, 2 (2), pp. 257–274.

Bucholtz, M. (2001). The Whiteness of Nerds: Superstandard English and Racial Markedness. *Journal of Linguistic Anthropology*, 11, pp. 84–100.

Bullock, B. E. (2009). Phonetic Reflexes of Code-Switching. In B. E. Bullock & J. Toribio (eds.), *The Cambridge Handbook of Linguistic Code-Switching*, pp. 163-181. Cambridge: Cambridge University Press.

Bullock, B. E. & Gerfen, C. (2004). Phonological Convergence in a Contracting Language Variety. *Bilingualism: Language and Cognition*, 7 (2), pp. 95–104.

Bullock, B. E. & Toribio, A. J. (2013). *The Spanish in Texas Corpus Project*. COERLL, The University of Texas at Austin. http://www.spanishintexas.org

Bybee, J. (2002). Word Frequency and Context of Use in the Lexical Diffusion of Phonetically Conditioned Sound Change. *Language Variation and Change* 14, pp. 261-290.

Calero, M. A. (1993). *Estudio Sociolingüístico del Habla de Toledo*. Lérida, Spain: Pagés.

Cameron, D. (2003). Gender Issues in Language Change. *Annual Review of Applied Linguistics*, vol. 23, pp. 187-201.

Campbell-Kibler. K. (2010). Sociolinguistics and Perception. *Language and Linguistics Compass* 4, pp. 377-389.

Campos-Astorkiza, R. (2010). Voicing Assimilation and Prosodic Structure in Spanish. *The Journal of the Acoustical Society of America*, vol. 128, issue 4, p. 2288.

Carlet, A. & Cebrian, J. (2014). Training Catalan Speakers to Identify L2 Consonants and Vowels: A Short-Term High Variability Training Study. *Proceedings of the International Symposium on the Acquisition of Second Language Speech*. Concordia Working Papers in Applied Linguistics, 5, 2014 © 2014 COPAL.

Carrasco, P. (2008). *An Acoustic Study of Voiced Stop Allophony in Costa Rican Spanish*. Doctoral Dissertation, University of Illinois.

Carrasco, P., Hualde, J. I., & Simonet, M. (2012). Dialectal Differences in Spanish Voiced Obstruent Allophony: Costa Rican versus Iberian Spanish. *Phonetica* 2012; 69, pp. 149-179.

Cartagena, N. (2002). *Apuntes para la Historia del Español en Chile*. Santiago: Academia Chilena de la Lengua.

Carter, T. (1970). *Mexican Americans in School: A History of Educational Neglect*. New York: College Entrance Examination Board.

Carvalho, A. M. (2006). Spanish (s) Aspiration as a Prestige Marker on the Uruguayan-Brazilian Border. *Spanish in Context* 3:1, pp. 85-114.

Cassano, P. (1972). The Influence of Guarani on the Phonology of the Spanish of Paraguay. *Studia Linguistica* 26, pp. 106-112.

Chappell, W. (2016). On the Social Perception of Intervocalic /s/ Voicing in Costa Rican Spanish. *Language Variation and Change*, 28, pp. 357-378.

Chappell, W. (forthcoming). Costa Rican Spanish Speakers' Phonetic Discrimination. *Estudios de Fonética Experimental*.

Colantoni, L. & Marinescu, I. (2010). The Scope of Stop Weakening in Argentine Spanish. In Marta Ortega-Llebaria (ed.), *Selected Proceedings of the 4th Conference on Laboratory Approaches to Spanish Phonology*, 100–114. Somerville, MA: Cascadilla Proceedings Project.

Cortés, S. (2007). *Representations and Transfer Processes in L2 Speech Production: Evidence from Catalan Learners of English*. Doctoral dissertation. University of Edinburgh.

D'Amico, S., Devescovi, A., & Bates, E. (2001). Picture Naming and Lexical Access in Italian Children and Adults. *Journal of Cognition and Development*, 2(1), pp. 71-105.

Davies, M. (2008). *A Frequency Dictionary of Spanish. Core Vocabulary for Learners*. New York: Routledge.

De León, A. (1983). *They Called Them Greasers: Anglo Attitudes Toward Mexicans in Texas, 1821–1900*. Austin: University of Texas Press.

De León, A. (1993). *Mexican Americans in Texas: A Brief Histor*y. Arlington Heights, Illinois: Harlan Davidson.

Dorian, N. (1993). Internally and Externally Motivated Change in Contact Situations: Doubts About Dichotomy. In C. Jones (ed.) *Historical Linguistics: Problems and Perspectives*, pp. 131-155, London: Longman.

Dubois, S. & Horvath, B. (1999). When the Music Changes, You Change Too: Gender and Language Change in Cajun English. *Language Variation and Change*, 11(3), pp. 287-313.

Eckert, P. (2008). Variation and the Indexical Field. *Journal of Sociolinguistics*, 12(3), pp. 453–476.

Eddington, D. (2011). What Are the Contextual Phonetic Variants of /β, ð, γ/ in Colloquial Spanish? *Probus, International Journal of Romance Linguistics*, vol. 23 (1).

Engstrand, I. (1996). *Quest for Empire. Spanish Settlement in the Southwest*. Golden, Colorado: Fulcrum Publishing.

Erker, D. (2010). A Subsegmental Approach to Coda /s/ Weakening in Dominican Spanish. *International Journal of the Sociology of Language* 203, pp. 9-26.

Flege, J., Schirru, C., & MacKay, I. (2003). Interaction between the Native and Second Language Phonetic Subsystems. *Speech Communication*, vol. 40, 4, pp. 467-491.

Foulkes, P., Scobbie, J., & Watt, D. (2010). Sociophonetics. In William J. Hardcastle, John Laver, and Fiona E. Gibbon (eds.) *The Handbook of Phonetic Sciences*, 2nd Edition, 703-756, Malden, MA: Blackwell.

Gerfen, C. (2001). A Critical View of Licensing by Cue: The Case of Andalusian Spanish. In L. Lombardi (ed.), *Segmental Phonology in Optimality Theory*, 183-205. Cambridge University Press.

Gerfen, C. (2002). Andalusian Codas. *Probus* 14, pp. 303–333.

Gonzalez, C. (2014). Stress Effects on Voicing and Frication in Voiced Obstruents in North-Central Spanish. *The Journal of the Acoustical Society of America*, vol. 110, (5).

Gordon, E. (1997). Sex, Speech, And Stereotypes: Why Women Use Prestige Speech Forms More than Men. *Language in Society* 26, pp. 47-63.

Hardin, S. (1994). *Texian Iliad*. Austin, Texas: University of Texas Press.

Harris, T. (1994). *Death of a Language. The History of Judeo-Spanish*. Newark: University of Delaware Press.

Haugen, E. (1953). *The Norwegian Language in America: A Study in Bilingual Behavior*. Bloomington: Indiana University Press.

Hay, J. & Drager, K. (2007). Sociophonetics. *Annual Review of Anthropology*, 36, pp. 89-103.

Hazan, V. & Boulakia, G. (1993). Perception and Production of a Voicing Contrast by French-English Bilinguals. *Language and Speech*, vol. 36, 1, pp. 17-38.

Herman, J. (2000). *Vulgar Latin*. University Park: Pennsylvania State University Press.

Hernández, J. E. (2002). Accommodation in a Dialect Contact Situation. *Filología y Lingüística*, XXVIII (2), pp. 93-110.

Herzog, M. (1965). *The Yiddish Language in Northern Poland*. Bloomington and The Hague: Mouton & Co.

Hickey, C. (2012). *Spanish Language Use and Linguistic Attitudes in Laredo, Texas between 1860 and 1930*. Doctoral thesis, Texas A&M University.

Hickey, R. (2004). Mergers, Near-Mergers and Phonological Interpretation. In C. Kay, C. Hough, & I. Wotherspoon (eds), *New Perspectives on English Historical Linguistics*. Amsterdam: John Benjamins.

Hickey, R. (2012). Internally and Externally Motivated Language Change. In J. M. Hernández-Compoy & J. C. Conde-Silvestre (eds), *The Handbook of Historical Sociolinguistics*, pp. 401-421. Malden, MA: Wiley-Blackwell.

Hinrichs, L. *et al*. (2015). Praat Script for Center of Gravity. http://dsbigham.net/texasenglish/index.html

Hölterhoff, J. & Reetz, H. (2007). Acoustic Cues Discriminating German Obstruents in Place and Manner of Articulation. *Journal of the Acoustical Society of America*, 121, pp. 1142-1156.

Hoyos Piñas, J. M. (2003). El Conflicto «b»/«v» en las Hablas Extremeñas. *Res Diachronicae*, vol. 2, pp. 190-195.

Hualde, J. I. (2009). Los Sonidos de la Lengua: Fonética y Fonología. In J. I. Hualde *et alii* (eds.), *Introducción a la Lingüística Hispánica.* New York: Cambridge University Press.

Hualde, J. I., Nadeu, M., & Simonet, M. (2010). Lenition and Phonemic Contrast in Two Catalan Dialects. In Sonia Colina, Antxon Olarrea, & Ana Carvalho (eds.), *Romance Linguistics 2009: Selected Papers from the 39th Linguistic Symposium on Romance Languages*, pp. 63–79. Amsterdam: John Benjamins.

Hualde, J. I., Simonet, M., & Nadeu, M. (2011). Consonant Lenition and Phonological Recategorization. *Laboratory Phonology*, 2, pp. 301–329.

Jakobson, R. (1941). *Kindersprache, Aphasie und Allgemeine Lautgesetze*. Uppsala: Alqmvist & Wiksell.

Jarvis, S. (2000). Methodological Rigor in the Study of Transfer: Identifying L1 Influence in the Interlanguage Lexicon. *Language Learning*, 50, pp. 245-309.

Jarvis, S., & Pavlenko, A. (2008). *Crosslinguistic Influence in Language and Cognition*. New York & London: Routledge.

Jongman, A., Wayland, R., & Wong, S. (1998). Acoustic Characteristics of English Fricatives: I. Static Cues. *Working Papers of the Cornell Phonetics Laboratory*, vol. 12, pp. 195-205.

Jongman, A., Wayland, R., & Wong, S. (2000). Acoustic Characteristic of English Fricatives. *Journal of the Acoustical Society of America*, 108(3), pp. 1252-1263.

King, R., Martineau, F., & Mougeon, R. (2011). The Interplay of Internal and External Factors in Grammatical Change: First-Person Plural Pronouns in French. *Language*, vol. 87, 3, pp. 470-509.

Kochetov, A. & Colantoni, L. (2011). Spanish Nasal Assimilation Revisited: A Cross-Dialect Electropalatographic Study. *Journal of Laboratory Phonology*, vol. 2-2.

Kreneck, T. (2010). *Little School of the 400*. Austin: Texas State Historical Association.

Labov, W. (1966). *The Social Stratification of English in New York City*. Washington, DC: Center for Applied Linguistics.

Labov, W. (1972). *Sociolinguistic Patterns*. Philadelphia: University of Pennsylvania Press.

Labov, W. (1994). *Principles of Linguistic Change, Vol. 1: Internal Factors*. Oxford and Cambridge (MA): Blackwell Publishers.

Labov, W. (2001). *Principles of Linguistic Change, Vol. 2: Social Factors*. Malden, MA: Blackwell Publishers.

Labov, W. (2010). *Principles of Linguistic Change, Vol. 3: Cognitive and Cultural Factors*. Oxford: Wiley-Blackwell.

Labov, W., Ash, S., & Boberg, C. (2006). *The Atlas of North American English: Phonetics, Phonology, and Sound Change: A Multimedia Reference Tool*. Berlin: Walter de Gruyter.

Labov, W., Karen, M., & Miller, C. (1991). Near-mergers and the Suspension of Phonemic Contrast. *Language Variation and Change*, 3, pp. 33-74.

Labov, W., Yaeger, M., & Steiner, R. (1972). *A Quantitative Study of Sound Change in Progress* (Vol. 1). US Regional Survey,

Labrune, L. (2012). *The Phonology of Japanese*. Oxford, UK: Oxford University Press.

Ladefoged, P. (1990). What Do We Symbolize? Thoughts Prompted by Bilabial and Labiodental Fricatives. *Journal of the International Phonetic Association*, 20 (2), pp. 33-36.

Ladefoged, P. & Johnson, K. (2010). *A Course in Phonetics*. Boston, MA: Cengage Learning.

Langacker, R. W. (1987). *Foundations of Cognitive Grammar. Vol. 1, Theoretical Prerequisites*. Stanford, CA: Stanford University Press.

Lipski, J. M. (1994). *Latin American Spanish*. London: Longman.

Lipski, J. M. (2008). *Varieties of Spanish in the United States*. Washington, D. C.: Georgetown University Press.

Lipski, J. M. (2016). On the Tenacity of Andean Spanish. In S. Sessarego & F. Tejedo-Herrero (eds.), *Spanish Language and Sociolinguistic Analysis*, pp. 109-134. Amsterdam: John Benjamins.

Lleó, C. (2002). The Role of Markedness in the Acquisition of Complex Prosodic Structures by German-Spanish Bilinguals. *The International Journal of Bilingualism*, vol. 6, 3, pp. 291-313.

Long, C. (2016). The Old Three Hundred. *Handbook of Texas Online*. Accessed February 25, 2017, http://www.tshaonline.org/handbook/online/articles/umo01. Uploaded on June 15, 2010. Modified on May 10, 2016. Published by the Texas State Historical Association.

Mack, S. (2010). A Sociophonetic Analysis of Perception of Sexual Orientation in Puerto Rican Spanish. *Laboratory Phonology*, 1(1), pp. 41–63.

Maddieson, I. (1984). *Patterns of Sounds*. Cambridge: Cambridge University Press.

Martínez-Gil, F. (1998). On the Spelling Distinction b vs. u/v and the Status of Spirantization in Old Spanish. *Theoretical Analyses on Romance Languages:*

Selected Papers from the 26th Symposium on Romance Languages (LSRL XXVI), Mexico City, 1996, pp. 283-316.

Mazzaro, N. (2011). *Experimental Approaches to Sound Variation: A Sociophonetic Study of Labial and Velar Fricatives and Approximants in Argentine Spanish*. Doctoral Dissertation, University of Toronto.

Menéndez Pidal, R. (1977). *Manual de Gramática Histórica Española*. Madrid: Espasa-Calpe.

Metz, L. (1993). *El Paso Chronicles: A Record of Historical Events in El Paso, Texas*. El Paso: Mangan Press

Meyerhoff, M. (1994). Updating "Gender" as a Sociolinguistic Variable. *University of Pennsylvania Working Papers in Linguistics*: Vol. 1: Iss. 1, Article 5. Available at: http://repository.upenn.edu/pwpl/vol1/iss1/5

Milka La Más Dura (2011). Te Vote. Videoclip for the song included in the album *Milka La Más Dura*. https://www.youtube.com/watch?v=kXr8vAi6bIQ

Milroy, L. (1980). *Language and Social Networks.* Oxford: Blackwell.

Moreno Fernández, F. (2005). *Historia Social de las Lenguas de España*. Barcelona: Ariel.

Morgan, T. (2010). *Sonidos en Contexto. Una Introducción a la Fonética del Español con Especial Referencia a la Vida Real*. New Haven, CT: Yale University Press.

Mougeon, R., Nadasdi, T., & Rehner, K. (2005). Contact-Induced Linguistic Innovations on the Continuum of Language Use: The Case of French in Ontario. *Bilingualism: Language and Cognition*, 8 (2), pp. 99–115.

Myers-Scotton, C. (2002). *Contact Linguistics: Bilingual Encounters and Grammatical Outcomes*. Oxford: Oxford University Press.

Nadeu, M. (2014). Stress- and Speech Rate-Induced Vowel Quality Variation in Catalan and Spanish. *Journal of Phonetics*, vol. 46, pp. 1–22.

Nakamura, Y. & Yoneyama, K. (2010). Lexical Familiarity Affects JapaneseSpeakers' Perception of /b/ and /v/. *The Journal of the Acoustical Society of America*, vol. 128(4), 2490.

National Center for Education Statistics (2017). *Digest of Education Statistics*. Washington DC: National Center for Education Statistics.

Nycz, J. (2013). New Contrast Acquisition: Methodological Issues and Theoretical Implications. *English Language and Linguistics*, 17(2), pp. 325-357.

Ohala, M. & Ohala, J. (2001). Acoustic VC Transitions Correlate with Degree of Perceptual Confusion of Place Contrast in Hindi. *Travaux du Cercle Linguistique de Copenhague*, 31, pp. 265-284.

Otheguy, R., Zentella, A. C., & Livert, D. (2007). Language and Dialect Contact in Spanish in New York: Toward the Formation of a Speech Community. *Language*, vol. 83 (4), pp. 770-802.

Ozubko, J. D., & Joordens, S. (2011). The Similarities (and Familiarities) of Pseudowords and Extremely High-Frequency Words: Examining a Familiarity-Based Explanation of the Pseudoword Effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, vol. 37(1), pp. 123-139.

Penny, R. J. (2000). *Variation and Change in Spanish*. Cambridge: Cambridge University Press.

Pépiot, E. (2013). Voice, Speech and Gender: Male-Female Acoustic Differences and Cross-Language Variation in English and French Speakers. *XVèmes Rencontres Jeunes Chercheurs de l'ED 268, Jun 2012, Paris, France*. (forthcoming)

Pew Research Center (2016). Washington, DC. URL http://www.pewresearch.org/

Pindziak, C. (2012). *On the Lack of Fricative Articulations of [β] in the World's Languages*. Master Thesis, University of Florida.

Piñeros, C.-E. (2002). Markedness and Laziness in Spanish Obstruents. *Lingua* 112, pp. 379-413.

Poplack, S. (1997). The Sociolinguistic Dynamics of Apparent Convergence. In G. Guy, J. Baugh, & D. Schiffrin (eds.). *Towards a Social Science of Language*. Amsterdam: Benjamins, pp. 285-309.

Poplack, S. & Levey, S. (2010). Contact-Induced Grammatical Change: A Cautionary Tale. In P. Auer & J. Schmidt (eds.). *Language and Space – An International Handbook of Linguistic Variation: Volume 1 – Theories and Methods*. Berlin: Mouton de Gruyter, pp. 391-419.

Poplack, S., Zentz, L., & Dion, N. (2012). Phrase-Final Prepositions in Quebec French: An Empirical Study of Contact, Code-Switching and Resistance to Convergence. *Bilingualism: Language and Cognition*, 15 (2), pp. 203-225.

Preston, D. R. (2002). *Handbook of Perceptual Dialectology*. Amsterdam: John Benjamins.

R Core Team (2017). *R version 3.0.2: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.

Real Academia Española (2016). *Diccionario de la Lengua Española*. URL: http://dle.rae.es

Reetz, H. (2009). Praat Script for Duration. http://menzerath.phonetik.uni-frankfurt.de/staff/reetz/reetz.html

Reetz, H. & Jongman, A. (2011). *Phonetics: Transcription, Production, Acoustics, and Perception*. Hoboken, NJ: Wiley-Blackwell.

Richardson, R., Anderson, A., Wintz, C., & Wallace, E. (2005). *Texas: the Lone Star State* (9th ed.). New Jersey: Prentice Hall.

Rodríguez, R. (2016). Bilingual Education. *Handbook of Texas Online*. Accessed February 25, 2017, http://www.tshaonline.org/handbook/online/articles/khb02. Uploaded on June 12, 2010. Modified on March 25, 2016. Published by the Texas State Historical Association.

Rogers, H. (2000). *The Sounds of Language: An Introduction to Phonetics*. Abingdon, UK: Routledge.

Romero, L., Guerreiro, Y., & Alviárez, L. (2008). Fricativas y Aproximantes: Labiodentalización y Refuerzo en el Español de Maracaibo. *Opción: Revista de Ciencias Humanas y Sociales*, ISSN 1012-1587, Nº. 57, 2008, pp. 58-73.

Ronquest, R. E. (2012). *An Acoustic Analysis of Heritage Spanish Vowels*. Doctoral Dissertation. Indiana University.

Rosselli, M., Ardila, A., Jurado, M. B., & Salvatierra, J. L. (2014). Cognate Facilitation Effect in Balanced and Non-balanced Spanish–English Bilinguals Using the Boston Naming Test. *International Journal of Bilingualism*, vol. 18(6), pp. 649–662.

Sadowsky, S. (2010). El Alófono Labiodental Sonoro [v] del Fonema /b/ en el Castellano de Concepción (Chile): Una Investigación Exploratoria. The Voiced Labiodental Allophone [v] of the Phoneme /b/ in the Spanish of Concepción (Chile): An Exploratory Study. *Estudios de Fonética Experimental,* ISSN 1575-5533, XIX, 2010, pp. 231-261.

Sadowsky, S., Painequeo, H., Salamanca, G., & Avelino, H. (2013). Mapudungun. *Journal of the International Phonetic Association*, 43 (1), pp. 87–96.

Schmidt, L. B. (2013). Regional Variation in the Perception of Sociophonetic Variants of Spanish /s/. In *Selected Proceedings of the 6th Workshop on Spanish Sociolinguistics, Ana M. Carvalho and Sara Beaudrie (eds.)*, Somerville, MA: Cascadilla Proceedings Project, pp. 289-302.

Sessarego, S. (2013). Afro-Hispanic Contact Varieties as Conventionalized Advanced Second Languages. *Iberia*, vol. 5 (1), pp. 99-125.

Siemund, P. (2008). Language Contact: Constraints and Common Paths of Contact-Induced Language Change. In P. Siemund & N. Kintana (eds.) *Language Contact and Contact Languages*. Hamburg: Hamburg Studies on Multilingualism (HSM).

Silva-Corvalán, C. (1984). The Social Profile of a Syntactic-Semantic Variable: Three Verb Forms in Old Castile. *Hispania*, 67, pp. 594-601.

Silva-Corvalán, C. (1994/2000). *Language Contact and Change: Spanish in Los Angeles*. New York & Oxford: Oxford Press/Clarendon Press.

Silva-Corvalán, C. (2004). Spanish in the Southwest. In E. Finegan & J. Rickford (eds.), *Language in the USA: Themes for the Twenty-First Century*. Cambridge: Cambridge University Press.

Simpson, A. (2009). Phonetic Differences Between Male and Female Speech. *Language and Linguistics Compass*, 3, pp. 621-640.

Squires, L. (2013). It Don't Go Both Ways: Limited Bidirectionality in Sociolinguistic Perception. *Journal of Sociolinguistics* 17, pp. 200-237.

Stevens, K. (1998). *Acoustic Phonetics*. Cambridge, MA: MIT Press.

Stevens, J. J. (2000). On the Labiodental Pronunciation of Spanish /b/ among Teachers of Spanish as a Second Language. *Hispania*, vol. 83, 1, pp. 139-149.

Strevens, P. (1960). Spectra of Fricative Noise in Human Speech. *Language and Speech* 3, pp. 32-49.

Tabain, M., Butcher, A., Breen, G., & Beare, R. (2016). An Acoustic Study of Nasal Consonants in Three Central Australian Languages. *The Journal of the Acoustical Society of America*, 139, 890.

Takawaki, S. L. (2012). *Orthographic Loyalty in the Spanish of Northern Mexican Speakers*. Master's Thesis, Arizona State University.

Tessel, C. (2013). *Neurophysiological Indices of the Effect of Cognates on Vowel Perception in Late Spanish-English Bilinguals*. Doctoral Dissertation, City University of New York.

Texas State Historical Association (2016). "The Handbook of Texas Online". *Handbook of Texas*. URL: https://www.tshaonline.org/handbook/online

Thomason, S. (2001). *Language Contact - An Introduction*. Edinburgh, UK: Edinburgh University Press.

Timmons, W. H. (1990). *El Paso, A Borderlands History*. El Paso: The University of Texas at El Paso.

Timmons, W. H. (2010). *El Paso, TX*. Austin: Texas State Historical Association.

Toribio, A. J. & Bullock, B. E. (2016). A New Look at Heritage Spanish and Its Speakers. In D. Pascual y Cabo (ed.), *Advances in Spanish as a Heritage Language*, 49:27–50, New York: John Benjamins.

Torres Cacoullos, R. & Ferreira, F. (2000). Lexical Frequency and Voiced Labiodental-Bilabial Variation in New Mexican Spanish. *Southwest Journal of Linguistics*, 19(2), pp. 1-17.

Treffers-Daller, J. (2011). Grammatical Collocations and Verb-Particle Constructions in Brussels French: A Corpus-Linguistic Approach to Transfer. *International Journal of Bilingualism*, 16(1), pp. 53-82.

Trovato, A. (2017). Presence of the Voiced Labiodental Fricative Segment [v] in Texas Spanish. In R. Lopes, J. Ornelas de Avelar, & S. Cyrino (eds.), *Romance Languages and Linguistic Theory 12. Selected Papers from the 45th Linguistic Symposium on Romance Languages (LSRL), Campinas, Brazil*. Campinas, Brazil: John Benjamins.

Trudgill, P. (1986). *Dialects in Contact*. Oxford: Blackwell.

Trudgill, P., Nevalainen, T., & Wischer, I. (2002). Dynamic *Have* in North American and British Isles English. *English Language and Linguistics*, 6, pp. 1-15.

U.S. Census Bureau (2014). U.S. Department of Commerce. URL http://www.census.gov/

VanCoetsem, F. (1988). *Loan Phonology and the Two Transfer Types in Language Contact.* Dordrecht: Foris.

VanCoetsem, F. (1995). "Outlining a Model of the Transmission Phenomenon in Language Contact". *Leuvense Bijdragen*, 84, pp. 63-85.

Vanek, C. & McDaniel, S. (2006). SurveyGizmo. Widgix, LLC.

Vega, J. E. (1980). *The Enactment of Bilingual Education Legislation in Texas, 1969–1973*. Ph.D. dissertation, University of Michigan.

Velázquez, I. (2009). Intergenerational Spanish Transmission in El Paso, Texas: Parental Perceptions of Cost/Benefit. *Spanish in Context*, 6(1), pp. 69–84.

Velázquez, I. (2013). Individual Discourse, Language Ideology and Spanish Transmission in El Paso, Texas. *Critical Discourse Studies*, vol. 10(3), pp. 245–262.

Vergara, V. (2010). Imágenes Elicitadoras de /b/. Instrumento de Apoyo a la Investigación, la Evaluación y el Diagnóstico. Concepción, Chile. [http://vivivergaraf.comuv.com/imagenes.zip].

Vergara, V. (2011). Producción de /v/ como Alófono de /b/ en Niños Prealfabetizados de la Provincia de Concepción (Chile). *Boletín de Lingüística* XXIII (35-36): 123-142.

Vergara, V. (2013). Relación entre Alfabetización y Producción de los Alófonos de /b/: Estudio del Habla Cuidada de Hablantes Prealfabetizados y Alfabetizados. *Onomázein*, 27, pp. 158-170.

Vergara, V. & Pérez, H. E. (2013). Estudio de la Incidencia de la Representación Gráfica (Escritura) en la Producción del Alófono Labiodental [v] del Fonema /b/, *Boletín de Filología,* Tomo XLVIII Número 2 (2013), pp. 119 –128.

Walker, A., García, C., Cortés, Y., & Campbell-Kibler, K. (2014). Comparing Social Meanings Across Listeners and Speaker Groups: The Indexical Field of Spanish /s/. *Language Variation and Change* 26, pp. 169-189.

Weber, D. (1992). *The Spanish Frontier in North America*. New Haven: Yale University Press.

Weinreich, U. (1953). *Languages in Contact: Findings and Problems*. New York: Linguistic Circle of New York.

Wheeler, M. (2005). *The Phonology of Catalan* (Phonology of the World's Languages Series). Oxford: Oxford University Press.

Wilbanks, E. (2016). *FASE: Forced Alignment System for Español.* http://phon.chass.ncsu.edu/cgi-bin/webalign_fase.cgi

Winford, D. (2002). *An Introduction to Contact Linguistics*. Hoboken, NJ: Blackwell Publishing.

Winford, D. (2005). Contact-Induced Changes. Classification and Processes. *Diachronica*, vol. 22:2, pp. 373-427.

Ziegler, J. & Ferrand, L. (1998). Orthography Shapes the Perception of Speech: The Consistency Effect in Auditory Word Recognition. *Psychonomic Bulletin & Review* volume 5, issue 4, pp. 683-689.

https://www.youtube.com/watch?v=Kg22qes1L