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The Vowels of Mexican Heritage English in a Chicago Community

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ABSTRACT

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This dissertation examines the effects of language contact on speakers' vowels in a Mexican ethnic community in Chicago, Illinois. Through detailed acoustic-phonetic analysis, the vowels of the contact variety, Mexican Heritage English (MHE), are characterized. Accent perception ratings and a social practices survey are employed to determine the relationship between vowel production, accentedness, and the social orientation of the MHE speakers toward their community.

Speech recordings were elicited using wordlists, sentences, passages and interviews from four relevant speaker groups of female speakers: Mexican Spanish, second-language English (L2E), MHE, and the regional norm (Anglo). Eleven monophthongal vowels were analyzed instrumentally for first and second formant values and temporal properties. Groups are distinguished by their vocalic structure, with MHE clearly differentiated from both L2E and Anglo. Unlike L2E, MHE maintains the vowel inventory of Anglo speech, but differs predominantly in the dynamic properties of the vowels: duration of the subsystems of long and short vowels, the conditioned lengthening of vowels preceding voiced consonants, and vowel inherent spectral change of /æ/.

Listeners consistently detected a wide range of accentedness across MHE speakers, with a correlation found between accentedness and vocalic features – such as /u/ fronting and /æ/ raising – as well as temporal properties of the vowels. Comparisons to other Inland North

regional studies indicate that intraregional variation exists, and that /æ/ is a pivotal vowel for regional comparisons. In addition, the analysis provides evidence for supraregional effects of Spanish/English contact based on durational subsystems.

A survey-based cultural analysis technique was adapted from anthropological research to determine community index scores for the MHE speakers. These scores indicate the extent to which the speakers reflect the practices and opinions of their community, and correlate with speaker age as well as vowel inherent spectral change in /æ/.

The analyses combine to present a comprehensive picture of the initiation and propagation of language change due to contact. As a variety of American English, MHE reveals a selective propagation of vocalic features both linguistic (internal) and social (external), traceable to Spanish language contact and speakers' cultural identities as Mexican-Americans in an ethnic community.

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Chapter 1. Language Contact and Language Change

Introduction

Languages change, and the search for the mechanisms of change has led researchers to look for both linguistic and social causes. Linguistic, or internal, factors are the constraints which are part of the structure of the language itself. For the study of sound change, the phonetic, phonemic, and morphological systems can be considered independently from social factors that inevitably guide the propagation of variants (Labov 1994). In addition to chain-shifts, mergers, and splits typically considered in dialectal study of vowels, the roles of typological distance and universal markedness are examples of linguistic factors that have been explored as factors in contact-induced language change (Thomason, 2001). Social, or external, causes play an important role as well. Studies of change in progress provide direct views into the motivating factors that result from the interaction of speakers with their communities and their social perceptions and positions. From the early sociolinguistic studies in Philadelphia outlined by Labov (1994), to more recent work on social indexing (e.g., Del Torto, 2010; Foulkes & Docherty, 2005; Hay et al., 2006), researchers have found that understanding speakers' social settings is crucial to understanding language variation and change.

Linguists have considered internal and external causes as predictors of the trajectory of change and generally agree on the usefulness of the distinction, if not which of the two causes is primary (Sankoff, 2002; Thomason, 2008; Thomason & Kaufman, 1988). But regardless of their interaction in effecting change, both social and linguistic causes are being explored by sociophoneticians who now have the methodological and technical tools to uncover empirical evidence for both – this on a time scale less than historical. The hope is that through the social

and phonetic study of language variation on a local level, we will better understand the gradual evolution of language, and gain insight into the causes of historical language shifts.

Language contact can cause sudden and extreme shifts in a language, allowing little dispute as to their source (Sankoff, 2002). From a thorough analysis of the language varieties that develop in local contact situations, we can trace the aspects of each language that are adopted by speakers in the initial stages of contact, and make predictions about what structural features we might expect to endure as historical changes in the language. By comparing these expectations to what we find in later stages as well as in other regions with similar contact environments, we hope to determine how internal and external factors influence the features that are ultimately selected for propagation in the community.

In addition to differences in language structure, the study of World Englishes has shown repeatedly that English varieties develop based on the needs of, and relationships between, the speakers of contact languages (Mufwene, 2007; Schneider, 2007). So no matter how change is manifested initially, what will ultimately guide a model of change is an account of the features that are actually propagated by a community and become features of a contact variety.

An assumption made explicit by Sankoff (2002) is that language contact affects the linguistic outcome much more than the kind of variation we find in its absence. On this basis we can think of language contact varieties as extreme cases of language change more generally.

Sociophonetics and Ethnic Communities

The current study is a sociophonetic analysis of the vowels of a Spanish/English contact variety. Hay and Drager (2007) identify three research areas not routinely combined in

sociophonetic research, yet necessary to establish a truly integrated bridge between the social and phonetic domains. These areas include a detailed phonetic analysis, an appraisal of the perception of phonetic variation, and an ethnographic approach to social characterization. Language contact research benefits greatly from the inclusion of these areas, and the current study strives to address all three. The phonetic analysis includes temporal vocalic features not typically considered in dialectal characterization. Perception of the contact variety is addressed through accent ratings made by raters from outside the community who are familiar with the regional norm. And while the study is not an ethnographic inquiry per se, our analysis of speakers' subjective orientation to their community uses community members' input, providing a social index based on behaviors and opinions from the community, not variables assigned a priori.

Ethnic communities hold promise as models with which to explore the mechanisms of change. Communities where bilingualism predominates and cultural differences between the linguistic minority and the local population are salient constitute a linguistic and social environment that is not available in a more homogeneous language setting. Contact varieties found in ethnic communities are defined by linguistic and cultural norms and are the result of a context in which the causes of change are intensified, allowing a more tractable view of language change. Since the process is generally subtle and slow-moving, a model in which the causes and effects of language change are accelerated is a welcome addition to our research toolkit.

Overview of the Study

In the tradition of dialectal work, the study takes the speech community rather than the individual as its primary focus. At the center of the study are the vowels of Mexican Heritage

English (MHE) speakers in the Albany Park neighborhood of Chicago, Illinois. For the study I define MHE speakers as native English speakers whose parents immigrated to the United States from Mexico, and regardless of their country of birth, were educated exclusively in local schools. More generally, MHE speakers are often residents of Mexican ethnic communities, and are linguistically unique. They speak with what is often described as a Spanish accent, in spite of the fact that they consider English to be their dominant language, and sometimes report limited or no proficiency in Spanish.

The four groups of speakers studied here (including MHE) represent a range of language contact possibilities in the community, with all groups recruited from Albany Park. We start the study by characterizing either end of our language spectrum using representatives of the contact languages – Spanish and English. These groups are used to establish the vocalic norms for the two languages; the analysis of their vocalic structure allows us to interpret our findings for the contact varieties. Spanish speakers allow a characterization of Mexican Spanish vowels that was not previously available. The Anglo speakers, in addition to their role as representatives of Chicago's monolingual English variety, are compared to speakers in other studies from the same dialect region. While an accounting of intraregional variation in and of itself is useful, this data was necessary to ensure that the variation we find due to language contact is not variation that is found intraregionally independent of contact with Spanish.

The contact varieties, situated between the two languages along our contact spectrum, are defined by their speakers' experience with English: late learners of English as a second language (L2E) began their formal training in English after the age of 16, while MHE speakers are first generation ethnic Mexican-Americans, and report English as their dominant language. The vocalic analysis of L2E provides a starting point for understanding contact effects. This

variety acts as a model for the initial stage of contact. MHE, then, acts as a model for the earliest stage of propagation. Through their selective propagation of contact features, MHE speakers represent a stage beyond initial contact, where we can begin to determine which features are most likely to become defining features of the variety.

Perception is an important feature of speech characterization. From early on in the variationist approach, sociolinguists determined that phonetic properties of individuals' speech index their social status. In addition, much sociolinguistic research on the perception of accented speech revolves around negative social stereotypes and discrimination that result from accented speech (e.g., Eisenstein, 1982; Lippi-Green, 1989; Purnell et al., 1999). While the current study does not attempt to address attitudes toward accented speakers, it is important to acknowledge that accent is a powerful social marker, and that the findings may bear on studies of profiling and negative stereotypes. In this study we first determine that variation from the norm is perceived, and then look to the detailed phonetic analyses to find vocalic features that correspond to perceived accentedness. MHE speakers are evaluated for accent using raters from outside the contact community who are familiar with the Anglo variety. The approach comprises two methods that verify the internal consistency of the ratings, and introduces the Ladder task, a novel approach to accent rating that may be useful in other testing contexts.

The study combines current laboratory speech analysis techniques with a sociolinguistic approach to the variation found. Romney et al.'s (1986) Cultural Consensus Model (CCM), a statistical tool developed for cultural studies in anthropology, is adapted here to provide a metric of a participant's cultural identity. This method has not previously been applied to sociophonetic research. Given the large body of variationist findings that show people's speech indexing their social position, it is reasonable to expect a speaker in an ethnic community

(defined by language and culture) to behave and orient toward that community in ways that may influence her speech. The CCM is adapted here to quantify that orientation through what we call a community index.

Moving from laboratory-based research to the community presents many challenges for phonetic research, but the data collected through fieldwork is crucial for understanding how the social structure of the community affects the speech found there. By going into the community and seeking out speakers who are not likely to come into our labs, we are able to acquire a broader range of data about participants' social identities than is available through a traditional subject pool. Sociophoneticians realize that the issues pertaining to phonetic implementation and social structure are inextricably linked, and the hope is that by combining sound sociolinguistic practices with tools from acoustic and phonological theory, we may begin to understand better the mechanisms by which language change is initiated and propagated through a population of speakers.

This study explores vocalic variation within this language contact community, and how the variation is distributed. The speakers have a unique life experience that has resulted in an English variety characterized here in terms of production and perception. Thus, the study determines the ways in which the vowels of MHE speakers in Albany Park reflect the influence of both the Spanish and English languages. Moreover, the study seeks to determine how MHE speakers index their subjective orientations toward their community using fine-grained features of these vowels.

Three aspects of MHE make it particularly amenable to a study of language change. First, it is of known provenance – it is English influenced by speakers' contact with the Spanish language. Because English has more than twice the number of vowel sounds of Spanish, MHE

provides an excellent opportunity for finding socially significant variation in the vowels that do not overlap in the two systems. Second, MHE has been stable for generations in ethnic communities throughout the United States, and is easily discriminable from the speech heard in the surrounding regions. This stability indicates that MHE contains phonetic features that are specific to the variety, and are propagated in the community. Third, despite its distinctiveness, MHE is nevertheless subject to influences from regional American dialects. Several studies have examined the extent to which MHE reflects the local non-ethnic dialect in various regions of the United States (e.g., Roeder, 2006; Wolfram et al., 2004), thus allowing us to look for supraregional properties of the variety. Understanding the local effects of contact should inform any predictions made regarding the general results of contact both linguistically and socially.

Building on the clear advantages of studying MHE, we consider the vowels, since they are robust indicators of language variation. Dialectal inquiries into regional vowel systems offer guidance for interpreting the differences we find in our contact variety. The fact that the community is located in Chicago, a city situated in a predominantly monolingual English dialectal region of the United States, certainly plays a role in the outcome of this contact. For this reason, the phonetic details of the vowel structure of the local, or matrix, dialect are also considered in relation to the variation found intraregionally, establishing a benchmark for the inquiry. From there we can look to language contact as the source of the variation we find among community speakers.

The approach consists of five interwoven steps:

1) The contact community is characterized in terms of speakers' experience with both Spanish and English.

2) Having established language experience categories, speakers' vowels are analyzed for the details of their production.
3) The local dialectal norm is appraised in relation to regional standards in order to determine the extent of variation found without language contact effects.
4) Then the divergence of MHE from the local norm is appraised in terms of community outsiders' perception of accent.
5) Finally, we determine how the variation in the MHE variety indexes the orientation of speakers to the community in terms of their community practices and opinions.

Mexican Immigration and the Albany Park Community

Ethnic communities have long been recognized by linguists as rewarding locations for the study of language contact and change. The characterization of these communities provides the social context in which language is negotiated by their residents and norms are established. An empirically based theory of language change therefore requires an understanding, or at least a historically based characterization, of the context in which speakers interact. Toward this end, this section provides a brief historical outline of Mexican-American communities in the United States, and describes the Chicago community from which our participants were recruited.

Early large-scale immigration of Mexicans to the United States began after the Mexican revolution of 1910. The majority of these immigrants settled in the American Southwest, but many followed jobs into the farms of the Midwest, the packing houses of Kansas City, and the industrial plants of Chicago and other urban centers. With the onset of World War II and the concomitant labor shortages, the United States and Mexico signed a series of agreements known as the Bracero Program. This guest-worker program provided United States employers with

Mexican temporary laborers who could work at non-migratory jobs, and who, as an incentive to return to Mexico, were guaranteed a portion of their earnings in a savings account to be received upon their return[1]. However, once the annual quotas of the Bracero program were filled, illegal immigrants provided a willing work force for businesses that sought to avoid the mandated wage and benefit levels of the program, thus undermining it. Labor unions saw the Braceros as an impediment to the organization of agricultural workers, and the program became unpopular, ending officially in 1964 (Navarro, 2005).

After the end of the Bracero program, the influx of immigrants continued in cities throughout the United States, supported by established enclaves that still act as port of entry for immigrants who have familial connections or find support through other social ties and a generally congenial and familiar environment. Ethnic enclaves in these urban settings are often established based on language as well as other cultural norms including food and entertainment. Chicago is no exception to this pattern, and is well known for its ethnic communities. Among the array of neighborhoods one finds there, Latino communities are prominent in several geographic areas, and are predominantly represented by either Mexican or Puerto Rican communities (Farr, 2005).

The 2000 census figures indicate that 26% of Chicagoans identified themselves as Latino, with the majority citing Mexican ancestry. Like most large urban settings in the United States, Chicago's population distribution is not homogeneous, and Latino communities have developed with ethnic heritage as a defining feature (Holli & Jones, 1995). Albany Park is one such neighborhood, and is typical of more recent immigrant communities in having a large increase in

[1] In spite of the promises, many returning workers did not receive these earnings (Navarro, 2005).

the Latino population in the last twenty years (see Wolfram et al., 2004, for an example in the mid-Atlantic South).

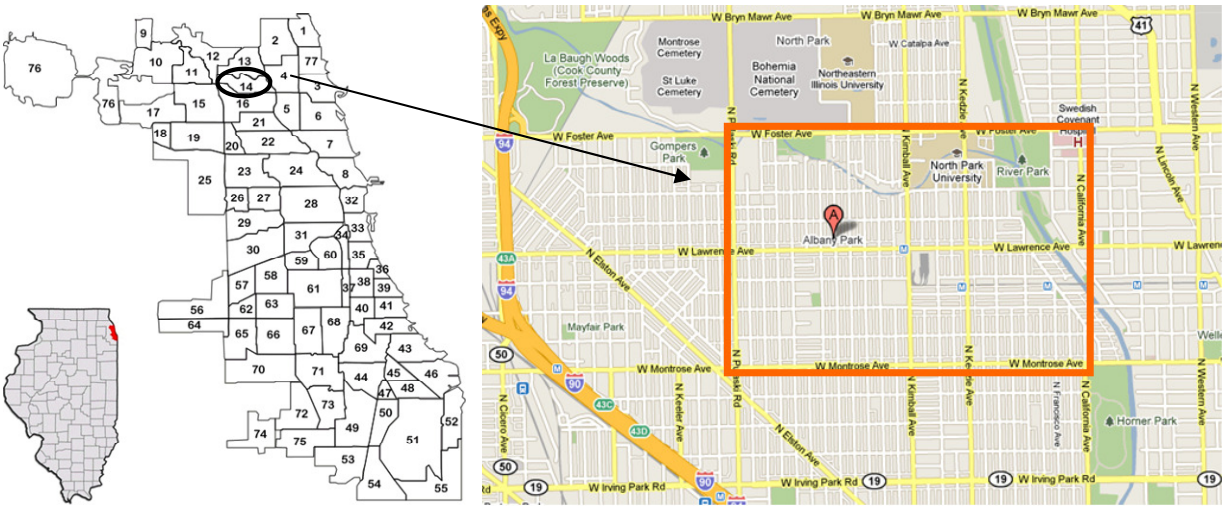

Figure 1.1. Albany Park location: Chicago, Illinois.

Albany Park is located on the northwest side of Chicago (Figure 1.1), in an area historically known as one of the most ethnically diverse areas of the United States. The neighborhood is mainly working class, with a mixture of residential and commercial properties. The community's boundaries, shown in Figure 1.1, contain some higher-income, low density census tracts, but 46% of the community comprises households that are below $25,000 annual income[2].

Albany Park serves as one of the main port-of-entry neighborhoods in Chicago. As an established immigrant community, it was already accustomed to a diverse ethnic population, and provides Mexican immigrants with inexpensive housing stock and a convenient location (close to both interstate highways and public transportation) for commuting throughout the Chicago

[2] Chicago median income from 2000 U.S. Census: $46,700.

region. Successful immigrants who find wages and living conditions better in Chicago than in Mexico foster social networks that support a further influx of immigrant families.

While public school enrollment data still show at least 36 different languages and dialects spoken by community residents, the most recent census figures[3] indicate that Latinos in Albany Park have become the predominant ethnic group. While Latinos were 27% of the population in the 1990 census, figures from the 2005-2009 American Community Survey 5-Year Estimates (U.S. Census) indicate that the population of approximately 47,000 is about 55% Hispanic/Latino, 26% white, 13% Asian and 5% Black, with many other ethnicities also represented.

Because it is not considered an established "Mexican neighborhood" as are other Chicago neighborhoods, the rising proportion of Latinos in Albany Park typifies recently established Mexican ethnic communities in other urban settings, making it representative of language contact communities more generally. The residents are aware of the ethnic diversity there, with almost all of the participants in the current study calling the neighborhood "diverse" when asked to describe it. None felt that their neighborhood was a "Mexican neighborhood" when asked, even though they overwhelmingly believed that someone could live comfortably in the neighborhood speaking Spanish only. From their descriptions of the neighborhood it is clear that these MHE speakers, in spite of their presence as an ethnic group, consider themselves integrated into the larger Chicago community. It is this environment which acts as the context for the language contact studied here. As Croft (1990) points out, "Languages don't change; people change language through their actions" (p. 257). It is in this spirit that we look toward the MHE

[3] U.S. Census tracts: 1401, 1402, 1403, 1406, 1407, 1408.

speakers as representatives of language change as they negotiate their identities in the community.

Chapter 2. Background for a Sociophonetic Analysis

Introduction

Sociophoneticians study the details of socially motivated variation in speech, and although their approach acknowledges the importance of both social influences and the details of acoustic-phonetic analysis, the research focus is often weighted toward one aspect or the other. Studies may emphasize the phonetic side, as in the characterization of dialectal differences, or the social side, highlighting speaker interactions, identity, and the context of phonetic variation. The study of language contact and its effect on speech demands detailed attention to both aspects in order to gain insight into how speech communities are involved in initiating and propagating language change. In this chapter I will advocate for the speech community as the appropriate level for this sociophonetic inquiry. Then I will review the vocalic characterization of American English, focusing on the Inland North dialect region. Next, I will recap the work that has been done on the speech resulting from the contact between Spanish and English in the United States, considering studies of ethnic communities and Chicano English specifically. Finally, I will provide a short review of the methodology I adapted for analyzing the social orientation of community members.

Speech Community

In sociophonetic study, the social structure within which speakers interact is usually defined in terms of the speech community. Having evolved from its initial definition as a group of individuals who speak a single language and are native speakers of that language (Chomsky, 1965), subsequent sociolinguistic research has resulted in a much more nuanced view. This view

is embodied by the variationist approach in which structured heterogeneity of the community is the rule (Weinreich et al., 1968), and variation is embraced as the object of study. The idea of a speech community has been further expanded by the recognition that all speakers belong to multiple speech communities and communities of practice (Eckert, 2000), and for this reason researchers will probably never agree on a single definition useful in all contexts.

In the case of ethnic and language contact communities, it is useful to think of the speech community as a geographically based ethnic enclave, in which speakers share a domain of cultural and linguistic expertise. Ultimately, as members of such a community, these speakers can develop speech norms that differ from the greater regional variety, and which may or may not be related directly to the minority language spoken there (Schneider, 2003). Ethnic communities are particularly interesting to language researchers because they tend to maintain their linguistic identities in the face of broad regional cultural influences, indicating that there are potent local factors that contribute to their cohesiveness (Sankoff, 2002). The social boundaries of a language contact community take on added significance as speakers can find themselves the victims of prejudice, or at least with a deep identification as the "other" within the larger social context (e.g., Baugh, 2007). For this reason, speakers' subjective orientations toward their community are expected to be reflected in their speech and have been explored in various ways (e.g., Dodsworth, 2005; Marshall, 2004).

In spite of its obvious appeal for understanding community structure, little linguistic work has been done to quantify speakers' subjective experience and orientation toward their communities (Dodsworth & Hume, 2005). It is in ethnic communities that we find a valuable testing ground for the role of a speaker's mental orientation to the community – this is where we

expect to find conspicuous linguistic and cultural attributes that can impact the results of language contact.

Immigration patterns in the United States have created many ethnic communities in which language and cultural practices are preserved from speakers' homelands and subject to the effects of contact with the larger community. These ethnic communities present a unique opportunity for researchers to get in on the ground floor of language change, and uncover the patterns and structure underlying both the initiation and the propagation of change. By analyzing the speech in these communities we can investigate change in fairly concrete terms – through the phonological variation found in the speech signal itself, and how it relates to local norms. This variation allows us to search for the linguistic and social causes that produce and propagate variants. As Croft (2000) points out, the initiation and propagation of change are certainly distinct entities, but nevertheless must be considered jointly if we are to begin to understand the mechanisms of language change.

The Vowel Space of American English Dialects

Linguists characterize dialects by lexical, grammatical, and pragmatic/semantic features, but vowels have been the focus of American English dialectal study (Hay & Drager, 2007). There are, of course, studies of consonantal variation and its relation to language variation. Studies of post vocalic /r/ (Romaine, 1978), final stop deletion (Guy, 1980), and glottalization and r-loss (Sullivan, 1992), as well as interdental fricatives in Cajun English (Dubois & Horvath, 1998) are examples of interest in dialectal consonantal variation in English. Tone and intonation have also been considered in dialectal contexts, for example in Swedish (Schötz et al., 2009), Dutch (Gussenhoven & Van der Vliet, 1999), and Serbo-Croation (Smiljanic, 2004).

Nevertheless, sociophoneticians often rely on vowels as dialectal indicators due to their salience and regional markedness. In the last 50 years, sociophonetic work has come to rely heavily on the spectrographic analysis of vowels, with sophisticated yet accessible technical tools replacing traditional impressionistic techniques. With these advances, researchers can now discern fine-grained continuous variation that was not previously apparent. Vowels are acoustically robust; they are salient to listeners, and with the advent of spectrographic analysis, more easily recovered in speech recordings than some consonantal features (e.g., flapping). They are also relatively easy to quantify, with well-established methods for describing the vowel space and other phonetic details.

Historically, Joos (1948) is credited with establishing the spectrographic representation of the F1xF2 vowel space, but the first visualization of what would be termed a standard General American English vowel space was the result of Peterson and Barney's (1952) landmark vowel study. In that work, 76 speakers were recorded reading hVd wordlists, samples of which were used in a vowel identification task. The combination of production and perception analyses provided a structured representation of the American English vowel space, and revealed the variation within, and overlap between, vowel categories. Although Peterson and Barney acknowledged the effects of dialectal background on the production and identification of vowels, they did not give a detailed account of the sample's dialects, and made no claim that the sample was a characterization of a particular dialect. Indeed, they described the women and children in general terms as speaking a Middle Atlantic dialect, and the majority of the male speakers were described as speaking "General American." In spite of its acknowledged heterogeneity, the vowel space described in that work became the default representation of standard American English.

Building upon this early spectrographic characterization of the vowel space, sociophonetic studies of American English were able to focus on regional variation, often using vowels to define dialectal boundaries. In a study refining the paradigm established by Peterson and Barney (1952), Hillenbrand et al. (1995) recorded hVd productions of 96 Northern Midwest speakers. Having recognized various limitations in the earlier study, Hillenbrand et al. employed a dialect screening process that helped establish their speakers as representative of a particular dialect at a specific point in time. The centrality of /ɑ/ and the raising of /æ/ when compared to the Peterson and Barney study mark this particular configuration as an example of the Northern Cities Vowel system (Labov, 1994), a defining feature of the Inland North dialect.

Later researchers have continued to develop broad vocalic characterizations of American regional varieties. Thomas (2001) plotted the vowel space of almost 200 speakers across three broad regions of the United States, and included detailed discussions of the vowels of African American, Mexican American, and Native American speakers. In their compilation of telephone survey data,[4] Labov et al. (2006) provide the most ambitious catalogue of American English ever assembled: in addition to over 100 dialect maps with isoglosses of vowel systems, *The Atlas of North American English* includes individual speakers' vowel charts and analyses of vowel shifts and mergers. This atlas defines current regional dialect boundaries and traces social influences on the progress of sound change. *The Atlas* provides vocalic benchmarks of the variation we find in American English, but due to the breadth of the collection, many regions are underrepresented. Relevant to the current study, *The Atlas* provides acoustic analysis from only one woman from Chicago.

In perceptual work on the classification of American dialects, Clopper & Pisoni (2006)

[4] Telsur, based on interviews with 762 individuals representing urbanized areas of the United States.

compiled a corpus of 48 talkers representing six regional varieties of American English. Raters were asked to identify and group sound samples from these talkers. Raters' residential histories (geographic mobility and location) were found to be important factors in their perceptual classification of dialect. Although this perception study focused on the effect of a listener's language background on the identification of dialect, two important by-products came of the work. One was the establishment of a replicable paradigm for compiling a comprehensive picture of American dialectal variation, and the other was the production of a corpus of high quality speech recordings available for further analysis. In this "Nationwide Speech Project," Clopper and Pisoni step beyond earlier dialectal work by providing laboratory recordings of a wide variety of speech sample types from each talker, ranging from wordlist reading to a short sociolinguistic interview.[5] Again, like *The Atlas*, the breadth of the sample in the Nationwide Speech Project is not a thorough geographic representation of each dialect region, but for our purposes the fact that the five female speakers were from Chicago or Northern Indiana is helpful for comparisons.

In addition to these broad dialectal surveys, sociophoneticians have also implemented more detailed comparisons of regional vocalic productions. In a study of vowel features relevant to the current study's phonetic analyses, Fox and Jacewicz (2009) found that vowel inherent spectral change (VISC), not normally specified in dialectal characterizations of monophthongs, is differentiated in three dialectal regions of American English (Southern Wisconsin, Western North Carolina and Central Ohio). VISC, a measure of vowel formant movement independent of the effects of consonantal context (Neary & Assman, 1986), was found to be a dialect-specific

[5] Information on the corpus is available at: http://www.ling.ohio-state.edu/~cclopper/nsp/index.html.

feature. The study found four important sources of dialectal variation for the monophthongs / ɪ, ɛ, æ, ɐ /: vowel duration; trajectory measured in terms of vector length (central 60% of the vowel duration); total length (across 4 segments of the central 60% of the vowel trajectory); and spectral rate of change.

Large-scale studies such as Hillenbrand et al. (1995) or Baranowski's (2007) study of 100 residents of Charleston, South Carolina provide detailed characterizations of the Inland North and Coastal Southeast vowel systems respectively. But as Hagiwara (1997) points out, few researchers have the resources to perform work of this scale for the many dialectal regions of the United States. His study of the vowels of 15 speakers in Southern California was motivated by what he saw as an opportunity for researchers to work on a more modest scale of dialectal study. Hagiwara called on researchers to objectively analyze the vowels of a dozen or so speakers from a distinct region, and thus contribute to a broader picture of American English that would identify areas of interest for further investigation. This desire reflects the need for a flexible notion of American English, and importantly for the current study, indicates that regional variation must be considered as we pursue the local effects of language contact.

The characterization of vowel production and perception for specific American dialects plays a central role in studies of language contact. In addition to their usefulness in building models of diachronic change in the form of vowel shifts (e.g., Clopper & Pisoni, 2006; Gordon, 2001; Labov, 1994) and mergers (Labov et al., 2006; Thomas, 2001), these dialectal studies provide phonetic benchmarks for assessing variation and change. The availability of powerful spectrographic tools allows us to consider fine-grained variation throughout speech communities where small differences have been found to act as significant markers of speakers' identities.

Unfortunately, comparability across dialect studies is hindered in several ways. First,

technological innovations such as the widespread use of spectrographic analysis and innovative recording hardware have not been applied consistently across dialect research studies, making it difficult to assess fine-grained vocalic differences across regions. Second, studies often differ in the vowels examined as well as in the details of their elicitation and measurement. Third, some studies provide extensive ethnographic information on individuals or communities without comprehensive or replicable speech elicitation schemes, while more phonetic-oriented studies may fail to provide the kind of demographic information about participants (e.g., language background) that could be fundamental to the interpretation of spectrographic data. Finally, without access to an archive of recordings and demographic information on participants, a comparative overview remains difficult.

A sociophonetic language contact study requires a local approach to dialect characterization since differences are expected to appear in very specific features of the languages in contact, and too broad a view will not allow detailed comparisons. Dialectal and regional varieties of American English provide the language settings in which minority languages are spoken and ethnic varieties of English emerge, but it is not clear that researchers can rely on broad regional definitions as benchmarks. The sociophonetician's definition of American English has evolved such that the notion of a General American English is not useful. But further, the view of intraregional variation is also evolving, and will be crucial for understanding the detailed effects of language contact. Although dialectal research provides some insight into intra- and interregional variation, researchers are forced to look quite closely at regional effects when assessing local speech norms.

Language Contact Between Mexican Spanish and American English

The current study follows Fought (2003) in her definition of Chicano English, but uses the term Mexican Heritage English (MHE) in place of Chicano English. Much of the research on the Spanish/English contact variety uses the term "Chicano English," but speakers outside of the Southwestern United States do not necessarily accept this label (Metcalf, 1984). Participants in the current work considered "Chicano" a political term, and not one that they would ascribe to themselves. In an effort to acknowledge our participants' affiliations (or lack thereof), I will use "Mexican Heritage English," or "MHE" to describe the variety investigated here. However, since much of the literature to date has used the term "Chicano English," I will often use it when referencing these studies.

Following Fought (2003), Mexican Heritage English is defined here as a non-standard variety of English influenced by contact with Spanish, and spoken as a native variety by both bilingual and, somewhat surprisingly, monolingual speakers of English. Importantly, this definition admits only native speakers of English, independent of their proficiency in Spanish. Thus, MHE is not the English of learners of English as a second language, and is not best described as Mexican-American English which could comprise both late learners and English monolinguals of Mexican heritage. Indeed, as we will see in the current study, a detailed phonetic analysis of MHE clearly distinguishes it from the Spanish-accented English of late learners.

Until relatively recently, non-standard speech patterns of Mexican-Americans were all regarded as Spanish accented English, implying an incomplete or inaccurate learning of English. This thinking has evolved, with the status of Chicano English reflecting more its roots as a

contact variety (Baugh, 1984; Wald, 1984). It is only through studies that characterize their talkers in detail that researchers have been able to differentiate between ethnic heritage speakers and second language learners. Although it is generally acknowledged that MHE speakers who report English as their dominant language (and are considered native speakers of English) show marked differences when their speech is compared to those of English learners from Mexico (e.g., Santa Ana, 1993), there has been no systematic appraisal of the two vocalic systems. Studies describing Chicano English often ascribe particular phonetic features to the variety to distinguish it from the matrix variety, but not from the speech of late learners of English.

The realization that monolingual English speakers within Latino communities could exhibit a "Spanish accent" without the benefit of Spanish fluency prompted several studies that began to treat this variety much like African American Vernacular English (AAVE); delimiting its characteristics and usage vis-à-vis the larger standard English speaking community (e.g., Godinez & Maddieson, 1985; Gordon, 2000; Metcalf, 1974; Wald, 1984; Wolfram & Beckett, 2000). As with early studies of AAVE, studies of Chicano English were often motivated by pedagogical considerations – many children speaking this dialect were required to attend "limited English proficiency" classes along with immigrant students, even though they were not learning English as a second language (Fought, 2003; Mendoza-Denton, 1997). It was clear that a better understanding of the dialect was needed to address the specific needs of the Mexican Heritage English speakers in the United States school systems.

Through these studies, characteristics of Chicano English were found in the semantics, syntax, and phonology of the dialect; however, the current study focuses on the vowels of MHE. As mentioned in the discussion of the American English vowel space, much of the sociophonetic characterization of English dialects has relied on vocalic studies. Accordingly, recent studies of

MHE also rely on instrumental measurements of vowels, although they vary in their accounts of the social and language backgrounds of the participants. The features of MHE vowels generally considered salient are listed by Fought (2003):

- Less frequent vowel reduction (Santa Ana, 1991)
- Frequent lack of glides for / i / and /u/
- Tense realization of / ɪ/ as / i / in *–ing*
- High central rounded realization of / ʊ/

Thomas (2001) compiled individual spectrographic vowel space data for 17 speakers of Mexican American English, mostly from Southern Texas, along with a review of previous work. A range of speaker ages is contained in the sample, but systematic data regarding Spanish proficiency and social factors is not provided. In spite of its lack of specificity regarding language backgrounds, the study helps establish this contact variety of American English as a recognized dialect.

In a preliminary study using interviews of 32 adolescents from Hispanic communities in North Carolina, Wolfram et al. (2004) assessed their adoption of a local unglided norm for the diphthong /ɑɪ/ as in *side*. The authors commented on their "general resistance to extensive accommodation to local forms" (p. 344), with Southern dialect vowels used only with particular (presumably more frequently encountered) lexical items. The study found a gradient effect among speakers for the diphthongal trajectory and the durational relationship of the glide to the vowel. This effect may be due to the speakers' English proficiency; the authors discuss the data in terms of "interdialectal forms" (p. 354) that are intermediate between Spanish and English. Due to the preliminary nature of the study, the MHE vocalic data for this region is not substantial, but the insights for considering these newly formed heritage communities are useful.

Only a handful of phonetic studies of Chicano English have begun to characterize a range of vowels and take advantage of instrumental techniques and language background information (e.g., Godinez & Maddieson, 1985, in California; Roeder, 2006, in Michigan). Both of these vowel studies also rely on comparisons to the matrix dialects of their respective regions, thus situating the contact variety in its dialectal context.

Godinez and Maddieson (1985) set out to systematically establish the vowel characteristics of Chicano English in East Los Angeles and also to assess the influence of Spanish on the dialect by comparing the spectrographic values of 15 Chicano bilinguals, 15 Chicano monolinguals, and 15 speakers of "General Californian English" (GCE). Using the speakers' vowel productions from hVd words read in a sentence frame, they found no significant difference in vowel duration between the three groups. They did, however, find that both groups of Chicano speakers exhibited higher and more fronted /ɨ, ɛ, æ/ and a less fronted /u/ than GCE speakers. Monolinguals and bilinguals differed in their productions of /ʊ/ (monolinguals were more fronted), but both Chicano groups produced distinct categories for the English vowels of interest. This is an important point, demonstrating that the speakers did indeed exhibit all the English vowels of the matrix dialect in their inventories. This is not the case for Spanish speakers who are late learners of English who tend to merge certain vowel categories (see Chapter 5).

Roeder (2006) provides a sociophonetic examination of accommodation of MHE speakers to local norms in Lansing, Michigan. In the study, 32 mono- and bilingual speakers of MHE from three distinct age groups were recorded reading a wordlist and passage, and in conversational interviews. The vowels /æ, ɛ, ɑ, ɔ/ (all participating in the Northern Cities Shift) were analyzed spectrographically and assessed as to whether speakers were accommodating to the local norm for these vowels. Using data from several Detroit speakers (Inland North dialect

region) as a reference point, Roeder found that young female MHE speakers had accommodated completely to the Detroit dialect for these vowels, while other speakers showed little accommodation across the vowels studied.

Several additional studies have found that members of Hispanic speech communities in the United States produce vowels that are distinct from their larger geographic communities (e.g., Frazer, 1996; Gordon, 2000). The findings suggest that these speech communities maintain distinct vowel spaces that are not completely subsumed by the larger geographic community. A desideratum of Spanish/English contact studies throughout the United States is the characterization of the contact variety in terms of features independent of the regional dialectal context. Because of variation in the language background of participants – early versus late learners of English – and limited information on the matrix dialect, a case for supra-regional effects remains difficult to make.

Ethnographic Approach to Chicano English

Ethnic communities provide an excellent testing ground for assessing the relationship between linguistic form and social groups, categories, and divisions particular to the community. Ethnographic studies of language variation in particular allow in-depth appraisal of communities (Eckert, 1991). Much of the sociophonetic work in ethnic communities has focused on characterization of specific Chicano vowels and their relationship to the regional speech patterns, but some sociolinguistic research has appraised the role of specific vowels that index speakers' social interaction patterns. Mendoza-Denton's (1997) ethnographic study of Latina high school girls found that identity for the 12 Mexican-American girls she studied in California was expressed in their vowels as well as their style of dress. The tense realization of /ɪ/ in *–ing*, one

of the commonly listed features of Chicano English, was found to pattern with the fluidity of the social groupings within the school including gang membership and affiliation.

In further ethnographic work, Fought (1999) studied 32 Chicano speakers in Los Angeles, and found that /u/ fronting, a change in progress for California English speakers, could be found in speakers from the Mexican-American community as well. Using data obtained through ethnographic interviews, her analysis of the speakers' productions identified social characteristics that helped explain the distribution of the feature. Interestingly, traditional sociolinguistic variables such as social class were not useful; instead, the social factors of importance to the community (in this case an interaction between gender, gang affiliation, and social class) best explained the data.

Fought (2003) expanded on this work by looking at /æ/ backing and /æ/ raising for the same Los Angeles community. These are also features of the matrix dialect, and presumably the source of variation for the Chicano speakers. Similar to the results for /u/ fronting, the extent of /æ/ backing was also correlated with gang membership and gender (non-gang speakers backed more than gang speakers, and women backed more than men). She found that /æ/ raising, however, showed the opposite pattern, indicating a rejection of the matrix dialect for non-gang members and women. She ascribes these mixed findings to the complexity of using a number of features to present social affiliation and "toughness" for these young adults. In the development of their identities, it is possible that speakers adopt speech norms that may appear to be conflicting in their similarity to the matrix dialect, but nevertheless index a distinct identity. Also important to note is that no difference was found between bi- and monolinguals in either study.

The success of in-depth ethnographic studies in elaborating the connection between language and identity indicates that social connections are key to understanding how individuals

propagate and maintain linguistic change in their communities. However, the intense effort required to properly run such studies can be daunting, especially to researchers who may not have a personal connection to a community of interest. The concept of social network as a tool for analysis of a speech community is one that would seem to hold promise for the quantitative study of social ties in ethnic communities. In discussions of social networks as applied to linguistic variation, Milroy's (1980) study in Belfast, Northern Ireland is generally cited as the first systematic application of social network principles to language variation (Chambers, 1995).

Social Networks

Social network analysis is a method for determining patterns and regularities (i.e., structure) in a social environment, an environment in which individuals interact with one another in order to achieve some set of goals (Scott, 2000). The method has been applied successfully to studies of business organizations, friendships, and community structure, and is a useful technique for analyzing any data that describe relations between people in groups. Relational, data such as the number and quality of social interactions, can be contrasted with attribute variables such as gender, income, education and social class, but is still subject to a traditional variable analysis. Attribute variables are clearly an important part of social structure, but relational data allows analysis of factors that may supersede typical social categories, and may not be apparent to the researcher a priori.

Individuals create for themselves personal communities that help them solve the problems of daily life. These communities can be described quantitatively by the nature of the interpersonal links. These links are the relationships between individuals, and will vary greatly in their strength and type. A social link characterized by more than one criterion (e.g., your

neighbor is also a workmate) is considered stronger, or more multiplex, than one that is based on a single level of interaction (e.g., workmate only). Also, in describing an individual's social circle, it is often the case that the individuals to whom a person are linked are also linked to each other. The density of this type of social network in which most of the participants know each other can also be quantified. The density and multiplicity of networks are two important properties of social networks of Belfast communities that were explored by Milroy (1987).

In order to operationalize the concept of social network, Milroy devised a social network strength scale, assigning scores for individuals based on five characteristics of their social situation. In the study, Milroy finds evidence that a dense, multiplex network structure will predict vernacular forms. Individuals' use of the vernacular forms correlated with the degree to which speakers were integrated into their networks, as well as other social variables such as age and gender.

There are several criticisms of this approach that are specific to the study, such as a male bias and inconsistent analysis (Murray, 1993), while others are more generally skeptical of the depth of the social network analyses in these settings (Dodsworth & Hume, 2005). But the desire to understand language variation through a systematic account of social factors (including states of mind and attitudes of speakers) continues to be pursued (Dodsworth, 2005; Marshall, 2004).

Charting a complete social network that lends itself to in-depth analysis in an urban community is not practical using the techniques currently available. These diffuse networks (which are in principle unbounded) are not good candidates for a detailed use of social network analysis techniques. Language researchers in ethnic communities have limited access to an extensive network due not only to limitations of time and funds, but also by reticence on the part of many would-be community participants to speak in detail about their social interactions. In

any event, a social network approach will yield only a partial slice from the entire network. Using a "snowballing" technique in which one participant recruits other participants known to him or her will provide only a narrow section of the entire network, and a broader approach to recruitment is not likely to yield participants who interact with each other. The use of a social network metric is an important contribution to quantifying community structure, and the insights gained are helpful, but an approach that is minimally intrusive, is replicable across a range of communities, and minimizes a priori assumptions about social structure would be welcome. This is the type of approach that is attempted in the current study.

Subjective Orientation and the Cultural Consensus Model

A viable alternative to the social network approach in ethnic communities needs to be sensitive to patterns of social variation within the community, and to somehow assess speakers' cultural identities within their community (Hazen, 2002). At the core of sociolinguistic theory lies the idea that individuals in a community speak a language influenced by their social situation, and that their perception of the community plays an important role in how they identify themselves linguistically. Labov's (1963) analysis of phonetic variation on Martha's Vineyard is an early example of how speakers' subjective experience with local social patterns is indexed by their speech productions of /ɑʊ/ and /ɑɪ/. The significant social factor influencing the speech of these island inhabitants was their orientation toward their community, and sociolinguistic work has continued to explore the relationship between linguistic identity and the community.

The Cultural Consensus Model (CCM) (Romney et al., 1986) is a technique for the analysis of within-group patterns and across-group differences in various cultural domains. Applying this technique, informants respond to a set of questions developed from ethnographic

methodologies such as interviews, focus groups, and free listing regarding some specific domain. The questions probe the information that is distinctive to, but broadly shared by, community members, and thus form the basis for community beliefs and orientation. Through their responses to the questions, informants provide individual profiles of their cultural knowledge, as well as a general estimate of the "correct" answers for the community being studied. The technique assumes that the cultural knowledge of the community is systematically distributed, with some informants possessing greater "cultural competence" than others. Responses are analyzed using principal component analysis (PCA) to obtain an individual index of each participant's cultural knowledge.

A previous application of the CCM to language study is an analysis of semantic universals in Japanese and English (Romney et al., 1997), but the method has not been applied to sociolinguistic study more broadly. Researchers have generally used the CCM to analyze "folk" medicine and biology (e.g., Atran et al., 2005; Ross & Medin, 2005; Weller & Baer, 2002), and to evaluate doctor-patient relationships by contrasting the priorities of patients and clinicians (Baer et al., 2004). The utility of CCM in these studies is its ability to objectively measure individuals' beliefs, and then characterize the belief structure of the community under study. The crucial feature of the approach is that it can reveal knowledge patterns that may not have been apparent a priori.

Groups that are not diverse along a particular social metric are best served by this approach since it is the participants' personal orientation toward the community through their opinions and behavior that is assessed. For example, individuals in an ethnic community that is homogeneous across an attribute such as class may be found to relate to their community in very different ways. Thus, unexpected social variables may emerge as the structure of that

relationship is analyzed. In Chapter 7 we adapt the CCM and assess its use as a community consensus metric in our language contact community.

Summary

Vowel structure has played an important role in the characterization of American dialects, and because of the variation we find between and within dialectal regions, vowels continue to play a role in assessing language variation. Language contact within ethnic communities provides a testing ground for documenting contact varieties, and understanding how the vowel structure of disparate systems interact. The vowels of contact varieties offer a view into the initiation of change since the principal cause is known to be structural: change based on differing vowel inventories, and internal to the language systems. As for the propagation of change, studying vowels and how they index subjective orientations to the community will help us understand how variation is propagated among community members. Previous research has demonstrated repeatedly that individuals index their identities through their speech; therefore, sociophonetic work in ethnic communities offers a unique opportunity to offer a well-defined picture of the relationship between speech, speakers, and community.

The current study uses field recordings and sociophonetic methods to focus on the vowels of MHE speakers within a specific language contact community. High-quality recordings of vowels from MHE, Anglo, and Spanish speakers, along with English learners (L2E), were elicited in a variety of contexts, and have been compiled, analyzed and archived online. The study also assesses perceptions of MHE speech by community outsiders, as well as speakers' attributes and their position in the community based on an adaptation of the CCM. We hope to provide a comprehensive view of the initiation and propagation of sound change through the

careful selection of speakers, a detailed phonetic analysis of the contact variety, and the exploration of the relationship between vocalic patterns and the attributes and social orientations of the speakers.

Chapter 3. Chicago Heritage English Speech Survey (CHESS)

Introduction

In his 1997 paper on the vowels of Southern California English, Hagiwara calls for small scale phonetic studies that could be carried out using a minimum of time, money, and scholarly resources. He points out that "studies of a dozen or so speakers are well within the scope of most researchers…" (p. 658). By combining studies, he maintains, linguists could provide a thorough characterization of American English.

The studies envisioned by Hagiwara would be a valuable addition to the dialectal literature; however, current technological advances have made it possible to look beyond independent studies, and to start laying the groundwork for an approach to archiving original speech materials in a systematic manner (Kendall, 2010). Sociophonetic research on speech dialects would be well served by a systematic elicitation protocol and compilation of recorded speech materials from large, defined sets of speakers (e.g., defined by region or community).

A useful corpus would provide details regarding language background and demographic information for speakers, giving researchers information that is relevant to the interpretation of findings. Such a corpus would thus provide a synchronic slice of speech production materials that could be mined for a variety of linguistic purposes from the phonetic to the discourse level. In addition, the recordings could be used for stimuli in perception experiments, and eventually provide data for future diachronic investigation. An additional desideratum of this corpus would be its standardization; researchers in other regions could gather data that is directly comparable, thus contributing to a large database of systematically obtained phonetic samples. Standardization would require low-cost (in terms of time, money and scholarly resources)

recruitment of participants, and procedures simple enough to require a minimum of technical skill on the part of the corpus compiler.

Toward these ends, the Chicago Heritage English Speech Survey (CHESS) Corpus comprises recordings of speakers from an ethnically diverse community of Chicago compiled between 2007-2010. The speakers were recruited for the study of Mexican Heritage English (MHE) speakers in Chicago, and make up four groups: MHE speakers, Anglo monolinguals, Mexican speakers of English as a second language, and Mexican Spanish speakers (groups defined below). Much of the protocol was adapted from the Nationwide Speech Project (Clopper & Pisoni, 2006). All speakers were recorded reading three types of elicitation materials (wordlist, sentences, passages) and they participated in a 30-45 minute sociolinguistic interview (Seidman, 1991). Participants also filled out a comprehensive demographic survey that included targeted language background questions (see Appendices A-D). Details of the CHESS corpus participants, materials and procedures are provided in this chapter.

Participants

Mexican Heritage English (MHE) speakers (N=14f) are English speakers whose parents immigrated to the United States from Mexico, and regardless of their country of birth, were educated exclusively in Chicago schools (grades K-12). These speakers have spent the majority of their lives in Albany Park, a multi-ethnic, predominantly working class community located on the northwest side of Chicago. All MHE speakers report English as their dominant language and vary in their self-reported Spanish proficiency from none to native-like fluency. Ages of participants ranged from 18-48 years. One participant was eliminated from analysis due to an unnatural wordlist reading (her exaggerated vowel productions were over twice as long as

average durations for the other MHE speakers).

Anglo speakers (N=12f) are monolingual English speakers raised in Albany Park and educated exclusively in Chicago schools (K-12). All speakers are of European heritage with parents born in the United States. Ages of participants ranged from 18-85 years.

Second Language English (L2E) speakers (N=12f) emigrated from Mexico to the United States, and began formal training in English after age 16. Participants were recruited from the Chicago Albany Park Community Center where they were students in Level 4 (top level) ESL courses. They are native Mexican Spanish speakers who produced only English for the study. Ages of these participants ranged from 20-50 years.

Mexican Spanish speakers (N=7f) were also recruited from the Level 4 (top level) ESL classes at the Albany Park Community Center. They are also native Mexican Spanish speakers who emigrated from Mexico to the United States, and began formal training in English after age 16. Although they were recruited from the same population of English learners as the L2E speakers, they did not participate as L2E speakers in this study; they produced only Mexican Spanish for the study. Ages of these participants ranged from 24-50 years.

Participant Demographic Information

The following speaker demographic and background information was gathered based on experience in earlier language studies (Li et al., 2006), and is available for researchers in the CHESS corpus: native language, gender, education (for participant, mother, and father), number

of siblings, birth order, year of birth, age, ethnicity, and self-reported Spanish/English proficiency. For MHE speakers, accent ratings and interview transcriptions are also available.

Session Protocol

Participants were recruited using flyers and verbal descriptions of the project. Participants were paid $12 per hour with a typical session lasting from 30-60 minutes. After completing permission and demographic information forms (see Appendix D for language background form), participants were fitted with a head-mounted microphone and asked to read aloud for recording level adjustment. Participants then read from three separate presentations (wordlist, sentences, and passages) on a computer monitor with a short break between each. After the reading tasks, participants were asked language background questions and interviewed about their neighborhoods and social ties (see Appendices D and E).

Recordings

Each speaker was recorded reading from a computer monitor while wearing an unobtrusive Shure WH20 dynamic head-mounted microphone. Using a directional head-mounted microphone controlled the microphone position, and eliminated much of the background noise found under field conditions. Recordings were made using a Marantz model PMD 670 digital recorder at a 22.05 kHz sampling rate. All recordings were field recordings, with the majority taking place in quiet rooms.

Stimulus Materials

Following are brief descriptions of the elicitation materials used to produce the corpus. These materials were selected to provide a broad range of speaking styles for analysis.

CVC Wordlist

All participants read 180 monosyllabic pseudo-randomized words presented individually using computer presentation software. The wordlist consisted of consonant-vowel-consonant (CVC) words containing 11 vowels of American English (i, ɪ, e, ɛ, æ, ɑ, ʌ, ɔ, o, ʊ, u) and the diphthongs (ɑ ʊ, ɑ ɪ, o ɪ) in a variety of phonetic contexts. See Appendix A for the complete wordlist.

SPIN Sentences

In addition to wordlist reading, vowel productions in sentential context were elicited. Sentences were selected from "speech perception in noise" (SPIN) test sentence sets developed by Kalikow et al. (1977). This standardized sentence list is balanced for target word familiarity, phonetic content, and sentence length. Each sentence ends with a monosyllabic noun as the target word in one of two conditions: the semantic context gives either no indication of the identity of the target (low probability), or aids the prediction of the target (high probability). See Appendix B for the complete list of SPIN sentences recorded for the CHESS corpus.

Passages

Four passages were presented to participants to elicit extended speech segments for

phonetic analysis. Each passage was chosen for its range of phonetic segments, and its role as a standardized speech tool in other speech production studies or corpora. Participants read each passage presented individually from a computer monitor. All passages used in the study can be found in Appendix C.

The Rainbow Passage has been used predominantly in studies of speech in clinical populations (e.g., Hillenbrand & Houde, 1996; McHenry, 1999). The first paragraph of the Rainbow Passage (Fairbanks, 1960) was used in the current study. Oral and nasal consonants are present in the approximate proportion found in everyday speech.

The North Wind Passage has been used to compare various English language varieties including Californian American English (Ladefoged, 1999), Southern Michigan American English (Hillenbrand, 2003), Tyneside British English (Watt & Allen, 2003) and RP British English (Roach, 2004). Although the North Wind Passage does not elicit a full range of phonemes (Deterding, 2006), the passage has been used in many speech studies. Researchers have recorded speakers reading the passage in 33 varieties of English worldwide and it has been used in a modified version for recording three English-based creoles (Schneider et al., 2004), making it a valuable tool for comparison of English varieties.

The Stella Passage focuses on eliciting consonant cluster productions, and is used in The Speech Accent Archive of George Mason University (http://accent.gmu.edu/). The passage was selected for CHESS for its possible comparison to samples from the archive. The Speech Accent Archive acts as a repository of recordings for the systematic appraisal of accented English, and represents speakers from a large variety of language backgrounds (both native and non-native speakers). Also making it useful, speakers provide demographic and language background information along with their recording of the passage.

The Angela Passage is a targeted passage designed for this study to elicit several samples of each monophthongal vowel in a variety of phonetic contexts.

Sociolinguistic Interview

A 30-45 minute interview was recorded with MHE participants. The basis for the interview was a questionnaire (Appendix D) that included questions regarding language background as well as more general demographic information (Dornyei, 2003). The interviewer also used a topic sheet adapted from interview protocol from Roeder (2006) to ensure that questions regarding social and community ties were covered (Appendix E). To promote a more casual speech register, interviews were not scripted, but the topic sheet helped guide the interviewer to questions related to a participant's social network as identified in Milroy's (1980) Belfast study. Transcriptions of the interviews have been phonetically aligned and are available as Praat textgrids.

Mexican Spanish Elicitation

The Mexican Spanish elicited for the study provided a comparable set of female vowel productions for the contact language. For this set of speakers, we elicited only Spanish wordlist and sentence reading, and the elicitation methodology varied from our English elicitations. The method is based on Bradlow's (1995) comparison of Spanish and English vowels in which the vowels of four male speakers of Madrid Spanish were analyzed as part of a broad comparison of the English, Spanish, and Greek vowel spaces. In the current study, seven female Mexican Spanish speakers were recorded reading Spanish disyllabic (CVCV) words embedded in the carrier sentence: *Escribe* _____ *bien.* The same words were also included in a wordlist

presentation.[6] The target words were selected so the consonant preceding and following the stressed (first) target vowel was either voiced or voiceless. Initial consonants were bilabial stops /b/ or /p/ with the following alveolar stop consonants /d/ or /t/. Five repetitions of each word were pseudo-randomized for a total of 100 productions per speaker. Vowels were analyzed as in the English speaking groups. Table 3.1 provides the words used in the computer presentation.

Table 3.1. Mexican Spanish wordlist.

i	e	a	o	u
bita	beta	bata	bota	buta
pita	peta	pata	pota	puta
bida	beda	bada	boda	buda
pida	peda	pada	poda	puda

File Naming Conventions

The corpus recordings are stored digitally in a .wav format. The file naming conventions are given in Table 3.2. As an example, the recording of MHE participant #12 reading the passages is coded as: MHE012PASS.wav.

[6] The current study employed both wordlist reading and words embedded in the sentence. No significant difference was found spectrally between the two elicitation procedures.

Table 3.2. Digital file naming conventions.

Speaker group		Participant number	Speech type	
MHE	Mexican Heritage English	e.g., 001	CVC	Wordlist
ANG	Anglo English		SPIN	SPIN sentences
L2E	Second Language English (Mexican)		PASS	Passages
SPN	Mexican Spanish		INT	Interview

Summary

The CHESS corpus is available at the Online Speech/Corpora Archive and Analysis Resource (OSCAAR), Northwestern University's online repository for linguistic recordings and experimental materials. This web-accessible and extensible repository is available to linguistic and speech science researchers at: http://oscaar.ling.northwestern.edu/. The range of materials and detailed background information for the participants in CHESS will enable researchers studying regional variation and language contact to compare the speech of their communities with the actual recordings analyzed in the current study. An important aspect of this effort is its long-term stability. Kendall (2008) points out that attention to preservation of the recordings is an ongoing concern, and for this reason, corpora housed through large institutions are a viable means to their long-term preservation.

The session protocol of the CHESS corpus lays the groundwork for future efforts on the standardization of regional dialect research and a standardized sociophonetic approach to fieldwork in speech studies. The range of elicitation materials, the speaker background information, and the accessibility of the original recordings are the bases for developing a comprehensive approach to sociophonetic fieldwork, one that is easily replicated and produces

recordings available for synchronic and diachronic comparisons. A more specific outline of a standardized sociophonetic field procedure is reserved for future work.

Chapter 4. Methods of Vowel Analysis

Consonant-Vowel-Consonant (CVC) Wordlist

The CVC wordlist readings were used for the bulk of the vocalic analyses. Due to coarticulatory effects on vowel formants, vowels in prenasal and preliquid position were excluded from analysis, leaving 92 monophthongal tokens included in the analysis. The word tokens, arranged by vowel, are provided in Table 4.1. Because the wordlist was designed to include a variety of lexical frequencies and phonetic environments for each vowel, and not all environments were represented in English, the number of words for each vowel varies, with a minimum of six tokens available for analysis. Words in bold were substituted for low-frequency hVd words.

Table 4.1. CVC vowels analyzed.

Vowel	# tokens	Token from CVC wordlist
/ i /	11	be, keep, beast, she, these, each, deep, feed, street, heed, deed
/ ɪ /	12	it, big, give, dish, lid, kiss, hid, wish, this, sick, dig, rip
/ e /	10	space, make, **paid**, tape, jade, bait, late, fade, age, they
/ ɛ /	8	death, fetch, head, sled, leg, less, text, wet
/ æ /	9	cab, have, bad, glad, tax, gap, had, math, fact
/ ɑ /	7	hot, **pod**, lot, mob, job, dock, nod
/ ʌ /	8	rust, **thud**, such, luck, love, smug, much, shrug
/ ɔ /	6	walk, dog, **thawed**, gawk, cough, log
/ o /	7	boat, poke, both, code, hope, most, **toad**
/ ʊ /	6	should, hook, good, cook, book, hood
/ u /	8	loop, who'd, loose, you, prude, hued, choose, tube

Each vowel was measured for duration, and first and second formant frequencies at the 0.20 , 0.50, and 0.80 marks of the duration (see Figure 4.1). Phonetic alignment of the word productions was automated using Triggerwave, a segmentation and force-alignment tool developed at Northwestern University. This software incorporates the Penn Phonetics Lab Forced Aligner (Yuan & Liberman, 2008).

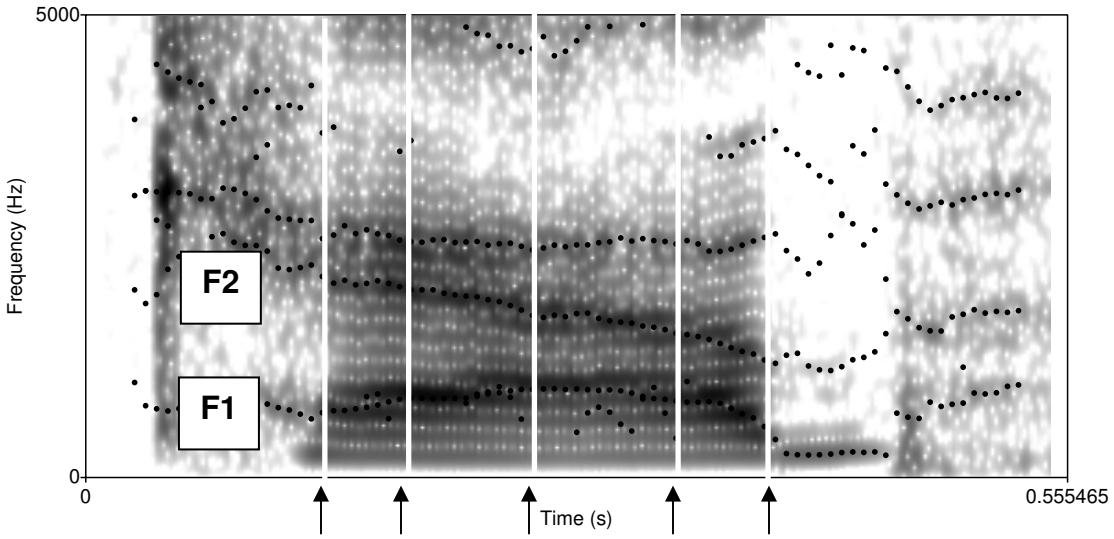

Figure 4.1. Spectrogram for the word "cab." Vertical white lines (at arrows) indicate beginning and end of vowel duration and the three vowel-internal measurement points of F1 and F2 (at 0.20, 0.50, and 0.80 points of vowel duration).

Following phonetic alignment, extraction of vowel duration, F1, and F2 were performed using a program script written for Praat 4.6.25. This speech analysis software provided a time-aligned waveform, F0 trace, and wide-band spectrogram with formant tracks for formants 1-5. Formant tracking was computed using LPC analysis over a 50 ms window with a 12.5 ms frame interval. Formant values were converted from Hertz to Bark for analysis, with no normalization of values since all speakers were adult females and are not expected to differ significantly in their vocal tract characteristics. Bark units provide a perceptually based plot of the vowel space,

compensating for the non-linearity of human perception of frequency measured in Hertz. Our perception of frequency is more sensitive in the lower frequency ranges, and the Bark scale captures a more accurate representation of how we interpret speech sounds. The Hertz to Bark conversion formula:

$$F_{Bark} = 13 \arctan (0.00076\ F_{Hertz}) + 3.5 \arctan ((F_{Hertz}/7500)^2)$$

where F is the formant frequency

Reliability of the automated technique for determining formant values was assessed using a subset of tokens analyzed by four Northwestern University Linguistics Department graduate students experienced in phonetic analysis. Sixty CVC tokens from each of three speakers were analyzed by hand for first and second formant values and compared to automated results. Agreement within 10% of the formant frequency in Hertz between the raters and the automated procedure was above 94%. This level of accuracy is suitable since any outliers from the automated procedure (>1.5 times the interquartile range for a speaker's productions of a particular vowel) were inspected and hand-checked. Formant value outliers were eliminated when judged to be misreadings or non-responses. Otherwise, the hand-determined values were included in the analysis.

All speakers were instructed to indicate words whose pronunciation they were unsure of (say: "I don't know") when they encountered unfamiliar words. Non-standard pronunciations not consistent with a speaker's other productions of that vowel were considered misreadings and excluded from analysis. The second language English (L2E) speakers produced a number of misreadings and non-responses since the wordlist contained low lexical frequency words and contractions (L2E speaker average of misread words: range 1-13, mean 8.25 tokens; 9% of tokens).

Applying the same conservative standards for elimination of tokens, MHE speakers had a much lower rate of misreading and non-response (MHE speaker average: range 0-2, mean .60 tokens; 0.7% of tokens). Outliers for all subjects that were not judged misreadings were inspected for anomalies in the recording and measured by hand when possible. The hand-inspected values were included in subsequent analyses. The same procedure was followed for the Anglo speakers, with no misreadings or non-responses.

Speech Perception in Noise (SPIN) Sentences

The SPIN test sentence sets were used to provide vowels in sentential context. The sentences were developed by Kalikow et al. (1977) for testing of production based on semantically predictable and unpredictable contexts, as well as for use as stimuli in perception experiments. This standardized sentence list is balanced for target word familiarity, phonetic content, and sentence length. Each sentence ends with a monosyllabic noun as the target word in one of two conditions: the semantic context gives either no indication of the identity of the target (low probability), or aids the prediction of the target (high probability). Example sentences are given in Table 4.2. See Appendix B for the complete list of SPIN sentences recorded for the CHESS corpus.

Table 4.2. SPIN sentence example.

SPIN Sentence	Predictability	Vowel Target
Mr. Black knew about the *pad*.	low	/æ/
Tear off some paper from the *pad*.	high	/æ/

The sentence-final words analyzed are listed in Table 4.3. All words were produced twice, once in each of the semantic contexts. Vowels from the final words in the SPIN sentence readings underwent a similar analysis to the CVC words above. Sample recordings of speakers were also used as stimuli in the accent perception testing in Chapter 6. Vowel plots based on semantic predictability did not show differences, and are not included here.

Table 4.3. SPIN vowels analyzed.

Vowel	# tokens	Token from SPIN sentence (twice each)
/ i /	8	grease, sleeves, seeds, fleet
/ ɪ /	8	strips, lid, crib, fist
/ e /	8	blade, cake, slave, hay
/ ɛ /	8	net, vest, shed, bread
/ æ /	8	map, draft, pad, track
/ ɑ /	6	knob, crop, lock
/ ʌ /	8	hug, mugs, drug, tub
/ ɔ /	0	N/A
/ o /	6	coast, robe, rope
/ ʊ /	2	brook
/ u /	6	crew, booth, bruise

Interview recordings were transcribed and phonetically force-aligned using software adapted from the Penn Phonetics Lab Forced Aligner (Yuan & Liberman, 2008). The transcriptions are available as Praat textgrids in the CHESS corpus. Vowels from this spontaneous speech were not extracted, and are reserved for future analysis.

Chapter 5. Phonetic Results: Vowels, Dialects, and Contact

Introduction

This study seeks to determine the effects of Spanish language contact on the English vowel space by characterizing vowel properties of narrowly defined populations within a single language contact community (i.e., from the same dialect region). In this section I analyze speech samples from the four groups comprising the CHESS corpus: Anglo speakers, Mexican Spanish speakers, English learners from Mexico (L2E), and Mexican Heritage English (MHE) speakers, all from the Albany Park community in Chicago (detailed criteria for inclusion in each group are given in Chapter 3).

First we consider both static and dynamic vowel properties for each of the groups, then we consider the features that differentiate them. We seek to account for the apparent influence of Spanish on the vowels of MHE speakers who, by definition, report English as their dominant language. Vocalic analysis of the four varieties is necessary first to characterize the sources of contact (English and Spanish), then to differentiate between the English vowels of late learners of English (L2E) and those of MHE speakers, and finally, to explore the vocalic features of MHE that distinguish it from the Anglo dialect. Since the MHE variety resulting from language contact is identified as accented by naïve listeners asked to rate the degree of foreign accentedness (see Chapter 6), the vowels are expected to reflect the perceived difference. The analyses provide a phonetic basis upon which to explore the initiation of English/Spanish contact effects, and with this foundation we are in a position to assess how contact effects may be mitigated or enhanced by extralinguistic factors such as ethnic identity.

The study exploits the well-established idea that individuals employ fine-grained phonetic information to both convey and interpret social identity. Because listeners are quite adept at distinguishing many of the details of speech production, it is important to consider even subtle changes effected by language contact. Less salient cues resulting from language contact can become speech features integral to speaker identity, resulting in dialect formation and acting as a catalyst for dialectal differentiation. Building on a strictly articulatory description of vowels as resonant vocal sounds produced without constrictions of the oral tract, in this section we provide a detailed phonetic characterization of the vowels of the speaker groups. We consider the F1xF2 vowel plots of traditional dialect study, and expand the analyses to include temporal features such as duration and vowel trajectories. This characterization allows a rich interpretation of vowel production and phonological status, providing detailed indexical information that speakers and hearers may use in establishing a speaker's social identity in a language contact situation.

The study was conducted in the city of Chicago, Illinois, which is situated in the regional dialect area known as the Inland North (Labov et al., 2006). Figure 5.1 shows Chicago and the general boundaries for American English dialects, highlighting the Inland North region. The vowels of this region participate in the well-known Northern Cities Shift (NCS). In a standard F1xF2 vowel plot, the six vowels comprising the shift (/ɪ, ɛ, ʌ, ɔ, ɑ, æ/) are believed to participate in a coordinated clockwise movement, with adjacent vowels affecting the position of certain neighbors. Due to its distinctive spectral structure and its putative role as an example of a historical chain shift in progress, the NCS has been well documented by a number of researchers interested in the dialect (Clopper & Pisoni, 2006; Gordon, 2001; Labov et al., 1972), thus establishing vocalic benchmarks of the Inland North dialect region.

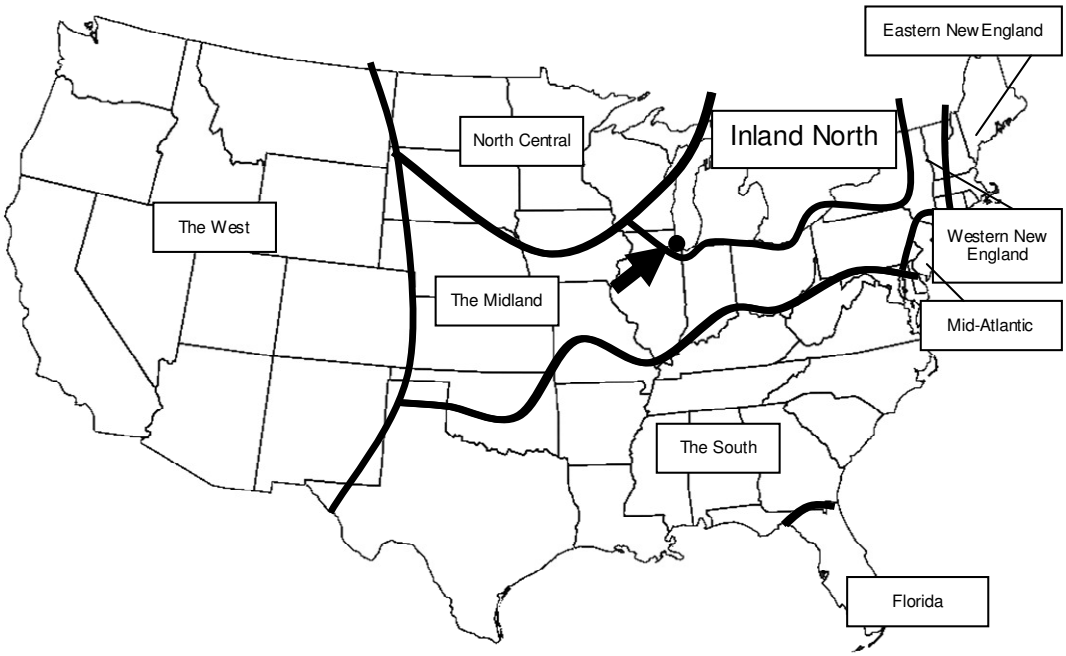

Figure 5.1. Inland North dialect region of American English. Chicago indicated by arrow. Based on Labov et al., 2006.

We will use the vowels of the NCS as dialectal markers and consider the relationship between our groups based on this example of language change in progress. We are especially interested in whether the vowels of MHE will reflect the properties of the NCS, given its role as a marker of regional, and perhaps social or cultural, identity.

For the purposes of the study, we categorized our Albany Park speakers based on their language history. The speakers we refer to as "Anglo" speakers are native English speakers, representative of the Inland North dialectal region of Chicago. They were recruited from the Albany Park community, as were all of the study's participants. The need for establishing a matrix dialect is clear – we seek to determine the influence of Spanish on the speech of Mexican Heritage participants, and will need to establish a regional monolingual English norm from the

same geographic area. Although a case can be made for using vowel data from large phonetic studies from the same dialect region as was done in Konopka and Pierrehumbert (2008), a sampling of the speakers from the same community provides direct and reliable access to the speech that serves as the local norm. By collecting a consistent set of speakers, we can control the methodology used to analyze the vowels and compare the groups[7].

Beyond obtaining a more relevant "control group" for the current study, we find that a thorough characterization of the vowels defining the Inland North dialect should include information about their temporal features (i.e., their durational properties and spectral trajectories). An important, yet understudied, feature of dialects is the dynamic structure of the vowel system. By differentiating English varieties in a single community, the current study comprises a data set that includes speaker groups differentiated by language history, yet from the same geographic community. In addition, comparisons to other studies in the same dialect region reinforce the importance of the dynamic features.

In this chapter we will consider the vowels of the four populations that comprise the CHESS corpus individually. The first section will cover the Anglo population, and provides a brief introduction and justification for each of the analyses. Subsequent sections give much of the same data for the Mexican Spanish, L2E, and MHE populations. Finally, the findings are summarized as we compare them across populations.

[7] A desideratum of this language contact study is to establish a consistent methodology that facilitates comparisons across geographic regions. This topic is considered along with the relationship between the vowels of Anglo Chicagoans and those of speakers from other studies across U.S. regions in Chapter 8.

Vowel Plots

The vowel space is a convenient abstraction of the relationship between a vowel's articulation and its first two formants. Early research on dialects focused on vowel quality in terms of three production parameters; tongue body height, back/frontedness, and lip rounding. Since the advent of spectrographic analysis, these parameters are usually represented as a two-dimensional Cartesian plot of the values of the first and second resonant frequencies (formants) of a vowel. Since the vowel percept produced by the first and second formants (F1 and F2) provides much of the information used to identify a particular vowel, this plot provides a visual analog of what is interpreted by a listener as a specific vowel (Joos, 1948; Peterson & Barney, 1952).[8]

The visualization of the relationship between F1 and F2 as a Cartesian plane provides an informative and easily interpretable realization of a vowel space, and for this reason the F1xF2 vowel plot has become the cornerstone of dialectal study, providing a visual mapping of a language's vocalic inventory. By plotting the formant frequency values appropriately (i.e., inverting the numerical values on both axes), a vowel plot provides both perceptual and articulatory representations.[9] The plot also effectively displays the inter- and intra-speaker variation of vowel production by allowing individual vowel productions to be mapped as points (or trajectories) in the Cartesian plane. Aggregating these points for specific vowel productions allows a phonological mapping of vowels based on their Euclidean distances from each other.

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[8]Vowel identification is quite good within the range from ~100-3,000 Hz., with first through third formant center values generally falling within this range. Typical telephone line bandwidth is around 180-3200 Hz, which is more than serviceable for vowel and voice recognition.

[9]Production is goal directed such that a given vowel may have many available articulations (Gay et al., 1981), but the vowel space plotted using production resonances corresponds to the traditional description of tongue position.

In the current study, F1 and F2 frequency values are plotted in Bark units. This perceptual scale of pitch is preferred to direct frequency values (in Hertz) since it captures the human perception of frequency as a non-linear function, and is for that reason a more authentic representation of the human vowel space. Bark is a physiologically based system (using cochlear sensitivities) of pitch intervals that reflects the critical bands set into vibration on the basilar membrane.[10]

Anglo Vowels

Anglo CVC Vowel Space

A vowel space plot summarizing the CVC productions of the 12 female Anglo participants is given in Figure 5.2a. Analysis was carried out on vowels preceding oral obstruents for all vowels unless otherwise indicated. The figure includes the average F1 and F2 values for 11 monophthongal vowels measured at the midpoint of the duration across speakers. In Figure 5.2b ellipses surround the speakers' average values (excluding outliers; >1.5 times the interquartile range) for each vowel; the size of the ellipse thus indicates the extent of inter-speaker variation for that vowel. Outliers were omitted from the figure for visual clarity, but all values, including outliers, are used in the analyses that follow. The schematized version of the vowel space in Figure 5.2b will be the standard representation in subsequent plots.

[10] Another empirically based system found in the phonetic literature is the Mel system, which uses subject discriminability ratings to develop the scale. Although both the Bark and Mel scales are similar in that they capture the non-linearity of frequency perception, the Bark scale is used here to allow convenient comparisons to recent sociophonetic studies.

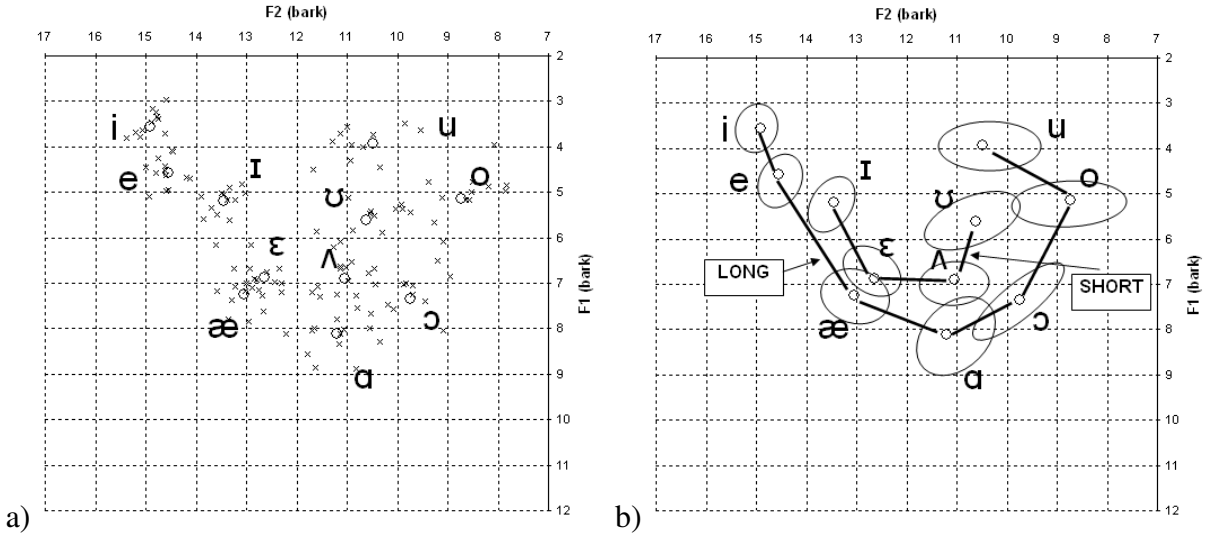


Figure 5.2. Anglo speakers' vowel plot. a) Figure indicates average CVC vowel production by speaker (x) and average over all speakers (○); b) Figure includes ellipses surrounding values of individual speakers, and connecting lines that denote long and short vocalic subsystems.

In addition to vowel positions, Figure 5.2b includes connecting lines denoting the two subsystems of "long" and "short" vowels (Peterson & Lehiste, 1960). This schematized version facilitates comparison of the two subsystems that are relevant to the analysis of dynamic vocalic features later in this chapter. Since English monophthongal vowels comprise two subsystems based on duration, and Spanish vowels exhibit no such distinction, vowel length is expected to be a property subject to the effects of language contact.

The Anglo vowel spaces of Figure 5.2 generally accord with other phonetic studies of this dialect (Clopper et al., 2005; Hillenbrand et al., 1995). However, the /u/ fronting seen in the plot is apparently due to the variety of phonetic contexts for the vowel (Strange et al., 2007). The fronting appears to be lexically conditioned with the words *loop*, *who'd* and *you* produced by the majority of the speakers with a more backed F2 (less than 10.0 Bark).[11] This may be due in part

[11]CVC words included in the analysis: *loop, who'd, loose, you, prude, hued, choose, tube.*

to the effects of prevocalic consonants, with the variety of environments allowing a range of productions.

To determine whether the Anglo Chicagoans of the current study produce /u/ in a manner typical of the Inland North dialect, a matched subset of the CVC vowels (hVd only) was compared to the formant values in hVd context from female Michigan speakers in Hillenbrand et al. (1995). These speakers are within the geographic boundaries of Inland North (see Figure 5.1). Using matched hVd productions we see little difference between positions of this phoneme for the two studies (See Chapter 8 for a more thorough comparison of the vowels across several studies). Within the current study the same CVC wordlist (i.e., identical phonetic contexts) was used for all English elicitations, obviating the need for restricting analyses to the hVd phonetic context only.

Anglo SPIN Vowel Space

Vowels extracted from keywords in the SPIN sentence recordings (Kalikow et al., 1977) were analyzed in the same manner as the CVC wordlist vowels. The SPIN sentences, originally developed to detect semantic predictability effects, were employed here to provide data pertaining to the degree of vowel reduction exhibited by speakers reading keywords in sentential context. Figure 5.3 plots the results of the SPIN vowel analysis along with the CVC values. As expected, some reduction of the vowel space is evident, with a tendency toward vowel centralization. Direct comparisons are not appropriate since the phonetic contexts for the vowels in the two elicitation schemes differed, but the comparison is useful in demonstrating the degree to which the word context affects the F1xF2 plot. No effects due to semantic predictability were detected.

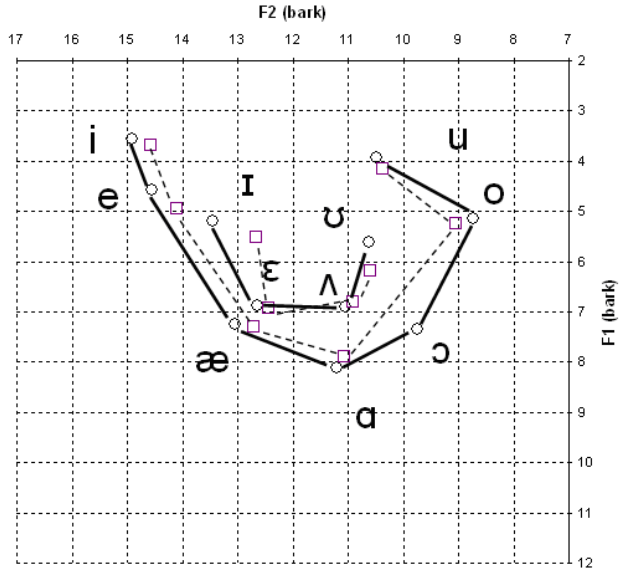


Figure 5.3. Anglo CVC and SPIN vowel plot. Comparison of average CVC (circles) and SPIN (squares) vowel productions. Note: no /ɔ/ tokens were elicited in SPIN sentences.

Anglo Vowel Duration

Vowels are not static entities. They unfold over time, and their dynamic properties are important features of their characterization. In languages with larger vowel inventories we often find that the inherent duration of vowels can be an important dimension of their language-appropriate production (Rosner & Pickering, 1994). This is certainly true for English where vowel length is not a phonologically distinctive contrast, yet is a discriminating feature of the two durational subsystems of long and short vowels. Although not primarily used to distinguish vowel categories by native speakers, the durational differences are often employed by English learners in lieu of spectral cueing – during their acquisition of English as a second language, learners are often instructed to use vowel duration to produce effective contrasts. For example, learners are told that by simply shortening the duration of /i/ they will produce a native-like /ɪ/

that does not rely on differences in vowel quality, differences which can be quite difficult for a learner to perceive or produce. This strategy is effective in producing a recognizable distinction between tense and lax vowels since listeners can reliably discriminate vowel durations that vary by as little as 20% (Stevens, 1998). This example from language acquisition illustrates how, beyond number and position of vowels in the Spanish and English inventories, the implementation of long and short duration in English is a crucial feature of native-like pronunciation.

Beyond variation across languages, differences in vowel duration within subsystems have also been documented for dialects of American English. Clopper et al. (2005) found the lax vowels of the Southern U.S. dialect were significantly longer than those of the other dialect regions studied, with no significant difference for the tense vowels (indicating no difference in speech rate overall). Fox and Jacewicz (2009) also found statistically significant differences in vowel duration between Wisconsin and North Carolina speakers across the five vowels studied. Given that duration has been demonstrated to show dialectal differences, and that the English monophthongal vowels (unlike Spanish vowels) comprise two subsystems based on duration, we investigate the durational differences between the three English speaking groups of the current study.

Anglo Vowel Duration and Consonantal Context

In this section we will first confirm the presence of the long and short subsystems, and then consider vowel duration effects due to voicing of the post-vocalic consonant. Measurements of vowels preceding oral stops in CVC context are provided in Table 5.1. Oral stops were chosen to provide consistent vowel measurements across many productions. The measurements confirm

the presence of two durational subsystems: long vowels +voice/-voice averaging 0.256 seconds (SD=0.061) and 0.162 seconds (SD=0.037) respectively, and short vowels +voice/-voice averaging 0.177 seconds (SD=0.035) and 0.117 seconds (SD=0.024) respectively.

Table 5.1. Anglo vowel dynamic properties summary.

Anglo	**Long vowels**							**Short vowels**			
Vowel dynamics	i	e	æ	ɑ	ɔ	o	u	ɪ	ɛ	ʌ	ʊ
+voice (sec)	0.25	0.27	0.28	0.26	0.28	0.27	0.20	0.18	0.17	0.18	0.18
-voice (sec)	0.16	0.16	0.18	0.17	0.20	0.15	0.12	0.11	0.12	0.14	0.10
dur avg (sec)	0.21	0.21	0.23	0.21	0.24	0.21	0.16	0.15	0.14	0.16	0.14
dur ratio	1.61	1.71	1.54	1.47	1.39	1.81	1.67	1.68	1.35	1.30	1.85
VISC (Bark)	0.90	1.45	1.80	0.81	1.05	1.83	1.68	0.87	1.04	1.21	0.93

Differential production of vowel durations before voiced and voiceless consonants is a common phenomenon across languages, with English showing a strong lengthening effect for vowels before voiced versus voiceless stops (Chen, 1970; Kluender et al., 1988; van Santen, 1992). In English, this contextual conditioning is especially pronounced and can actually cue the perception of voicing in the following consonant (Raphael, 1972).

The duration ratios (+voice/-voice durations) for the Anglo speakers are included in Table 5.1, and show the extent to which this phenomenon is found in the current study – lengthening ranging from 30% to 85%. Figure 5.4 illustrates this contextual difference quite clearly.

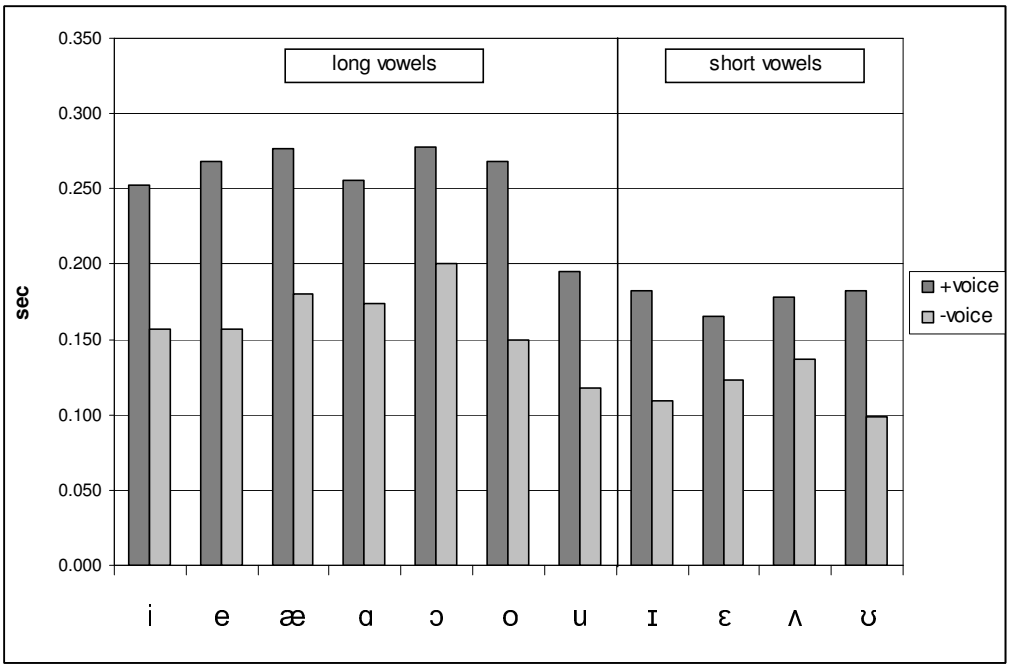


Figure 5.4. Anglo vowel duration by context (voicing of the following stop).

Anglo VISC

Traditional research on vowel acoustics regards the vowel nucleus as that portion of the vowel relatively unaffected by the adjacent phonetic environment. This central portion of a vowel or "steady state" is often used to characterize monophthongal vowels, implying that these values represent an invariant vowel target used in the production/perception process (Lindblom, 1963; Peterson & Lehiste, 1960). It was recognized early on that the formant movement in transition areas before and after this target were caused by consonantal context and had a marked effect on formant structure (Joos, 1948), leading to research on transitional movement due to pre- and post-vocalic consonantal environments (e.g., Hillenbrand et al., 2001). The role of these formant transitions on vowel recognition was explored in perceptual work which found that a vowel can be identified reliably even after excision of the steady state, with listeners apparently using only transition cues (Strange et al., 1983).

Independent of transition effects, the English vowel system is described as comprising monophthongs / i, ɪ, ɛ, æ/, phonetic diphthongs /e, o/, and true (or phonemic) diphthongs /ɑɪ, ɑʊ, ɔɪ/. Research has shown that nominal monophthongs are often "diphthongized" in various English dialects (e.g., Fox, 1983; Hillenbrand et al., 2001; Nearey & Assman, 1986). This distinctive formant movement over the vowel duration, excluding contextual effects caused by adjoining segments, is called vowel inherent spectral change (VISC). Neary and Assman found that certain vowels have characteristic on- and off-glides and spectral movement that aid in their identification. Listeners are better at identifying vowels in which the VISC is preserved, thus demonstrating that listeners use dynamic cues to enhance their identification (Watson & Harrington, 1999).

Having determined that dynamic cues (i.e., vowel durations, formant transitions) are used and useful for vowel identification, sociophonetic studies have recently begun to explore dialectal differences in vowel dynamics. Studies of monophthongization of /ɑɪ/ in the Southern region of American English (e.g., Bailey & Tillery, 1996) or African American English (e.g., Green, 2002; Yaeger-Dror & Thomas, 2010) recognized the role of dynamic properties[12], but less obvious features captured in VISC measurements have recently been found to be helpful in characterizing vowels of American English dialects more generally (Fox & Jacewicz, 2009).

VISC has been modeled in a number of ways (see Morrison, 2006, for a review), but the dual-target model with formant values measured at the beginning and end of the vowel target captures the relevant cues for perception, and will be applied in the current work. VISC as a vector length is a measure of the Euclidean distance between the two targets in the F1xF2 plot.

[12]Monophthongization is a feature of the Southern American English dialect that has been used as a defining feature, but movement within putative monophthongs has not been widely studied. For an interesting application of this feature to the study of African American English, see Hay et al. (1999).

The 0.20 and 0.80 points in the vowel duration have been commonly used as the points for formant measurements in order to minimize the local effects of transitions out of, and into, the adjoining obstruents. Although measurements subdividing the central vector further have been made to account for non-linearity in the trajectory (Fox & Jacewicz, 2009), the current work seeks to determine gross features of VISC, thus monophthongal VISC was measured as a single vector length. We will leave a more detailed phonetic analysis for future work.

The VISC values are averaged over the same CVC tokens used to build the static plot. Figure 5.5 shows a plot of the trajectory measurements, indicating the general degree and direction of movement for vowels traveling in the formant space.

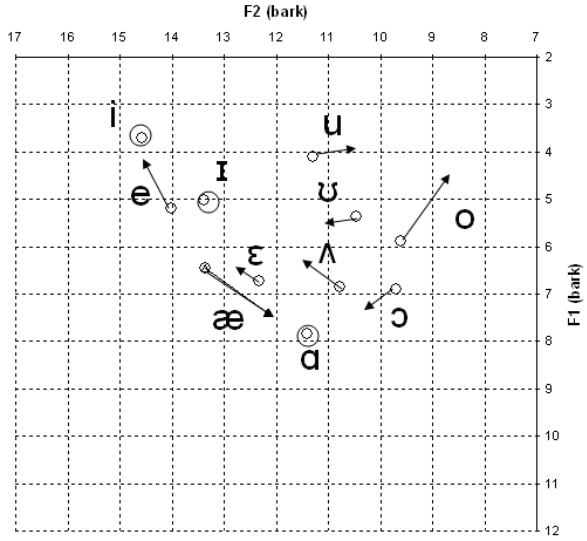


Figure 5.5. VISC for Anglo speakers. Arrows indicate length and direction of the trajectory from 0.20 to 0.80 of the vowel duration. Vowels without arrows show little discernible VISC.

In order to determine that the central 60% of the vowel was not subject to coarticulatory effects, subsets of each vowel, based on phonetic context, were compared. Using alveolar versus velar postvocalic contexts (hVd and _Vk when available), ANOVAs were calculated for the vowel VISC.

The ANOVA calculated for the MHE and Anglo populations revealed a significant main effect for vowel, indicating only that differences exist for VISC for individual vowels [$F(10, 480) = 9.97$, $p < .001$]. Vowel by context interaction was found [$F(10, 480) = 7.20$, $p < .01$], so individual t-tests were run on each vowel. The vowel / ʊ / was the only category that showed significant differences between the contexts for VISC, $t(25) = -7.84$, $p < .001$, revealing that the post-vocalic context was affecting the VISC for this vowel. This difference for /ʊ/ does not affect the interpretation of VISC for this vowel among the participants in this study since they all read from the same wordlist, but is more important for a proper characterization of the dialect. In Chapter 8 the comparisons across studies are all based on hVd readings, so this effect will not be an issue. For ten of the eleven vowels considered here, no coarticulatory effects were found; transitions in the central portion of the vowel did not vary systematically based on place of articulation. A more detailed characterization of vowels using VISC will require a wordlist controlled closely for consonantal context.

A summary of the VISC values for Anglo vowels is given in Figure 5.6. It should be noted that it is not the case that long vowels always exhibit greater VISC than short vowels due to their longer duration. Although the short vowels are among those vowels exhibiting less VISC overall, long vowels such as /i, ɑ, ɔ/ also exhibit low VISC, comparable to that of the short vowels.

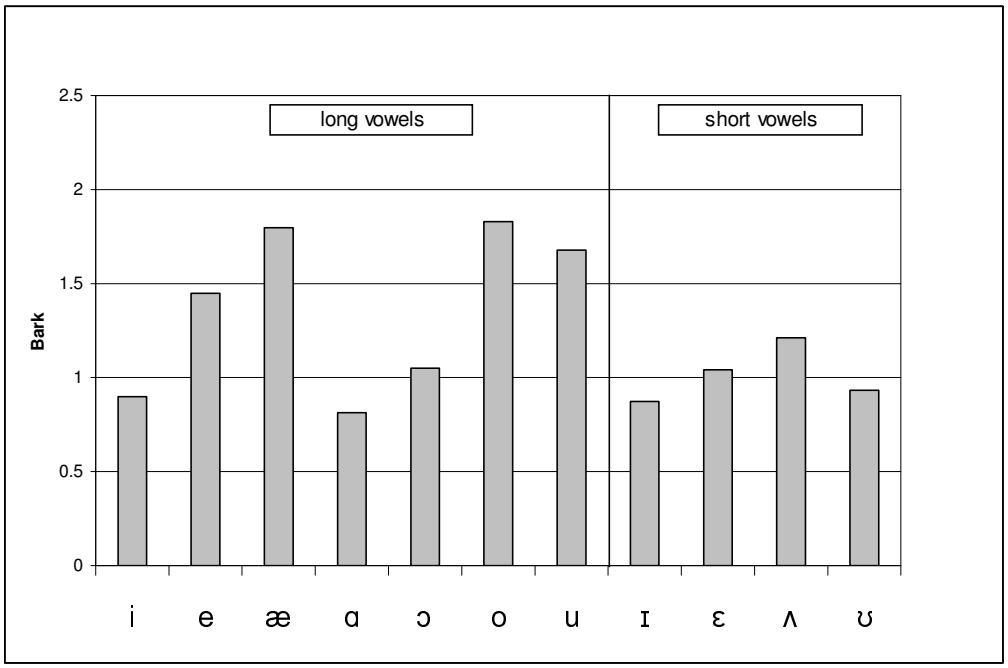


Figure 5.6. Summary of Anglo VISC.

Mexican Spanish Vowels

Introduction

In this section we characterize the vowel space of the Mexican Spanish spoken in the Albany Park community where the majority of Mexican immigrants originate from the Mexican state of Michoacán. While variation exists in the usage and vocabulary of Mexican Spanish, the dialectal differences are not generally manifested in the vowels (Hualde, 2005). The Spanish system comprises a typologically common five-vowel inventory (i, e, ɑ, o, u) and does not contain distinct sets of short and long vowels (Maddieson, 1984). In Spanish, limits on consonants in coda position severely restrict the number of single syllable words with the variety of consonantal environments that we find in English (Hualde, 2005). For this reason CVCV words were used for vowel elicitations. For the wordlist and methodology, see Chapter 3.

Mexican Spanish Vowel Space

The formant analysis of the Mexican Spanish vowels is plotted in Figure 5.7a, and includes VISC for /u/ and /o/, the only two vowels showing significant movement. Relevant to our interest in the consequence of language contact, comparison of this system and the Anglo American English system (based on hVd tokens only) in Figure 5.7b reveals two features of note: one is the location of the Spanish back vowels /u/ and /o/ relative to those of the comparable Anglo vowels, and the other is the position of /e/ relative to /i/. The low and back position of the Spanish /e/ relative to that of the Anglo Chicagoans is probably due to the "diphthongization" in English (i.e., /eɪ/). Since formant measurements were taken at the midpoint of the vowels, the midpoint of the English /e/ reflects the influence of the off-glide found in English (see Figure 5.5). In this case the L2E and MHE VISC for /eɪ/ might be expected to show a Spanish language influence.

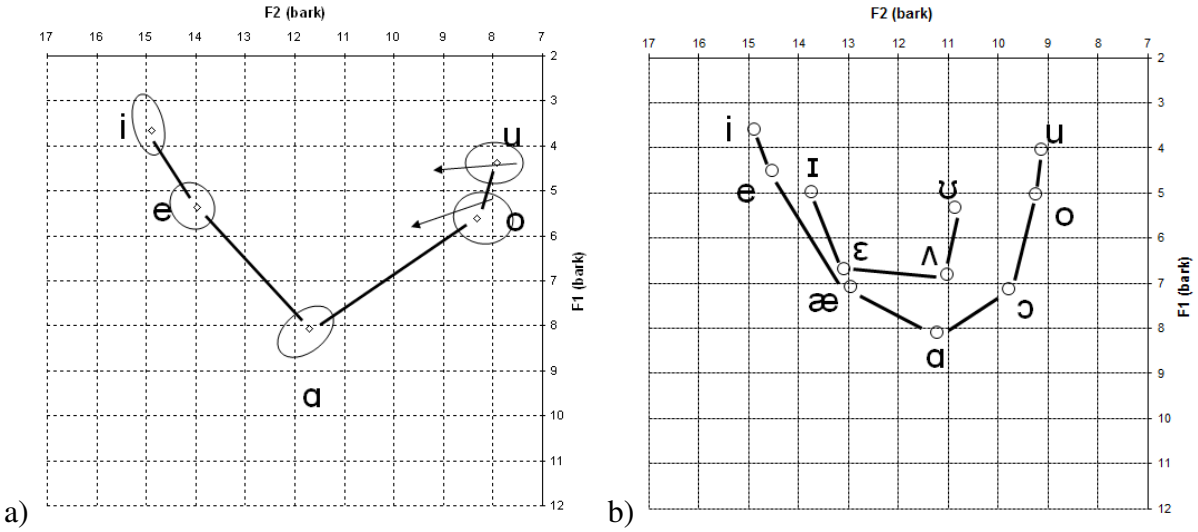


Figure 5.7. Vowel space: a) Mexican Spanish CVCV; b) Anglo hVd.

As mentioned previously, the consonantal contexts differed for the vowels in Spanish and English due to lexical restrictions and the differing phonotactics of the two languages. Although vowel measurements were taken from the stressed (first) syllable of each word, syllabification undoubtedly affects vowel production. In her study of Spanish vowels, Bradlow (1995) found a statistically significant difference between the F2 values for vowels from English CVC versus CVCV elicitations, with the CVCV values slightly lower. But even after controlling for the difference using CVCV words for her American English speaking participants, she found that the Spanish vowel space was backed relative to English, with the exception of /ɑ/, which was slightly fronted.[13] Mexican Spanish spectral results would thus be expected to show a backed system relative to that elicited by the CVC words used for English in the current study, and this is indeed what we see in the plot.

Mexican Spanish Vowel Duration and Consonantal Context

As noted earlier, the Spanish vowel system does not differentiate between vowels on the basis of inherent duration. Figure 5.8 illustrates the homogeneity of the vowel durations in contrast to the Anglo vowels (shown in Figure 5.4), and additionally shows that, like the English vowels, consonantal voicing context affects vowel length – but not to the same extent.

[13] The Bradlow (1995) analysis did not include /ɑ/, but the data presented therein was used to determine spectral plots. A more detailed comparison of Mexican and Peninsular Spanish is provided later in this section.

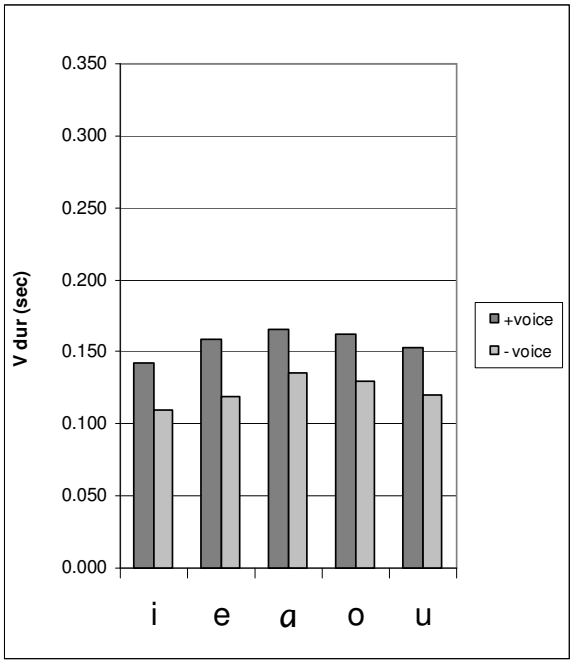


Figure 5.8. Spanish vowel duration by consonantal context.

The dynamic properties of the Spanish vowels are tabulated in Table 5.2. Due to the syllabic constraints of Spanish, the consonant following the vowel in the Spanish case is not the syllable coda, but instead is the onset for the second syllable. This may have a mitigating effect on vowel lengthening. But in any event, a voiced consonant produces a consistent lengthening of the preceding vowel, in this case by an average of 28% across the five vowels (+voice mean = .157, SD = .025; -voice mean = .123, SD = .022).

Table 5.2. Dynamic properties of Mexican Spanish vowels.

Mexican Spanish	**Vowels**				
Vowel dynamics	i	e	a	o	u
__+voice (sec)	0.15	0.16	0.17	0.16	0.15
__-voice (sec)	0.11	0.12	0.13	0.13	0.12
avg dur (sec)	0.13	0.14	0.15	0.15	0.14
dur ratio (+/- voice)	1.31	1.33	1.23	1.25	1.28
VISC (Bark)	0.55	0.67	0.69	1.84	1.69

Mexican Spanish VISC

Measurements of the VISC illustrated in the vowel plot are also tabulated in Table 5.2. Surprisingly, VISC is almost three times greater for the back vowels /o/ and /u/ than the others. In addition, the average trajectory length for these two vowels (1.84, 1.69 respectively) is almost identical to that found in the same Anglo vowels (1.83, 1.68 respectively), but in the diametrically opposed direction. That is, the Spanish back vowels tend toward centralization, unlike the Anglo high-back offglide for these two vowels.

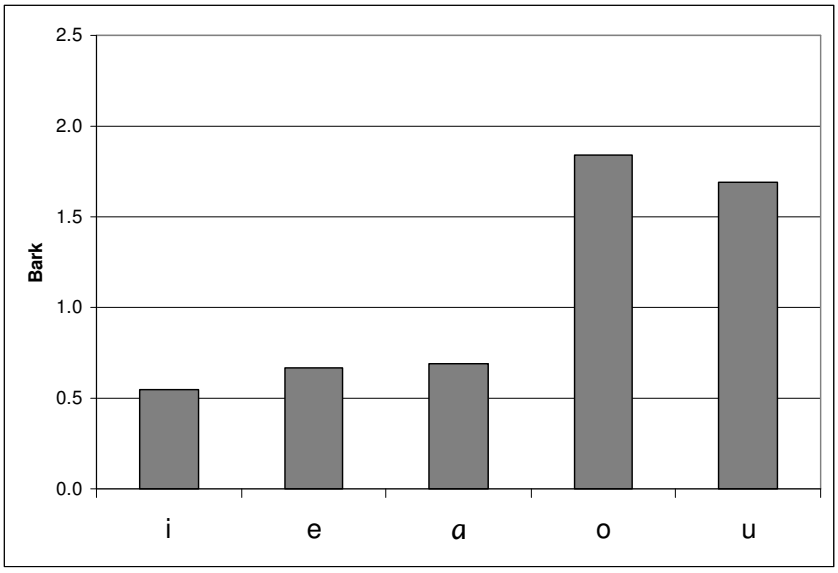


Figure 5.9. VISC for Mexican Spanish.

Since the vowels in all the Spanish stimuli preceded alveolar stops, is the larger VISC for the Spanish back vowels caused by a lengthening of the articulatory gesture? To determine whether the effect is due to the elicitation materials, or is indeed a feature of the Mexican Spanish vowel system, we recorded a female monolingual English speaker from Chicago reading

from the English CVC stimuli, and in a separate session, from the Spanish CVCV stimuli. Since the subject did not speak Spanish, we transcribed the Spanish words into English non-words to obtain the desired vowel sounds. For example, the Spanish word /bita/ was transcribed to an English non-word *beeta.* Results of this test case (Figure 5.10) show that although the speaker varied in VISC between the elicitation schemes for the two languages, there was no evidence of the extreme VISC differences we see in the Mexican Spanish speakers' /o/ and /u/. If it was due to articulatory effects, we would expect a pattern similar to that of the Mexican Spanish speakers. These results indicate that the VISC found for /o/ and /u/ in Mexican Spanish are not due to articulatory effects, but are truly vowel inherent features of the Spanish vowels.

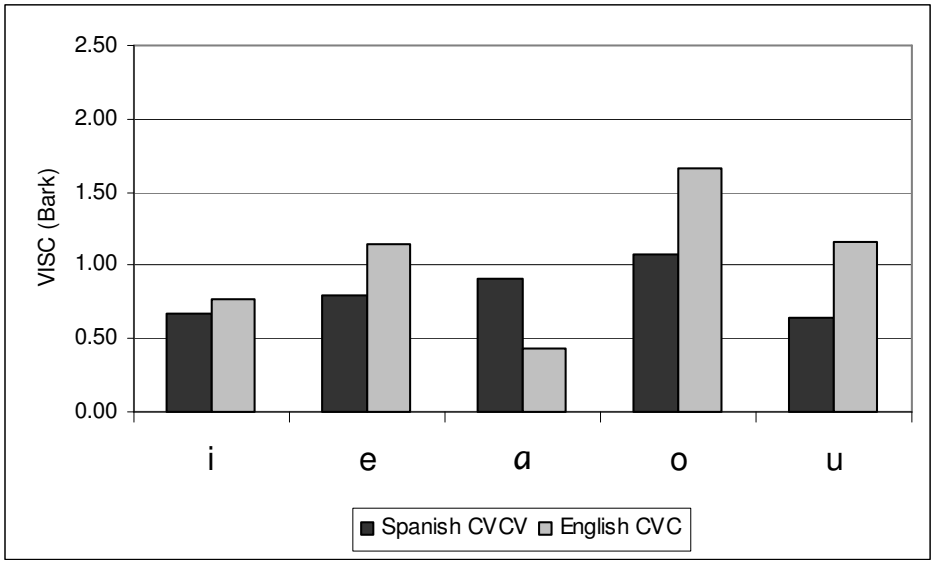


Figure 5.10. VISC: Chicago Anglo speaker reading English CVC and Anglicized Spanish CVCV words.

Finally, since the Mexican Spanish vowels were elicited using the same CVCV words used by Bradlow (1995), a comparison of the normalized F1 and F2 Bark values[14] for the Mexican female speakers of the current study and the male Madrid Spaniards from Bradlow is possible, and is shown in Figure 5.11. Remarkably, the Figure indicates little difference between the static positions of the vowels in the Mexican system and the Madrid system of Bradlow's study, in spite of the speakers' disparate origins.

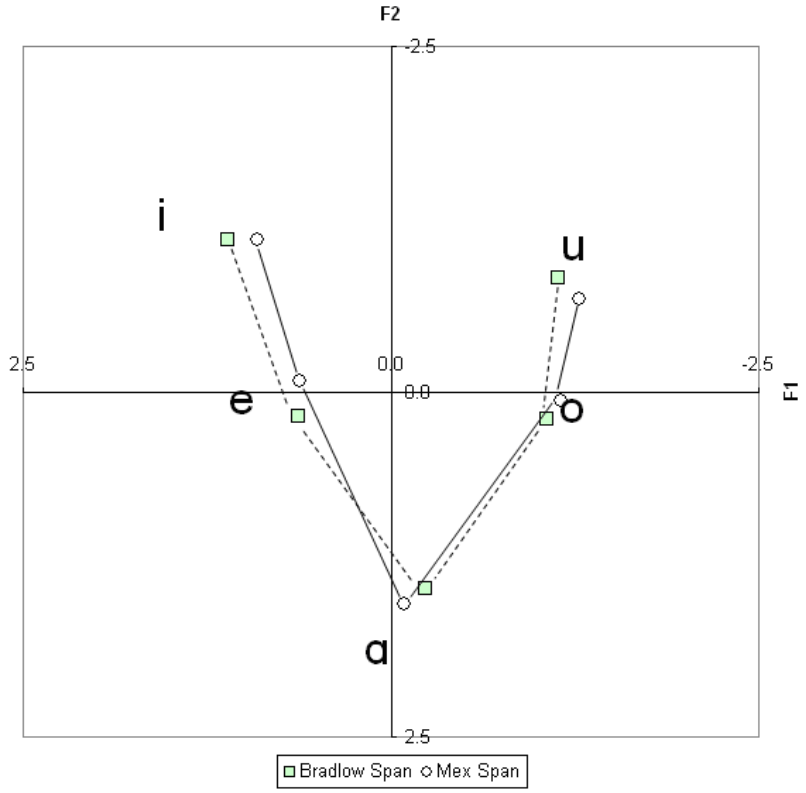


Figure 5.11. Normalized vowel space comparing CHESS Mexican Spanish speakers and Bradlow (1995) Madrid Spanish speakers.

[14] Normalization is necessary to facilitate comparison of male participants in Bradlow (1995) and female vowel productions in the current study since the vowel resonances will vary as a function of the size of the vocal tracts. Lobanov's (1971) Z score transform is a widely used and effective means of normalization (Adank et al., 2004). Lobanov Fti = (Fti - μti) / δti where F is the value in Hertz for formant number i and μti is the average formant frequency across eleven monophthongal vowels for talker t and δti is the standard deviation for average μti. This system uses vowel extrinsic information (mean and standard deviation across an individual's vowel inventory) applied to individual formants (as opposed to F1 – F0, F3 – F2 values (e.g., Hillenbrand et al., 1995).

Learners of English as a Second Language (L2E) Vowels

Introduction

In much of the early research on Chicano English, a distinction was not made between speakers born and/or raised in the United States and those who had immigrated later in life. This is problematic for the characterization of Chicano English as an American English dialect since the range of language learning contexts for second language speakers has been shown to have a telling effect on the vowels ultimately obtained (e.g., Flege et al., 1997). It is for this reason that the current study delimits two sets of Mexican-American participants: English language learners and native speakers of English. A consistent description of speakers' language histories makes it possible to compare explicitly the vowels produced by the two populations. Certainly each individual's language learning environment is unique, and Mexican Heritage English speakers can vary in important ways in their personal language experience (Potowski, 2004). But to study the enduring features of language contact we have defined a basic distinction between native speakers of English and those who acquired English as a second language later in life. In this section we consider the English vowels of second language English (L2E) speakers from the CHESS corpus, and compile the static and dynamic data that differentiate L2E vowels from those of a typical native English speaker (i.e., Anglos).

L2E Vowel Space

The vowel space for 12 female L2E speakers is plotted in Figure 5.12. It is immediately apparent from the overlap of certain adjacent vowels that the L2E speakers as a group have not completely reconciled the differences between their native five-vowel Spanish system and that of

the regional variety comprising 11+ English vowels (compare to the Anglos in Figure 5.2b). The results confirm the expectation that Spanish-speaking learners of English make certain accommodations to the expanded inventory, and display collapsed categories that are readily apparent in a spectral representation.

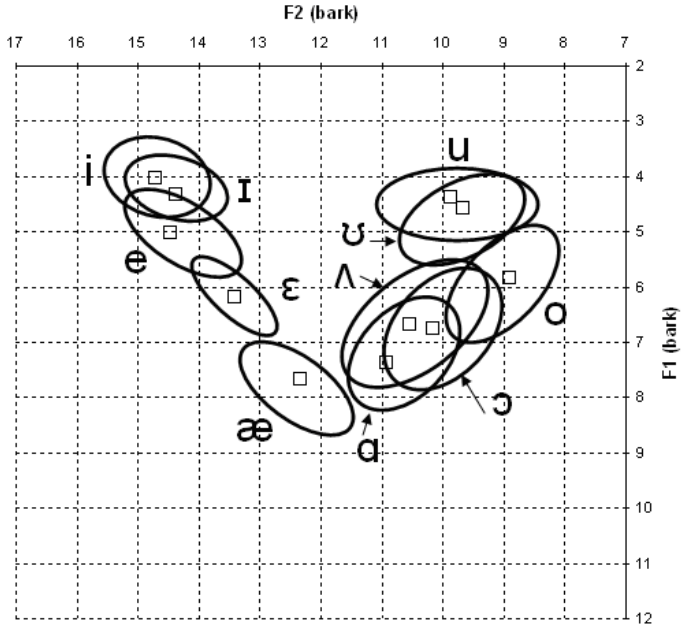


Figure 5.12. L2E vowel space.

The conspicuous feature of the L2E vowel space in Figure 5.12 is the overlap of the vowel pairs / i, ɪ, /, / u, ʊ /, and / ɔ, ʌ /, indicating that they are not differentiated as separate categories in these productions. Individual t-tests set at p=.001 were run on these pairs, and showed that the categories are not distinct: for / i, ɪ, / $t(10) = -2.01$, $p = .07$; for / u, ʊ /, $t(10) = 2.43$, $p = .04$; and for / ɔ, ʌ /, $t(10) = -0.55$, $p = .60$.

This collapse of vowel categories results in stereotypically Spanish-accented English in which *bit* is pronounced *beat*, and *look* is pronounced *Luke*. In addition to the areas of vocalic overlap or merger, we see that the position of /æ/ for these speakers corresponds more closely to

the Spanish /ɑ/ than the /æ/ of American English. As might be expected for Spanish speakers whose language contains a five vowel inventory and no subsystems of long and short vowels, their English vowel space has been heavily influenced by their experience with Spanish.

L2E Vowel Duration

Vowel durations for the L2E speakers are listed in Table 5.3. Note that the duration of /e/ is longest, possibly influenced by the relatively common Spanish diphthong /eɪ/. This is further supported by the VISC for /e/ determined in the following section. We find little evidence in L2E of English vowel duration subsystems, with the average long vowel at 0.20 sec. and the average short vowel at 0.18 sec. This compares to Anglo 0.21 and 0.15 sec. respectively.

Table 5.3. L2E dynamic properties summary.

L2E	**Long vowels**							**Short vowels**			
Vowel dynamics	i	e	æ	ɑ	ɔ	o	u	ɪ	ɛ	ʌ	ʊ
+voice (sec)	0.22	0.28	0.23	0.21	0.21	0.24	0.19	0.19	0.21	0.20	0.20
-voice (sec)	0.18	0.24	0.18	0.17	0.15	0.19	0.16	0.15	0.15	0.18	0.16
dur avg (sec)	0.20	0.26	0.21	0.19	0.18	0.22	0.18	0.17	0.18	0.19	0.18
dur ratio	1.23	1.17	1.31	1.22	1.38	1.26	1.18	1.28	1.42	1.11	1.26
VISC (Bark)	1.33	2.33	1.15	1.03	1.33	1.35	2.10	1.21	1.20	1.31	1.09

L2E Vowel Duration and Consonantal Context

As in both the Spanish and English data, vowel lengthening for the L2E speakers is conditioned by the post-vocalic consonantal context. The effects are plotted in Figure 5.13.

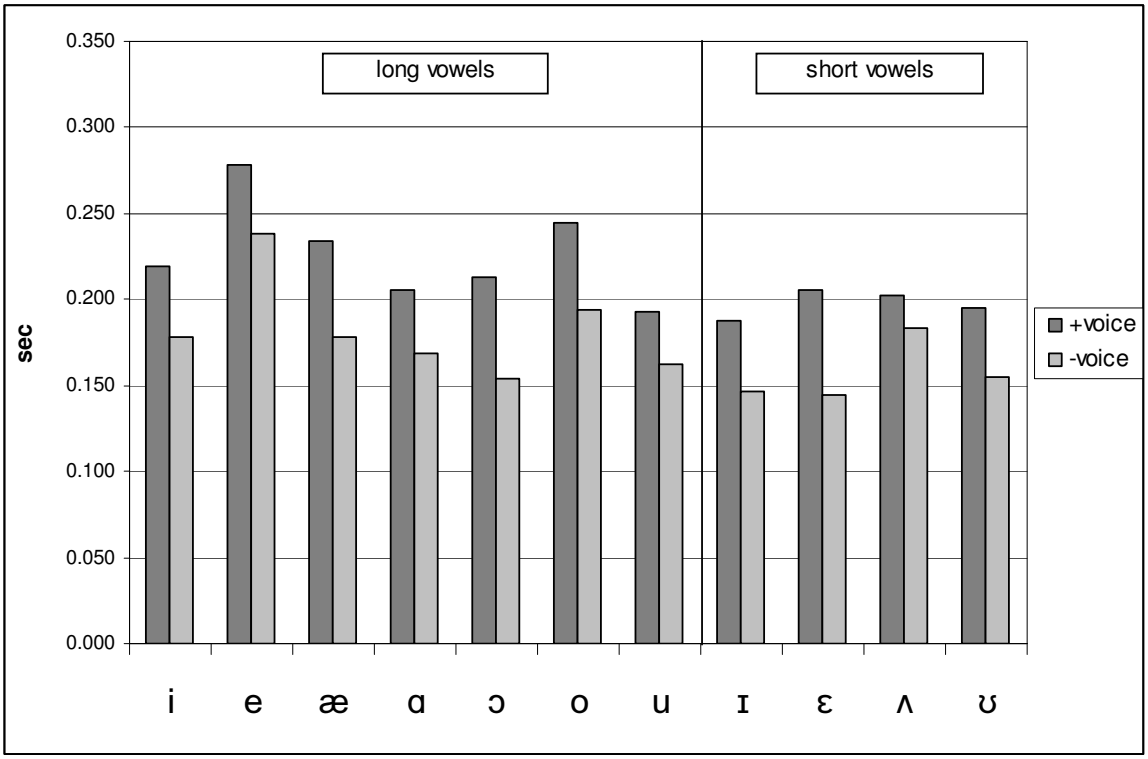


Figure 5.13. L2E vowel duration by voicing context of the following stop.

L2E VISC

L2E VISC is not consistent with the other English varieties. Figure 5.14 provides the values for VISC, while Figure 5.15 shows the direction of the vowel trajectories. VISC is evident only in the vowels /e/ and /u/. The Spanish speakers did not exhibit much VISC for /e/, so it is possible that these learners are using their Spanish diphthong /eɪ/ to correspond to the Anglo equivalent. In any event, the VISC profile of the L2E speakers appears to be a hybrid of Spanish and English.

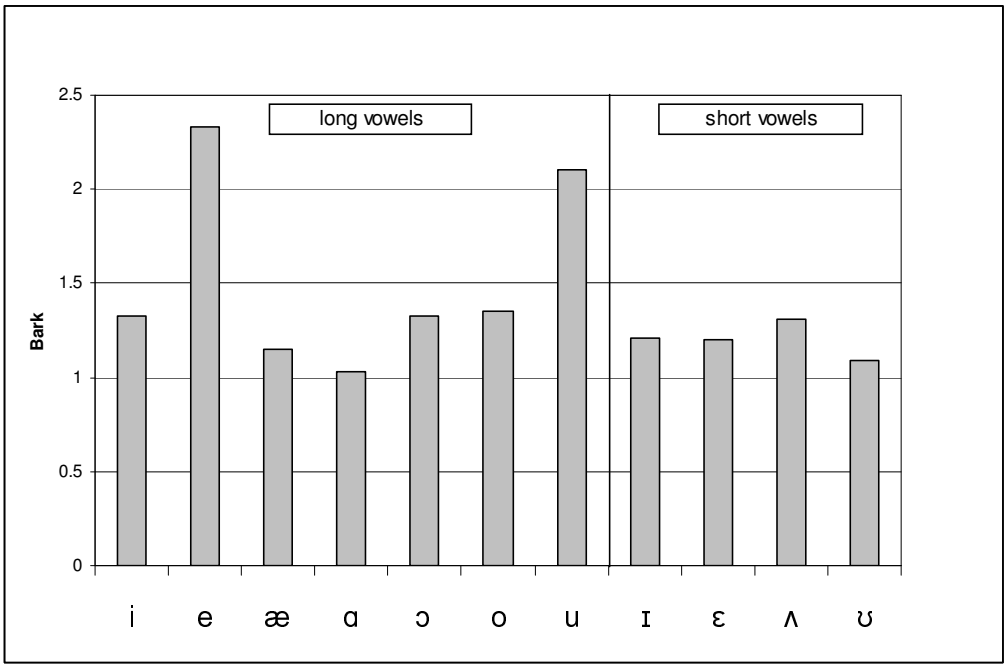


Figure 5.14. L2E VISC.

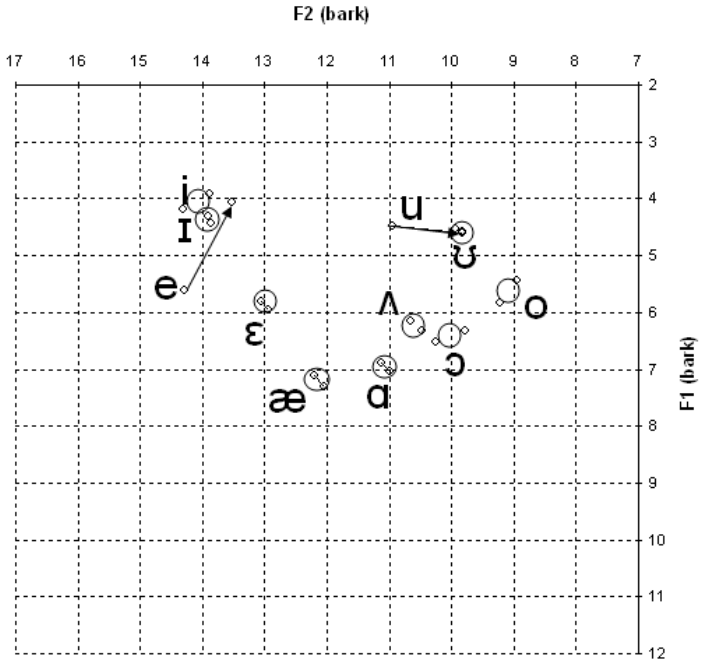


Figure 5.15. Vowel plot of L2E VISC.

Mexican Heritage English (MHE) Vowels

MHE CVC Vowel Space

In contrast to the vowel space of the L2E speakers presented above, the plot of MHE vowels in Figure 5.16 shows distinct categories for all vowels in the English inventory. As one might expect from native speakers of English, they have spectrally resolved their vowel productions resulting in very little overlap of adjacent vowels. The area of overlap between /æ/ and /ɛ/ is similar to the overlap seen in the Anglo vowel space, with the same distinction between the vowels as we will determine in the comparison section of this chapter.

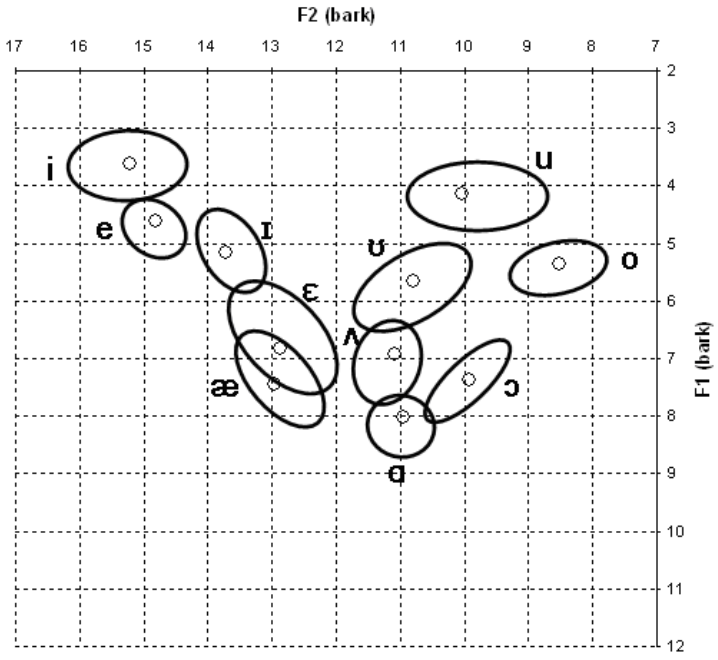


Figure 5.16. Vowel plot of MHE speakers.

MHE SPIN Vowel Space

The results of the SPIN sentence vocalic analysis are plotted in Figure 5.17. We find a reduction of the vowel space similar to that found for the Anglo speakers. The vowel space is essentially backed relative to CVC.

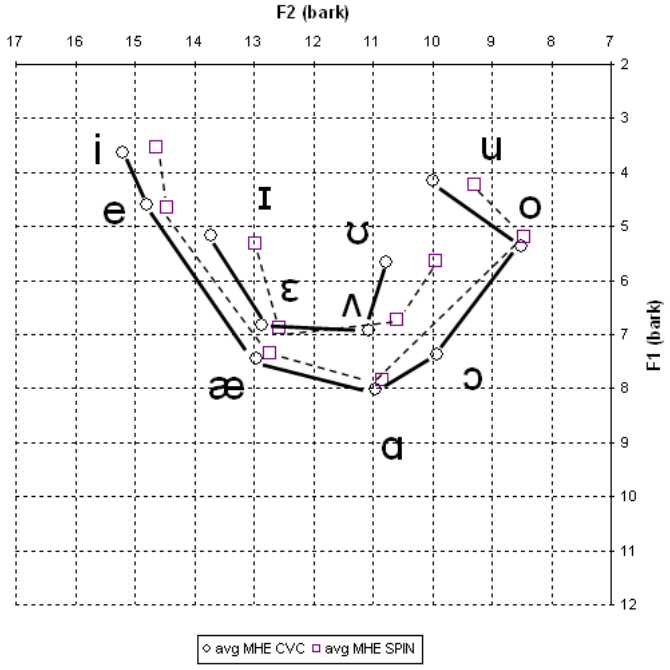


Figure 5.17. MHE CVC versus SPIN vowels (note: no /ɔ/ tokens for SPIN).

MHE Vowel Duration and Consonantal Context

Vowel durations for the MHE speakers are tabulated in Table 5.4 and illustrated in Figure 5.18. Much like the Anglo speakers, these speakers exhibit vowels differentiated by duration into long and short vowel categories. In addition, vowels preceding voiced oral stops are lengthened relative to their production before voiceless stops.

Table 5.4. MHE dynamic properties summary.

MHE	Long vowels							Short vowels			
Vowel dynamics	i	e	æ	ɑ	ɔ	o	u	ɪ	ɛ	ʌ	ʊ
+voice (sec)	0.26	0.29	0.29	0.27	0.29	0.28	0.19	0.22	0.20	0.20	0.21
-voice (sec)	0.19	0.20	0.21	0.21	0.20	0.19	0.16	0.15	0.16	0.18	0.15
dur avg (sec)	0.23	0.25	0.25	0.24	0.25	0.23	0.17	0.18	0.18	0.19	0.18
dur ratio	1.35	1.46	1.39	1.28	1.48	1.46	1.21	1.48	1.24	1.09	1.42
VISC (Bark)	1.16	1.68	1.47	0.94	1.16	1.80	1.64	1.07	1.15	1.25	0.99

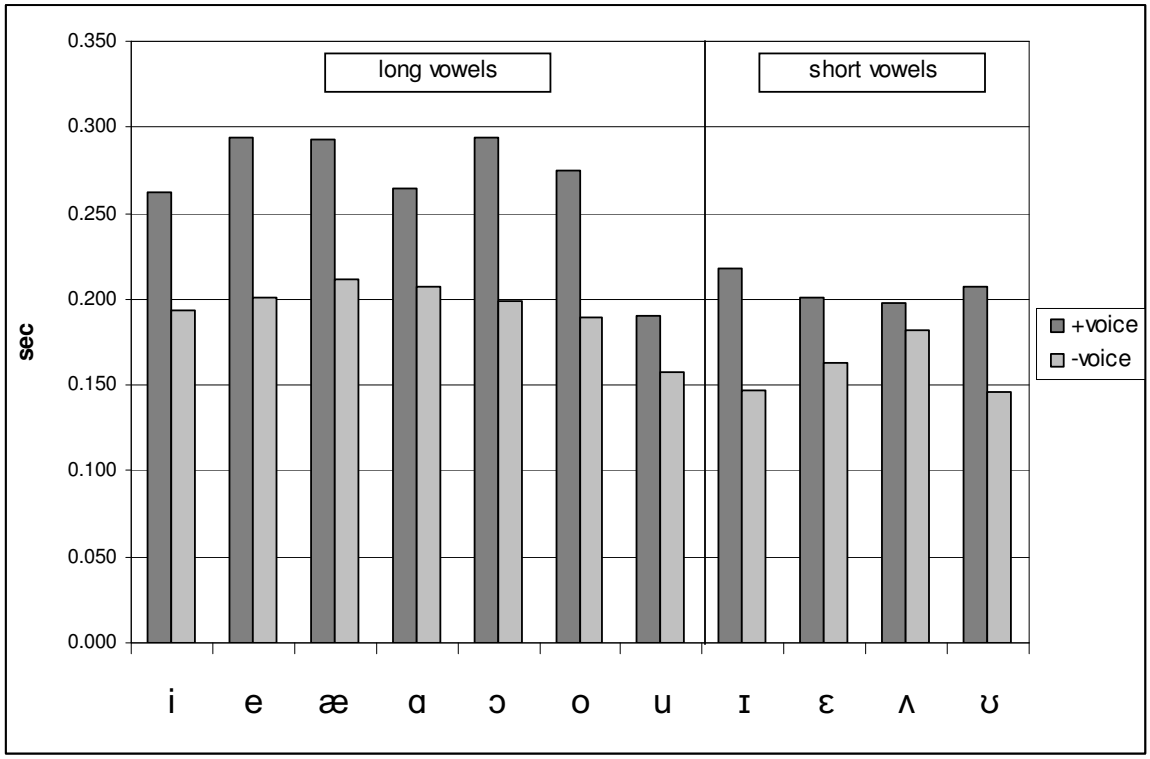


Figure 5.18. MHE vowel duration by voicing context of the following stop.

MHE VISC

The VISC profile for the vowels of the MHE speakers in Figure 5.19 is nearly identical to the Anglo profile. The one exception is the VISC for /æ/ which shows a significant difference from that of the Anglo production. Statistical comparisons are made in the following section.

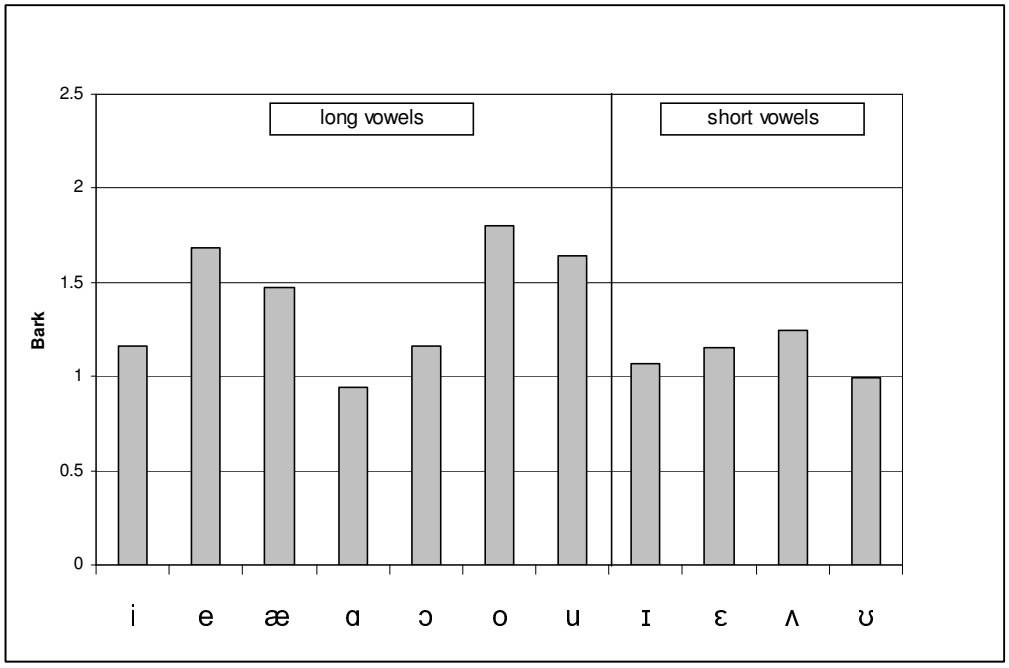


Figure 5.19. MHE VISC.

Comparisons of Speaker Populations

Ultimately we wish to characterize the vowels of MHE in relation to the Anglo dialect and determine which phonetic features exhibit an influence from the Spanish vowels. We wish to examine how this contact variety relates to not only the Spanish language, but also the speakers' expression of ethnicity. With this information we can determine vowel features that correlate

with the perceived accent of the speakers, and what role social factors (e.g., a speaker's ethnic identity) play in vocalic production.

Having characterized the static and dynamic properties of the vowels for our four speaker groups, we are in a position to look for features that reflect the role of Spanish in MHE vowel structure. This section will focus on the relationship between MHE and the other population groups. The goals for this section are:

First, to demonstrate that MHE vowels comprise a system distinct from that of English learners (i.e., L2E), and enumerate the features that distinguish the two varieties.

Second, to demonstrate that MHE vowels are not reliably distinguished from Anglo vowels on the basis of static (spectral) features alone, and enumerate the features that distinguish the two varieties.

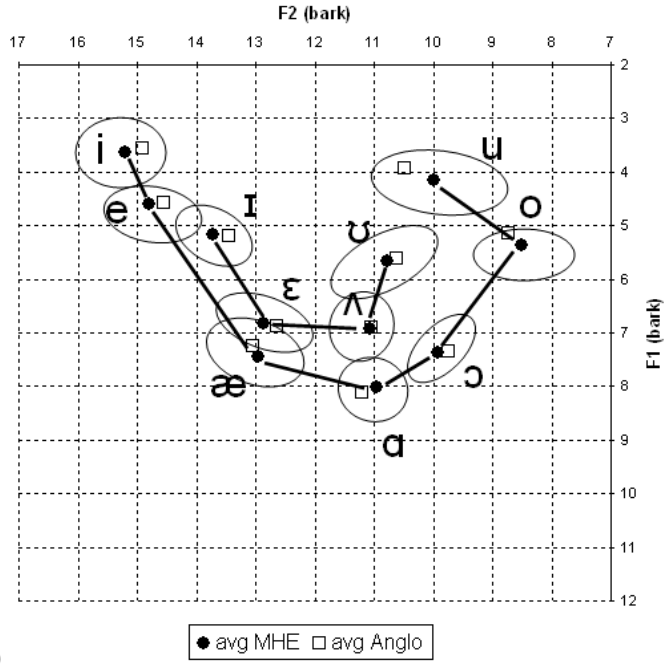
Third, to determine the influence of Mexican Spanish on the production of MHE vowels.

To determine whether statistical differences exist between the vowel systems for the L2E, MHE and Anglo populations of speakers, an ANOVA was calculated using vowel categories (/ i, ɪ, e, ɛ, æ, ɑ, ʌ, ɔ, o, ʊ, u /) as within-subjects variables, and speaker populations (L2E, MHE, Anglo) as between-subjects factors for each of four properties: F1 and F2 at vowel midpoint, duration, and VISC. Following Clopper et al. (2005), an alpha level of 0.01 was used for each ANOVA when a number of analyses were run.

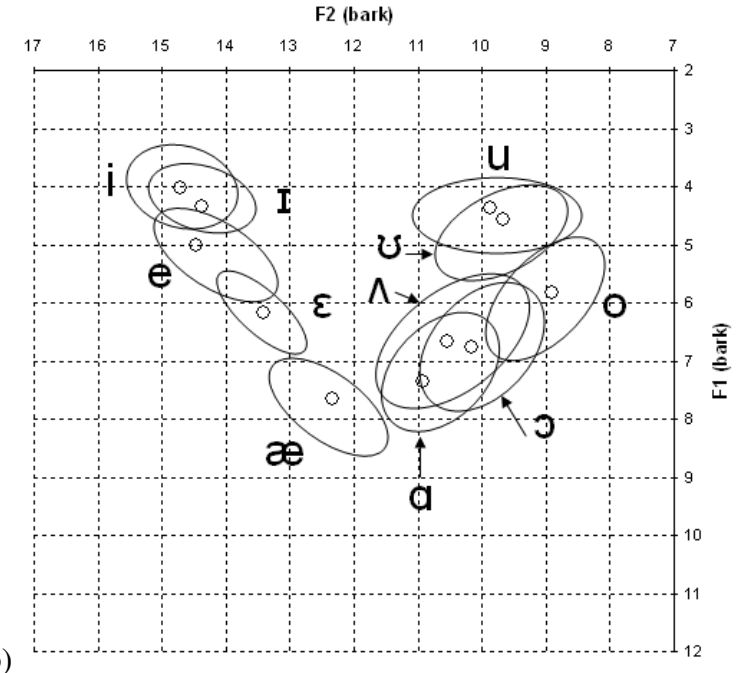
Spectral Properties (Static Vowel Plots)

The static plot comparisons in Figure 5.20 graphically show the similarity in vowel structure for MHE and Anglo speakers (Figure 5.20a), and how dissimilar that structure is from L2E speakers (Figure 5.20b). Individual MHE vowels overlap minimally, indicating distinct

vowel categories, unlike the L2E vowels. In spite of their speech being generally recognized as accented by listeners familiar with the regional Anglo norm (see Chapter 6), the static vowel plot indicates little difference between MHE vowels and the Anglo system.



a)



b)

Figure 5.20. Vowel plot comparisons. a) MHE/Anglo vowel plot with ellipses surrounding MHE productions; b) L2E vowel plot.

For comparisons of the vowel spaces we will focus on the MHE and Anglo varieties. Results of the analysis of the L2E vowel space above indicated that these late learners of English did not produce the complete inventory of English vowels, so statistical comparisons of their vowel space to MHE and Anglo spaces will not be carried out.

A repeated measures ANOVA was run using vowel category (/ i, ɪ, e, ɛ, æ, ɑ, ʌ, ɔ, o, ʊ, u /) as a within-subjects factor and population (L2E, MHE, Anglo) as a between-subjects factor for F1 and F2 measurements. The ANOVA revealed a significant main effect of vowel category [$F(10, 350) = 752.1$, $p<0.001$ for F1, and $F(10, 350) = 822.5$, $p < 0.001$ for F2] indicating simply that the vowel categories, as described by the first and second formants measured here for American English, are distinct. No main effect for population was detected. Vowel by population interaction was detected for F1 [$F(20, 350) = 16.7$, $p<0.001$], and F2 [$F(20, 350) = 7.8$, $p<0.001$].

The vowel by population interaction suggests that individual vowels vary significantly between populations. A one-way ANOVA on F1 and F2 was computed on each vowel to explore the interaction, with population as the between-subjects factors. Due to the number of analyses, alpha was set at .001 for the post-hoc Tukey tests. Significant main effects of population were found for F1 in /ɑ/ [$F(2, 35) = 12.8$, $p<0.001$] (L2E < MHE and Anglo), /ɔ/ [$F(2, 35) = 9.2$, $p<0.001$] (L2E < MHE and Anglo), /ɛ/ [$F(2, 35) = 11.6$, $p<0.001$] (L2E < MHE and Anglo), /ɪ/ [$F(2, 35) = 25.6$, $p<0.001$] (L2E < MHE and Anglo), /o/ [$F(2, 35) = 8.2$, $p<0.001$] (L2E < Anglo only), and /ʊ/ [$F(2, 35) = 37.9$, $p<0.001$] (L2E < MHE and Anglo). Significant main effects of population were found for F2 in /æ/ [$F(2, 35) = 11.1$, $p<0.001$] (L2E< MHE and Anglo), /ɛ/ [$F(2, 35) = 11.1$, $p<0.001$] (L2E< Anglo only), /ɪ/ [$F(2, 35) = 17.4$, $p<0.001$] (L2E > MHE and

Anglo), and /ʊ/ [$F(2, 35) = 16.5$, $p<0.001$] (L2E< MHE and Anglo). In all cases, it is L2E that is significantly different from the other populations' vowels.

A defining feature of MHE is that it is spoken by native speakers of English. So, perhaps it should not be surprising to find no significant difference between MHE and Anglo vowel inventory structure in a static F1xF2 plot (Figure 5.20a). On the other hand, an accent rating task showed that listeners reliably identified MHE speech as accented, and were consistent in rating their degree of accentedness (see Chapter 6). Given that the majority of sociophonetic studies focus on vowels as important markers of dialect, and that the vowels of the L2E speakers are so clearly affected by language contact, it is surprising to find no Spanish influence in the vowel plot of the MHE variety versus the matrix Anglo dialect.

Vowel Duration

Clopper et al. (2005) found in their study of six regional dialects of American English that particular regions differed in their vowel durations, while in a recent study of three American English regional dialects, Fox and Jacewicz (2009) found that vowels exhibited dialect-specific spectral change. With these findings in mind, we will take a more comprehensive look at the vowels to determine whether influence from Spanish is exhibited in the temporal properties of the contact variety, MHE.

In this section we consider MHE vowel durations in light of the Spanish and Anglo vowel system analyses earlier in this chapter. Figure 5.21 gives average duration values for all English CVC and Spanish CVCV vowel productions preceding oral stops. The figure reveals the similar vowel durations for the three groups of English speakers, and shows the general duration

differences between the English and Spanish vowel systems. This data does not, however, illustrate the differences known to exist in the durational subsystems of English.

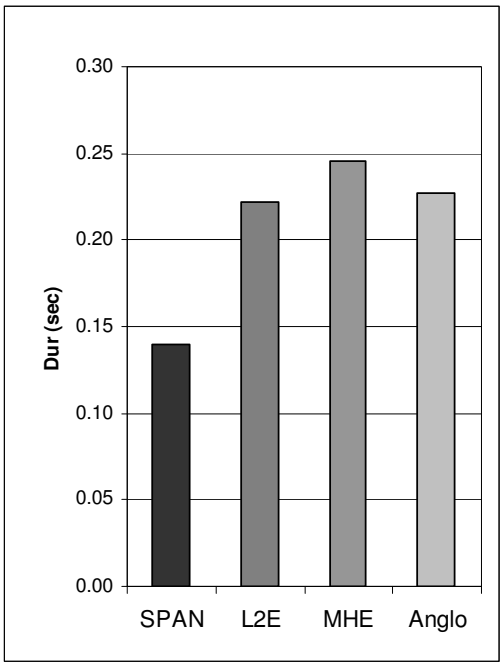


Figure 5.21. Overall vowel durations.

Having selected the contact languages based on the contrasting vowel inventory sizes and concomitant lack of a durational subsystem in Spanish, it is important to consider the three English speaking varieties based on their subsystems of long and short vowels. In addition, we will consider vowel lengthening effects due to consonantal context. To begin the analysis, Figure 5.22 compiles the duration data for the individual vowels by subsystem. The vowels analyzed are preceding voiced oral stops since they exhibit the greatest effect. The figure shows evidence of differences between individual vowel productions of the English-speaking groups, and illustrates the clear difference between the short and long vowel subsystems.

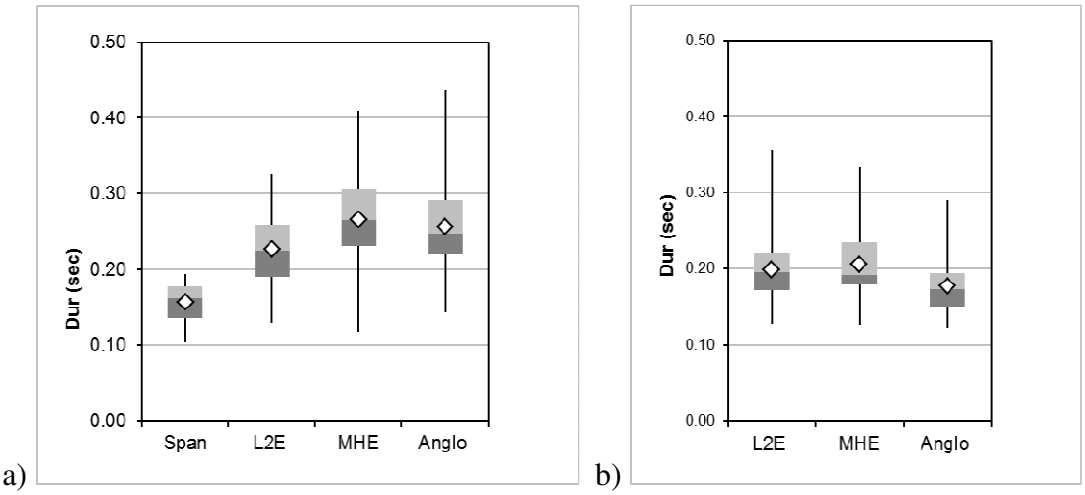


Figure 5.22. Boxplot comparison of vowel durations (preceding voiced oral stops). a) long, +voice; b) short, +voice. Spanish vowels are included with the long vowels since they are found in the English inventory.

To explore vowel by dialect interactions in vowel durations and consonantal contexts, separate one-way ANOVAs were run for vowel duration, long/short vowel duration ratio, and +voice/-voice context duration ratio for the L2E, MHE and Anglo populations. An alpha level of .01 was used for each ANOVA. The ANOVA revealed a significant main effect of vowel category [$F(10, 350) = 113.2$, $p<0.001$] reflecting the inherent duration differences between vowels (due mainly to the two durational subsystems found in American English; see Figure 5.22). No main effect for population was detected. However, a significant vowel by population interaction was detected [$F(20, 350) = 13.3$, $p<0.001$].

The vowel by population interaction suggests that individual vowels vary significantly between populations. A one-way ANOVA on duration was computed on each vowel to explore the interaction, with population as the between-subjects factors. Due to the number of analyses, alpha was set at .001 for the post-hoc Tukey tests. Significant main effects of population were found for /ɑ/ [$F(2, 35) = 12.8$, $p<0.001$] (L2E < MHE and Anglo), /ʌ/ [$F(2, 35) = 9.7$, $p<0.001$]

(Anglo < L2E and MHE), /ɔ/ [$F(2, 35) = 9.4$, $p<0.001$] (L2E< MHE and Anglo), /ɛ/ [$F(2, 35) = 10.6$, $p<0.001$] (Anglo < L2E and MHE), /ɪ/ [$F(2, 35) = 8.2$, $p<0.001$] (Anglo < MHE), and /ʊ/ [$F(2, 35) = 9.1$, $p<0.001$] (Anglo < L2E and MHE). Note that /ʌ, ɪ, ɛ, ʊ/ are the members of the short vowel subsystem of English, and are significantly shorter for the Anglo speakers than the other two populations.

Table 5.5 gives a comprehensive summary of duration data for the three English speaking groups categorized by subsystem (long and short) and by consonantal context (vowels preceding voiced and voiceless oral stops).

Table 5.5. Vowel duration averages (seconds).

V subsystem	voicing	L2E	MHE	Anglo
long V (sec)	+voice	0.227	0.268	0.256
	-voice	0.182	0.194	0.162
short V (sec)	+voice	0.198	0.206	0.177
	-voice	0.157	0.159	0.117
average		**0.195**	**0.213**	**0.187**

This data indicates that the durational subsystems and the consonantal context effects vary between the three speaker groups. A visual interpretation of the data is shown in Figure 5.23. Each context contains 4-6 tokens per vowel for each speaker. The figure shows that vowel durations for Anglo speakers are shorter than the other groups in three of the four contexts, but mainly confirms the pronounced difference between the short and long durational subsystems and the effect of post-vocalic consonant voicing on duration.

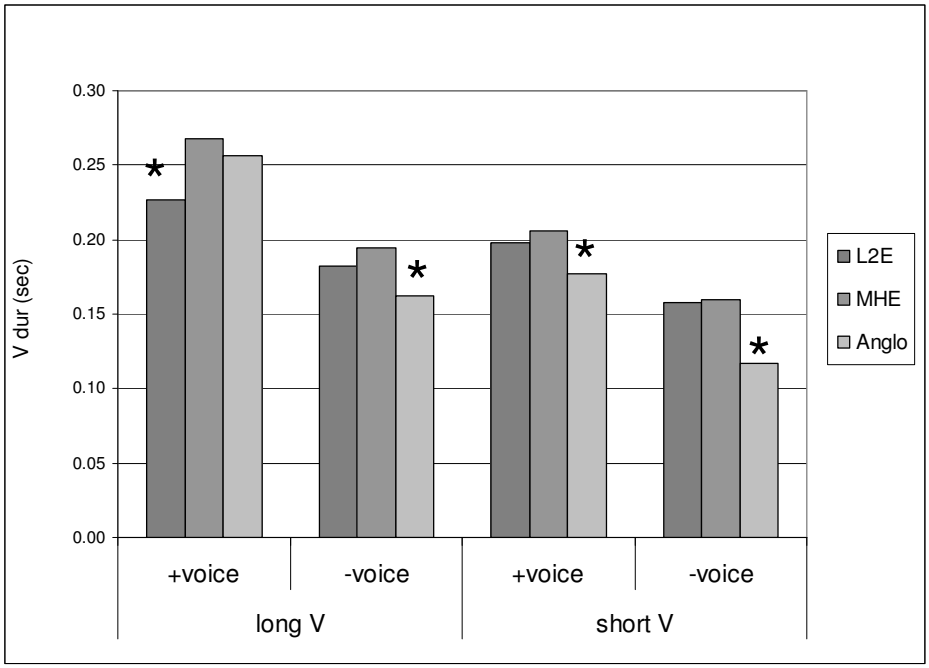


Figure 5.23. Vowel duration by context and vowel subsystem. An asterisk over group indicates statistically significant difference from the other two groups (see text for details of analysis).

In order to visualize the differences in the long versus short subsystems for the three populations, we can compare the ratio of their long and short vowel durations (Figure 5.24). This figure shows clearly the differences between the groups.

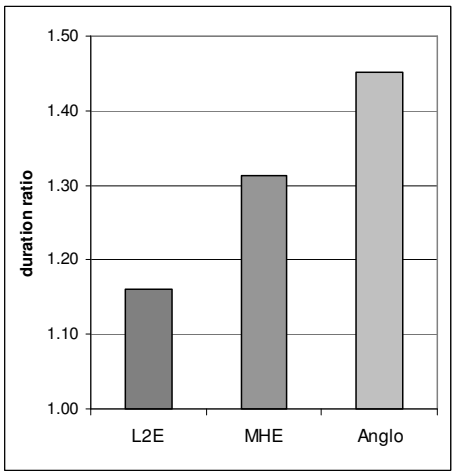


Figure 5.24. Long:Short vowel duration ratio (CVC, +voice).

The long to short vowel duration ratios indicate that the MHE speakers contrast their subsystems in a ratio between the L2E and Anglo speakers (L2E 1.16; MHE 1.32; Anglo 1.45). This finding demonstrates that although the MHE speakers are contrasting their long and short vowel durations, the degree to which they do so is apparently influenced by Spanish. L2E speakers, whose accented speech reveals a more obvious Spanish influence, exhibit very little duration difference between the vowel subsystems, reflecting the lack of such subsystems in Spanish.

One-way ANOVA with population (L2E, MHE, Anglo) as a factor was computed, and a main effect was found for the subsystem ratio [$F(2, 35) = 9.4$, $p<0.001$]. Tukey post-hoc analyses revealed a significant difference ($p<0.001$) for Anglo versus L2E, and close to significance for Anglo versus MHE ($p<0.04$), and MHE versus L2E ($p=0.02$).

Vowel Duration and Consonantal Context

As mentioned earlier, English exhibits conditioned lengthening of vowels preceding voiced consonants. This phenomenon is found across languages, with various explanations put forth (for a review, see Chen, 1970, or Kluender et al., 1988). Because this is a particularly robust feature of English, we might expect a Spanish language influence to mitigate the effect for MHE speakers (compare Spanish vowels in Figure 5.8 to Anglo vowels in Figure 5.4). To determine whether this influence is exhibited in MHE, the duration ratios of vowels preceding voiced and voiceless consonants were analyzed for comparison across our speaker groups. First we will consider how Spanish and English compare in this respect, and then look for differences in our populations.

By limiting our consideration to the vowels that are shared between Spanish and English we can include Spanish vowels to make relevant comparisons along with the three English varieties. Durations before voiced and voiceless oral stops for / a, e, i, o, u / are shown in the boxplots in Figure 5.25. Again, as with long versus short vowels, the MHE speakers pattern differently for the two different contexts. ANOVA indicated no significant difference between MHE speakers and Anglo speakers before voiced consonants, and no significant difference between MHE and L2E speakers before voiceless consonants.

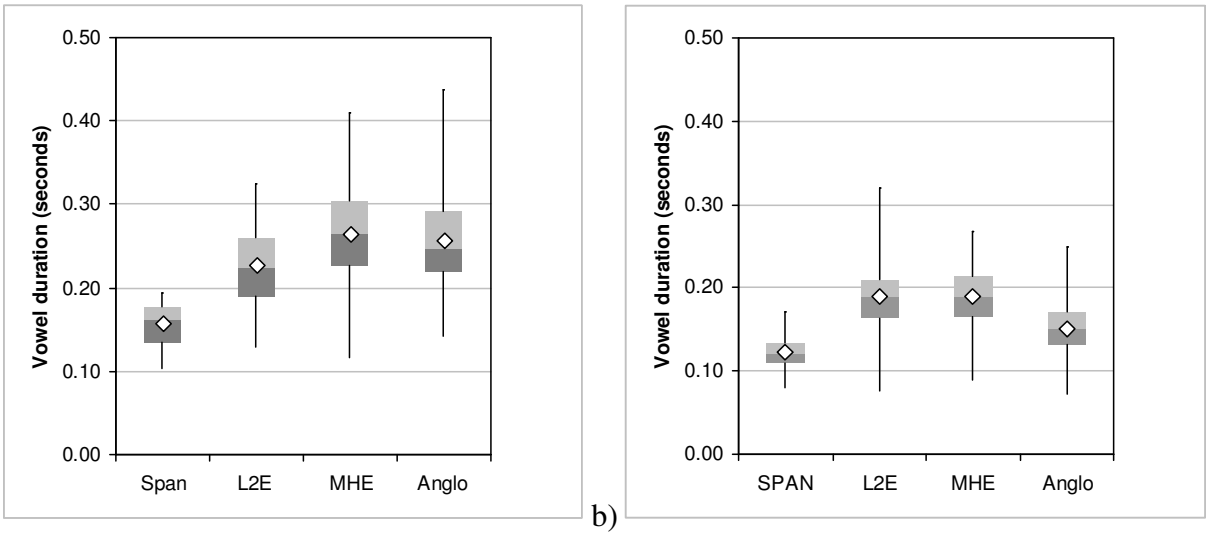


Figure 5.25. Vowel duration comparisons (Spanish and English shared vowels). a) +voice post-vocalic context; b) -voice post-vocalic context.

To explore dialect effects in contextual vowel lengthening, a one-way ANOVA was run on +voice/-voice context duration ratio for the Spanish, L2E, MHE, and Anglo populations. Again, these comparisons were made on the five vowels shared between the two contact languages. The alpha level used was 0.01 each ANOVA. The ANOVA revealed a significant main effect of population [$F(3, 41) = 15.5$, $p<0.001$] revealing differences between the

populations for this ratio. Post-hoc Tukey HSD tests showed significant differences between the Anglo population and all others ($p < 0.001$), with no significant differences between MHE, L2E and Spanish populations for the five Spanish vowels.

A summary of this finding using duration ratios across the shared vowels of Spanish and English is presented in Figure 5.26. This plot shows the degree to which Anglo speakers exhibit contextual vowel lengthening compared to the other groups. This data from the shared vowels supports the idea that the Spanish vowel system is the source of variation in the English speaking groups. The similarity between Spanish and L2E speakers demonstrates the influence of the Spanish system, with MHE values falling between the extremes. Note that these results show this trend in spite of any possible effect of elicitation materials (CVC versus CVCV in Spanish).

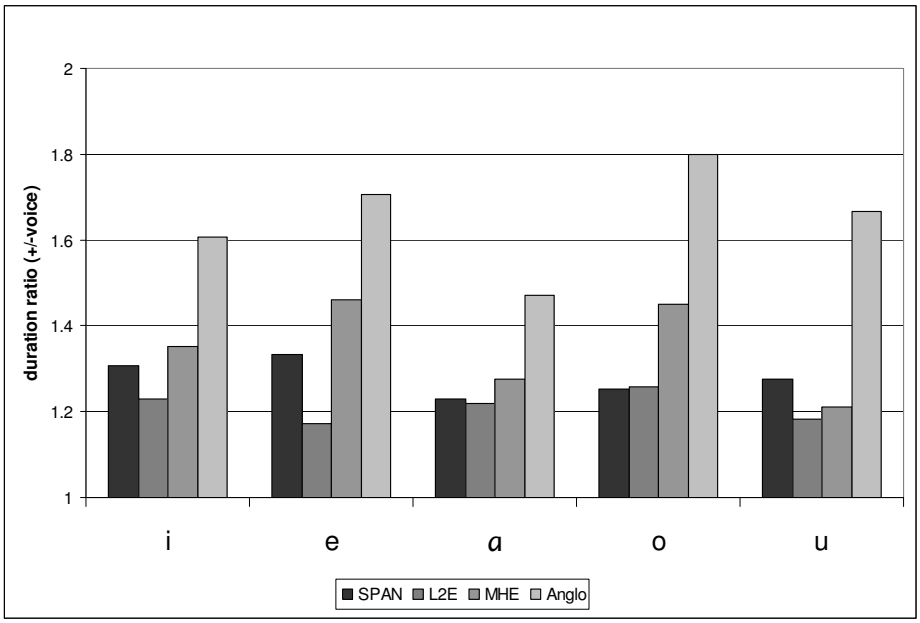


Figure 5.26. Duration ratios (vowels preceding +voice / -voice consonants).

Sociophoneticians often rely on vowel formant frequency plots to provide a quantitative measure of dialect identity that may correlate with a variety of regional and social factors. The results of the duration analyses here provide evidence that vowel duration is also a distinguishing phonological feature of the MHE variety. Phonological effects caused by durational differences between Spanish and English reflect the influence of language contact on dynamic vowel properties. The phonological process that dictates vowel lengthening preceding a voiced consonantal context in English appears to have been mitigated by Spanish language contact. The MHE speakers accurately produce the vowel spectral positions of the matrix English dialect, but the patterns of contextual variation, and subsystem contrasts, are influenced by their Spanish language experience.

VISC Comparisons

The VISC determined for the MHE and Anglo vowels is included along with the Spanish results in Figure 5.27. The ANOVA calculated for the L2E, MHE and Anglo populations revealed a significant main effect for vowel, indicating that VISC differs for individual vowels [$F(10, 350) = 27.5$, $p<0.001$]. No main effect for population was detected. The vowel by population interaction was significant [$F(10, 350) = 4.6$, $p<0.001$], and post-hoc Tukey tests showed significant differences for /ɔ/ (L2E < MHE, $p<0.001$), /e/ (L2E > MHE, $p<0.001$), and /o/ (L2E< Anglo and MHE, $p<0.001$). The vowel /æ/ was the only category revealing differences approaching significance between the MHE and Anglo populations for this feature ($p = 0.002$).

The average MHE VISC for /æ/ is nearing a significantly lower value than that of Anglo speakers in spite of agreement in the static spectral position of this pivotal NCS vowel. In

addition, the reduced VISC comes with a longer duration for /æ/ in MHE (0.294 seconds versus 0.276 seconds). This lower VISC value corresponds to the L2E results above, indicating a Spanish influence, and additionally indicates a difference from the regional norm. The variation within the MHE speaker group for this property will be explored further as we seek correlations to social factors in Chapter 7.

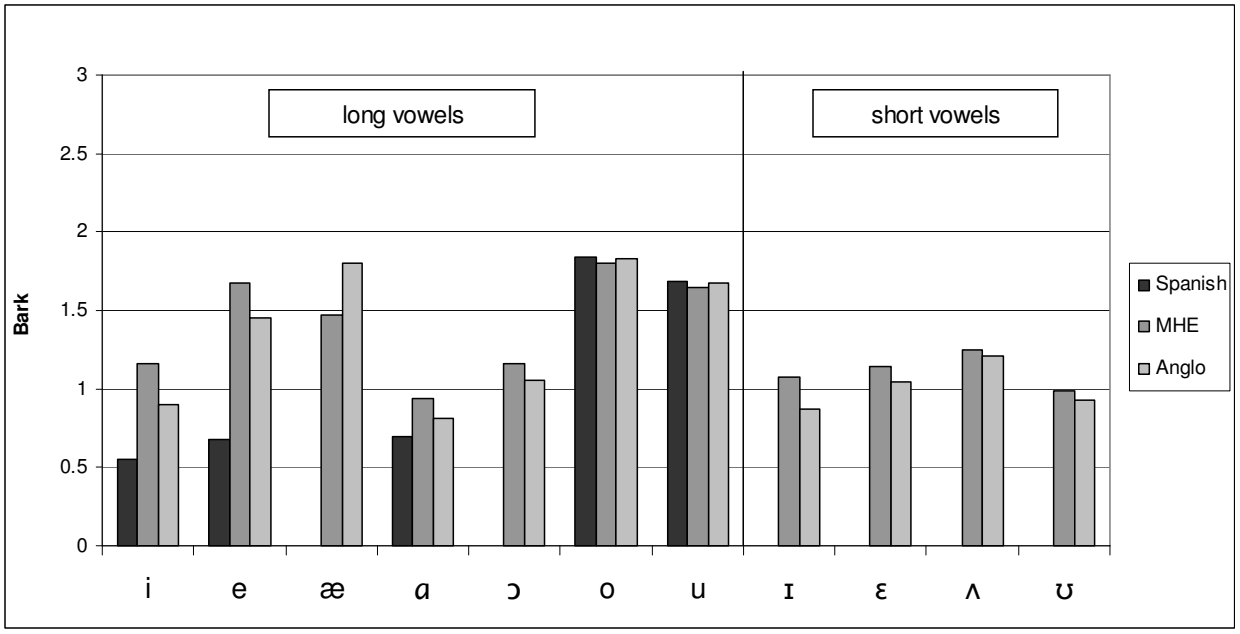


Figure 5.27. VISC comparison: Spanish, MHE, Anglo.

Given the lack of spectral change exhibited for this vowel by L2E speakers considered earlier, we might infer that Spanish has influenced the production. However, the spectral position of /æ/ for L2E speakers makes it more likely that they have conflated the vowel categories for /æ/ and /ɑ/. In any event, the importance of this difference for MHE speakers may lie in its status as an identity marker. It is of note that /æ/ is a pivotal vowel in the NCS, believed to be one of the vowels initiating the shift (Labov, 1994, p. 195), and for this reason may play a central

role in defining an individual's regional identity. The shorter /æ/ trajectory may thus index the ethnic identity of the MHE speakers.

Chapter 6. Accent and Mexican Heritage English

Introduction

Sociolinguistic work has shown that identity and social information is detected consistently in the speech signal. Perception of ethnicity (Purnell et al., 1999) as well as regional origins (Clopper & Pisoni, 2006) have been investigated. While identity construction through speech is predominantly studied through production, current sociophonetic work is beginning to include speech perception as an important component of a thorough account of language variation and change (Drager, 2010).

In order to understand the role of vocalic features in the identification of MHE speech, we will analyze the variety in terms of the Spanish influence generally perceived by listeners. For a guide we can look to the laboratory work on the vowels of accented second language (L2) English (e.g., Flege et al., 1995; Fox et al., 1994). This work has focused on the effect of language-related life experience on speakers' ability to perceive and produce native-like vowels across a range of first languages (e.g., Flege et al., 1998; Flege et al., 1999; Ingram & Park, 1997; Munro, 1993). Generally, research on the speakers of L2 English indicates that the ability of these learners to produce native-like vowels is a gradient effect related to their experience with English. Factors such as age of learning, amount of L1 currently being used, length of residence in the U.S., gender, amount of formal instruction, motivation, and language learning aptitude have all been investigated (for a review, see Piske et al., 2001).

Studies of this type focus on the degree to which learners of a second language are able to produce accurate vowel categories, and the influence of their native language vowel inventory on their productions in the acquired language. The main thrust of this line of research is to develop a

model of phonological acquisition that predicts how learners will accommodate their native vowel structure to a new system, and determine which factors best explain the variation that is found among learners. By definition MHE is the result of early exposure to Spanish and English (both Anglo and MHE), and we seek correlations between vowel features and accentedness in order to determine how the Spanish influence manifests itself in the perception of MHE vowels.

For most Chicagoans familiar with the local speech norms, it is clear from casual listening that MHE differs from Anglo speech. But for a thorough characterization of MHE, we not only need to ensure that it is reliably identified as accented, but we need to determine the amount of variation we find among speakers. The variation found through accent ratings of our MHE speakers allows us to look for correlations between the vocalic features of MHE and the perceived accent.

MHE accent ratings were obtained from speakers of American English familiar with the regional speech norm. The accents quantified, we then sought correlations with the phonetic details of the vowels and the social backgrounds of the speakers. Given our analysis of the CHESS corpus, we may determine whether vowel features associated with a Spanish language influence are the ones associated with MHE accent, and whether there are autochthonous features that may be used to distinguish MHE from the regional (Anglo) variety. In addition, ratings will help us determine the role that accent plays in speakers' orientation toward the community using the Cultural Consensus Model (Romney et al., 1986) in Chapter 7.

In this study, we applied two approaches to quantifying speakers' accentedness. First, we administered a traditional accent rating task (ART) using a numerical rating of speech samples from the MHE speakers. A second approach, called the Ladder task, employed a computer

graphic interface in which subjects placed speech recording icons into a linear array based on their similarity to Anglo or L2E reference recordings.

Accent Ratings Experiment

In a single one-hour session, subjects participated in two ranking tasks of the MHE recordings: an accent rating task (ART) and a Ladder task. Northwestern University Linguistics subject pool subjects received course credit for their participation. Northwestern University is located just north of the Chicago city limits, and the student participants are familiar, or at least acquainted with, the regional dialectal norm.

Sentences for the rating tasks were selected from the SPIN sentence recordings in the CHESS corpus. The three sentences were selected based on the variety of vowels represented in each, and the quality of the recordings across all speakers. Identical sentences were used in both tasks, and are listed in Table 6.1.

Table 6.1. Sentences rated in accent rating experiments. (Note: no /ɔ/ in SPIN sentences.)

Sentence	Target vowels
SPIN 15. *The cop wore a bullet-proof vest.*	/ɑ,ʌ,ʊ,u,ɛ/
SPIN 93. *This key won't fit in the lock.*	/ɪ,i,o,ɪ,ɪ,ɑ/
SPIN 98. *Tom fell down and got a bad bruise.*	/ɑ,ɛ,æ,ɑ,æ,u/

Accent Rating Task (ART)

Subjects (N=31) rated the three SPIN sentences for degree of accent on a Likert scale from 1 (no foreign accent) to 9 (very strong accent). Each subject participated in three separate presentations. Each presentation consisted of an identical sentence read by 16 talkers (14 MHE,

1 L2E, 1 Anglo). Sentences were randomized at each presentation by the presentation software[15]. Subjects heard each speaker only once. Speakers' scores were averaged across all presentations.

Ladder Task

Because subjects in the above task could conceivably rate all the speakers as having the same degree of accentedness, we forestalled this issue by employing a second method for accent rating. This method was adapted from an experimental paradigm developed by Bradlow et al. (2010) in their study of the perception of typological similarity. In the current study, raters placed speaker recordings in order from least to most accented. The ordinal nature of the task required subjects to employ fine-grained interpretations of the speech to make decisions on speakers' relative accentedness.

This Ladder task[16] was developed for the study as a web-enabled interface that required subjects to rank-order the speech files. The task employed the same talker sound files used in the Likert/ART rating task, with the Anglo and L2E speakers situated as reference targets at either end of a rectangular array, or "ladder" (see Figure 6.1). Raters clicked on sound file icons (initially presented in a 2x7 grid on the left of the screen) to hear a talker, and then used the mouse to "drag and drop" icons onto "rungs" of the ladder, based on their similarity to the target recordings (L2E at the top and Anglo at the bottom of the ladder). Subjects could click to hear speakers as many times as they liked, and could move icons freely until the completed ladder was submitted. Icons could not share a rung, thus no "ties" were permitted.

[15] Inquisit 2.0 presentation software, available at http://www.millisecond.com/download/archives.aspx.
[16] Ladder task software was developed at Northwestern University for use as a general web-based experimental procedure.

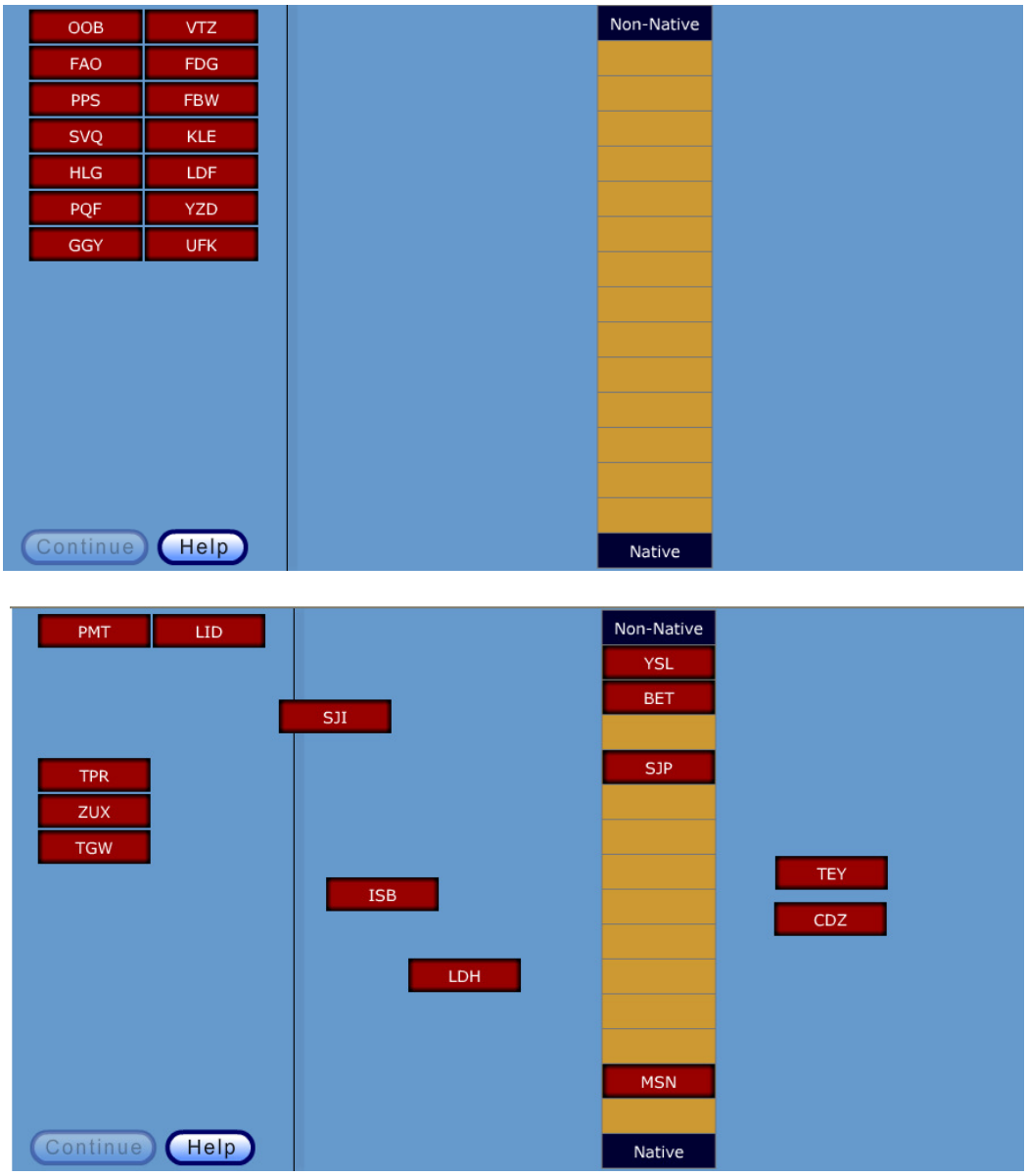


Figure 6.1. Initial interface for Ladder task, then the task in progress.

Each rater performed the Ladder task three times (as in the ART), with each repetition composed of the same set of talkers reading the same sentences heard in the ART. The program assigned recordings to random slots with randomly generated three-letter labels to assist subjects in keeping track of speakers. Twenty-six of the 31 subjects who participated in the ART also performed the Ladder task. Scores for each talker were compiled from average linear rankings

from all repetitions. A score (1-14) was assigned to each of the fourteen ladder slots, and the number of times a speaker was assigned to the slot, across all subjects, was multiplied by the score value for that slot. A speaker's score is the sum of values assigned by raters divided by the number of ratings (number of ratings = 3 repetitions x 26 raters).

Results

Accent ratings for the 14 MHE speakers are tabulated in Table 6.2. The ART score is the average Likert rating from 1-9, from "no foreign accent" to "very strong accent." These scores are based on the average ratings of 31 raters (3 repetitions each). Ladder scores are based on the average rank scores across 26 raters (3 repetitions each), a range of 1-14 for the 14 speakers.

Table 6.2. Accent rating scores.

MHE subject	ART score	Ladder score
mhe004	1.34	1.35
mhe032	2.02	2.83
mhe005	2.16	3.45
mhe036	2.37	4.59
mhe009	3.26	5.18
mhe013	3.86	6.81
mhe040	4.30	7.72
mhe012	4.40	8.21
mhe033	4.58	8.68
mhe011	5.16	9.71
mhe035	4.74	9.91
mhe010	5.91	11.36
mhe006	5.62	12.13
mhe007	6.67	13.09

ART ratings are shown in Figure 6.2 with speakers arranged in ascending order. Ladder ratings are similarly shown in Figure 6.3, and vary little from the rank order for ART, with only

two pairs of speakers transposed. A comparison of the two rating tasks is given in Figure 6.4 where the regression line in the figure indicates the high correlation of the two tasks. Converting ART scores to an ordinal scale, we determine correlation $r_s = .99$ (2-tailed Spearman Rho $p<0.001$).

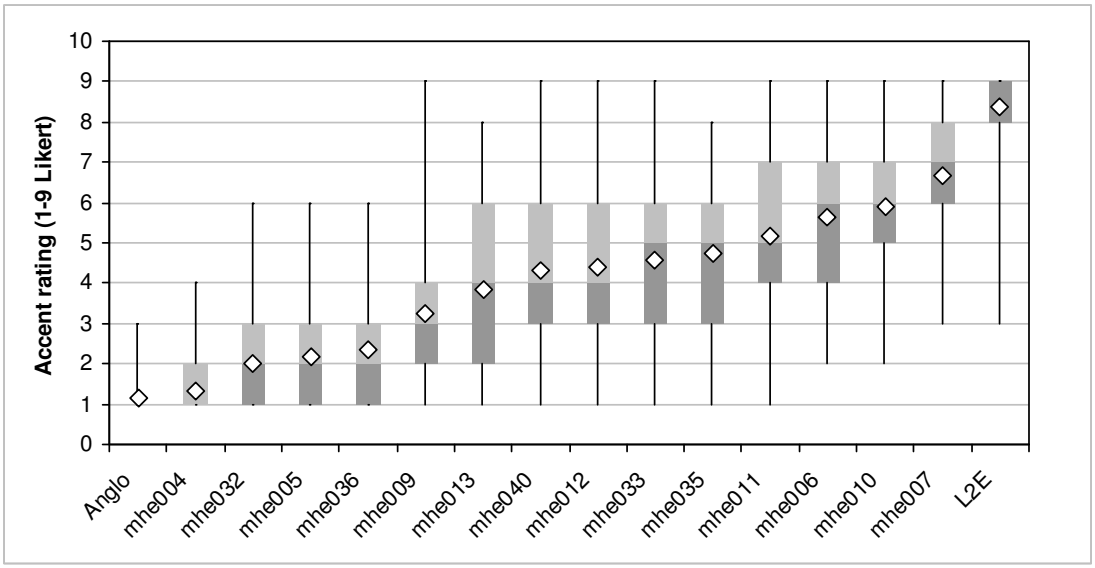


Figure 6.2. ART ratings (N=31). (Likert rating 1 (no accent) – 9 (very strong accent).

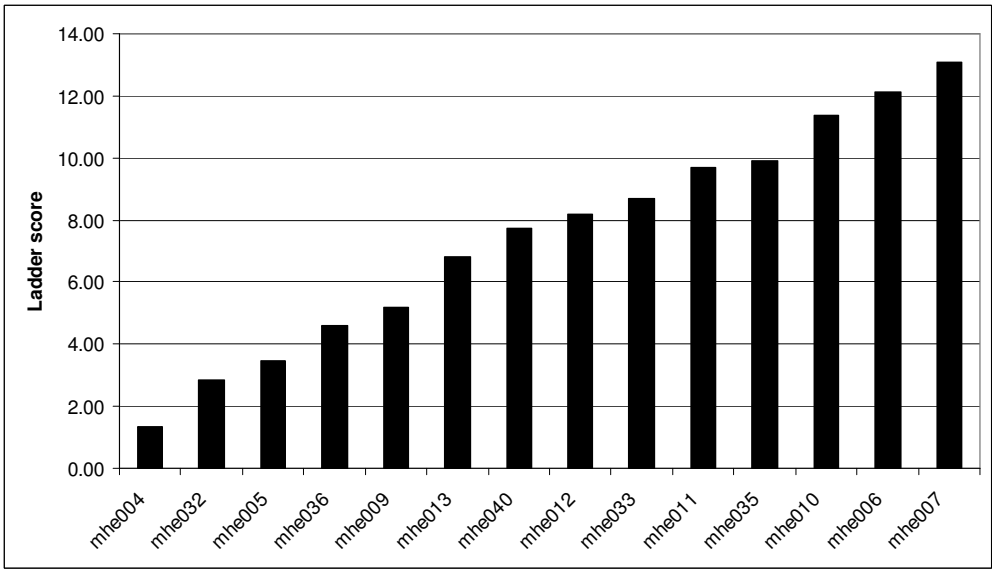


Figure 6.3. Ladder accent ratings (ranking average, N=26).

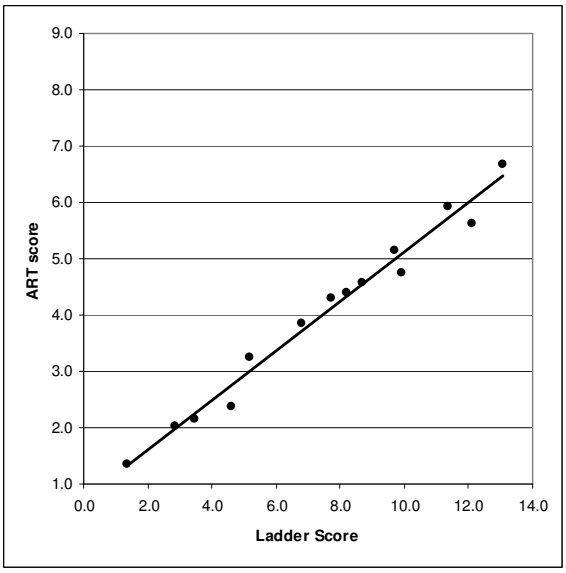


Figure 6.4. ART score versus Ladder score with regression line (r_s = .99).

Comparison of Tasks

The high correlation between the two test types indicate that the Likert scores assigned by raters in the ART did in fact reflect fine-grained judgments about speakers' accents. The initial concern prompting the use of two test types was that we might find subjects rating all of the accents at some level which would not differentiate speakers effectively. The high correlation between results for the two tasks indicates that this was not the case. Speakers' ordinal ranking from the Ladder task corresponded well to their Likert rankings in the ART, indicating that either procedure is appropriate for accent rating.

In a debriefing session following their sessions, 17 subjects were asked which task they preferred and why, and on which task they thought they performed better. The results of the debriefing as well as average time spent on the task are compiled in Table 6.3.

Table 6.3. Respondents' accent rating debriefing results.

Debriefing	ART	Ladder
Which task did you prefer?	7	10
Which task do you think you performed better on?	2	15
Average time spent on task (minutes)	7:20	11:40

Interestingly, 88% of the subjects questioned felt that they did better rating accents using the Ladder task. However, the high correlation between the rating tasks indicates that the opportunity to hear the speakers repeatedly does not affect overall ratings. Subjects were more split on which task they preferred, with 59% preferring the Ladder task. Subjects that preferred the ART generally liked the shorter length of the task (the time spent on the ART was about two-thirds that of the Ladder task) and/or preferred to rely on their first impressions. Subjects that favored the Ladder task generally preferred to listen to the recordings multiple times, allowing them to feel that they were making a more well-informed rating. Considering that the average time to complete the entire session, including consent, instruction, and debriefing, was around 30 minutes, either test individually is a rather simple task to include as one aspect of a more comprehensive speech perception experiment. Because the Ladder task relies on moving and clicking icons rather than a numerical response, it is possibly a more amenable task for special populations, such as young children, or in a web-based application where the more novel task could encourage better response rates.

Discussion

Since MHE speakers by definition report English as their dominant language, foreign accent ratings are expected to reflect their community affiliations and experience with Spanish generally. Beyond their correlations with the features of vowel production, accent ratings may act as an index of a listener's perception of a speaker's social identity and ethnic affiliation. The question of which subtle phonetic cues are important for listeners in differentiating varieties of English is addressed in Chapter 7 where we consider how the accent ratings of our MHE speakers correlate with phonetic and social factors.

Chapter 7. Social Analysis

Language researchers who attempt to characterize speakers' social affiliations vary in their approaches, and have demonstrated repeatedly that linguistic forms correlate with social groupings. Labov's (1963) landmark analysis of phonetic variation on Martha's Vineyard is an early example of how speakers' identities within the social structure of a small fishing island are indexed by their speech productions of /ɑʊ/ and /ɑɪ/. Forty years later, in a telling follow-up to that study, Blake and Josey (2003) found that as the economic conditions on the island changed, so did the degree to which speakers indexed their local allegiance through the centralization of the /ɑɪ/ diphthong. The decline of traditional fishing operations reduced the degree to which the local Vineyarders marked their speech in opposition to outsiders.

This example demonstrates the fluidity of speakers' orientation toward their community, and the concomitant flux in speech features. At the core of sociolinguistic theory lies the idea that individuals in a community speak a language influenced by their social context, and that their orientation toward the community plays an important role in how they identify themselves linguistically. In the Martha's Vineyard study, Labov found that the significant social factor influencing the speech of these island inhabitants was their regard for their community and its tourist trade. A speaker's identity and ideology, however, do not make for a simple metric, having complex undertones established within the community as well as by outsiders' perceptions. An interesting observation by Labov is contained in a footnote from that 1963 study:

> The information given in the following discussion of social patterns on Martha's Vineyard was derived in part from conversation with the 69 informants. Even more significant, perhaps, was information gained from discussions with community leaders who were in a position to view these patterns as a whole. (p. 296)

He then thanks the head of the chamber of commerce, the editor of the local newspaper and the superintendent of the regional high school. In this note of gratitude, Labov expresses the intuition that much of what we might discover about the social structure of a community can be learned directly from "community leaders;" in this case local authority figures. Although this "top-down" approach is valid in that there are often particular members of any community who can provide historical perspective, it is not always the case that these people can be so readily identified, or that their subjective interpretations of the social structure are always useful.

The variationist paradigm, with its focus on synchronic variation and the speech community, views language as a systematic social construct that can be studied through both quantitative and qualitative approaches. One such approach adapts social network analysis – a set of sociometric methods that explores relations between individuals – to quantify speakers' relations. The concept of the social network was operationalized for language study by Milroy (1987), who attempted to quantify speakers' relationships within their Belfast neighborhoods through scores based on the number (density) and the type(s) (multiplexity) of relations. By quantifying individual speakers' neighborhood ties based on kinship, workplace, proximity, and friendship, she found that structural features of their interactions provided insight into how local linguistic forms were maintained. In spite of criticism of Milroy's approach (e.g., Murray, 1993), social networks have proved conceptually useful in understanding the effect of local social interactions on language (de Bot & Stoessel, 2002; Evans, 2004; Lippi-Green, 1989; Marshall,

2004). The relationship networks of individual speakers reveal features beyond traditional attributes such as class, and have shown that speakers' positions in the community social structure are important in defining speech patterns.

In a novel demonstration of how social network analysis might be applied to language study, Dodsworth (2005) focused on the perceptions of Worthington, Ohio community members regarding their social space. Community preservation and urban sprawl are issues that act as the subtext for this study of two phonetic variables. Using her "attribute networking" method, the most salient social characteristics of the community, or "nodes," were identified through ethnographic interviews with community members. By tabulating the links between nodes, Dodsworth used speakers' subjective perceptions of their social structure to demonstrate how the linguistic variables correlated with that structure. This method employed a more systematic approach to network analysis than generally found in sociolinguistic studies, and was a step toward a quantitative analysis of speakers' orientation toward their community.

Dodsworth's work builds upon the community-of-practice concept (Eckert, 2000; Meyerhoff, 2002) employed successfully in ethnographic approaches to sociolinguistic analysis. By using speakers' subjective experience of their social spheres as the key to finding correlations between linguistic features and speakers' social lives (e.g., Labov, 1972), ethnographic analyses explore speakers' social networks in a nuanced way that does not rely on traditional social categories. An ethnographic approach seeks to frame speakers' worlds in ways that are unique to their social contexts, and is generally not employed in order to establish an analytical metric. The underlying principle is that the subjective experience of speakers will determine how they express their identities. For sociolinguistic analysis, the assumption is that participation in social interactions focused on shared interests will in turn affect language use. Relevant to the current

project, ethnographic studies of Chicano youths have shown how speakers' affiliations with local gangs correlated with certain phonetic features in California communities (Fought, 1999; Mendoza-Denton, 1997).

The study of social structure in ethnic communities presents a unique research challenge in that these communities are cohesive by definition, and often the residents are homogeneous in their educational or language backgrounds, thus rendering a traditional analysis of a social variable, such as class, ineffective. The researcher uncovers the social dynamics of participants through direct observation and interaction within the communities, and is often a member of, or has special access to, the community.

Unfortunately, little work has been devoted to characterizing social identities when a detailed social analysis is not feasible. In this section we address this issue through the adaptation of Romney et al.'s (1986) Cultural Consensus Model (CCM). By applying the CCM to MHE speakers in the Albany Park community of Chicago, we demonstrate how this model contributes to the study of language contact communities, complementing ethnographic and social network approaches.

Two obstacles for researchers interested in a sociophonetic study of language contact communities are the issue of in-depth access to individuals, and the inability to systematically replicate the work for comparison across communities. While a social variable such as gang affiliation may be particularly salient in some communities, there are certainly other features of the community that will bear on the results of language contact.

Cultural Consensus Model (CCM) (Romney et al., 1986)

The aims of the CCM are best summarized by Romney et al. (1986): "(The Cultural Consensus Model is) a way of describing and measuring the amount and distribution of cultural knowledge among a group of informants in an objective way."

CCM is a statistical analysis approach used in psychological and anthropological research (e.g., Atran et al., 2005; Weller & Baer, 2002) to provide "cultural competence" scores for participants. The scores are usually based on answers to domain-specific questions regarding bodies of community knowledge such as "diseases" or "types of fish." The questions can be formulated by the researcher (e.g., "Which of the following diseases are contagious?") or can be developed from a population using ethnographic methodologies such as interviews and focus groups. The questions are meant to probe the information that is broadly shared by community members, and form a basis upon which the researcher can determine the extent to which an individual shares beliefs and behaviors with others in the community. Once formulated, the questionnaire is administered to the participants in the study. The degree to which a participant's answers agree with the other participants' is reflected by her CCM score, with a higher score indicating more agreement with others answering the same set of questions. This score provides an index of cultural knowledge for each individual.

The CCM technique makes three important assumptions:

1) Cultural knowledge is shared throughout the community, and is systematically distributed, with some members possessing greater "cultural competence" than others.
2) Each participant's answers are given independently of other informants.

3) The question items are all of the same level of difficulty for a participant, and the questions are drawn from a coherent domain.

The first two assumptions of the model are the more readily satisfied. We can define culture as a community construct with shared practices and beliefs acting as guidelines for its representation, with individuals carrying and transmitting this information. Because no single individual can know all of the countless features that define their community's culture, we can assume that some will know more than others, and that we can determine an individual's "cultural competence." The method is devised to meet the second assumption – participants do not collude, and answer the questions independently. The answers should reflect only participants' implicitly shared knowledge.

The third assumption of a coherent domain is best addressed through statistical means. We can think of this as an assumption of monotonicity – that the questions evince a single domain. While some domains are more clearly coherent than others, Romney (1999) gives the example of the culture of tennis. We expect tennis players to do better on a particular test referencing that domain than non-tennis players. The coherence can be tested using principal component analysis as outlined in the methods section below.

The Study

Defining an individual's ethnic identity as a coherent domain through a set of survey responses is no mean feat, and the expectation for finding an indisputable measure of the domain is not realistic. That said, a methodology that could begin to index speakers' orientation to their community, and be introduced into a language study efficiently and with a minimum of disruption, would be a welcome addition to the sociophonetician's toolkit.

Since the current study bases the survey questions not on a set of facts, but on a set of practices and opinions of respondents, it is grounded in the behavior and beliefs of respondents. In this way it is closer to an ethnographic approach than a technique based on social variables or social network scores that define, a priori, the variables of interest. Because we are interested in the consensus of the participants on their actions and opinions, the survey questions are not expected to reveal any special expertise. Instead, the survey is intended to uncover a speaker's subjective orientation toward the community. For this reason the criteria for coherence of domain can be set somewhat low, with judgments of the efficacy of the approach based mainly on its ability to correlate community index scores with variables (linguistic or demographic) collected from participants.

Method

We developed a questionnaire based on the results of two separate five-member focus groups. The groups were made up of the researcher and four female community members comprising both recent immigrants and MHE speakers from the Albany Park neighborhood. In addition, interviews during recording sessions with early participants and in pilot work also provided topics to consider in a coherent set of questions about this community. None of the consultants who helped devise the questions were administered the questionnaire for the study.

The focus groups were described to participants as "brainstorming sessions" in which they were asked to think of questions that they believed would give us clues to a responder's Mexican identity, language background, and feelings about the community. The conversations often turned toward the difference between recent immigrants, urban, and suburban ethnic Mexicans, and how the questions might get at the differences between them. The researcher

acted as facilitator and also participated in the group discussions. The survey was ultimately composed of fifteen questions divided into five roughly defined domains: language, food, family, Mexico and public behavior. The number of questions was determined based on the recommendations in Romney et al. (1986), and was intentionally kept to a minimum in order to streamline the entire recording session which had a number of recording and administrative tasks. The questions generated for the survey are listed in Appendix F.

As a statistical model, the CCM requires us to determine the extent to which the response matches between participants produce a single factor structure, and thus a coherent domain. In order to address the coherence issue we consider participants' responses to look for monotonicity. Using principal component analysis, we can determine the extent to which the questions constitute a coherent domain.

Principal component analysis (PCA) is a method for reducing multidimensional data into fewer dimensions that will account for the majority of the variance in the data. The mathematical procedure converts a set of variables that may be correlated into a set of variables that are uncorrelated. The resultant variables are the principal components, with the first component accounting for the maximum amount of the variability in the data. The following components are calculated in turn such that each has the highest variance possible, but is uncorrelated with the ones preceding. The results of a PCA are described in terms of the loadings, or the weight by which the original variable is multiplied to determine the component score (the transformed variable value of the original variable).

The use of PCA in the current work is as a mathematical tool for determining participants' consensus scores. Its first role is to verify that the survey is measuring a coherent domain. A PCA of the response matches that shows the first factor significantly larger than

subsequent factors indicates that a coherent domain is represented by the responses. If the questions are taken from a single domain, the first factor will account for a large portion of the variance in the set, thus producing an eigenvalue for the first component that is large relative to the next factor's value.

Having established the presence of a coherent domain, the analysis of the questionnaire responses determines a score for an individual's response set. The score is the loading value onto the first component; that is, the degree to which that participant's response set correlates to the principal component for the survey. In this case, the score will indicate individuals' correlations to community consensus.

Results

The questionnaire was administered to ten of the fourteen MHE speakers who participated in the speech elicitation sessions. The responses for each participant are given in the response profile in Table 7.1.

Table 7.1. Response profile. Participants are listed on the y-axis with questions coded by domain listed across the top: L=language; Fd=food; Fm=family; M=Mexico; P=Public behavior. Responses are indicated by a 1 for "yes", and 0 for "no." Survey questions are listed in Appendix F.

	L1	P1	Fm1	L2	P2	Fd1	Fm2	M1	Fd2	M2	L3	P3	Fd3	Fm3	M3
MHE040	0	1	0	0	0	1	1	0	1	0	1	0	1	1	1
MHE036	1	0	1	1	1	0	1	1	0	0	0	1	0	1	1
MHE004	1	0	0	1	1	1	0	0	1	1	1	1	0	1	1
MHE032	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1
MHE033	0	1	1	0	1	1	1	0	1	0	1	0	0	1	0
MHE035	1	0	0	0	0	1	1	0	0	1	1	1	1	1	0
MHE005	1	1	1	1	1	1	0	0	0	0	0	1	0	1	1
MHE013	1	0	1	0	1	1	1	1	1	0	0	0	1	0	1
MHE011	1	0	0	0	1	1	1	1	1	1	1	0	1	1	1
MHE010	1	0	1	1	0	1	1	0	0	1	1	0	1	1	1

We first determine that there is a principal component that exceeds the others – this indicates that we have captured a coherent domain. Having established the coherence, we determine the individuals' responses loading values onto the first component. These loading values are the values used as the community index. The scree plot for the first ten eigenvalues based on the identity matrix for the questionnaire responses is shown in Figure 7.1. The eigenvalue is an indicator of the variance accounted for by each component. The coherence of the domain for the questionnaire (community orientation) is indicated by the large value of the first eigenvalue relative to the second.

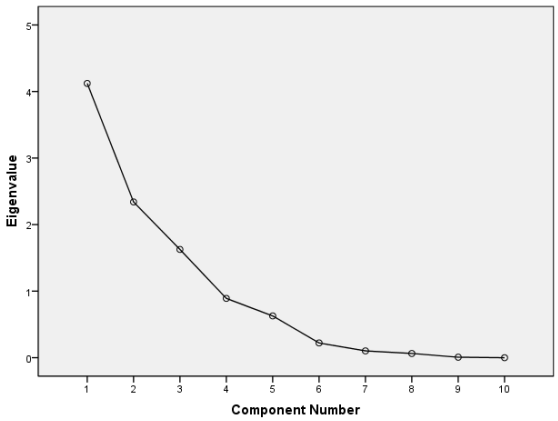


Figure 7.1. Scree plot for CCM principal component analysis.

Using the response profile we calculate the proportion of agreement for each participant. Table 7.2 provides the proportion of answer matches for each participant in the form of an identity matrix. Each value reflects the proportion of agreement between all the participants (listed on both axes). For example, MHE032 and MHE004 agreed on seven items out of fifteen (.47). The diagonal indicates the identity value (1.00).

Table 7.2. Proportion of matches.

	MHE 032	**MHE 033**	**MHE 035**	**MHE 005**	**MHE 013**	**MHE 011**	**MHE 004**	**MHE 036**	**MHE 040**
MHE033	0.47	1.00	0.40	0.53	0.53	0.53	0.47	0.40	0.73
MHE035	0.60	0.40	1.00	0.40	0.40	0.67	0.60	0.40	0.60
MHE005	0.40	0.53	0.40	1.00	0.47	0.33	0.67	0.73	0.40
MHE013	0.67	0.53	0.40	0.47	1.00	0.73	0.40	0.60	0.53
MHE011	0.67	0.53	0.67	0.33	0.73	1.00	0.67	0.47	0.67
MHE004	0.47	0.47	0.60	0.67	0.40	0.67	1.00	0.53	0.47
MHE036	0.40	0.40	0.40	0.73	0.60	0.47	0.53	1.00	0.27
MHE040	0.60	0.73	0.60	0.40	0.53	0.67	0.47	0.27	1.00
MHE010	0.60	0.47	0.73	0.53	0.53	0.67	0.60	0.53	0.60

The matrix is submitted to a principal component analysis using SPSS 14.0 statistical software package. The first factor loading values are used as our community indices, and are presented in Table 7.3. The values indicate the degree to which each speaker is in agreement with the others in the set regarding opinions and behavior in the Albany Park community.

Table 7.3. Community index scores extracted from the PCA. Scores are the loading values for each speakers response set on the first component of the PCA.

Participant	Community Index Score
MHE005	-0.942
MHE036	-0.869
MHE004	-0.409
MHE033	0.235
MHE013	0.277
MHE010	0.282
MHE035	0.559
MHE011	0.742
MHE032	0.766
MHE040	0.806

Correlations with Vocalic Features

The results of the vocalic analyses for the four groups of speakers (Chapter 5) were used to determine the intergroup differences. In this section, we will look at the intragroup variation for our Anglo and MHE speakers to determine the vocalic properties that correlate with each other and with other attributes of the speakers. A Pearson product-moment correlation coefficient was computed to assess the relationship between vocalic and attribute properties for the speakers.

Anglo Correlations

The correlation matrix for the Anglo speakers is provided in Table 7.4, and includes the variables that bear on the present discussion. We find that /æ/ VISC, /u/ fronting and speaker age are the significant intragroup variables. Age correlates positively with /æ/ VISC – older speakers display more spectral change in their /æ/ formants. Age is also approaching significance (negative) in its correlation to /u/ fronting (p=.065; 2-tailed) while /u/ fronting shows a negative correlation to /æ/ VISC. To summarize: younger speakers are exhibiting a shorter trajectory for /æ/ and more /u/ fronting.

Table 7.4. R^2 correlation matrix for Anglo speakers (negative value indicates negative correlation). * p<0.05, **p<0.01 (2-tailed of Pearson *r*).

Anglo R^2 n=12	age	SpRate	/u/ front	/æ/ VISC	/æ/ raising
SpRate	0.02				
/u/ fronting	-0.30	-0.14			
/æ/ VISC	**0.42***	0.18	**-0.50****		
/æ/ raising	0.25	0.04	-0.18	0.24	
DurRatio	0.00	0.00	0.03	0.00	-0.12

One interpretation of this finding, based on apparent time reasoning,[17] is that we are witnessing diachronic change in the two vowels, with the current trend heading toward reduced VISC and more /u/ fronting. Another possibility is that apparent time reasoning is not valid in this case. It is possible that speakers have accommodated their speech according to the demands

[17] Apparent time reasoning argues that linguistic differences based on the age of speakers indicates a shift in the language structure over time. This line of reasoning assumes, of course, that the linguistic variable under consideration does not change once speakers reach their full language competence.

of the linguistic marketplace as they have aged. That is, as they join the workforce and gain more experience interacting with a larger community of speakers, their speech changes accordingly (Sankoff & LaBerge, 1978). Since the current study does not include the kind of diachronic data needed to resolve this question, we will leave this open for future work.

MHE Correlations

Vocalic and attribute properties for the MHE speakers are tabulated in the correlation matrix below (Table 7.5). The analysis will first consider the instrumentally measured phonetic properties, then the properties we will refer to as contact variables: Spanish proficiency, accent ratings, and community index.

Table 7.5. R^2 correlation matrix for MHE speakers (negative value indicates negative correlation). *significance of Pearson *r* correlation $p<0.05$, (2-tailed).

MHE R^2 n=14	age	/u/ front	/æ/ VISC	/æ/ raising	Dur Ratio	Span Prof	accent
/u/ front	**0.35***						
/æ/ VISC	**0.56****	0.18					
/æ/ raising	-0.05	-0.06	-0.07				
DurRatio	0.02	0.09	0.00	-0.09			
SpanProf	0.05	0.02	0.13	-0.04	-0.01		
accent	**-0.30***	**-0.38***	-0.12	**-0.38***	**-0.40***	-0.01	
CCM	**-0.65***	-0.21	**-0.39***	-0.04	-0.07	0.02	0.19

Phonetic Variables

Here, as within the Anglo group, age is a factor for phonetic features among the MHE speakers: /æ/ VISC correlates with age as in the Anglo population, with this feature more pronounced among older speakers. /u/ fronting also correlates with age, although among MHE speakers the correlation is *positive*, such that older speakers are more /u/-fronting.

The static positions of /i/ and /ɪ/ (F2 higher for MHE speakers) that were found to differ between the Anglo and MHE groups do not correlate with any of the variables, neither perception (accent rating) nor any other features measured. Although we found a statistically significant difference between the static plots for MHE versus Anglo for these two vowels, they do not vary systematically with the other language contact features measured.

Contact Variables

Spanish proficiency

Given that MHE speakers are native speakers of English, it should not be too surprising that self-reported Spanish proficiency does not correlate with other features (including accent). This lack of correlation could be due to a ceiling effect – these MHE speakers generally reported high proficiency in Spanish, and thus the variability was low. Interestingly, the one monolingual English MHE speaker (MHE033) obtained a Likert rating of 4.58 out of 9 (9 = "very strong accent"). This perceived accentedness demonstrates that for this individual at least, lack of Spanish proficiency did not preclude her from being rated more accented than 5 of the 14 MHE speakers with a higher degree of Spanish proficiency.

Perceived accent

Accent ratings were variable across MHE speakers, and correlate negatively with age (older MHE speakers are less accented), /u/ fronting (more /u/ fronting, less accent), /æ/ raising (less raising, more accent) and duration ratio (larger ratio, less accent). The two significant differences that we found for the static plot of the vowel space, /i/ and /ɪ/ do not correlate well

with the accent ratings. While /ɪ/ shows no correlation, /i/ correlates slightly, but in the reverse direction such that a less fronted (more Anglo) position is rated as more accented.

We can base our expectations for the features associated with accentedness upon the differences that we found between the Anglo and MHE populations. The expectation is that those features that differ between the populations should be the ones that would correlate with listeners' accent ratings. For the most part, this is what we find. In our comparisons of MHE to the Anglo population we found that MHE exhibited a smaller duration ratio (more like second language English (L2E)), so it is appropriate that the correlation to accent is negative (less ratio, more accent). The static position of /æ/ in the vowel space was not significantly different between the two groups, so the correlation with accentedness is somewhat surprising, but the low /æ/ of the L2E speakers suggests that this is a significant feature of a Spanish accent, and that the variability in this feature could correlate with accent. Accent rating and the community index do not correlate significantly. This indicates that speakers most integrated into their community are not necessarily those who are perceived by outsiders as having the most accented speech.

Community Index

As mentioned above, age correlates positively with /u/ fronting for the MHE speakers, unlike the Anglo population. The community index may help us understand this finding – the negative correlation of community index and age tells us that older MHE speakers who are not as integrated into the ethnic community display a more Anglo-like /u/ fronting. Thus older MHE speakers are fronting /u/ more like the younger Anglos in the community.

Although duration ratio and /æ/ raising correlate with accent, these are not indexed by the community index. As a measure of insider status, the community index is not obligated to track

with all contact features. Thomason (2008) points out that social causes can, and do, often trump linguistic features in language contact situations. The lack of correlation with accent features indicates that accent is not a prominent part of what is captured by the community index. That is, MHE speakers' integration with the community is not indexed by accent as perceived by outsiders. Instead, /æ/ VISC, which does not correlate with ratings from community outsiders, does correlate with the community index.

Again, as with the phonetic features above, /i/ and /ɪ/ fronting do not correlate with the CCM, thus there is no evidence for the fronting as an identity marker of the MHE variety in spite of its difference in the MHE and Anglo groups. If the static position of these two vowels were autochthonous features of MHE, we would expect their variation to correlate with CCM since it would be expected to index membership in the MHE community.

Analysis

For both the Anglo and MHE speech communities, age is an important factor in vocalic production, correlating with phonetic and contact variables. Accentedness correlates with the vocalic features in the expected directions, with the features that distinguished MHE from Anglo speech playing a prominent role.

The community index results indicate that speakers more integrated into the Mexican ethnic community will tend to be younger, with vowel structure that exhibits less /u/ fronting and less /æ/ VISC. Their degree of accentedness, however, will not be an indicator of their community affiliation.

The correlations we find for the community index with /æ/ VISC demonstrate the value of the index as an indicator of community orientation. The community index appears to parallel

both the age of MHE speech speakers and this dynamic feature of their speech. Through its systematic bottom-up genesis, the community index reveals that community behaviors and opinions can correlate with linguistic features that are not associated with other variables such as Spanish proficiency or accent. Although its strong correlation with age will have an effect on its interpretation, the index has captured the systematicity of the vowel variation in the community structure, and the likely importance of age in how integrated a participant is into the community.

One of the important applications of the community index is its ability to identify the speakers who best represent the practices and opinions of the community. Using this metric we are able to determine the speakers with whom we might like to follow up in an in-depth study. The method has allowed us to find the speakers who we might consider the equivalent of "community leaders" as evidenced not by their status as community officials, but by how well they represent community norms. The speech of these participants can now be investigated more closely as representative of the community norm. For example, a researcher may want to ask questions of community members regarding their experience in an ethnic neighborhood, but would not otherwise know how informative any one participant might be about local norms. Through the community index the most informative members can now be identified.

Discussion

The CCM is a unique approach to determining speakers' orientations toward their community. Respondents' scores capture the degree to which they are like everyone else in the group, and their answers indicate the *culturally* important behaviors and opinions. By allowing community members to develop the questionnaire we avoid assigning social attributes to our

participants a priori. Instead we rely on this bottom-up approach to identify the bellwethers of the community based on their community index score.

The CCM approach presents several advantages over other methods. It allows us to quantify a speaker's affiliation to the contact community with minimal intrusion into the participants' lives. It can be used alone, or to augment deep ethnographic work, which by definition requires an intense relationship with participants. While an ethnographic approach to communities can be quite revealing of norms and relationships, this in-depth access is usually reserved for researchers with personal ties to the community. This can be a huge obstacle to researchers from outside the community who are interested in how language contact effects play out socially.

Similar to an ethnographic approach, the community index does not make assumptions as to which social constructs will index fine-grained vocalic features; instead it seeks to determine the relevant constructs by inquiring into the practices and opinions of the community members. Thus, the CCM lends itself well to standardization across language contact communities – the questions generated by participants will vary across communities, but the intent of the questions will always be to identify the extent to which speakers agree with each other on their unique practices and opinions. In addition, the method identifies the speaker(s) most representative of community behavior generally, and provides the "correct" answers to the questions for community members based on the survey results.

The method is not seeking certain behaviors or opinions that define ethnic orientation, but rather how individuals' response patterns overlap and the extent to which an individual reflects the overall cultural norms.

Chapter 8. Regional Comparisons of American English Vowels

Introduction

Having collected the speech samples for the Chicago Heritage English Speech Survey (CHESS) Corpus we are in a position to compare MHE, Anglo, L2E, and Spanish vowels within this single language contact community in Chicago. However, in order to understand the extent to which variation is found without language contact, and how this might bear upon the interpretation of our findings, we can also use the data to assess dialectal differences within and across regions. Useful delineations of major United States dialectal regions certainly exist, but noteworthy variation within these large regions is also found. In the following sections, we will consider the CHESS data in light of other comparable sociophonetic studies: the Nationwide Speech Project (Clopper & Pisoni, 2006); *The Atlas of North American English* (Labov et al., 2006) (henceforth, *The Atlas*); and Hillenbrand et al.'s (1995) study of speakers from the Inland North dialect region in Michigan. Specifically, we will compare both static and dynamic vowel characteristics (when such information is available) that are not traditionally considered defining dialectal features. These comparisons contribute to a fine-grained account of the vocalic variation found within the Inland North dialect region.

In addition, we will interpret our findings for the vowels of MHE in Chicago in light of Spanish/English contact in other regions of the United States. We hope to gain a more informed interpretation of results for MHE supraregionally by comparing Chicago MHE to MHE from an entirely different locality, but the same dialect region (Michigan speakers from Roeder, 2006).

Godinez and Maddieson's (1985) work with a similar population in California will also be considered as we look for supraregional effects.

American English - Inland North

Linguists recognize at least five broad dialect regions of the United States based on the confluence of linguistic factors such as lexical choice and phonetic features (Labov et al., 2006). The Inland North dialect region, in which Chicago and the lower peninsula of Michigan are located, is defined mainly by the vocalic structure of the dialect, with six vowels participating in the Northern Cities Vowel Shift (NCS). The NCS is a coordinated chain shift of neighboring vowels in the F1xF2 vowel space such that a change in a vowel's position apparently influences the position of adjacent vowels in a roughly clockwise direction. A comprehensive historical review of the NCS is provided by Gordon (2001), from which Figure 8.1 is drawn.

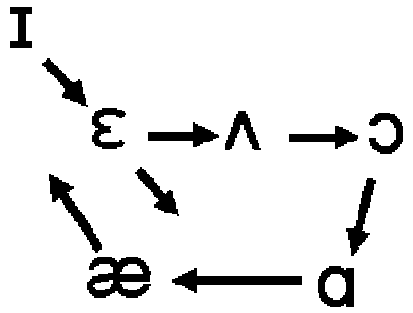


Figure 8.1. Northern Cities Vowel Shift (NCS). The figure is adapted from Gordon (2001).

The NCS is named for the large industrial northern cities (including Chicago) that line the Great Lakes. It is considered a shift based on the interpretation of historical dialect patterns that indicate that speakers in the Inland North region produce vowels that have shifted from their

initial positions over the past 200 years or so. The dialect map of the United States (Figure 8.2) shows that the Inland North cuts a swath through the states abutting the Great Lakes as well as some adjoining areas. Historically, this region follows the Western settlement patterns of the industrial cities of the United States following the opening of the Erie Canal around 1825. The canal created a navigable water route from the Atlantic Ocean to the Great Lakes, spurring a population surge as jobs became available in the larger industrialized centers along the lakes. The region today is defined by the vocalic structure, although, as we will see, variation exists.

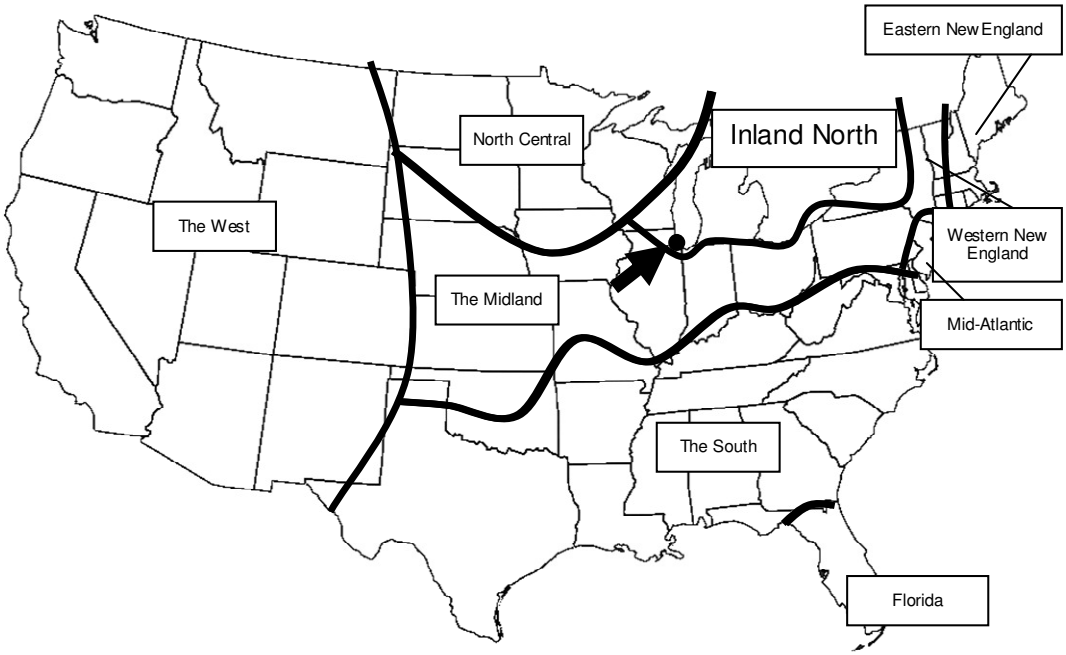


Figure 8.2. Dialect areas of the United States (based on Labov et al., 2006). The arrow points to Chicago. (This figure is the same as Figure 5.1.)

CHESS Anglo Speakers

The CHESS corpus contains sociophonetic data specific to the vowels of American English in Chicago (see Chapter 3). One set of speakers in the corpus comprises Anglo speakers

from the Albany Park community. These speakers represent the regional norm, or matrix dialect, for the current study. As residents of Albany Park, Anglo participants are members of an ethnically diverse community, but their strongest ties are to the broader dialectal region. They are all monolingual speakers of the matrix dialect and their speech is presumed to reflect the regional majority norm spoken throughout the Chicago area.

Inland North Comparisons

In this section we will compare vocalic analyses of these Anglo speakers to those of the Northern Inland dialect region reported in *The Atlas* (Labov et al., 2006); the Nationwide Speech Project (Clopper & Pisoni, 2006); and Hillenbrand et al. (1995). These three studies are noteworthy in that they provide spectrographic analysis of a wide range of the Inland North vowels across many speakers. Because this dialect region is defined by the spectral positions of the vowels (as elaborated in the NCS), it is crucial for the current study to determine the relationship between the vowels of our Chicago Anglo speakers and the reported regional norm. The relationship of the CHESS corpus to extant corpora that are considered dialectal "controls" for regional studies will determine the extent to which we may make meaningful comparisons of MHE across studies.

The sociophonetic studies considered in this section were selected on the basis of the type of vocalic data reported; their breadth (number of participants, number of vowels); and consistency (type of data elicited). They all include spectrographic data for the majority of the American English vowels in a variety of phonetic contexts. Since the CHESS corpus is made up exclusively of women, all comparisons are with female speakers, obviating the need for normalization of formant values. In spite of these encouraging features, it is appropriate to

acknowledge the difficulties inherent in these comparisons. The various approaches to the elicitation and measurement of vowel data from the selected studies are not standardized, and for this reason the attempt has been made to be explicit about the type of data being compared in each case. Reconciling studies requires not just a match of vowel context but also a consistent vowel measurement protocol. With these issues in mind, the comparisons are nevertheless useful, and in one case the recordings from the study were obtained[18] and reanalyzed using CHESS procedures, thus maximizing the consistency of the analysis[19]. In Chapter 3, I argued for a concerted effort to develop a standardized set of protocols and materials to allow the consistent and efficient archiving of speech recordings for both synchronic and diachronic analysis. The regional comparisons here demonstrate how such an archive would be valuable.

The hVd data for the Anglo speakers extracted from CVC productions that will be used in the relevant analyses is summarized in Table 8.1. Results for CVC and SPIN data are available in Chapter 5.

[18] Thank you to Cynthia Clopper for providing recordings from the Nationwide Speech Project.
[19] Comparisons to Labov et al. (2006) data are from CHESS SPIN (sentential context) for Anglo speakers; all other regional comparisons are made to CHESS vowels in hVd contexts, a subset extracted from the CVC data.

Table 8.1. Vowel data (hVd) for Anglo speakers extracted from the CHESS corpus.

Anglo		.2 duration (Bark)		.5 duration (Bark)		.8 duration (Bark)		
Vowel (hVd)	duration (msec)	F1	F2	F1	F2	F1	F2	Trajectory (Bark)
i	240	3.69	14.53	3.58	14.90	3.62	14.68	0.56
e	272	5.27	14.26	4.49	14.54	4.08	14.58	1.33
æ	282	6.32	13.49	7.06	12.96	7.15	12.28	1.83
ɑ	242	8.18	11.26	8.07	11.23	7.76	11.66	0.82
ɔ	316	6.89	9.86	7.10	9.80	7.16	10.93	1.16
o	276	5.96	10.52	5.02	9.26	4.54	9.46	1.82
u	193	4.26	9.33	4.01	9.14	3.83	9.57	0.95
ɪ	176	4.81	14.01	4.95	13.76	5.03	13.54	0.59
ɛ	168	6.95	13.09	6.67	13.10	6.16	13.11	0.87
ʌ	199	6.51	11.21	6.80	11.04	6.30	11.84	0.85
ʊ	181	5.24	10.12	5.31	10.87	5.15	12.18	2.14

The Atlas of North American English (Labov et al., 2006)

In *The Atlas of North American English*, Labov et al. (2006) provide an extensive catalogue of American English dialects with vocalic formant data compiled for a large subset of the entire corpus. The goal of the project was "to represent ongoing sound changes in the urbanized areas of North America" and "to measure the vowel systems and … obtain a complete and accurate inventory of the phonemes and allophones involved in sound change" (p. 36). Spectrographic data is available for 439 of the 762 participants in the original Telsur project. The data from this project was the basis for the analyses in *The Atlas*, and consisted of recordings of speakers being surveyed by telephone from throughout the United States. Of these participants,

we will consider spectrographic data from interviews of 37 female speakers (ages 19 to 65 at date of sampling, 1992-1995) of the Inland North dialect region[20].

Vowel formant data for *The Atlas* comprise a single F1 and F2 measurement taken in most cases at the maximum of the first formant – generally at the center of the vowel nucleus as described in detail in *The Atlas*. Each vowel category comprises measurements of no fewer than three tokens (usually 5-10). Dynamic features of the vowels were not measured; i.e., no additional formant or duration measurements were compiled.[21] This precludes any comparison of duration or VISC for this study; however, the static positions are informative as we compare vowel category configurations.

The vowels of the Inland North dialect region from *The Atlas* are plotted in Figure 8.3. The data has been converted to the Bark scale for easy comparison to the vowel formant values of the CHESS corpus. Although the data were elicited by telephone interviews and compiled using keywords (as opposed to wordlist reading, for example), this data is nevertheless useful since it represents the broadest dialect standard currently available for American English.

The vowel plot for the CHESS Anglo Chicagoans is also provided in Figure 8.3. The plot is based on vowels from keywords in sentences (SPIN) containing a variety of consonantal contexts (see Appendix B). The SPIN sentence reading data allows us to compare the more reduced (centralized) vowel space elicited in the sentence reading task to the interview data from *The Atlas*. As determined in Chapter 5, the SPIN sentence data corresponds quite well to the relative positions for the hVd productions from the same speakers, and are expected to represent

[20] Participants include one 56-year-old Chicagoan.
[21] In justifying the omission of duration and additional formant measurements, Labov cites Labov et al. (1972) as demonstrating that the F1xF2 vocalic plot illustrates the most salient social and regional differences.

more natural vowel productions than those from wordlist reading. Note that no /ɔ/ tokens were elicited in the SPIN sentences, and all vowel tokens precede oral stops.

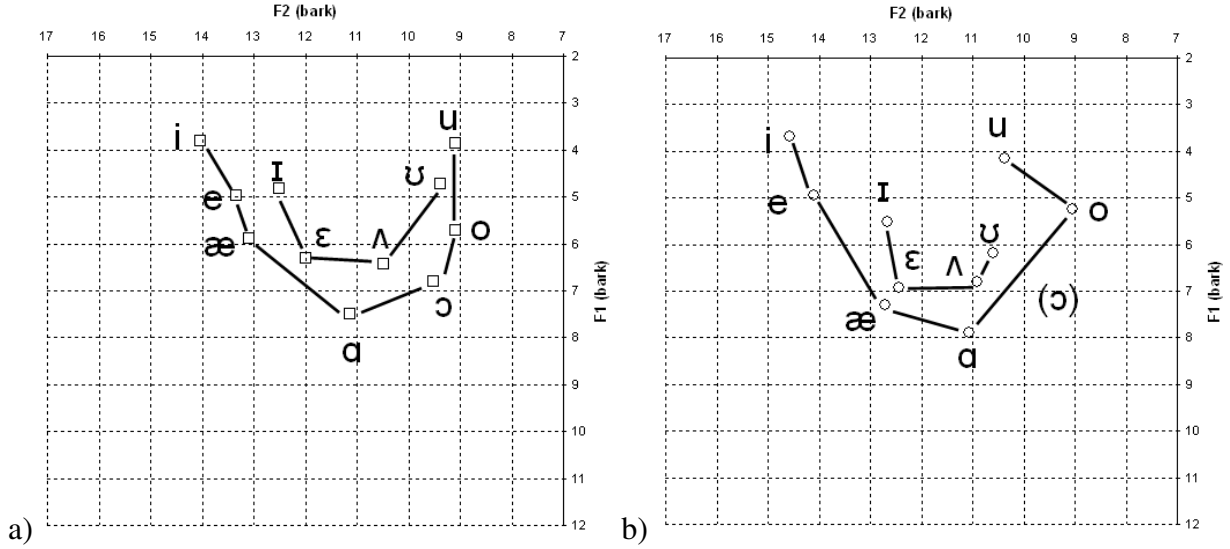


Figure 8.3. Vowel plots. a) *The Atlas of North American English;* b) CHESS Anglo. Note: no tokens elicited for /ɔ/ in CHESS SPIN.

In spite of the use of sentential context speech recorded in the SPIN sentences, the details of the vowel spaces for the Anglo Chicagoans and *The Atlas* data do not correspond well. Figure 8.4 shows that beyond the more backed space overall (possibly due to differences between spontaneous speech and scripted material), the positions of /ʊ/ and /æ/ relative to /u/ and /ɛ/, respectively, are quite different. For the Anglo CHESS speakers, both /ʊ/ and /æ/ display a great amount of vowel inherent spectral change (VISC) (see Chapter 5), and since the vowel formants for the Anglo speakers were measured at the .50 duration point, this may add to any discrepancy. If we assume that the "steady state" measurement is made early in the VISC trajectory, correspondence between the studies may be improved, but the need for this added interpretation of the data demonstrates the difficulty of making such comparisons. When we

consider the data for Hillenbrand et al. (1995) in the next section we will see that the measurement at 0.20 of the duration corresponds quite well to the steady state that they determined for /ʊ/ and /æ/. This indicates that VISC is a relevant factor as we attempt to characterize the vowel space, and that measurement protocols will play an important role in defining vocalic structure.

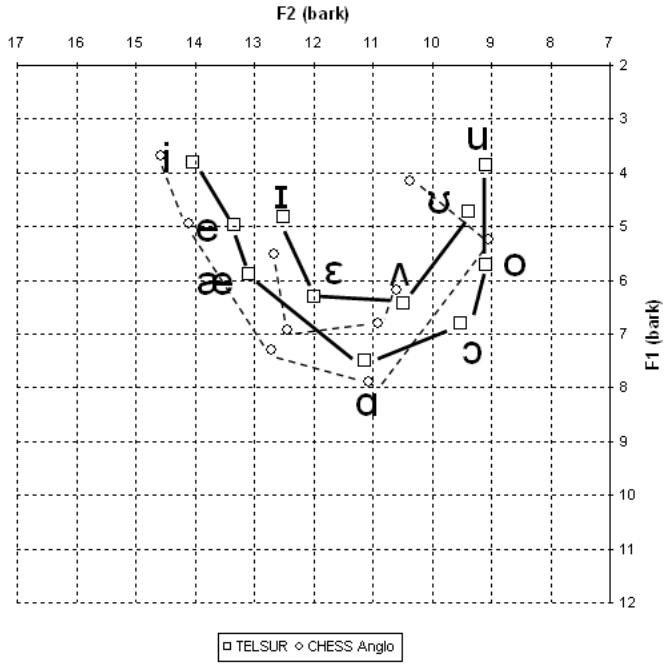


Figure 8.4. Vowel plot comparison of *The Atlas* (from Telsur data) and CHESS Anglo vowels.

As noted earlier, /æ/ is a salient feature of the NCS. It is therefore noteworthy that the CHESS Anglo speakers do not exhibit the same degree of raising and fronting of this vowel as do *The Atlas* speakers sampled from the same dialect region. Several possibilities exist for the discrepancy: 1) the time between studies reflects diachronic change; 2) the limited sample size taken from individual regions for *The Atlas* has skewed the data; 3) there is a difference in the types of speech analyzed; or 4) the NCS is not the same in Chicago.

Because of the time between the two studies (speakers from the Telsur project were interviewed between 1992-1995; the CHESS corpus 2007-2010), it is possible that we are capturing a phonetic change that is still in progress (using apparent time reasoning). The characterization of the Hillenbrand et al. (1995) speakers in the following section, however, do not show the degree of raising found in *The Atlas* even though they were recorded around the same time. The analysis of the vowels of the one 56-year-old Chicagoan from *The Atlas* indicate that her /æ/ was more raised and fronted (F1 = 5.7 Bark; F2 = 13.6 Bark) than the average for that study. This result from the Chicago speaker precludes a bias toward raising due to other speakers of the region. The more likely reasons for the discrepancy are the differences between spontaneous and scripted speech vowels, and given the following analyses, that the CHESS corpus reveals local effects within the greater dialect region. The CHESS corpus also contains interview recordings, and a more direct comparison will be pursued in future work.

Due to the differences in vowel elicitation procedures and phonetic analyses noted above, it would be fruitless to belabor the differences we find between the Telsur data and the CHESS corpus. Thus, no statistical analyses were run to compare the vowel data. Rather, we consider this an example of how a systematic compilation of speech recordings could be useful for future dialectal study. *The Atlas* is arguably the most thorough characterization of American English dialects ever compiled, yet in this case, does not allow controlled diachronic sociophonetic comparisons.

Hillenbrand et al. (1995)

The spectral data for the vowels of 48 adult female speakers of the Inland North dialect is available from Hillenbrand et al. (1995)[22]. This study was intended to replicate and extend upon the classic study of Peterson and Barney (1952) by compiling formant and duration values of American English to compare production and perception data with that of the original study. The majority of the Hillenbrand et al. (1995) participants were from the southern portion of the lower peninsula of Michigan. The study reported data for 48 females, 45 males, and 46 children. Of these participants, 87% were reported as Michigan residents, with the remainder also from the Inland North region (Indiana, Illinois and Wisconsin). The current analysis includes the 48 adult female speakers. Because of their geographic origin, we consider their vowel structure representative of the NCS.

Table 8.2 provides vocalic measurements taken from recordings of female speakers reading three repetitions of randomized wordlists containing 12 monophthongal vowels of American English in the hVd context (/ i, ɪ, ɛ, e, ʌ, ɔ, ɑ, æ, ʊ, u, o, ɝ /). Vocalic measurements include F1 and F2 at 0.20, 0.50, and 0.80 of the vowel duration, allowing direct comparison to the present study. Figure 8.5 provides the F1 x F2 plot of the formant values[23] measured at 0.20, 0.50, and the steady state of the vowel duration as determined in the study. The figure is included to determine the degree of correspondence between the measurements taken at the 0.20 duration and the steady state measurements. This is of particular interest as we consider VISC and its relation to apparent /æ/ raising in the NCS.

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[22] The data is available online at: http://homepages.wmich.edu/~hillenbr/voweldata.html.

[23] /ɝ/ excluded from analysis since this vowel is not present in the CHESS Corpus.

Table 8.2. Vowel data for female speakers from Hillenbrand et al. (1995).

Hillenbrand et al. (1995)		.2 duration (Bark)		.5 duration (Bark)		.8 duration (Bark)		
Vowel (hVd)	**duration (msec)**	**F1**	**F2**	**F1**	**F2**	**F1**	**F2**	**VISC (Bark)**
i	307	4.26	15.10	4.17	15.12	4.11	15.11	0.26
e	321	5.03	14.54	4.53	14.78	4.27	14.96	0.96
æ	334	6.20	14.09	6.82	13.54	7.20	12.85	1.64
ɑ	324	8.05	11.29	7.98	11.46	7.52	12.17	1.12
ɔ	351	7.17	9.59	7.27	10.03	7.23	11.53	2.21
o	327	5.61	9.00	4.95	8.55	4.49	8.49	1.31
u	304	4.43	9.36	4.34	9.07	4.27	9.22	0.69
ɪ	241	4.58	14.20	4.92	13.90	5.02	13.62	0.81
ɛ	252	6.60	13.38	6.61	13.21	6.17	13.23	0.70
ʌ	237	6.86	10.74	6.78	11.24	6.09	12.53	2.00
ʊ	249	4.88	9.84	5.27	10.65	5.31	12.24	2.49

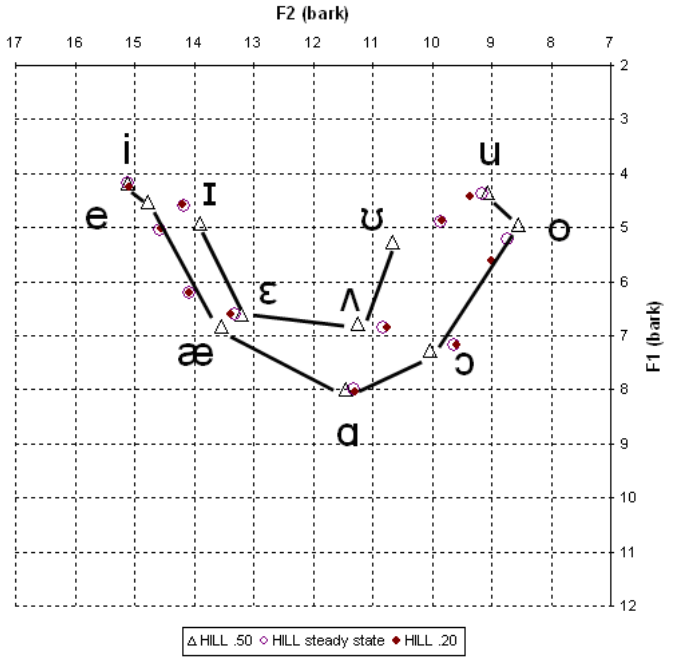


Figure 8.5. Vowel plot of data from Hillenbrand et al. (1995). Note correspondence of steady state determination and 0.20 duration.

To facilitate comparison, the plot of the averaged vowel productions of the hVd tokens for the CHESS Anglo speakers is presented with the Hillenbrand et al. (1995) data in Figure 8.6 (formant measurement at duration midpoint for both populations).

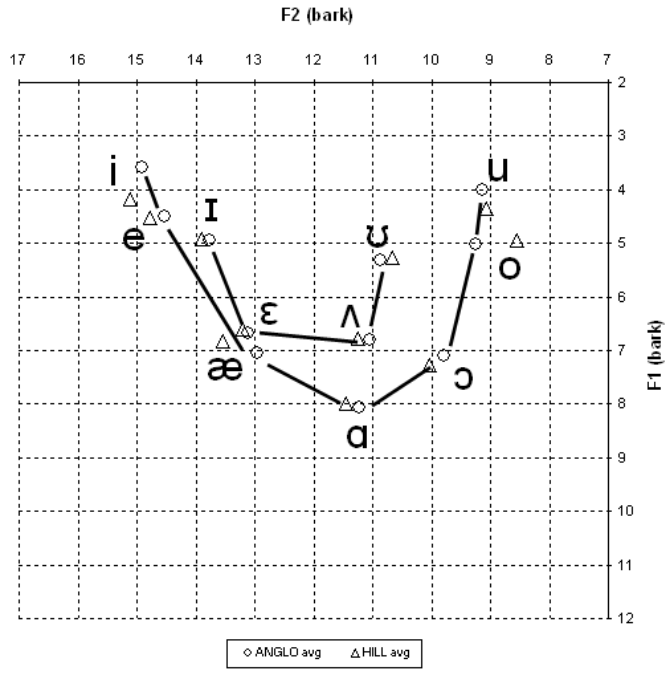


Figure 8.6. Vowel plot comparison: CHESS Anglo versus Hillenbrand et al. (1995). Measurement at 0.50 vowel duration.

To determine whether statistical differences exist between the vowel systems for the Hillenbrand et al. and Anglo populations of speakers, an ANOVA was calculated using vowel categories (/ i, ɪ, e, ɛ, æ, ɑ, ʌ, ɔ, o, ʊ, u /) as within-subjects variables, and speaker populations (Hillenbrand et al., Anglo) as between-subjects factors for each of four properties: F1 and F2 at vowel midpoint, duration, and VISC. Due to the number of analyses run, alpha levels were set to 0.01 for each ANOVA.

The repeated measures ANOVA on the F1 and F2 measurements revealed a significant main effect of vowel category [$F(10, 580) = 568.8$, $p<0.001$ for F1, and $F(10, 580) = 219.1$, $p<0.001$ for F2] indicating simply that the vowels as described by the first and second formants measured here for American English are distinct. A significant vowel by population interaction was detected for F1 [$F(10, 580) = 4.0$, $p<0.001$] indicating that the variation in individual vowels

was not consistent between the two populations. No interaction was detected for F2 [(10, 580) = 1.602, $p = 0.10$]. To explore any interactions, a one-way ANOVA on both F1 and F2 was run for each of the 11 vowels. To correct for the large number of analyses, the alpha level was set to 0.001 for each ANOVA. Significant differences were found for F1: /i/ F1 [$F(1, 58) = 22.7$, $p<0.001$]; /æ/ F2 [$F(1, 58) = 9.9$, $p= 0.003$] (approaching significance).

As mentioned previously, the Inland North regional dialect is defined in terms of the vocalic structure (speakers' participation in the NCS) and only one of the vowels that show a decided difference between the two regions is a vowel of the NCS (/æ/). Whether speakers' dialectal regions could be differentiated by listeners based on these spectral differences is doubtful, but is an empirical question that is beyond the scope of the present work.

Duration Comparisons – Hillenbrand et al. and CHESS

In spite of its relative ease of measurement, vowel duration is generally not used as a defining feature in dialectal studies (but cf. Jacewicz et al., 2007). Because of the durational differences found for MHE and Anglo vowels in Chapter 5, comparison was made of the dynamic properties of the vowels of Michigan and Chicago speakers. Most striking is the difference in average vowel durations. On average, all vowel durations were greater for the Hillenbrand et al. speakers. Figure 8.7 provides a summary of the duration comparison of the two regions. ANOVA repeated measures analyses were run on duration values for the Hillenbrand et al. and hVd data from the CHESS corpus.

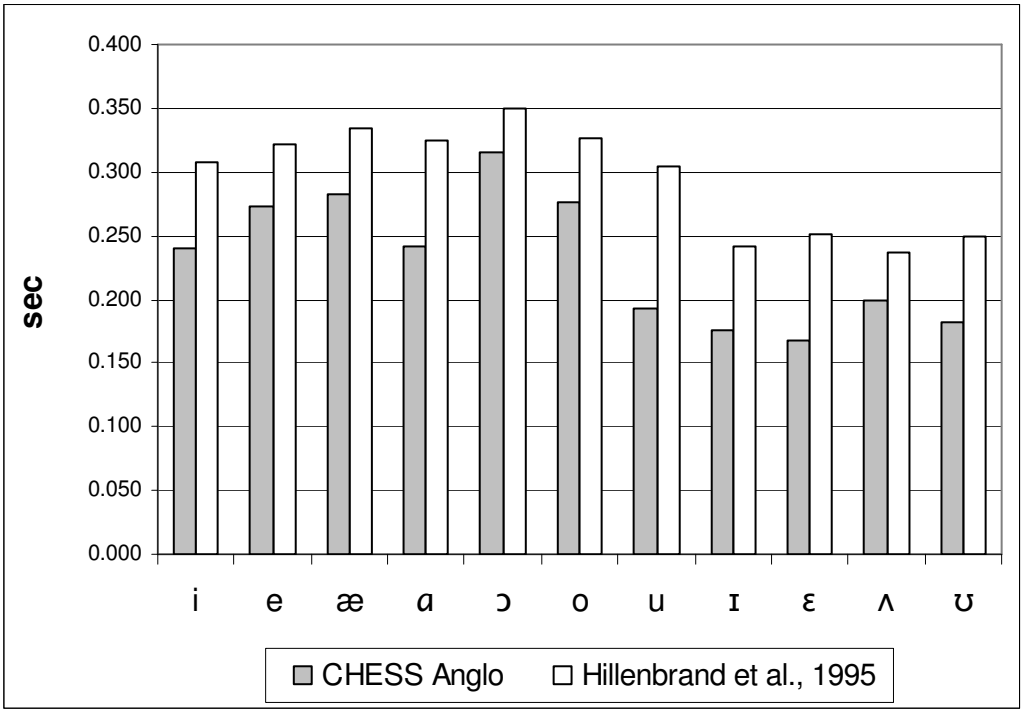


Figure 8.7. Vowel duration comparison: CHESS Anglo and Hillenbrand et al. (1995).

The repeated measures ANOVA on the duration measurements revealed a significant main effect of vowel category [$F(10, 580) = 101.3$, $p<0.001$] indicating simply that the vowels as described by duration measured here for American English are distinct. A significant vowel by population interaction was detected for duration [$F(10, 580) = 6.3$, $p<0.001$] indicating that the variation in individual vowels was not consistent between the two populations. To explore any interactions, a one-way ANOVA on duration was run for each of the 11 vowels. To correct for the large number of analyses, the alpha level was set to 0.001 for each ANOVA. Significant differences in duration were found for seven vowels: / ɑ / [$F(1, 58) = 24.8$, $p<0.001$]; / æ / [$F(1, 58) = 10.9$, $p<0.001$]; / ɛ / [$F(1, 58) = 26.2$, $p<0.001$]; / ɪ / [$F(1, 58) = 16.6$, $p<0.001$]; / i / [$F(1, 58) = 19.9$, $p<0.001$]; / ʊ / [$F(1, 58) = 18.2$, $p<0.001$]; / u / [$F(1, 58) = 35.7$, $p<0.001$].

In their discussion of vowel duration, Hillenbrand et al. acknowledge a longer duration for their female speakers compared to the male speakers in the same study. Although this is an interesting aspect of the data in its own right, it of course does not explain the current finding, since both populations under consideration are female. The speakers vary between the two studies not only in their geographic origin, but also in the social setting, with the Chicago speakers representing a major metropolitan area versus the less urban origins of the southern Michigan speakers. Empirical studies have not found evidence for slower speech in rural versus urban areas (Hewlett & Rendall, 1998), but regional variation in vowel duration has been found between American English dialects (Jacewicz et al., 2007), and the current finding may reflect a local feature within the dialect region.

VISC Comparisons – Hillenbrand et al. and CHESS

As discussed in Chapter 5, another dynamic feature of vowel production is vowel inherent spectral change (VISC), a measure of the distance formants move over time in the F1xF2 vowel space, independent of the vowel's consonantal context. As in the analysis of the CHESS corpus, VISC for the Hillenbrand et al. data was calculated using the vector length between the .20 and .80 points in the vowel trajectories in F1xF2 vowel plots.

The repeated measures ANOVA on the VISC measurements revealed a significant main effect of vowel category [$F(10, 580) = 43.9$, $p<0.001$] indicating simply that the vowels as described by VISC measured here for American English are distinct. A significant vowel by population interaction was detected for VISC [$F(10, 580) = 10.4$, $p<0.001$] indicating that the variation in individual vowels was not consistent between the two populations. To explore any interactions, a one-way ANOVA on duration was run for each of the 11 vowels. To correct for

the large number of analyses, the alpha level was set to 0.001 for each ANOVA. Significant differences were found for VISC: / ɔ / [$F(1, 58) = 17.2$, $p<0.001$]; / o / [$F(1, 58) = 13.2$, $p<0.001$]; /ʌ / [$F(1, 58) = 36.7$, $p<0.001$].

The results of VISC determinations indicate that in addition to vowel duration differences, VISC is a viable distinguishing feature of the Chicago and Southern Michigan regions. Three of the eleven vowels under consideration exhibited significant differences (Figure 8.8). While there was no significant difference found in /æ/ VISC, Hillenbrand et al. speakers produced /ɔ/ and /ʌ/ with approximately twice the VISC of the CHESS Anglos. Because measurements were made on identical consonantal environments, and trajectory measurements were taken only on the central 60% of the vowel duration, these vowel comparisons indicate marked variation within the Inland North dialect region (Hillenbrand, 2003).

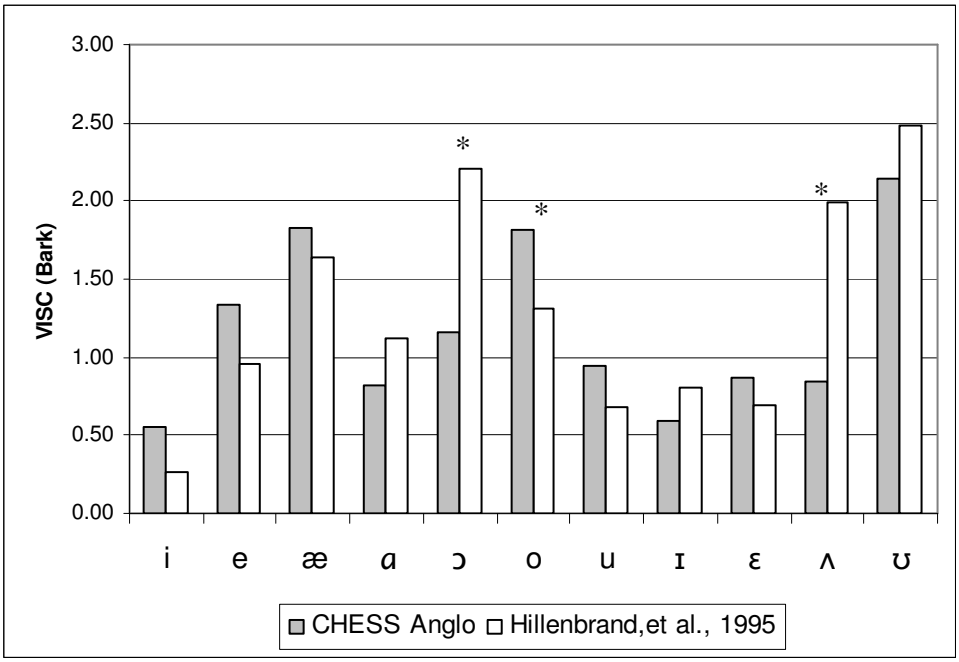


Figure 8.8. VISC comparison for CHESS Anglo and Hillenbrand et al. (1995) speakers.

Summary of Hillenbrand et al. (1995) Versus CHESS Data

Although the Hillenbrand et al. vowel data from Michigan ostensibly represent the same dialectal region of American English as Chicago, a number of vocalic features, both static and dynamic, differentiate the two regions. This finding illustrates the value of collecting data from the specific Chicago region under study, allowing a more precise characterization of the vowels representative of the local community. It is particularly relevant as we consider the effects of language contact on the vowels. For example, in previous work Konopka and Pierrehumbert (2008) found that MHE vowels showed significant differences in spectral position when compared to data from Hillenbrand et al. It is now apparent that although the data is representative of the regional Inland North dialect data, it did not reflect the local Chicago speech norm.

Is it possible that this variation is a manifestation of diachronic change? Since 15 years separate the two studies in question, one possible explanation for the difference is that we are seeing evidence of a change in progress. The speakers from the Hillenbrand et al. study were university students, and although demographic data is not available, it is likely that these students were in their late teens to early twenties at the time of recording. Although a vowel change of this magnitude in one generation is possible in principle, it is not likely that such a dramatic change would take place. This is, of course, an empirical question – a follow-up study of the same region should resolve the question.

Nationwide Speech Project

The Nationwide Speech Project (NSP) (Clopper & Pisoni, 2006) is a corpus of speech materials comprising sixty American English speakers categorized into six United States dialect regions. Each region is represented by recordings of ten speakers (5f, 5m) providing speech materials ranging from wordlist reading to 15-minute interviews. The intent of the corpus is to provide researchers with a wide variety of speech recordings of consistently high quality (laboratory produced) for use as a benchmark for the study of American English dialect variation. Speakers were recruited from the student population, with their city of origin used as the criteria for their regional assignment. The similarity of the elicitation materials to the CHESS corpus makes possible a meaningful comparison of these speakers to the Anglo Chicagoans.

For the purposes of the current study, recordings of wordlist readings of the five female speakers from the Inland North dialect region were obtained for analysis. These consisted of five repetitions of each of ten American English vowels in hVd phonetic context (heed, hid, hayed, head, had, hod, hud, hoed, hood, who'd).[24] The recordings were analyzed using the protocol from the current study (see Chapter 4), with measurements of F1 and F2 taken at the 0.20, 0.50, and 0.80 points of the vowel duration. The results of the analysis are tabulated in Table 8.3.

[24] /ɔ/ was not recorded for the NSP speakers.

Table 8.3. Nationwide Speech Project (NSP) – Vowel analysis data from the five female representatives of the Inland North dialect region.

NSP		0.20 duration (Bark)		0.50 duration (Bark)		0.80 duration (Bark)		
Vowel (hVd)	duration (msec)	F1	F2	F1	F2	F1	F2	Trajectory (Bark)
i	226	3.39	15.21	3.42	15.35	3.45	15.04	0.53
e	247	5.20	14.40	4.49	14.77	4.22	14.84	1.34
æ	257	6.62	13.44	7.59	12.80	7.43	12.58	1.56
ɑ	254	8.10	10.69	8.07	11.05	7.45	11.89	1.60
o	252	5.57	9.53	4.89	8.94	4.32	9.18	1.49
u	237	4.05	9.86	3.90	9.60	3.83	9.84	0.72
ɪ	186	4.99	14.04	5.25	13.76	5.13	13.50	0.72
ɛ	179	7.08	12.45	6.88	12.58	6.29	12.81	1.16
ʌ	187	6.75	10.49	6.68	11.20	5.91	12.56	2.29
ʊ	196	5.22	9.88	5.49	10.59	5.24	12.24	2.43

To determine whether statistical differences exist between the vowel systems for the NSP and Anglo CHESS populations of speakers, an ANOVA was calculated using vowel categories (/i, ɪ, e, ɛ, æ, ɑ, ʌ, ɔ, o, ʊ, u /) as within-subjects variables, and speaker populations (NSP, Anglo) as between-subjects factors for each of four properties: F1 and F2 at vowel midpoint, duration, and VISC. Due to the number of analyses run, the alpha level was set to 0.01 for each ANOVA.

The repeated measures ANOVA on the F1 and F2 measurements revealed a significant main effect of vowel category [$F(9, 135) = 300.7$, $p<0.001$ for F1, and $F(9, 135) = 147.4$, $p < 0.001$ for F2] indicating simply that the vowels as described by the first and second formants measured here for American English are distinct. No vowel by population interaction was

detected for F1 or F2. A plot of the median vowel formant values is shown in Figure 8.9. No significant difference in formant values were found between the NSP and CHESS Anglo speakers.

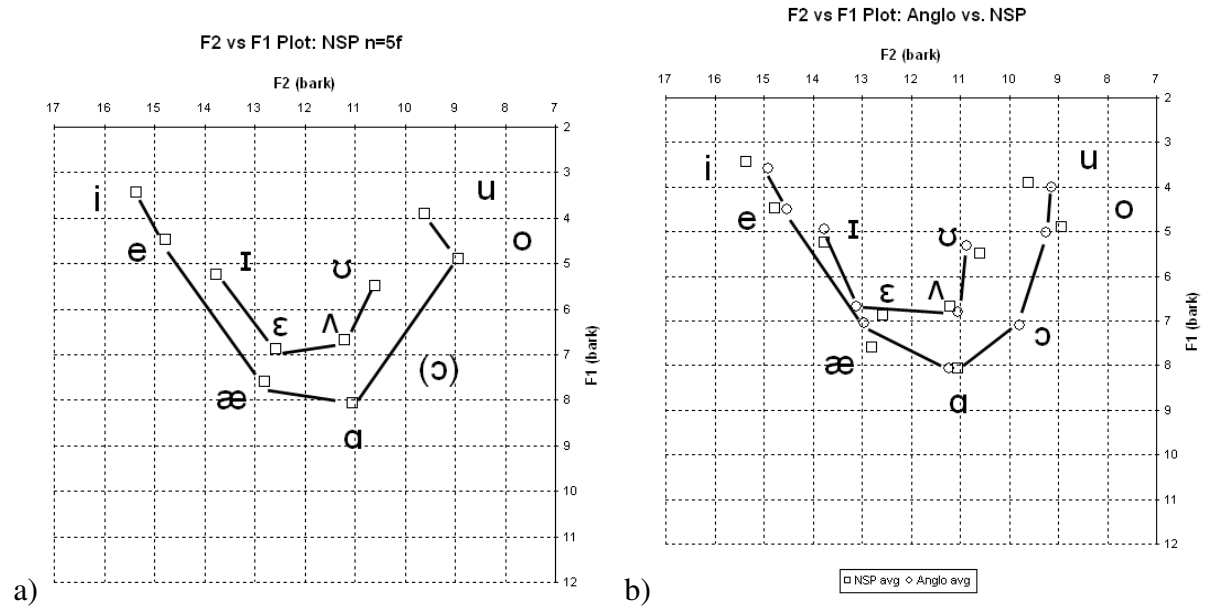


Figure 8.9. Vowel plots. a) NSP; b) CHESS Anglo versus NSP.

Duration Comparisons – NSP and CHESS

The repeated measures ANOVA on the duration measurements revealed a significant main effect of vowel category [$F(9, 135) = 62.9$, $p<0.001$] for duration indicating simply that the vowels as described by duration measured here for American English are distinct. No vowel by population interaction was detected for duration. A plot of the vowel duration values is shown in Figure 8.10.

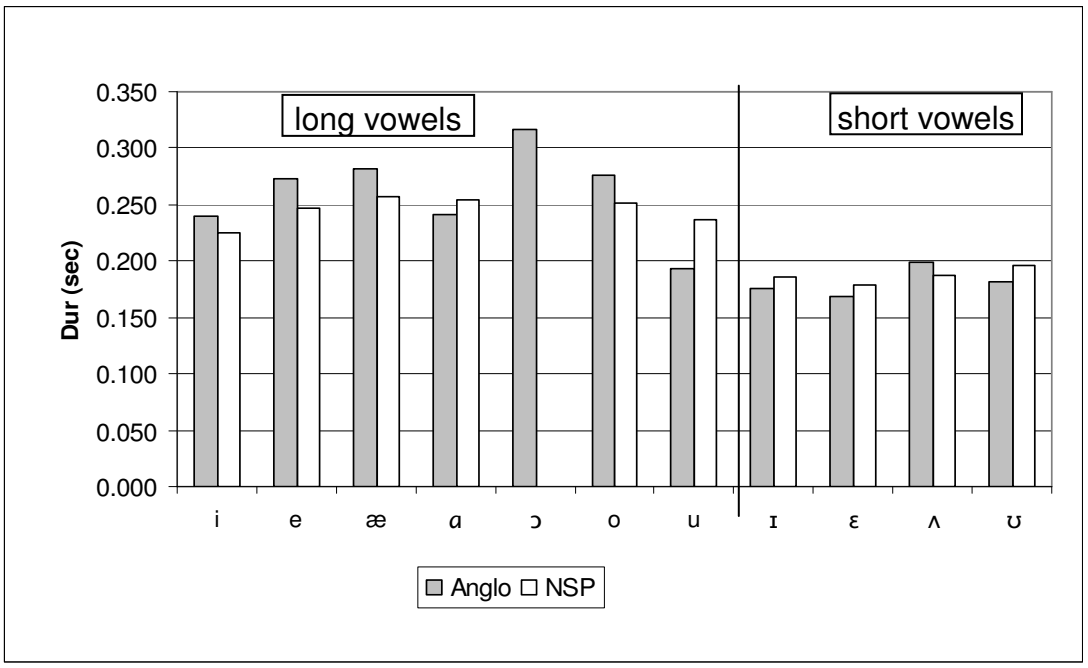


Figure 8.10. Comparison of vowel durations: CHESS Anglo versus NSP.

Calculating the duration ratio between the long and short vocalic subsystems we find a slight difference in duration ratios (Figure 8.11). Lack of significant differences in individual vowel durations (and thus, durational subsystems), may be due to the small sample size in the NSP, since the duration ratios for NSP and Hillenbrand et al. (1995) are quite similar (see Figure 8.11), and we saw significant differences between CHESS and Hillenbrand et al. for this feature.

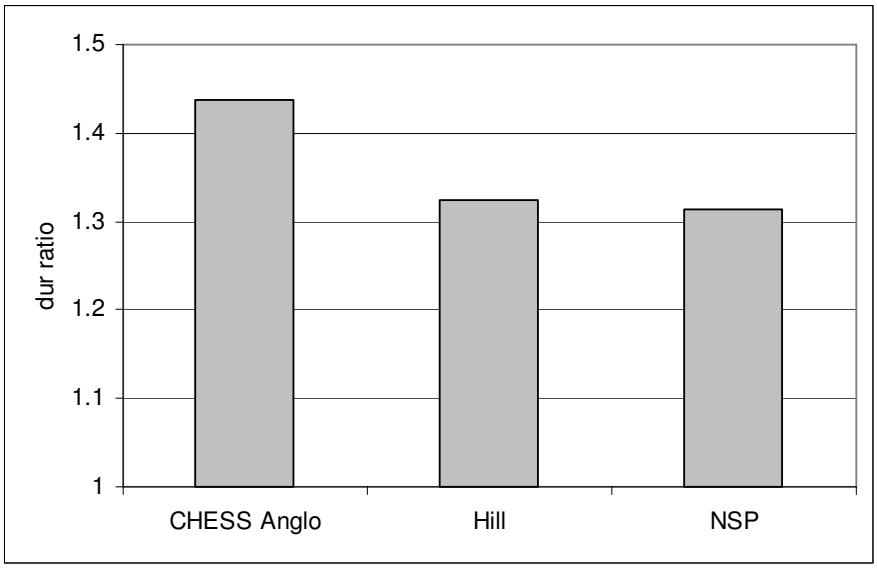


Figure 8.11. Duration ratios of Long to Short vowels (hVd context).

The calculation (excluding /ɔ/) indicates that the NSP speakers' ratio (NSP long/short duration ratio = 1.31) differs from the Anglo Chicagoans (1.44), but on the other hand is quite similar to the Hillenbrand et al. speakers (1.32).

VISC Comparisons – NSP and CHESS

The repeated measures ANOVA on VISC measurements for CHESS Anglo speakers and the NSP revealed a significant main effect of vowel category [$F(9,135) = 17.3$, $p<0.001$] indicating simply that the vowels as described by VISC measured here for American English are distinct. A vowel by population interaction was detected for VISC [$F(9, 135) = 17.4$, $p<0.001$] indicating individual differences among the vowels. To explore the interaction, a one-way ANOVA on duration was run for each of the 11 vowels. To correct for the large number of analyses, the alpha level was set to 0.001 for each ANOVA. Significant differences were found for VISC: /ɑ/ [$F(1, 15) = 36.1$, $p<0.001$]; /ʌ/ [$F(1, 15) = 57.5$, $p<0.001$].

VISC is similar across the two studies, with the exception of the two vowels /ɑ/ and /ʌ/. The shorter trajectories for these two vowels in the CHESS corpus were also significantly different from those of Hillenbrand et al., and thus may indicate a distinctive feature of the Anglo speakers in Chicago. It is worth noting that although the trajectories differed significantly, the duration of the vowels did not. Thus it is not the case that a longer duration allowed a larger movement in the F1xF2 space. Indeed, looking at Figure 8.12 we see that /ʊ/ has the highest VISC, but one of the shortest durations of all the vowels analyzed. Conversely, in spite of its long duration, /i/ has the shortest trajectory.

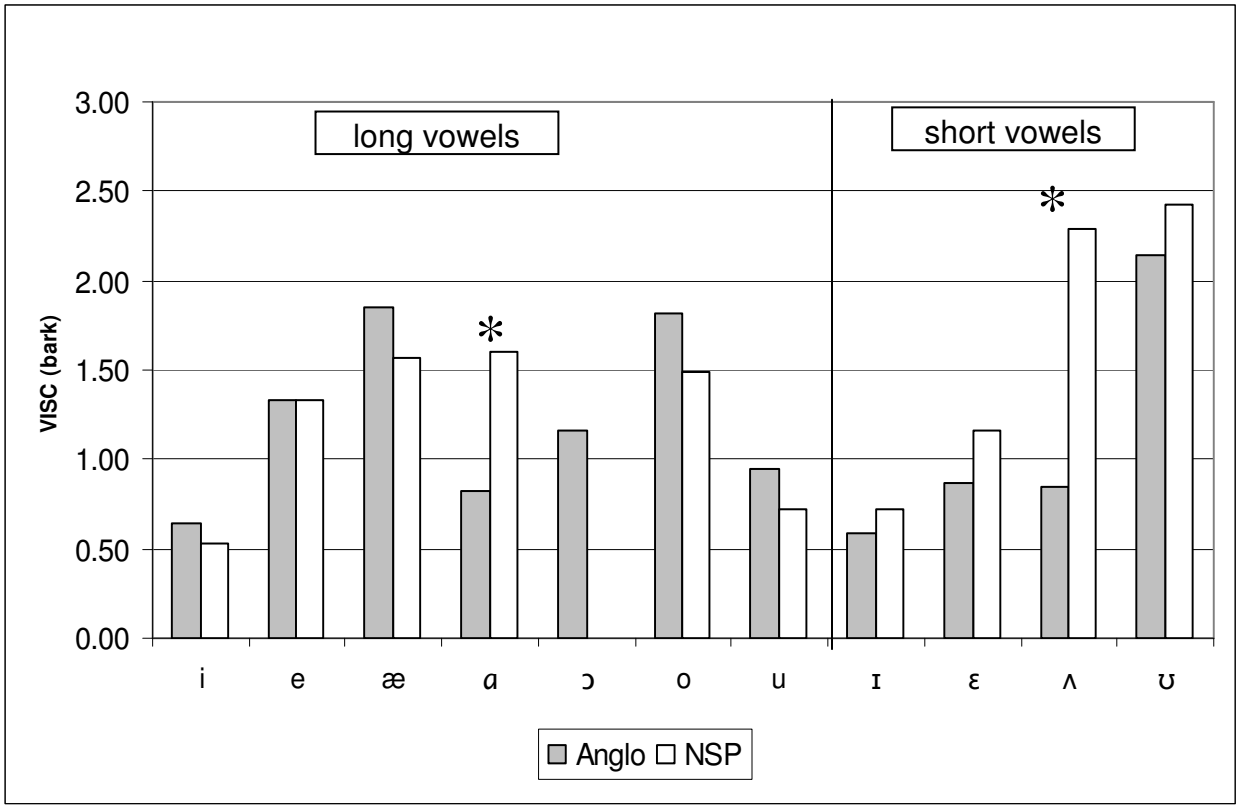


Figure 8.12. VISC comparison: NSP versus CHESS Anglo (*sig p<0.001).

It appears that the NSP is a promising representative of Chicago area speech, but in spite of its similarities in the static vowel plot, there are particular differences in temporal features, such as VISC, that make it inappropriate for use as the regional norm for the current study.

Summary of Inland North Comparisons

The vowels of the Northern Cities Shift (NCS) are generally considered a basis for characterizing the Inland North dialect region. As such, we might expect a consistent vowel structure for speakers throughout the geographic region. The case is not so straightforward. The indication is that there may be very local effects in the degree to which speakers exhibit /æ/ raising and/or fronting. The implications of this finding for the analysis of the NCS as a change in progress are beyond the scope of the current study, but it is clear from the above comparisons that vowel productions vary by locality within the Inland North dialect region, and that temporal features in particular are useful in distinguishing local effects. Due to a lack of temporal information and its reliance on exclusively spontaneous speech, data from *The Atlas of North American English* is not very amenable to extensive comparison. Given the limitations, it appears that /æ/ raising, a defining feature of the NCS, may be more extreme for these speakers than CHESS speakers.

Table 8.4. Summary of temporal features for the three studies in which hVd tokens were elicited.

	Chicago Anglo (hVd)		Hillenbrand et al. (hVd)		Nationwide Speech Project (hVd)	
vowel	dur (msec)	VISC (Bark)	dur (msec)	VISC (Bark)	dur (msec)	VISC (Bark)
i	240	0.56	307	0.26	226	0.53
e	272	1.33	321	0.96	247	1.34
æ	282	1.83	334	1.64	257	1.56
ɑ	242	0.82	324	1.12	254	1.60
ɔ	316	1.16	351	2.21	na	na
o	276	1.82	327	1.31	252	1.49
u	193	0.95	304	0.69	237	0.72
ɪ	176	0.59	241	0.81	186	0.72
ɛ	168	0.87	252	0.70	179	1.16
ʌ	199	0.85	237	2.00	187	2.29
ʊ	181	2.14	249	2.49	196	2.43

By using controlled wordlists to compare the Michigan speakers to the CHESS corpus, we find some significant differences in the static vowel space as well as in the temporal features of vowel production. The vowels of the two studies do not differ much in their static plots (/i /, /æ/ differ in one dimension each). The vowel / æ / is approaching significance in the F2 dimension, but is only one of the six vowels of the NCS. So, on the one hand, this demonstrates the utility of the static positions of vowels of the NCS as dialectal markers. But on the other hand, the analysis reveals strong distinctions in the vowels of the two regions based on their temporal properties (see Table 8.4). Vowel durations differ across a range, with all Hillenbrand et al. vowels longer than their CHESS Anglo counterparts. Significant VISC differences are also

evident for two of the eleven vowels considered (/ɑ, ʌ/). Whether the differences between the CHESS corpus and the Hillenbrand et al. data are synchronic or diachronic in nature is an empirical question that will require further study. However, it is clear that that particular data set is not representative of the vowels of the matrix dialect in Chicago.

Finally, the NSP gives us spectral data that is more representative of the Chicago region (note that the five female speakers contributing to the Inland North dialect region for the NSP were from the Northern Indiana/Chicago region). But even this corpus shows important differences in temporal properties of the vowels. Of special note are the differences in VISC for /ɑ/ and /ʌ/. The dramatic differences in these two vowels should give us pause as we consider a representative vowel structure for the regional variety.

Comparison of Mexican Heritage English (MHE) Across Three Regions

One question we wish to address is whether other language contact communities across the United States will exhibit patterns of vocalic features similar to the MHE speakers of the CHESS corpus. In this section we will compare CHESS data with two other regional sociophonetic studies of Chicano English in the United States (California, Michigan). This analysis will indicate the extent to which English/Spanish language contact has resulted in a vocalic inventory we might consider a feature of a supraregional MHE dialect of American English. In the following sections we will assess both the relationship between MHE vowels and those of the matrix dialect, as well as MHE vowels across regions.

Godinez and Maddieson (1985): MHE in Los Angeles

The first comprehensive sociophonetic study of the vowels of Chicano English was carried out in East Los Angeles by Godinez and Maddieson (1985). The study systematically compared selected vowels of three sets of high school students from the same geographic region (n=15m in each group): General California English (GCE), monolingual Chicano (English), and bilingual Chicano (Spanish/English). While this study is of male high school speakers only, it is one of the few Chicano English studies that provides data on a range of vowels in hVd wordlist format. Comparisons are made to a local Anglo population, and it is the relationship between the Chicano vowels and those of the matrix dialect that concerns us here.

The researchers analyzed seven English vowels (/ ɪ, ɛ, e, ʌ, ɑ, ʊ, u /) elicited twice in a randomized hVd context. In the vowel plots of the three groups, Godinez and Maddieson found that Chicano speakers (both mono- and bilingual) exhibited higher and more fronted /i, ɛ, æ/ and a less fronted /u/ than GCE speakers. While these findings indicate a much more pronounced effect on the static vowel space than that found for the CHESS MHE speakers (/i, ɪ/ were the two vowels that were higher and fronted for CHESS MHE speakers relative to Anglo), it is interesting to note that this does not appear to be an indication of a Spanish influence according to the CHESS Mexican Spanish data. Here, Spanish data does not show extreme fronting relative to the Anglo vowel space. Although Godinez and Maddieson view their results of backed /u/ as showing a relic of Spanish influence, they do not speculate on the social implications this may hold for Chicano speakers. It is possible to view the lack of fronting as a lack of participation in the fronting of / u / found in the California dialect (Clopper & Pisoni, 2006; Hagiwara, 1997; Labov et al., 2006), and thus a marker of Chicano identity in this region rather than an effect of

Spanish. The raised and fronted high front vowels may indeed be a supraregional feature (as we find in CHESS MHE), but the lack of fronting for /i/ in the Roeder (2006) data from Michigan do not support this idea.

The two Chicano groups (mono- and bilingual) produced distinct categories for all of the English vowels studied, and differed from one another only in their productions of /ʊ/ (monolinguals were more fronted). This finding, as in the current study, indicates that the speakers did indeed possess all the English vowels of their matrix dialect in their inventories, and thus were not speaking a Spanish-accented form of second language English as determined for L2E speakers in the CHESS corpus.

The researchers found no difference in mean vowel duration between the Chicano and the General California English groups, but did not consider short and long vowels as vocalic subsystems in their analysis. They observed "less of a range of difference" (p. 45) between vowel durations for the groups but did not pursue the point, and recommended a larger subject pool as an option for confirming any effect. It is possible, however, to use the vowel duration data from Godinez and Maddieson to compare the duration ratio of long to short vowels between the Chicano and General California English populations as we did in comparing the MHE and Anglo speakers in the CHESS corpus. The results of this analysis are shown in Figure 8.13.

Similar to the results from the current study, the Anglo population exhibited a more marked difference between the two subsystems. Thus, in addition to certain differences in the structure of the vowel space as determined by a static plot, there was indeed a difference in the relationship between the long and short vowels not reported in the original study. It would appear that as we search for a supraregional effect for contact between Mexican Spanish and American

English, the phonological relationship between vowel durations of the two subsystems holds promise as such an effect.

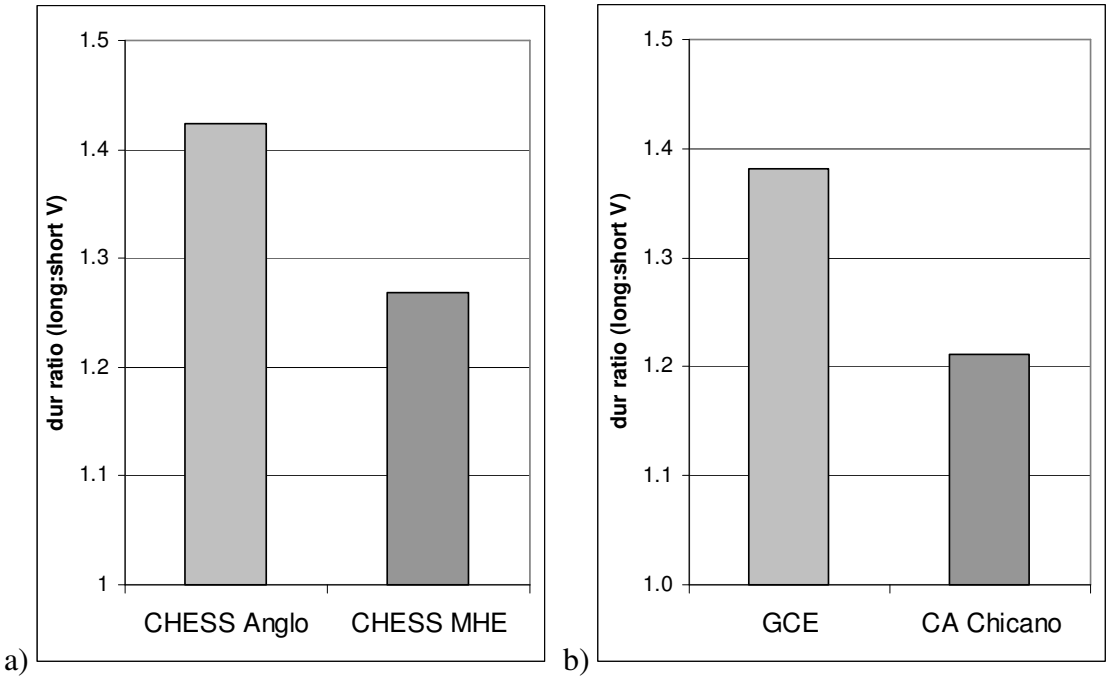


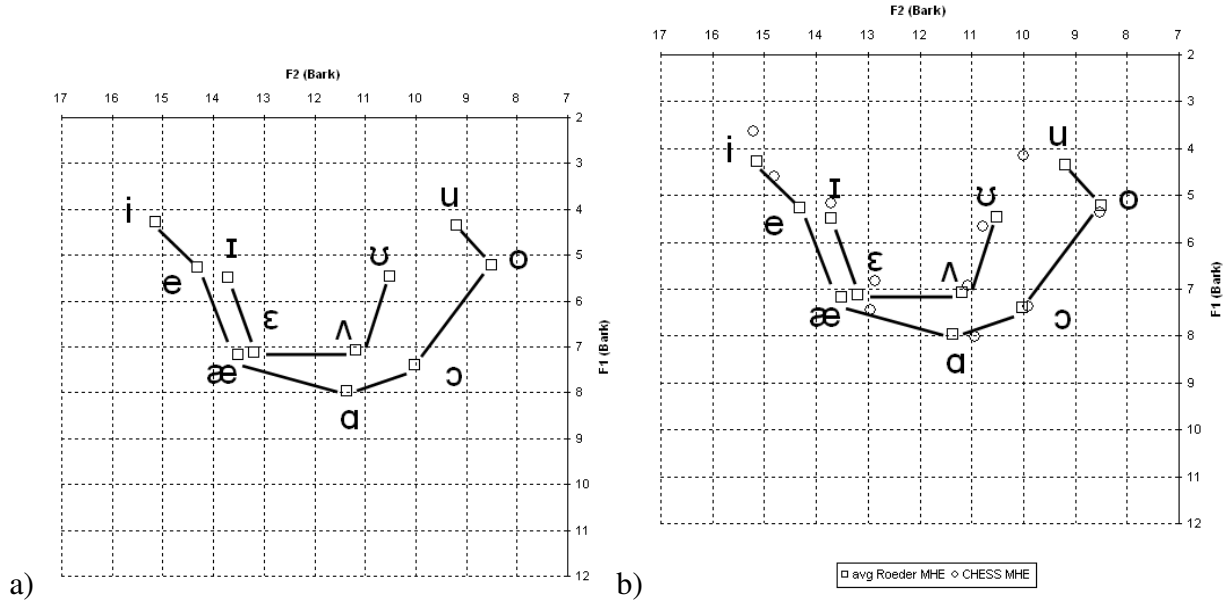
Figure 8.13. Long to short vowel duration ratio comparison. a) CHESS corpus; b) California speakers (Godinez & Maddieson, 1985).

Roeder (2006): MHE in Lansing, Michigan

In a recent study of Mexican American English, Roeder (2006) characterized the vowel systems of 16 Mexican-Americans in Lansing, Michigan. The study determined the extent to which the vowels of these speakers participated in the NCS as represented by Detroit speakers. These speakers originate from the same dialect region (Inland North) as those of the CHESS corpus, and the vocalic spectral data is obtained from a wordlist reading paradigm. By extracting

the data from the six female MHE speakers of the Roeder study[25], we are able to compare their vowel space to that of the current study. Data is compared to CVC data from the CHESS corpus since no hVd tokens were included.

A comparison of the Roeder data and CHESS MHE is shown in Figure 8.14. CHESS MHE speakers are fronting their /u/ as do their Anglo counterparts (not found in the Roeder results), and differences are found in the vowels /e/ and /i/ which show more fronting for the CHESS MHE. /æ/ is slightly higher and fronter (similar to Hillenbrand et al., 1995) for these Michigan MHE speakers when compared to CHESS MHE, but what is most striking in comparing the two MHE vowel spaces is their overall similarity.



a) b)

Figure 8.14. Vowel plot. a) MHE from Roeder (2006); b) Comparison with CHESS MHE.

[25] Speakers corresponding to CHESS MHE speakers are ethnic Mexicans who are native speakers of English and lifelong residents of Michigan. Values for individual speakers from vowel plots provided in vowel charts and converted to Bark for comparisons.

The CHESS MHE speakers do, however, produce a more raised / i /, and fronted /u/ relative to the NCS, and interestingly, do not exhibit as much raising of /æ/ – one of the more salient features of the NCS. These results contrast with the Lansing MHE speakers who produce a raised /æ/ that is consistent with the NCS, but do not pattern with the Chicago speakers' high vowel productions. It appears that these features (raised / i /, fronted /u/, and lower /æ/) may be associated with Chicago MHE, and this local effect may reflect the differences between the Mexican ethnic communities and their relationship to the corresponding non-ethnic community in the two cities.

As mentioned in the previous analyses, the higher CHESS MHE /e/ is probably due to VISC and the differences between a measurement taken at steady state and median duration. Much of the difference between the vowel plots of Roeder speakers and CHESS MHE may be due to VISC. The analyses of dialectal differences in this feature in American English show that VISC is quite variable across dialects. The vowel space plots do not provide strong evidence for a supraregional MHE.

Discussion

These comparisons of MHE across three regions of the United States do not provide evidence for a supraregional MHE in the static plots of the vowels. Based on evidence from the CHESS corpus, it is in the temporal features of the English vowels that we are more likely to find the influence of Spanish. Through the analysis of the duration ratio data in Godinez and Maddieson (1985), we see more evidence to support this claim, especially since comparisons were made on hVd tokens, providing consistency in the tokens measured. A thorough search for

supraregional effects will require specificity in both the populations studied and the type of speech elicited for analysis.

Chapter 9. Conclusion

Consuetudo loquendi est in motu.
The vernacular is always in motion.
Varro (116-27 BCE)

Language change is inevitable. And to explain the process of change, researchers are called on to address two fundamental issues: how change is initiated and how it is propagated (Croft, 2000). As in many dialect studies, this study focused on delimiting boundaries of variation as regional or social phenomena. This work, however, has sought to go beyond dialect characterization by systematically appraising the speech in a local setting where variation is clearly evident and the source of that variation is not in dispute.

Ethnic heritage communities provide an ideal testing ground for the effects of language contact on language change (Fought, 2002). These communities are by definition isolated from the larger community through differences in certain cultural norms and language practices, thus allowing the study of both the linguistic and the social factors that influence the propagation of change. Observing the results of language contact at this community level allows a fine-grained account of contact effects, drawing from a pool of speakers who are closely related spatially, if not culturally.

The Study

In this study I collected and analyzed speech recordings from residents of Albany Park, a Mexican ethnic community in Chicago. The population density of this urban enclave allowed an analysis of speakers who in daily interactions are integrated with the larger regional speech variety, yet whose cultural ties play an important role in their identities. The sociophonetic

analysis focused on the vowels of these speakers for two reasons. First, the disparate vowel inventories of Spanish and English allow us to readily identify language contact effects. Second, vocalic characterization is an important part of traditional dialect study, allowing us to compare our findings to studies of both language contact communities and regional varieties that for the most part are not in regular contact with languages other than English.

In the spirit of Hay and Drager (2007), this study included three important components of current sociophonetic methodology: detailed phonetic analysis, accent perception rating, and a social practices survey. My account of vocalic contact effects consists of four intertwined examinations. First, I analyzed acoustic recordings of four language populations within a single urban community: Anglo, Spanish, Second Language English (L2E), and Mexican Heritage English (MHE). The language background distinctions between these groups were drawn explicitly, and guided the analysis of the vocalic structure of each, with the contact variety – MHE – exhibiting features that differentiate it from both the local Anglo norm and L2E.

Next, I assessed the role of regional variation on the interpretation of the results and found that extant dialectal studies are not reliable benchmarks of the English vowels in Chicago. Large-scale studies representative of the Inland North dialectal region showed enough intraregional variation to warrant recruiting a group of Anglo speakers from the same neighborhood as our Mexican-American speakers. Comparisons between the current work and these other regional studies indicated the amount and type of variation to be expected within a dialect region absent language contact.

I used the recordings of the Chicago MHE speakers to probe listeners' perception of accentedness. Two accent rating methodologies were used: one employed a traditional Likert rating scale, and the other an interactive "Ladder" ranking task. Raters from outside the

community, but familiar with Chicago dialectal norms, were consistent in detecting a fairly wide range of Spanish influence across the MHE speakers, and the results of the two methods correlated well. This revealed that the MHE variety was consistently detected as accented by listeners, and the range of the accent detected allowed the search for correlations with vocalic features.

Finally, I adapted the Cultural Consensus Model (CCM), a statistical technique used primarily in anthropology, to determine the extent to which the MHE speakers reflect the practices and opinions of their Mexican ethnic community. This survey-based approach to quantifying social integration provided a community index score for the MHE speakers. This index then allowed us to interpret the phonetic findings for MHE in terms of both linguistic differences and social variables. The community index correlated with vowel inherent spectral change (VISC), a dynamic feature of vowel production that did not correlate with perceived accent, demonstrating how a feature that is correlated with social orientation within the community is not necessarily correlated with perceived accentedness.

Overview of Findings – Contact Effects

The study provides definitive empirical evidence that MHE is not L2E. The results of the vocalic analysis show that MHE speakers contrast with their L2E counterparts who show a collapse of vowel categories resulting in accented speech typical of English learners. The MHE speakers differentiate their English vowels much like Anglo speakers do, with a standard F1xF2 vowel plot showing little difference between the two varieties. It is the dynamic features of the vowels, such as the distinctions between long and short durational subsystems and vowel lengthening processes, however, which can be used to differentiate MHE from Anglo.

This three-way distinction between the English varieties is discussed in previous work on Chicano English, but has been made explicit here through instrumental analysis of the vowels. The details of the distinction are clearly important as research continues on MHE and in language contact settings more generally. The vocalic differences we find between English learners and MHE speakers alert us to the importance of considering the details of participants' language backgrounds as we assess the propagation of language change. Variants should be considered propagated only to the extent that they are found in the speech of native speakers. So, for example, the collapse of /u/ and /ʊ/ vowel categories in L2E should not be considered a feature of the contact variety since it is not found in MHE speech.

MHE speakers are not speaking a learner's version of English, and this study reveals that it is the dynamic properties of the vowels that help define MHE as a distinct variety of English. The differences found between MHE and Anglo vowels are best accounted for by a detailed comparison to those of Mexican Spanish and L2E speakers. The dynamic properties of the MHE vowels are clearly influenced by Spanish. These are properties not routinely reported in dialectal studies, but are found here to be important results of contact-induced change. As we attempt to explain historical processes of vowel shifting and merger, it may be helpful to investigate these processes in light of the temporal features of vowel production. These are features that have been shown here to exhibit a more enduring effect than the vowels' static positions alone.

Duration

The study shows that Spanish has influenced the MHE vocalic subsystems of short and long vowels. MHE vowels show a reduced distinction between the two subsystems relative to the Anglo vowels; MHE short vowels are longer than those of Anglo speakers, resulting in less

contrast between the subsystems. This difference is best illustrated by comparing the duration ratios between the subsystems, with the MHE ratio falling about halfway between the L2E and Anglo ratios.

In addition to this phonetic effect, the conditioned lengthening of vowels preceding voiced consonants was found to be a distinguishing feature of MHE. While MHE speakers exhibit more vowel lengthening compared to Spanish or L2E speakers, the effect is significantly less than for Anglo speakers. This mitigating influence of Spanish demonstrates that phonological processes are also subject to change due to Spanish/English language contact.

VISC

Given its role as a salient marker of the Inland North dialect, /æ/ has been the focus of attention for studies of the Northern Cities Shift and, more specifically, in Spanish/English language contact. Roeder (2010) found that in a static F1xF2 plot, /æ/ was the only vowel that did not pattern with the local norm for her Mexican American speakers in Michigan. In the current study, the static position of the MHE /æ/ does not differ from the Anglo vowel, but there is less formant movement (VISC), in spite of its greater duration in MHE when compared to Anglo. The vowel /æ/ was the only category between the populations that revealed differences for VISC bordering on statistical significance. This finding reinforces the importance of /æ/ in the characterization of the dialect, and importantly, the key role that vowel dynamics play in the study of contact effects (Konopka & Pierrehumbert, 2010). The variability of VISC in vowel production may be related to vowel shifting, and should be considered in any model of shifts or mergers.

Supraregional effects

One important question resulting from inquiries into language contact effects is whether the variation we find in one geographic or dialect region will be found in the contact varieties of other regions. The quest for supraregional effects of a Spanish/English contact variety is still underway. Presently, the sociophonetic studies are few and inconclusive on this point. Due to inconsistencies in defining speakers' language backgrounds and varying detail in the vocalic analyses of earlier studies, definitive claims are not possible. However, in comprehensive studies of the vowel space that address this issue (e.g., Godinez & Maddieson, 1985; Roeder, 2010), it appears that MHE varieties show mainly the influence of the regional matrix dialect on the static F1xF2 vowel plots.

The present study points toward the dynamic features of the vowels as viable candidates in the search for supraregional effects. For example, reanalysis of the results from Godinez and Maddieson (1985) indicates that the relationship between the durations of the long and short vocalic subsystems is a distinguishing feature of California Chicano English – as was found for our MHE Chicagoans. Another example is the VISC analysis for /æ/. This vowel seems to be an important locus for differences between the MHE and Anglo populations across studies of the same dialect region (cf. Roeder, 2010). Future sociophonetic research on MHE in other American communities will help determine whether the dynamic features of vowel production will help define supraregional effects of Spanish-English contact.

Intraregional Variation in American English

To assess the results of language contact I first characterized the varieties in contact, and then compared the results to those of regional studies representing the Inland North dialectal region. This analysis revealed the extent of the variability found within the region, and found the patterns of some differences to be distinct from the contact-induced changes of MHE. For example, in the Nationwide Speech Project corpus, which corresponded most closely to the present study, comparable VISC measurements differed significantly from our Anglo speakers for /ɑ/ and /ʌ/, whereas neither of these vowels' VISC differed between Anglo and MHE.

However, for the ratios of the durational subsystems we find that our MHE speakers, who show a significant difference from our Anglo speakers, pattern quite well with both the Nationwide Speech Project speakers and the Hillenbrand et al. (1995) speakers. This finding is contrary to what we might expect based on Thomason's (2001) deceptively simple definition of contact effects: "Contact is a source of linguistic change if it is less likely that a given change would have occurred outside a specific contact situation." (pp. 62-63). Based on the current study, the same effects (due to language contact) are found among speakers in other regions that are experiencing no such contact. Thus, the finding demonstrates the utility of the duration ratio as a dialectal feature, but also demonstrates the difficulty in differentiating contact-induced differences from what may be other sources of change. How "likely" the change was to occur between the localities is difficult to assess.

The study indicated that both the F1xF2 vowel space and vowel duration differ intraregionally, making the use of vowels as dialectal standards useful for broad regional comparisons only. Additionally, traditional work on vowel characterization of American English

has not treated duration as an identifying feature (Thomas, 2002). The comparisons here of local varieties of the Inland North show that duration was clearly a distinguishing feature, and recommend it as an important dialectal feature.

Perception and Variation

A "Spanish accent" is one of the hallmarks of MHE, so a perceptual account of MHE should shed light on the association between the details of vowel production and the accent ratings made by naïve listeners. Our analysis of MHE, Spanish, and L2E vowel features allows us to seek a Spanish language influence on the perceived accentedness of our MHE speakers. We expect vocalic features of L2E that are clearly associated with those of Spanish to play an important role in a perceived accent for MHE speakers. As discussed earlier, it is the vowels of American English that have been used to characterize the various regional dialects in the United States, and for this reason vowels are likely to exhibit features that correlate with accent ratings.

The results of the accent rating experiment revealed a wide range of Spanish influence on MHE. Raters from outside the community rated the MHE speakers from 1.3 to 6.7 on a 1-9 Likert rating scale, with 1 = "no foreign accent" to 9 = "very strong accent." This shows that MHE is consistently identified as accented relative to the Anglo norm (i.e., >1.0), but is nonetheless fairly heterogeneous. This range allowed us to determine the vocalic features that correlated with accentedness. We found that /u/ fronting, /æ/ raising, and the long:short vowel duration ratio all correlated (negatively) with accent ratings given by community outsiders.

The motivation for the current study is to understand how and why the vowels of the contact variety, MHE, differ from those of the greater regional community. The results here show that the temporal features of vowel production should be included in a more complete

picture of the role of vowels in accentedness. Variation in the static vowel space is often used as a defining feature of dialect, and has been found repeatedly to index speakers' social identity. Recent indications are that dynamic cues are related to regional dialects (beyond monophthongization), providing reason to believe that such cues will have a role to play in social identity. Social affiliations and interactions are at the core of recent phonological models (Pierrehumbert, 2006), and a rich understanding of both phonetic and social details should contribute to more advanced models.

Adapting the Cultural Consensus Model (CCM)

The social analyses of MHE speakers using the survey-based CCM method found negative correlations between speakers' community index scores, /æ/ VISC, and age. While age also correlated with accentedness, /æ/ VISC did not. So, although /æ/ VISC differs somewhat between Anglo and MHE speakers, and might thus be expected to correlate with accentedness, it did not. Instead, this dynamic feature of vowel production correlates with MHE speakers' community indices.

The community index scores were determined through the use of a questionnaire generated by members of the community. This community index is a proxy for a speaker's orientation toward her ethnic community (i.e., the degree to which she reflects the consensus practices and opinions of her community, or "cultural competence"), and is thus an indicator of "insider" status. The MHE speakers were found to exhibit a vocalic feature that correlates with their insider status, but that status is *not* indexed by their accentedness as perceived by community outsiders. It appears that /æ/ VISC is a sociophonetic indicator of ethnic orientation that is not correlated with accentedness. So, surprisingly, /æ/ VISC is not used by outsiders to

detect accent, but tracks insider status as evidenced by the community index. The implication for a socially driven model of diachronic change is that this feature's role as an internal or linguistic feature, correlating as it does with external or social orientation, is a candidate for a substratum feature of the variety; that is, a feature that is a remnant of earlier language contact (e.g., final consonant devoicing from German as in Purnell et al., 2005, or Bauer & Parker, 2008).

The community consensus index can be thought of as a reflex of a speaker's connectedness to the ethnic community. /æ/ VISC, then, is an indicator of this connectedness, and is a speech feature that, while not associated with accentedness, is nevertheless a feature of language contact. By contrast, we might have predicted that a Spanish accent would be the strongest correlate to a Mexican ethnic community consensus, dependent on the extent to which MHE speakers speak Spanish and interact with both MHE and L2E speakers in the community. But this is apparently not the case here. The community index correlates with a lower /æ/ VISC which is indeed a variant from the Anglo norm, but not related to the perception of accentedness.

The traditional study of regional dialects allows a synchronic view of language variation, and provides a snapshot of the initial conditions from which future change stems. A socially motivated diachronic view is available by taking into account speakers' practices and opinions within their ethnic community as evidenced through the community index. Features that are exhibited by speakers connected to their community are the ones that are expected to endure as the community itself endures. This index helps us find the phonetic details that we can associate with this community.

The Chicago Heritage English Speech Survey (CHESS) Corpus

Researchers interested in the effects of language contact as well as those characterizing dialectal variation will find speech sample recordings from the study archived for further analysis in the CHESS corpus. In addition to the specificity of the populations in the corpus, the range of elicitation materials makes the recordings valuable for future work. Wordlists comprising various word frequency and phonetic contexts, normed sentences, common passages, and interview speech all await analysis. The recordings have been archived in the Online Speech/Corpora Archive and Analysis Resource (OSCAAR) by the Northwestern University Linguistics Department.

Methodological Considerations

As byproducts of the study, I have validated the use of several sociophonetic methodologies that may prove useful to future projects. Through the sociolinguistic application of the CCM I found that a speaker's orientation toward, and integration into, the community correlates with vocalic features. This finding shows promise for the community index as a tool for providing a quantitative measure of speakers' relationships with their community, a tool that might be applied to linguistic features beyond vowel production.

The index is useful for several reasons: It is used with a community of speakers, allowing for a sample size amenable to statistical analysis. It does not rely on a priori assumptions about speakers' positions in the social structure of their community; in fact, the index identifies respondents who can be considered most "in touch" with the community norms. The method does not require a connected network of participants since participants are indexed by their

opinions and behaviors relative to those of the community. Importantly, the method is flexible, with a unique questionnaire developed by the participants from the community of interest, allowing application in a wide range of contact situations. In this way the community index allows researchers interested in language change to assess the correlation of social identity and linguistic variation more generally.

The accent rating tasks performed in the study validated the use of the Ladder task as a viable means of obtaining accent ratings. Because the task required raters to perform the rating in a visual manner, raters could linearly rank speech recordings without the need for devising an internal scale of accentedness. Because the results correlated closely to the more typical Likert scale rating task, the method may prove useful to researchers working with special populations (e.g., children) that may find the task easier, or more engaging, than numerical rating.

A minor methodological note is the successful use of headset microphones for field recording. This simple tool has provided more consistent high quality recordings than those obtained through desk or lavaliere-type microphones typical of fieldwork. Participants in this study showed no aversion to the headset, probably due to the ubiquity of telephone headsets and personal listening devices.

Moving Forward

Social and ethnic identities are expressed through speech, and for this reason sociophoneticians will undoubtedly continue to investigate language contact communities. As the discipline of sociophonetics advances, with a greater commingling of its social and phonetic elements, researchers will continue to struggle with the characterization of both social and phonetic structures. In order to investigate communities in a way that provides statistical

leverage, yet captures the relevant social and linguistic variables, it is important to continue to develop tools for phonetic and social analysis. Vowel analysis of a language contact variety has been shown here to be enhanced by the consideration of dynamic features that are not typically used as markers of dialectal varieties, and the application of the community index shows promise for getting at speakers' orientation toward their community. Both of these tools will continue to help researchers account for language variation and change. The most helpful tools will be those that are flexible enough to be applied across diverse studies and will provide consistency to research on language contact.

Tools that provide efficient access to a community of speakers do not preclude empathy and compassion for community members. In fact, a genuine interest in the community is what will drive research innovation and demonstrate sociophoneticians' willingness to engage with the community. Methodologies for elucidating the role of individual choices on speech behavior will continue to evolve, and for linguists interested in language change on the community level, a variety of approaches will be required to assess social interactions. The CCM holds promise as a statistical approach to speaker/community characterization through its bottom-up approach; it requires input from community members to determine the questions that define their orientation to the community. The results of its use in the current study are encouraging, and further refinement could make it a relatively quick and effective tool for language study more broadly.

In the current study, the analysis of regional dialectal studies in the United States indicates that a more consistent characterization methodology could enhance our understanding of both synchronic and diachronic variation. The current work incorporates and builds upon methodological features of previous dialectal work, but a consensus among researchers on a protocol comprising a core set of best methodological practices for sociophonetic work would be

a useful tool to obtain consistency in dialectal research. A basic protocol would allow interested researchers to produce micro surveys of speech patterns throughout the United States without a huge expenditure of resources. If made accessible as regional corpora, methodologically consistent small surveys would contribute to a broader view of language variation.

In order to allow research from this broader view, researchers will need access to the primary data. Hand in hand with a consistent methodology for obtaining quality speech recordings, their archiving and management would require securing the recordings through an institutionally supported archiving process. The current work acts as a model for this approach through its availability online.

Finally, sociophonetics is a dual undertaking in which researchers apply new methodological techniques to both the social and phonetic realms. Through my fieldwork in Chicago's Albany Park neighborhood I have found both the phonetic analyses and the opportunity to work with participants in the community very rewarding. At the very least, I believe that this study lays the groundwork for a systematic approach to the study of Spanish/English contact in Mexican ethnic communities. I hope that the insights gained through the sociophonetic approach taken here have shed light on the subtle effects of language contact on speech, and how speakers' orientation to their community will inform predictions for the initiation and propagation of language change.

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Appendix A. CVC Wordlist

bean	tool	job	bite	fact
space	side	luck	crown	dawn
death	void	heard	meal	hope
can	foul	loop	kiss	choose
mill	beast	shine	they	heed
hot	vent	in	sled	coin
walk	thawed	bait	hand	full
rust	make	tell	dock	deed
sense	it	cough	small	sick
boat	false	home	hid	main
pod	both	cook	roof	smug
should	soon	voice	lean	tube
mule	sour	moon	wish	most
guide	mile	head	prude	dig
town	she	lull	rice	bout
be	big	tax	doubt	hood
hook	paid	late	pile	dull
game	fetch	lid	drown	rip
cab	bad	each	love	text
lot	fun	fade	hued	strong
come	crowd	clan	this	coal
thud	give	doll	bane	much
poke	tape	from	leg	nod
bull	pal	who'd	and	tall
loud	such	code	wool	mind
pine	sail	loose	south	boil
dog	bone	white	man	toed
then	toyed	deep	dock	wet
pin	jade	hill	feed	lane
keep	dish	age	had	rise
scale	these	them	less	dune
hide	glad	gap	math	shrug
have	gawk	log	on	fell
mob	lunch	book	pen	van
run	good	how'd	street	hole
clone	heal	you	melt	con

Appendix B. SPIN Sentences

Unlock the door and turn the knob.
Lubricate the car with grease.
The old man discussed the dive.
Bob heard Paul called about the strips.
I should have considered the map.
To open the jar, twist the lid.
He caught the fish in his net.
Mary hasn't discussed the blade.
Close the window to stop the draft.
My T.V. has a twelve-inch screen.
Nancy had considered the sleeves.
David has discussed the dent.
Ruth poured the water down the drain.
The boat sailed along the coast.
The cop wore a bullet proof vest.
He can't consider the crib.
The farmer harvested his crop.
All the flowers were in bloom.
I am thinking about the knife.
David doesn’t discuss the hug.
To store his wood he built a shed.
You've considered the seeds.
Miss Black knew about the doll.
The Admiral commands the fleet.
She couldn't discuss the pine.
Bill might discuss the foam.
The beer drinkers raised their mugs.
After his bath he wore a robe.
The ship's captain summoned his crew.
Mr. Black knew about the pad.
Nancy should consider the fist.
I made the phone call from a booth.
Tom wants to know about the cake.
She's spoken about the bomb.
They marched to the beat of the drum.
We hear you called about the lock.

You're glad they heard about the slave.
You hope they asked about the vest.
The cushion was filled with foam.
For your birthday I baked a cake.
The railroad train ran off the track.
They did not discuss the screen.
She's glad Jane asked about the drain.
Tear off some paper from the pad.
I had a problem with the bloom.
Peter should speak about the mugs.
Watermelons have lots of seeds.
The sport shirt had short sleeves.
She wants to speak about the ant.
You cannot have discussed the grease.
We hear she called about the drum.
They fished in the babbling brook.
Tom could have thought about the sport.
Miss Smith knows about the tub.
They drank a whole bottle of gin.
Bob was cut by the jack knife's blade.
Mr. Black considered the fleet.
The airplane went into a dive.
We're lost so let's look at the map.
I want to know about the crop.
He hit me with a clenched fist.
The rancher rounded up his herd.
Betty has talked about the draft.
Tom discussed the hay.
She has known about the drug.
The airplane dropped a bomb.
Cut the bacon into strips.
We spoke about the knob.
Spread some butter on your bread.
I gave her a kiss and a hug.
Paul should know about the net.
I cut my finger with a knife.

He could discuss the bread.
His boss made him work like a slave.
The farmer baled the hay.
They're glad we heard about the track.
A termite looks like an ant.
The doctor prescribed the drug.
Football is a dangerous sport.
Sue was interested in the bruise.
Ruth will consider the herd.
Paul took a bath in the tub.
The girl talked about the gin.
Miss Black could have discussed the rope.
Stir your coffee with a spoon.
Jane didn't think about the brook.
The girl should not discuss the gown.
A bear has a thick coat of fur.
They played a game of cat and mouse.
He tossed the drowning man a rope.
Tom heard Jane called about the booth.
She wants to talk about the crew.
This key won't fit in the lock.
The woman knew about the lid.
Miss Brown might consider the coast.
Bob could have known about the spoon.
The little girl cuddled her doll
Tom fell down and got a bad bruise.
He had considered the robe.
The furniture was made of pine.
How did your car get that dent?
We hear they asked about the shed.
The baby slept in his crib.
The man could not discuss the mouse.
The bride wore a white gown.
They knew about the fur.

Appendix C. Passages

Rainbow Passage

When sunlight strikes the raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

North Wind Passage

The North Wind and the Sun were disputing which was the stronger, when a traveler came along wrapped in a warm cloak. They agreed that the one who first succeeded in making the traveler take his cloak off should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew the more closely did the traveler fold his cloak around him, and at last the North Wind gave up the attempt. Then the Sun shone out warmly, and immediately the traveler took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two.

Stella Passage

Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station.

Angela Passage

While on a walk, Angela saw a mob boss driving down the hill to meet his pals at the dock. As a reporter, she knew that death sells, and hopped into a cab to follow him. When she arrived, she hid behind a wall. The weather was cold and wet, but that's not what made the pen in her hand shake. In fact, it was his hot breath: "Listen doll, I wish you would go away." He coughed and left. She felt a little sick and decided this was the wrong day to dig further into this story.

Appendix D. Participant Language History and Background Form

PARTICIPANT LANGUAGE HISTORY AND BACKGROUND

We will use this questionnaire to find out about your language experience, how proficient you are with the languages you use, and how much you use different languages in different situations. It will take 5-10 minutes to fill out. There are some questions asking about your racial/ethnic background, education, and details about the family you were raised in. These questions allow us to figure out how your background might affect how you speak. You will complete the first page of the questionnaire on your own and then the experimenter will ask you the rest of the questions and write down your answers. Remember, You may skip any questions that you do not wish to answer.

Participant Information

☐ MALE ☐ FEMALE age: _____ Occupation(s): _____

What is your ethnic background: ☐ Hispanic/Latino ☐ Not Hispanic/Latino

What is your racial background:

☐ South Asian ☐ Native American ☐ Hawaiian/Pacific Islander
☐ East Asian ☐ White ☐ Other _____
☐ Southeast Asian ☐ Black/African American

Your education history:
☐ didn't complete high school ☐ some college ☐ post-graduate education
☐ high school graduate ☐ college graduate

Your mother's education history:
☐ didn't complete high school ☐ some college ☐ post-graduate education
☐ high school graduate ☐ college graduate ☐ don't know

Your father's education history:
☐ didn't complete high school ☐ some college ☐ post-graduate education
☐ high school graduate ☐ college graduate ☐ don't know

When you were a child, how many children were raised in your home (including you, your siblings, half- or step-siblings, and other children)? _____

Of these children, which number were you (where '1' is oldest)? _____

Did you ever have any hearing impairment or language disability? Please explain:

STOP. The experimenter will now ask you the following questions and will fill in your answers in the spaces below. Feel free to look at the questions before handing the form back to the experimenter to complete.

Language Use in Childhood

1. Where have you lived and how old were you when you lived there?

2. What language(s) did your parents/caretakers speak with you when you were young? What percentage of the time did they speak each language? (Did you notice any foreign or regional accents?)

3. What language(s) did you speak with your parents/caretakers? What percentage of the time did you speak each language?

4. Did anyone speak other languages in your home (including on television)? If so, who, and how often (percentages)? Did you speak or understand any of these languages?

5. If people spoke more than one language in your home, was there any language-mixing, where more than one language was used within a single sentence? Describe how often this happened (never, sometimes, often), and who spoke this way. What topics or situations encouraged mixing?

6. How old were you when you started school (or preschool/daycare), and what languages did people use at school (percentages)? Describe any differences between language use in class and on the playground.

7. As a child, what languages did you hear in your community, outside the home? Were there any languages you heard often (on the street, in grocery stores, etc.). If you moved around a lot, can you describe any language differences between the places you lived?

8. Did you ever hear or use other languages in any special settings (e.g. church, when visiting relatives, etc.)? If so, please describe. How often did this happen?

9. What language(s) did you use in high school (percentages)? Describe any differences between language use in class and outside of class.

Language Use in Adulthood

10. List all of the languages you have spoken or studied in school. For each language (including your native language), give the age at which you started learning it, the number of years you have spoken it, and the number of years you studied it in school. On a scale of 1-10, where 1 = poor and 10 = native speaker, rate your current proficiency at expressing your ideas, following conversation, and pronunciation in each language.

Language	Age	Yrs spoken	Yrs school	Express	Comprehend	Pronounce

11. Which languages do you currently use on a regular basis? For each language, on average, how often do you use it (percentages), and with whom?

12. Are there any other languages that you hear on a regular basis but don't speak? For each language, how often do you hear it (hours/week), and from whom?

Language Identity (for bilinguals only)

13. What language would you call your dominant language? If there is more than one, does your choice change depending on where you are or what you are talking about? If so, how often is each language dominant?

14. What culture do you identify with? On a scale from 0-10, please rate how much you identify with that culture. Examples of possible cultures: American, Mexican, Catholic, Jewish, etc.

15. If you wanted to read an article that is available in any language, which language are you most likely to read it in? How often (percentage-wise) would you choose to read it in each of your languages?

16. If you had just met someone who is equally fluent in all your languages, what percentage of time would you choose to speak each of your languages?

17. What language(s) do you typically think/dream in? When you do math in your head, what language(s) do you use? (24 + 13 = ??). Does this differ depending on time/place?

18. In what order did you learn your languages?

English

Age when you…	began acquiring English	became fluent in English	began reading English	became fluent in reading English

Please list the number of years and months you spent in each language environment:

	Years	Months
A country where English is spoken		
A family where English is spoken		
A school and/or working environment where English is spoken		

On a scale from zero to ten, please select your *level of **proficiency*** in English:

Speaking:	Understand spoken language:	Reading:

On a scale from zero to ten, please select how much the following factors helped you learn English:

Interacting with friends	Reading	Watching TV
Interacting with family	Language tapes/self instruction	Listening to the radio

Please rate to what extent you are currently exposed to English in the following contexts:

Interacting with friends	Reading	Watching TV
Interacting with family	Language tapes/self instruction	Listening to the radio

How much of a foreign accent do you think you have in English? Rate from 1-10:

Please rate from 1-10 how frequently others identify you as speaking with an accent in English:

Spanish

Age when you…	began acquiring Spanish	became fluent in Spanish	began reading Spanish	became fluent in reading Spanish

Please list the number of years and months you spent in each language environment:

	Years	Months
A country where Spanish is spoken		
A family where Spanish is spoken		
A school and/or working environment where Spanish is spoken		

On a scale from zero to ten, please select your *level of **proficiency*** in Spanish:

Speaking:	Understand spoken language:	Reading:

On a scale from zero to ten, please select how much the following factors helped you learn Spanish:

Interacting with friends	Reading	Watching TV
Interacting with family	Language tapes/self instruction	Listening to the radio

Please rate to what extent you are currently exposed to Spanish in the following contexts:

Interacting with friends	Reading	Watching TV
Interacting with family	Language tapes/self instruction	Listening to the radio

How much of a foreign accent do you think you have in Spanish? Rate from 1-10:
Please rate from 1-10 how frequently others identify you as speaking with an accent in Spanish:

Appendix E. Interview Outline

Community

What's your neighborhood like? How would you describe the people in the neighborhood? Do people in the neighborhood get along well?

Do you think residents here feel that Albany Park is a separate community in Chicago? What are the borders of the community? In other words, when does the neighborhood seem unfamiliar? What is a major intersection near your home?

Do you use any of the neighborhood facilities, like parks, community centers, libraries, open gyms?

What types of people live in your community? What kinds of people are a part of the community, and what kinds aren't? Are there people that claim to be part of the community, but aren't?

If you live in an apartment, do you know the other people in your building? If you are in a house, do you know your neighbors? Who lives on your block?

Do many people speak Spanish in your neighborhood? What would you say is the main problem for speakers of Spanish in Chicago today?

What other languages are spoken in the community? Do you speak with these people much? Which ethnic groups?

Is this a good community to grow up in? Why or why not? Is crime a big issue in your neighborhood?

What are the best and worst things about living in this area?

Individual

Where do your best or closest friends live? In your neighborhood? Do most of your friends know each other as well as knowing you?

Do you go to church? Which one? Do you have many friends from the church? Do any of your friends go to this church?

Do you take part in any groups that meet regularly? (Youth groups, church, sports, cards) Are these groups with school/work friends?

Do you follow politics? local? national? Do you go to political events? For example, do you know the name of your alderman or precinct captain?

Do you have any relatives who live in your neighborhood? How many?

Do you have many family members in the community? Co-workers?

Do any of your coworkers (school friends) live in your neighborhood? Are they the same sex as you? Do you spend time with them after work or on weekends? Holidays?

Do you have kids? How many? What are their ages? How would you describe their ability to speak Spanish? English?

Where did you go to school? Do you still have friends from school?

When did your family come to the US from Mexico? Where did they first settle? Where were your parents born? When did they move to Chicago? (map of Mexico)

Students: What's your major? Do you socialize with your classmates outside of school? Do you go to school with 2 or more people from your neighborhood? What do you plan to do when you finish school? Do you plan to stay in Chicago after graduation?

Workers and professionals: What do you do for a living? What is your title or position? How do you like working there? How long is your commute? Do you socialize with people from work? Do you work with 2 or more people from your neighborhood? Are they the same sex as you? Do you work with people from different ethnic groups? Which ones? What do you plan to do when you retire?

Affiliations

How do these areas tie in with other relations – family, workmates, etc.

school work church sports clubs holidays

Talk about your heritage a bit. Do you feel proud to be Mexican American? What term do you use to describe yourself? As a Mexican American, how comfortable do you feel living in Chicago?

What do you usually do when you have some spare time?

Do you get your entertainment in the community? for example, movies, concerts, clubs?

Do you read any newspapers or magazines? Which ones?

Do you have any questions that you would like to ask concerning the interview?

Appendix F. Cultural Consensus Model Questionnaire

Question	Domain
Do you speak Spanish every day?	Language
Do you use public transportation more than once a week?	Public
Do you go to a church more than once a month?	Family
Do you ever dream in Spanish?	Language
Do you feel the police are effective in your community?	Public
Do you know a good place to get carnitas?	Food
If you had a daughter, would you like her to have a Quinceañera?	Family
Have you visited Mexico in the last 3 years?	Mexico
Do you buy food from food carts in your neighborhood?	Food
Do you visit the Pilsen neighborhood?	Mexico
Do more than half of your friends speak Spanish?	Language
Do you talk about politics with friends?	Public
Have you eaten a home-made tortilla in the last year?	Food
Would you like to see relatives more often than you do now?	Family
Do you hope to visit Mexico in the future?	Mexico