Fronting of /æ/ and /ɛ/ before /g/ in Seattle English: Effects of Style and Gender

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Honors Thesis

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Linguistics 499: Undergraduate Research

Winter and Spring Quarters 2009

June 12, 2009

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ABSTRACT:

Seattle's comparatively under-studied dialect is often considered nearly left undifferentiated from the rest of the western United States, but in fact it exhibits salient features different from this "Western" dialect. This study intends to investigate style-based differences affecting one such feature: raising and fronting of BAG class items /æ/ and BEG class items /ɛ/ to [e:] before [g]. Based on the fact that /æ/ raises and fronts by a greater phonetic distance than /ɛ/, this study hypothesizes that /æ/ will raise and front more frequently and by a higher degree in more casual styles. This study hypothesizes that /ɛ/ will not change with style; we expect this linguistic change to be taking place below the level of consciousness and such variation by style would have no motivation. Acoustic measurements will be taken on corpus data from the Pacific Northwest English Project (Wassink and Conn, in progress) for three male and three female speakers, first defining each speaker's vowel space and then showing the amount of raising and fronting across style.

I. Statement of the Problem and Purpose of the Study

Seattle's dialect of English is relatively understudied despite the presence of numerous salient characteristics such as /oʊ/ monophthongization, /u/ and /oʊ/ fronting, pre-lateral mergers of back vowels and /æ/ and /ɛ/ raising before [g] (Wassink and Conn, in progress). Labov, Ash and Boberg (2006) note in their section on the western United States that regarding Seattle and Portland that "there is nothing in the ANAE data to support the identification as phonologically distinct from the rest of the West." Labov, Ash and Boberg (2006) also cite Carver (1987), noting that he distinguishes the Pacific Northwest on the basis of "western" lexical items, but they do not appear to have any phonological correlates. The Pacific Northwest English Project- (Wassink and Conn, in progress) hereafter referred to as PNWE - is a broad attempt at defining Seattle's dialect, but this study investigates effects of style and gender on a single change. /æ/ raising and fronting before [g] is a phonological phenomenon which occurs in other dialects of English in the United States, as is /ɛ/ raising and fronting before [g], but there is no documented dialect which raises and fronts both vowels in such a context, leading to a unique potential three-way merger of /æ/, /ɛ/ and /e:/ before [g]. This study is needed to document what may be a linguistic change in progress and try to define the distribution of the change. It also may show that this change is not diffusing regionally in a typical way – this change is often associated with the Midwest (Baker, Mielke and Archangeli, 2008), which is obviously quite a distance from the Northwest.

II. Introduction and Theoretical Framework

Each velar consonant has a raising and fronting effect on the preceding vowel, that is, it which lowers F1 and raises F2 (the classic "velar pinch," which causes raising of F2 but lowering of F3, is not of interest here). This often corresponds to the physiological effect of raising the tongue dorsum. These are the changes in formants involved in a shift from /æ/ to [e:] and /ɛ/ to [e:] (Baker, Mielke and Archangeli, 2008). Thus, a phonetic motivation is suspected for such a sound change. Further, an earlier study of speakers who exhibit this sound change (Squizzero, 2008) shows this vowel to be somewhat diphthongal, or broken; the vowel starts off as an [æ] comparable to that of the same vowel in other non-raised contexts (Figure 2), and then gradually F1 lowers and F2 raises to a point comparable to the vowel [e:] in other phonetic environments (Figure 1). The acoustic trajectory of this vowel, however, is very different from the "changed" /æ/ found in Philadelphia (Labov, 1994), which has formant values beginning in a position of a speaker's [e:] and centralizing towards the speaker's [æ], ending in the position of a speaker's [ə]. Another interesting point shown by Squizzero (2008) is that while the shift of [æ] to [e:] is often referred to as raising in the literature, this particular vowel shows more of a fronting effect, as F2 seems to change more than F1. Squizzero (2008)

also shows that this phonological phenomenon, generally referred to as /æ/-raising, may be more accurately referred to as fronting, given a more sizeable attested difference in F2 than F1.

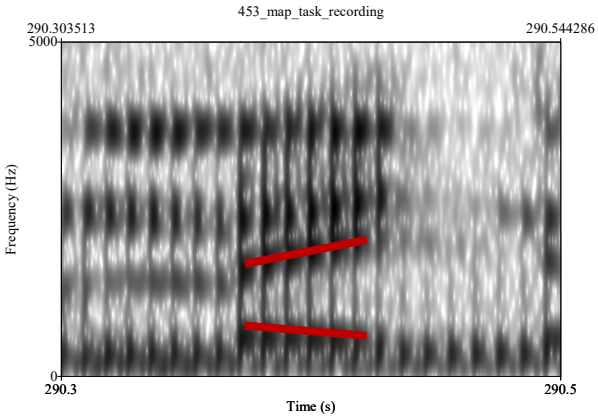

Figure 1: Magnolia

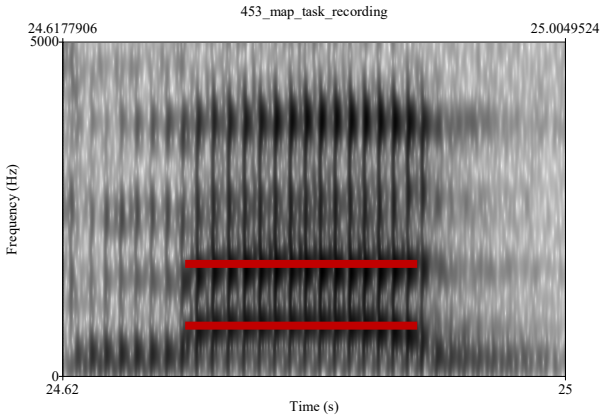

Figure 2: Mad

It is not expected that this raising occur before all velar consonants. We do not expect to see this change before [k], as voiceless consonants are known to obscure the formant transitions at the end of a word (Johnson, 2003). We are also not investigating this change before [ŋ] because [æ] is already expected to raise and front to [e:] before nasals in this dialect (Wassink and Conn, in progress) and because there are very few words in the English language containing /ɛ/ before /ŋ/.

Further on coarticulation, Harrington, Kleber and Reubold (2008) concluded that listeners compensate perceptually for the expected coarticulatory influence of an anterior consonant on [u] in Standard Southern British by judging tokens which have F2 values closer to those expected of [i:] as containing [u] when followed by an anterior consonant. It is expected that Pacific Northwest speakers similarly compensate for tokens of vowels having F1 values closer to those expected as [e:] as containing [æ] when followed by the anterior consonant /g/.

III. Review of the Literature

The earliest published studies of regional dialect variation in the Pacific Northwest were published in the 1950s and 1960s by the dialectologist Carroll Reed. Reed (1961) was an early dialectological study carried out with within the framework of Kurath (1949) and Kurath and McDavid (1961) over the geographic area of Washington, Idaho, and the adjacent areas of Oregon and Montana. Reed (1961) notes that the /ɛ/ in words such as “keg” and “egg” are infrequently realized as [e:] and [eɪ]. Reed does not further specify where the realization of /ɛg/ is occurring as [e:g] and [eɪg] geographically within the Pacific Northwest. Since 1961, the realization of /ɛ/ as [e:] before /g/ seems to have gone relatively undetected, at least from the point of view of available literature.

In contrast, Reed (1961) notes that most native speakers in the Pacific Northwest have the vowel [æ] or “slight variations” thereof in the word “bag.” This information is simply found in a list of word class items and their most common realizations and contains nothing more. This is especially interesting as the realization of /æ/ as [e:] in the literature is much better documented as occurring in a variety of regions, such as the Northern Cities, Philadelphia, (Labov, 1994) and Wisconsin (Baker, Mielke and Archangeli 2008). This is also interesting because the realization of /æ/ as [e:] would theoretically be more salient in this dialect than the realization of /ɛ/ as [e:] as /æ/ would have to move a greater phonetic distance than /ɛ/.

As evidenced by the fact that the linguistic variables here do not appear to be ascribed to a particular group within the community, this study expects to find evidence of a merger by approximation of these three vowels. The approximation mechanism is most consistent with Labov’s (1994) discussion on types of mergers,

although a merger by expansion may also be possible. This study also does not anticipate the type of merger by transfer that Labov (1994) outlines, with lexical forms gradually changing from one category to the next.

Milroy (1979) and Milroy and Harris (1981) investigated a merger of /e:/ and /i:/ in certain lexical items. He describes "Meat class" words as those which sometimes have the vowel [e:], and "Mate class" words as those which always have the vowel [e:]. Milroy and Harris investigated in what manner the present day merger between Meat and Meet coming about and if, in fact, this sound change is a merger, largely in response to Labov, Yaeger and Steiner (1972), Labov and Nunberg (1972) and Labov (1975). Milroy (1979) hypothesizes that the two vowels in Meat and Mate never completely merged, but rather approximated. He tested these questions by interacting with three inner-city working-class communities in Belfast and used methods which would elicit very casual, informal speech used when members of these closeknit social networks are interacting with each other. Milroy was able to identify about 100 occurrences of Meat class tokens with [e:] pronunciation. He determined that these lexical items are normally pronounced with [i:] – and states that no informant responded with [e:] in reading style. Milroy concludes that in Belfast, some speakers exhibit a three-way contrast for these lexical items of [e:], [i:] and [ɛ], but as for the tokens in Meat and Mate, he determined that there is a statistically significant difference between the two vowels ([e:] and [ɛ]). However, this study's informants believe that the two vowels are the same, so in short, the slight distinction between the two vowels is "preserved only below the level of consciousness" and "the residual three-way distinction is interpreted as a two-way distinction." While this study aims to discover whether there is spectral overlap between mid and low front vowels before velar consonants, these vowels may be altogether merged, or they may belong to a specific lexical set. These examples from Belfast show that the raising and fronting of the BAG (æ) and BEG (ɛ) class in Seattle English may be an example of a lexically diffusing change in progress, and that this shift may be occurring below the level of consciousness. While I do not hypothesize that this change is proceeding lexically, I do take possible lexical effects into account (see section VI). I do hypothesize, however, that one of the two linguistic changes I am investigating (raising and fronting of /ɛ/ to [e:] before [g]) is occurring entirely below the level of consciousness, while the other (raising and fronting of /æ/ before [g]) is occurring somewhat above the level of consciousness. I hypothesize that the three way-distinction between /æ/ /ɛ/ and /e:/ is analogous to Milroy's three-way distinction between [ɛ], [e:] and [i] in that this three-way distinction is interpreted as a two-way distinction ([e:] and [æ]), and I will use a similar approach (controlling for style) in investigating this possible merger.

Milroy (1979) investigated /æ/ raising before [g] in Belfast. He states that "There is evidence of a historic pre-velar raising rule that appears to have been missed in standard histories." While the patterns occurring in Seattle and Belfast may not be identical, it is possible that the realization of a historic pre-velar raising rule is currently being realized in various dialects of English throughout the world. The raising of this variable in places far away as Seattle and Belfast provides further language-internal evidence of motivations for these sound changes.

Gender is commonly shown to influence linguistic change, typically with women leading in the use of sound changes in progress (Eckert 1990, Labov 1994, Eckert and McConnell-Ginet 1999). This is often tied to the theory of linguistic capital, either because women are more status-conscious or must amass symbolic capital to alter their socio-economic status in the absence of other possible actions in the marketplace. As such, this study investigates the influence of gender on the linguistic variables. The aforementioned studies also show that women tend to be on both extreme ends of the linguistic spectrum – with working class women using more vernacular speech than working class men and professional women using more standard speech than professional men. The outcome may point to presence or absence of social significance of these variables; if considerable gender effects are shown, the theory behind language-externally motivated sound change may be attested here.

The proportion of certain phonological variables a speaker uses is shown to vary by style (Bell, 1984). This variation, when orderly, tends to reflect a particular social meaning, as it also implies the existence and

awareness of a "standard" form. Use of vernacular (as opposed to standard) language may be associated with typical non-linguistic categories associated with sociolinguistic studies, such as age, gender or social class, or they may have a more specific meaning within the context of a speaker's social networks. Theories of stylistic variation as old as attention to speech and as new as audience design all expect more standard language in more formal linguistic styles. Sociolinguistic experiments interested in stylistic variation are designed to control for style by subjecting the respondent to different types of tasks over the course of an interview (see Labov, 1984). We expect to see raising and fronting of /æ/ before [g] influenced by style based on impressions from metalinguistic commentary that this linguistic change is occurring partially above the level of consciousness and for reasons explained in Section IV. If speakers are able to identify a form as standard or vernacular, they are often able to orient themselves toward one end of the sociolinguistic spectrum. Conversely, if the social awareness is lacking, speakers will be unable to intentionally choose their language based on social meaning, and no clear effect for style should be reflected in the data.

Numerous studies since Labov (1966) have shown correlation patterns of style with social class – the more formal the style, the less use of nonstandard regionally-marked forms, with each social class starting its correlation line at a different point on a graph. I argue that the raised variants of the two vowels of interest before /g/ in this study are not socially marked, and as such the study is not investigating the issue of social class. However, it is possible that the speakers are aware that their pronunciation is in some way nonstandard and adjust their pronunciation accordingly with style, consistent with Bell (1984). This pattern is an expected result of this study.

IV. Questions and Hypotheses

This study has five research questions:

1. Is there spectral overlap between /æ/ /ɛ/ and /e:/ (raising of /æ/ and /ɛ/ to /e:/). before [g] centered around [e:] in native speakers of Seattle English?
2. Does conversational style influence raising and fronting of /æ/ to [e:] before [g] in these speakers? If so, how?
3. Does gender influence raising and fronting of /æ/ to [e:] before [g] in these speakers? If so, how?
4. Does conversational style influence raising and fronting of /ɛ/ to [e:] before [g] in these speakers? If so, how?
5. Does gender influence raising and fronting of /ɛ/ to [e:] before [g] in these speakers? If so, how?

H1: Yes, this spectral overlap is present.
H2: Yes, conversational style does influence this raising. Speakers will raise more frequently and to a higher degree in more casual styles, as this is a non-standard feature of American English.
H3: Despite Labov's (1994) observations, I do not expect any influence of gender on this variation.
H4: No, conversational style does not influence this raising. I believe almost all tokens of the vowel /ɛg/ will be realized as /e:/ regardless of style.
H5: Despite Labov's (1994) observations, I do not expect any influence of gender on this variation.

V. The Design – Methods and Procedures

For the analysis, I will use corpus data from the PNWE study to examine this variable. The PNWE study involves data collected from two types of speakers: lengthy interviews with indigenes (Judgment Sample) and shorter interviews with speakers living in Seattle (Random Sample). I will only be using the data from the judgment sample in order to control for variation that speakers raised in other parts of the country may be

bringing with them to Seattle. This project has approval from the University of Washington Human Subjects Research Division and all speakers who agreed to participate in the PNWE study that I will be using in this study also agreed to allow their data to be used for follow-up studies at the University of Washington and Portland State University. As a result, this project will not require any further Human Subjects approval. I will examine 6 speakers (3 males, 3 females), and there is approximately an hour and a half of speech available for each speaker. Two speakers who already know each other personally are interviewed in each session, usually lasting 3-4 hours. The project collects demographic data for age, gender, ethnicity, social class at birth, social class now, regionality, neighborhood and education, as well as data for study of koineization and social network analysis. The study is also designed to collect five styles of data – conversational (dyad, each speaker with a close friend or family member), demographic data (each of the two speakers from the dyad speaker one-on-one with the researcher), linguistic tasks (eliciting lists of items, specific lexical items, minimal pairs, syntactic and semantic differentials), a short reading passage ("The Cat and the Mice," from Aesop's fables) and a word list (177 words, three repetitions each in the carrier phrase "Write ___ today"). The styles are elicited in the above order as it is more effective in eliciting casual speech. Starting with a more formal style may cause the respondents to use more formal speech in the conversational and demographic data portions of the interview (Labov, 1984).

The project records speakers with an M-Audio 24/96 microtrack digital recorder with two XLR microphones, one for each speaker. The recording will have a 44.1 kHz sampling rate and 16-bit WAV encoding and will be downsampled to 22.05 kHz using Praat. The first and second formants of each token will be examined using the program Praat's formant listing command and the pitch will be examined using Praat's autocorrelation tracking. I will use a window length of 400 milliseconds, a view range of 0 Hz to 3500 Hz, a Pitch range of 55 Hz to 500 Hz and a dynamic range of 50 dB. Respondents are typically interviewed in one of the two respondent's homes in an attempt to make them more comfortable and elicit more natural speech, which is especially of interest during the more casual interview styles. Respondents are seated across from each other at a table, with the researchers positioned across from each other next to the respondents. Certain identifying information (mostly names, including first names) are removed from the recording when they are uploaded to the project's workspace. The conversational and demographic data portions of each interview are transcribed into English by a professional and verified by a researcher working on the project. The words of interest for the conversational, demographic data and linguistic task portions of each interview are marked with a text tier in Praat, which allows the researchers to see the word of interest (in English orthography), a transcription in IPA, the historic word class, the topic being discussed and the onset and offset of the vowel being measured.

I will measure the vowels in question using acoustic analysis. In addition to measuring /æ/ and /ɛ/ before [g], I will measure these vowels before another consonant, where possible [d], in order to define each speaker's vowel space and subsequently make statements as to whether the vowels in question are raised or not. I choose [d] because it is shown to have little influence on the preceding vowel and because it is a voiced stop, before which vowels tend to be longer in English. If I cannot find a word with the vowel I am looking for followed by a [d] in a particular portion of the interview, I will replace it with a word ending in a different consonant, always trying to keep the vowel long and minimize the coarticulatory effect of the preceding consonant on the vowel. I will extract the first three formants of each vowel I select using a script for Praat (205080.praat) written by Alicia Beckford Wassink. The script provides me with the measurements (in Hz) in a format which can be easily concatenated with each speaker's demographic data and the style of speech for each token using the program Akustyk (for information about what Akustyk keeps track of to combine with the script's data, see Appendix A). I will determine the onset and offset of each vowel, and the script will take measurements of the first three formants at onset, 20% after the onset, 50% after the onset, 80% after the onset and the offset. The script also takes timestamp measures (to keep track of which token of the word it is examining) as well as duration and pitch measures. I will examine the relational frequencies of the first two

formants of these vowels along with duration to determine the degree of spectral overlap between them. I will look at plots of the measures taken at 20%, 50% and 80% separately rather than calculating an average. The third formant is being measured for normalization – using Nearey's log mean method. I will use the Spectral Overlap Assessment Metric (SOAM), which is the theory behind VOIS3D, a program authored by Wassink (see Wassink 2006) which will plot the formants and length of each vowel for each speaker and calculate and draw ellipses of each vowel within a specified number of standard deviations of the mean. VOIS3D also allows the user to select certain data at a time, grouped by sociolinguistic variable, phonetic environment, and/or speaker.

Many of the vowels in question have already been measured and will continue to be measured as part of the ongoing PNWE Study. To explain this more fully, I will list the vowels and words I will be investigating. The word list has one token of /æg/ (bag) and two of /ɛg/ (egg and beg), all have three repetitions each. I will also examine one token of /æd/ (had), one of /ɛd/ (head), and one of /e:t/ (hate), also with three repetitions each. All of these will be measured by researchers working on the PNWE Study. The reading passage has one token of /æg/ (bag) and two of /ɛg/ (legs and peg), however I will only measure one as the initial lateral in "legs" will distort the vowel. I will also examine one token of /æt/ (cat), one of /ɛd/ (dead) and one of [e:s] (paced). "Bag" and "dead" will be measured by the researchers on the PNWE study, and I will measure peg, cat and paced. Each token is repeated only once - except cat, which I will measure only once for the sake of consistency. The linguistic tasks have two tokens of /æg/ (bag and tag), one token of /ɛg/ (egg) all with at least one repetition and potential for other repetitions. I will measure one token of /æd/ (bad), one of /ɛt/ (set) and one of /e:k/ (bacon). The only words being measured in the linguistic tasks section by PNWE researchers are "egg" and "bacon." The demographic and conversational portions do not elicit any specific words, but "bag," "beg" and "egg" are automatically measured by the researchers up to three times each in both the conversational and demographic styles (so up to six total between the two conversations) if speakers say them. I will look for other /æg/ and /ɛg/ tokens in the transcriptions and measure them as available (up to three times each). Because it is difficult to predict which words will come up in the conversational and demographic data portions, I will be using the most frequently occurring measures of /æd/, /ɛd/ and /e:d/ which the researchers take for each speaker (to be determined after that analysis is complete for the six speakers I am examining).

Table 1: Number of tokens for each environment, per speaker, by style

(Environment)	Conversational	Demographic	Linguistic Tasks	Reading	Word List
/e:g/	variable	variable	0	0	0
/e:d/	variable	variable	0	1	1
/e:k/	variable	variable	1	0	0
/ɛg/	variable	variable	1	1	2
/ɛd/	variable	variable	1	1	1
/æg/	variable	variable	2	1	1
/æd/	variable	variable	1	1	1

VI. Results

First, spectrograms will be provided to clarify the phonetic nature of two of the phonetic variables of this study. Then, trajectory plots will be provided to address the first, second and fourth research questions – the presence of spectral overlap and stylistic effects. Trajectory plots will prove particularly invaluable in the investigation of these phonetic variables. Following those plots, Spectral Overlap plots generated by VOIS3D

will address the effect of gender on these variables. Lastly, tables of spectral overlap measures will address all the research questions by explaining the effects of style and gender on the overlap of these variables.

Spectrograms

The spectrograms below are examples of one speaker's pronunciations of (tag) (Figure 3) and (bad) (Figure 4). Consistent with the spectrograms in Section I from Squizzero (2008), the end of the formants in (tag) show the raising (F1 decrease) and fronting (F2increase) characteristic of pre-velar vowels. The spectrogram of (bad) shows centralization – the opposite of the pre-velar raising and fronting – with an increase in F1 and decrease in F2. Upon closer inspection, this phenomenon is somewhat visible in the spectrogram of (mad) in Section I from Squizzero (2008), although the effect is much more gradual below, starting around the 60% point of the vowel as opposed to near the offset in the spectrogram in Section I. This centralization is also attested for BEG class items. Relevant patterns of the raising and fronting process and the centralization process as well as inter- and intra-speaker variation will be discussed in the coming paragraphs.

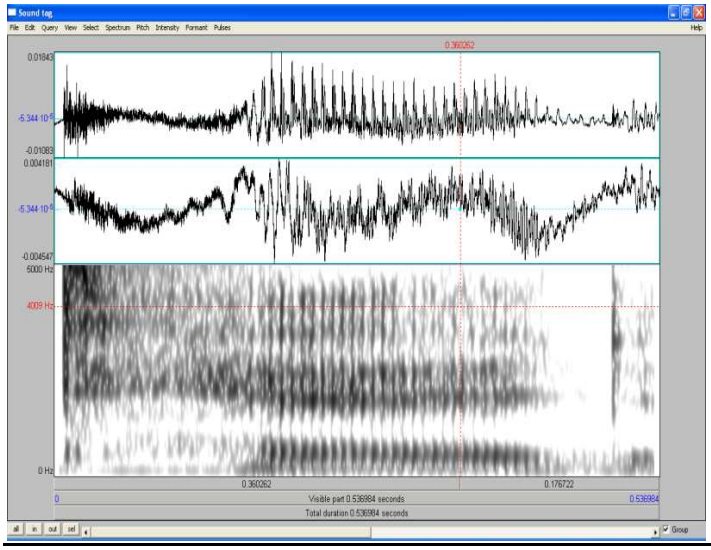

Figure 3: Spectrogram of (tag)

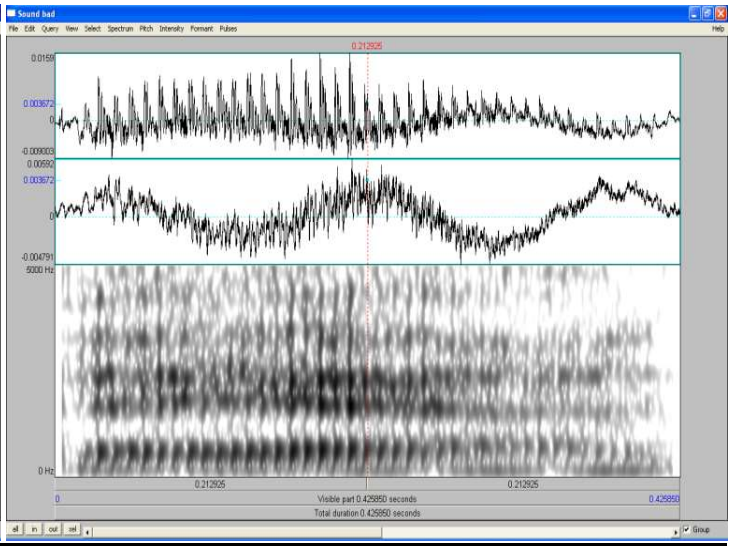

Figure 4: Spectrogram of (bad)

Trajectory

Most speakers demonstrate raising and fronting or centralization of the vowels /æ/ and /ɛ/ depending on phonetic context. Using vowel trajectory plots, a total of six vowel shift patterns have been observed, with each speaker participating in a minimum of three of the shifts. These plots have not been normalized – values will not be compared across speakers, only the trajectory patterns themselves. Pattern 1 shows raising and fronting for /ɛg/ but centralization for /ɛd/ and occurs in five of the six speakers. Pattern 2 shows the same raising and fronting for /ɛg/ as Pattern 1, but without the centralization and occurs only for Speaker D (see figure 6). Patterns 1 and 2 show no evidence of stylistic variation. Pattern 3 shows raising of the /æg/ onset and the remaining trajectory fronting to the phonetic area of the onset occupied by /ɛ/ (both /ɛg/ and /ɛd/). Pattern 3 is shown by the same five speakers as Pattern 1, with the exception of the linguistic tasks style for speaker E. Pattern 4 shows more extreme /æg/ raising, with the onset raising to /ɛ/ and the remaining trajectory fronting to the area of /e/. This is shown in speaker D, and again in the linguistic tasks for speaker E. Pattern 5, like the centralization of /ɛ/ in Pattern 1, shows centralization of /æ/, and is shown in the same speakers that exhibit Patterns 1 and 3, with the exception of speaker A. Pattern 6 shows higher /ɛg/ raising

than in Pattern 1, and shows the onset of /ɛg/ overlapping with/e:D/. This is demonstrated in the word list and reading passage styles for speakers A and D, and in the linguistic tasks style for speakers B and C. Gender effects cannot be accurately examined using trajectory plots.

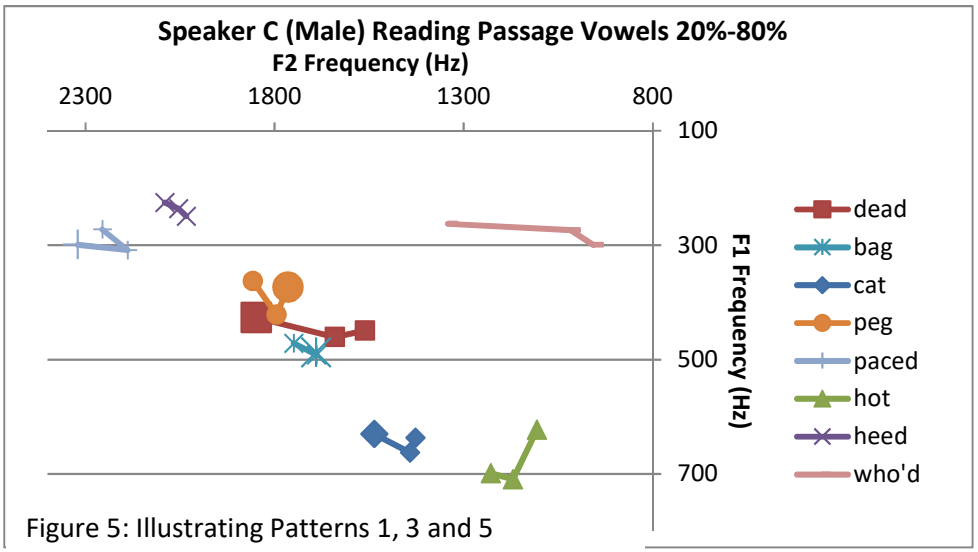

Figure 5: Illustrating Patterns 1, 3 and 5

Spectral Overlap Calculations

Vowel ellipses (normalized F1 x F2) calculated for each gender group make a separate kind of contribution to the analysis. Figures 9 combines all styles of the BEG and BACON class for females to show that BEG has joined the BACON class; it shows overlap of BEG and BACON at 89%, but it also shows overlap of BEG and BED at only 14%. Figure 12 shows that there is no merger of BEG and BACON for the men, but rather an intermediate form has surfaced. The men show 44% overlap between BEG and BACON, but 39% overlap between BEG and BED. BED and BACON are still distinct, showing 0% overlap, indicating the emergence of the BEG vowel as an intermediate variant between BED and BACON. Figures 10, 11, 13 and 14 show the wide area of the BAG class, indicating complete overlap of the BED class and the BAG class (100%) and partial overlap between the BAG class and BAD class (61%) fo r females (see

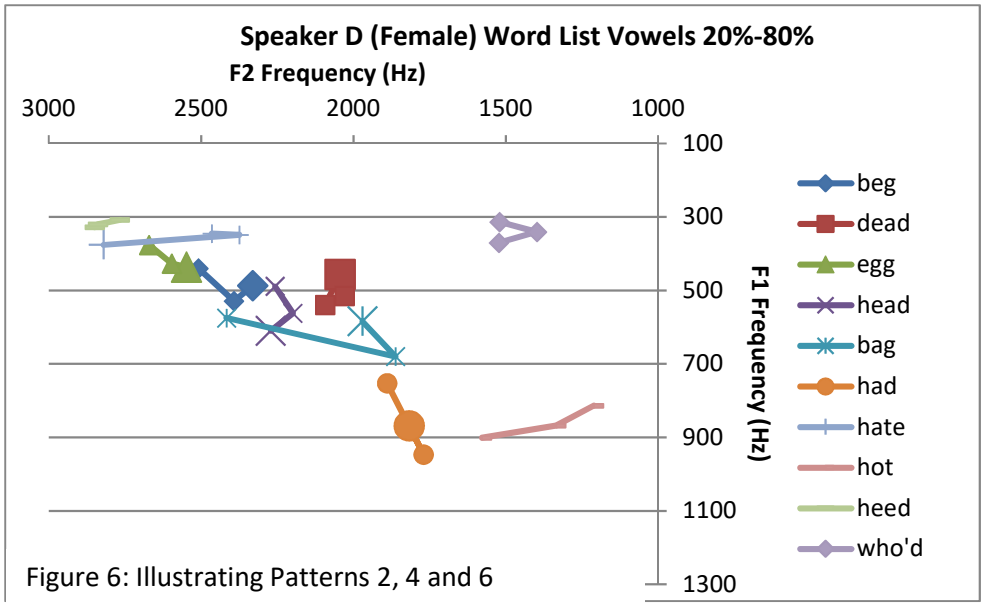

Figure 6: Illustrating Patterns 2, 4 and 6

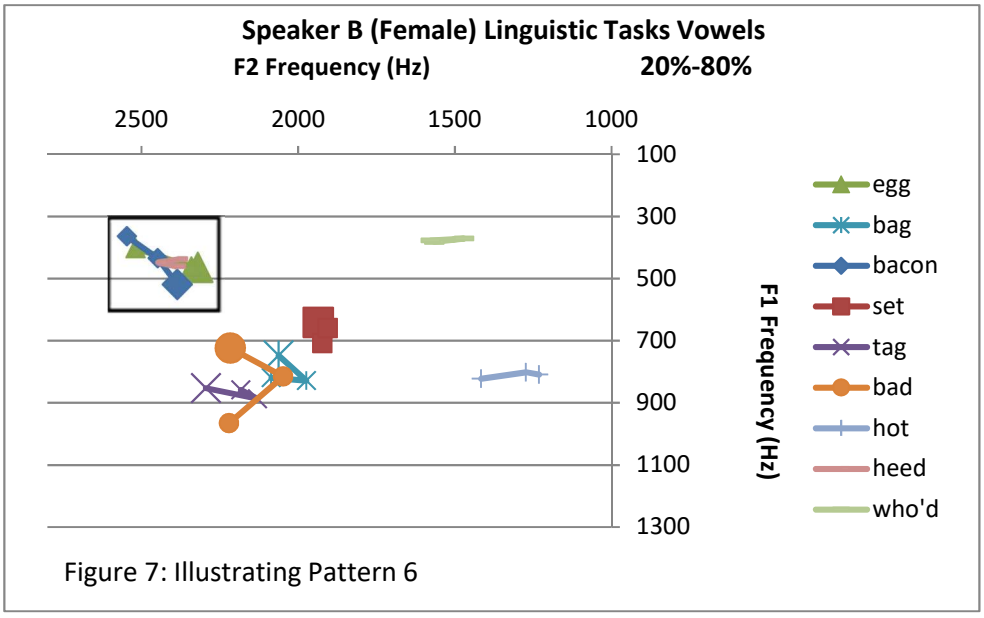

Figure 7: Illustrating Pattern 6

Figure 10 specifically). Figures 11, 13 and 14 indicate that the wide area of the BAG class is not exclusive to females. Figure 11 shows that men have 88% overlap between the BED and BAG classes, but also 81% overlap between the BAD and BAG classes. Figure 14 shows the most robust evidence this study has produced for a total merger (96% overlap) of the three vowels – for males in the linguistic tasks style. This is evidence of a merger by expansion as (consistent with Figures 10, 11, 13 and 14) the BAG class items have the largest area of phonetic variability. It is clear that for men in the linguistic tasks style (Figure 14), the BAG class has expanded to include the area of BEG and BACON class items. Figure 13 shows overlap of the same three vowels for all styles of speech; from this view, the BAG class is not as large nor as far fronted as in the linguistic tasks style, and the BEG and BACON classes take up a larger area.

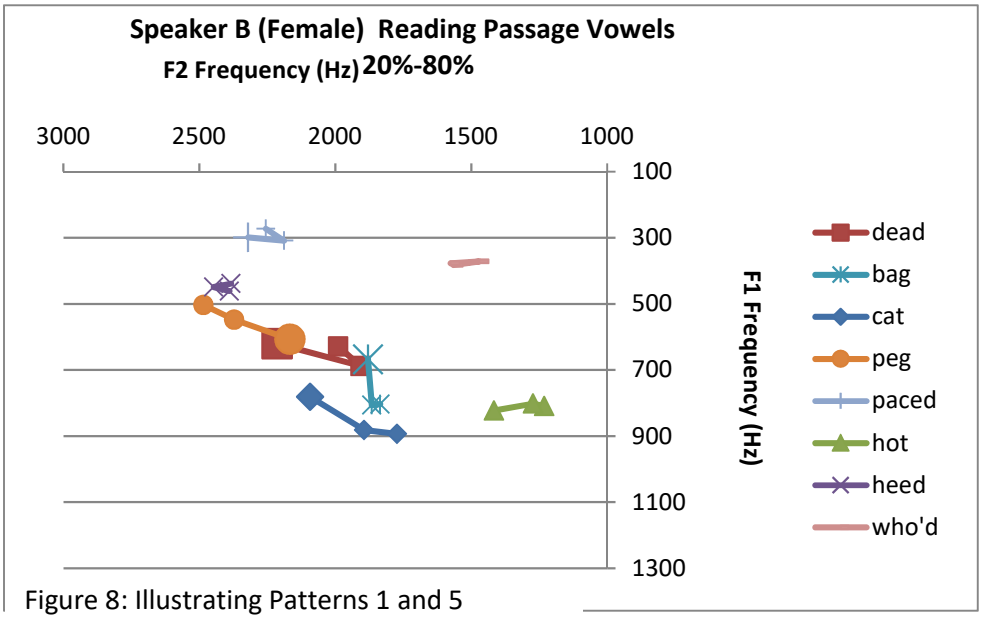

Figure 8: Illustrating Patterns 1 and 5

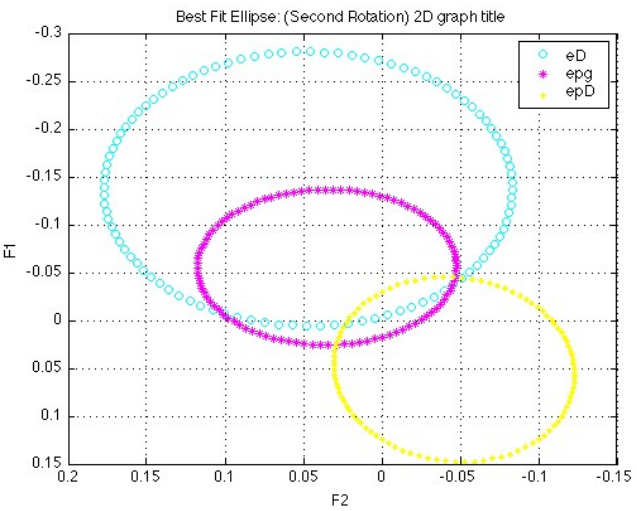

Figure 9: BACON, BEG and BED class items for females (all styles)

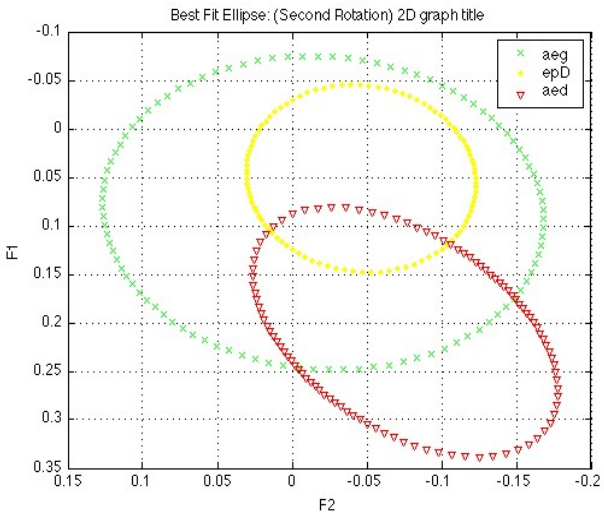

Figure 10: BAG, BED and BAD class items for females (all styles)

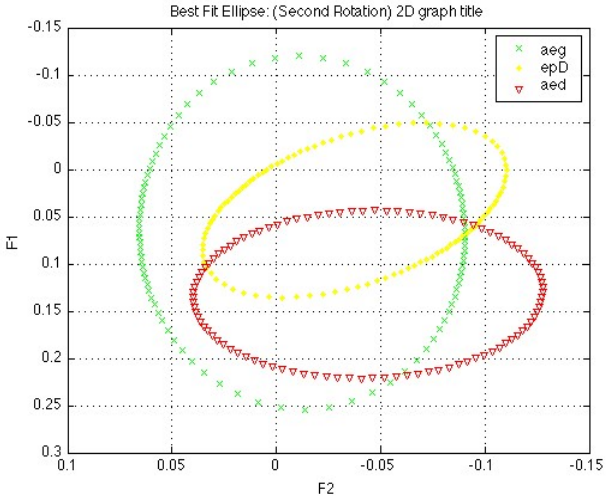

Figure 11: Figure 10: BAG, BED and BAD class items for males (all styles)

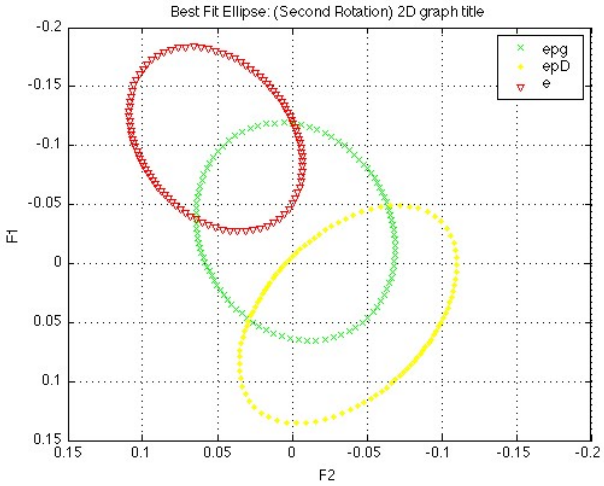

Figure 12: BACON, BEG and BED class items for males (all styles)

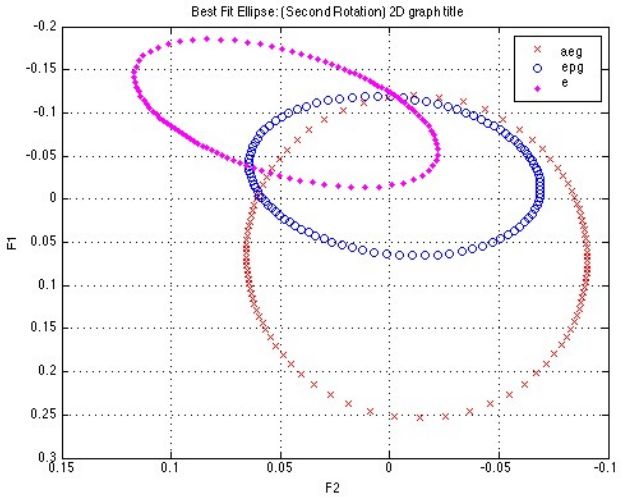

Figure 13: BAG, BEG and BACON class items for men (all styles), indicating 96% overlap

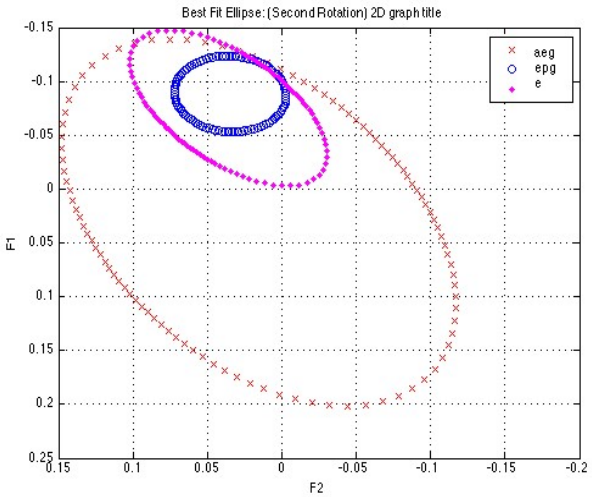

Figure 14: BAG, BEG and BACON class items for men (linguistic tasks style), indicating 96% overlap

Tables

Table 2 shows overlap of the vowel classes broken down by style and gender, averaged across speakers. By spectral overlap measure, females appear to be leading in one linguistic change, whereas males appear to be leading in the two others. There is some overlap of /e:/ and /ɛ/ present in each style for both genders, but moreso in the more casual styles for women. The men seem to be lagging behind by one style for this change, with the Reading Passage values being more comparable to the Word List values for the females. The exception in this case is Speaker E, who is the most advanced in the word list style despite being a male, and who patterns more with the females for this overlap. For the other two men, merger is only present in the linguistic tasks style. However, the men appear to be leading the raising of /æg/, both in terms of overlap with /e:/ and with /ɛ/. Regarding the more moderate raising to /ɛg/, the most formal style yields 0% overlap, but the other two styles show complete overlap at 100%. The more advanced raising of /æg/ to /e:/ also does not surface in the word list style (as expected given the previous statement), but shows up to a small extent in the reading passage style and yields full merger in the linguistic tasks style. The females, on the other hand, do not

show similar raising, with the exception of 25% overlap between /æg/ and /e:/ in the linguistic tasks style. The 45% overlap value of /æg/ and /ɛg/ for the females in the word list style comes from one speaker with an overlap value of 56%; the other two speakers have 0% overlap. When combined, the result is 45%.

Table 2: Two-dimensional overlap (F1 x F2) by style and by gender

Historic Word Class:	**BACON v. BAG**			**BEG v. BAG**			**BEG v. BACON**		
Gender/Style	**WL**	**RP**	**LX**	**WL**	**RP**	**LX**	**WL**	**RP**	**LX**
Male average	**0%**	**18%**	**100%**	**0%**	**100%**	**100%**	**14%**	**29%**	**96%**
Female average	**0%**	**0%**	**25%**	**45%**	**0%**	**0%**	**37%**	**83%**	**100%**

Table 3: By-speaker overlap for the Word List style

Speaker	**Wl /æg/ v /e:/**	**Wl /æg/ v /ɛg/**	**Wl /ɛg/ v /e:/**
A (Female)	14%	56%	74%
B (Female)	0%	0%	43%
D (Female)	0%	0%	46%
C (Male)	0%	4%	0%
E (Male)	9 %	8%	83%
F (Male)	0%	0%	0%
Male avg	0%	0%	14%
Female avg	0%	45%	37%
All avg	0%	35%	42%

A Note on Elicitation Methodology

It is often accepted in the theory of sociolinguistic experiment design that in order to elicit the speaker's true pronunciation of a word for a given style, the researcher should not say the word that he wants the speaker to pronounce, rather he should use hints or cues to elicit the word from the speaker (Labov 1984). In the linguistic tasks portion of this study, specifically in the semantic differentials section, the vowels of the words for which the study is aiming to determine a specific meaning are not intended to be measured (although in the original Telsur study, they were measured), and so the researcher simply asks the subject what the difference is between the two words. One such example is "What's the difference between a bag and a sack?" (Wassink and Conn, in Progress). However, it is worth noting that despite the lack of raising evident in the interviewer's pronunciation of the words "bag" and "tag," the subjects who typically raise their /æ/ vowels before [g] continue to do so, and one even asks for clarification as to what the researcher was trying to ask[1]. This result does not suggest that the assumptions underlying this particular elicitation methodology are incorrect, however this particular instance does call into question the degree to which the perception of a subject is influenced by the pronunciation of the researcher, suggesting it may be less than previously expected.

[1] Interviewer: "What's the difference between a label and a tag (tæg)?" Respondent (#5): "A label and a what?" Interviewer: "A label and a tag (tæg)." Respondent (#5): "Oh, a tag (tɛɪg)."

VII. Discussion

Despite the early discussion (Section III) on linguistic change, it is necessary to state that this study has a synchronic focus. The scope of this experiment deals with explaining motivations for the synchronic variation and there is an insufficient amount of data to conclude how or why these linguistic variables are merging or shifting over time.

Minimally, every speaker in this study shows some degree of overlap between two of the vowels of interest. According to trajectory plots, only one style of one speaker (linguistic tasks for speaker #5) shows overlap of the three vowels hypothesized. However, the VOIS3D plots show total overlap for the linguistic tasks style for the men when taken as an average (by-speaker data unavailable due to a shortage of tokens). It is also important to mention that /æg/ usually does not raise to /e:/, but closer to the area of /ɛ/ with an offglide towards /ɪ/.

All of the vowels appearing in all of the conditioning environments in this study appear to be diphthongal for most speakers. /e:/ is a diphthongal vowel in this dialect - [eɪ]. /ɛg/ can be considered realized as /e:/ as its trajectory is most similar and the offset ends where the onset of /e:/ begins for most speakers, whereas /ɛ/ in other positions tends to centralize, distinguishing the vowel. Auditorily, I am more inclined to consider /ɛ/ to be part of the /e:/ class as well. I have been unable to identify any /e:g/ words in English that are not loan words or based on loan words (such as plague and vague). This lexical gap may provide some motivation for /ɛg/ overlapping with /e:/'s phonetic space.

/æg/ is less clear. In general, it overlaps the same area as /ɛd/ and /æd/, but with a trajectory more closely resembling that of /e:/. /æg/ has expanded to encompass a large area of the speakers' phonetic space, and as a result, it is difficult to categorize it into another class. The exact source of this widespread variability does not appear able to be categorized using the analysis techniques of this study, so we assume that the class is naturally that variable without phonological constraint until otherwise proven. This means that it has created its own type of vowel occupying unique phonetic space, with some overlap with /ɛd/ and /æd/.

This study suggests gradual phonetic change of the pre-velar variables. The spectrograms confirm that the coarticulatory effect of the following velar consonant is in fact extending farther backwards and causing a raising and fronting effect on the previous vowel – at least for /æ/ and /ɛ/. It would be interesting to see if a similar result is being caused for other vowels before /g/.

The trajectory plots do not appear to support hypothesis 2, style effects on /æg/ raising and fronting. There is some degree of /æ/ raising and fronting present for all speakers, but the only speaker who shows any sort of stylistic variation is speaker 5, who shows more raising in the least formal style. The real data in support of the hypothesis comes from Table 2's spectral overlap values. For the BACON v. BAG category, men start to raise and front in the reading passage task (at 18% overlap), and have the vowels completely merged in the linguistic tasks section. Women start to show overlap in the most formal task only. The BAG v. BEG category is a bit more nebulous, with some overlap for women in the most formal task only, but the men show overlap in the two lesser formal tasks, which is as expected.

Table 2's values, however, support the opposite of hypothesis 4: there does appear to be a substantial influence of style on the raising and fronting of /ɛg/. For BEG v. BACON, each gender group increases its overlap value as the task gets less formal, starting at 14% for men and 37% for women. In the least casual task, there is complete overlap for all speakers. In addition to the spectral overlap values, the trajectory plots provide some evidence to support hypothesis 4. Pattern 6 appears in four speakers (A, B, C and D), and only in particular styles. However, speakers A and D show the pattern in the word list and reading passage styles, but speakers B and C show the pattern in the linguistic tasks style, meaning the effect is more complicated than the simple "more formal is more standard" theory.

The results of this study serve to echo calls in the field for a more-involved level of phonetic analysis, such as Thomas (2007). A simple plot of F1 x F2 vowel midpoints stops short of addressing the phonological

phenomena at work here, rather the trajectory plots and overlap calculations allow us to begin to understand the nature of these vowel shifts and mergers. Duration may also play a role in distinguishing some or all of these variables, as well as the duration of nuclei as opposed to offglides. The issue for the data in this study is that the suitable instances of /e:/ in the corpus for formant analysis only ever occurred before voiceless consonants, shortening their duration and making them unsuitable for comparison to tokens of other classes. The few duration comparisons (between /æg/ and /ɛg/ available were inconclusive and subsequently not included in the results section of this paper.

The corpus also provided insufficient data to test for lexical effects. It only guaranteed a small number of words for each speaker in most styles, and as for the tokens elicited in the more casual styles, any analysis would be hard-pressed to separate lexical effects from style effects. Such an area is certainly ripe for more research and could very well reveal some aspects of this variation not present from the currently completed analysis.

The phonological variables that merit the most further research are Pattern 2 (/ɛg/ raising but no /ɛD/ centralization) and Pattern 4 (/æg/ trajectory matching that of /e:/). Further research would reveal if these patterns are anomalous and idiosyncratic or actually illustrative of widespread patterns in the region. Further research may also reveal social motivations besides style and gender behind this potential variability.

Style effects on these linguistic variables conform to the expected pattern, with more standard forms ((ae) for BAG, (ep) for BEG) showing up in more formal styles. The social awareness of and attitudes toward these linguistic variables are not clearly defined. On one hand, it is certainly not the case that these changes are occurring under the level of consciousness for all speakers, but it is also not as widely known as a change such as (r) deletion.

Regarding the effect of gender, it is clear from the table providing spectral overlap that men and women are treating these linguistic variables differently. Men show more advanced forms in more formal styles for BACON v. BEG comparisons, but women show more advanced forms in BACON v. BAG comparisons. The trajectory plots, however, do not show any gender effects. The exact social meaning of these variables as pertaining to gender is unclear, if at all present. I have received no direct or indirect metalinguistic commentary involving this variable pertaining to gender. Traditional notions of women using innovatory forms or using more conservative forms for the purpose of gaining linguistic capital are not attested in this study.

This study leaves these variables open for further exploration, but it is conclusive that there is spectral overlap and trajectory overlap among the five total linguistic variables. It is also conclusive that there are style and gender effects governing the synchronic distribution of this variable, which have been shown consistently in some cases. From a dialectological standpoint, this study proves that there is a distinctive way of speaking in the Pacific Northwest and the distinctive features of this dialect are subject to the same assumptions of variationist sociolinguistics as other dialects of English. This will be the first of many projects to come in exploring the forms of English in this region, and as more linguistic and social variables are considered, we will get closer to truly understanding these distinctive features.

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