The Canadian Shift: Its Acoustic Trajectory and Consequences for Vowel Categorization

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Introduction. The Canadian Vowel Shift (CS), generally described as a systematic lowering and backing of the front lax vowels (/ɪ, ɛ, æ/; as in KIT, DRESS, and TRAP), has been investigated by several researchers over the last two decades (see Boberg 2005, 2008, 2010; Clarke, Elms & Youssef 1995; Hoffman 2010; Labov, Ash & Boberg 2006; Roeder & Jarmasz 2010; Sadlier-Brown & Tamminga 2008, among others). Using apparent-time comparisons of older and younger Canadians' vowel spaces, these studies do not always agree on the acoustic trajectory of the CS, notably whether the front lax vowels are principally receding and/or lowering; perhaps these disagreements are unsurprising given the ongoing nature of the vowel shift, the variety of birth years interviewed, and the studies' methodological differences and diverse locales. Boberg (2005) found /ɛ/ to be retracting and /æ/ to be lowering and then retracting in the speech of Anglophone Montrealers; this paper addresses the current apparent-time trajectory of the CS in one Montreal community. In addition, though several studies have investigated the CS in vowel production, nearly none (save De Decker 2010) have probed its effect on the perceptual categorization of vowels. This paper also introduces a perception experiment carried out with the same participants interviewed for production data.

I aim to address several questions in the realms of production and perception. Boberg (2008:137) concluded from his study of the Canadian English vowel system that "the regional profile of the Canadian Shift is far from clear," and given how few studies have been carried out within each major Canadian city, the sociophonetic data I present has the potential to clarify the trajectory and operation of the CS in Montreal. The dearth of research on perception of the CS is not unique: few studies have investigated the role of perception in ongoing vowel shifts (Thomas 2002). The pairing of a vowel categorization experiment with concurrent pronunciation data on the participants' own relative shiftedness is a novel methodology which offers insight into the operation of a vowel shift in active progress.

Methodology. To control for the effect of local ethnolect (a major source of variation in Montreal; see Boberg 2004), this study is limited to Jewish Montrealers (n=28), who comprise one of the city's well-established English-speaking communities (pop. 80,000). Subjects needed to have been born in Montreal to at least one Jewish parent, with English as a first or home language.

Two experiments were run in each interview. In Experiment I, participants were recorded reading a list of 44 sentences containing words with stressed /ɛ/, /æ/, /ɔ/, and /ʌ/ vowels. Target words were mostly controlled for the voicing, place, and manner of articulation of the consonant following the vowel; these linguistic factors have been shown to variably favour or inhibit shifting, unlike the status of preceding consonants (De Decker & Mackenzie 2000).

Participants then put on headphones and used a computer screen and mouse for Experiment II. Human-sounding synthetic vowel stimuli, 250ms in duration, were played to each subject as

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four large buttons of equal size, with the labels BAT, BET, BUT, and BOUGHT, appeared on the screen. 96 stimuli were produced with F1 ranging from 700 Hz to 950 Hz and F2 ranging from 1200 Hz to 1950 Hz. A 150Hz neutral tone of 250ms duration was used as a mask between each stimulus. Stimuli were played in the same, random order for every participant.

Results – Production. Age and gender were found to have several significant effects on vowels' F1 and F2 values in a two-way between-subject ANOVA. There was no statistically significant effect on the F1 of /ʌ/, but age (p=.02) and gender (p=.04) significantly affected its F2. The F1 of /ɛ/ was affected by age (p<.01) and gender (p=.06), while the F2 of /ɛ/ differed only by age (p<.01). The F1 of /æ/ was not significantly affected by age or gender, but its F2 differed by both age (p<.001) and gender (p=.02). /ɔ/ was only significantly affected in its F1, by gender (p=.05).

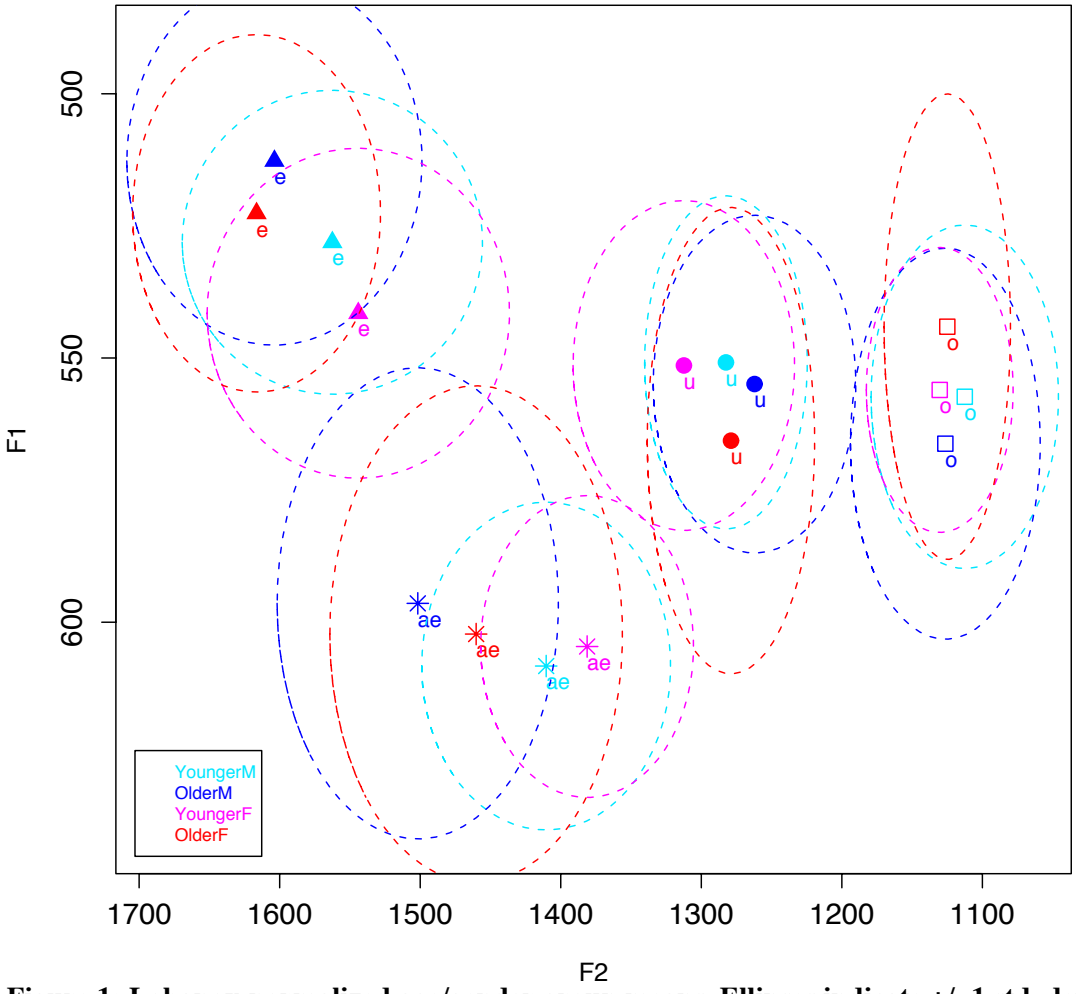

Figure 1: Lobanov-normalized age/gender group means. Ellipses indicate +/- 1 std. dev. /ɛ/ = e /æ/ = ae /ʌ/ = u /ɔ/ = o

Results – Perception. Since the perception stimuli were spaced along a two-dimensional range of F1 and F2 dimensions, response data can be presented in a number of ways to illustrate how these Montrealers' perceptual categorizations of isolated vowels differ by age and gender group. Figure 2 is a visualization of one of the most striking instances of younger and older participants drawing different perceptual boundaries between /ɛ/, /ɔ/, and /ʌ/; it charts responses to the stimuli which had F1 set at 700Hz, differing only along the single dimension of F2 (backness) from 1200Hz to 1950Hz.

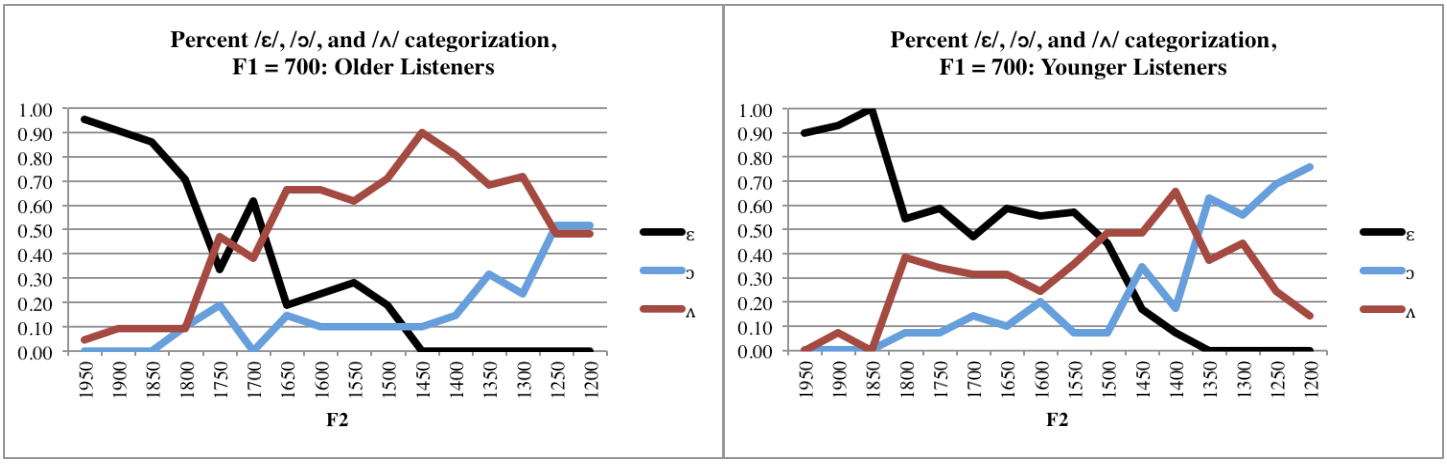

Figure 2: /ɛ/, /ɔ/, and /ʌ/ categorization, stimulus F1=700Hz

While the older group classified no stimuli with F2<1700 as /ɛ/ more than 30% of the time, younger listeners took until F2<1500 to drop below that threshold. The lines of /ɛ/ and /ʌ/ cross each other between F2=1800 and F2=1750 and between F2=1700 and F2=1650 for older listeners; the crossover to hearing /ʌ/ for younger speakers is much farther back, at F2=1500.

Discussion. Experiment I demonstrates that /æ/ and /ɛ/ are shifting in apparent time in the vowel spaces of English-speaking Montrealers (Figure 1). An analysis of interspeaker variation shows a significant degree of ordered heterogeneity, with young women leading the change and older males retaining the most conservative pronunciations, the typical progression for a sound change advancing in a community below the level of consciousness (Eckert 1989; Labov 1990). But in contrast to what Boberg (2005) found, it seems as though the operation of the CS in Montreal now involves the retraction of /æ/ without any accompanying lowering, while /ɛ/ is simultaneously backing and lowering in the vowel space.

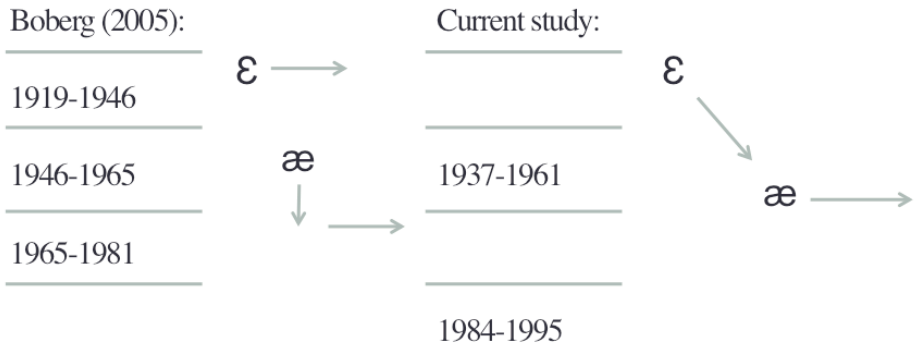

Figure 3: Comparison of subject group birth years and results from Boberg (2005, three groups) and current study (2013, two groups). /æ/ has stopped lowering, while /ɛ/ has begun lowering.

One implication of this finding could be that since Boberg's (2005) study of Montreal, the change has progressed in real time, with its trajectory evolving (Figure 3). The eldest speaker in his sample was born in 1919, and the youngest in 1981; the birth years of my older group range from 1937 to 1961, while my younger group ranges from 1984 to 1995. Given that there is a gap of three years between his youngest subject and the eldest member of my younger group, the generations are clearly not comparable. It therefore seems likely that over the last decade, /æ/ has 'bottomed out', as it were, having lowered as far in the vowel space as it will go, and is now retracting. Though the initial stages of /ɛ/-movement in Montreal may have been only along the F2 dimension, it seems that it is now backing *and* retracting into the space being vacated by /æ/. This reflects Roeder & Jarmasz's (2010) proposal for the Canadian Shift, in which /æ/ and /ɛ/ initially back and lower, before they stop lowering and only continue to retract.

In regards to intergenerational perception during an ongoing vowel shift, younger speakers "still must classify the older generations' sounds correctly – something they learned when they were small children. Thus perception cannot shift too radically away from the parents' pattern" (Janson 1983:31). But though they must be able to perceive older generations' sounds correctly, an important priority remains the perception of peers' speech. Deprived of cues as to speaker age or gender, younger participants seem ambivalent about vowel categorization in the space currently being affected by /ɛ/ retraction (Figure 2). For stimuli with F1=700, /ɛ/ assignment remains around 50% for the younger group from F2=1800 to F2=1500, while it finally drops below 50% at F2=1650 for older listeners. This illustrates Boberg's (2005:20) observation that "the retraction of /ɛ/… diminishes the margin of security between /ɛ/ and /ʌ/, potentially causing *deck* and *best* to sound like *duck* and *bust*," but the results of Experiment II suggest that only the older generation is likely to misperceive /ɛ/ in this way. Younger listeners, given no contextual information to aid their interpretations, are less consistent in their responses to stimuli lying between their mental exemplars of /ɛ/ and /ʌ/; older listeners have no such issue, perhaps because it is less relevant for their perception to register more retracted vowels as /ʌ/.

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