# MAINTENANCE OF CANADIAN ENGLISH NEAR THE AMERICAN BORDER

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## 1. Introduction

The U.S.-Canada border presents an interesting situation for studying dialect diffusion and the interaction between distance, population, and speaker identity. Since diffusion has been shown to depend on both the size and distance of communities (Trudgill 1974), we might expect border towns to share more linguistic similarities with each other. However, the border also forms a socio-political boundary which may limit the adoption of foreign variants in favour of variants linked to national or local identity. The question therefore is whether the proximity and contact between speakers near the border will lead to greater similarities or whether the border will act as a barrier for diffusion.

The current study examines this question by looking at the use of Canadian and American English variants in the Niagara border region between Ontario and New York. The primary goal is to characterize the effect of the border on the adoption of American variants in Canada. To do this, I use both a dialect questionnaire and acoustic analysis of recorded interviews. While the questionnaire focuses on non-structural features (e.g., vocabulary, phonemic incidence pronunciations, spelling, grammatical forms), the acoustic study looks more at phonetic variation (e.g., vowel shifts, mergers). I examine three regions of interest: Niagara, ON; Niagara, NY; and the Greater Toronto Area (GTA). The inclusion of Toronto allows for a comparison of how proximity to the border (Niagara, ON) and larger community size (the GTA) may affect diffusion. Additionally, I look at how patterns of diffusion and non-diffusion may interact with variable type and speaker attitudes.

In section 2, I outline the relevant background on diffusion and the border. Section 3 details the methodology and results for the questionnaire while section 4 details the interviews. Section 5 discusses and concludes on the combined results. I will show that Canadian English is generally maintained; though patterns of diffusion are identified, they are seemingly dependent on the variable and weaker than size and distance would predict, suggesting the border typically acts a barrier to diffusion.

## 2. Background

Diffusion describes the type of change spread through contact between different speech communities, as opposed to transmission of features via community-internal developments (Labov 2007). As contact typically occurs between adult speakers, diffusion mainly involves non-structural features which are more easily adapted to the speaker's system (Labov 2007). Previous studies have shown that both the size of the speech communities and the distance between them can affect how likely diffusion is to occur, with more

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diffusion typically linked to larger communities and greater proximity (e.g., Trudgill 1972, Callary 1975, Bailey et al. 1993, Boberg 2000).

The role of the border in diffusion has been of interest for many years. Avis (1954, 1955, 1956) suggested that American influence is greater near the Ontario border due to Loyalist settlement and contact with American speakers. Additionally, Allen (1959) found that American features are more likely to be adopted by Canadians than vice versa. Still, the border regions remain mostly distinct from American English with the border forming a boundary for the majority of variants (e.g., Chambers 1994, Miller 1989, Burnett 2016).

The Niagara border region is of particular interest due to the high degree of contact between speakers and with tourists. Additionally, Niagara, ON is situated between two much larger communities (Buffalo and Toronto) which allows for a comparison of distance and size effects. There is limited research on this area specifically though it is included in Chambers' (1994) Dialect Topography project. Easson (1999) analyzed this Dialect Topography data and found that most variants in Niagara, ON remain distinct from the variants used across the border. He did identify a handful of variables with increasing use of the American variants; however, there was still a sharp drop-off in rates of use at the border suggesting at least some barrier effect.

In addition to size and distance, cross-border diffusion has been shown to be related to the type of variable. As previously noted, non-structural variables like lexical differences are more likely to be involved in diffusion (Labov 2007). For pronunciation, Boberg's (2000) study of the Detroit-Windsor border found that phonemic incidence variables like foreign (a) pronunciation (e.g., *drama*, *pasta*, *taco*) are more likely to diffuse across the border than structural phonetic variables (e.g., vowel shifts). We may therefore expect the type of pronunciation variables in the questionnaire to be more likely to diffuse than the structural variables measured in the acoustic study.

Social identity also plays a role in cross-border diffusion. In particular, Miller (1989) notes that language is used by Canadians to separate themselves from Americans. This separation may be especially important for speakers living near the border; for instance, Burnett (2016) found that Canadians near the border were actively maintaining and even increasing their use of certain Canadian variants. Personal ideologies may also affect the maintenance of local variants. For example, Swan (2020) showed that BAG-raising in the Seattle-Vancouver area was more common amongst speakers who were more concerned about encroachment and change in their city. The impact of identity may therefore also depend on the salience of the variable and attitudes towards its variants. The current study thus seeks to identify which variables Canadians and Americans perceive as particularly salient markers and how this relates to which variables are diffusing or not.

## 3. Questionnaire

### 3.1 Methods

The first phase of the study used an online dialect questionnaire which included 49 language questions. The variables were largely drawn from Avis' (1954, 1955, 1956) Ontario-U.S. border studies, Scargill and Warkentyne's (1972) Canadian English survey,

Chambers' (1994) Dialect Topography project, and Boberg's (2005) survey of modern Canadian English vocabulary. A few novel variables were also included such as the use of *brackets* vs. *parentheses*. The main focus was on notable Canadian-American differences to compare the degree of "Canadian" and "American" usage in each region. The questions covered vocabulary (e.g., *tap/faucet*, *washroom/bathroom*), pronunciation (e.g., *pasta, asphalt*, *progress*), grammatical forms (e.g., *sneaked/snuck*, *I'm done (with) my homework*), and spelling variants (e.g., *grey/gray, centre/center*).

In addition to language questions, the questionnaire gathered demographic (gender, year of birth) and social opinion data as potential correlates or barriers to diffusion. The social opinion questions consisted of five-point Likert scales. The first two measured how similar/dissimilar and pleasant/unpleasant participants perceived Canadian and American people, culture, and accents. The third scale asked how positive participants felt about their hometown, moving to another city, and moving across the border.

Participants from the three regions were recruited through social media. In total, 803 usable responses were received. The majority of participants were from Niagara, ON (422; 52.5%), but many responses were also gathered from Niagara, NY (289; 36%) and the GTA (92; 11.5%). The respondents were also skewed in terms of gender with 75.7% female, 23% male, 0.9% non-binary, and 0.1% unlisted gender.[1] The overall range for year of birth was 1932 to 2004 (approx. 18–90 years old at time of collection), with a median of 1969. The Niagara, ON participants were fairly representative (range: 1941–2003, median: 1971), while the Niagara, NY participants were generally older (range: 1932–2004, median: 1960) and the GTA participants were generally younger (range: 1945–2003, median: 1986).

To analyze aggregate use, variants were coded as "Canadian," "American," or "Other" based on findings from previous studies. The total amounts of Canadian and American variants for each participant were then calculated overall and for each subsection (vocabulary, pronunciation, grammar, spelling), with "Other" responses counting towards neither score. These usage scores were then compared at each level of aggregation: overall, by subsection, and for key individual variables. The aggregate analyses involved ANOVA tests followed by post-hoc Tukey tests to determine which pairs of regions differed in terms of Canadian and/or American usage scores. Response frequencies for individual variables were compared using Fisher's exact test. Correlations for year of birth and the Likert scales were analyzed with Pearson's *r*. In this paper, I will focus only on the key findings for diffusion and non-diffusion.

### 3.2 Results

The aggregate results, summarized in Table 1, clearly show that both Niagara, ON and the GTA always differ from Niagara, NY ($p<0.001$ for all scores). Canadian participants use significantly more Canadian and fewer American variants overall and for each subsection.

[1] No gender response was provided for 0.2% of participants.

**Table 1.** Tukey test results between regions for Canadian (Can.) and American (Am.) usage scores. * = $p<0.05$; ** = $p<0.001$. NNY=Niagara, NY; NON=Niagara, ON.

| Regions | Score | Overall | Vocabulary | Pronunciation | Grammar | Spelling |
|---|---|---|---|---|---|---|
| NON – NNY | Can. | ** | ** | ** | ** | ** |
| | Am. | ** | ** | ** | ** | ** |
| NON – GTA | Can. | - | - | * | - | - |
| | Am. | - | - | * | - | - |
| GTA – NNY | Can. | ** | ** | ** | ** | ** |
| | Am. | ** | ** | ** | ** | ** |

In most cases, the Canadian regions do not differ from each other. However, there is a difference for pronunciation ($p<0.05$) where Niagara, ON uses more American variants and fewer Canadian variants than the GTA. This suggests there is at least some cross-border diffusion such that Niagara, ON speakers are adopting American pronunciations more quickly than Toronto speakers. Pronunciation may thus be more likely to diffuse than the other types of variables. At the same time, this diffusion is clearly limited by the border since the Niagara, ON speakers still greatly differ from the Niagara, NY speakers.

We must also look at individual variables to reveal which variants are more likely to be adopted or maintained. For pronunciation, only five variables actually show significant differences between Niagara, ON and the GTA and the direction varies. Niagara, ON uses more of the American variant for *pasta* (like "possible"; $p<0.0001$), *caramel* (2 syllables; $p<0.05$), and *niche* (like "ditch"; $p<0.05$). These variables therefore follow the overall pattern of diffusion seen in Table 1, suggesting proximity to the border may result in greater adoption of American variants. On the other hand, the GTA uses more of the American variant for *asphalt* (without /ʃ/) and *route* (like "shoot"). In these cases, community size seems to matter more with the larger region adopting the American pronunciation more quickly. Additionally, there are a handful of non-significant differences: American *leisure* (like "seizure") is strongly preferred in all three regions and American *project* (vowel of "got") and *almond* (with /l/) are equally preferred in the GTA and Niagara, NY.

Both Niagara, ON and the GTA therefore differ overall from Niagara, NY but show diffusion of some variables. Why then does Niagara, ON show greater overall American usage than the GTA? This result seems to be driven by the use of the "possible" vowel[2] in *pasta* (Table 2). It is the only variable where the majority response differs between Niagara, ON and the GTA and it is by far the largest difference ($p<0.0001$). Notably, *pasta* is also the only foreign (a) variable which differs as the others favour the American /ɑ/ variants in both regions; I will return to this topic in the acoustic study. The border therefore acts primarily as a barrier with only certain variables following clear patterns of diffusion.

[2] It should be noted that the /ɑ/ vowel represented by "possible" differs in quality between Niagara, ON (merged with back /ɔ/) and Niagara, NY (fronted and unmerged). This is addressed in the acoustic study in section 4.

**Table 2.** Frequencies of Canadian-coded (like "passing" (/æ/)) and American-coded (like "possible" (/ɑ/)) pronunciations of *pasta* by region. The most frequent variant is bolded.

| Region | Like "passing" (/æ/) | Like "possible" (/ɑ/) |
|---|---|---|
| Niagara, ON | 42% | **58%** |
| Greater Toronto Area | **72.5%** | 27.5% |
| Niagara, NY | 12.4% | **87.6%** |

The border also forms a clear barrier for vocabulary. Only two variables (*napkin*, *dinner*) show majority use of the American variant in the Canadian regions. Most variables instead highly favour the Canadian variant, such as *tap* over *faucet*, *icing* over *frosting*, *eavestroughs* over *gutters*, *bill* over *check*, and *brackets* over *parentheses*.

Similarly, Canadians strongly prefer Canadian spellings. Most variables show a sharp divide between Canadian vs. American usage (*colour* vs. *color*, *cheque* vs. *check*, *travelled* vs. *traveled*). For *grey* vs. *gray* and *centre* vs. *center*, more participants selected the "either one" choice; however, the majority of Canadians still chose Canadian *grey* and *centre*. Americans showed a greater split for *grey* vs. *gray*: "either one" was the most popular response (49%), suggesting this variable may be less salient as a national marker.

The grammatical variable results were more complicated. While Americans did use more of the "American" variants than Canadians, the majority response in all regions was the American-coded response for four of the five variables (*snuck* over *sneaked*, *different than* over *different from*, *lent* over *loaned*, *dove* over *dived*). These results are in line with previous findings (Avis 1955, Scargill and Warkentyne 1972), as the Canadian-coded variants come from British English or Old English and are less popular and often linked to rurality or education. The fifth variable (*done (with)*) does however show a clear national divide: the majority of Canadians in both regions use *done* while the Americans overwhelmingly prefer *done with* (Table 3).

**Table 3.** Frequencies of Canadian-coded (*done*) and American-coded (*done with*) use of *done (with)* by region. The most frequent variant is bolded.

| Region | I'm done my homework. | I'm done with my homework. |
|---|---|---|
| Niagara, ON | **81%** | 19% |
| Greater Toronto Area | **78.7%** | 21.3% |
| Niagara, NY | 2.9% | **97.1%** |

The social variables also reveal interesting patterns. Year of birth correlations do show some increase in American usage and decrease in Canadian usage in both Canadian regions. This is most prominent for pronunciation: both regions show a moderate increase in American variants (Niagara, ON: $r$=0.37, $p$<0.001; GTA: $r$=0.39, $p$<0.001) and decrease in Canadian variants (Niagara, ON: $r$=-0.42, $p$<0.001; GTA: $r$=-0.55, $p$<0.001) for younger speakers. The vocabulary results are much weaker with only a very small increase in

American ($r$=0.1, $p$<0.05) and decrease in Canadian ($r$=-0.1, $p$<0.05) usage in Niagara, ON. In the GTA, there is also a small decrease in Canadian usage ($r$=-0.28, $p$<0.01) but no significant increase in American vocabulary. Spelling only shows a small decrease in Canadian variants in Niagara, ON ($r$=-0.14, $p$<0.01) and grammar shows no apparent time change. These correlations do not necessarily reflect a border effect considering both regions have similar results; instead, this may be a general increase in American variants in Canada over time or age as reported in previous studies (e.g., Scargill and Warkentyne 1972). In other words, proximity to the border does not seem to enhance the increase in American forms in apparent time. There were no gender differences for any variable type.

The Likert scales showed little correlation with Canadian or American usage scores. Across all participants, only the affiliation towards hometown/country scale produced a significant correlation ($r$=0.15, $p$<0.01). This suggests that speakers who view their hometown/country more positively use fewer American and more Canadian variants, similar to Swan's (2020) findings that closer ties to the speaker's city and opposition to newcomers were correlated with use of the local variant. However, the correlation is small and not significant for any individual region suggesting that it is not particularly strong.

When looking at pronunciation on its own, there are some small correlations between views on people/culture/accents and usage scores in Niagara, ON. Positive views of America were correlated with both higher American usage scores ($r$=0.13, $p$<0.01) and lower Canadian usage scores ($r$=-0.12, $p$<0.05), but positive views of Canada were also correlated with higher American usage scores ($r$=0.15, $p$<0.01) and lower Canadian usage scores ($r$=-0.11, $p$<0.05). While the implications of this pattern are not quite clear, it does preliminarily suggest that attitudes towards both countries might affect the pronunciation diffusion pattern identified in Niagara, ON.

The scales rating American and Canadian accents were also examined separately to see general attitudes. Canadians ranked American speech as significantly less pleasant than Canadian speech and only 28% gave American speech a positive Likert score (4-5), in comparison to 79% for Canadian speech. Though it is not clear what aspects participants are rating, this shows that Canadians generally have a less positive attitude towards American English.

Overall, the results suggest that Canadian English remains largely distinct. In all cases, both Canadian regions differ significantly from Niagara, NY. While pronunciation does show greater propensity for diffusion, it is still limited to certain variables. Additionally, the diffusion that does occur is not always directly across the border as some variants are more frequent in the GTA rather than Niagara, ON. In the acoustic results, we will further see that Canadian English is mostly maintained with only certain variables showing potential diffusion.

## 4. Interviews

### 4.1 Methods

The acoustic phase used interviews to look at pronunciation variation that cannot be measured via a questionnaire and to gather acoustic data on foreign (a) variables to compare

with the questionnaire results. The interviews included both a word list and spontaneous speech section; I will report solely on the word list data here. The words targeted the entire vowel space but my analysis will focus only on key Canadian-American differences and potential changes: the low back merger and vowel shifts, Canadian Raising, and foreign (a) pronunciation.

Interviews were recorded on Zoom with 66 participants. The majority again came from Niagara, ON (42; 63.6%) with 12 (18.2%) each from Niagara, NY and the GTA. As with the questionnaire, most participants were female; gender effects will therefore not be analyzed here as the number of male speakers is low. Year of birth ranged from 1947 to 2001 (approx. 21–75 years old at time of interview) with a median of 1973. The Niagara, ON participants were slightly younger (range: 1947–2001, median: 1975). Similar to the questionnaire, participants were younger in the GTA (range: 1953–1998, median: 1983) and older in Niagara, NY (range: 1949–1997, median: 1957).

The target vowels were annotated in Praat (Boersma and Weenink 2021). The first and second formant were measured at single points following the Atlas of North American English method (Labov et al. 2006), with only the nucleus measured for diphthongs. The formants were then normalized using Labov et al.'s (2006) method which scales the formant values in hertz; normalized hertz will simply be referred to as hertz (Hz) in the results. ANOVAs and post-hoc Tukey tests were again used to compare differences between regions in terms of F1, F2, or Euclidean distance as needed. Apparent time correlations were again analyzed using Pearson's *r*.

In addition to the acoustic data, qualitative attitudinal data were collected. Participants were asked for opinions on Canadian and American speech. They were also asked to identify specific features that make someone sound Canadian/American. Additionally, given the strong difference for pronunciation of *pasta* found in the questionnaire, participants were asked who they think uses the opposite pronunciation. For example, if the participant used /ɑ/ then they were asked where someone who uses /æ/ is from. The goal of these questions was to identify salient features and assess attitudes towards these features which may influence their adoption or rejection.

### 4.2 Results

The first point of interest is the low back merger and its interaction with the Low-Back-Merger Shift (LBMS) and Northern Cities Shift (NCS). We can therefore look at the relative position of both /ɑ/ (LOT) and /ɔ/ (THOUGHT). The Canadians are expected to merge these two vowels towards the low back corner of the vowel space while the Americans are expected to show no merger and a fronted /ɑ/ vowel, a key component of the NCS (Labov 1991). Additionally, we can look at the position of /æ/ (TRAP). Canadians are expected to have a low, retracted /æ/ in line with the LBMS pattern (Clarke et al. 1995, Labov et al. 2006) while American are expected to have a raised, fronted /æ/, the second key component of the NCS (Labov 1991). Figures 1-3 show that the expected patterns do occur in each region.

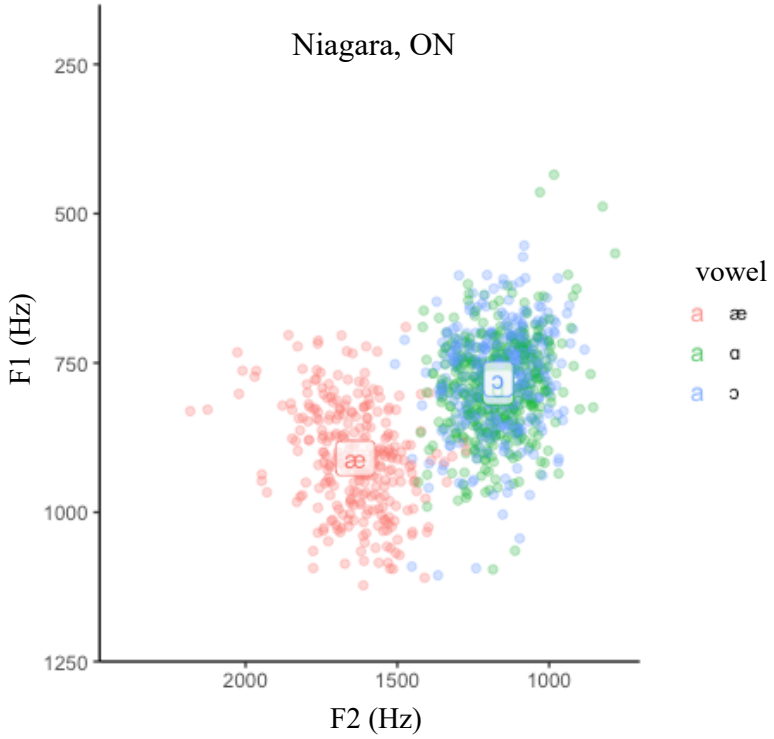


**Figure 1.** Tokens (dots) and means (labelled boxes) of /ɑ/, /ɔ/, and /æ/ in Niagara, ON.

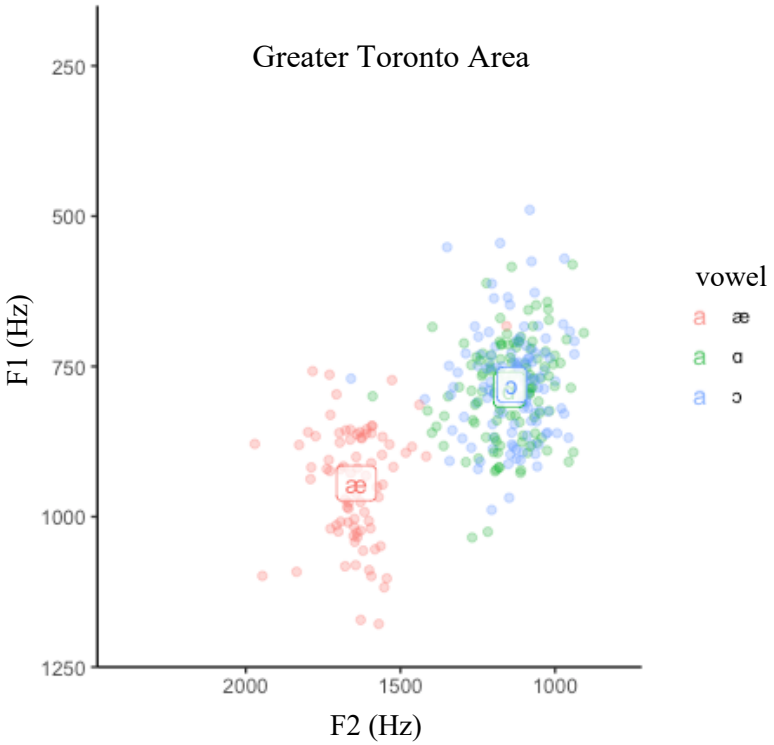


**Figure 2.** Tokens (dots) and means (labelled boxes) of /ɑ/, /ɔ/, and /æ/ in the GTA.

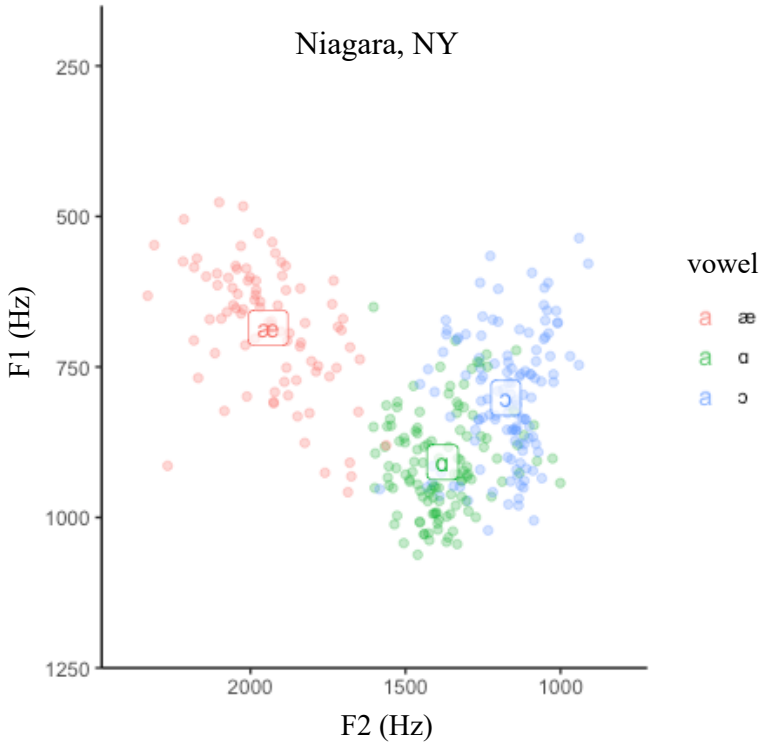


**Figure 3.** Tokens (dots) and means (labelled boxes) of /ɑ/, /ɔ/, and /æ/ in Niagara, NY.

These observations are confirmed statistically. In Niagara, NY, /ɑ/ and /ɔ/ differ significantly in F1 ($p$<0.001) and F2 ($p$<0.001). Neither differ in F2 in Niagara, ON nor the GTA and F1 does not differ in the GTA. There is a significant difference overall in F1 in Niagara, ON ($p$<0.05) but this may be due to the particularly high outlier /ɑ/ tokens seen in Figure 1; a more in-depth analysis of individual speakers would clarify this pattern. In either case, /ɑ/ and /ɔ/ are clearly back in both Canadian regions while /ɑ/ is fronted in Niagara, NY. For /æ/, Niagara, NY is significantly higher and fronter than both Niagara, ON (F1: $p$<0.001; F2: $p$<0.001) and the GTA (F1: $p$<0.001; F2: $p$<0.001). Niagara, ON has slightly higher /æ/ than the GTA (F1: $p$<0.05) but they do not differ in backing and the difference in means is very small (35Hz) compared to the differences between the Canadian and American means (>200Hz). Overall, the expected pronunciations are therefore maintained with little cross-border influence. To analyze year of birth effects on the merger, Pillai scores were also calculated to assess degree of merger by speaker. This analysis revealed that younger speakers in Niagara, NY have more merging (lower Pillai scores) of /ɑ/-/ɔ/ ($r$=-0.68, $p$<0.05), suggesting potential merger in progress. There was no correlation in either Canadian region.

For Canadian Raising, we must look at the difference between the tokens where the diphthong is expected to be raised (/auT/ and /aiT/, where T represents any following voiceless obstruent) and unraised (/au/ and /ai/ elsewhere) (Figure 4). In Ontario, both /auT/ and /aiT/ are expected to be raised *and* fronted relative to /au/ and /ai/ (Boberg 2010). Many regions in the U.S., including Upstate New York, have previously shown raising of /aiT/

while raising of /auT/ is less widespread (Boberg 2010). We may therefore expect /aiT/ to also show Canadian Raising in Niagara, NY but not /auT/.

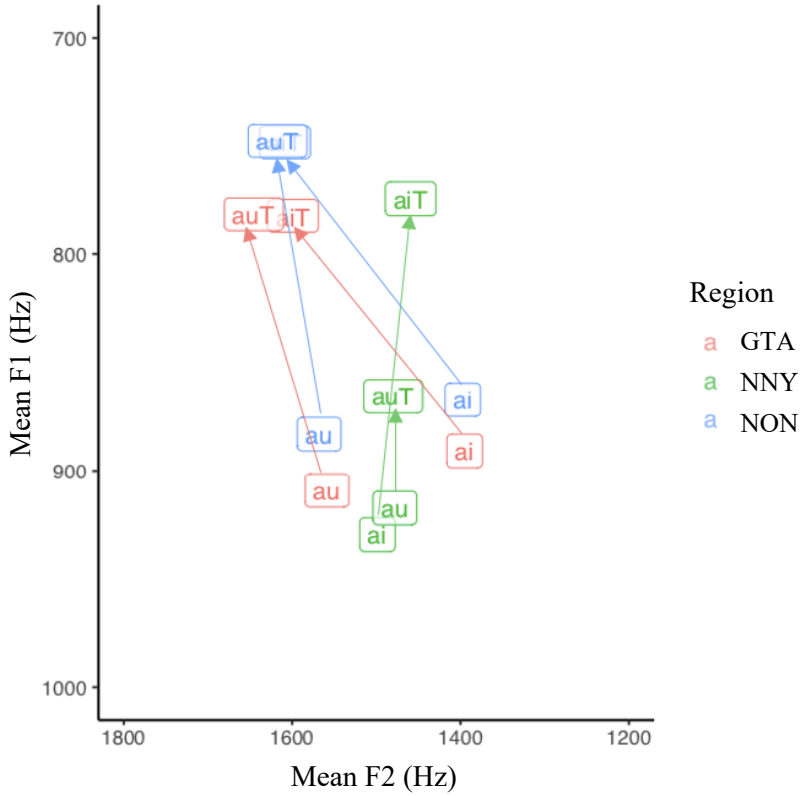


**Figure 4.** Mean formants for Canadian Raising. NNY=Niagara, NY; NON=Niagara, ON.

As seen in Figure 4, /auT/ and /aiT/ are clearly raised and fronted in Canada in comparison to their counterparts. This is again confirmed statistically: /aiT/ and /auT/ are both higher (F1) and fronter (F2) than /ai/ and /au/ in Niagara, ON (F1: /au/–/auT/ $p<0.001$, /ai/–/aiT/ $p<0.001$; F2: /au/–/auT/ $p<0.01$, /ai/–/aiT/ $p<0.001$) and the GTA (F1: /au/–/auT/ $p<0.001$, /ai/–/aiT/ $p<0.001$; F2: /au/–/auT/ $p<0.01$, /ai/–/aiT/ $p<0.001$). Both Canadian regions therefore show Canadian Raising. In Niagara, NY, /aiT/ is raised relative to /ai/ (F1: /ai/–/aiT/ $p<0.001$), as expected. However, /auT/ is also raised (F1: /au/–/auT/ $p<0.05$). In both cases, raising is only in terms of height without the fronting that occurs in the Canadian regions. Thus, these findings may not reflect diffusion from Ontario to New York, though it is possible that contact with the Canadian speakers enhances the pattern.

To compare the degree of raising in each region, we can use the Euclidean distances between each speaker's raised and unraised means. For /ai/–/aiT/, the only significant difference is between Niagara, ON (mean: 253Hz, SD: 93Hz) and Niagara, NY (mean: 174Hz, SD: 53Hz) ($p<0.05$). Niagara, ON therefore has a greater degree of /aiT/-raising than Niagara, NY while the GTA (mean: 243Hz, SD: 85Hz) does not differ from either region. For /au/–/auT/, the Canadian regions did not differ but Niagara, NY (mean: 77Hz, SD: 52Hz) has a significantly smaller degree of raising than both Niagara, ON (mean:

172Hz, SD: 80Hz; $p<0.01$) and the GTA (mean: 182Hz, SD: 104Hz; $p<0.01$). Raising of /auT/ is thus much smaller in Niagara, NY, though it is still significant and meets Labov et al.'s (2006) threshold for Canadian Raising (60Hz).

The Euclidean distances show no apparent time change. There is however increased fronting of /auT/ in Niagara, ON for younger speakers (F2: $r=0.48$, $p<0.01$). This suggests that the Canadian Raising pattern is being actively maintained, and potentially becoming more different from the Niagara, NY pattern which does not involve fronting. There are no significant correlations for /aiT/-raising or for either pattern in Niagara, NY or the GTA. Canadian Raising therefore appears to be generally stable in the Canadian regions. Additionally, the /auT/-raising pattern in Niagara, NY is apparently not an emerging change, though a larger sample would help clarify this pattern.

For foreign (a), we are first interested in the actual phonetic quality of the pronunciation in each region. The foreign (a) variables involve loanwords with orthographic <a> which are mostly interpreted as /ɑ/ in American English and, traditionally, /æ/ in Canadian English, with /ɑ/ becoming increasingly more common in Canada (Boberg 2000, 2009, 2020). The questionnaire data suggested that Canadians and Americans both typically choose the /ɑ/ pronunciation, except for *pasta* where Niagara, ON prefers the /ɑ/ pronunciation but the GTA prefers /æ/. Since /æ/, /ɑ/, and /ɔ/ have different qualities in Niagara, NY and the Canadian regions (see Figures 1-3), we can look at the tokens and means of (a) in each region in comparison to these three vowels (Figures 5-7). These vowel plots reveal that (a) in Niagara, NY typically overlaps with their fronted /ɑ/ pronunciation while the Canadians split (a) across the vowel space, with some tokens closer to /æ/ and others closer to merged /ɑ/-/ɔ/.

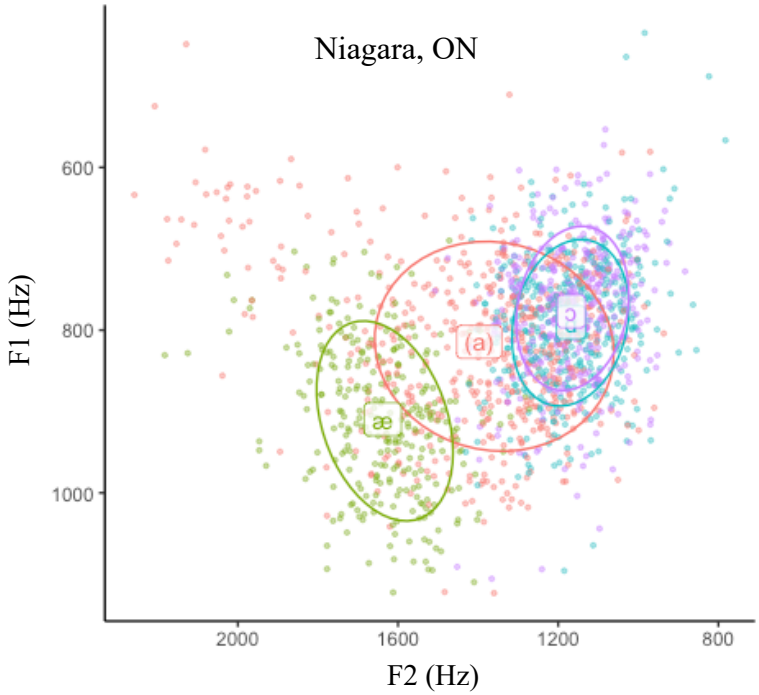


**Figure 5.** Comparison of tokens (dots) and means (boxes) of foreign (a), /æ/, /ɑ/, and /ɔ/ in Niagara, ON with a 68% confidence interval.

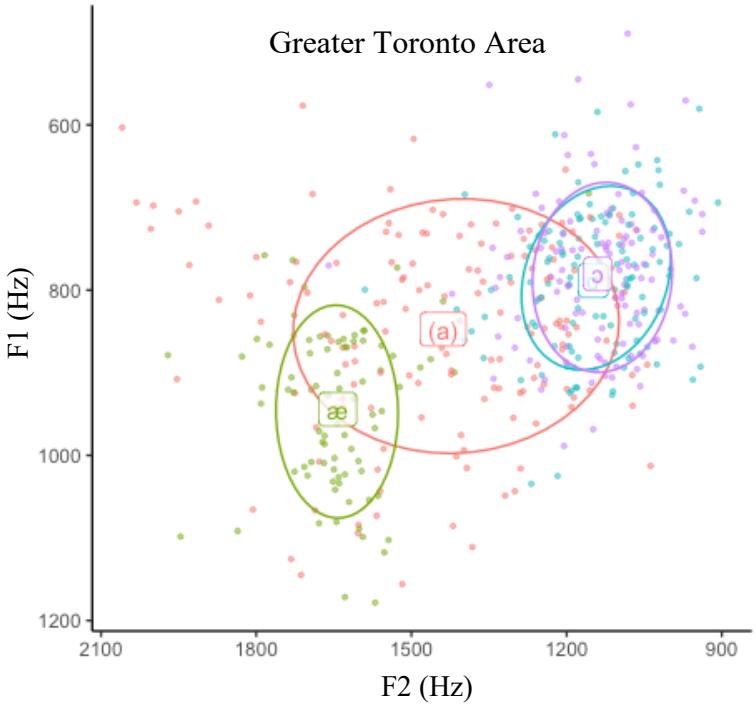


**Figure 6.** Comparison of tokens (dots) and means (boxes) of foreign (a), /æ/, /ɑ/, and /ɔ/ in the GTA with a 68% confidence interval.

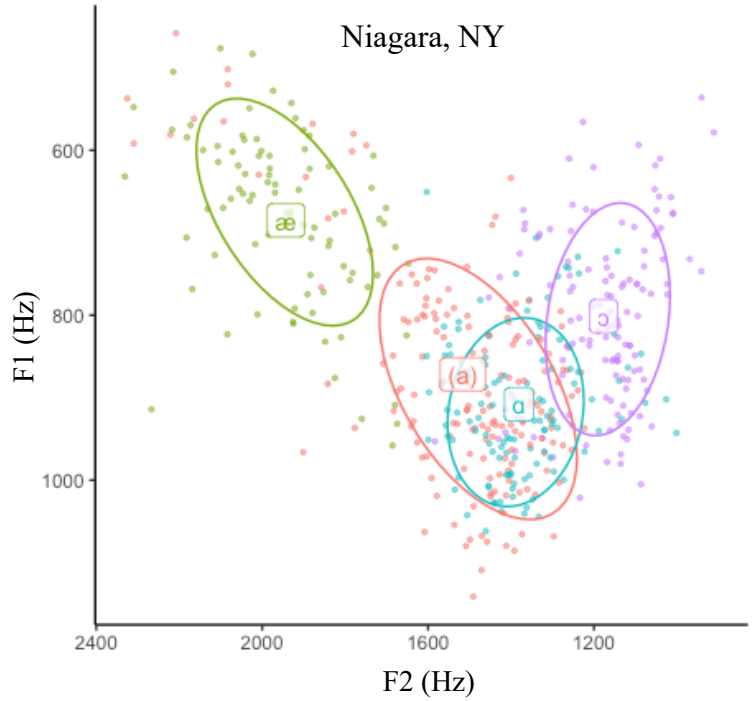


**Figure 7.** Comparison of tokens (dots) and means (boxes) of foreign (a), /æ/, /ɑ/, and /ɔ/ in Niagara, NY with a 68% confidence interval.

The pronunciation of (a) in Canada therefore differs from Niagara, NY in that there are more front /æ/ tokens in the Canadian regions and the back /ɑ/ tokens are often more back (with merged /ɑ/-/ɔ/) than Niagara, NY (with unmerged, fronted /ɑ/). However, these plots combine all tokens which does not allow us to see the difference in /æ/ and /ɑ/ frequencies between Niagara, ON and the GTA or when each vowel is used. To see which words actually tend towards /æ/ or /ɑ/ usage, I used Boberg's (2020) method of categorization: pronunciations within two standard deviations of the speaker's mean /æ/ or /ɑ/ are categorized as such while tokens outside of this range (or within the overlap of the speaker's /æ/ and /ɑ/ range) are considered intermediate. The frequencies of each variant by word in each region are listed in Table 4.

**Table 4.** Frequencies (%) of /æ/, /ɑ/, and intermediate (inter.) pronunciations by word in each region, rounded to the nearest whole number. The most frequent variants are bolded.

| | Niagara, ON | | | Niagara, NY | | | GTA | | |
|---|---|---|---|---|---|---|---|---|---|
| Word | /ɑ/ | /æ/ | inter. | /ɑ/ | /æ/ | inter. | /ɑ/ | /æ/ | inter. |
| avocado | **63** | 5 | 32 | **92** | 0 | 8 | **58** | 17 | 25 |
| bratwurst | 10 | **68** | 23 | **62** | 31 | 8 | 8 | **67** | 25 |
| Colorado | 41 | 15 | **44** | **92** | 0 | 8 | **45** | 27 | 27 |
| drama | **80** | 7 | 12 | **92** | 0 | 8 | **58** | 25 | 17 |
| façade | **85** | 5 | 10 | **92** | 0 | 8 | **67** | 17 | 17 |
| Iran | 20 | **66** | 15 | 23 | **69** | 8 | 17 | **75** | 8 |
| Iraq | 7 | **83** | 10 | **46** | **46** | 8 | 17 | **75** | 8 |
| llama | **83** | 5 | 12 | **92** | 0 | 8 | **64** | 9 | 27 |
| nachos | 27 | 20 | **54** | **50** | 8 | 42 | 17 | 25 | **58** |
| pajamas | 15 | **54** | 32 | 38 | **62** | 0 | 8 | 42 | **50** |
| panache | 32 | **46** | 22 | **62** | 8 | 31 | 0 | **75** | 25 |
| pasta | **70** | 18 | 12 | **85** | 0 | 15 | 9 | **73** | 18 |
| taco | **83** | 7 | 10 | **67** | 0 | 33 | **50** | 33 | 17 |
| Mean | **47** | 31 | 22 | **69** | 17 | 14 | 32 | **43** | 25 |

These frequencies show that Niagara, NY has the overall highest use of /ɑ/ pronunciations while /æ/ is much more common in both Canadian regions. However, it is also clear that the Canadian regions do differ as /ɑ/ is the most popular variant in Niagara, ON (47%) compared to /æ/ in the GTA (43%). As with the questionnaire, the difference is most prominent for *pasta* with 70% /ɑ/ in Niagara, ON and 73% /æ/ in the GTA. Thus, while the actual quality of /ɑ/ is not the same as Niagara, NY, the Niagara, ON speakers do use more of the "American" pronunciation. The question remains whether the higher rates of /ɑ/ in Niagara, ON are in fact cross-border diffusion with the /ɑ/ adapted to the native /ɑ/-/ɔ/ phoneme or whether this difference comes from elsewhere (e.g., American media with the merged /ɑ/-/ɔ/ pronunciation).

The year of birth analysis shows that (a) is further back amongst younger speakers in Niagara, ON both overall (F2: $r$=-0.32, $p$<0.05) and for *pasta* specifically (F2: $r$=-0.41,

$p<0.05$). There is no apparent time change overall or for *pasta* in Niagara, NY or the GTA, suggesting (a) pronunciations may be stable, though the samples here are small.

Finally, the qualitative results revealed that speakers tend to perceive American and Canadian English as mostly similar but are also able to identify certain vocabulary and pronunciation differences. Canadians most frequently mentioned aspects of the NCS as American markers, imitating and exaggerating the fronted /ɑ/ and tensed /æ/ vowels. Notably, these NCS vowels were often associated with negative attitudes. When asked about *pasta*, the Niagara, ON participants who used /ɑ/ frequently misidentified the /æ/ pronunciation as American and associated it with tensed /æ/. One potential explanation is that the fronted /ɑ/ pronunciation is close to their own retracted /æ/ pronunciation and thus becomes exaggerated to tensed /æ/. In either case, these speakers stigmatized the /æ/ pronunciation in the same way they stigmatized the NCS vowels, which may account for the higher /ɑ/ use in Niagara, ON.

## 5. Discussion and conclusion

Overall, the border seems to primarily act as a barrier to diffusion. In both the questionnaire and interviews, the Canadian regions remained distinct from Niagara, NY for nearly all variables. When diffusion did occur, the Canadians were still much more similar to each other than to Niagara, NY. The border therefore has a weakening effect on diffusion, as size and distance alone would predict greater similarities.

The degree of diffusion also largely depends on the variable type and the variable itself: pronunciation showed more diffusion in the questionnaire and this was mainly attributed to a handful of variables. In contrast, the vocabulary, spelling, and grammar variables showed lower rates of diffusion. Though the apparent time correlations showed potential increases in American usage, these correlations tended to be small and Canadian variants were strongly preferred for the majority of variables. Speakers therefore generally seem to be maintaining Canadian forms and resisting American influence.

Additionally, diffusion of pronunciation was linked to phonemic incidence variables (foreign (a), *caramel*, *asphalt*, etc.) rather than phonetic or phonological features (low back merger, vowel shifts, Canadian Raising). The foreign (a) variables are the strongest case for cross-border diffusion with more /ɑ/ forms in Niagara, ON and more /æ/ forms in the GTA. However, the quality of /ɑ/ differs between the Canadians and Americans and the American fronted /ɑ/ is often stigmatized. One possibility is that the higher /ɑ/ use in Niagara, ON is cross-border diffusion as a result of higher contact with Niagara, NY speakers, with the /ɑ/ adopted to the native merged phoneme. Another possibility is that the increasing adoption of /ɑ/ overall in Canada (Boberg 2000, 2009, 2020) is enhanced near the border in response to negative attitudes towards the fronted /ɑ/ pronunciation which speakers in Niagara, ON misperceive as /æ/. Thus, increased contact with Niagara, NY likely has an effect on the foreign (a) pattern in Niagara, ON but the quality difference makes the cause unclear.

Importantly, the instances of diffusion and non-diffusion both support a barrier effect: diffusion is often blocked by the border, and when it does occur it seems to be weaker than size and distance would predict. The barrier effect may be driven by identity maintenance,

social salience, and attitudes, supporting previous findings on identity factors (e.g., Bailey et al. 1993, Miller 1989, Burnett 2006, Swan 2020): the Canadians maintained differences linked to their Canadian identity and rejected American variants they viewed negatively. This study thus shows that cross-border diffusion is more complex than distance and community size; the interaction between identity and the border is an essential component of diffusion in the U.S.-Canada context.

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