A Sociophonetic study of Filipino English in Winnipeg, Canada

by

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Abstract

The Filipino community in Winnipeg is unique, for that they are not only the largest minority group in the city, they also settled primarily in the northwest area of the city, forming a close-knit enclave. In addition, they are a highly visible group in Winnipeg and have strong familial and community ties. This dissertation explores the sociophonetic patterns among Filipinos in Winnipeg. To achieve this goal, I compare the linguistic behavior of Filipinos to the general population by examining three phonetic features: Canadian Raising, /æg/-raising and Voice Onset Time (VOT). Acoustic phonetic analyses and statistical analyses are carried out on the data that are drawn from 26 Filipino Winnipeggers (FWs) and 17 Traditional Winnipeggers (TWs).

The major findings of the three linguistic variables are as follows. For Canadian Raising, first-generation FWs do not participate in Canadian Raising of /aɪ/ and /aʊ/. Second-generation FWs show the same extent of /aɪ/-raising, but less degree of /aʊ/-raising as compared to the local mainstream speakers. This pattern may correlate with the different regional distributions of the two diphthongs and indicate second-generation FWs are more oriented toward national standards or large urban centers. For /æg/-raising, the Filipino second-generation women show the same degree of raising as their local counterparts, while the Filipino second-generation men have less raising and pattern with the first generation. This gendered difference reflects the more diverse social networks among second-generation women than among second-generation men. For VOT, language transfer effects are only found in the first-generation FWs, and have not passed along to second-generation FWs, which aligns with the findings of Hoffman and Walker (2010).

This study indicates that the linguistic variation among Filipinos is potentially influenced by their social roles and social connections in Winnipeg. The findings of this dissertation support

an intersectional approach, taking into account of ethnicity, gender, and generation, while investigating ethnolinguistic variation. This dissertation is also the first to discuss Filipino Canadians in Winnipeg and their English production patterns, and provides more materials for the growing studies of sociolinguistic variation in Asian communities.

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Dedication

To my dearest parents

献给我的父母

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Abbreviations

F1	First formant
F2	Second formant
FW	Filipino Winnipegger
TW	Traditional Winnipegger
LIPP	Languages in the Prairies Project
Gen.1	First generation
Gen.2	Second generation
CR	Canadian Raising
VOT	Voice Onset Time
AAVE	African American Vernacular English

1 Introduction

1.1 Research overview

This study aims to document the patterns of sociophonetic variation in the speech of Filipinos living in Winnipeg and to seek explanations of any phonetic patterns that may correlate with social factors. To achieve this goal, I have chosen three variables: Canadian Raising (/aɪ/ and /aʊ/), /æg/-raising and Voice Onset Time (VOT). I compare the usage of the linguistic variables between the Winnipeggers of Filipino background and Winnipeggers of European background to identify any patterns emerging. I also adopt a multigenerational approach to compare generations, and look at gendered differences within each ethnic group. All investigations were conducted with a combination of quantitative analyses and qualitative interpretations. This research is the first to examine data from an understudied yet important ethnic group in Winnipeg, Canada, contributing to a better understanding of the role of ethnicity in regional linguistic variation and change.

Before presenting the methods and results of this study, this chapter reviews the literature that inspired this thesis and presents the settlement history of Filipinos in Winnipeg and Canada, as well as their current cultural and social backgrounds and standing in the city that might influence their linguistic behavior.

1.2 Variationist approach to ethnolinguistic variation

The variationist framework is implemented in this study to explore ethnolinguistic variation in the Winnipeg speech community. Variationist sociolinguistic research investigates linguistic variation among individuals, social groups and communities. Major demographic categories such as age, sex and social class have been shown to influence the use of linguistic variables (Chambers, 2009; Eckert & McConnell-Ginet, 2003; Labov, 1963, 1966; Labov et al., 1968; Trudgill, 1974).

When a minority ethnic group exists in a surrounding that is dominated by a larger majority ethnic group, the minority ethnic group often starts to shift to the use of the dominant language, sometimes abandoning their heritage language(s) in later generations (Fishman, 1964, 1991). Previous studies have found distinctive English linguistic features that show particular usage patterns within certain ethnic groups. Two of the most extensively examined and well-documented ethnic varieties of English are African American Vernacular English (AAVE) (Fought, 2006; Green, 2002; Mufwene et al., 1998; Rickford, 1999, among others) and Chicano English (Fought, 2003; Penfield & Ornstein-Galicia, 1985; Santa Ana, 1991; among others), where AAVE and Chicano English speakers are consistently found to use syntactic, phonological, and morphological variables that are different from those used by mainstream populations. Fought (2006) provides a number of salient features in phonology and in grammar that are used to reflect the ethnicity of Chicano speakers. For instance, speakers use /i/ as a variant of /ɪ/, especially in the morpheme *-ing*, so that *going* sounds like [gowin].

In addition, studies have addressed linguistic variation and change across different ethnic groups. It has been found that in some cases ethnic groups do not adopt distinctive linguistic features of local or regional vernacular (Boberg, 2004; Labov, 1994). In other cases, research has

found the opposite: ethnic minority groups do participate (Fought, 2003; Hoffman & Walker, 2010; Poplack, 1978) and are even among the most innovative speakers with respect to ongoing sound changes (Hall-Lew, 2009; Rosen et al., 2015). Furthermore, linguistic features used by minority groups may be the source of language variation for the mainstream language system (Feagin, 1997; Wolfram, 1974).

1.3 Ethnolinguistic studies in Asian communities

In comparison to the significant bodies of work on AAVE and Chicano English, however, ethnolinguistic studies on Asian English are comparatively less common (Boberg, 2012b; Ito, 2010; Lo & Reyes, 2004). For instance, in Canada, even though 22.3% of Canada's population are reported to belong to visible minorities (Statistics Canada, 2017), 17.7% of whom have Asian origins, ethnolinguistic studies that examine the role of ethnicity in language variation and identity construction in Asian communities have received comparatively less attention.

One of the main reasons for this lack of attention is that Asian English does not appear to have the salient ethnically marked and distinctive linguistic variation seen in AAVE or Chicano English (Hall-Lew, 2009; Lo & Reyes, 2004). It has also been argued that problematic assumptions of classifying Asians as either "forever foreigners" who would never acquire "legitimate" English or as "honorary whites" who eventually assimilate to the white middle-class mainstream, have made the issues of the linguistic practices of Asian English rather neglected (Kaiser, 2011; Lo & Reyes, 2004; Tuan, 1998). However, research in both perception (Hanna, 1997; Kaiser, 2011; Newman & Wu, 2011) and production (Hall-Lew, 2008, 2013; Ito, 2010; Kaiser, 2011; Wong, 2007, 2010) has shown that Asian English may be ethnolinguistically distinguishable, even though Asian English in North America may not show features that are as distinctively marked as those found in AAVE and Chicano English.

Perception studies have revealed that listeners are able to identify the speaker's race using subtle cues. Hanna (1997) recorded the speech of 12 Asian Americans and eight Caucasian Americans and recruited 30 Asian Americans and 30 Caucasian Americans to judge the ethnic identity of the speakers. The results showed that both Asian American and Caucasian American judges can correctly distinguish speakers' identity, with a success rate of 67% and 63% respectively. This study also found that speakers who have more social interactions with Asian communities were more likely to be identified as Asian Americans. Newman and Wu (2011) recruited speakers from four ethnic backgrounds: Asian Americans, African Americans, Latinos and European Americans. They showed that, even though Asian Americans' voices are less perceptually robustly identifiable, certain features do associate participants with Asian American ethnicity. Finally, in Kaiser's (2011) dissertation, listeners were able to tell Hmong Americans and European Americans apart in Minnesota, and a three-way interaction between speaker ethnicity, listener ethnicity, and vowel class was reported to display a significant correlation, especially for TRAP and THOUGHT vowels. Previous studies have suggested that Asian American speakers are linguistically different from their local European counterparts to some degree. What is the source of these differences? Have they picked up some language features from the preceding generation? Are there language transfer effects from their heritage languages spoken by their parents?

Hoffman and Walker (2010) examined language transfer effects while exploring the role of ethnicity in producing stable and change in progress variables and did not find evidence of language transfer in their study. For stable variable t/d deletion, first-generation Chinese and Italian speakers did not show the same phonological effects as British/Irish speakers, while the second- and third-generation Chinese and Italian speakers had largely uniform linguistic

constraints similar to British/Irish speakers[1]. Generational discrepancies were also found regarding participation in the ongoing change known as Canadian Shift. First-generation Chinese and Italians did not exhibit shifting and retraction of Canadian Shift vowels, while the second-generation speakers participated in Canadian Shift, even though there was varied rate of use. Based on these multigenerational differences, their study suggests that language transfer does not persist after the first generation.

However, the results from Rosen et al. (2015) might suggest otherwise. In this study, Filipino English first language (L1) and second language (L2) speakers in Winnipeg both participated in Canadian Shift and were even more advanced than the local European counterparts. One of the possible explanations for this result is that there is language interference and transfer among L1 and L2 speakers, where L2 speakers have acquired vowels from the heritage languages (Tagalog, Kapampangan and Ilocano) spoken by L1s. However, this claim needs further investigation, particularly with regards to the vowel systems of each heritage language. Another phonetic feature that clearly contrasts between English and the Filipino heritage languages, for example VOT, would also help to validate this conjecture.

Even if immigrant children show similar linguistic patterns to their parents' generation, this does not necessarily suggest there are language transfer effects. Speakers may reallocate the usage of the native or non-native features to index other social meanings. For instance, the aforementioned result of advanced participation in Canadian Shift among Filipino speakers might also indicate that they are more extra-local. Their production of Canadian Shift orients more toward the national pattern in larger Canadian cities such as Vancouver and Toronto

[1] In their study, the first-generation informants all arrived in Toronto after the age of 18 and have lived in Toronto for at least 20 years. The second-/third-generation informants were born and raised in Toronto or arrived before the age of five (Hoffman & Walker, 2010).

(Onosson et al., 2019). Since Filipino L1 and L2 speakers pattern together with respect to Canadian Shift, Rosen et al. (2015) and Onosson et al. (2019) also suggest that Filipinos in Winnipeg may represent an Emergent linguistic marketplace reflecting similar results among Asian communities in San Francisco (Hall-Lew, 2009).

The term "Emergent linguistic market" was coined by Hall-Lew (2009) to refer to the linguistic market found among Asian Americans who had emigrated and settled in San Francisco as a newer important ethnicity in the region. Hall-Lew (2009) investigated the low back vowel merger, as in *cot* and *caught*, and back vowel fronting, as in *goat* and *goose*, as produced by Asian and European Americans in San Francisco. She found that the merger was a change-in-progress favoring merger among Asian Americans, while it was more stable among European Americans. With respect to back vowel fronting, there were no significant ethnic differences, but the most fronted distributions of *goat* were found in Asian speakers. Hall-Lew argued based on this evidence that there were two coexisting linguistic markets in the San Francisco neighborhood: an Emergent linguistic market and a Traditional linguistic market. Asian Americans were more oriented to the Emergent linguistic market and adopted linguistic features of wider regional patterns, while European Americans showed more adherence to the Traditional linguistic market.

Other studies have also shown that Asian speakers do not entirely adopt local mainstream linguistic patterns. Wong (2010) described the second-generation American-born Chinese in New York use certain New York City English (NYCE) features, for instance keeping the distinction between *cot* and *caught*, but not other, for example, not adopting the traditional short-*a* split system in NYCE. Ito (2010) reported that Hmong Americans in Minnesota do not participate in the advancing merger of low back vowels that is found among young middle-class

Minnesota white speakers. Instead, younger Hmong speakers, regardless of age and age of arrival have maintained the distinction between the *cot* and *caught* vowels.

In order to examine how well a speaker's speech is integrated into the "standard" speech, one may also take into account the speaker's social roles and social contacts in the community. Sharma (2011) analyzed self-recordings in a number of settings from four British-born South Asians (akin to the second-generation Filipino speakers in this study) and examined how British-born South Asians use a Punjabi-derived phonetic feature in different social contexts. She found a reversal of gender roles where younger women and older men patterned together by using a more differentiated repertoire, while younger men and older women employed a more fused repertoire[2]. This result aligned with the historical phases each generation grew up in. For the older groups, it was the older men who had more diverse connections within and outside of the community. However, for the younger groups, it was the younger women who showed full participation in both Asian and British communities.

To that end, Asians do not show consistent linguistic patterns, and more sociolinguistic studies on different Asian communities should be conducted. In Canada, more recent projects have included Asian speakers in their samples. The *Contact in the City Project* (Hoffman, 2010; Hoffman & Walker, 2010) included examination of the English spoken by Chinese Canadians in Toronto. The *Heritage Language Variation and Change* project (Nagy, 2009) recruited Asian participants who speak Cantonese, Korean, and Tagalog. In Winnipeg, Filipinos have a particularly important role in the city, as discussed in Section 1.5. It is also with this background that this study is initiated to focus on a less commonly examined community in the hope of

[2] A differentiated repertoire refers to the fact that speakers use Indian variants for home recordings and British variants for community interface contexts. A fused and invariant repertoire indicates a mixed use of Indian and British variants across social settings (Sharma, 2011).

contributing new insights to studies on phonetic variation in Asian English. In the meantime, the results of this study will likely help in our understanding of the relationship between ethnicity and language variation.

1.4 The city: Winnipeg

Winnipeg is the capital of Manitoba and one of the largest cities in the Canadian Prairies.[3] The city was established on the banks of the Red River and Assiniboine River, which made it an important transportation junction from coast to coast. The city name *Winnipeg* originates from the Cree language: *win* means muddy, and *nipee* means water.[4]

The city saw a mass influx of primarily English, Scots, and Irish immigrants after the city entered Confederation in 1870 and the main line of the Canadian Pacific Railway was approved to pass through the city at the end of 1880s. This growth in population fundamentally changed the population structure in Winnipeg, moving the English to the dominant position from one that had previously been balanced with the French and Métis (Artibise, 1977). In the first 20 years of the 19th century, other ethnic groups from Europe such as Ukrainians, Russians, and Jews had also started to settle in Winnipeg, benefiting from the presence of the Canadian Pacific Railway. Unlike European immigrants, people from Asia were restricted from entering Canada. For example, Chinese immigrants were required to pay a head tax of as much as $500 in 1903. The restriction was executed to its fullest extent when the Chinese Exclusion Act was passed in 1923 to ban people of Asian descent, especially Chinese, from entering Canada (Chan, 2019).

[3] The Canadian Prairies are comprised of three provinces: Alberta (capital: Edmonton), Manitoba, and Saskatchewan (capital: Saskatoon). The three provinces feature vast fields of crops and flat lands.
[4] This information is retrieved from https://winnipeg.ca/History/HistoricalProfile.stm

The "White Canada forever" situation was not changed until 1967, when a points system was implemented and incorporated into the new immigration regulations to recruit overseas workers and allow them to immigrate to Canada based on work, education, and language skills instead of race (Knowles, 2016). It was after these more objective systems were put in place that Canada saw the first period of immigration from developing countries such as the Philippines and China. Since then, the population of ethnic minorities in Canada has grown steadily. It was also during this same time period when Winnipeg started to accept immigrants.

According to the Statistics Canada 2016 Census report, the population of the city is 705,244, and is the eighth largest city in Canada by population size. "European" origins, such as English, Canadian, and Scottish, account for the majority population in Winnipeg. Winnipeg also has the largest population of Indigenous people in Canada, with 92,810 people identifying as First Nations, Métis, or Inuit. The visible minority groups in total account for 28% of the entire population. Filipino, at 10.6%, ranks first among visible minorities.

Table 1.1 Population of visible minority groups in Winnipeg (first 10)
(Statistics Canada, 2017)

Visible minority groups	Population (% of total)
Filipino	73,365 (10.6)
South Asian	37,570 (5.4)
Black	26,890 (3.9)
Chinese	19,660 (2.8)
Southeast Asian	7,880 (1.1)
Latin American	6,715 (1.0)
Multiple visible minorities	5,875 (0.9)
Arab	4,565 (0.7)
Korean	3,780 (0.5)
West Asian	2,450 (0.4)

The languages used in the city reflect its population. English is the lingua franca across the city. Of the total population in Winnipeg, 94.9% use English as their first official language, and 67.8% report English as a mother tongue. Tagalog, as shown in Table 1.2 below, is the second

most spoken mother tongue, surpassing French (the other official language in Canada) (Statistics Canada, 2017). In comparison to the large population of Tagalog speakers, the other heritage languages have far fewer speakers.

Table 1.2 Mother tongue for the total population in Winnipeg (first 10) (Statistics Canada, 2017)

Languages	Population (% of total)
English	471,825 (67.8)
Tagalog (Pilipino,Filipino)[5]	44,445 (6.4)
French	22,390 (3.2)
Punjabi (Panjabi)	17,190 (2.3)
German	13,595 (2.0)
Mandarin	8785 (1.3)
Ukrainian	7880 (1.1)
Spanish	6690 (1.1)
Cantonese	6055 (0.9)
Portuguese	5685 (0.8)

Ethnolinguistic studies on Asian English speakers have focused on metropolitan cities such as San Francisco (Hall-Lew, 2009), New York (Newman & Wu, 2011; Wong, 2015), Toronto (Hoffman & Walker, 2010), and Vancouver (Umbal, 2016). Such cities have a large number of recent immigrants and often have several different ethnic enclaves. However, Winnipeg is a relatively smaller city on the Prairies with fewer immigrants belonging to visible minorities (28%). In comparison, visible minorities in Toronto and Vancouver account for 51.5% and 51.6% of the population, respectively. In this case, examining the largest ethnic minority group in a smaller city would assist us to explore the question: does the speech of Filipinos in Winnipeg orient to the linguistic trends in larger cities?

[5] The language names used here follow the terms used in Statistics Canada (2017). However, it is important to note that Filipino, instead of Tagalog or Pilipino, is designated as an official language of the Philippines. Filipino is the standardized variety of Tagalog. The structure of Filipino is originally based on Tagalog (Gonzalez, 1998).

1.5 Filipinos in Winnipeg

1.5.1 History of Filipino immigration

Due to the high demand for nurses in the late 1950s and early 1960s, the Canadian government started to accept nurses from the Philippines. In 1959, 30 Filipino nurses who applied for temporary visas from the United States were approved to work in Canada (Malek, 2019:116). Nine of them came to Winnipeg (Winnipeg Free Press, 1960). The Canadian government approved the applicants because the nurses already had work and training experience in an Anglo-dominated society through the American Exchange Visitor Program in the United States (Choy, 1972; Malek, 2019). The operation was also meant to smooth the relationship between Canada and the Philippines (Department of Employment and Immigration, 1959; Malek, 2019). In the 1960s, the Philippine government started to pressure Canada to accept Filipino applicants by rejecting the entry of Canadians into the Philippines. In 1965, a scheme was initiated by Canadian Pacific Air to recruit 520 nurses directly from Manila to fill positions in healthcare. In the end, after passing credential screenings in Manila, around 250 Filipino nurses were granted employment offers from Canadian hospitals (Department of Manpower and Immigration, 1965; Malek, 2019).

Starting in 1967, immigration to Canada from the Philippines has slowly increased and can be divided into three periods (Vachon & Toews, 2008). The first period is from 1967 to 1974. During this period, due to the high demand of nurses and medical professionals, Filipino women with medical training were especially sought after. This was also the period when Manitoba started to recruit Filipino immigrants to fill job gaps created by the expanding textile

industry.[6] From 1968 to 1969, several hundreds of Filipino immigrants were chosen and recruited directly from the Philippines by Canadian Immigration and Manpower to work in the garment industry in Manitoba (Buduhan, 1972). The second period, from 1974 to 1985, primarily featured family reunification, as economic recession led to the decline of independent immigrants. Most were sponsored and dependent on the people who had immigrated earlier during the first period. In the third period, from 1985 onwards, there was again a rise in the number of Filipino immigrants for labor market reasons. Since then, Filipino immigration consists of more professionals, including managerial, engineering, and natural science occupations.

The early history of Filipino immigration to Canada was not gender-balanced. Filipino arrivals in Canada were at first intended to fulfil the need for nurses[7] and caregivers, primarily women. During the first wave of Manitoba immigration, 412 garment workers arrived in total, only 15 of which were men. Because of this immigration pattern at the beginning, women have played an essential role in the Winnipeg Filipino population. It was women who voluntarily followed the recruitment as a "trial" group and proved to their family back home that working in Canada was not a hoax; this reassurance was necessary because no one had immigrated to Canada before (Buduhan, 1972). Many of them were addressed as "Mommy" or "Mother" by the migrants who followed them (Buduhan, 1972:69) for helping the arriving garment workers. It was also women who initiated the sponsorship chain: they sponsored their siblings and close

[6] The importance of this migration was made evident with the 50th anniversary celebration of the Philippine Garment Workers immigrating to Winnipeg, held in September 2018. (Source: https://www.cbc.ca/news/canada/manitoba/filipino-garment-workers-winnipeg-1.4825692.)

[7] *Prairie Nurse*, a book written by Marie Beath Badian in 2017 and adapted for the theatre the following year, tells a story of two Filipina nurses who came to Canada in 1967 and worked in a small town in rural Saskatchewan, one of the three provinces in the Prairies. Based on a real-life experience, this story reflects the early immigration of Filipina nurses without family or friends, underscoring the importance of this population on the Prairies.

relatives first, and the people who were sponsored then sponsored their side of the family, which gradually extended to the whole family. This method of coming to Canada was brought up many times during interviews. For example, speaker 219, who is a first-generation Filipino, talked about how her family came to Canada:

> "my... my two- my- my sister- well the oldest sister came in first, worked with the um, what did they call it, garment factory, that's how she came here so pardon me, and then, she sponsored my oldest brother then my old- then my second oldest sister, and then the second oldest brother came, so all four of them came here a year after each other I think, and then my brother, then all of them sponsored my parents, and that's where I was included as an under- I think I was eighteen years old, when they filed the petition, so I came in as a sponsor, mm-hm"

The Filipino population in Canada reached 780,125 in 2016, with the largest population in Ontario (311,675), followed by British Columbia (145,025) and Manitoba (79,815) (Statistics Canada, 2016). The Filipino community accounts for 2.42% of the Canadian population, which makes them the third largest Asian-Canadian group.

1.5.2 Filipinos in Winnipeg today

Filipinos are the largest visible immigrant minority in Winnipeg, with a population of 73,880 (men: 34,860, women: 38,500), according to Census of Population 2016. They also make up nearly 10% of the entire population of Winnipeg. With this large population, Tagalog, one of the two official languages in the Philippines, has become the most common immigrant language in the city, followed by German and Punjabi. As an important part of Winnipeg culture, Filipino culture has been maintained and has flourished over the years. Filipino food, music, and services are available all around the city. As one example, the newspaper *Filipino Journal* [8] was founded in 1987 and is published bimonthly, featuring not only local news, but also news from the Philippines. Since 2012, the Manitoba Filipino Street Festival has been held to celebrate Filipino

[8] https://filipinojournal.com/

traditional culture, music, and art, and to interact with and spread knowledge of Filipino culture and life to other Winnipeggers.

In addition to culture maintenance, the Filipino language is also being maintained in the Filipino community in Winnipeg. *Good Morning Philippines*, a program aired on the radio station CKJS AM810, plays Filipino songs and broadcasts Filipino-related news in Tagalog every weekday from 5:30am to 9:00am. *Filipino Express,*[9] a news magazine based in Winnipeg, has articles published in Tagalog. More significantly, the Seven Oaks School Division established a Filipino bilingual program for the 2018-2019 school year, the first in Canada. All of these activities and events not only reflect the importance of Filipino immigration to Winnipeg, but also are evidence that the Filipino community is interested in maintaining its heritage languages and culture.

At the same time, Filipinos are also well adapted and integrated into mainstream culture. Most of the Filipinos who came to Canada have learned English very well and are able to converse in English fluently. They are usually either Christian or Catholic and are members of local religious organizations. Hence, they share linguistic and cultural similarities with local Canadians and are able to fit into the host community easily. During one of the interviews conducted, the Filipino interviewer, put it as follows:

> we're not like other Asian cultures that come here who like keep it like… super, I-don-t-know steady I guess… we'll evolve, [incomplete] or like we change according to where we live…

[9] http://www.pilipino-express.com/.

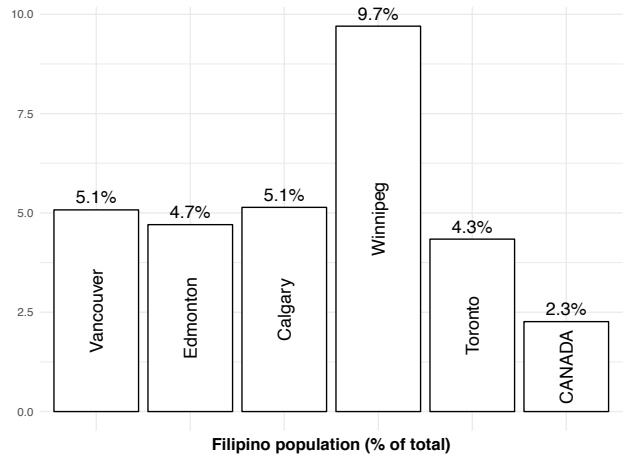
Their cultural and linguistic adaptability have made Filipinos perfect candidates to apply for and to be approved by the Manitoba Provincial Nominee Program (MPNP).[10] The MPNP offers quicker processing times and is more targeted to the shortage of jobs in Manitoba that often require lower level of education and skills as compared to the Federal Skilled Worker Program (FSWP) (Carter et al., 2010). The MPNP program offered several flexible streams. Two of these were the skilled worker overseas stream and the family support stream, both of which were especially beneficial toward Filipino immigration to Winnipeg. The family support stream[11] enabled Filipinos who had already settled in Winnipeg to sponsor family members who were in the Philippines. The skilled worker overseas stream is a convenient channel for Filipinos to work directly in Manitoba without having to obtain a Canadian degree. Many Filipinos have taken advantage of this program, as nearly 40% of Filipinos have immigrated to Winnipeg through this channel (Carter et al., 2010). Compared to other Canadian cities, Winnipeg Filipino immigration is unique. The three main immigration categories nationwide that brought Filipinos to Canada are the Live-in Caregiver Program (LICP), the FSWP, and the Family Class. In Ottawa, almost 40% of Filipinos came through the LICP, while in Toronto, the FSWP and Family Class are primarily used.

The MPNP has been an effective way for the province to attract immigrants to resettle in Manitoba. According to Carter et al. (2010), the retention rate of immigrants in Manitoba was consistently above 70% from 2001 to 2006, which is reflected in the Filipino community. With the strong family connections and community supports, Filipinos are more likely to stay in Winnipeg after obtaining permanent residency status, rather than using Winnipeg as a

[10] This program was initiated by the federal government, a mechanism that enables provinces to create locally oriented criteria to determine applicants' eligibility to apply for permanent residency. Manitoba was one of the first three provinces that signed federal-provincial agreements to create nominee programs in 1998 (Carter et al., 2010).
[11] This stream is no longer offered in Manitoba.

transitional place. Anecdotally, it appears that migrants from many other ethnicities land in Winnipeg, but then move to bigger cities such as Toronto and Vancouver, where they can find a larger community. In Winnipeg, even though the total number of Filipinos is substantially less than the other cities and provinces, its population is the largest among visible minority ethnic groups in Winnipeg, as shown in Figure 1.1 (Onosson et al., 2019).

Figure 1.1 Percentage of Filipino population in the four major western cities and Toronto (Onosson et al., 2019)

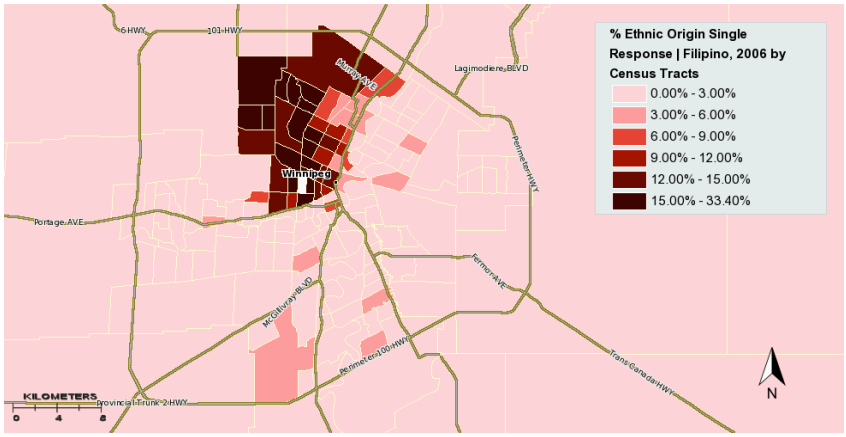


Filipinos in Winnipeg are also differentiated from Filipinos in core cities such as Vancouver and Toronto in terms of their settlement patterns. Filipinos in Vancouver and Toronto reside in and are widely scattered across ethnically diverse neighborhoods (Kelly, 2014; Umbal, 2016). Filipinos in Winnipeg, on the other hand, have formed an ethnic enclave, geographically concentrated in the northwest area of the city, as shown in Figure 1.2. These adjacent Filipino neighborhoods in Winnipeg not only construct a built-in support mechanism and attract many newcomers and Tagalog speakers to settle in the same areas, but also provide the necessary infrastructure for the maintenance of heritage languages and culture. In addition, such a residential pattern allows close-knit social networks in the community to develop, which lead speakers to primarily interact with people from the same ethnic background (Hoffman & Walker, 2010). This context may constrain speakers' linguistic behavior from assimilating to local speech

and promote subsequent generations' speech to resemble more with their parents' generation, demonstrating substrate transfer effects. This study seeks to explore the linguistic behavior of Filipinos in Winnipeg while negotiating their social roles.

Figure 1.2 Geographic distribution of Filipinos in Winnipeg.

(Map provided by Philip Kelly, Filipino Youth Transitions in Canada project, York University.)



1.5.3 Second-generation Canadian Filipinos

It is important to understand the social landscape of second-generation Filipinos to explore the linguistic variation within the community. Kelly (2014) showed that Filipinos born in Canada have lower unemployment rates and are more likely to finish a university degree than the national average. However, Filipinos who immigrated to Canada at a younger age are much less likely to obtain a university degree compared to the national average and other visible minorities. The situation is especially reflected among Filipino men, who are least likely to be university degree holders across all ethnic groups, affecting the socioeconomic status of Filipino men. Kelly's study was based on the National Household Survey in 2012 and depicts the struggles Filipino youth faces across Canada, but it did not present Filipino education and employment status in specific cities. Even in Winnipeg, where Filipino men have a higher rate of obtaining a university degree, their income is below the average.

As shown in the Table 1.3, there are differences between Filipino men and women with regards to education: women are more likely to have postsecondary education than men, and this pattern is common elsewhere (Kelly, 2014). Comparing Filipinos to the general population, Filipinos are more likely to attain higher education than their non-Filipino counterparts. This suggests that the second-generation Filipinos are more likely to achieve higher levels of socioeconomic status than their same-age cohorts.

Table 1.3 Rate of postsecondary education in Manitoba ages 25-34[12]
(Census of Population, 2016)

Gender	Filipino[13]	Total population[14]
Men	62%	52%
Women	77%	65%

Looking at average income comparisons, Table 1.4 shows that the second-generation Filipino men and women achieve similar incomes. In contrast to Filipinos, however, there is a wider gender income gap in the total population, where men have a much higher average income than women. Comparing Filipinos in particular to the total population, we see that Filipino women tend to exceed the local average in terms of financial income in the same age group. On the other hand, Canadian-born Filipino men have a much lower average income than the total population, suggesting that relative to their non-Filipino peers, Filipino men attain a lower status as compared to Filipino women.

[12] The original source includes several different age groups. The age group here is limited to 25~34, because this age group is more likely to belong to the second generation of Filipino immigrants. In addition, this age group is more likely to have finished a postsecondary education.
[13] The Filipino group here only includes the second generation. According to the *Guide to the Census of Population*, 2016, the second generation are people who were born in Canada and have at least one parent born outside Canada.
[14] Following the *Guide to the Census of Population*, 2016, total population here includes South Asian, Chinese, Black, Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, Visible minority n.i.e, Multiple visible minorities, and Not a visible minority.

Table 1.4 Average annual income ($) in Manitoba ages 25-34
(Census of Population, 2016)

Gender	Filipino	Total population
Men	38212	44090
Women	38088	34153

Table 1.3 and 14 suggest that younger Filipino men in Winnipeg who have a higher level of education do not achieve higher incomes. This unconventional situation may be attributed to limited access and connections to a more professional labor market. Previous research has revealed that younger generations in enclave communities were exposed to limited professions and types of employment and that strong social networks in neighborhoods can impede pathways for younger generation to pursue different professions outside their social circles (Mais, 2012). Mais (2012) and Kelly (2014) argue that compared to Filipino women who have more role models to learn from, particularly in nursing professions, second-generation Filipino men have fewer male role models in professional careers. In this case, Filipino men are more limited to working in services and manufacturing. These types of jobs limit their interactions with people outside the community, which could be an important factor that affects the linguistic behavior of Filipino men. For example, Rosen and Li (2016) have shown that in enclave communities, groups with greater economic power are further along in the production of innovative linguistic forms.

1.6 Phonetic variables studied

Three phonetic variables were chosen to compare the linguistic performance of Filipinos with local mainstream language patterns and to explore whether there is substrate transfer from heritage languages. The social variables examined are: generation, gender, and ethnicity.

The first phonetic variable studied is Canadian Raising, or the raising of the two diphthongs /aɪ/ and /aʊ/. When these diphthongs are followed by a voiceless consonant, as in the words *tight* /aɪ/ and *about* /aʊ/, the diphthong onset of the vowels are raised toward /ʌɪ/ and /ʌʊ/. However, when the following phonetic context is a voiced consonant as in words like *tide* /aɪ/ and *loud* /aʊ/, the two diphthongs are not raised (Chambers, 1973; Thomas, 1991). Canadian Raising of /aɪ/ is more widely distributed geographically across North America, while the raising of /aʊ/ is more characteristic of Canadian speech (Labov et al., 2006) and can index Canadian nationality (Niedzielski, 1999). This variable is selected to examine ethnic variations of Canadian Raising and to test whether Filipinos in Winnipeg show any different patterns in the production of /aɪ/ and /aʊ/.

The second linguistic variable studied is /æg/-raising, which features a considerably more raised /æ/ before /g/ as compared to before other environments. This variable is reported to be especially robust in the Canadian Prairies (Boberg, 2008). This variable is examined to reveal whether Filipinos in Winnipeg participate in the reported local /æg/-raising or not, and whether they adopt or resist this local norm.

The third linguistic variable is VOT. This is a durational feature that measures the time interval between the release of the stop and offset of glottal pulsing (Lisker & Abramson, 1964). This variable is chosen to investigate possible substrate language transfer, to see if speakers are maintaining elements of a heritage language. VOT in Filipino heritage languages employs a short-lag and long-lead voicing system (see Chapter 5), whereas English is an aspirating language with a short-lag and long-lag voicing contrast. In this case, for the first-generation Filipinos, language transfer is more likely to transfer from their first language into their English, and the speech patterns of the first generation might persist in the subsequent generations.

Comparisons between first- and second-generation Filipinos allows us to determine whether language transfer is occurring in the English of Filipino Winnipeggers (FWs).

1.7 Organization of the thesis

This thesis explores Winnipeggers' ethnolinguistic performance through three phonetic variables. The organization of this thesis is as follows. Chapter 2 describes the methodology used in this study. Chapter 3 compares the production of Canadian Raising by Filipino Winnipeggers (FWs) and Traditional Winnipeggers (TWs). Chapter 4 presents the results of the local phonetic change /æg/-raising. Chapter 5 reports the results of VOT to understand the potential effect of substrate transfer. Specific methods used for each variable are given in more detail in each chapter. Chapter 6 reviews and summarizes the main findings of previous chapters, and provides discussion and potential explanations of the overall results.

2 Methodology

This chapter outlines the methodological framework used in this study. It begins with an overview of the speakers (§2.1), the materials used throughout the studies (§2.2) and the procedure of processing audio data (§2.3), followed by descriptions of social and linguistic variables (§2.5 and §2.6) and proceeds with general statistical tests (§2.7). Detailed methods such as the number of tokens collected for each phonetic variable and statistical models used to examine each element are given in Chapters 3, 4, and 5, as the variables are discussed.

2.1 Speakers

Data used in this study is drawn from the Languages in the Prairies Project (LIPP), a corpus that was created to explore variation and change in the Canadian Prairies. Participants from this corpus are stratified by first language, age, gender, ethnicity, urbanity and geographic location. All the participants of LIPP were recruited based on the interviewers' social network. Each elicitation lasted approximately 90 minutes, including a 45- to 60-minute sociolinguistic interview followed by a 220-long word list and two reading passages, *The North Wind and the Sun* and *From Aesop's Fables: The Cat and the Mice,* based on Boberg (2008) and Wassink et al. (2009). All speakers were digitally recorded at 44 kHz in uncompressed WAV format, using a Zoom handheld recorder and Sennheiser EK 100G2 wireless lavalier microphones. To minimize the observer's paradox (Labov, 1972), all elicitations were conducted by interviewers who share the same speech community with the interviewees.

To achieve the main purpose of this dissertation of investigating the English spoken by Filipinos in Winnipeg, speakers from two ethnic groups, 26 FWs and 17 TWs, were included and analyzed. As listed in Tables 2.1 and 2.2, speakers from both groups were stratified according to gender and generation. The Filipino data was collected by an interviewer who is also Filipino and has strong social ties with the community.

The terms *Traditional Winnipeggers* and *Filipino Winnipeggers* were chosen to represent the European and Filipino communities in Winnipeg. The term *Traditional* is taken from Hall-Lew's (2009) research on phonetic production among Chinese Americans in San Francisco. Hall-Lew described the Chinese community as the *Emergent linguistic market*, which is more strongly oriented to a broader and newer regional pattern, while the European community, remain tied to the *Traditional linguistic market* and favoured the local and older linguistic patterns. Our earlier study on Canadian Shift found that Filipinos are more adherent to extra-local trends than the local Winnipeg European speakers (Onosson et al., 2019), which is in line with Hall-Lew's study.

In this study, FWs consist of nine first-generation and 17 second-generation participants. *Gen.1* in Table 2.1 represents first-generation FWs, who immigrated to Canada after 18 of age and who have resided in Winnipeg for over 20 years. Gen.1s are all fluent English speakers and native speakers of at least one of the heritage languages. They acquired English in the Philippines, where English is one of the two official languages. The Philippines was colonized by the United States from 1898 to 1946, during which time English was implemented in the school system and was established as a medium of instruction (Dolan, 1991).

Gen.2 represents second-generation FWs who were either born or locally raised in Winnipeg from no older than five years of age. Gen.2s are all monolingual English speakers and

do not speak Filipino heritage languages fluently. The language they use at home is mainly English. The scheme of separating FWs into Gen.1 and Gen.2 follows the mutigenerational approach used in Hoffman and Walker (2010). Three speakers were removed from the original dataset, as they are bilingual speakers and were not raised in Canada, but immigrated to Canada after 10 years of age, and would be part of a 1.5 generation, which I am not analyzing here.

Table 2.1 FWs separated by gender and generation

Gen.1 (age: 48-62)		Gen.2 (age: 19-41)	
Men	Women	Men	Women
4	5	9	8
Total: 9		Total: 17	
Grand total: 26			

TWs were born and raised in Winnipeg and are monolingual English speakers. The younger participants are those between 18 and 35 years old at the time of the interview. The middle-aged speakers are between 36 and 59 years old, and the older participants were all more than 60 years old at the time of their interview. The TW participants are not perfectly balanced by generation or gender, skewing toward women in the younger group and men in the older group. Interpretations of the results in Chapters 3, 4, and 5 will take this situation into consideration.

Table 2.2 TWs stratified by gender and generation

Younger (18-35)		Middle-Aged (36-59)		Older (60+)	
Men	Women	Men	Women	Men	Women
2	7	2	2	3	1
Total: 9		Total: 4		Total: 4	
Grand total: 17					

2.2 Materials

For this study, I used the wordlist recordings as the main data source to conduct phonetic analyses. One of the reasons for this is that wordlist data can decrease the influence of phonetic, prosodic, lexical, and other linguistic variables (Boberg, 2008:133). For instance, wordlist data reduces the possibility of overlapping waveforms between preceding and following words, making it easier for us to locate the exact onset and offset points to measure VOT of stops. In addition, some words are difficult to obtain in spontaneous speech. To have the ideal data to examine prevelar raising or /æg/-raising, we need to collect tokens of /æ/ that precede /g/ and are in stressed position in monosyllabic words. The wordlist that is used in this study includes the words *tag, bag* and *gag*. However, in interviews we cannot guarantee that similar numbers of tokens would appear and meet these linguistic requirements. Besides, the duration of VOT, one of the variables examined in this study, can be affected by speaking rate; fast speaking rate will decrease VOT values of voiceless stops and vice versa (Miller et al., 1986; Volaitis & Miller, 1992; Kessinger & Blumstein, 1998). Wordlist data can thus minimize the effect of uncontrolled speaking rate. Wordlist data also enables us to make better comparisons between the present study and related studies, such as Hagiwara (2006) on Winnipeg English. What is more, the wordlist recordings were not collected in a laboratory setting, but in a casual setting such as participants' home, which helps lessen the participants' self-consciousness about their speech. More importantly, if phonetic variation is found in wordlist items that tend to represent formal norms of pronunciation, even stronger evidence of ethnolectal variation occurring in naturalistic speech would be expected (Boberg, 2004). Accordingly, tokens extracted from wordlists achieve the main goal of this project to examine and present ethnic linguistic variation in a highly

integrated community. To gain a deeper understanding of the results, I also incorporate some qualitative ethnographic analyses of the interviews recorded as part of the same project.

2.3 Vowel extraction and measurements

Tokens of vowel variables in this study were aligned and extracted using Forced Alignment and Vowel Extraction (FAVE) (Rosenfelder et al., 2011). FAVE is a semi-automated analysis tool particularly designed to assist sociophoneticians to process a large quantity of data. It comes with two downloadable toolkits: FAVE-align and FAVE-extract.[15] To implement FAVE on the data, all recordings were transcribed first into Praat TextGrids (Boersma & Weenink, 2015). The locally downloaded FAVE-align toolkit was then used to align each phonetic segment. Following the Carnegie Mellon University pronouncing dictionary, FAVE-align automatically converts all the words in orthographic transcription into phonemic transcription and returns a *TextGrid* and an *.errorlog* file, which provided me a further opportunity to fix any errors between unmatched audio and intervals.

Once reliable alignments were confirmed, the tokens in these alignment files were extracted using the FAVE-extract toolkit. Tab-delimited datasets containing comprehensive information of each vowel were returned. In the datasets, there is a variety of information including vowel; stress; word; first formant (F1) and second formant (F2) measurements at 20%, 35%, 50%, 65%, and 80% points of the vowel's duration; mean values of F1, F2, and F3; and other detailed information, such as the preceding and following segments to the nucleus. Furthermore, the results returned by FAVE included both unnormalized and normalized vowel formant values. The normalized formant values were normalized into z-scores first using the

[15] The new website to download FAVE is https://github.com/JoFrhwld/FAVE. I used the original website, fave.ling.upenn.edu, which is no longer available.

Lobanov normalization procedure (Lobanov, 1971) and then rescaled to Hertz values. This normalization process is automatic and implemented in FAVE by default. In our case, to minimize physiological differences (Thomas, 2002) and preserve sociolinguistic differences, normalized data were exclusively employed in phonetic analyses. All vowel information was saved in Excel and used for statistical analysis in RStudio.

2.4 Acoustic analysis

This project analyzes the sociolinguistic variation of three phonetic variables: two vowel features and one consonant feature. This section introduces the acoustic measurements that are implemented mainly in Chapters 3 and 4 to describe vowel differences. The detailed procedures and methods to measure consonants are presented in Chapter 5. The basic acoustic analysis of vowels was conducted by measuring the F1 and F2 values. F1 is inversely correlated to vowel height: high vowels have low F1 values and low vowels have high F1 values. F2 is correlated to vowel frontness: front vowels have high F2 values and back vowels have low F2 values (Thomas, 2011). F1 and F2 values are used as dependent targets to test the significance of social factors.

The formant transitions were also drawn using the vowel formant values returned by FAVE (see §2.3) at five proportional timepoints: 20%, 35%, 50%, 65%, and 80% of vowel duration. This visualization method not only gives a dynamic view of vowel movements, but also helps provide additional information of the vowel formant values at multiple points in addition to their mean values. Another advantage to using this method is an increased chance of finding more complex and systematic patterns for some vowels, especially diphthongs, that other methods would not find (Di Paolo et al., 2011).

2.5 Social variables

Three social factors: *gender*, *generation* and *ethnicity* are investigated in this study. To report the results of the social factors, each chapter follows the same process: it examines the roles of gender and generation within the two speech communities first, and then conducts cross-ethnic comparisons on a community level. Literature reviews on how social factors condition the performance of each variable are given in the respective chapters.

2.5.1 Gender[16]

The critical influence of gender on language variation has been explored in numerous sociolinguistic studies. Two of the common findings are that women use more standard forms and lead in particular sound changes. The gender effect is also associated with broad categories, which can be explained by its interaction with other social factors, such as social class (Labov, 2001a; Trudgill, 1972b), age (Eckert, 1988), and social network (Chambers, 2009; Fought, 1999; Lippi-Green, 1989; Milroy & Milroy, 1992). Labov formulated four principles of language change, and three of them are concerned with gender (Labov, 2001):

> Principle 2: For stable sociolinguistic variables, women show a lower rate of stigmatized variants and a higher rate of prestige variants than men. (Labov, 2001a:266)
>
> Principle 3: In linguistic change from above,[17] women adopt prestige forms at a higher rate than men. (Labov, 2001a:274)
>
> Principle 4: In linguistic change from below,[18] women use higher frequencies of innovation forms than men. (Labov, 2001a:292)

[16] We investigate differences between men and women, although we recognize there are other genders.
[17] *Change from above* occurs when prestige forms of linguistic variables are imported from outside the speech community, or involves the redistribution of prestige forms within the community (Labov, 2001a).
[18] *Change from below* refers to linguistic forms that operate within the speech community below the level of social awareness.

Within the same speech community, women and men may use different linguistic forms. Women are more likely to favor supra-local variants, while men prefer localized norms (Milroy & Gordon, 2003; Watt, 2002). For instance, Watt (2002) found that women in Tyneside rarely use traditional vowel variants and lead changes to use more supra-local and national variants, while men use more variants that may symbolize local identity. Hence, it is necessary to examine the factor *gender* in order to have a better understanding of the speech performance among FWs.

The research questions that are answered regarding the effect of gender on constraining the production of linguistic variables are:

1) Are there any differences between men and women in each age subgroups across FWs and TWs?
2) If gender is a significant predictor, is the effect of gender on the production of linguistic variables the same across FWs and TWs?

2.5.2 Generation

Another factor to consider in looking for correlations in language patterning is generation. Comparing different usages of linguistic features across generations in the speech community can identify the status of a linguistic change, whether it is stable or a change in progress (Labov, 1994).

For this study, including generation as a predictor not only contributes to the exploration of generational differences in the Filipino community, but also contributes to identifying the linguistic patterns of stable and changing variables in the TW community. Based on the stratification explained in §2.1, the generational similarities and differences in FWs are examined by comparing first-generation and second-generation immigrants. For TWs, the generational

patterns are explored by comparing three age groups: younger, middle-aged, and older. The research questions that are addressed:

1) Are there generational discrepancies in FWs and TWs?
2) Are there generational discrepancies in the same gender group?

2.5.3 Ethnicity

Following the examinations of inter-corpora similarities and differences, intra-ethnic group comparisons were conducted. The research questions that are included:

1) What are the differences and similarities between the second-generation FWs and TWs?
2) Are the generational and gendered linguistic patterns the same between FWs and TWs?

2.6 Linguistic variables

Three linguistic variables, Canadian Raising, /æg/-raising, and VOT, were analyzed and are covered in Chapters 3, 4, and 5, respectively. A more detailed literature review of these variables will be given in each respective chapter, but this section briefly introduces the variables and explains why they were chosen.

Canadian Raising involves two diphthongs, /aɪ/ and /aʊ/. Canadian Raising refers to the raising of these diphthongs when they are followed by voiceless consonants, as in words like *tight* /aɪ/ and *about* /aʊ/, usually phonetically transcribed as /ʌɪ/ and /ʌʊ/. However, no raising occurs when they are followed by voiced consonants, as in words like *tide* /aɪ/ and *loud* /aʊ/ (Chambers, 1973; Thomas, 1991). Canadian Raising of /aɪ/ occurs in more places across North America, while Canadian Raising of /aʊ/ tends to be limited to Canada. The results of the two diphthongs reveal whether FWs participate in the supra-regional and regional linguistic features or not.

/æg/-raising is a phenomenon where /æ/ raises when it precedes velar /g/, as in the words *tag* or *gag*. It is a more local feature on the Prairies that may be undergoing regional change (Boberg, 2008). The investigation of this particular phenomenon informs us of the general status of /æg/-raising in Winnipeg, as well as how and whether FWs use this apparently locally indexed feature.

VOT is the time between the release of stop consonants /p/, /t/, /k/, /b/, /d/, and /g/ and the onset of voicing. English and the Filipino heritage languages spoken by FWs have different voicing systems regarding VOT (see Chapter 5). This variable is chosen to explore the potential substrate effects of Filipino heritage languages on the English spoken by FWs.

In summary, the three linguistic variables are chosen to investigate regional phonetic variation (Canadian Raising and /æg/-raising) and language transfer effects (VOT).

2.7 Statistical analyses

Linear regression models, and in particular, linear mixed-effects models in RStudio (RStudio Team, 2016) were performed to test the significance of social predictors. The main reason for employing mixed-effects models is that they allow us to account for both fixed effects and random effects. In the data there are two factors, *speaker* and *word*, that cannot be experimentally controlled and could potentially interfere with the calculation of the effects of fixed predictors on the dependent variable. To avoid this, speaker and word were taken as random factors in a linear regression mixed-effects model (Bates et al., 2015) and thus I included the effects of individual variation and between-item variation in the analyses. This better ensured that the results returned by the linear regression mixed-effects models were not influenced by individual differences. In other words, if fixed predictors were returned as significant, their significance would be well-established and not distorted by individual variation (Drager & Hay,

2012; Hay, 2011). Independent predictors include both linguistic and social variables. The effect of social variables such as *ethnicity*, *gender,* and *generation* were tested.

To determine the best fit of the model, a manual stepwise forward elimination procedure was chosen and carried out (Schweinberger, 2020). In this procedure, I added independent predictors and the interactions of the predictors one by one. Predictors were included in the final model if they significantly improved the model fit; otherwise, they were eliminated. The value of Akaike Information Criterion (AIC) (Akaike, 1974) was used to assess the significance of a certain statistical model relative to other models. A model is a better fit if it has a lower AIC. When two models have equal AIC, the Bayesian Information Criterion (Schwarz, 1978) was used instead. Mixed-effects models were structured using the lme4 package (Bates et al., 2015) in R (R Core Team, 2015) and tailored for each linguistic variable. Specific model structures are covered in each of the result chapters. For best visualization and to support the results of statistical testing, graphics such as scatter plots, bar plots, and ellipses were drawn in RStudio (RStudio Team, 2016), mainly using the ggplot2 package (Wickham, 2009).

2.8 Summary

This dissertation is a sociophonetic and ethnolinguistic study of the speech of 26 FWs and 17 TWs. Their speech was examined using methods of acoustic phonetic analyses and quantitative statistical analyses to determine the significance of the social factors of *generation*, *gender,* and *ethnicity* on the three linguistic variables. Canadian Raising and /æg/-raising were chosen to explore how FWs fit into the larger matrix of Canadian English. VOT was used to investigate substrate language transfer. This study helps provide a better understanding of the place of Filipinos in the Winnipeg linguistic landscape.

3 Canadian Raising

This chapter presents the realization of Canadian Raising in the speech of Winnipeggers. There are two diphthongs involved in Canadian Raising: /aɪ/ and /aʊ/. Canadian Raising of /aɪ/ is a widely distributed feature in dialects across North America, while Canadian Raising of /aʊ/ is seen as the stereotypical pronunciation in Canadian speech: for example, “oot” and “aboot” are exaggerated version of raised *out* and *about*. The raised /aʊ/ has also been found to index Canadian nationality (Niedzielski, 1999; Swan, 2017). The investigation of the two diphthongs can help us understand how FWs fit into the larger matrix of Canadian speakers through the use of both /aɪ/ and /aʊ/. As introduced in Chapter 1, Filipinos in Winnipeg reside in close-knit neighbourhoods and are a recently immigrated ethnic group. Not only are they potentially influenced by their heritage languages and culture, they are also well-integrated into the local Canadian culture. It is expected that there will be both similarities and differences between FWs and TWs with respect to the production of /aɪ/ and /aʊ/.

This chapter thus explores issues and answers questions concerned with social differentiations, and particularly with ethnic variations in the production of pre-voiced and pre-voiceless /aɪ/ and /aʊ/. Section 3.1 introduces and reviews previous literature on the study of Canadian Raising. Section 3.2 presents the specific methodology used in this chapter. Section 3.3

reports descriptive and statistical results from the examinations of /aɪ/ and /aʊ/. Section 3.4 discusses the results.

3.1 Background

Canadian Raising is widely known as a phonological process involving the diphthongs /aɪ/ and /aʊ/.[19] When these diphthongs are followed by voiceless obstruents, as in words like *tight* /aɪ/ and *about* /aʊ/, the nucleus of the diphthongs /a/ is raised toward the mid vowel /ʌ/ (Chambers, 1973; Thomas, 1991). However, when they are followed by voiced consonants, as in words like *tide* /aɪ/ and *loud* /aʊ/, no raising occurs (Chambers, 1973). This process was first described in Joos (1942).

Canadian Raising involves both /aɪ/ and /aʊ/ having the same phonological motivation (Chambers, 1989), but the two diphthongs pattern very differently across Canada and the United States. The raising and fronting of /aʊ/ is more locally restricted to Canada and has become one of the salient features of Canadian English. Major Canadian cities such as Vancouver, Toronto, Montreal, Winnipeg, etc. have been shown to participate in raising of /aʊ/ before voiceless consonants, but there are fewer locations reported to show occurrences of /aʊ/-raising in the United States. (Carmichael, 2020; Dailey-O'Cain, 1997; Labov, 1963). In addition, /aʊ/-raising carries more socio-indexical meanings, especially indexing an identity of being Canadian, than /aɪ/-raising does. For instance, listeners from Detroit assigned more raised /aʊ/ tokens to the speaker if the speaker's nationality was given as a Canadian (Niedzielski, 1999). Swan (2017) found that national pride was a predictor of /aʊ/-raising in Vancouver speakers, who employed /aʊ/-raising more when they talked about local and national orientations. /aʊ/-raising is also

[19] For consistency's sake, I use /aɪ/ and /aʊ/ throughout this study. Note that some other scholars, such as Boberg (2008) and Smith (2018), use /ay/ and /aw/ notation.

exploited by Canadians who have moved to the United States to convey their attitudes toward the host country; /aʊ/ is more raised when speakers express distance from the United States and less raised when speakers show closeness to the United States (Nycz, 2018).

In comparison to /aʊ/-raising, /aɪ/-raising is more widely distributed across the dialects of North American English. Not only are there more locations in the United States that have been documented to participate in /aɪ/-raising, such as Ohio (Thomas, 1995), Vermont (Roberts, 2007), and Philadelphia (Fruehwald, 2008), among other locations, Canada also exhibits a uniform distribution without significant regional differences of /aɪ/-raising across the country (Boberg, 2008).

The strong correlation between the two raising processes and locations has prompted scholars to reframe Canadian Raising. According to Onosson (2018:231):

> Canadian Raising is best described as an abbrevatory process which specifically affects /aw/ before voiceless codas, altering its formant trajectories in a particular pattern which is distinct from other dialects. (emphasis in original)

Davis et al. (2019) also advocated referring to pre-voiceless /aɪ/-raising with or without concomitant /aʊ/-raising as "American raising." The previous literature thus suggests that the occurrences of /aɪ/-raising and /aʊ/-raising are not strongly dependent. Accordingly, this chapter reports the results of the two diphthongs separately for the Filipino and traditional speech communities in Winnipeg, Canada.

3.1.1 Canadian Raising across Canada

Canadian Raising is one of the most well-known phonological features of Canadian English. The *Phonetics of Canadian English* (PCE) project (Boberg, 2008:139) indicates that "Canadian Raising is a largely uniform feature of Canadian English." The national mean F1 values of raised and unraised /aʊ/ are 731 Hz and 870 Hz respectively, a 142 Hz difference. The national average

F1 values of the two allophones of /aɪ/ are 732 Hz and 844 Hz, a 110 Hz difference. Both of the F1 differences are well above 60 Hz, the threshold that was defined to indicate the occurrence of Canadian Raising in Labov et al. (2006). Even though Canadian speakers show uniform raising of /aɪ/ and /aʊ/, there are inconsistencies observed across Canada. In particular, compared to the consistent distribution of /aɪ/-raising across Canadian provinces, /aʊ/-raising is more socially and regionally varied. For example, Boberg (2008) observed significant regional differences in terms of the degree of /aʊ/-raising before voiceless consonants, where Southern Ontario participants show the most /aʊ/-raising, followed by the Prairies and British Columbia.

Turning to the Prairies (Manitoba, Saskatchewan, and Alberta), these three provinces all show Canadian Raising of /aɪ/ and /aʊ/. The production of /aʊ/ in both the raising and fronting dimensions are more saliently different from other provinces in Canada. The distance between /aʊ/ and /aʊT/[20] in F1 is the second greatest after Southern Ontario, among the eight Canadian regions (Boberg, 2008).

Hagiwara (2006) recruited 10 monolingual English speakers in Winnipeg ranging from 18 to 25 years of age and first presented the dynamic movement of /aʊ/ and /aɪ/ in Winnipeg English. He found that even though the nuclei of /aʊ/ and /aɪ/ raised to the /ʌ/ category, the backness of the raised nuclei did not reach the same height as /ʌ/. Using acoustic-spectral analysis on Winnipeg data, Onosson (2018) also studied the production of Canadian Raising and found that pre-voiced and pre-voiceless environments result in different vowel heights in these diphthongs. Hagiwara (2006) and Onosson (2010, 2018) are all fine-grained studies focusing on the phonetic process of Canadian Raising on the Prairies, while the picture of sociophonetic

[20] In Boberg's (2008) study, /aʊT/ represents diphthongs that appear before voiceless consonants. Tokens of /aʊ/ include *cow*, *foul*, *loud*, *proud and sour*, and tokens of /aʊT/ include *doubt*, *house*, *shout* and *south.*

variation among generational, gendered, and ethnic subgroups is less clear and deserves more investigation.

3.1.2 Fronting of /aʊ/

In addition to the raising of /aʊ/ and /aɪ/, /aʊ/ is also subject to a separate phenomenon in Canadian English. The onset of /aʊ/ has been found to be fronted in addition to being raised before voiceless consonants. This variation has not been observed with /aɪ/. Chambers and Hardwick (1986) observed that the fronting of /aʊ/ in Toronto and Vancouver is a change in progress with clear gendered and aged gradations, where younger people exhibit more fronted onsets than their elders, and women tend to front more than men of the same age. Davison (1987) used the same methodology and showed similar sociophonetic results in terms of the fronting of /aʊ/ in Victoria, BC. More recent studies by Hall (2016) and Smith (2018)[21] also suggested that women favour fronted /aʊT/ more than men. In addition to these socially-varied distributions, /aʊ/-fronting is also regionally differentiated. Speakers from Ontario have the most fronted /aʊT/ as compared to the further back position of /aʊT/ in the Prairies and British Columbia (Boberg, 2008). Hall (2016) also compared speakers from Toronto and Vancouver and found the same regional differences, but only in men.

The aforementioned studies on /aʊ/-fronting examined data from larger cities on the west and east coasts. There are fewer studies exploring the social differentiations of /aʊ/-fronting on the Canadian Prairies. Labov et al. (2006) found that the raised /aʊT/ is articulated further back on the Prairies, identifying F2 of /aʊT/ being less than 1550 Hz as one of the four features consistently occurring across the Prairies. Boberg (2008) also found that the Prairies has the lowest mean F2 value among Canadian regions. There were also two participants from

[21] Smith's (2018) study is based on the data collected from communities in Northern Ontario, which includes Kirkland Lake and Temiskaming Shores.

Edmonton in that study who did not have the stereotypical Canadian /aʊ/-raising, but rather showed the most extreme backing of /aʊ/. Accordingly, one of the tasks in this chapter is to determine the status of fronting of /aʊ/ in Winnipeg and to explore how it is influenced by social factors such as *age*, *gender,* and *ethnicity*.

3.1.3 Ethnic variation of Canadian Raising

While many studies have investigated the correlation between Canadian Raising and social factors, such as age, gender, location, etc. (Chambers, 1989; Hung et al, 1993; Boberg, 2008; among many other studies), only a few studies have focused their attention on the ethnic differentiations in the production of Canadian Raising. In the United States, Thomas (2000) examined offset spectrals of /aɪ/ in pre-/t/ and pre-/d/ conditions and found that Mexican Americans from southern Texas exhibit less spectral difference in the two conditions of /aɪ/ than non-Hispanic whites from central Ohio communities. Boberg (2014) recruited speakers from three ethnic groups in Montreal: Italian, Jewish, and British. His results show that speakers of Italian heritage do not participate in the general Canadian Raising; speakers of British and Jewish heritage, however, do show Canadian Raising in the context of /aʊT/, similar to other Canadians. This prompted Boberg (2014:68) to predict that more recently arrived ethnic groups possibly have not acquired the pattern yet, and "the likelihood of raising depends on a speaker's ethnic identity." Moreover, inside each ethnic community, there are gendered differences that also interact with ethnicity to generate intersectional effects. Walker (2016) found gendered differences in the production of Canadian Raising among Anglo, Italian, and Chinese participants in Toronto. For instance, Italian women exhibit more /aɪ/ and /aʊ/ raising than Italian men, while Chinese women and men show comparable production of the two diphthongs.

Accordingly, one of the main tasks in the analysis of Canadian Raising is to determine whether speakers in the recently arrived Filipino group participate in Canadian Raising or not. Motivated by Walker (2016), the analysis also explores the potential generational and gendered variation within the FW community with respect to extent of participation in Canadian Raising. This chapter also investigates the correlation of ethnicity and Canadian Raising to contribute to the body of research in Canadian Raising.

3.2 Methods

3.2.1 Materials

As shown in Table 3.1, 27 words with Canadian Raising vowels were chosen from the ~ 220-word list. 1135 tokens in total were extracted and analyzed. /~T/ is used to represent diphthongs that are followed by voiceless consonants. Other phonetic environments, such as following voiced consonants or open syllables, are represented with /aʊD/ and /aɪD/.

Table 3.1 Words tested for Canadian Raising

Vowel class	Words	Tokens
/aʊD/	cow, foul, how'd, loud, proud, sour	253
/aʊT/	doubt, house, out, shout, south	210
/aɪD/	eyes, file, hide, rider, side, sign, tide, tie, tire, whine	420
/aɪT/	fight, height, sight, spice, tight, writer[22]	252
Total		1135

3.2.2 Measurements

Formant measurements of each diphthong were automatically processed through FAVE as a two-step process (Rosenfelder et al., 2011). The first step was to segment each word into its

[22] When /t/ is used between vowels, it is pronounced as a voiced alveolar flap /ɾ/, such as *letter* sounds similar to *ladder*. This phonological process is known as t flapping. When t flapping appears with raising for instance in *writer*, there is counterbleeding relationship between raising and t flapping. Raising continues to apply opaquely (Chambers, 1973; Joos, 1942). That is, the distinction between *writer* and *rider* happens in the quality of the vowel, but not in the voicing of /t/ (Fruehwald, 2008).

component phonemes using FAVE-align. Figures 3.1 and 3.2 below show examples of the annotated Praat textgrids for the words *doubt* and *loud*, respectively. The second step was to extract vowel formant values through FAVE-extract. The output of FAVE-extract provides the measurements of F1 and F2 at five time points across the vowel duration (20%, 35%, 50%, 65%, 80%). For the measurement of Canadian Raising, some studies employ a single measurement point. Boberg (2008) and Sadlier-Brown (2012) first implemented linear predictive coding analysis to determine the first and second formants, and then took a single measurement at the maximal height of F1. Smith (2018) also used the F1 maximum through vowel duration for the measurement of /aɪ/ tokens and chose the measurement point at halfway between beginning of the segment and F1 maximum for /aʊ/ tokens. For this study, the formant values at onset, i.e., 20% of vowel duration, were used, for the reason that the raising process is involved with the nuclei, which is the onset part of the diphthong. This is supported by the observation that, as shown in Figure 3.1, the starting part of the spectrogram has relatively higher formant values than the rest, which is also in keeping with previous studies. The formant values at other intervals were used to plot Praat-like vowel formant transitions. Tokens that were more than 2 standard deviations outside the range of each vowel class were double checked and measured manually in Praat. Tokens were removed if the spectrograms in Praat were not clear enough to get the formant values from visual inspection.

Figure 3.1 FAVE alignment of the word *doubt* by speaker 204mufe91fnl.

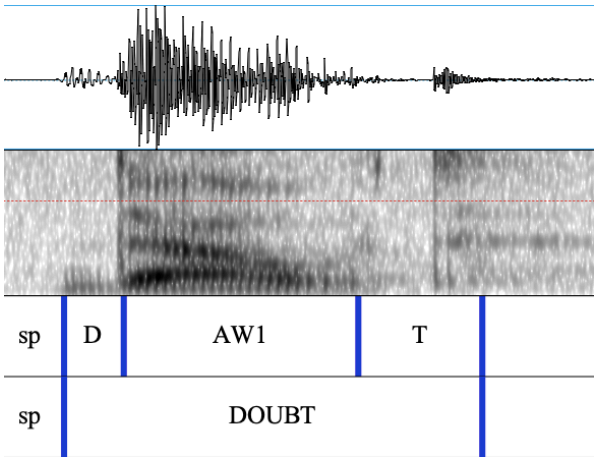
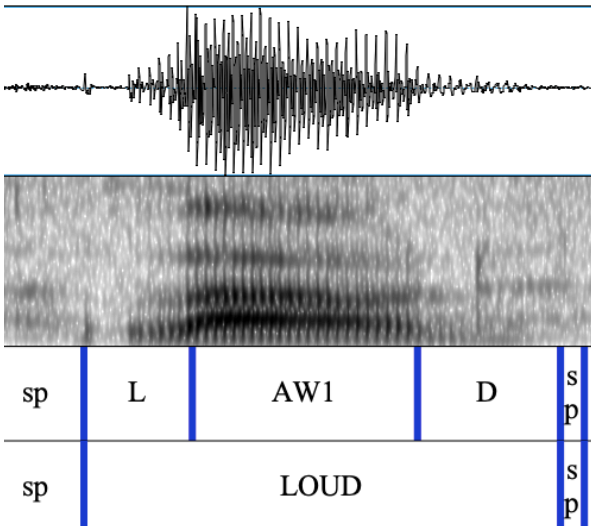


Figure 3.2 FAVE alignment of the word *loud* by speaker 204mufe91fnl.



3.2.3 Linear regression mixed-effects models

The primary goal of this chapter is to report on whether and how certain social factors such as ethnicity, age, and gender influence speakers' performance of raising diphthongs /aɪ/ and /aʊ/ in voiceless environments. Linear mixed-effects regression models were conducted to test the significance of social factors on the dependent factors, F1 and F2. Independent factors include *vowel class*, *duration*, *generation*, *gender,* and *ethnicity*. *Speaker* and *word* are included as random effects. The results of each diphthong are reported separately.

Duration measurements in milliseconds of the diphthongs are also included in the linear regression model, as raised diphthongs tend to have shorter durations than their unraised counterparts (Hagiwara, 2006; Onosson, 2018; Thomas, 2000). Onosson (2018), in particular, has studied the correlation of the raising process of Canadian Raising diphthongs and pre-voiceless vowel abbreviation using data collected from Winnipeg and two American English dialects in Colorado and Wisconsin. His study found that the Winnipeg dialect has shorter vowel duration in pre-voiceless contexts than the other two dialects for the diphthong /aʊ/, while the three dialects share similar durations before voiceless codas for diphthong /aɪ/. Hence, including duration information is necessary and allows for an interpretation of the production of Canadian Raising vowels.

3.2.4 Definitions

Whether Canadian Raising of /aʊ/ and /aɪ/ are present in FW and TW communities or not is determined by significant differences between pre-voiceless and pre-voiced diphthongs in terms of F1 for the raising dimension and F2 for the fronting dimension. Following the generally accepted standards, the thresholds for significance used throughout are 1.96 for *t* and 0.05 for *p*. The comparisons of the degree of participation between sub-groups are conducted by also combining the results of inferential statistics, descriptive statistics, and visual presentations.

3.3 Results for /aɪ/-raising

This section presents the acoustic findings of the /aɪ/ tokens. The results are presented first for TWs and then for FWs. Comparisons between the two groups are presented last. Each subsection starts with the descriptive and statistical results of /aɪ/ F1 and then reports the results of /aɪ/ F2. The following research questions are answered:

1) Is /aɪ/-raising a feature among TWs? Do social factors play a role in the raising of /aɪ/?

2) Do FWs participate in /aɪ/-raising? Are there in-group differences?

3) Do FWs show the same extent of /aɪ/-raising as TWs?

3.3.1 Canadian Raising of /aɪ/ in Traditional Winnipeggers (TWs)

This section presents the outcomes of the acoustic and statistical analyses of /aɪ/ tokens produced by TWs. The analyses report on the height (F1) and frontness (F2) of /aɪ/ tokens, and how various predictors (*vowel class*, *duration*, *gender*, *age category*) influence the production of /aɪ/.

F1

Table 3.2 and Figure 3.3 below quantitatively and visually summarize the distribution of F1 values for /aɪD/ and /aɪT/ across the TW gender and age groups. Overall, throughout all speaker sub-groups, /aɪ/ in pre-voiceless environments has consistently lower mean F1 values than /aɪ/ in pre-voiced environments. The same observation is also found in the duration values, where /aɪT/ tokens uniformly have shorter duration than /aɪD/ tokens. The most salient finding to emerge from Table 3.2 is that younger TW women have the lowest mean F1, and thus the most raised /aɪT/ in pre-voiceless context as compared to other gender and age groups. Younger women also have the most discernable differences in height between /aɪD~aɪT/.

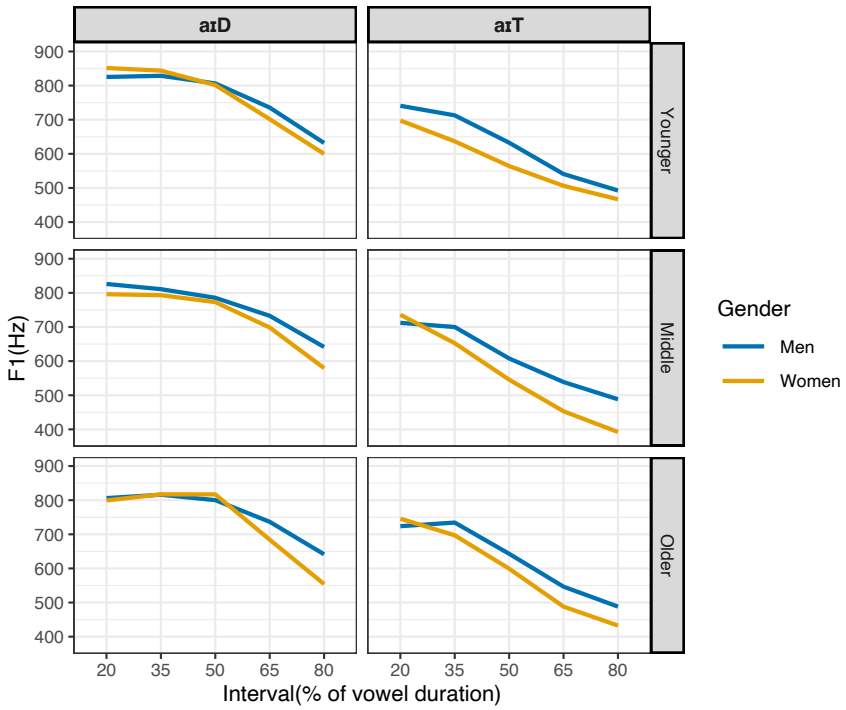
Table 3.2 Onset frequency for F1 and duration of /aɪ/ among TWs

Group		**F1(Hz)**			**Dur(ms)**		
		/aɪD/	/aɪT/	*Diff.*	/aɪD/	/aɪT/	*Diff.*
Younger	Men	825	741	84	256	156	100
	Women	**851**	**698**	**153**	293	178	115
Middle-Aged	Men	826	712	114	235	163	72
	Women	796	736	60	308	172	136
Older	Men	806	724	82	269	178	91
	Women	799	746	53	304	210	94

The formant transitions of /aɪ/ shown in Figure 4.3 confirm the results of the diphthong onset values in Table 3.2. Not only do the tokens before voiceless consonants have much lower F1 onsets, these differences also persist throughout the duration of the vowels. There are greater gender differences in the younger groups, with women having lower F1s of /aɪT/ extending from

onset to offset than younger men. Middle-aged and older women also have higher F1 of /aɪT/ than their younger counterparts, except for the onset point.

Figure 3.3 Formant transitions of /aɪD/ and /aɪT/ F1 among TWs by gender and age category. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the dataset to explore the correlation of linguistic and social predictors to the variation of /aɪ/ among TW participants. The dependent variable is the value of F1 at the 20% point. Independent predictors that were tested include *duration* in milliseconds, *vowel class* (/aɪD/, /aɪT/), *age category* (younger, middle-aged, older), and *gender* (men, women). The best-fit model includes duration and a three-way interaction of vowel class, age category and gender as fixed effects. Random effects are speaker and word. Output of the best-fit model is listed in Table 3.3.

F1model = lmer(F120 ~ dur + VowelClass*AgeCategory*Gender
+ (1|Speaker)+(1|Word), REML=F, data = ayF1_TW)

Table 3.3 Output of the best-fit model for F1 of /aɪ/ produced by TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	790.58	20.54	38.49	<2e-16***
VowelClassaɪT	-102.57	21.45	-4.78	4.29e-06***
dur	0.15	0.06	2.45	0.016*
AgecategoryOld	-24.05	18.37	-1.31	0.2
AgecategoryYoung	-3.79	19.87	-0.19	0.85
GenderWomen	-40.25	20.13	-2.0	0.05
VowelClassaɪT:AgecategoryOld	33.75	25.43	1.33	0.19
VowelClassaɪT:AgecategoryYoung	33.3	27.55	1.21	0.23
VowelClassaɪT:GenderWomen	62.57	27.64	2.26	0.025
AgecategoryOld:GenderWomen	27.83	30.09	0.93	0.36
AgecategoryYoung:GenderWomen	61.09	25.34	2.41	0.023
VowelClassaɪT:AgecategoryOld: GenderWomen	-33.17	42.08	-0.79	0.43
VowelClassaɪT:AgecategoryYoung: GenderWomen	-129.56	35.25	-3.68	0.0003***

The statistical model first shows that there are significant differences between /aɪD/ and /aɪT/. /aɪT/ tokens have significantly lower F1 values than /aɪD/ tokens, indicating that /aɪT/ is more raised than /aɪD/ in the TW dataset. *Duration* is also significantly correlated with F1. That is, tokens that have shorter vowel duration are more likely to have lower F1s. While there is no significant interaction between vowel class and vowel duration, descriptive statistic results suggest that /aɪT/ tokens have shorter average vowel duration than /aɪD/ tokens. Finally, there is a significant three-way interaction among *vowel class*, *age category*, and *gender*, indicating that younger women are more likely to distinguish /aɪ/ in pre-voiced and pre-voiceless contexts to a greater extent than middle-aged and older TW participants, which also supports the descriptive statistic results presented in Table 3.3. Age category and gender alone have no significant effects on F1 values. The results reveal that TW subgroups are all participating in Canadian Raising of /aɪ/-raising, with younger women raising the most.

F2

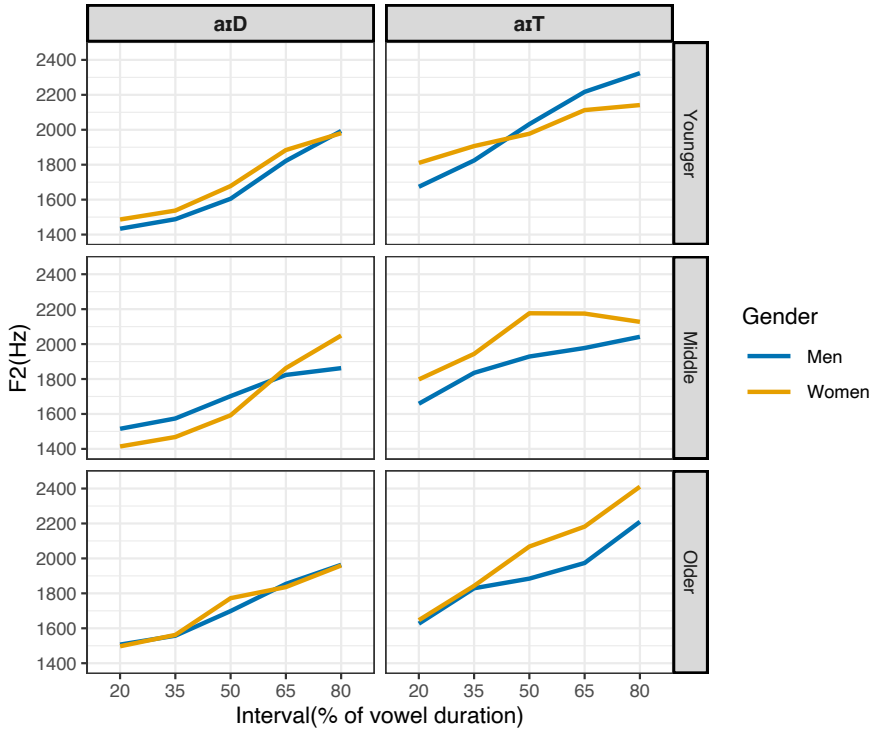
The F2 values of /aɪ/ in the two phonetic contexts are presented in Table 3.4 and Figure 3.4. In general, the average F2 values of /aɪT/ across each sub-group are higher than /aɪD/, indicating that /aɪT/ has a fronter position in the vowel space. In terms of social variation, the average F2 values of /aɪT/ increase inversely with age, and in each age group women have higher F2 values than men.

Table 3.4 Onset frequency for F2 and duration of /aɪ/ among TWs

Group		**F2(Hz)**			**Dur(ms)**		
		/aɪD/	/aɪT/	*Diff.*	/aɪD/	/aɪT/	*Diff.*
Younger	Men	1433	1674	241	256	156	100
	Women	1486	1810	324	293	178	115
Middle-Aged	Men	1515	1658	143	235	163	72
	Women	1414	1798	384	308	172	136
Older	Men	1507	1626	119	269	178	91
	Women	1497	1646	149	304	210	94

The formant transitions in Figure 3.4 show that, across gender and age groups, /aɪT/ has higher F2 values than /aɪD/ throughout the duration. The gender differences in F2 occur mainly in the middle-age group, where women show greater /aɪD~aɪT/differences than men.

Figure 3.4 Formant transitions of /aɪD/ and /aɪT/ F2 among TWs by gender and age category. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the dataset of F2 onset values for /aɪ/ by TWs. The best-fit model is the same as the one for F1 values, which contains an individual predictor duration and a three-way interaction among *age category*, *gender*, and *vowel class* as fixed effects. Random effects are *speaker* and *word*.

F2model = lmer(F220 ~ dur+VowelClass*AgeCategory*Gender+
(1|Speaker)+(1|Word), REML=F, data = ayF2_TW)

Table 3.5 Output of the best-fit model for F2 of /aɪ/ produced by TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1648.03	49.1	33.56	< 2e-16***
VowelClassaɪT	103.32	57.78	1.79	0.082
dur	-0.57	0.13	-4.24	3.33e-05***
GenderWomen	-58.8	37.85	-1.55	0.13
AgecategoryOld	10.36	34.26	0.3	0.76
AgecategoryYoung	-75.12	36.99	-2.03	0.051
VowelClassaɪT:AgecategoryOld	-24.11	46.66	-0.52	0.61
VowelClassaɪT:AgecategoryYoung	86.31	50.56	1.71	0.089
VowelClassaɪT:GenderWomen	203.14	50.91	3.99	8.84e-05***
AgecategoryOld:GenderWomen	70.3	56.05	1.25	0.22
AgecategoryYoung:GenderWomen	137.48	47.23	2.91	0.0067**
VowelClassaɪT:AgecategoryOld: GenderWomen	-186.45	77.29	-2.41	0.017*
VowelClassaɪT:AgecategoryYoung: GenderWomen	-132.98	64.74	-2.05	0.041*

There is a significant negative correlation between duration and F2. That is, /aɪ/ tokens with shorter vowel duration are more likely to have higher F2 values, which also indicates a fronter realization. Although the descriptive statistical results in Table 3.5 demonstrate that, on average, /aɪ/ tokens before voiceless environments have higher F2s than /aɪ/ before voiced ones, this does not turn out to be statistically significant.

The significant two-way interaction between gender and vowel class is the largest effect in the model. It means that men and women are significantly differentiated regarding the production of /aɪD/ and /aɪT/ in normalized F2. Across the three age groups, not only do TW women produce a substantially higher F2 of /aɪT/ than TW men, they also differentiate /aɪT/ from /aɪD/ to a more extreme degree than TW men. In other words, TW women show a much fronter realization of /aɪT/, but not /aɪD/, than TW men.

Age category alone does not have a significant independent effect on F2 values, but it has significant two-way and three-way interactions with gender and vowel class. First, there are

significant gender differences among the younger participants. Younger women produce higher F2 values and thus move /aɪ/ to a fronter position in the vowel space relative to younger men. Secondly, the two three-way interactions suggest that the gender differences among middle-age speakers in terms of the contrast of /aɪD/ and /aɪT/ are more distinctive as compared to the gender groups in the younger and older age groups.

Summary

The significant correlation between vowel class and F1 values at the diphthong onset point shows that TWs all participate in Canadian Raising of /aɪ/. Younger women in particular not only produce the most raised /aɪT/, but also show the most separation of /aɪ/ in pre-voiced and pre-voiceless contexts. In the F2 dimension, /aɪD/ and /aɪT/ tokens are not significantly differentiated, which is not surprising given that variation of /aɪ/ refers mainly to vowel height. Significant differences in variation within F2 are found in gender and age groups. For instance, women have a fronter realization of /aɪT/ tokens than men. With respect to the effect of duration, the results show that vowel duration has significant linear correlations with both F1 and F2, indicating that /aɪ/ tokens that have shorter vowel duration are more likely to have lower F1 (more raised) and higher F2 (fronter), and vice versa.

3.3.2 Canadian Raising of /aɪ/ in Filipino Winnipeggers (FWs)

This section presents the data of /aɪ/ collected from the Filipino community to investigate the status of /aɪ/-raising in each Filipino generation and gender group.

F1

Table 3.6 compares the mean formant values and duration of /aɪD/ and /aɪT/ in FW speakers separated by generation and gender. The results demonstrate a clear pattern in terms of F1: the tokens of /aɪT/ for Gen.2 have much lower F1 values, i.e., are more raised in the vowel space,

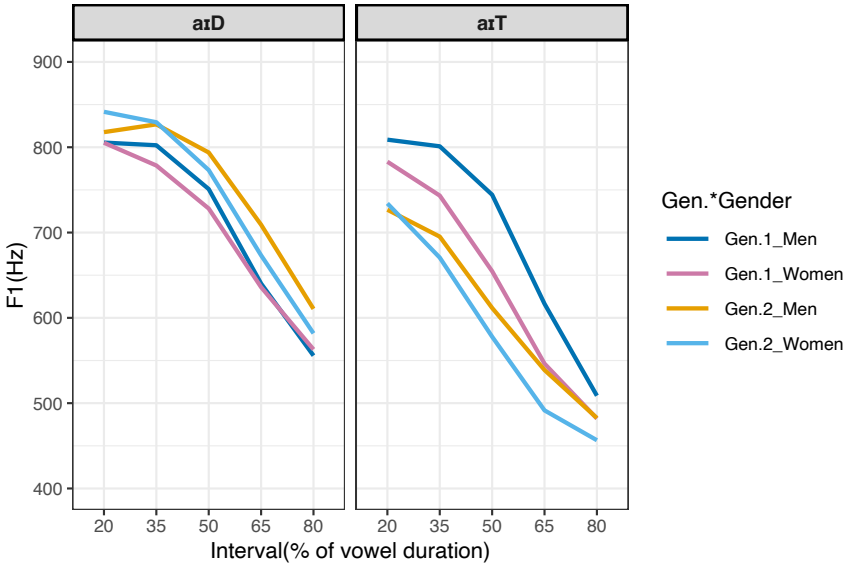
than the tokens produced by Gen.1 speakers. Gen.1 men especially show negligible raising. This result is also reflected in vowel duration. The two Gen.2 groups both show shorter vowel duration than the Gen.1 groups, particularly when /aɪ/ is in pre-voiceless contexts.

Table 3.6 Onset frequency for F1 and duration of /aɪ/ among FWs

Group		**F1(Hz)**			**Dur(ms)**		
		/aɪD/	/aɪT/	*Diff.*	/aɪD/	/aɪT/	*Diff.*
Gen.1	Men	805	809	4	286	216	70
	Women	805	783	22	273	214	59
Gen.2	Men	818	727	91	234	152	82
	Women	842	734	108	265	177	88

To more straightforwardly compare the four groups, I have plotted the formant transitions together in one graph below. As shown in Figure 3.5, the four groups are largely clustered together for /aɪD/. Over the duration of the segment, F1 of the diphthong /aɪD/ produced by all four groups is approximately the same, with less than 50 Hz difference between them. The visual distribution of F1 of /aɪT/ is more separated, with the formant transitions the of Gen.1 groups showing higher F1 values than the Gen.2 groups. Gender variations, where women have lower F1s, can be found in both generation groups. That is, in each generation, women show lower F1 values than men. In particular, the mean formant transitions of Gen.1 women do not overlap with those of Gen.1 men.

Figure 3.5 Formant transitions of /aɪD/ and /aɪT/ F1 among FWs by gender and generation. The x-axis indicates five time-proportional points along the vowel.



Mixed-effects linear regression models were fit to the dataset of F1. Independent predictors tested include *gender, generation, vowel class* and *duration*. The final best-fit model achieved through a stepwise procedure includes three two-way interactions and one three-way interaction as fixed effects, and speaker and word as random effects.

Model=lmer(F1~VowelClass*Gender+Gender*dur+Gender*Generation+
VowelClass*dur*Generation+(1|Speaker)+(1|Word), data=F1FWaydataset)

Table 3.7 Output of the best-fit model for F1 of /aɪ/ produced by FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	773.37	28.87	26.79	2e-16***
VowelClassaɪT	44.9	42.34	1.06	0.29
GenderWomen	-45.95	27.0	-1.7	0.09
dur	0.12	0.09	1.24	0.22
GenerationFW_Gen.2	67.06	27.82	2.41	0.02*
VowelClassaɪT:GenderWomen	-11.5	12.27	-0.94	0.35
GenderWomen:dur	0.17	0.09	1.98	0.049*
GenderWomen:GenerationFW_Gen.2	29.15	14.3	2.04	0.05
VowelClassaɪT:dur	-0.17	0.17	-0.99	0.33
VowelClassaɪT:GenerationFW_Gen.2	-181.56	45.53	-3.99	7.99e-05***
dur:GenerationFW_Gen.2	-0.22	0.09	-2.29	0.03*
VowelClassaɪT:dur:GenerationFW_Gen.2	0.43	0.21	2.03	0.04*

The results show that the three factors of *duration*, *vowel class* and *gender* alone are not significantly correlated with F1 values. However, there are significant interactions between the linguistic and social factors. The interaction of gender and duration is significant in affecting the value of F1, suggesting a slightly more significant correlation between dur and F1 in the women's dataset.

The output of the statistical results brings focus on the significant effect of generation. First, generation alone is significant in predicting F1 values of /aɪ/ tokens no matter the following context. Second, the significant interaction between generation and vowel class, which is also the largest effect in the model, confirms the essential role of generation in determining the varied distributions of /aɪD/ and /aɪT/ among FW participants. It demonstrates that when /aɪ/ is followed by voiceless consonants, second-generation Filipino participants raise the diphthong to a greater extent than the first-generation participants. Finally, there are a significant two-way and three-way interactions involving generation, duration, and vowel class. These interactions provide another notable difference between Gen.1 and Gen.2 participants regarding /aɪ/-raising. That is, compared with Gen.1, F1 values of /aɪ/ tokens pronounced by Gen.2 speakers are more strongly correlated with duration. Their further interaction with vowel class shows that the phenomenon wherein /aɪ/ in pre-voiceless context corresponds with lower F1 and shorter duration is more salient in the Gen.2 dataset.

F2

Table 3.8 presents the mean F2 formant values of /aɪ/ across FWs stratified by gender and generation. There is a salient generational difference regarding the extent of raising of /aɪT/ from /aɪD/. Gen.2 speakers apparently separate /aɪD/ and /aɪT/ more than Gen.1s. However, the mean

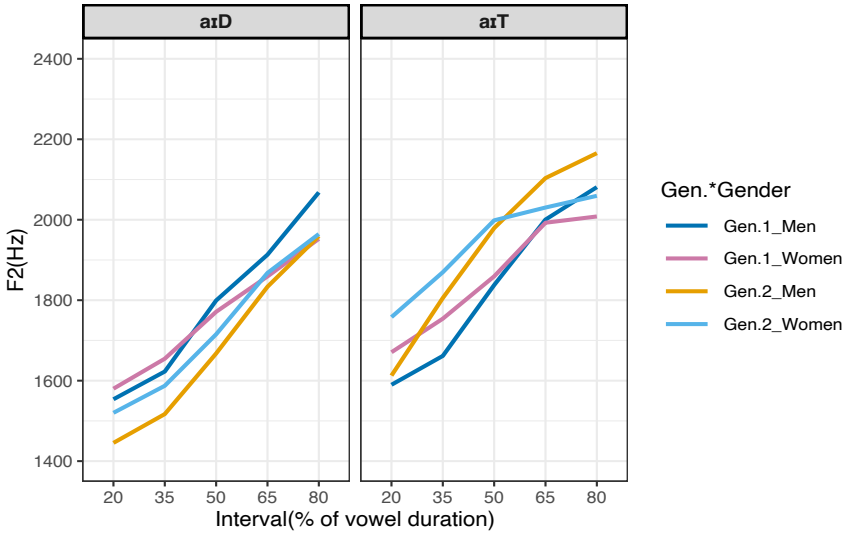
value of F2 of /aɪT/ tokens shows a different pattern. Women produce higher F2s, meaning a more fronted /aɪT/, than men.

Table 3.8 Onset frequency for F2 and duration of /aɪ/ among FWs

Group		**F2(Hz)**			**Dur(ms)**		
		/aɪD/	/aɪT/	*Diff.*	/aɪD/	/aɪT/	*Diff.*
Gen.1	Men	1554	1590	46	286	216	70
	Women	1580	1671	91	273	214	59
Gen.2	Men	1445	1613	168	234	152	82
	Women	1520	1758	238	265	177	88

While the formant transitions of F2 do not demonstrate as clear gradient changes as the ones in F1 (Figure 3.5), they do show that spectral differences are influenced by generation. Comparing /aɪD/ and /aɪT/ horizontally in Figure 3.6, the Gen.2 groups have larger /aɪD ~ aɪT/ differences throughout, from formant onset to offset, than the Gen.1 groups. Even though Gen.1 women have a higher diphthong onset F2 than Gen.2 men, the comparison does not persist through the remaining formant movement. In addition, a gender pattern can be drawn from the /aɪT/ formant transitions. With respect to the shape of formant transitions, second-generation women parallel first-generation women, as do second-generation men and first-generation men.

Figure 3.6 Formant transitions of /aɪD/ and /aɪT/ F2 among FWs by gender and generation. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the data of /aɪ/ tokens produced by FWs. The dependent variable is F2 at the 20% point. Independent variables that were tested include *gender* (men, women), *generation* (FW_Gen.1, FW_Gen.2), *vowel class* (/aɪD/, /aɪT/), and *duration*. The best-fit model selected by a stepwise procedure includes four two-way interactions as fixed effects. Again, the random effects are *speaker* and *word*.

```
Model=lmer(F220~VowelClass*dur+VowelClass*Generation+VowelClass*Gender
+Gender*Generation + (1|Word)+(1|Speaker), data=F2FWaydataset)
```

Table 3.9 Output of the best-fit model for F2 of /aɪ/ produced by FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1699.79	51.85	32.78	< 2e-16***
VowelClassaɪT	23.98	69.24	0.35	0.73
dur	-0.52	0.13	-4.04	6.50e-05***
GenerationFW_Gen.2	-134.32	35.34	-3.8	0.0008***
GenderWomen	21.31	38.6	0.55	0.59
VowelClassaɪT:dur	-0.11	0.25	-0.45	0.65
VowelClassaɪT:GenerationFW_Gen.2	120.21	24.17	4.97	1.01e-06***
VowelClassaɪT:GenderWomen	66.87	20.48	3.27	0.0012**
GenerationFW_Gen.2:GenderWomen	70.13	46.91	1.5	0.15

The model suggests that both vowel duration and generation significantly predict F2 values. Vowel class is also a significant predictor when it interacts with generation and gender.

In contrast with the non-significant correlation of duration and F1 values, we see a significantly negative relationship between duration and F2 values. In other words, a shorter duration for /aɪ/ predicts a higher F2 value which indicates a fronter vowel. The significant effect of generation and its interaction with vowel class indicates that Gen.2 participants show greater contextual fronting than Gen.1s. The significant interaction between vowel class and gender suggests that it is women across the board who have more significant differences between /aɪD/ and /aɪT/ in terms of F2 values. These results are consistent with descriptive observations and are reflected in the formant transitions in Figure 3.6.

Summary

The realization of /aɪ/ within the Filipino Winnipeg community is primarily predicted by generation. For /aɪT/ tokens, a significantly larger degree of raising and fronting of /aɪ/ was found in second-generation Filipino participants as compared to the first-generation Filipino participants. Gender was shown to be a significant predictor on F2 values: women have substantially higher F2 values for /aɪT/ tokens. There are no significant interactions between generation and gender on the variation of /aɪ/ in both the raising and fronting dimensions, confirming that neither second-generation men nor second-generation women pattern with their parents in the first generation.

Across the whole FW dataset, pre-voiced /aɪ/ has longer durations than pre-voiceless /aɪ/. Vowel duration is a significant predictor for both F1 and F2 values except that, for F1, duration is only significant among the second-generation speakers.

3.3.3 Between-community comparisons

This section compares Canadian Raising of /aɪ/ of FWs and TWs. The previous section showed that the first and second generation of FWs have significantly different contextual realizations of /aɪ/ in both the fronting and raising dimensions. As a result, this section separates FW speakers into two generational groups and makes comparisons between the two generations and TWs as a whole. For the statistical analyses, the TW group was set as the intercept of the linear regression mixed-effects models by using the *as.factor* function as shown below.

Df$Ethnicity <- as.factor(df$Ethnicity, levels=c("TW", "FW_Gen.1", "FW_Gen.2"))

The structure of this section follows the previous sections by presenting the F1 values of /aɪ/ first and the F2 values second.

F1

Table 3.10 lists the mean normalized F1 values of /aɪ/ in both pre-voiceless and pre-voiced contexts with comparisons between Filipino Gen.1s, Filipino Gen.2s (recall that these speakers were born in Winnipeg to Filipino Gen.1 parents), and TWs. When /aɪ/ is followed by voiced consonants, the difference in mean normalized F1 values produced by FW Gen.2 and TWs approaches 0, and is less than 30 Hz between FW Gen.1 and TWs. When /aɪ/ is followed by voiceless consonants, the formant value differences between the three groups are larger, with FW Gen.1 having the highest F1, followed by FW Gen.2 and then TW. In addition, FW Gen.1 also has the smallest /aɪD ~ aɪT/ difference, or the least raising, of the three groups, with just 11 Hz between the raised and non-raised contexts. By contrast, the formant value difference between /aɪD/ and /aɪT/ for FW Gen.2 and TW are 99 Hz and 112 Hz respectively. With respect to the duration of /aɪ/ tokens, FW Gen.1 interestingly has a similar duration to that of TW before voiced consonants; for the average duration of /aɪT/ tokens, FW Gen.1 has the biggest value, followed by FW Gen.2 and then TW. What stands out most strikingly in Table 3.10 is that FW Gen.2 and TW show similar productions of /aɪ/, which are different from the FW Gen.1 /aɪ/ tokens.

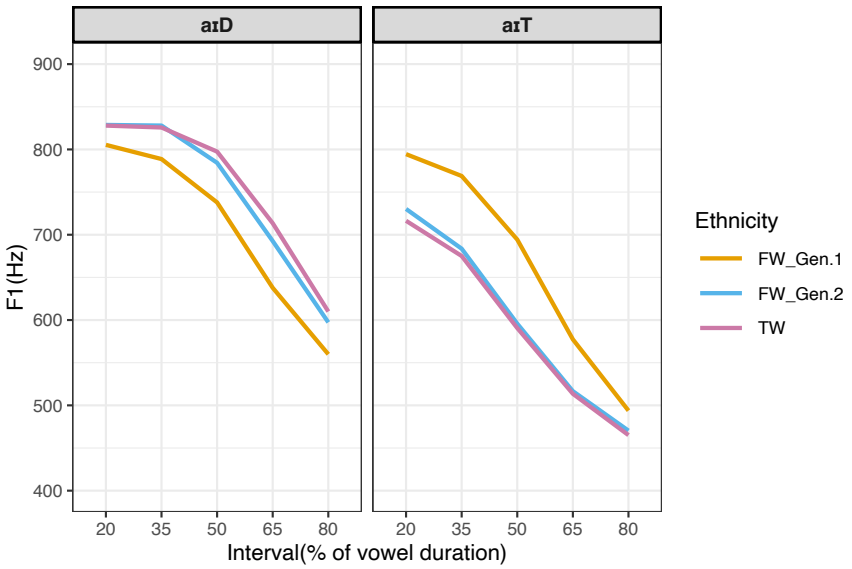
Table 3.10 Onset frequency for F1 and duration of /aɪ/ among FWs and TWs

Groups	**F1(Hz)**			**Dur (ms)**		
	/aɪD/	/aɪT/	*Diff.*	/aɪD/	/aɪT/	*Diff.*
FW_Gen.1	805	794	11	279	215	64
FW_Gen.2	829	730	99	249	164	85
TW	828	716	112	280	175	105

The differences of mean formant values among the three groups are also reflected in the formant transitions shown in Figure 3.7. As shown in both panels, the formant transitions of FW Gen.2s and TWs are almost entirely overlapping, having similar shapes throughout the duration, while the formant transitions of FW Gen.1s are more visibly distanced from the other two groups. Moreover, it is clear that the formant transitions of FW Gen.2s and TWs are largely

lowered for /aɪ/ in pre-voiceless environments, while this shift is not found in the formant transitions of FW Gen.1s.

Figure 3.7 Formant transitions of /aɪD/ and /aɪT/ F1 among FWs and TWs. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the data of /aɪ/ produced by both FWs and TWs. The dependent variable was the F1 value at the 20% point. Independent predictors that were tested include *vowel class* (/aɪD/, /aɪT/), *duration in milliseconds*, *gender* (men, women), and *ethnicity* (FW_Gen.1, FW_Gen.2, TW). The best-fit model, as listed below, has one two-way interaction and one three-way interaction as fixed effects.

Model=lmer(F120~VowelClass*Gender +VowelClass*dur*Ethnicity
+ (1|Word)+(1|Speaker), data=F1aydataset)

Table 3.11 Output of the best-fit model for F1 of /aɪ/ produced by FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	807.56	19.02	42.47	< 2e-16***
VowelClassaɪT	-155.14	27.96	-4.12	5.14e-05***
dur	0.04	0.06	0.57	0.57
EthnicityFW_Gen.1	-75.67	27.21	-2.78	0.0056**
EthnicityFW_Gen.2	21.05	22.17	0.95	0.34
GenderWomen	16.71	6.53	2.56	0.013*
VowelClassaɪT:dur	0.14	0.12	1.14	0.26
VowelClassaɪT:EthnicityFW_Gen.1	187.85	46.21	4.07	5.39e-05***
VowelClassaɪT:EthnicityFW_Gen.2	-12.59	35.78	-0.35	0.73
VowelClassaɪT:GenderWomen	-28.06	8.58	-3.27	0.0011**
dur:EthnicityFW_Gen.1	0.19	0.09	2.09	0.037*
dur:EthnicityFW_Gen.2	-0.07	0.08	-0.85	0.4
VowelClassaɪT:dur:EthnicityFW_Gen.1	-0.39	0.2	-1.92	0.056.
VowelClassaɪT:dur:EthnicityFW_Gen.2	0.1	0.18	0.56	0.58

As shown in Table 3.11, vowel class has a significant independent effect on F1 values of /aɪ/ for all participants. Tokens of /aɪT/ have significantly lower F1s than tokens of /aɪD/. There are also significant interactions between vowel class and the social predictors. The significant interaction of vowel class and ethnicity is unsurprising given the descriptive statistics presented in Table 3.11 and the formant transitions in Figure 3.7. That is, first-generation FWs are less likely to separate the /aɪD/ and /aɪT/ nuclei than TWs and second-generation FWs. The non-significant interaction of vowel class and ethnicity (FW_Gen.2) also suggests that the second-generation FWs share a similar extent of raising /aɪ/ before voiceless environments with TWs. The significant interaction between gender and vowel class indicates that women are more likely to raise the nucleus of /aɪT/ to a higher position in the vowel space than men. With respect to the effect of duration on F1 values, the model does not show a significant linear correlation. The significant interaction of duration and ethnicity shows that this non-significant relationship is

more reflected in the dataset of /aɪ/ produced by FW Gen.1 speakers, as compared to the realization of /aɪ/ among TWs and FW Gen.2s.

F2

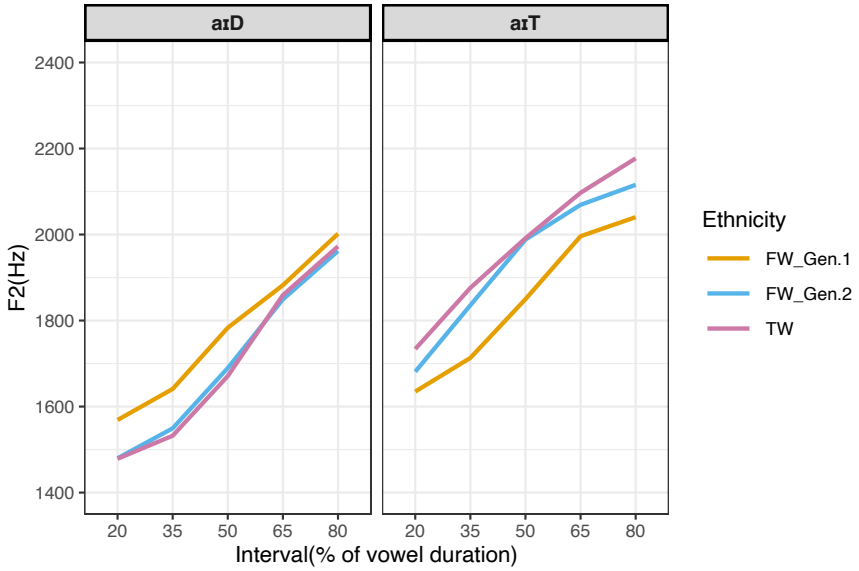
The average formant values of /aɪD/ and /aɪT/ in the F2 dimension are shown in Table 3.12. The comparisons across the three groups reveal similar patterns to those we saw in the F1 dimension. FW Gen.1 speakers have highest F2 for /aɪD/ and the lowest F2 for /aɪT/, and have the least difference between /aɪT/ and /aɪD/, at 66 Hz. Again, FW Gen.2s and TWs pattern more similarly to each other than to the FW Gen.1s. FW Gen.2s and TWs not only produce a similar average value of F2 for /aɪD/ tokens, they also both have at least a 200 Hz /aɪD ~ aɪT/ difference in the F2 (fronting) dimension. However, TWs do show a higher F2 than FW Gen.2s in pre-voiceless environments.

Table 3.12 Onset frequency for F2 and duration of /aɪ/ among FWs and TWs

Groups	**F2(Hz)**			**Dur(ms)**		
	/aɪD/	/aɪT/	*Diff.*	/aɪD/	/aɪT/	*Diff.*
FW_Gen.1	1569	1635	66	279	215	64
FW_Gen.2	1480	1681	201	249	164	85
TW	1479	1734	255	280	175	105

Figure 3.8 below illustrates the formant movements of /aɪD/ and /aɪT/ for the three groups. As we saw for F1, the formant transitions of /aɪT/ by FW Gen.2s and TWs are entirely overlapping from onset to offset, and have lower values than FW Gen.1s. The visual distribution of /aɪT/ is characterized as having gradually increasing F2 values from FW Gen.1 (lowest), to FW Gen.2, to TWs (highest).

Figure 3.8 Formant transitions of /aɪD/ and /aɪT/ F2 among FWs and TWs. The x-axis indicates five time-proportional points along the vowel.



Mixed-effects linear regression models were fit to the dataset for F2 at the 20% point. Independent predictors that were tested include *gender* (men, women), *ethnicity* (FW_Gen.1, FW_Gen.2, TW), *vowel class*, and *duration*. The dependent variable is F2. The final best-fit model achieved through a stepwise procedure includes three two-way interactions as fixed effects, and speaker and word as random effects.

Model <- lmer(F220~VowelClass*Ethnicity+VowelClass*Gender+dur*Gender +(1|Word)+(1|Speaker), data=F2aydataset)

Table 3.13 Output of the best-fit model for F2 of /aɪ/ produced by FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1574.2	43.11	36.51	< 2e-16***
VowelClassaɪT	154.08	45.99	3.35	0.0033**
dur	-0.43	0.12	-3.57	0.00039***
EthnicityFW_Gen.1	88.4	22.18	3.99	0.00021***
EthnicityFW_Gen.2	-9.56	18.69	-0.51	0.61
GenderWomen	100.59	37.86	2.66	0.0082**
VowelClassaɪT:EthnicityFW_Gen.1	-158.12	21.84	-7.24	1.36e-12***
VowelClassaɪT:EthnicityFW_Gen.2	-32.63	18.01	-1.81	0.071.
VowelClassaɪT:GenderWomen	74.22	19.54	3.8	0.00016***
durms:GenderWomen	-0.21	0.13	-1.63	0.103

The significant effect of *vowel class* on F2 values indicates that Winnipeg participants in general have more fronted realizations for /aɪT/ tokens in comparison to /aɪD/ tokens. However, as with the descriptive results, the extent of the fronting of /aɪT/ is largely constrained by ethnicity and gender. The statistical results confirm that both TWs and FW Gen.2s differentiate /aɪD/ and /aɪT/ to a greater extent than FW Gen.1s based on the significant interaction between *vowel class* and *ethnicity*. In the comparisons between men and women, women produce higher F2s than men and front /aɪT/ to a more significant extent.

Summary

This section divided FWs into two generational groups and compared their production of /aɪ/ with TWs. The results are consistent in both the F1 and F2 dimensions. The first-generation FW participants, the generation born in the Philippines who moved to Winnipeg as adults, show significantly less raising and fronting of /aɪ/ before voiceless consonants as compared to the Canadian-born TW and the second-generation FW participants. TWs and the second-generation FWs, all raised in Winnipeg, pattern together regarding the production of /aɪ/ in both pre-voiced and pre-voiceless contexts. In other words, the first-generation FWs in the overall FW sample are mainly responsible for FWs' overall lower production of raised /aɪT/ tokens.

3.3.4 Intermediate summary

*Research question 1: Is /*aɪ*/-raising a feature in the speech of TWs?* Do social factors play a role in the raising of /aɪ/?

FWs all participate in /aɪ/-raising and significantly separate /aɪD/ and /aɪT/. Statistical results show that age category significantly affects /aɪ/-raising, with younger women having the most separation of /aɪ/ in pre-voiced and pre-voiceless contexts compared to other gender and age groups.

Research question 2: Do FWs participate in /aɪ/-raising? Are there in-group differences?

There are crucial differences between first- and second-generation FWs with respect to the degree of raising /aɪ/ before voiceless contexts. Second-generation FWs raise /aɪ/ before voiceless contexts to a statistically significant extent and thus participate in Canadian Raising of /aɪ/. First-generation FW speakers, however, show only slight and non-significant differences between /aɪD/ and /aɪT/.

Research question 3: Do FWs show the same extent of /aɪ/-raising as TWs?

First-generation FWs do not participate in /aɪ/-raising; thus, they raise /aɪ/ less than TWs. The production of /aɪ/ tokens by second-generation FWs in both pre-voiced and pre-voiceless contexts is not significantly different from the /aɪ/ tokens produced by TWs. The formant transitions of /aɪD/ and /aɪT/ between TWs and second-generation FWs show near-to-total overlap, suggesting second-generation FWs show the same extent of /aɪ/-raising as TWs.

3.4 Results for /aʊ/-raising

This section first shows the production of pre-voiced and pre-voiceless /aʊ/ among FWs stratified by gender and age group, and then examines the effect of generation and gender on the production of /aʊ/ within FWs. Comparisons of the results between FWs and TWs are then carried out. Each subsection starts with the descriptive and statistical results of /aʊ/ for F1 and F2. This section investigates the following research questions:

1) Are /aʊ/-raising and /aʊ/-fronting features in the speech of TWs?
2) Do FWs participate in /aʊ/-raising and /aʊ/-fronting? Are there in-group differences?
3) Do FWs show the same extent of /aʊ/-raising and /aʊ/-fronting as TWs?

3.4.1 Canadian Raising of /aʊ/ in Traditional Winnipeggers (TWs)

This section presents the findings of /aʊ/-raising (F1) and /aʊ/-fronting (F2) in TWs.

F1

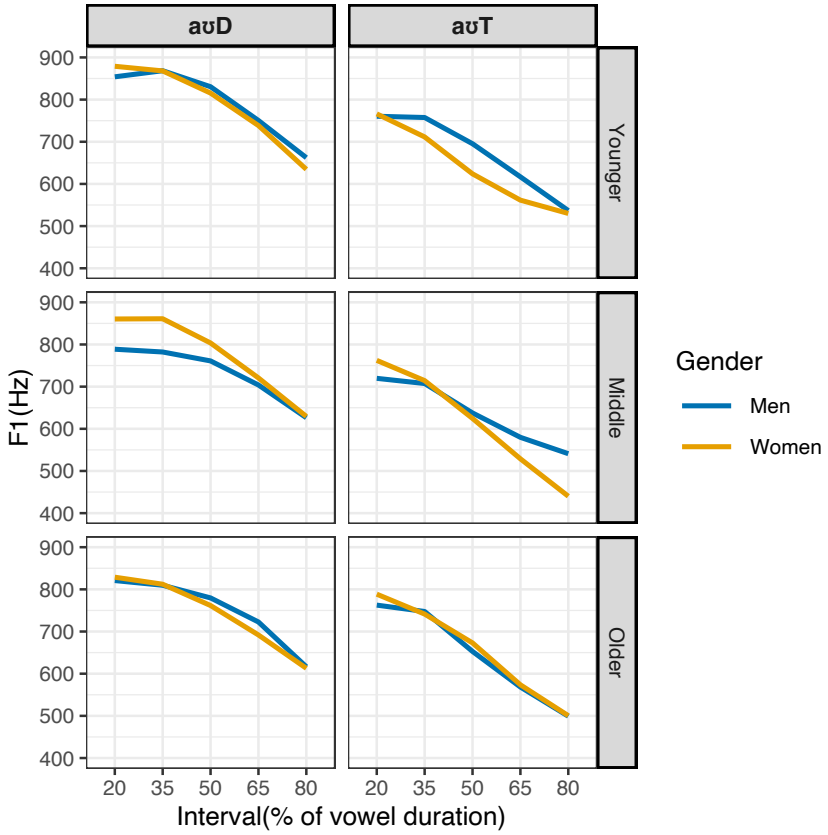
Table 3.14 summarizes the average F1 values and duration of /aʊ/ according to age and gender in TWs. In general, all three age groups exhibit lower mean F1 and vowel duration values for /aʊT/ tokens as compared to /aʊD/ tokens. Comparing across the three groups, there is a gradient decrease inverse to age regarding the /aʊD~aʊT/ difference of F1 values, suggesting a greater extent of /aʊ/-raising among the younger participants. The average F1 values of /aʊT/ across the six age and gender groups are all around 760 Hz, with the exception of middle-aged men, who have the lowest F1, and older women, who have the highest F1. The durational differences are more obvious between genders; that is, overall, the duration of women's /aʊ/ is longer than the men's is.

Table 3.14 Onset frequency for F1 and duration of /aʊ/ among TWs

Group		**F1(Hz)**			**Dur(ms)**		
		/aʊD/	/aʊT/	*Diff.*	/aʊD/	/aʊT/	*Diff.*
Younger	Men	854	760	94	253	200	53
	Women	879	766	113	271	222	49
Middle-Aged	Men	789	720	69	245	173	72
	Women	860	762	88	285	238	47
Older	Men	821	763	58	245	217	28
	Women	829	789	40	273	214	59

Figure 3.9 shows that across the three TW age groups, as well as the two gender groups, the formant transitions of /aʊD/ are more elevated than the formant transitions of /aʊT/, indicating that /aʊ/ is more raised when it is followed by voiceless consonants. There are more gender differences in the younger and middle-aged groups than the older group. The formant transitions of /aʊT/ by younger women are lower than those produced by younger men. Middle-aged women show a steeper formant transition for /aʊT/ as compared to their male counterparts.

Figure 3.9 Formant transitions of /aʊD/ and /aʊT/ F1 among TWs by gender and age category. The x-axis indicates five time-proportional points along the vowel



Linear regression mixed-effects models were fit to the dataset of F1 for /aʊD/ and /aʊT/ produced by TW participants. The dependent variable is the F1 value at the 20% point of the vowel. Independent predictors that were tested include *duration* in milliseconds, *vowel class* (/aʊD/, /aʊT/), *age category* (younger, middle-aged, older) and *gender* (men, women). The best-fit model includes duration and two two-way interactions of *vowel class, age category* and *gender* as fixed effects. Random effects are *speaker* and *word*. Output of the best-fit model is listed in Table 3.15.

Model<lmer(F120~dur+VowelClass*Agecategory+Agecategory*Gender
+(1|Speaker)+(1|Word), data=F1TWawdataset)

Table 3.15 Output of the best-fit model for F1 of /aʊ/ produced by TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	753.95	24.18	31.18	<2e-16***
VowelClassaʊT	-72.91	20.17	-3.61	0.0011**
dur	0.17	0.08	2.16	0.032*
AgecategoryOlder	21.92	15.44	1.42	0.16
AgecategoryYounger	63.67	15.39	4.14	5.51e-05***
GenderWomen	49.1	14.29	3.44	0.0007***
VowelClassaʊT:AgecategoryOlder	25.89	19.68	1.32	0.19
VowelClassaʊT:AgecategoryYounger	-27.33	16.4	-1.68	0.098
AgecategoryOlder:GenderWomen	-35.44	20.99	-1.69	0.093
AgecategoryYounger:GenderWomen	-36.18	17.58	-2.06	0.041*

Linguistic factors of vowel class and vowel duration both have significant effects on F1. /aʊT/ has significantly lower formant values than /aʊD/, indicating that /aʊ/ is more raised in the vowel space when it is followed by a voiceless consonant. Duration has a positive correlation with F1; that is, /aʊ/ tokens with longer durations are more likely to have higher F1 values.

Social factors do not significantly affect the F1 values of /aʊD/ and /aʊT/. Even though the younger participants produce significantly higher F1s than middle-aged participants ($t = 4.14$, $p < .0001$), there is no evidence that middle-aged TWs raise /aʊ/ more than younger TWs, since the interaction of age category and vowel class is not significant. The extent of raising of /aʊ/ between TW men and women is not significantly different either. These results suggest that Canadian Raising of /aʊ/ is consistent in the speech of FWs, based on the lack of significant differences of the extent of raising across all TW subgroups.

F2

As summarized in Table 3.16, all six groups show higher average F2 values for /aʊ/ in pre-voiceless contexts. The highest F2 of /aʊT/ tokens is found in younger women, who share with their younger male counterparts the distinction between /aʊD~aʊT/. The most conspicuous in-

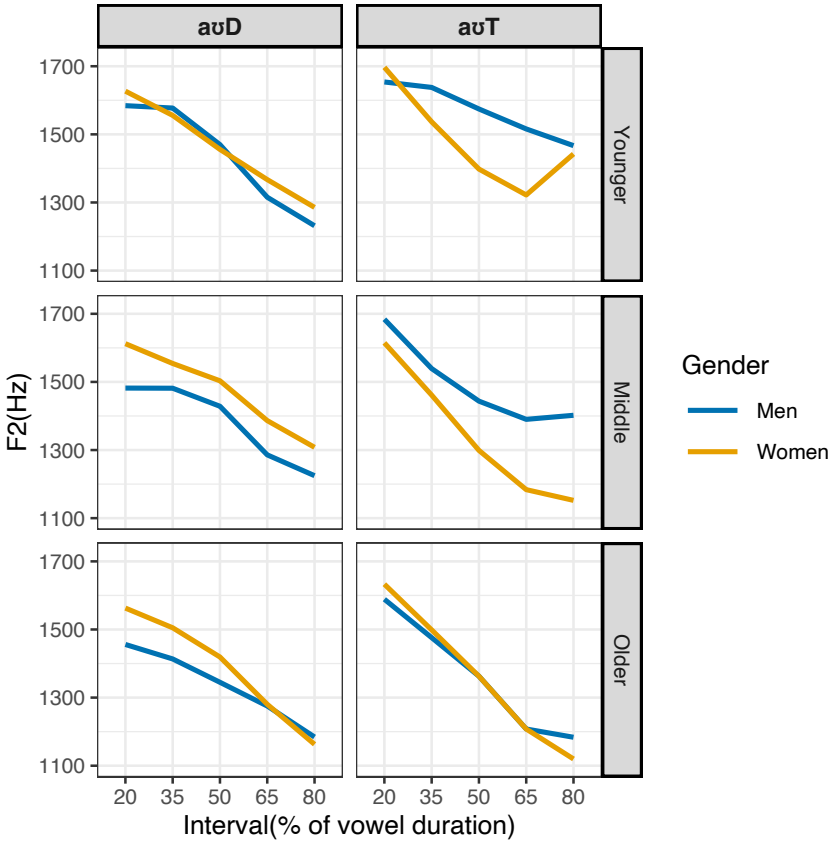
group variance is among the middle-aged group, as women have a /aʊD~aʊT/ difference of nearly zero, while men separate /aʊD/ and /aʊT/ to the greatest extent among the six groups. Between the two older groups, women show a higher F2 of /aʊT/ than men, while men differentiate the two more than women. These cross-generational differences suggest an apparent-time variation of /aʊT/-fronting in the speech of TWs. Recall that we previously saw in Table 3.14 that the duration of /aʊ/ before voiceless consonants is shorter than before voiced consonants.

Table 3.16 Onset frequency for F2 and duration of /aʊ/ among TWs

Group		**F2(Hz)**			**Dur(ms)**		
		/aʊD/	/aʊT/	*Diff.*	/aʊD/	/aʊT/	*Diff.*
Younger	Men	1584	1654	70	253	200	53
	Women	1627	1697	70	271	222	49
Middle-Aged	Men	1482	1684	202	245	173	72
	Women	1612	1615	3	285	238	47
Older	Men	1456	1589	133	245	217	28
	Women	1563	1633	70	273	214	59

Across the board, all speakers show higher F2s for /aʊT/ tokens in comparison with /aʊD/. Figure 3.10 also shows that, comparing /aʊD/ with /aʊT/, there are larger gender differences in the middle-age groups than the younger or older groups. From onset to offset, the formant transitions of the two vowel classes for middle-aged men are further apart than middle-aged women. In addition, the formant transitions for middle-aged women start at a similar point, but pre-voiceless /aʊ/ ends in a backer position than pre-voiced /aʊ/.

Figure 3.10 Formant transitions of /aʊD/ and /aʊT/ F2 among TWs by gender and age category. The x-axis indicates five time-proportional points along the vowel.



Mixed-effects linear regression models were fit to the dataset for F2 at the 20% point. Independent predictors that were tested include *gender*, *age category*, *vowel class*, *duration* and interactions of these four factors. The final best-fit model achieved through a stepwise procedure includes *age category* and two two-way interactions as fixed effects, and *speaker* and *word* as random effects.

Model<lmer(F220~Agecategory+VowelClass*Gender+Gender*dur+(1|Speaker)+(1|Word), data=F2TWawdataset)

Table 3.17 Output of the best-fit model for F2 of /aʊ/ produced by TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1390.28	74.03	18.78	<2e-16***
VowelClassaʊT	154.25	47.21	3.27	0.0047**
AgecategoryOlder	-55.75	29.31	-1.9	0.076 .
AgecategoryYounger	37.91	25.1	1.51	0.15
GenderWomen	228.57	78.01	2.93	0.0039**
dur	0.49	0.27	1.85	0.066.
VowelClassaʊT:GenderWomen	-103.33	31.53	-3.28	0.0013**
GenderWomen:durms	-0.57	0.29	-1.97	0.05.

Vowel class /aʊT/ is significantly different from vowel class /aʊD/ in terms of F2, showing that the TW speakers in general are fronting /aʊ/ before voiceless contexts. The significant correlation between F2 and gender suggests that women produce higher F2s than men overall. However, according to the significant two-way interaction of vowel class and gender, the difference between /aʊD/ and /aʊT/ is larger for TW men than for TW women, suggesting that TW men engage in /aʊ/-fronting to a more extreme extent than women.

Duration and the interaction of duration and gender have a marginally significant effect on F2. /aʊ/ tokens that have longer durations are more likely to have higher F2 values, and this correlation is mostly reflected in the TW women. As shown in Table 3.17, women have relatively higher average F2s than men in both their pre-voiced and pre-voiceless realizations of /aʊ/ and, correspondingly, women also produce longer vowels than men.

Summary

TW speakers across the board show significant /aʊ/-raising and /aʊ/-fronting before voiceless consonants. F1 values are not significantly different between genders and ages, suggesting that /aʊ/-raising is stable in the data examined. In terms of the extent of /aʊ/-fronting, a significant

contrast is found between the genders: TW men have more fronted /aʊ/ tokens with characteristics of greater differentiation of their pre-voiced and pre-voiceless tokens than women.

3.4.2 Canadian Raising of /aʊ/ in Filipino Winnipeggers (FWs)

This section describes the variation of /aʊ/ in F1 and F2 produced by FWs.

F1

The descriptive results of FW subgroups are summarized in Table 3.18. Comparing the two generations, Gen.2 speakers show a higher F1 of /aʊD/ than Gen.1, which also leads to larger /aʊD~aʊT/ differences than Gen.1 speakers. Among the four groups, Gen.2 women produce the lowest F1 of /aʊT/, i.e., the most raised /aʊT/ in the vowel space, and they are the only FW group that has a similar value to TWs (760 Hz). All speakers, except for Gen.1 men, display shorter vowel duration for /aʊT/ as compared to /aʊD/.

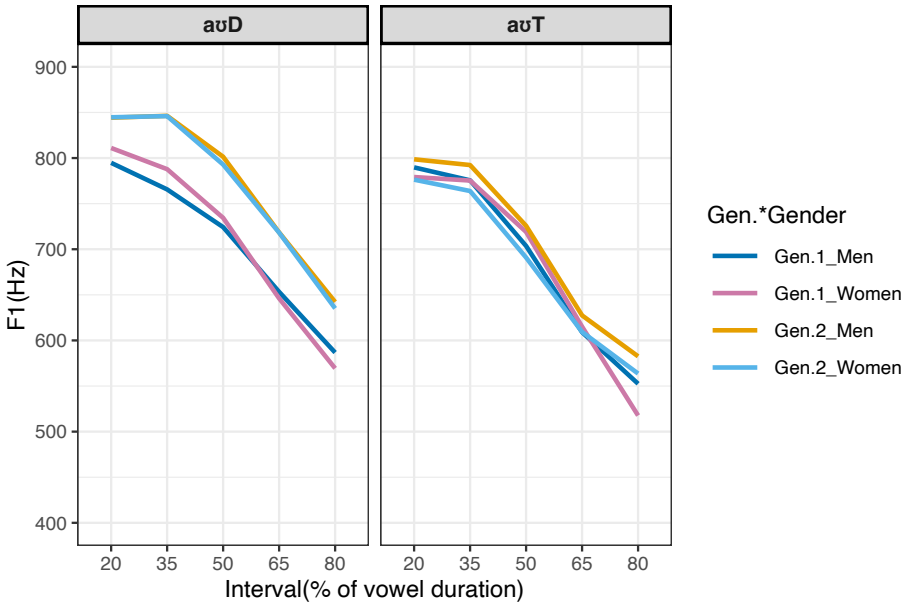
Table 3.18 Onset frequency for F1 and duration of /aʊ/ among FWs

Group		**F1(Hz)**			**Dur(ms)**		
		/aʊD/	/aʊT/	*Diff.*	/aʊD/	/aʊT/	*Diff.*
Gen.1	Men	795	790	5	238	238	0
	Women	811	779	32	275	244	31
Gen.2	Men	844	799	45	218	190	28
	Women	845	**766**	79	247	209	37

The important role of generation in constraining F1 values is also reflected in the vowel formant movements. As shown in Figure 3.11, not only are the formant transitions of /aʊD/ for Gen.1 men and women nearly completely overlapping over the course of the segment, they are also clearly different from the formant tracks of the two Gen.2 groups. However, when /aʊ/ is followed by voiceless consonants, the formant transitions of Gen.1s overlap with Gen.2 women, and all three groups show lower F1 values than Gen.2 men. This is unexpected, as the second-generation speakers are assumed to be more aligned with TWs and maybe are further ahead in

participating in /aʊ/-raising than the first generation. Further explanations are provided in the discussion.

Figure 3.11 Formant transitions of /aʊD/ and /aʊT/ F1 among FWs by gender and generation. The x-axis indicates five time-proportional points along the vowel.



Four predictors, *vowel class* (/aʊD/, /aʊT/), *dur*, *generation* (FW_Gen.1, FW_Gen.2), and *gender* (men, women) were tested in linear mixed-effects regression models. The predictors that significantly improved the model returned by a stepwise procedure were *duration* and two two-way interactions of *vowel class* and the two social factors *gender* and *generation*. The model is given below, and Table 3.19 lists the fixed effects of the best-fit model to F1 of /aʊ/ by FWs.

Model<lmer(F120~dur+VowelClass*Generation+VowelClass*Gender+(1|Speaker)
+(1|Word), data=F1FWawdataset)

Table 3.19 Output of the best-fit model for F1 of /aʊ/ produced by FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	745.14	20.66	26.06	< 2e-16***
VowelClassaʊT	-3.9	15.53	-0.25	0.8
dur	0.23	0.07	3.24	0.0015**
GenerationFW_Gen.2	47.1	10.44	4.51	3.47e-05***
GenderWomen	-1.03	10.06	-0.1	0.92
VowelClassaʊT:GenerationFW_Gen.2	-34.83	12.87	-2.71	0.0073**
VowelClassaʊT:GenderWomen	-21.00	12.29	-1.71	0.089 .

In the model listed in Table 3.19, vowel class is not significant, but the interaction of *generation* and *vowel class* is a significant predictor of F1. The significant interaction indicates that Gen.2 speakers raise /aʊ/ before voiceless consonants to a greater level than Gen.1s, while the non-significant role of vowel class seems to suggest that Gen.1 speakers do not participate in the raising of /aʊ/. To test this hypothesis, two separate linear mixed-effects regression models were conducted, one for Gen.1 speakers, and the other for Gen.2 speakers. The Gen.1 model shows that vowel class does not have a significant effect on F1 (t = -1.45, p = 0.18), while the Gen.2 model shows a significant effect of vowel class (t = -3.81, p = 0.0042**). Hence, we find that in FWs there is an important generational difference wherein Gen.2 participants do raise /aʊ/, with significant /aʊD ~ aʊT/ differences, while Gen.1s do not.

F1 is also marginally conditioned by the interaction of vowel class and gender, indicating that FW women raise /aʊT/ more than FW men. This result mirrors those revealed in the descriptive observations in Table 3.18. The correlation between duration and F1 reaches significance, indicating that /aʊ/ tokens with longer durations tend to have higher F1s.

F2

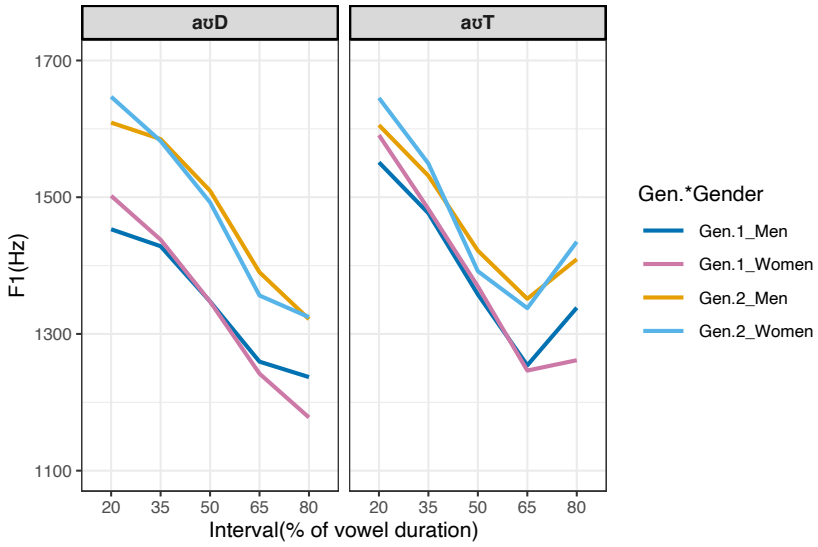
Table 3.20 presents the mean F2 of /aʊ/ across all FWs. The in-group variance not only exists in the two generations but also appears among men and women in each generation. Comparing Gen.1s with Gen.2s, we find that Gen.2s have higher F2 for /aʊ/ across the board. In addition, Gen.2 speakers also have lower mean /aʊD~aʊT/ differences as compared to Gen.1 speakers. With respect to gender, women in each generation appear to produce higher F2s, i.e., fronter /aʊ/ tokens.

Table 3.20 Onset frequency for F2 and duration of /aʊ/ in FWs

Group		**F2(Hz)**			**Dur(ms)**		
		/aʊD/	/aʊT/	*Diff.*	/aʊD/	/aʊT/	*Diff.*
Gen.1	Men	1453	1551	98	238	238	0
	Women	1502	1591	88	275	244	31
Gen.2	Men	1609	1605	4	218	190	28
	Women	1647	1645	2	247	209	38

The difference of mean formant values is also reflected in the formant transitions shown in Figure 3.12. In both graphs, we see that Gen.2 participants produce higher F2 values than Gen.1. The formant transitions of /aʊD/ and /aʊT/ for the Gen.1 speakers show an approximate 100 Hz difference, while formant tracks for the two allophones of /aʊ/ by Gen.2 display much less differentiation. The formant transitions of both genders in each generation show partial to complete overlap. For instance, the formant tracks of /aʊT/ by Gen.1 men and women overlap throughout much of the vowel, even though their onset and offset points differ.

Figure 3.12 Formant transitions of /aʊD/ and /aʊT/ F2 among FWs by gender and generation. The x-axis indicates five time-proportional points along the vowel.[23]



[23] The upgliding of /aʊT/ in the coda position is due to another phonetic change that is happening in English, which is /u/-fronting. Filipino Winnipeggers were found to be more advanced in their participation in /u/-fronting than local Traditional Winnipeggers (Rosen et al., 2015).

Linear mixed-effects regression models were fit to the dataset of F2 in FWs. The best-fit model was achieved through a stepwise procedure. *Duration* and the two-way interaction of *vowel class* and *generation* significantly improve the model fit, and are the only two fixed effects.

```
Model<-lmer(F220~dur+VowelClass*Generation+(1|Speaker)+
(1|Word), data=F2FWawdataset)
```

Table 3.21 Output of the best-fit model for F2 of /aʊ/ produced by FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1364.91	57.33	23.81	< 2e-16***
VowelClassaʊT	99.69	55.04	1.81	0.098
dur	0.45	0.16	2.89	0.0042**
GenerationFW_Gen.2	157.72	26.81	5.88	9.95e-07***
VowelClassaʊT:GenerationFW_Gen.2	-89.54	24.66	-3.63	0.00034***

The statistical results for F2 are similar to those for F1 seen in Table 3.20. Vowel class does not significantly condition F2 values, while the interaction of *vowel class* and *generation* does. The significant effect of generation on F2 values is mainly due to the much higher F2 values among Gen.2 speakers for both pre-voiced and pre-voiceless /aʊ/ tokens as compared to the Gen.1 group.

The interaction between *vowel class* and *generation* indicates that Gen.1 and Gen.2 participants are significantly different in terms of the extent of fronting of /aʊT/ in comparison with /aʊD/. Two separate linear mixed-effects regression models on the dataset of Gen.1s and Gen.2s were conducted. The results show that vowel class is significant in neither the dataset of Gen.1s (t = 1.35, p = 0.21) nor the dataset of Gen.2s (t = -0.08, p = 0.94), suggesting that neither Gen.1 nor Gen.2 participate in the fronting of /aʊ/.

Duration significantly correlates with F2, meaning that F2 increases with the increase in duration. However, the interaction of duration and vowel class did not improve the model fit. Therefore, there is no significant correlation between vowel duration and the fronting of /aʊ/.

Summary

In summary, *generation* is the primary factor constraining the distribution of /aʊ/-raising and /aʊ/-fronting. First-generation FWs do not participate in either /aʊ/-raising or /aʊ/-fronting, while second-generation FWs only show significant raising. For F1 of /aʊ/, second-generation FWs produce higher tokens of /aʊD/ than first-generation FWs, so that second-generation FWs separate /aʊD/ and /aʊT/ tokens substantially more than the first-generation groups. In the fronting dimension, first-generation FWs separate /aʊD/ and /aʊT/ to a greater extent than second-generation FWs, whereas the second-generation FWs maintain higher F2 values for both /aʊD/ and /aʊT/ tokens than the first-generation FWs over the course of the duration. Duration is also a significant predictor for both F1 and F2 values.

3.4.3 Between-community comparisons

This section compares the production of /aʊ/ across FW and TW communities in Winnipeg.

F1

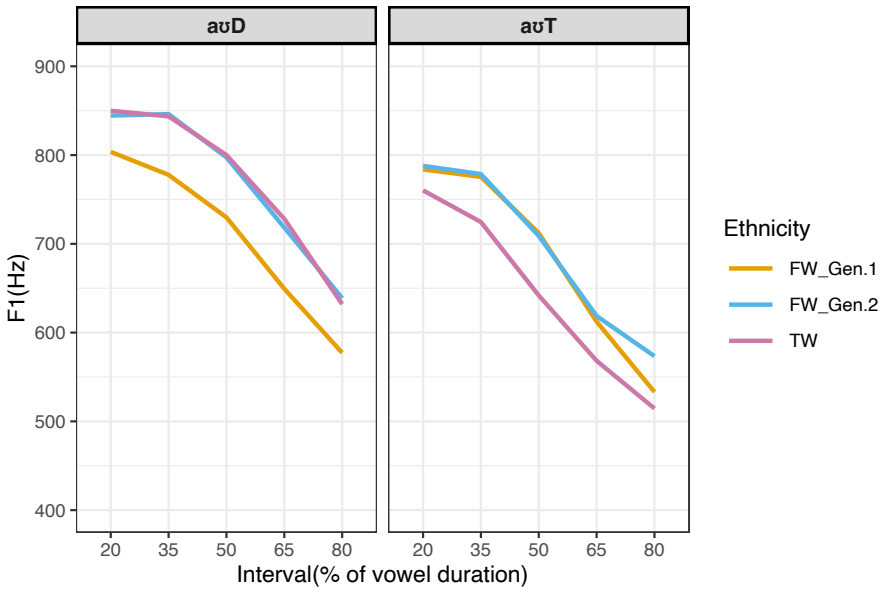
Descriptive comparisons between FW and TW participants are illustrated in Table 3.22. Interestingly, Gen.2 speakers pattern with TWs with respect to the mean value of /aʊD/, while Gen.2 produce a value of /aʊT/ which is more similar to Gen.1s. Across the three groups, TWs have the largest /aʊD~aʊT/ difference and the lowest F1 for /aʊT/, followed by FW Gen.2s and FW Gen.1s. The durational difference of /aʊD/ and /aʊT/ for the three groups also shows this same order, with TWs distinguishing /aʊD/ and /aʊT/ to the greatest extent, followed by FW Gen.2s and FW Gen.1s.

Table 3.22 Onset frequency for F1 and duration of /aʊ/ among FWs and TWs

Groups	**F1(Hz)**			**Dur(ms)**		
	/aʊD/	/aʊT/	*Diff.*	/aʊD/	/aʊT/	*Diff.*
FW_Gen.1	804	784	20	258	241	17
FW_Gen.2	844	788	56	232	199	33
TW	850	760	90	263	214	49

Turning to vowel formant transitions in the figure below, a clear and striking pattern emerges. For /aʊD/ tokens, the formant transition of FW Gen.2s shows total-overlap with TWs, while for /aʊT/ tokens, it overlaps with FW Gen.1s throughout the five interval points. In this case, the figure suggests that FW Gen.2s raise /aʊ/, but only to the same level with FW Gen.1s, rather than TWs. In other words, FW Gen.2s show less /aʊ/-raising than TWs throughout the formant transition.

Figure 3.13 Formant transitions of /aʊD/ and /aʊT/ F1 among FWs and TWs. The x-axis indicates five time-proportional points along the vowel.



Mixed-effects linear regression models were fit to the dataset for F2 at the 20% point. Independent predictors that were tested include *gender* (men, women), *ethnicity* (FW_Gen.1, FW_Gen.2, TW), *vowel class* and *duration*. The dependent variable is F2. The final best-fit

model achieved through a stepwise procedure includes three two-way interactions as fixed effects, and speaker and word as random effects.

```
Model=lmer(F120~dur+VowelClass*Ethnicity+VoweClass*Gender+
Ethnicity*Gender+(1|Speaker)+(1|Word), data=F1awdataset)
```

Table 3.23 Output of the best-fit model for F1 of /aʊ/ produced by FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
(Intercept)	768.32	18.52	41.5	< 2e-16***
VowelClassaʊT	-64.47	16.16	-3.99	0.001**
dur	0.22	0.05	3.94	9.78e-05***
EthnicityFW_Gen.1	-27.99	14.23	-1.97	0.055 .
EthnicityFW_Gen.2	27.24	11.69	2.33	0.024*
GenderWomen	40.55	11.41	3.55	0.0008***
VowelClassaʊT:EthnicityFW_Gen.1	62.7	12.45	5.04	7.03e-07***
VowelClassaʊT:EthnicityFW_Gen.2	27.64	10.42	2.65	0.0083**
VowelClassaʊT:GenderWomen	-24	9.26	-2.7	0.0073**
EthnicityFW_Gen.1:GenderWomen	-29.58	17.42	-1.7	0.098 .
EthnicityFW_Gen.2:GenderWomen	-45.03	14.55	-3.1	0.0037**

As shown in Table 3.23, the linguistic factors *duration* and *vowel class* both have significant independent effects on F1 values of /aʊ/ for Winnipeg participants. /aʊ/ tokens with higher F1 values are more likely to have longer vowel duration. Tokens of /aʊ/ before voiceless contexts have significantly lower F1s than tokens of /aʊ/ before voiced contexts. There are also significant interactions between vowel class and the social predictors. *Ethnicity* alone is shown to be a significant predictor for F1 values, and the effect size is much larger when it interacts with vowel class. The two interactions between *vowel class* and *ethnicity* indicates that both FW Gen.1 and FW Gen.2 have significantly less raising of /aʊT/ from /aʊD/ as compared to TWs. The results are consistent with the descriptive and visual observations in Table 3.23 and Figure 3.13.

Gender also significantly predicts F1 values, with women having higher F1 of /aʊ/ than men, which is mainly represented by the TW dataset, since Section 3.4.1 revealed that TW

women have significantly higher F1 of /aʊ/ than TW men, while Section 3.4.2 found that gender is not a significant predictor of F1 values in the FW dataset. The significant interaction between *gender* and *vowel class* indicates that women in Winnipeg separate F1 of /aʊT/ and /aʊD/ to a greater extent than men.

F2

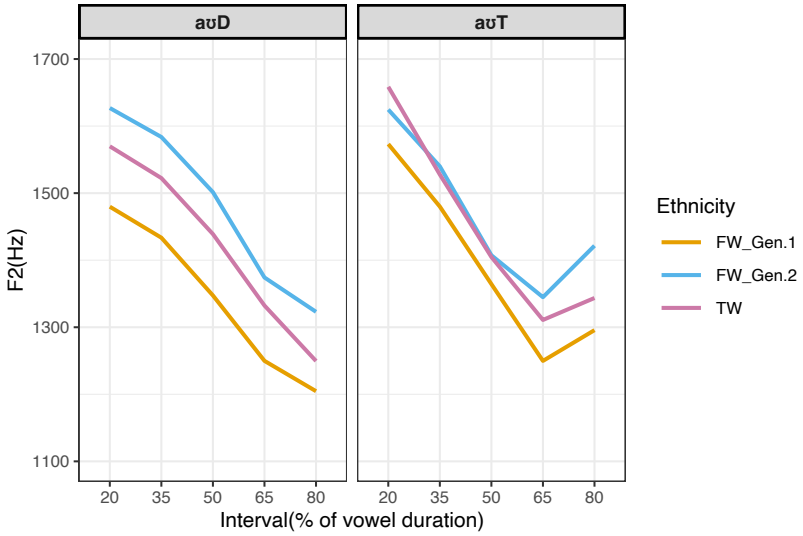
As shown in Table 3.24, FW Gen.2 group stands out among the three groups by having nearly no F2 difference between /aʊT/ and /aʊD/, while FW Gen.1s and TWs both separate /aʊT/ from /aʊD/ along the F2 dimension. Comparing the mean F2 value of /aʊT/, TW has the highest value, followed by FW Gen.2 and then FW Gen.1 respectively. Looking at duration, the correlation that pre-voiceless /aʊ/ favors shorter duration and higher F2 is not found in the FW Gen.2 group.

Table 3.24 Onset frequency for F2 and duration of /aʊ/ among FWs and TWs

Groups	**F2(Hz)**			**Dur(ms)**		
	/aʊD/	/aʊT/	*Diff.*	/aʊD/	/aʊT/	*Diff.*
FW_Gen.1	1480	1573	93	258	241	17
FW_Gen.2	1627	1625	2	232	199	33
TW	1570	1659	79	263	214	49

The formant tracks in the figure below clearly show that FW Gen.1 speakers produce lower F2s than the other groups throughout, from onset to offset. FW Gen.2s and TWs are mainly distinguished in their production of /aʊD/ tokens; F2 values of /aʊD/ from FW Gen.2 speakers are approximately 50 Hz higher than those produced by TWs along the full duration of the diphthong. TWs and FW Gen.2s do not show contrasting differences for the production of /aʊT/ except for at the offset, where the two groups largely separate with FW Gen.2 having higher F2 values than TWs.

Figure 3.14 Formant transitions of /aʊD/ and /aʊT/ F2 among FWs and TWs. The x-axis indicates five time-proportional points along the vowel.



The four factors of *vowel class*, *duration*, *gender*, and *ethnicity* are again included to test their effects on the variance of the dependent variable F2. The model that fits best to the dataset of F2 includes *duration*, *gender*, and the interaction of *ethnicity* and *vowel class* as fixed effects. Again, *speaker* and *word* are random effects.

Model=lmer(F220~dur+Gender+Ethnicity*VowelClass+(1|Speaker)+
(1|Word), data=F2awdataset)

Table 3.25 Output of the best-fit model for F2 of /aʊ/ produced by FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
(Intercept)	1444.85	47.27	30.57	< 2e-16***
VowelClassaʊT	103.84	49.28	2.11	0.06 .
dur	0.37	0.12	3.02	0.0027**
EthnicityFW_Gen.1	-85.16	26.14	-3.26	0.0019**
EthnicityFW_Gen.2	74.41	22.19	3.35	0.0014**
GenderWomen	49	17.85	2.75	0.009**
VowelClassaʊT:EthnicityFW_Gen.1	-5.65	25.28	-0.22	0.82
VowelClassaʊT:EthnicityFW_Gen.2	-96.14	21.07	-4.56	6.63e-06***

Duration is a significant predictor of F2, where shorter durations tend to have higher F2. The social factors of *ethnicity* and *gender* are returned as significant predictors of F2. FW Gen.1s have lower F2 of /aʊ/ across the board, whereas FW Gen.2s display higher F2 than TWs.

Overall, women are more likely to have a higher F2 than men for the production of /aʊ/. The largest effect on F2 is from the interaction of *vowel class* and *ethnicity* (FW_Gen.2), indicating that TWs separate /aʊT/ from /aʊD/ to a greater degree than FW Gen.2 participants. There are no significant differences in the fronting of /aʊT/ between FW Gen.1s and TWs.

Summary

In the F1 dimension, the production of /aʊ/-raising by second-generation speakers is more consistent with first-generation speakers rather than TWs. Specifically, when /aʊ/ is not raised (/aʊD/ tokens), second-generation FWs have similar results to TWs, with close mean formant values and almost fully overlapping formant transitions. However, in the raising environment (/aʊT/ tokens), second-generation FWs pattern like their first-generation counterparts. Statistically, TWs raise /aʊT/ to a greater extent than FWs. Recall that for /aɪ/-raising, second-generation speakers pattern with TWs, which is in contrast with /aʊ/-raising, meaning second-generation speakers treat these two diphthongs differently. This point is further discussed in Section 3.5.1.2.

In the F2 dimension, FW speakers have a lower F2 value for /aʊT/ and do not participate in /aʊ/-fronting. Comparing across the groups, both TWs and first-generation FWs show a greater differentiation between /aʊD/ and /aʊT/ than second-generation FWs.

3.4.4 Interim summary

Research question 1: Are /aʊ/-raising and /aʊ/-fronting features in the speech of TWs?

Overall, TWs participate in both /aʊ/-raising and /aʊ/-fronting. For /aʊ/-raising, there are no significant generational or gendered differences. With respect to /aʊ/-fronting, TW men engage in /aʊ/-fronting to a greater extent than women.

Research question 2: Do FWs participate in /aʊ/-raising and /aʊ/-fronting? Are there in-group differences?

For /aʊ/-raising, there are no significant differences between /aʊD/ and /aʊT/ in first-generation speakers, meaning first-generation FWs do not participate in /aʊ/-raising. Second-generation speakers, on the other hand, keep /aʊD/ and /aʊT/ significantly separated and participate in /aʊ/-raising. Second-generation speakers also raise /aʊT/ in the same way as first-generation speakers. For /aʊ/-fronting, neither first-generation FWs nor second-generation FWs engage in /aʊ/-fronting.

Research question 3: Do FWs show the same extent of /aʊ/-raising and /aʊ/-fronting as TWs?

With significantly greater differentiation between /aʊD/ and /aʊT/ tokens, TWs have greater /aʊ/-raising than FWs. TW speakers also front /aʊT/ to a greater degree than FWs. The production of F2 of /aʊT/ by second-generation speakers is in an intermediate position between TWs and first-generation FW speakers. The differences here are discussed further in the section below.

3.5 Discussion

This chapter has examined the production of Canadian Raising in FWs and TWs. The major finding is that the two diphthongs /aɪ/ and /aʊ/ pattern differently for second-generation FWs. Second-generation FWs raise the nucleus of the /aɪ/ diphthong to the same extent as TWs, but produce /aʊ/ before voiceless consonants similar to first-generation FWs. In other words, the patterns of Canadian Raising in second-generation FWs are split: second-generation FWs pattern *with* TWs and *unlike* first-generation FWs for /aɪ/, but *with* first-generation FWs and *unlike* TWs for /aʊ/. This section explains these observations.

3.5.1 Canadian Raising in Filipino Winnipeggers (FWs)

3.5.1.1 Canadian Raising in the first generation

The findings for /aɪ/ and /aʊ/ suggest that first-generation FW speakers do not participate in Canadian Raising. The lack of raising is most likely explainable by the age period at which first-generation FWs were exposed to Canadian Raising. Most of the Filipino first-generation participants immigrated to Canada in their 20s or 30s, at which age they would have passed the critical period to fully acquire linguistic features that have complicated phonological rules. Canadian Raising is a complicated phenomenon. It involves two diphthongs which are both constrained by certain contexts (Chambers, 1992). In Chambers' (1992) study, a 56-year-old speaker showed less raising of /aʊ/ before voiceless consonants than his cohorts, as the speaker had moved to Toronto from New York at 11 years old, at which point it was too late for him to completely acquire Canadian Raising. As Chambers (1992:690) puts it:

> Between the ages of seven and 14, then, people who immigrate to different dialect areas will vary in their ability to acquire the more complex features of the new dialect. They may, like the people younger than themselves, become early acquirers or, like the people older than themselves, later acquirers. If the latter, they will probably never completely master the intricacies of a complex phonological rule.

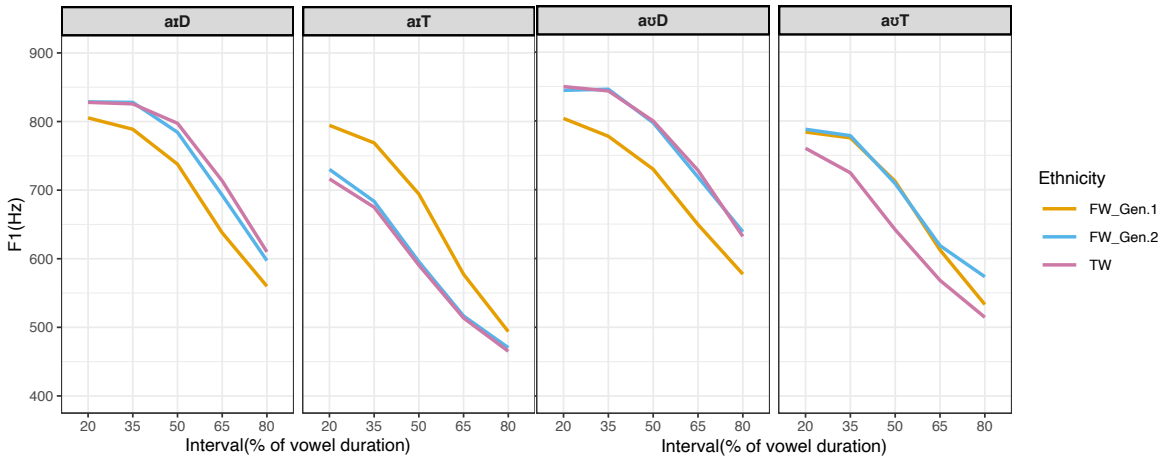
The two diphthongs /aɪ/ and /aʊ/ also appear in Philippine English (Lesho, 2018), therefore the first-generation FWs would have already acquired these two diphthongs before immigrating to Canada and being exposed to Canadian Raising. The diphthong system in first-generation participants would have thus been stable enough to resist phonetic features from another English dialect.[24]

[24] See also Nycz's work on second dialect acquisition (Nycz, 2011, 2018, 2019).

3.5.1.2 Canadian Raising in the second generation

The most striking finding is that for /aɪ/-raising, first-generation FWs pattern differently from second-generation FWs, but for /aʊ/-raising, first-generation FWs produce the same pattern as second-generation FWs. The production of the two diphthongs by second-generation FWs are thus split between TWs and first-generation FWs. As displayed in the Figure below, for Canadian Raising of /aɪ/, second-generation speakers actively participate in the pre-voiceless raising and pattern together with TW speakers. For Canadian Raising of /aʊ/, even though second-generation FWs raise /aʊ/ somewhat, the degree of distinguishing between /aʊT/ and /aʊD/ is significantly less than for the TWs. In addition, the position of /aʊT/ among second-generation speakers is much more similar to that of first-generation speakers, i.e., their parents' generation.

Figure 3.15 Formant transitions of F1 for /aɪ/ and /aʊ/ in FWs and TWs.
The x-axis indicates five time-proportional points along the vowel.



Canadian Raising of /aɪ/ has been considered a typical phonological process in English (Chambers, 1973; Joos, 1942). It is widely used in the dialects of North American English and has a wider distribution than Canadian Raising of /aʊ/ (Dailey-O'Cain, 1997; Labov, 1963; Niedzielski, 1999). There are no significant regional variations in its production across Canada

(Boberg, 2008). It is thus expected that second-generation FWs, who were born and raised in Canada and are English-dominant or monolingual-English speakers, would have /aɪ/-raising in their linguistic system, just like TWs. second-generation FWs active participation in /aɪ/-raising is one piece of evidence that they actively adopt mainstream culture and speech patterns. Moreover, the fact that second-generation FWs do not pattern with first-generation FWs seems to suggest that there is no language transfer from first-generation FWs' L2 Philippine English.

Unlike /aɪ/-raising, second-generation FWs do not raise /aʊ/ like the TWs, which suggests that second-generation FWs conform more to extra-local trends than to local speech patterns.[25] /aʊ/-raising occurs primarily in Canadian English and is not widely spread across North America. Furthermore, within Canada, there are significant regional effects, where the Prairies and Southern Ontario have stronger /aʊ/-raising than other Canadian regions (Boberg, 2008:140). second-generation FWs do raise /aʊT/ tokens to a greater degree than /aʊD/ tokens, but to a lesser extent than TWs. This pattern may indicate that second-generation FWs are more oriented toward national standards or large urban centers such as Vancouver and Toronto, where /aʊ/-raising is less extreme than in the Prairies (Boberg, 2008). This interpretation also supports Onosson et al. (2019), where FWs were found to show more advanced participation in Canadian Shift and /u/-fronting than local TW speakers, representing an orientation toward national trends rather than local trends.

A side note that needs to be mentioned is that second-generation women tend to pattern more with the local community, while second-generation men tend to pattern with their parental generation. Although this difference does not reach statistical significance, F1 (raising) of the

[25] From a sociological view, individuals who maintain strong ties and attachment to the local community are more likely to have local orientations, while individuals who are involved in social, economic and political networks in metropolis are more like to show extra-local orientations (Oropesa, 1987:91)

onset /aʊT/ among second-generation women shows only a 3 Hz difference from TW younger speakers, while second-generation men have F1 values closer to first-generation FWs. This trend wherein second-generation women are closer to the local linguistic norms than second-generation men is also found in the production of /æg/-raising presented in the next chapter, and is discussed more in depth there.

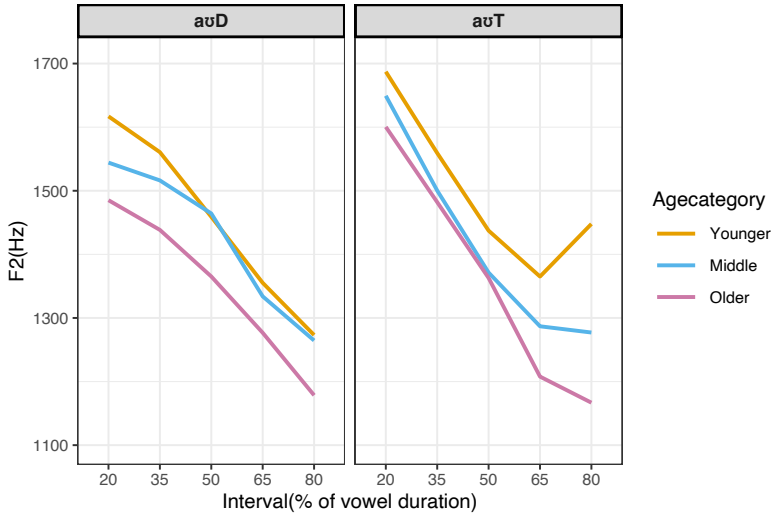
3.5.2 Phonetic analyses

3.5.2.1 /aʊ/-fronting within Canadian English

Based on the results collected from TW speakers, the status of a more back /aʊ/ on the Prairies (Boberg, 2008; Labov et al., 2006) seems to be changing to become more fronted in Winnipeg, Manitoba, as supported by Figure 3.16 below. Even though the mean value of F2 (fronting) for /aʊT/ tokens is 1659 Hz among TW speakers, which is lower than the national value of 1692 Hz (Boberg, 2008) suggesting a more back /aʊ/ overall, there are in-group variations. Younger speakers on average have approximately the same F2 (fronting) with the national standard and are more fronted than older speakers, while older speakers all have closer value to the mean F2 of /aʊT/ on the Prairies in Boberg's study.[26]

[26] Again, the comparisons here are relative, and not absolute. F2 values in Boberg's (2008) study were measured at the point of inflection where the vowel moves toward and then away from the rear periphery of the vowel space. F2 here is measured at the 20% point.

Figure 3.16 Formant transitions of /aʊD/ and /aʊT/ F2 among TWs split by age category. The x-axis indicates five time-proportional points along the vowel.



The age difference is consistent with what has been found in previous studies, that younger speakers feature a more fronted /aʊ/ than older speakers (Chambers & Hardwick, 1986; Davison, 1987). Among TWs, all speakers show a great differentiation between /aʊD/ and /aʊT/, except for middle-aged women, who only show a 3 Hz difference between /aʊD/ and /aʊT/. This observation suggests that /aʊ/-fronting is not yet a part of the normative speech in Winnipeg, since middle-aged women, who are in their prime working years, are more likely to adopt standard linguistic features (Bourdieu, 1977).

3.5.2.2 Canadian Raising and vowel duration

The results among both second-generation FWs and TWs show a significant correlation between raised diphthongs and their duration, and are overall consistent with the general pattern of vowel duration that pre-voiced vowels have longer duration than pre-voiceless vowels (Peterson & Lehiste, 1960). Among first-generation FW speakers, since no raising is found, the result shows non-significant correlations between duration and F1 values of /aɪ/ and /aʊ/.

3.6 Conclusion

This chapter has investigated the ethnolinguistic production of Canadian Raising vowels in Winnipeg speakers. The main finding is that second-generation FWs produce the same extent of raising as TWs for /aɪ/-raising, while showing less raising of /aʊ/ than TWs and somewhat pattern similarly to first-generation FWs. The potential interpretation of this pattern is that second-generation FWs are more oriented to national standards than local trends, since the Prairies feature a more raised /aʊ/ than the national average (Boberg, 2008; Labov et al, 2006). The different patterns of the two diphthongs among second-generation speakers also may be thought to mirror their in-between position of holding onto two different cultures: the mainstream dominant culture and their heritage culture. Future qualitative studies need to be conducted to follow up.

/aʊ/-raising has socio-indexical meanings and is attached to Canadian nationality (Niedzielski, 1999), which likely causes stylistic variations across speakers (Nycz, 2018). Second-generation speakers might raise /aʊ/ to a greater extent in their conversational speech, especially when they express Canadian identity and convey positive attitudes toward Canada. More qualitative analyses from sociocultural interviews are needed to follow up in this direction.

4 /æg/-raising

In this chapter, I first present a review of previous literature on /æg/-raising (§4.1). I then provide a detailed description of the methods that are specifically implemented in the present study (§4.2). The results are followed by both a within-community examination and a between-community comparison (§4.3). Discussion of the results and summary of this chapter are given in the final section (§4.4).

4.1 Background

Prevelar raising is a pattern where the low front vowel /æ/ is raised and tensed when it is followed by the voiced velar /g/.[27] Acoustically, the following /g/ is believed to cause the lowering of F1 and raising of F2 values of the preceding vowel /æ/ (Baker et al., 2008). In the articulatory view, raising occurs with more forward lips and greater anterior constriction (Purnell, 2008). It also involves an advanced tongue root to facilitate voicing and a raised tongue body to achieve the velar closure (Mielke et al., 2017).

Raising of /æ/ before /g/ was first noticed and documented by Zeller (1997) in the Midwestern United States. She suggested this sound change was in progress, as younger

[27] Note, there are both phonological and articulatory reasons for /æ/ to be raised. From an articulatory view, /æ/ is a low front vowel, and /g/ is a velar that requires raising of the dorsum against the soft palate. Under this condition, the vowel may be raised to form the closure when preceding /g/. Phonologically, it is possible for /æ/ before /g/ to be raised since it is followed by a voiced consonant, and voiced consonants are found to significantly lower F1 comparing to voiceless consonants (Hillenbrand et al., 2001). However, the focus of this chapter is not to confirm whether /æ/ before /g/ is raised or not; rather, this chapter focuses on exploring the possible different degrees of raising among TWs and FWs.

generations showed more merging instances between /æg/ and /eyg/ tokens, such that *haggle* rhymes with *bagel*. This phonetic change was then reported in the *Atlas of North American English* (Labov et al., 2006), showing that it not only happens in Wisconsin, but also in Minnesota, both neighboring regions of northwestern Ontario and the Canadian Prairies. This study is also the first to mention the emergence of prevelar raising in the Canadian Prairies. Boberg (2008) showed that speakers in the Prairies have the strongest /æ/ raising before /g/ of speakers in all Canadian regions, which makes prevelar raising a distinctly local phonetic feature in the Prairies. The analysis in this chapter seeks to determine if Filipino speakers in Winnipeg use this local feature and show a similar degree of /æg/-raising to TWs.

Little published literature has investigated /æg/-raising among ethnic groups. Using data collected from five ethnic groups in Washington State, specifically African Americans, Caucasians, Japanese Americans, Mexican Americans, and members of the Yakama Nation, Riebold (2015) found that, like Caucasian speakers in Seattle (Freeman, 2014; Wassink et al., 2009), all investigated groups participate in the change in progress of prevelar raising and share a common linguistic system regarding this phonetic variable. Therefore, differences in prevelar raising are not considered to index ethnicity in this region, since non-significant cross-ethnic differences were found. However, Rosen and Skriver's (2015) analyses of the Mormon community in Southern Alberta, Canada, suggest otherwise. According to their results, while Mormon English speakers participate in other phonetic changes in progress such as the Canadian Shift, based on apparent-time evidence, their retracted /æ/ and raised /æg/ are not as pronounced as the non-Mormon rural communities in Southern Alberta, Canada. In Southern Alberta, then, raised /æg/ reflects an ethno-religious differentiation between Mormons and non-Mormons.

The Filipino community in Winnipeg has settled in a metropolitan area, just as the groups in Riebold's (2015) study; however, a close-knit social network has also been formed in this community, similar to the Mormon community in rural Southern Alberta (Rosen & Skriver, 2015). In this case, how do FWs construct their linguistic system in terms of prevelar raising? In this change-in-progress, are they more advanced speakers than FWs, matching the results of the production of Canadian Shift vowels (Rosen et al. 2015)? Or do they resist linguistic innovation and thus lag behind their Caucasian counterparts due to their strong-tie networks (Milroy & Milroy, 1992)? The following sections investigate these questions with the assistance of statistical analysis and data visualization.

4.2 Methods

4.2.1 Materials

Eight words containing the vowel /æ/ and three words that have /æg/ were selected from the ~220 word list (Boberg, 2006; Wassink et al., 2009), as shown in Table 4.1. All words are monosyllabic or disyllabic, with the stress on the vowel measured. In total, 458 tokens were extracted from 41 speakers. A detailed illustration of the number of the tokens for each sub-group in FWs and TWs is also provided in Table 4.2 and Table 4.3.

Table 4.1 List of words selected for /æg/-raising analyses

Phonetic environment	**Words**	**Tokens**
/æ/	sack, happy, sat, cast, tap, bad, sad, had	335
/æg/	tag, bag, gag	123
Total		458

Table 4.2 Number of tokens for each sub-group in TWs

Generation	/æ/		/æg/		Total
	Men	Women	Men	Women	
Younger	15	55	6	21	97
Middle-Aged	15	16	6	6	22
Older	25	8	9	3	45
Total N	119		45		164

Table 4.3 Number of tokens for each sub-group in FWs

Generation	/æ/		/æg/		Total
	Men	Women	Men	Women	
Gen.1	36	43	12	15	106
Gen.2	73	64	27	24	188
Total N	216		78		294

Fewer tokens are shown for the syllable /æg/ because there are few words that are both monosyllabic and also have the consonant /g/ as a coda. There are also fewer tokens for the TW groups, especially in the middle-age generation, as there are fewer speakers in that group in this study.

4.2.2 Measurements

As with the measurement of Canadian Raising diphthongs, a combination of static and dynamic methods was implemented to measure the /æ/ and /æg/ tokens. However, unlike the 20% measurement point of Canadian Raising, the midpoint of the vowel, i.e., 50% of vowel duration, was used in the following analyses. The midpoint of a vowel token is assumed to receive minimal influence from preceding and following consonants. The midpoint method has also been applied to previous studies on /æg/-raising (Rosen & Skriver, 2015; Wassink, 2015). Midpoint measurements were augmented by dynamic formant movement presented through the use of five measurement points (20%, 35%, 50%, 65%, 80%) across vowel duration.

4.2.3 Statistical analysis[28]

Linear regression mixed-effects models were used to test the degree of significance of the differences between each social group along the F1 and F2 dimensions. For this section, random effects for all models are *speaker* and *word.* Fixed effects include *vowel class* (/æ/ and /æg/), *gender* (women and men), *generation* (FWs: Gen.1 and Gen.2; TWs: younger, middle-aged, and older), *ethnicity* (TW, FW_Gen.1, and FW_Gen.2). Different data subsets were used according to whether within-community or between-community variations were being explored. The commonly used thresholds, 1.96 for *t-value* and 0.05 for *p-value,* were implemented here to determine the significance of social and linguistic factors.

4.3 Results

This section presents the acoustic findings from /æ/ tokens in prevelar and non-prevelar contexts. The results for FWs are presented first, followed by TWs. Comparisons between the two ethnic groups are shown last. Each subsection starts with the descriptive and statistical results of F1 of /æ/ and then proceeds with reporting the results of F2 of /æ/. The following research questions are addressed:

1) Is /æg/-raising a feature in TWs? Do social factors play a role in the raising of /æg/?
2) Do FWs participate in /æg/-raising? Are there in-group differences?
3) Do FWs show the same extent of /æg/-raising as TWs?

[28] Note, aside from English, Filipino English speakers in our data use three different native languages (Tagalog, Ilocano, Kapampangan). There are no significant differences found with respect to the effects of the three languages on F2 of the two variants. However, for F1, speakers whose first language is Tagalog are significantly ($p = .03$) different from the other language groups. Although it is not ideal to categorize participants into one group, separating them into three different groups according to first language in this study does not provide enough explanatory power. Thus, the analyses in the following sections do not present them separately in terms of first (non-English) language. Speakers whose first language is not English are all categorized as first-generation Filipino participants.

4.3.1 /æg/-raising in Traditional Winnipeggers (TWs)

This section examines the status of /æg/-raising among TWs and answers the following questions:

1) Do TWs show phonetic evidence of raising /æ/ before /g/?

2) If they show raising of /æ/ before /g/, is the phenomenon an ongoing change?

3) Is the raising differentiated between men and women?

The F1*F2 plot in Figure 4.1 shows an overview of how TWs distribute their pronunciations of /æ/ and /æg/. It is apparent from this figure that the distribution of /æg/ is more fronted and raised than non-prevelar /æ/ by having a visibly higher F2 (indicating a more fronted position) and lower F1 (indicating a more raised position) than plain /æ/. Linear regression models with vowel class (levels: /æ/ and /æg/) as an independent predictor identify vowel class as a significant independent predictor for both F1 (t = -20.66, p < .0001) and F2 (t = 19.29, p < .0001) based on midpoint values, indicating significant differences between /æ/ and /æg/ in terms of F1 and F2 in TWs.

Figure 4.1 Distribution of /æ/ and /æg/ in TWs

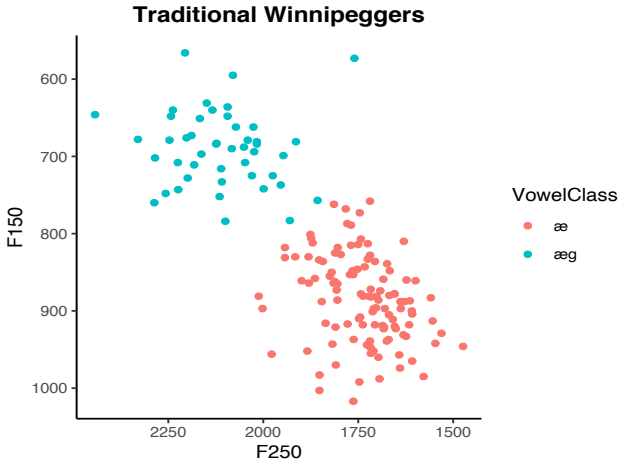
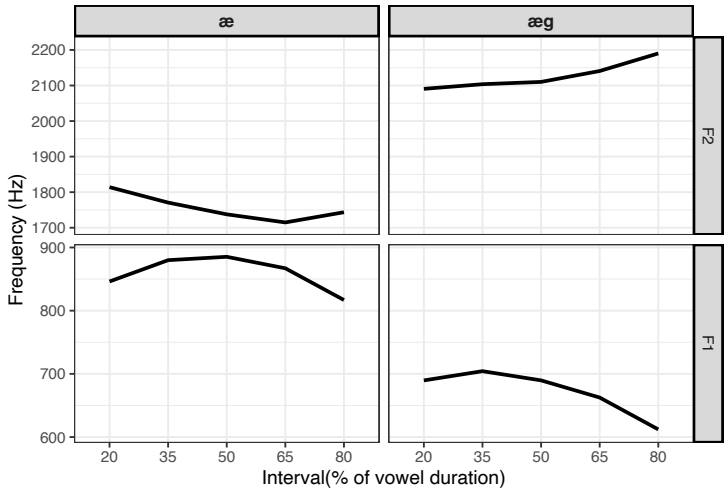


Figure 4.2 shows the formant transitions of the two variables as produced by TW participants. The two vowel variants do not show any trace of overlap along their formant

transitions in either (normalized) F1 or F2. In Figure 4.2, we can see that /æ/ before /g/ is much more raised and fronted than plain /æ/. In the F1 dimension, /æg/ is at least 100 Hz lower than /æ/ across all five temporal points along the formant transition. In addition to the F1 differences, /æg/ is 200 Hz higher than /æ/ in the F2 dimension, indicating more fronted vowels. The two variants also seem to have distinct formant transition shapes. Close observation reveals that /æg/ has a steeper trajectory in F1. Along the vowel's duration, the F2 trajectory falls for plain /æ/ but rises when it is followed by /g/. In summary, TW /æ/ before /g/ is produced with a strongly diphthongal configuration.

Figure 4.2 Formant transitions of /æ/ and /æg/ produced by TWs.
The x-axis indicates five time-proportional points along the vowel.



The average F1 and F2 values for plain /æ/ among the TWs in this study are similar to the national means reported for Standard Canadian English as reported in the PCE project (Boberg, 2008), as shown here in Table 4.4. However, greater differences occur when /æ/ is followed by /g/. Relative to the results of the PCE project, TWs have a lower F1 by 84 Hz and a higher F2 by 159 Hz. Furthermore, the mean Euclidean distance between /æ/ and /æg/ calculated for the TW dataset is 384 Hz, which is close to the 352 Hz reported for the Prairies in the PCE project. The comparisons of average formant values and Euclidean distance suggest that TWs are

participating in /æg/-raising, and to a slightly greater degree in comparison to Standard Canadian English.

Table 4.4 Comparisons between TWs and Standard Canadian English in the PCE project for /æ/ and /æg/

Group	**F1 (Hz)**		**F2 (Hz)**	
	/æ/	/æg/	/æ/	/æg/
TW	885	690	1738	2110
PCE	884	774	1742	1951

F1

Table 4.5 lists the mean F1 and vowel durations of /æ/ and /æg/ for TWs divided by age group and gender. In general, all six groups differentiate /æ/ from /æg/ and show similar positions of /æg/ in height (F1). The main between-group differences occur in F1 values of /æ/, which also leads to varying degrees of raising, i.e., /æ ~ æg/ differences. Middle-aged women show the largest /æ ~ æg/ difference at 245 Hz, followed by younger women at 215 Hz. Regarding duration, all groups show longer duration for /æg/ tokens; this is most especially pronounced among older women.

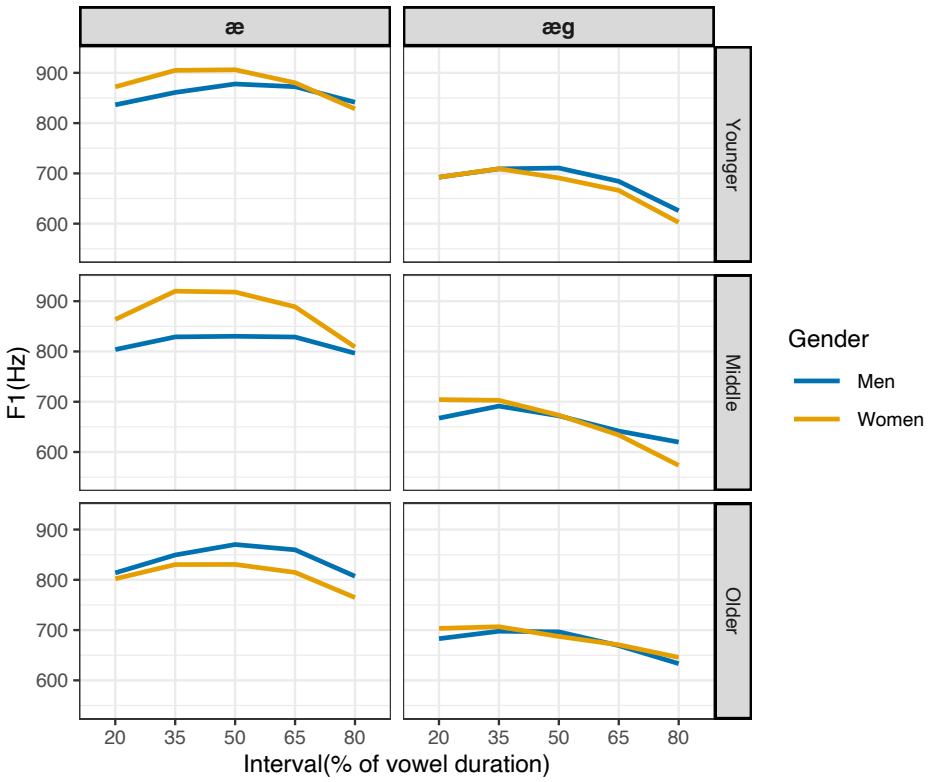
Table 4.5 F1 at midpoint and duration of /æ/ and /æg/ in TWs

Groups		**F1(Hz)**			**Dur(ms)**		
		/æ/	/æg/	*Diff.*	/æ/	/æg/	*Diff.*
Younger	Men	878	711	167	227	253	26
	Women	906	691	215	235	266	31
Middle-Aged	Men	830	672	158	212	226	13
	Women	918	673	245	255	301	46
Older	Men	870	696	174	223	230	7
	Women	831	687	144	229	310	81

The formant transitions demonstrated in Figure 4.3 below more clearly show the differences between TW men and women. The most salient observation is that /æ/ produced by men appears to have somewhat lower F1 values across the formant transition, while the formant transitions of /æg/ tokens compared between men and women across the three age groups show

near-to-complete overlap throughout the entire duration, indicating that men raise /æ/ before /g/ in much the same way as women. The exception is among the older groups, in which women display a lowered F1, indicating more raised /æ/ tokens than men.

Figure 4.3 Formant transitions of F1 for /æ/ and /æg/ in TWs by gender and age category. The x-axis indicates five time-proportional points along the vowel.



Statistical analyses were carried out in linear mixed-effects regression models using a stepwise procedure. The independent predictors that were tested include *vowel class, duration, age category* and *gender*. Random effects were *speaker* and *word*. *Vowel class, age category* and *gender* significantly improved the model fit, as did the two two-way interactions of *vowel class* and *gender*, and *age category* and *gender*.

Model <- lmer(F150~VowelClass+Agecategory+Gender+VowelClass*Gender+
Agecategory*Gender+(1|Speaker)+(1|Word), data=TWdataset)

Table 4.6 Output of the best-fit model of F1 for /æ/ and /æg/ tokens produced by TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	833.84	13.09	63.68	<2e-16***
VowelClassæg	-168.23	15.77	-10.67	3.28e-11***
AgecategoryOlder	36.24	15.52	2.34	0.032*
AgecategoryYounger	44.77	16.4	2.73	0.015*
GenderWomen	77.09	17.23	4.74	0.0003***
VowelClassæg:GenderWomen	-45.41	16.15	-2.81	0.0056**
AgecategoryOlder:GenderWomen	-94.46	25.42	-3.72	0.0018**
AgecategoryYounger:GenderWomen	-49.28	21.19	-2.33	0.033*

The best-fit linear mixed effects model confirms that /æg/ tokens produced by TWs have statistically significant higher F1 than plain /æ/. Vowel class also shows the largest effect on F1 in this model. There is a significant interaction between gender and vowel class, indicating that TW women in general have more differentiation between /æ/ vs. /æg/ tokens than men in the F1 dimension. However, this interaction might not indicate that TW women raise /æ/ before /g/ significantly more than TW men. As suggested in the descriptive results presented above, few between-gender differences were found regarding the position of /æg/ in F1.

The significant interaction between age and gender suggests that the gender differences of F1 in the middle-aged group is more extreme than either the younger or older groups. This result pertains to the F1 in both phonetic contexts (/æ/ and /æg/), and there are no significant interactions between age category and vowel class, suggesting that the three age groups do not differ considerably in the extent of their raising of /æ/ before /g/.

F2

For F2, there is a clear difference between /æ/ and /æg/. The six age and gender groups each show at least a 300 Hz /æ~æg/ difference. Middle-aged women show the largest mean formant difference at 400 Hz. This same group also has the lowest F2 for /æ/ tokens among all groups,

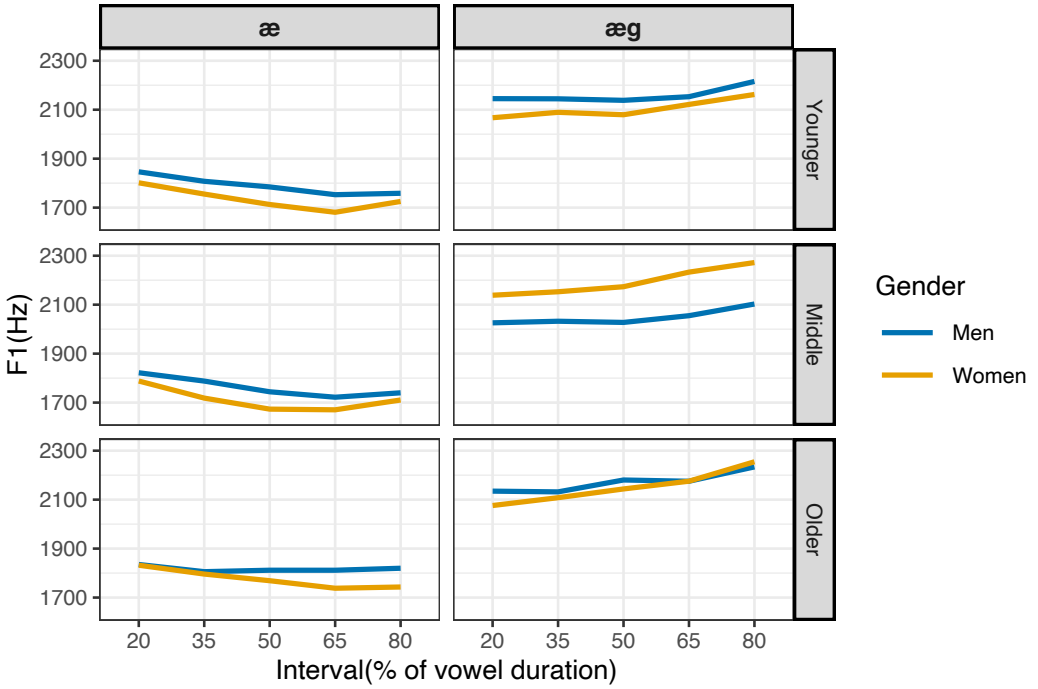
and a relatively higher mean value for /æg/ tokens. The smallest /æ~æg/ difference occurs for middle-aged men, who also have the lowest mean F2 frequency for tokens of /æg/. In this case, men and women are more different in the middle-aged group than the younger and older groups. This result is also consistent with the extent of raising in the F1 dimension, which might suggest a correlation between raising and fronting of /æ/ before /g/.

Table 4.7 F2 at midpoint and duration of /æ/ and /æg/ in TWs

Groups		**F2(Hz)**			**Dur(ms)**		
		/æ/	/æg/	*Diff.*	/æ/	/æg/	*Diff.*
Younger	Men	1785	2138	353	227	253	26
	Women	1713	2079	366	235	266	31
Middle-Aged	Men	1744	2028	314	212	226	5
	Women	**1673**	**2173**	**400**	255	301	46
Older	Men	1812	2180	368	223	230	7
	Women	1769	2144	375	229	310	81

Figure 4.4 displays a clear separation between /æ/ in the left panel and /æg/ in the right panel, and formant transitions of /æg/ have more rising upglides over the course of their duration. Across all age and gender groups, the formant transitions are almost identical in shape. The figure also demonstrates a clear separation of formant movements between men and women, except for the oldest speakers. Once again, we see that /æg/ is distinct from /æ/ to the greatest extent for middle-aged women, and to the least extent among middle-aged men, followed by the younger and older age groups, a result that is consistent with the statistical analyses below.

Figure 4.4 Formant transitions of F2 for /æ/ and /æg/ in TWs by gender and age category. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the dataset of F2 for /æ/ and /æg/ produced by TW participants. The dependent variable was F2 at the 50% point. Independent predictors that were tested include *duration* in milliseconds, *vowel class*, *age category* and *gender*. Random effects were *speaker* and *word*. Only vowel class and generation were found to significantly improve the model fit. The output of the best-fit model is listed in Table 4.8.

Model=lmer(F250~VowelClass+durms+Agecategory+Gender+
VowelClass*durms+(1|Speaker)+(1|Word), data=TWdataset)

Table 4.8 Output of the best-fit model of F2 for /æ/ and /æg/ tokens produced by TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1682.43	45.9	36.65	< 2e-16***
VowelClassæg	146.26	105.1	1.39	0.17
durms	0.27	0.18	1.44	0.16
AgecategoryOlder	78.16	23.25	3.36	0.00098***
AgecategoryYounger	29.48	19.61	1.5	0.14
GenderWomen	-61.47	18.16	-3.38	0.00091***
VowelClassæg:durms	0.83	0.4	2.07	0.04*

For the linguistic factors, the statistical output does not show a significant role of vowel class, which suggests that /æg/ is not significantly more fronted than /æ/. There was no significant linear relationship between normalized duration and F2, either. However, there is a significant interaction between *vowel class* and *duration*, indicating that non-prevelar /æ/ tokens are more likely to have a shorter duration as compared to prevelar /æ/ tokens.

The two social factors of *gender* and *age category* were found to have significant effects on the formant values of F2. The significant result of age category implies that older TW participants produce higher F2s than the middle-aged participants. This result is based on vowel token data from both phonetic environments and participants in both gender groups, which thus should not be taken to indicate that older TWs have a more fronted /æg/ than middle-aged TWs. This clarification also applies to the significant role of gender. According to its *t* value (*t* = *-3.38*), *gender* appears to have the largest effect on the production of F2, which suggests overall that TW women have a significantly lower F2 (less fronting) of both prevelar and non-prevelar /æ/ tokens than TW men.

Summary

In the raising dimension (F1), TW participants raise their prevelar /æ/ considerably. There are no significant differences across age groups with respect to the extent of raising. Women show greater differentiation of the two types of the tokens than men. This gendered difference is mainly in the middle-aged groups: middle-aged women have the largest /æ~æg/ difference (F1(æg)-F1(æ)), while middle-aged men have the second smallest difference. This observation will be explored further in a future study, since the focus of this research is the speech of FWs. In the fronting dimension (F2), although large /æ~æg/ mean differences were revealed in the descriptive statistics, vowel class was not found to be a significant factor in the production of F2

values based on inferential statistics. Duration significantly correlates with F2 values rather with than F1 values.

4.3.2 /æg/-raising in Filipino Winnipeggers (FWs)

This section presents the results of /æg/-raising in FWs and answers the following questions:

1) Do FWs participate in /æg/-raising?

2) Do gender or generation affect the production of /æ/ variants?

F1

The mean formant values and vowel duration produced by Filipino Gen.1 and Gen.2 participants are listed in Table 4.9. Across all Filipino generation and gender groups, /æ/ is raised before velar /g/ with the F1 of /æg/ tokens being lower than the F1 of /æ/ tokens, indicating that FWs are participating in ongoing prevelar raising. For Gen.1 Filipinos, F1 of /æg/ and /æ/ differ by 91 Hz for men and 85 Hz for women. Similar differences are also seen in the Gen.2 groups, with over 100 Hz differences for F1 in both genders.

As highlighted in Table 4.9, the most extreme results occur in among Gen.2 women, who have the lowest /æg/ F1 tokens and differentiate between /æ/ and /æg/ to the greatest extent.

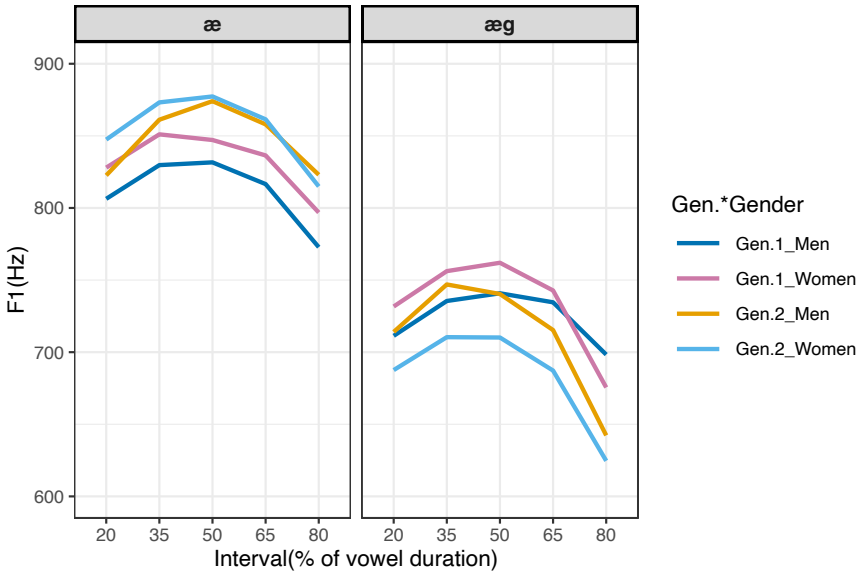
Table 4.9 F1 at midpoint and duration of /æ/ and /æg/ in FWs

Groups		**F1(Hz)**			**Dur(ms)**		
		/æ/	/æg/	*Diff.*	/æ/	/æg/	*Diff.*
Gen.1	Men	832	741	91	204	240	36
	Women	847	762	85	245	272	27
Gen.2	Men	874	740	134	189	225	36
	Women	877	**710**	**167**	204	263	59

Figure 4.5 presents the vowel formant transitions produced by FWs, separated into four groups according to gender and generation. Overall, all four groups consistently produce /æg/ differently than /æ/ throughout the formant transitions. For F1, all four groups display a similar

bell-shaped curve for both variants, while prevelar /æg/ is more diphthongal with a sharp downward formant transition starting from the 50% point of duration.

Figure 4.5 Formant transitions of F1 for /æ/ and /æg/ in FWs by gender and generation. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the dataset of F1 for /æ/ and /æg/ produced by FW participants. The dependent variable is F1 values at the 50% point. Independent predictors that were tested include *duration* in milliseconds, *vowel class* (/æ/, /æg/), *generation* (FW_Gen.1, FW_Gen.2), and *gender* (men, women). Random effects are speaker and word. Only vowel class and generation were found to significantly improve the model fit. The output of the best-fit model is listed in Table 4.10.

Model <- lmer(F150~VowelClass*Generation + (1|Speaker)+(1|Word), data=FWdataset)

Table 4.10 Output of the best-fit model of F1 for /æ/ and /æg/ tokens produced by FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	840.33	11.38	73.86	<2e-16***
VowelClassæg	-87.74	17.91	-4.9	6.34e-05***
GenerationFW_Gen.2	35.59	11.87	2.99	0.0051**
VowelClassæg:GenerationFW_Gen.2	-62.04	16.75	-3.7	0.0003***

The statistical model shows, unsurprisingly, that there are significant differences between /æ/ and /æg/, where /æg/ tokens have significantly lower F1 values than /æ/ tokens, indicating that /æg/ is more raised than /æ/ in the FW dataset. The social factor *generation* is revealed to significantly influence the degree of /æ/ raising before /g/, as FW Gen.2 participants show greater differentiation of their /æ/ and /æg/ tokens. Even though the descriptive statistics demonstrated that FW Gen.2 women produce the most raised /æg/ and separated /æ/ and /æg/ the most, gender was not found to be a significant predictor, nor was the interaction of gender and generation. Duration was not found to be a significant factor either.

F2

Table 4.11 summarizes the descriptive statistical results of the formant values for each social group (age and gender). As with the results of F1, Table 4.11 shows that Gen.2 women not only have the highest F2 values, but also produce the greatest degree of differentiation between /æ/ and /æg/ in terms of F2 values, and are very distinct from the other three groups. A similar observation also applies to duration: the durational differences between /æ/ in the two contexts are the largest in Gen.2 women. Finally, Gen.2 men pattern more similarly to the Gen.1 groups in terms of /æ~æg/ differences.

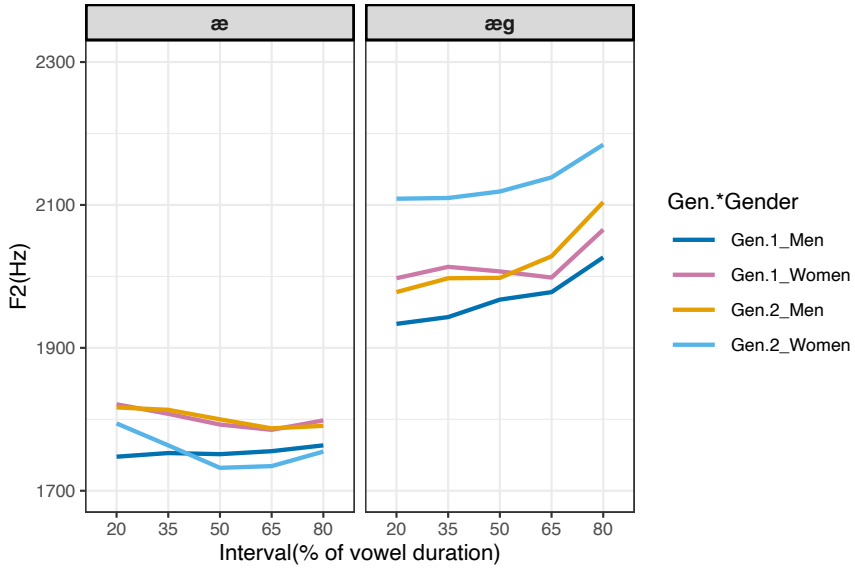
Table 4.11 F2 at midpoint and duration of /æ/ and /æg/ in FWs

Groups		**F2(Hz)**			**Dur(ms)**		
		/æ/	/æg/	*Diff.*	/æ/	/æg/	*Diff.*
Gen.1	Men	1751	1968	217	204	240	36
	Women	1793	2007	214	245	272	27
Gen.2	Men	1800	1998	198	189	225	36
	Women	1732	**2119**	**387**	204	263	59

Figure 4.6 depicts a clear distinction between the formant transitions in the panels on the left showing non-prevelar /æ/, and the formant transitions in the panels on the right showing prevelar /æg/, suggesting speakers from all four groups front their /æg/ tokens to a more

advanced position in the vowel space. In line with the results of the single-point measurement, the formant transitions also display an apparent in-group difference. Gen.2 women produce much higher F2 values for /æg/ than the other three groups across the full segment duration.

Figure 4.6 Formant transitions of F2 for /æ/ and /æg/ in FWs by gender and generation. The x-axis indicates five time-proportional points along the vowel.



Linear regression mixed-effects models were fit to the data of F2. The dependent variable is F2 at the 50% point. Independent variables that were tested include *gender* (men, women), *generation* (FW_Gen.1, FW_Gen.2), *vowel class* (/æ/, /æg/), and *duration*. The best-fit model selected by a stepwise procedure includes two three-way interactions as fixed effects. Again, random effects are *speaker* and *word*.

Model <- lmer(F250~VowelClass*durms*Generation +
VowelClass*Generation*Gender+(1|Speaker)+(1|Word), data=FWdataset)

Table 4.12 Output of the best-fit model of F2 for /æ/ and /æg/ tokens produced by FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1670.35	41.94	39.83	<2e-16***
VowelClassæg	134.28	115.18	1.17	0.25
durms	0.39	0.17	2.35	0.02*
GenderWomen	24.89	32.29	0.77	0.45
GenerationFW_Gen.2	74.28	49.7	1.5	0.17
VowelClassæg:durms	0.29	0.47	0.61	0.54
VowelClassæg:GenderWomen	-7.57	48.11	-0.16	0.88
VowelClassæg:GenerationFW_Gen.2	262.21	128.47	-2.04	0.04*
durms:GenerationFW_Gen.2	-0.1	0.21	-0.5	0.62
GenderWomen:GenerationFW_Gen.2	-96.27	39.58	-2.43	0.02*
VowelClassæg:durms:GenerationFW_Gen.2	-1.21	0.53	-2.31	0.022*
VowelClassæg:GenderWomen:GenerationFW_Gen.2	224.43	58.98	3.81	0.00018***

The model reveals significant interactions among *duration*, *vowel class*, *gender* and *generation*. First, normalized duration alone significantly predicts the values of F2, suggesting that vowel duration is prolonged as F2 increases. The three-way interaction of *duration*, *vowel class* and *generation* indicates that duration is also related to vowel class, and that the relationship is significantly manifested in the dataset of Gen.2 speakers. The significant interaction between *vowel class* and *generation* seems to suggest that Gen.2 participants have relatively higher F2 values for /æg/ tokens as compared to /æ/, while the three-way interaction with *gender* confirms that it is primarily Gen.2 women who contribute to the significant effect of generation. This three-way interaction also has the largest effect for FW participants according to the size of *t* value ($t = 3.18$).

Summary

In the raising dimension (F1), *generation* has a statistically significant effect on the F1 of /æ/ and /æg/, meaning that second-generation FW participants are engaging in more /æg/-raising than first-generation FWs. This result is not surprising given that all of the first-generation speakers have English as a second language, while most of the second-generation speakers are native English speakers. It is therefore not unexpected that the two generational groups have different phonetic realizations. Gender was not shown to be a significant predictor.

In the fronting dimension (F2), the data demonstrates a slightly different phenomenon than the results for F1. Comparing the two generations, gender-based variation is significantly greater for second-generation speakers than for first-generation speakers. Second-generation women have much greater fronting of /æg/ vs. /æ/ than second-generation men and first-generation speakers of either gender.

4.3.3 Between-community comparisons

The previous sections have investigated the effects of gender and age on the production of /æg/-raising in each ethnic community, TWs and FWs. The main goal of this section is to explore the role of ethnicity in conditioning the extent of /æg/-raising in both the F1 and F2 dimensions. To do so, I separated FWs speakers into two generational groups and compared the two generational groups and TWs, as generation was shown to be a significant predictor (§4.3.2). I also arranged the TW group in the intercept of the linear regression mixed-effects models by using the *as.factor* function in RStudio (RStudio Team, 2016) to compare each FW group with TWs.

```
df$Ethnicity <- as.factor(df$Ethnicity, levels=c("TW", "FW_Gen.1", "FW_Gen.2"))
```

F1

In general, all groups show participation in /æg/-raising by producing lower F1 values of /æg/ than /æ/. Comparing across the three groups, Table 4.13 reveals that the TW group shows more

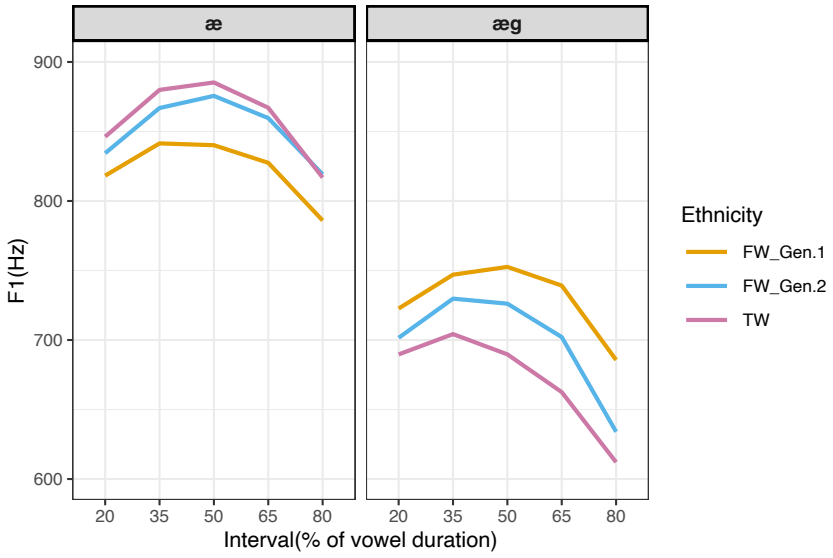
/æ~æg/ differences than either of the two FW generational groups. In particular, FW Gen.1s separate /æ/ and /æg/ a little under half, while FW Gen.2s is just around the third quarter of the raising of TWs. This observation seems to suggest that TWs see more raising of /æg/ than FWs. With respect to vowel duration, there are fewer in-group differences.

Table 4.13 F1 at midpoint and duration of /æ/ and /æg/ in FWs and TWs

Groups	**F1(Hz)**			**Dur(ms)**		
	/æ/	/æg/	*Diff.*	/æ/	/æg/	*Diff.*
FW_Gen.1	840	753	**87**	229	258	29
FW_Gen.2	876	726	**150**	196	243	47
TW	885	690	**195**	231	261	30

The formant transitions formed by five time-proportional measurement points displayed in the figure below return similar results. The right panel of /æg/ tokens displays a clear separation between the three groups across the entire vowel duration. TWs display the lowest F1 at all five time points, followed by FW Gen.2s and FW Gen.1s. The left panel for the /æ/ variant shows a different picture, with the FW Gen.1 having a lower F1 than both TWs and FW Gen.2s.

Figure 4.7 Formant transitions of F1 for /æ/ and /æg/ in FWs and TWs.
The x-axis indicates five time-proportional points along the vowel.



Linear mixed-effects models were carried out to test the significance of vowel class, vowel duration, gender and ethnicity. The dependent variable was the F1 value at the 50% point. The best-fit model returned by a stepwise procedure includes vowel class and two two-way interactions as independent predictors, as listed below.

```
Model <- lmer(F150~VowelClass+VowelClass*Ethnicity+VowelClass*Gender
+(1|Speakers) + (1|Words), data= FWTWdataset)
```

Table 4.14 Output of the best-fit model of F1 for /æ/ and /æg/ tokens produced by FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	873.24	10.37	84.25	< 2e-16***
VowelClassæg	-177.25	15.82	-11.21	8.10e-13***
EthnicityFW_Gen.1	-43.71	11.62	-3.76	0.0004***
EthnicityFW_Gen.2	-6.65	9.82	-0.68	0.5
GenderWomen	19.78	8.7	2.28	0.027*
VowelClassæg:EthnicityFW_Gen.1	105.5	15.67	6.74	5.89e-11***
VowelClassæg:EthnicityFW_Gen.2	41.2	13.25	3.11	0.002**
VowelClassæg:GenderWomen	-29.13	11.7	-2.49	0.013*

As shown in Table 4.14, vowel class has a significant independent effect on the F1 values of /æ/ variants for all participants in Winnipeg, and is the largest effect in the model as indicated by its *t* value. Tokens of /æ/ before velar /g/ have significantly lower F1s than non-prevelar /æ/. Vowel duration does not have a significant linear correlation to F1 values.

There are also significant interactions between vowel class and the social predictors. The two significant interactions between *vowel class* and *ethnicity* indicate that both FW Gen.1s and FW Gen.2s are less likely to separate the /æ/ and /æg/ nucleus in comparison to TWs. This result is also supported and demonstrated by the descriptive observations in Table 4.13 and the formant transitions in Figure 4.6. Recall that in Section 4.3.2, the production of /æg/ by Gen.2 men is less raised than Gen.2 women and patterns more with FW Gen.1s. The significant differences between TWs and Gen.2s mainly come from the Gen.2 men, and not the Gen.2 women, who are more in line with the TWs. Finally, the significant interaction between *gender* and *vowel class*

indicates that women are more likely to raise the nuclei of /æg/ to a higher position in vowel space than men.

F2

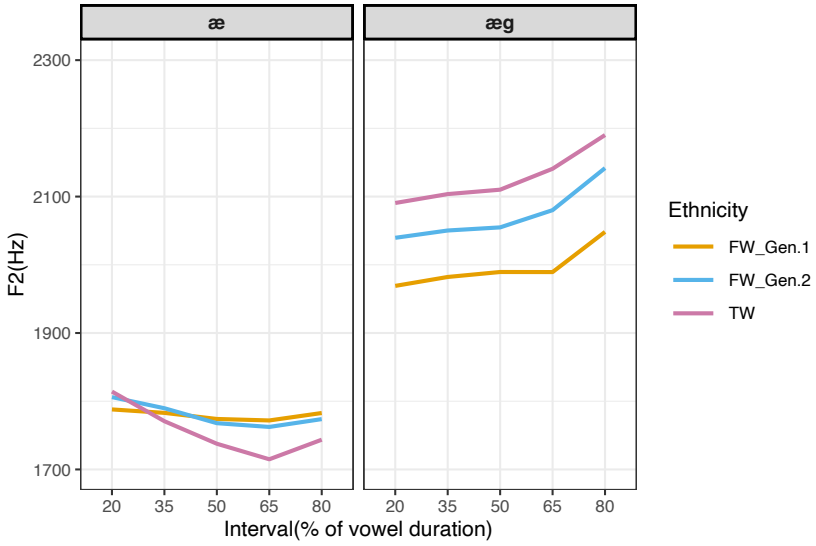
The average formant values of /æ/ and /æg/ in the F2 dimension are shown in Table 4.15 below. The comparisons across the three groups pattern with the descriptive results from the F1 dimension. FW Gen.1 speakers have the highest F2 for /æ/ and the lowest F2 for /æg/, and thus separate /æ/ and /æg/ by least at 215 Hz. The opposite is true for TW speakers who produce the lowest F2 for /æ/ and the highest F2 for /æg/, and thus front prevelar /æg/ the most. The average value of /æ/ and /æg/ by FW Gen.2s are in an intermediate position between FW Gen.1 and TWs.

Table 4.15 F2 at midpoint and duration of /æ/ and /æg/ in FWs and TWs

Groups	**F2(Hz)**			**Dur(ms)**		
	/æ/	/æg/	*Diff.*	/æ/	/æg/	*Diff.*
FW_Gen.1	1774	1989	215	229	258	29
FW_Gen.2	1768	2055	287	196	243	47
TW	1738	2110	372	231	261	30

Figure 4.8 illustrates the formant movements of /æ/ and /æg/ for the three social groups. The formant transitions of /æ/ by FW Gen.1s and Gen.2s overlap almost entirely from onset to offset and have slightly higher values than TWs. The visual distribution of /æg/ is characterized by gradually increased F2 values from FW Gen.1, to FW Gen.2, to TWs.

Figure 4.8 Formant transitions of F2 for /æ/ and /æg/ in FWs and TWs.
The x-axis indicates five time-proportional points along the vowel.



Linear mixed-effects regression models were fit to the dataset of F2 at the 50% point. Factors that were tested include *vowel class, duration, ethnicity and gender*. The best-fit model for F2 achieved through a stepwise procedure is more complex than was the statistical model for F1 values. Three-way interactions were shown to be more predictive than individual factors and two-way interactions of the factors.

Model=lmer(F250~VowelClass*durms*Ethnicity+VowelClass*Ethnicity*Gender
+durms*Ethnicity*Gender+(1|Speakers)+(1|Words), data=FWTWdataset)

Table 4.16 Output of the best-fit model of F2 for /æ/ and /æg/ tokens produced by FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	1798.97	70.33	25.58	< 2e-16***
VowelClassæg	146.23	110.24	1.33	0.19
durms	-0.08	0.31	-0.26	0.79
GenderWomen	-170.59	81.08	-2.1	0.036*
EthnicityFW_Gen.1	-203.5	86.73	-2.35	0.019*
EthnicityFW_Gen.2	-61.72	76.4	-0.81	0.42
VowelClassæg:EthnicityFW_Gen.1	-36.76	154.84	-0.24	0.81
VowelClassæg:EthnicityFW_Gen.2	242.74	123.28	1.97	0.05*
VowelClassæg:GenderWomen	7.48	39.97	0.19	0.85
GenderWomen: EthnicityFW_Gen.1	339.17	109.85	3.09	0.002*
GenderWomen: EthnicityFW_Gen.2	130.68	95.92	1.36	0.17
VowelClassæg:durms	0.82	0.45	1.82	0.07
durms:EthnicityFW_Gen.1	0.84	0.38	2.2	0.028*
durms:EthnicityFW_Gen.2	0.41	0.34	1.2	0.23
durms:GenderWomen	0.42	0.34	1.23	0.22
VowelClassæg:durms:EthnicityFW_Gen.1	-0.49	0.63	-0.77	0.44
VowelClassæg:durms:EthnicityFW_Gen.2	-1.72	0.51	-3.35	0.00097***
VowelClassæg:GenderWomen:EthnicityFW_Gen.1	2.78	62.15	0.05	0.96
VowelClassæg:GenderWomen:EthnicityFW_Gen.2	216.38	53.49	4.05	6.27e-05***
durms:GenderWomen:EthnicityFW_Gen.1	-1.06	0.46	-2.32	0.021*
durms:GenderWomen:EthnicityFW_Gen.2	-0.58	0.42	-1.39	0.17

For Winnipeg speakers as a whole, *vowel class* alone does not have a significant effect on the values of F2, which is not unexpected, given that it was not returned as a significant predictor in either the dataset of TWs (§4.3.1) or the dataset of FWs (§4.3.2). The linguistic factor of duration alone does not have a significant linear correlation with F2 either. However, there are significant interactions involving vowel class, duration, and social factors.

There are great differences between TW and FW Gen.1 speakers in terms of vowel duration. Across all tokens (/æ/ and /æg/), FW Gen.1 women produce longer vowel duration than

Gen.1 men; this difference is greater than the difference between TW women and men. This is indicated by the significant three-way interaction of *duration*, *gender,* and *ethnicity*. FW Gen.1 speakers also produce a more retracted /æ/ in both environments than TWs. However, the statistical results do not show a substantial contrast between the two groups in the degree of contextual frontness.

Turning to the comparisons between TWs and FW Gen.2s, the significant three-way interaction of *vowel class, gender,* and *ethnicity*, which is also the largest effect observed in the model ($t = 4.05$), suggests that the difference between Gen.2 men and women is significantly greater than TW men and women in terms of the extent of frontness. Section 4.3.2 has also shown and confirmed that Gen.2 women differentiate /æg/ from /æ/ to a significantly greater level in comparison to Gen.2 men. In addition to the gender difference in F2, FW Gen.2s are also differentiated from TWs with respect to vowel duration. The three-way interaction of *vowel class, duration,* and *ethnicity* indicates that duration of /æg/ tokens among FW Gen.2s is much longer than /æ/ tokens, while the difference between the /æ/ and /æg/ tokens among TWs is less significant.

Summary

This section has compared the production of /æ/ and /æg/ between TWs and the two FW generational subgroups. The results are somewhat different across the raising (F1) and fronting (F2) dimensions. For F1, Winnipeg speakers as a whole show significant raising of /æg/ from /æ/. Between ethnic groups, TWs exhibit a greater extent of contextual raising than both first- and second-generation FWs. The differences between TWs and second-generation FWs are driven primarily by the second-generation men, however, who are found to display F1 values of

/æ/ variants corresponding closely to those of first-generation speakers. Section 4.4 provides more in-depth details of this gender split.

With respect to the fronting dimension, TWs also differ from each FW generation, but in different aspects. TWs have considerably higher F2 values and less durational differences than first-generation FWs for the production of /æ/ in both phonetic environments (prevelar and non-prevelar). However, the main difference between TWs and second-generation FWs is reflected in the degree of fronting: TWs significantly separate /æ/ from /æg/ more than second-generation FWs, and this contrast is even more striking between TWs and second-generation men. This comparison is consistent with the result presented in Section 4.3.2, in which second-generation men have more retracted /æg/ tokens. Discussion of these findings is provided in Section 4.4.

4.3.4 Interim Summary

Research question 1: Is /æg/-raising a feature in TWs? Do social factors play a role in the raising of /æg/?

TWs all show significant raising of /æ/ before velar /g/. There are no considerable differences among age groups, suggesting /æg/-raising is not a change in progress in TWs. TW women significantly separate /æg/ from /æ/ more than TW men. However, this difference is primarily from /æ/ tokens. The mean value of F1 for /æg/ tokens is quite close across social groups.

Research question 2: Do FWs participate in /æg/-raising? Are there in-group differences?

Overall FWs show participation in /æg/-raising. There are significant generational and gendered differences. These differences stem largely from the second-generation women, however, who distinguish /æ/ from /æg/ the most. The second-generation men pattern with the first-generation FWs in both the raising (F1) and fronting (F2) dimensions.

Research question 3: Do FWs /æg/-raise to the same extent as TWs?

Among FWs, there is a split among gender and generation groups. Second-generation FW women are the only group that shows a similar raising to TWs, while second-generation FW men and first-generation FWs show significantly less raising than TWs.

4.4 Discussion

This chapter has investigated the status of /æg/-raising in the speech of Winnipeggers while also comparing TWs and FWs. Results were presented with both one point mean normalized formant values and five time-proportional points data. This section discusses several implications for the intra- and inter-group differences.

4.4.1 /æg/-raising among Traditional Winnipeggers (TWs)

Evidence collected from the TW dataset shows that /æg/-raising is found throughout the community in the speech of TWs. The three age groups of TWs all raise /æ/ tokens in the prevelar environment to a considerably greater level than in the non-prevelar /æ/ environment. The mean value of F1 for /æg/ among TWs is 690 Hz, much lower than the national mean value 774 Hz as reported in Boberg (2008). In other words, /æ/ before velar /g/ is more raised in Winnipeg than in the national standard, which is in line with Boberg's (2008) results showing that prevelar raising is more pronounced in the Prairies region.

The results also show women have a greater differentiation between /æ/ and /æg/ than men. In particular, middle-aged women display the greatest amount of /æg/-raising, followed by younger women. This observation seems to suggest /æg/-raising is still a change in progress. However, looking more closely at the mean values of /æ/ and /æg/ for each group, the in-group differences are mainly due to the /æ/ tokens, rather than the /æg/ tokens. As shown in Table 4.5,

F1 values of /æ/ tokens range from 830 Hz to 918 Hz across groups,[29] while F1 values of /æg/ tokens have a smaller range from 672 Hz to 711 Hz. The less varied /æg/ also suggests /æg/-raising is a feature in Winnipeg English[30] and is not a change in progress.

4.4.2 /æg/-raising among Filipino Winnipeggers (FWs)

The usage of /æ/ and /æg/ in FWs is primarily predictable by generation. First-generation FWs have significantly less /æ ~ æg/ differences in both F1 and F2 than second-generation FWs. Filipino women of the second generation are the main driver of the generational differences, while second-generation men display similar /æg/ formant values to first-generation FW groups. Due to L1 influence and the late age of English acquisition, it is expected that first-generation FWs would not have acquired this sociolinguistic variable and would lag behind second-generation FWs and TWs regarding the extent of /æg/-raising. This also may suggest that the linguistic system of first-generation speakers is not fully integrated into the local linguistic market yet.

With regards to second-generation Filipinos, it is expected that second-generation FW women would be more advanced in the prevelar raising of /æ/ than second-generation men, since women have been shown to be the leaders in adopting mainstream linguistic forms over men (Labov, 2001; Milroy & Gordon, 2003; Watt, 2002). This phenomenon also reflects the social characteristic of /æg/-raising constructed in TWs. The distribution of raised /æ/ before /g/ tokens is primarily predicted by gender in TWs. In this case, by displaying gender differences, second-

[29] Here, the variability of /æ/ aligns with Canadian Shift, an ongoing change that features greater participation among younger speakers. The shift involves three front lax vowels /æ/, /ɛ/, and /ɪ/, which are undergoing retracting and lowering movements (Clarke et al., 1995; Labov et al., 2006).

[30] This observation also raises the issue that /æ/ before /g/ is not actually more raised to a higher position, but rather it is /æ/ before other phonetic environments that have undergone more lowering (Onosson, under review; Onosson & Rosen, 2020).

generation FW participants, who are English-dominant or monolingual-English speakers, are supposed to have acquired the same social pattern of /æg/-raising.

What is interesting is that, even though second-generation FW men also engage in /æg/-raising, the degree of raising is significantly less and does not align with TWs or second-generation FW women. In this case, unlike second-generation women, second-generation men do not seem to adopt the local linguistic norm with respect to /æg/-raising. The gendered pattern of /æg/-raising among second-generation FW speakers is also observed in the Filipino community in Metro Vancouver (Umbal, 2016), where Filipino women show more advanced participation in Canadian Shift Vowels.

The diversity of networks each gender group has developed within and outside of the Filipino community may explain the differences in linguistic behavior (Milroy & Milroy, 1992). Kelly (2014) reports that Canadian-born Filipino men are far behind Filipino women with regards to holding a university degree. Second-generation Filipino women are more likely to have attained a postsecondary degree than men, which brings more opportunities for second-generation women to work outside the community and develop more diverse social networks than second-generation men. This observation is especially justified from the interviews of second-generation FW speakers. When they were asked one of the interview questions *are people you work with Filipino?*, the responses from second-generation women were mostly *no*:

*In IT, I am the **only** Filipino…*	203mufe77fpi
***no**, um … there's not a lot of Filipinos at Saint-Boniface…*	204mufe91fni
***no**, I have one Filipino that works there, another Filipino, that's it…*	206mufe90fpi
***one** is…*	211muft92fni
***hardly**…*	217mufe95fni
*um, **no** not really, I- I don't really see a lot of Filipinos working office jobs…*	220mufe93fni
***no** I was the only one for like, years…*	228mufe85fpi

Out of seven Filipino women, only speaker 202mufe73fpi said her department was mostly made up of Filipinos. Every other response from the women indicated they worked in a diverse job situation with non-Filipinos.

On the other hand, the responses from second-generation men for the same question *are people you work with Filipino?* are mostly affirmative, with few exceptions:

> *ah lately yeah there's a new estimator his name is Miguel I love that guy he, speaks very good Tagalog … and have a co-worker Eileen so there's three Filipinos in the office,* ***majority****…* 207mufe83mpi
> *yeah, yeah ah I have* ***a number of****, ah, Filipino co-workers who are permanent residents here…* 208mufe79mpi
> ***yeah****, yeah all my friends work with me…* 209mufe90mpi
> *um, yeah there's* ***a good amount of*** *Filipinos, like maybe like 10% maybe I guess…* 221mufe95mni
> *um, there's like* ***two*** *of us…* 223mufe93mni
> *mm* ***fifty-fifty****, at my branch, ah in- as a organizational whole it is growing…* 229mufe79mpi

In contrast to the women, most of the Filipino men said they worked with other Filipinos. This split means that second-generation FW women in general interact more with other locals at work, which linguistically influences them to adopt and align with local speech patterns (more /æg/-raising), while second-generation FW men overall work more with their peers from the Filipino community, which may influence them to use the linguistic variant that is more used within the speech community, and which may align more with the less /æg/-raising of the first-generation FWs.

The gender differences aligning with social networks and linguistic diversity in second-generation FWs are reminiscent of Sharma's (2011) findings. In Sharma's study, linguistic variation between the men and women of the younger generation is also found to be due to the different social network each group has developed. Younger women construct a much more diverse social network than men, as they "pursue higher education more extensively than the

boys and finding employment both outside and within the community… younger women are freer to pursue opportunities beyond the community" (Sharma, 2011:485). In this case, the linguistic behavior of women is a reflection of the socioeconomic opportunities that their social roles afford (Nichols, 1978). It is apparent that the younger Indian women in Sharma's study and the younger Filipino women in the present study demonstrate similar social and linguistic behaviors that are common in urban contact settings. As Sharma (2011:485) put it: "The pattern described for the younger generation is typical of Western working-class and LMC (lower middle-class) societies, with men more insulated within the community and women mediating the interfaces (Nichols 1979; Milroy 1987)." The findings show that an intersectional approach that takes into account ethnicity and gender is necessary when examining language variation and change in an ethnic community.

5 Voice Onset Time (VOT)

VOT refers to the time interval between the release of a stop consonant and the onset of glottal pulsing. This phonetic feature has been found to vary across languages (Lisker & Abramson, 1964). For example, English is usually described as an aspirating language, with voiceless stops having long-lag VOTs (>30ms), while voiced stops usually have short-lag VOTs (0-25ms) (Docherty, 1992; Lisker & Abramson, 1964; Morris et al., 2008). By contrast, the heritage languages and Philippine English spoken by first-generation Filipinos in general have short-lag VOTs for voiceless stops and long-lead VOTs for voiced stops (§5.1). These seemingly contrasting systems between English and Filipino heritage languages provide a conflict site within which to diagnose and investigate traces of substrate effects (Poplack, 1980; Rosen, 2006; Stewart, 2015). VOTs produced by second-generation FWs might show phonetic influence from Filipino heritage languages spoken by their first-generation parents. This section seeks to answer the question of whether there is substrate transfer of VOT, and whether or not it persists from first-generation to second-generation FWs.

5.1 Background

VOT is a phonetic cue that appears in stop consonants. It is the interval between the release of a stop and the onset of voicing before a following vowel (Lisker & Abramson, 1964). According to Keating (1984), stop consonants in languages have three phonetic types: voiced, voiceless

unaspirated and voiceless aspirated. The voiced stops have overall lead voicing (negative) VOT values. Voiceless unaspirated stops are a "swing" category and may have either short-lag (short positive) or lead VOTs (Keating, 1984:309). Voiceless aspirated stops in general have long-lag (long positive) VOT values.

The main goal of this section is to provide background on the phonetic differences of VOT particularly between Tagalog, the homeland language spoken by some FWs, and Canadian English. First, I will refer to previous studies on VOT in English (§5.1.1). I will then provide some background on the voicing system of each heritage language that is spoken by Filipino participants (§5.1.2). Finally, I will then discuss existing work on the role of social factors in the production of VOT in the last section (§5.1.3).

5.1.1 Voicing system in English

English is a two-category language having both voiced stops (/b/, /d/, and /g/) and voiceless stops (/p/, /t/, and /k/) (Lisker & Abramson, 1964). English is an aspirating language with long-lag VOTs for voiceless stops in the range of 30 ms to 100 ms. VOTs of voiced stops are somewhat complicated. Depending on the context, it could be short-lag with the range of 0 ms to 25 ms, or negative VOTs ranging from -100 ms to 0 ms (Docherty, 1992; Keating, 1984; Lisker & Abramson, 1964; Morris et al., 2008). For instance, there are individual speaker differences, where most English speakers produce short-lag VOTs, while some use lead VOTs. In either possibility, it is clear that the voicing system of English is different from the short-lag and voicing lead contrast of the Philippine languages spoken by FWs.

5.1.2 Voicing system in the first languages of the Philippines

5.1.2.1 Voicing system in Tagalog

Tagalog has sixteen consonant phonemes, seven of which are stops (Schachter & Reid, 2008): voiceless stops /p/, /t/, /k/,[31] and /ʔ/, and voiced stops /b/, /d/, and /g/. Unlike English, all of the voiceless stops and their allophones in Tagalog are produced without aspiration (Schachter, 1972), and all voiced stops are prevoiced, with long negative VOTs. Therefore, in terms of VOT, Tagalog employs a short-lag versus voicing lead system (Abella et al., 2015; Kang et al., 2016), in contrast with the short-lag versus long-lag system in English.

VOT in Tagalog has not been examined extensively in previous studies. Two recent studies (Abella et al., 2015; Kang et al., 2016) measured VOT of Tagalog stops within an exploration of cross-language influence. According to Abella et al. (2015), the average VOT value for voiceless stops (/p/, /t/, /k/) produced by native Tagalog speakers is around 20 ms. For voiced stops (/b/, /d/, /g/), the average duration is -65 ms. For mixed tokens (§5.1.2.5), the value is -45 ms. The average VOT value for each stop, however, was not reported. These results are summarized in Table 5.1.

Table 5.1 Mean VOT in Tagalog retrieved from Abella et al. (2015)

Voicing	Duration (ms)
Voiceless stops	20
Voiced stops	-65
Mixed	-45

Kang et al. (2016), in a detailed study on Tagalog VOTs, reported the VOT production of monolingual English, monolingual Tagalog and bilingual English-Tagalog speakers. Though the exact average duration is not presented, the study provided the range of VOT values for each

[31] /k/ has a fricative allophone [x], which appears intervocalically, especially before low and back vowels (Schachter, 1972).

word-initial stop. For voiceless stops, the average VOT duration of labial and alveolar articulations is within 10-15 ms; for velars, VOTs are in the range of 30 ms to 35 ms (Kang et al., 2016). With respect to voiced stops, all are prevoiced: the VOT of labial and alveolar stops varies from -55 ms to -60 ms and the VOT of velar stops is within the range of -25 ms to -30 ms (Kang et al., 2016). Accordingly, for voiceless stops in Tagalog, the effect of place of articulation follows the general trend of velar stop having longer VOTs than alveolar and bilabial stops. For voiced stops the pattern is reversed, with alveolars and bilabials having longer VOTs than velars, which is a common phenomenon in true voicing languages (Docherty, 1992; Smith, 1978; Zlatin, 1974).

5.1.2.2 Voicing system in Kapampangan

Kapampangan is one of the eight major languages in the Philippines. It is mostly spoken in the province of Pampanga. It has 15 consonants, seven of which are stops. Voiceless stops include: /p/, /t/, /k/, and /ʔ/; voiced stops are /b/, /d/, and /g/ (Forman, 1971). Jovel (2016) measured VOTs in Kapampangan and found that voiceless stops are not aspirated and have short-lag VOTs, while voiced stops all have rather long prevoicing, suggesting that Kapampangan is a voicing language with a long-lead and short-lag contrast. This report also shows that voiceless velars in Kapampangan have longer mean VOT values than voiceless bilabials and alveolars, which is consistent with the general order of place of articulation (Docherty, 1992). The fact that Kapampangan is closely related to Tagalog, and is a voicing language like Tagalog, supports the use of data collected from Kapampangan speakers alongside data collected from Tagalog speakers.

Table 5.2 Mean VOT in Kapampangan (Jovel, 2016)

Consonants	Duration (ms)
/b/	-84
/d/	-79
/g/	-96
/p/	12
/t/	13
/k/	52

5.1.2.3 Voicing system in Ilocano

Another L1 in our sample is Ilocano, another related language of Tagalog. It is the third most spoken language in the Philippines. The consonant inventory of Ilocano includes 15 consonants and, like the other Filipino languages looked at so far, it has seven stops. It has two labial consonants /b/ and /p/, two dental/alveolars consonants /t/ and /d/, and two velar consonants /k/ and /g/. As with Tagalog, Ilocano also has glottal stop /ʔ/. There is a two-way contrast among stops, voiced vs. voiceless (Yamamoto, 2017), which indicates that Ilocano is a two-category language with respect to the voicing system. The voiceless stops are unaspirated in all positions (Constantino, 1971). While the existing literature does not describe whether the voiced stops in Ilocano are prevoiced, the fact that the other two related languages (Tagalog and Kapampangan) have long prevoicing VOTs suggesting that Ilocano pattern may similarly have a lead and short-lag voicing system.

5.1.2.4 Voicing system in Philippine English

Recall from the Section 2.1, the first-generation FWs all have learned Philippines English before they immigrated to Canada. Although Philippine English originates from American English, it has adapted to the local linguistic and social settings and established its own distinct linguistic features (Llamzon, 1966; Tayao, 2004). Lesho (2018) offered a description of the voicing system of Philippine English, an acrolect spoken in Metro Manila, a region where Tagalog is mainly

spoken. As with other varieties of English, it also has three voiced stops (/b/, /d/, /g/) and three voiceless stops (/p/, /t/, /k/) (Lesho, 2018). Voiced stops, unlike most other varieties of English, are prevoiced with a mean VOT over -60 ms (Lesho, 2018). For voiceless stops, previous studies have different findings. Tayao's (2008) study rarely observed aspirated stops, while the more recent study by Lesho (2018) shows that speakers tend to produce more occurrences of aspirated tokens. Table 5.3 shows the mean VOTs of the word-initial stops from the four speakers documented in Lesho (2018).

Table 5.3 Mean VOT in Philippine English from the four speakers in Lesho (2018)

Consonants	**Duration (ms)**
/b/	-86
/d/	-87
/g/	-78
/p/	41
/t/	51
/k/	73

5.1.2.5 Mixed tokens[32]

Both Abella et al. (2015) and Kang et al. (2016) reported a particular voicing pattern, where some voiced stop tokens have both voiced and voiceless closure, displaying coexisting prevoicing and burst, as shown in Figures 5.1 and 5.2. Two patterns of this case were found: Figure 5.1 shows a short-lag following right after prevoicing; Figure 5.2 exhibits prevoicing of stops to silence before the burst. Previous literature has classified the first type as *partially voiced,* stating that the VOT should be calculated from the beginning of voicing to burst onset (Abramson & Whalen, 2017). For the second voicing type, it has been variously called *prevoicing ceased* (MacKay et al., 2001), *hump* (Davidson, 2016) and *partially prevoiced* (Abramson & Whalen, 2017).

[32] The term used here follows previous studies. I am aware that the mixed tokens we found here might be aspirated stops. Further fine-grained acoustic research and analyses beyond the scope of this study are needed to investigate the particularities of these tokens.

Figure 5.1 Spectrogram of the word *go* by FW Gen.1 speaker 201muft55fpl

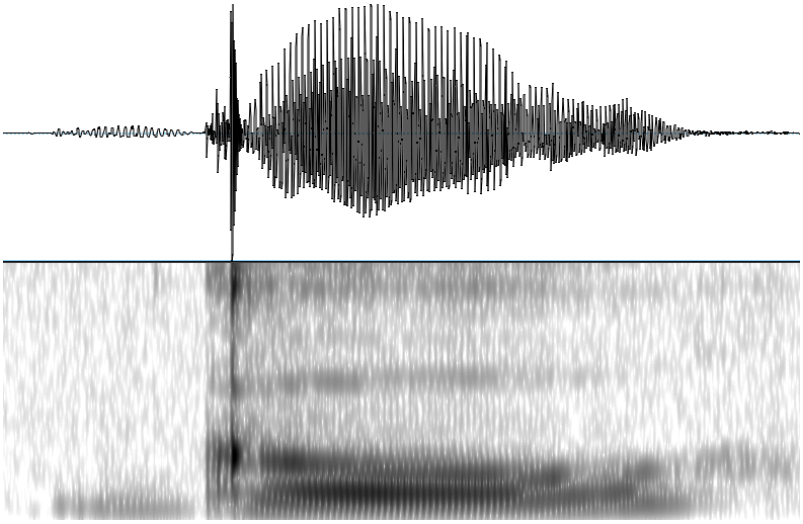
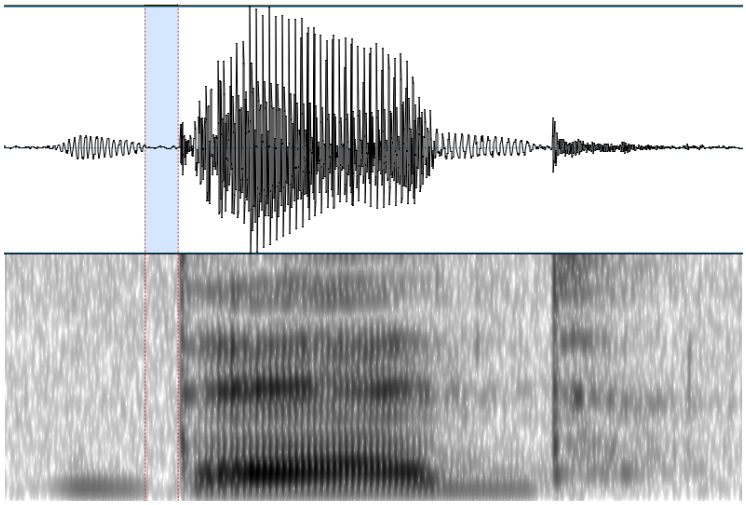


Figure 5.2 Spectrogram of the word *dirt* with a gap between prevoicing and burst by FW Gen.1 speaker 201muft55fpl.



Both of these patterns have been confirmed in Abella et al.'s (2015) and Kang et al.'s (2016) studies from their experiments on the speech of Tagalog native and heritage speakers, classified as *prevoiced-mixed* and *prevoiced-partial* respectively. They were found in a small number of native Tagalog speakers, but there was a greater proportion of partially voiced stops produced by heritage speakers (Kang et al., 2016). It was considered to be a third voicing type *mixed tokens* in Abella et al. (2015). Kang et al. (2016) did not single out the results for these

two types, and simply categorized these cases as voiced stops. However, a different method of measurement was applied,[33] instead of the traditional calculation that subtracts the time of voice onset from the burst onset.

In this study, the two distinct voicing patterns do not exclusively appear in Filipino English speakers, as similar tokens have also been observed in TWs. Moreover, scholars (Abramson & Whalen, 2017; Docherty, 1992) have found this type of pre-voicing in English and have not separated them from voiced stops. Therefore, these tokens are categorized as voiced stops in this study and the traditional measurement procedure is applied in the analyses.

5.1.3 VOT and linguistic factors

Foundational work by Lisker and Abramson (1964) established the function of VOT of initial stops as separating phonemic categories in many languages. They also proposed the widely recognized spectrographic method of measuring VOT: "the time interval between the burst that marks release and the onset of periodicity that reflects laryngeal vibration" (Lisker & Abramson, 1964:422). Since then, the literature on VOT has been prolific. It has been shown that VOT can be conditioned by both linguistic and social factors. Relevant linguistic factors conditioning VOT values include stress (Llewellyn, 1994), following vowels (Morris et al., 2008; Whiteside et al., 2004), place of articulation (Cho & Ladefoged, 1999; Lisker & Abramson, 1964), and speech rate (Docherty, 2007; Kessinger & Blumstein, 1998). Social factors include gender (Li, 2013; Morris et al., 2008; Oh, 2011), age and race (Ryalls et al., 1997; Ryalls et al., 2004), and the individual (Chodroff & Wilson, 2017).

VOT is also reported to be affected by place of articulation. The general finding is that VOT increases as place of articulation moves from anterior to posterior, so that velars have

[33] The VOT of mixed tokens was calculated by adding up the negative value of prevoicing duration and positive value of voicing lag (Kang et al., 2016:196)

longer VOT values than alveolars and bilabials (Fischer-Jørgensen, 1954). This phonological pattern has been reinforced by many studies for both aspirated and unaspirated voiceless stops which respectively have long-lag and short-lag VOT values (Cho & Ladefoged, 1999; Mielke & Nielsen, 2018; Morris et al., 2008; Nearey & Rochet, 1994). However, for stops with lead VOTs, the effect of place of articulation is the opposite: velars have shorter VOT duration, thus less prevoicing, than alveolars and bilabial (Docherty, 1992; Smith, 1978; Zlatin, 1974). The effects of place of articulation are also present in the Filipino heritage languages. As presented in Section 5.1.2, both Tagalog and Kapampangan follow the pattern that velars have longer VOTs than bilabials and alveolars in the voiceless stop series. In the voiced stop series, Tagalog has the reversed pattern, showing that velars have the shortest lead values compared to bilabials and alveolars (Kang et al., 2016). The same pattern is also demonstrated in Philippine English above (Table 5.3). The following sections examine and report whether the linguistic conditioning of place of articulation is consistent among FWs and TWs.

5.1.4 VOT and social factors

Not only is VOT conditioned by linguistic factors, its variability also correlates with social factors such as ethnicity, gender, and age. Despite many studies on VOT over the past 50 years (Abramson & Whalen, 2017), relatively few have focused on the role of ethnicity in the production of VOT. Two such studies are Ryalls et al. (1997) and Ryalls et al. (2004). Ryalls et al. (1997) first investigated differences in English VOT production regarding gender and race based on the data collected from 10 African-Americans and 10 Caucasian-Americans evenly divided between genders. The results of this study showed that African-Americans produced voiced stops with significantly longer VOT values than Caucasian-Americans. However, such effects were not found for voiceless stops, nor was there an interaction between race and gender.

Ryalls et al. (2004) replicated the experiment to examine the effects of gender and ethnic background in a group of older speakers. The results from this study show the opposite pattern. For voiceless stops, Caucasian speakers have longer positive VOT values than African-Americans, while for voiced stops, longer negative VOT values of Caucasian speakers were found in /b/ and /d/ tokens, but not /g/ tokens. Although the specifics of these two studies are not consistent with each other, both reveal VOT differences based on ethnic background.

This chapter investigates the interaction of ethnicity and gender, as gender can also condition VOT values. In English, studies have consistently found that women produce longer VOTs for voiceless stops than men (Morris et al., 2008; Ryalls et al., 2004; Whiteside & Irving, 1998). However, studies disagree on whether or not women display longer VOTs than men for voiced stops. Ryalls et al. (2004) and Whiteside and Irving (1997) found that women display a longer voiced VOT than men. However, in Whiteside and Irving (1998), opposing results were reported, likely due to differences in study design (Morris et al., 2008; Oh, 2011). By controlling speech rate and the phonetic environments, Morris et al. (2008) did not find significant differences between men and women. In addition, studies have found contrasting gender-differentiated VOT patterns in different languages, which leads researchers to argue that gender-related differences are actually generated by social factors rather than by anatomical and physiological differences (Li, 2013; Swartz, 1992; Whiteside & Irving, 1998). Li (2013) found that in Mandarin Chinese, gender only plays a significant role for voiced VOTs when speech rate was controlled, which is not in line with the major pattern of gender-related differences in English. This result of language-based differences prompted Li (2013:146) to conclude: "Language/cultural factors (i.e., sociolinguistic, stylistic effects) rather than biological/anatomical factors may be the cause of why women and men produce stops

differently." In this case, including gender as an independent factor could provide deeper understandings of potential similarities and dissimilarities between FWs and TWs in terms of VOT production.

To my knowledge, Abella et al. (2015) is the first study to document VOT in heritage Tagalog speakers. In this study, not only did they document VOT values of voiced and voiceless stops in Tagalog, but they also compared voicing systems between native Tagalog and heritage Tagalog speakers. The data used in this study was collected from a randomized wordlist including 36 disyllabic Tagalog words recorded from 10 native speakers and 10 heritage speakers currently living in Canada. Acoustic analysis found that native Tagalog speakers produce long-lead VOTs for voiced stops and short-lag VOTs for voiceless stops. Surprisingly, and contrary to their hypothesis that heritage speakers of Tagalog would produce a voicing system closer to English, they found that heritage speakers produce long lead-VOTs in voiced stops in heritage Tagalog. The same heritage speakers also produced short-lag VOTs for voiceless stops closer to their Tagalog, showing no interference from English.

Kang et al. (2016) recruited four groups of participants: English-control, English-heritage, Tagalog-control, and Tagalog-heritage, to probe cross-language influence in English and Tagalog bilingual speakers in Toronto. English-heritage and Tagalog-heritage speakers produced English and Tagalog native-like voiceless stops, respectively, in both word-initial and word-medial contexts and produced the same stress effects as their monolingual counterparts. However, for voiced stops, heritage speakers of English showed more prevoiced stops than the English-control group (i.e., they were more Tagalog-like), but the stress effects on voiced stops mirrored the English norm.

The cross-language transfer from Tagalog to heritage Tagalog found in Abella et al. (2015) and Kang et al. (2016), along with the different voicing systems between Tagalog and English, prompt a hypothesis where the first-generation FWs, who are English L2 speakers, produce more Tagalog-like VOT values, while the second-generation Filipinos, who are English L1 speakers, produce more English-like VOTs.

5.2 Methodology

This section presents the methods for VOT collection (§5.2.1) and measurement (§5.2.2).

5.2.1 Materials

From the original wordlist (see Chapter 2), 82 words beginning with the stops /b/, /d/, /g/, /p/, /t/, and /k/ were chosen. The total number of words collected for each consonant is shown in Table 5.4. Stops were all in onset position of stressed syllables. Since the source data (wordlist) was not specifically designed for VOT research, the distribution of each stop is uneven. Note, too, that an unequal number of items was extracted from every speaker. This is because some tokens had to be discarded due to recordings being interrupted by noise, syllables being too short to label the events, or mispronunciations.

Table 5.4 Number of tokens for each stop

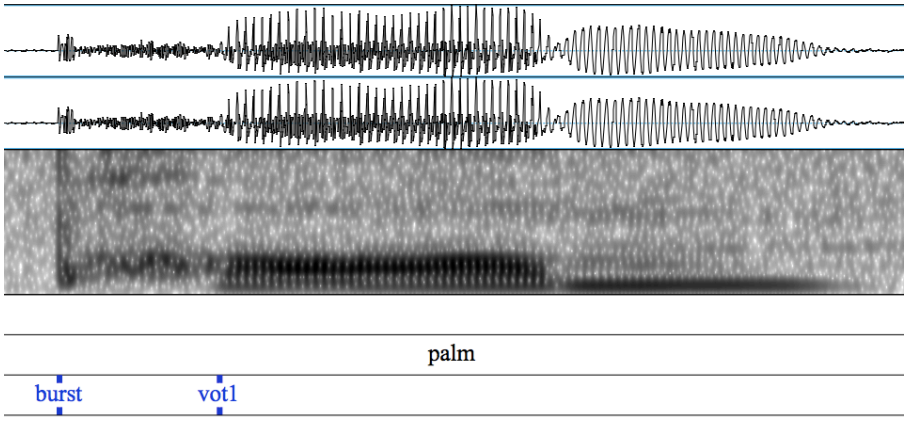
Stops	Words	Tokens
/b/	14	572
/d/	12	492
/g/	5	198
/p/	7	285
/t/	23	944
/k/	21	859

5.2.2 Measurements

The entire process of segmentation and annotation was undertaken in Praat (Boersma & Weenik, 2017). Speech events such as burst and voice onset were manually annotated by displaying both

the waveform and spectrogram with the assistance of a Praat script,[34] as shown in Figure 5.3, and then automatically extracted using another Praat script. Following the widely recognized definition proposed by Lisker and Abramson (1964:422): "VOT is [the] time interval between the burst that marks release and the onset of periodicity that reflects laryngeal vibration," the burst onset of VOT was defined as the first peak of an individual spike from a cluster of spikes that compose the transient noise energy of constriction release, as illustrated in Figure 5.4. The voice onset was recognizable in the first voicing cycle that deviates from the zero crossing in the waveform (Netelenbos et al., 2014), which can be seen in Figure 5.5.

Figure 5.3 Illustration of the event labels in the word *palm* by speaker 204mufe91fnl.



[34] Written and provided by Dr. Fangfang Li, University of Lethbridge.

Figure 5.4 Illustration of burst onset in the word *palm* by speaker 204mufe91fnl.

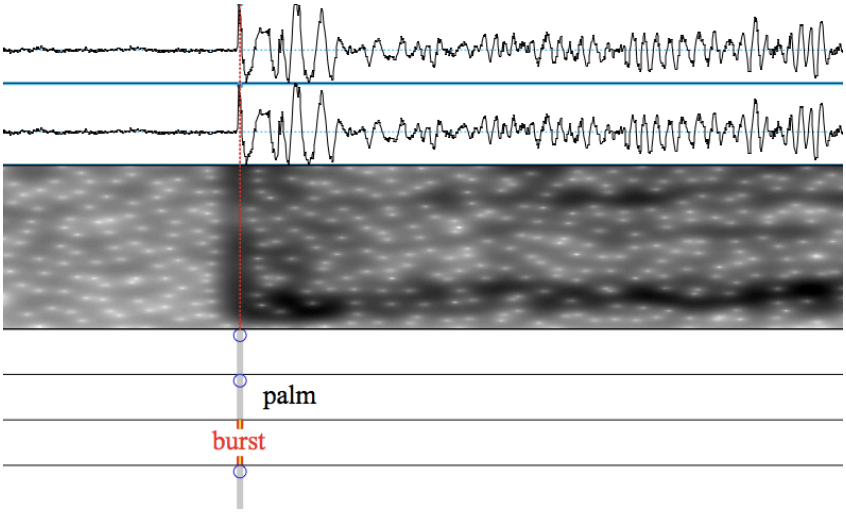
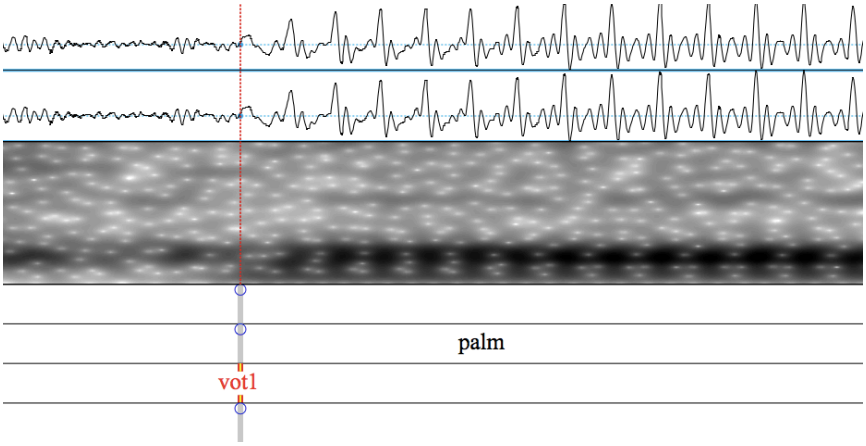


Figure 5.5 Illustration of voice onset in the word *palm* by speaker 204mufe91fnl.



VOT measurements were taken by subtracting the time of voice onset from the burst onset if: 1) voicing began after the release (Figure 5.6); 2) prevoicing started before the burst release and did not decline through the burst into the following vowel(s) (Figure 5.7); 3) the closure had both prevoicing and a burst without any silence gap in between (Figure 5.8); 4) voicing started with a period of prevoicing and declines to silence (Figure 5.9).

Figure 5.6 Illustration of positive VOT in the word *coin* produced by speaker 404mueempl

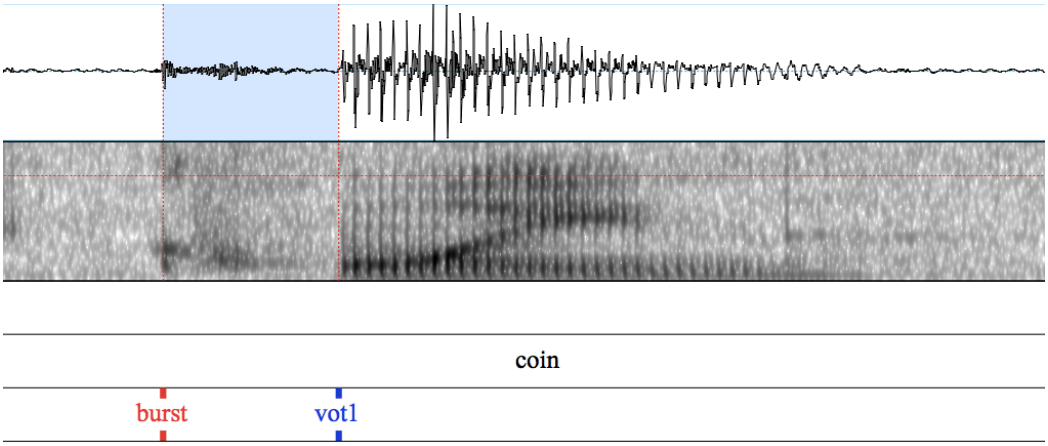


Figure 5.7 Illustration of prevoicing occurring before burst release in the word *bold* by speaker 409muee76fpl

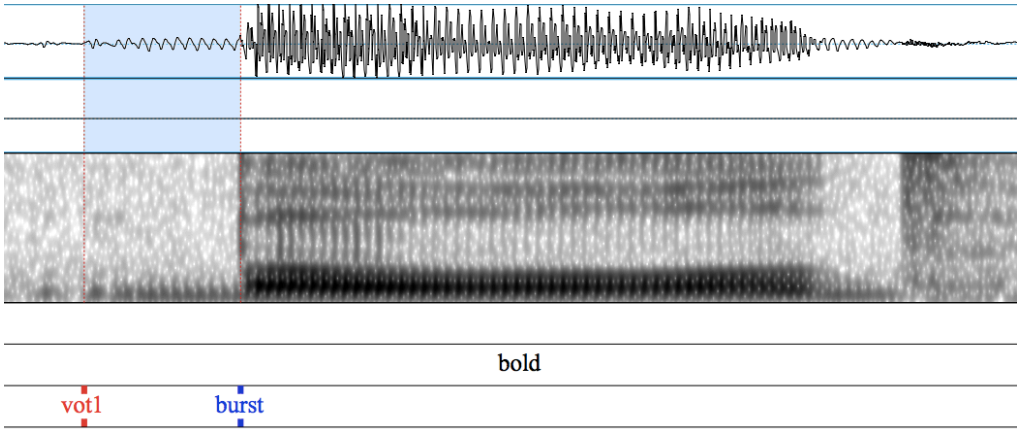


Figure 5.8 Illustration of partially voiced VOT in the word *goose* by speaker 201muft55fpl

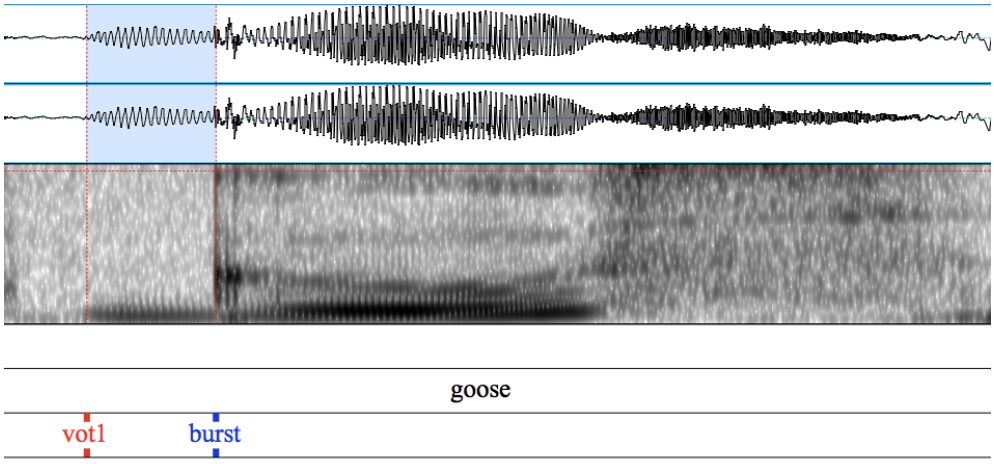
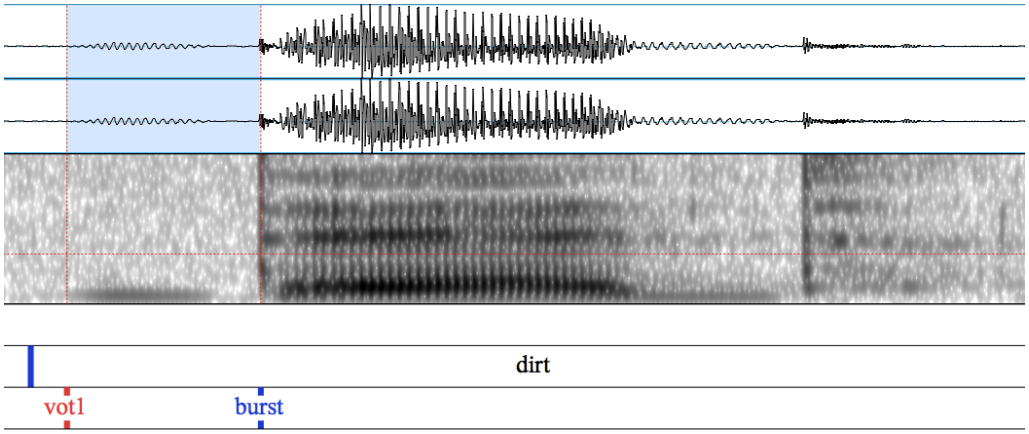


Figure 5.9 Illustration of co-occurrence of prevoicing and aspiration in the word *dirt* by speaker 201muft55fpl



The figures above illustrate how negative and positive VOTs were extracted in Praat. This process was carried out in a consistent fashion throughout the study. The voiceless stops /p, t, k/ all have positive VOTs. The voiced stops /b, d, g/ have more prevoicing and in some cases are produced with positive VOTs.

5.2.3 Statistical analysis

Descriptive statistics include VOT mean values, standard errors, and its overall distribution across social groups. Inferential statistics are employed to test the significance of each social factor and their interactions. Voiced stops and voiceless stops are examined separately. Six separate mixed-effects linear regression models are constructed in R (R Core Team, 2013) using the lmer function of the lme4 package (Bates et al., 2015). Fixed effects that are tested include *place of articulation* (alveolar, bilabial, velar), *generation* (FW: Gen.1 and Gen.2; TW: younger, middle-aged, older), *gender* (men, women), *ethnicity* (FW_Gen.1, FW_Gen.2, TW), and the interactions of these predictors. Random effects are *speaker* and *word*.

5.3 Results

As mentioned in Section 5.1, VOT has been shown to be not only a phonetic cue separating L2 learners from L1 speakers, but also an indicator of differentiation between ethnolects. Depending on which voicing systems are found in the L1 or L2, the duration of stops in the second language as produced by L2 learners might show influence from the L1. For this study in particular, the first-generation participants, whose L1 is Tagalog (or Kapampangan or Ilocano), could produce either Tagalog-like or English-like VOTs,[35] and possible substrate language transfer from Tagalog to English is expected. In Sections 5.3.1 and 5.3.2, I first present the within-community VOT results, and then in Section 5.3.3, I discuss the between-community (FWs vs. TWs) results with respect to VOT production.[36]

5.3.1 Voice onset time (VOT) in Filipino Winnipeggers (FWs)

This section presents the production of VOT among FWs and the social differences of VOTs among gendered and generational subgroups. The results for the voiced stops are presented first, followed by the results for the voiceless stops.

Voiced stops

Table 5.5 and Figure 5.10 summarize the mean VOT duration for FW speakers stratified by generation and gender. Figure 5.10 shows clear differences between the two generations in their VOT production for voiced stops. Across the board, first-generation participants seem to have

[35] Three languages, Tagalog, Kapampangan, and Ilocano, are the first languages for the Filipino English speakers in this study. The term *Tagalog-like* is used to cover all three languages, to maintain concision and consistency. Tagalog is the main language spoken by Filipinos in Winnipeg, and in the data, the L1 of most of the first-generation FW speakers is Tagalog. In addition, a mixed-effects linear regression model was conducted with *first language* as a fixed effect and *speaker* and *word* as random effects. First language is not a statistically significant factor affecting the production of VOT ($p = 0.54$). In this study, *Tagalog* is used to represent all languages spoken by the Filipino English L2 speakers.

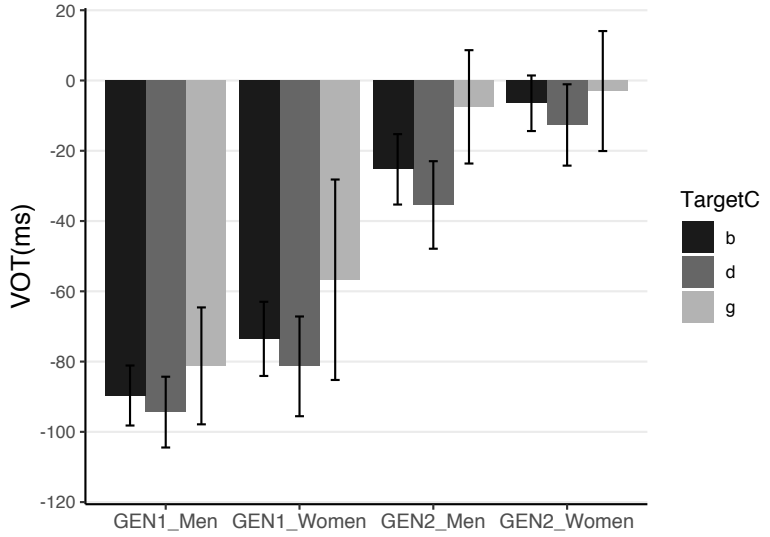
[36] The order of the results section is flipped compared to Chapters 3 and 4, because this chapter mainly explores the language transfer effect in FWs. It is expected that first- and second-generation speakers would show different production of VOTs. Findings in this chapter focus on VOTs by FWs.

transferred the long-lead VOT values of their first language(s) (Tagalog/Kapampangan/Ilocano) into their English. On the other hand, the VOTs produced by the Gen.2 group are much shorter. There is also a decreasing gradient of VOT values starting from Gen.1 men to Gen.2 women: both Gen.1 groups have substantially longer VOT duration than both Gen.2 groups. Within each generational group, men produce longer prevoicing than women. These gendered and generational patterns are consistent for all three voiced stops /b/, /d/, and /g/.

Table 5.5 Mean VOT of voiced stops among FWs split by gender and generation

	Gen.1_Men	Gen.1_Women	Gen.2_Men	Gen.2_Women
/b/	-90	-74	-25	-7
/d/	-94	-81	-35	-13
/g/	-81	-57	-8	-3

Figure 5.10 VOT of voiced stops produced by FWs separated by gender and generation.



Statistical analyses were carried out using a stepwise procedure in linear mixed-effects regression models. The independent predictors that are tested include *place of articulation* (alveolar, bilabial, velar), *generation* and *gender*. Random effects are *speaker* and *word*. For voiced stops, the best-fit mixed-effects model contains two fixed effects: *place of articulation* and *generation*. Other models that contain interactions of predictors do not fit the data significantly better.

Model <- lmer(VOT~PofA+Generation+(1|Speaker)+(1|Word),data=FWvoicedstops)

Table 5.6 Output of the best-fit model for voiced stops among FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	-87.45	10.78	-8.12	6.44e-09***
PofABilabial	6.98	4.85	1.44	0.16
PofAVelar	19.22	6.56	2.93	0.0067**
GenerationFW_Gen.2	65.69	12.70	5.17	2.70e-05***

The statistical analysis reveals that VOT duration correlates strongly and significantly with *generation* in the three voiced contexts ($t = 5.17$, $p < .0001$). There is no significant interaction between generation and place of articulation, indicating that the difference between Gen.1 and Gen.2 is significant through all the three voiced contexts, which is expected given that the Gen.1 participants are all English L2 speakers. With respect to the effect of gender on VOT, even though men have longer mean negative VOT duration than women, these differences were not found to be significant. Likewise, there are no significant two-way interactions between gender and generation. The significant effect of *place of articulation* suggests that velars in the FW dataset have longer durations than alveolars and bilabials.

Voiceless stops

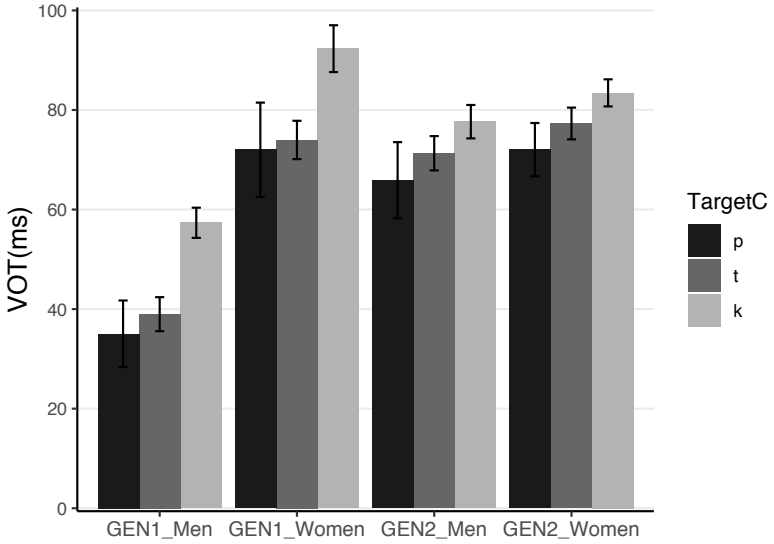
The VOT duration for the three voiceless stops (/p/, /t/, /k/) separated by generation and gender is shown in Table 5.7 and Figure 5.11. Women are more likely to produce longer positive VOTs than men in both generations. However, the expected generational difference that Gen.1 participants use shorter positive VOT duration than Gen.2s is only found in the men. Gen.1 men have the shortest VOT values; in particular, the mean VOT duration of alveolar and bilabial tokens is close to the short-lag range (0 – 30ms) for voiceless stops. The mean VOT values of Gen.1 women are at a similar level to the VOTs of Gen.2 women and surpass the mean values of Gen.2 men. This pattern holds true across different places of articulation. What is more,

voiceless velars on average have the longest VOT duration, followed by alveolars and labials for all four groups, in line with previous literature showing that posterior places of articulation produce longer VOTs in English (Lisker & Abramson, 1964). What also stands out from Table 5.7 is that the mean VOT of /k/ tokens produced by Gen.1 women is the highest compared to the other three groups.

Table 5.7 Mean VOT of voiceless stops among FWs split by gender and generation

	Gen.1_Men	Gen.1_Women	Gen.2_Men	Gen.2_Women
/p/	35	72	66	72
/t/	39	74	71	77
/k/	57	92	78	83

Figure5.11 VOT of voiceless stops produced by FWs separated by gender and generation



Statistical analyses on the VOT of voiceless stops were conducted. The best-fit mixed-effects linear regression model returned by a stepwise procedure includes two two-way interactions.

Model <- lmer(VOT ~ Gender*Generation+PofA*Generation+
(1|Speaker)+(1|Word), data=FWvoicelessstops)

Table 5.8 Output of the best-fit model for voiceless stops among FWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	38.94	6.45	6.04	2.84e-06***
PofABilabial	-3.04	3.51	-0.87	0.39
PofAVelar	18.17	2.45	7.42	3.72e-1 1***
GenderWomen	35.18	8.42	4.18	0.00039***
GenerationFW_Gen.2	31.71	7.62	4.16	0.00038***
PofABilabial:GenerationFW_Gen.2	-2.46	3.0	-0.82	0.41
PofAVelar:GenerationFW_Gen.2	-11.86	2.09	-5.68	1.66e-08***
GenderWomen:GenerationFW_Gen.2	-28.59	10.4	-2.75	0.012*

The output of the best-fit linear regression model on the dataset of voiceless stops shows that *place of articulation*, *generation* and *gender* all have significant effects on VOT in the FW dataset. Voiceless velar /k/ has a significantly longer positive VOT than voiceless alveolar /t/ and bilabial /p/, and this difference has a greater extent in the dataset of FW Gen.1s, as indicated by the significant interaction of place of articulation and generation. The largest of the significant effects observed in the model is for *gender*, with FW women in both generational groups producing longer positive VOTs. This result is the opposite to that of voiced stops, where men show longer negative VOTs than women. The statistical output also contains a significant interaction of generation and gender (t = -2.75, p = .011), meaning that there is a significant discrepancy between men and women, and it is greater in the Gen.1 groups than the Gen.2 groups, which is supported by the observations in Figure 5.11.

Summary

For the VOTs of voiced stops (/b/, /d/, /g/), generation has the largest effect size. First-generation FWs produce negative VOTs for voiced stops, being more similar to the reported VOTs in their heritage languages, such as Tagalog and Kapampangan. On the other hand, second-generation FWs produce significantly shorter mean VOTs than first-generation FWs, by at least 60 ms. FW

men in each generation also have longer VOTs than women, but these differences are not statistically significant. However, for VOTs of voiceless stops (/p/, /t/, /k/), gender has the most sizable effect, with significantly shorter values for FW men than for FW women. The differences between men and women are more pronounced in the first generation, where first-generation men produce the shortest VOT duration for all three stops, while first-generation women have long-lag values comparable to second-generation women.

5.3.2 Voice onset time (VOT) in Traditional Winnipeggers (TWs)

This section examines how social factors such as age and gender correlate with VOT in the TW community. VOT variation of voiced stops is presented first, followed by examinations of VOT in voiceless stops. A summary is given at the end.

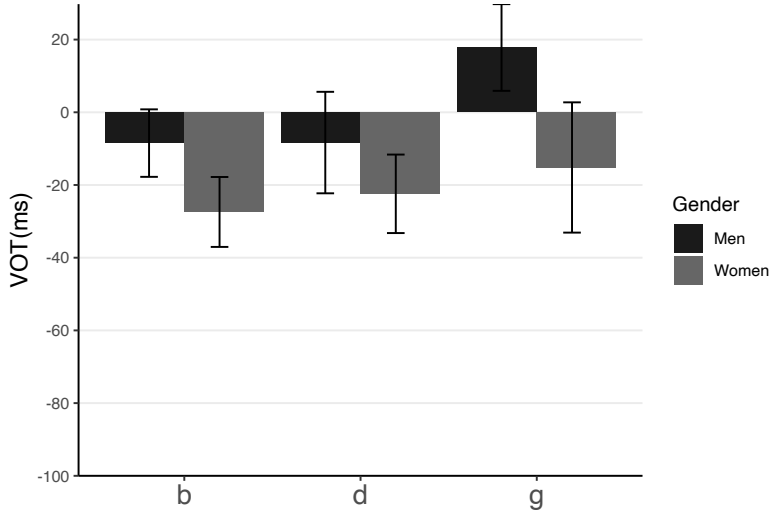
Voiced stops

The durational distributions and average durations of VOT for each voiced stop are presented in Figure 5.12 and Table 5.9, which show that there is more prevoicing among women than men across the three stops. This pattern is particularly notable for the younger and middle-aged groups. However, the opposite is true in the older groups, with older men on average prevoicing more than older women.

Table 5.9 Mean VOT of voiced stops among TWs split by gender and age category

	Younger		Middle-Aged		Older	
	M	W	M	W	M	W
/b/	4	-28	1	-33	-23	-11
/d/	10	-21	-3	-47	-24	15
/g/	26	-17	27	-27	6	24

Figure 5.12 VOT of voiced stops produced by TWs separated by gender



To test the significance of place of articulation, gender, age group, mixed-effects linear regression models were conducted. The best-fit model achieved through a stepwise procedure contains only one independent variable that significantly affects the production of VOT. As listed in Table 5.10, velars have significantly longer positive VOTs than alveolars. Neither age category nor gender are shown to be significant predictors in the VOT production of voiced stops.

TWvoicedmodel = lmer(VOT ~ PofA+(1|Speaker)+(1|Word), data=TWvoicedstops)

Table 5.10 Output of the best-fit model for voiced stops among TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	-16.65	11.01	-1.51	0.15
PofABilabial	-2.98	4.4	-0.68	0.5
PofAVelar	16.74	6.14	2.72	0.009**

Voiceless stops

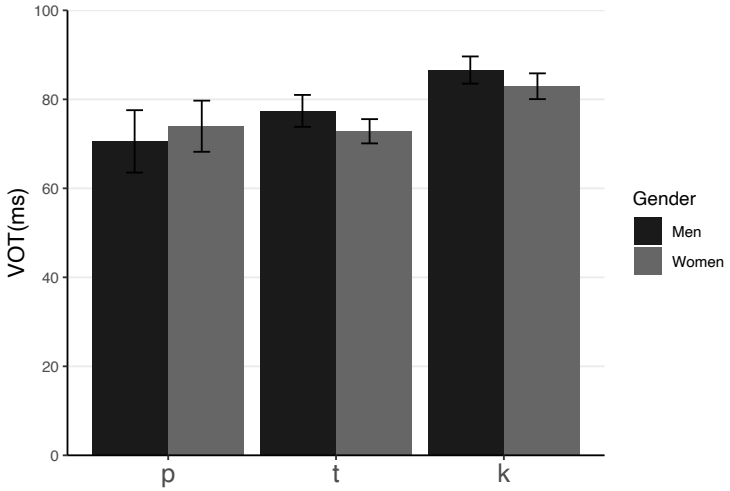
The descriptive statistics in Table 5.11 shows that all groups produce long-lag VOTs with no noticeable patterns emergingwith respect to age and gender. All the means of the three stops are in the range of 56 ~ 97 ms. Regarding place of articulation, the results are consistent with the

general effect in that the velar /g/ across each group has the longest VOT, compared to alveolar /t/ and bilabial /p/.

Table 5.11 Mean VOT of voiceless stops among TWs split by gender and age category

	Younger		Middle-Aged		Older	
	M	W	M	W	M	W
/p/	73	71	81	96	62	56
/t/	89	69	81	89	68	69
/k/	90	79	86	97	85	87

Figure 5.13 VOT of voiceless stops produced by TWs separated by gender



Statistical analyses were carried out using a stepwise procedure in linear mixed-effects regression models. The independent predictors tested include *place of articulation* (alveolar, bilabial, velar), *age category* and *gender*. Random effects are *speaker* and *word*. For voiceless stops, the best-fit mixed-effects model contains three two-way interactions that improve the model fit significantly.

```
TWvoicelessmodel=lmer(VOT~PofA*Agecategory+PofA*Gender+
Agecategory*Gender+(1|Speaker)+(1|Word), data=TWvoicelessstops)
```

Table 5.12 Output of the best-fit model for voiceless stops among TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	82.04	5.82	14.1	1.23e-09***
PofABilabial	-1.6	4.98	-0.32	0.75
PofAVelar	3.81	3.49	1.09	0.28
AgecategoryOlder	-13.02	7.33	-1.78	0.1
AgecategoryYounger	4.87	7.94	0.61	0.55
GenderWomen	5.67	7.99	0.71	0.49
PofABilabial:GenderWomen	9.68	4.43	2.19	0.029*
PofAVelar:GenderWomen	5.61	3.09	1.8	0.07
PofABilabial:AgecategoryOlder	-8.63	5.65	-1.53	0.13
PofAVelar:AgecategoryOlder	11.91	3.94	3.02	0.0026**
PofABilabial:AgecategoryYounger	-8.4	4.96	-1.69	0.09
PofAVelar:AgecategoryYounger	-0.69	3.44	-0.2	0.84
AgecategoryOlder:GenderWomen	-9.09	11.8	-0.77	0.46
AgecategoryYounger:GenderWomen	-22.98	10.03	-2.29	0.042*

The linguistic factor place of articulation and the social factors of age category and gender do not show significant effects on the production of VOT on their own. The significant interaction of *place of articulation* and *gender* suggests that differences between men and women are more pronounced in the VOTs of bilabials as compared to the VOTs of alveolars. There are durational differences between velars and alveolars, and these differences are more significant in the dataset of VOTs produced by older speakers than those of middle-aged speakers. There is also a significant interaction between *age category* and *gender*, indicating that the VOTs of voiceless stops in all three positions produced by younger women are significantly lower than their counterparts in middle-aged women.

Summary

This section has shown that TWs in this dataset use long-lag VOTs for voiceless stops and some short negative VOTs for voiced stops. The velar /g/ has significantly fewer prevoiced tokens than the bilabial and alveolar stops, and there are no significant generation- or gender-based VOT

differences among the three voiced stops. Older speakers have significantly higher long-lag VOTs for /k/ than younger and middle-aged speakers.

5.3.3 Between-community comparisons

This section presents the effects of ethnicity on VOT by comparing the VOTs produced by FWs and TWs. FWs are split into two groups according to generation, as generation is the main factor constraining VOTs in the Filipino groups. I first present the VOT differences of voiced stops by comparing first-generation FWs, second-generation FWs, and TWs. I will then explore the VOT of voiceless stops between the three groups. Predictors that are investigated include: *ethnicity* (FW_Gen.1, FW_Gen.2, TW), *gender* and *place of articulation*.

Voiced stops

Table 5.13 presents the descriptive statistics of VOT for the voiced stops. The voiced stop results illustrate that the VOTs produced by FW Gen.2 speakers are more in line with those of TWs, while the VOTs produced by FW Gen.1s differ greatly from the other two groups, with much higher negative VOT values. The proportion of prevoiced stops produced by FW Gen.2s (159/527, 30.2%) and TWs (139/456, 30.5%) is almost identical. For FW Gen.1s, however, most of their word-initial voiced stops show prevoicing (247/278, 88.8%).

There are differences between men and women across the three groups as well. The women in both of the two FW groups have shorter lead VOTs than men, while it is the opposite for TWs, in that women have longer lead VOTs than men.

Table 5.13 Mean VOT of voiced stops among FWs and TWs

	FW_Gen.1		FW_Gen.2		TW	
	M	W	M	W	M	W
/b/	-90	-74	-21	-7	-9	-20
/d/	-94	-81	-30	-13	-8	-14
/g/	-81	-57	-5	-1	18	-7

As shown in Table 5.14, the best-fit linear regression model arrived at through a stepwise procedure yields *place of articulation* and *ethnicity* as significant effects. Gender and the interactions of gender, place of articulation and ethnicity were discarded as they did not improve the model fit. As summarized in Table 5.14 below, comparisons of voiced velars and alveolars are highly significant ($p < .001$). FW Gen.1 speakers employ considerably longer prevoicing than TW speakers, while comparisons of TWs and FW Gen.2 are not significant in terms of VOT.

Model = lmer(VOT ~ PofA+Ethnicity+(1|Speaker)+(1|Word), data= voicedstops)

Table 5.14 Output of the best-fit model for voiced stops among FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	-14.39	8.96	-1.61	0.12
PofABilabial	2.66	3.45	0.77	0.44
PofAVelar	17.76	4.74	3.75	0.00046***
EthnicityFW_Gen.1	-70.85	14.51	-4.88	1.78e-05***
EthnicityFW_Gen.2	-5.17	12.13	-0.43	0.67

Voiceless stops

Table 5.15 shows that the six groups examined here show similar distributions of /p, t, k/. Duration is constrained by place of articulation, with /k/-initial syllables having the longest lag followed by /p/ and /t/. As seen in the results presented in Section 5.3.1, Gen.1 men use much shorter lag for /p/, /t/, and /k/, while Gen.1 women favor relatively longer lag much like those of FW Gen.2s and TWs, who all show long-lag VOTs.

Table 5.15 Mean VOT of voiceless stops among FWs and TWs

	FW_Gen.1		FW_Gen.2		TW	
	M	W	M	W	M	W
/p/	**35**	72	65	73	71	73
/t/	**39**	74	71	77	77	74
/k/	**57**	**92**	77	83	87	83

Linear regression mixed-effects models were fit to the dataset of VOT values for voiceless stop consonants (/p/, /t/, /k/). The best-fit model returned through a stepwise procedure

contains two two-way interactions of *place of articulation*, *gender* and *ethnicity* as fixed effects. Random effects are *speaker* and *word*.

```
Model=lmer(VOT~PofA*Ethnicity+Gender*Ethnicity+(1|Speaker)+(1|Word),
data=voicelessstops)
```

Table 5.16 Output of the best-fit model for voiceless stops among FWs and TWs

	Estimate	Std.Error	t value	Pr(>|t|)
Intercept	76.93	4.58	16.79	< 2e-16***
PofABilabial	-3.55	2.68	-1.33	0.19
PofAVelar	9.57	1.87	5.12	8.51e-07***
GenderWomen	-2.98	5.92	-0.5	0.62
EthnicityFW_Gen.1	-37.78	7.45	-5.07	1.08e-05***
EthnicityFW_Gen.2	-6.06	6.0	-1.01	0.32
PofABilabial:EthnicityFW_Gen.1	0.2	3.34	0.06	0.95
PofAVelar:EthnicityFW_Gen.1	8.62	2.33	3.7	0.00022***
PofABilabial:EthnicityFW_Gen.2	-2.23	2.86	-0.78	0.44
PofAVelar:EthnicityFW_Gen.2	-3.26	2.0	-1.63	0.1
GenderWomen:EthnicityFW_Gen.1	38.16	9.84	3.88	0.00043***
GenderWomen:EthnicityFW_Gen.2	9.56	8.21	1.16	0.25

As shown in Table 5.26, *place of articulation* emerged as a significant predictor of VOT, with velars having the longest-lag VOTs over alveolars and bilabials. *Place of articulation* also interacts with *ethnicity,* indicating that there are significantly fewer differences between TWs and FW Gen.1s with respect to the production of velar /k/, as compared to the voiceless bilabial /p/ and alveolar /t/. The significant interaction between *gender* and *ethnicity* suggests that VOTs produced by FW Gen.1 men are more significantly differentiated from those produced by TWs in comparison to the differences between FW Gen.1 women and TWs. There are no significant differences of VOT production between FW Gen.2s and TWs across the three stop consonants.

Summary

The above sections compared VOT values produced by FWs and TWs. Across voiced and voiceless consonant stops, the results reveal that VOT values are affected by the same predictors, with significant effects of *place of articulation* and *ethnicity* (FW_Gen.1, FW_Gen.2, TW).

Velar stops (/g/, /k/) have significantly longer VOT durations than alveolars (/d/, /t/) and bilabials (/b/, /p/). For voiced stops, the VOT distribution of TWs is largely different from that of first-generation FWs, while the VOT comparison between TWs and second-generation FWs is not significant. For voiceless stops, there are still strongly contrasting VOT values between TWs and first-generation FWs, where the differences are more common in the VOT distributions of first-generation FW men. The VOT distributions of first-generation FW women have the similar level to second-generation FWs and TWs. Significant VOT differences among TWs and second-generation FWs were not found.

5.4 Discussion

This chapter has examined the VOTs of stop consonants produced by FWs and TWs. The results show that TWs produce long-lag positive VOTs and some prevoicing negative VOTs for the voiced stops /b, d, g/. The mean VOTs for voiceless stops and voiced stops are 76 ms and -15 ms, respectively, demonstrating a long-lag and lead contrast, which does not seem to be in line with the widely documented long-lag (> 30 ms) versus short-lag (0-30 ms) voicing system in English (Docherty, 1992). Nevertheless, the prevoiced tokens are primarily from some individual speakers, who produce substantial prevoicing. In addition, the data was obtained from wordlist recordings with isolated words, a context that can result in more negative VOTs for /b, d, g/ syllables (Lisker & Abramson, 1967). The short voicing lead employed by TWs might also be a regional feature of the English in the Canadian Prairies. Further investigation is necessary to validate this conjecture. With respect to the effect of gender on VOT production, TW men and women are not significantly different from each other, a result consistent with Morris et al. (2008).

Language transfer was not found in the VOTs produced by second-generation FWs. Substrate language transfer may appear in the speech community of ethnic groups when the linguistic behavior of subsequent generations shows similar linguistic traits with the first generation and differs from the majority population (Chambers, 2003; Hoffman & Walker, 2010; Labov, 2008). However, in the data of this study, second-generation FWs overall use short-lead VOTs for voiced stops, which resembles the VOT production patterns of TWs and significantly differs from the long-lead VOTs of first-generation FWs. This observation suggests that language traits appearing in first-generation FWs are not passed along to the second generation, at least for VOT. This result also corresponds to Hoffman and Walker's (2010) study on Canadian Shift and t/d-deletion among Chinese and Italian Torontonians, which showed that there are large discrepancies between first-generation and second-generation Chinese and Italians, where second-generation speakers pattern more like British heritage speakers.

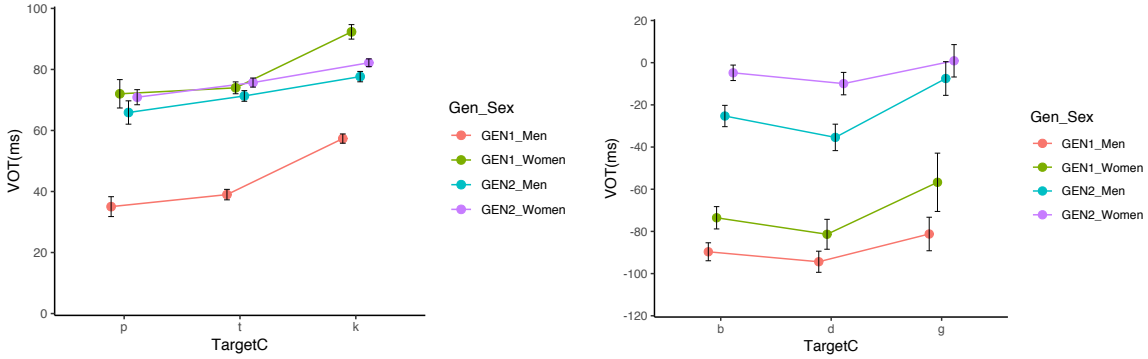
The absence of substrate transfer in second-generation speakers should not necessarily come as a surprise. On the one hand, in general, subsequent generations of ethnic groups tend not to acquire the foreign accents of their parents (Labov, 2008). The second-generation FWs in this study were all born or raised in Winnipeg, and are all English L1 speakers who use English as their dominant language. They show more accommodations to the speech patterns of TWs. On the other hand, the fact that second-generation speakers are adopting and assimilating to the local norms might suggest that second-generation speakers are not necessarily behind in any different linguistic behaviors. If anything, second-generation speakers are well integrated into the mainstream speech patterns, and sometimes are even more advanced and at the forefront of linguistic variation and change (Onosson et al., 2019), with the occasional exception of second-generation men.

First-generation FWs produce nearly exclusively long-lead VOTs with voiced stops, patterning with both Tagalog and Philippine English (§5.1.2). This may be expected, as the first-generation Filipino speakers in this study all came to Canada as adults. There is a strong chance for them to produce /b, d, g/ distinctly from the local English dialect due to significant differences in VOT between Filipino heritage languages and the local mainstream English in Canada. What is interesting, however, is that for voiceless stops, first-generation FW women produce long-lag VOTs similar to second-generation FWs and TWs, while first-generation men show significantly lower-lag VOTs. It appears that the VOTs of first-generation women do not transfer the short-lag VOTs from their L1s into their VOTs in English. The differences between first-generation men and first-generation women might be explained by their social connections and engagement with the local community.

Filipino women have more employment positions in clerical occupations and the healthcare industry, which require more social interaction, whereas Filipino men are more likely to work in the services and manufacturing sectors (Bonifacio, 2013; Statistics Canada, 2006). In addition, women may hold more economic power in the family, since the first-generation Filipino men suffer more severe deprofessionalization than women after immigrating to Canada. As Kelly (2014:26) puts it: "[Filipino] male deprofessionalization is especially acute in the Canadian labor market, and gendered roles within the household have often been reworked as [Filipino] women take on the role of principal breadwinner." The labor market for women is much wider and enables them to connect more with both the local and larger communities. The social networks they establish through work could thus influence their linguistic behavior. In this case, they may be more adapted to the local linguistic market than men are.

Although this is beyond the scope of this study, the long-lag VOTs of /p, t, k/ by first-generation women could also occur in part because first-generation women in general arrived in Canada earlier than first-generation men did. They would have therefore received longer exposure to Winnipeg English, since the longer the speaker's L2 experience, the closer their VOT productions are to the VOT of their L2 (Flege, 1987). It would be worthwhile to compare their results with other first-generation women speakers who arrived in Canada more recently.

Figure 5.14 VOT produced by FWs split by gender and generation



Previous studies have shown that place of articulation can affect VOT duration. For voiceless stops, VOT increases with place of articulation, moving from anterior to posterior positions, and thus voiceless velars have higher positive values than the other two voiceless stops (Docherty, 1992; Lisker & Abramson, 1964; Morris et al., 2008). The results from voiceless stops in each social group are consistent with this claim, as revealed in Figure 5.14. For stops featuring prevoicing, previous studies suggest the opposite, meaning that velars produce shorter VOTs than bilabials and alveolars (Docherty, 1992). This pattern is also found in the mean VOT values for voiced stops, as shown in Figure 5.14. This observation seems to suggest that, even though VOT values differ among FWs, they share the same system.

5.5 Conclusion

The main goal of this chapter was to investigate potential language transfer effects among FWs. VOTs produced by first- and second-generation FWs are expected to be similar to their heritage languages and Philippine English, while differing from Canadian English spoken by TWs. The main finding is that second-generation speakers produce VOTs patterning with TWs, while first-generation speakers produce long-lead VOTs for voiced stops, resembling their first languages. The results suggest that traces of language transfer only appear in first-generation FWs and do not persist in second-generation FWs. Another noticeable finding is that first-generation women produce long-lag VOTs for voiceless stops, patterning with second-generation FWs and TWs, while first-generation men have significantly shorter VOTs. This observation suggests that first-generation women are more integrated into the local mainstream linguistic system than first-generation men.

6 Discussion and conclusion

6.1 Summary of findings

The main goal of this dissertation has been to explore some phonetic features of FWs, in comparison to TWs. To pursue this goal, I explored the connections between three phonetic linguistic variables and two social variables (gender and generation) across two ethnic groups. I then presented the realizations of the three variables with quantitative analyses and qualitative descriptions. The first variable, Canadian Raising, was chosen to examine the participation of FWs in national phonetic variation. The second variable, /æg/-raising, was to investigate the linguistic behavior of FWs toward a local regional phonetic pattern. The third variable, VOT, was chosen to determine any effect of heritage language transfer. This section briefly reviews the results of these three variables.

Chapter 3 first looked at the status of /aɪ/, one of the two vowels involved in Canadian Raising. The results showed that the degree of /aɪT/-raising is significantly constrained by generation and ethnicity. Both TWs and the second-generation Filipinos participate in the Canadian Raising of /aɪ/, with strong raising and fronting of /aɪT/, as compared to /aɪD/. In particular, second-generation FWs raise /aɪT/ like TWs. However, first-generation FWs do not significantly separate /aɪD/ and /aɪT/ in either the F1 or the F2 dimension, and have /aɪT/ and /aɪD/ productions that are distinct from both second-generation FWs and TWs. These results suggest that second-generation FWs have adopted the mainstream pattern regarding /aɪT/-raising, while first-generation speakers have maintained the diphthongs that appear in Philippine English

(Lesho, 2018). This result could be explained by difficulties in the late acquisition of phonological rules.

Chapter 3 also investigated the production of /aʊ/ before voiced and voiceless contexts. The results revealed that the raising of /aʊ/ is correlated with the following context and the social dimensions of ethnicity and generation. TWs participate in /aʊ/-raising by having significant differences in F1 between /aʊT/ and /aʊD/. This feature is consistent among TW participants, based on non-significant differences among all speakers. For FWs, second-generation speakers participate in /aʊ/-raising, with significant differences between /aʊT/ and /aʊD/, while first-generation speakers do not. Nevertheless, unlike the results of /aɪ/-raising, even though second-generation speakers do raise /aʊ/ somewhat, the degree of distinguishing between /aʊT/ and /aʊD/ is significantly less than it is for TWs. In addition, the position of /aʊT/ among second-generation speakers is much more similar to that of first generation, i.e., their parents' generation.

This contradictory result between the two diphthongs may be connected to their geographic distributions: /aɪ/-raising is more transnational and is widely used in North American English dialects, while /aʊ/-raising is a feature that appears particularly in Canadian English. In addition, there are significant regional differences for /aʊ/-raising in Canada, which is not the case for /aɪ/-raising. Specifically, the Prairies and Southern Ontario see stronger /aʊ/-raising than other Canadian areas. In this case, the main pattern observed in this chapter may indicate that second-generation speakers are more oriented toward national standards or large urban centers such as Vancouver and Toronto, where /aʊ/-raising is less extreme than in the Prairies (Boberg, 2008). This interpretation is also consistent with Onosson et al. (2019), in which Filipinos

produce more extra-local language patterns and show more advancement of Canadian Shift and /u/-fronting than local Winnipeggers.

In addition to Canadian Raising, it was found that the /aʊ/ vowel also displays *fronting*, as also reported for other varieties of North American English (Labov et al., 2006). TWs in this study were found to participate in /aʊ/-fronting. The significant contrast in TWs is manifested between the genders: TW men display more differences of /aʊ/ in the two allophonic environments than TW women. In addition, although neither first-generation nor second-generation FWs participate in /aʊ/-fronting, there are generational differences. First-generation speakers separate /aʊD/ and /aʊT/ to a greater extent than second-generation speakers, and second-generation speakers maintain higher F2 values for both /aʊD/ and /aʊT/ tokens than first-generation speakers over the course of the duration. These differences mean that the mean value of /aʊT/ in second-generation FWs is closer to that of the TWs, though the extent of /aʊ/-fronting among second-generation speakers remains significantly less.

Chapter 4 presented the analysis of /æg/-raising. The results here show that /æg/-raising in the Prairies is more pronounced than the national reported means in Boberg (2008). The results further show that FWs participate in the raising of /æ/ before /g/, and that the status of /æ/ before /g/ is largely shaped by the interaction of generation and gender. On the one hand, first-generation FWs lag significantly behind second-generation FWs in the raising and fronting of /æ/ before /g/. On the other hand, gender differences only appear in the second generation: second-generation women's results align with those of the TWs, while second-generation men tend to produce /æg/ more like the first-generation FW speakers. In other words, second-generation women adopt the local linguistic system (more /æg/-raising), while second-generation men appear to maintain the norms of the older FW generation. The gender differences mirror the

differing social networks of second-generation women and second-generation men, where second-generation women have more diverse social network than the male counterparts. This finding is reminiscent of Sharma (2011), in which younger women have wider connections both outside and within the community.

Chapter 5 examined the production of English stops by TWs and FWs. TWs produce long-lag positive VOTs for voiceless stops, and some negative VOTs, indicating prevoicing, for the voiced stops /b, d, g/. The voicing system used by FWs significantly varies depending on *generation* and *gender*. For voiced stops, first-generation FWs produce more long-lead VOTs, patterning with Philippine English (Lesho, 2018) and Filipino heritage languages (Kang et al., 2016; Jovel, 2016; Yamamoto, 2017), while second-generation speakers pattern largely like TWs. For voiceless stops, most FW speakers produce stops with long-lag VOTs, in line with TWs. The exception to this is first-generation men, who produce voiceless stops with shorter positive VOTs. The results suggest that although language transfer from background languages may have affected the first generation's pronunciations of voiced stops, as would be expected with a later L2 acquisition, it shows no traces in the second generation in terms of VOT. The finding aligns with Hoffman and Walker's (2010) study, where language transfer effects among second-generation Chinese and Italian Canadians were not found. The gender differences among first-generation speakers are discussed more in depth in Section 6.2.1.

6.2 Implications

Chapters 3, 4, and 5 presented the results of three different linguistic variables. However, while investigating these variables, some cross-cutting themes arose. For instance, gender plays a significant role for both first-generation and second-generation FWs. This section brings together

findings across the three variables and discusses overall gender effects and language transfer effects.

6.2.1 Intersection of gender and ethnicity

Research has shown that gender patterns formed in different ethnic communities are strongly correlated with speakers' social roles and social contacts within and outside of that community (Sharma, 2011). For example, it has been found that younger women converge more toward the local mainstream norms (Sharma, 2011), while in the older generation, men are more likely to use more localized norms (Sharma, 2011; Ito, 2010). This is the same in the FW community, and FWs appear to follow similar patterns to the immigrant groups elsewhere.

In second-generation FWs, there is a split according to gender. Second-generation men produce features patterning more with first-generation speakers, such as less Canadian Raising of /aʊ/, longer negative VOTs of voiced stops, and significantly less /æg/-raising, than second-generation women. However, both second-generation men and women raise /aɪ/ before voiceless contexts, patterning with TWs. This different linguistic behavior suggests that second-generation women have adapted more to the local mainstream phonetic features and are more in line with TWs, while second-generation men appear to converge less to the local dialect and are more like the older FW generation. I argue that the different patterns between men and women can be explained by the social roles and connections of second-generation speakers in Winnipeg.

As was introduced in Chapter 1 (Tables 1.3 and 1.4), Filipino women in Manitoba have higher rates of postsecondary education than men. This educational attainment brings more opportunities for younger women to pursue careers in a wider job market, and thus potentially develop more diverse social networks than Filipino men. This tendency is borne out in the small sample of speakers interviewed, where seven out of eight second-generation women in this study

have non-Filipino coworkers, while four out of six second-generation men are in a workplace where the majority of their coworkers are Filipino. Given these differences, Filipino women are more likely to have a wider network of social contacts and more exposure to the local mainstream dialect. This pattern in the second generation is also consistent with previous research on Asian immigrant and heritage communities. Particularly, in Sharma's (2011) study, second-generation British Asian men and women use two different types of repertoires, reflecting their networks within and outside of the Indian and British communities. Men strongly favor local employment and entertainment, while women show participation in both the Indian and British communities. Women thus develop more diverse networks than men. Similarly, for this study, the observation that second-generation FW women are more in line with TWs also reflects a more extensive network than second-generation FW men beyond the Filipino community.

A similar gender-differentiated pattern revealed in the second-generation FW is also observed in first-generation FWs. With respect to the production of VOT, first-generation women have long-lag VOTs for voiceless stops, which aligns with second-generation speakers and TWs, while first-generation men show significantly shorter VOTs. This result seems to suggest that first-generation women are more integrated into the local linguistic market than first-generation men are. This could be explained by the social environments and structures in the first generation. The typical immigration process in the 1960s and 1970s was that Filipino women came to Winnipeg first through recruitment, often into the textile industry or healthcare, later sponsoring their husband, children, and parents. Women also play a lead role in community associations (Malek, 2019). In addition, first-generation Filipino women have more positions in clerical occupations and the healthcare industry, which require more linguistic interaction with

non-Filipino interlocutors, whereas first-generation Filipino men are more likely to work in services and manufacturing (Bonifacio, 2013; Statistics Canada, 2006). For these reasons, as compared to first-generation men, women may be quicker in assimilating to mainstream language patterns and integrating more mainstream linguistic variants into their speech.

In summary, the approach of intersecting gender and ethnicity brings more in-depth understandings of how Filipinos show different language practices according to gender. The gender effect should be examined with a focus on social context and women and men's social roles in the target community. Categorizing men and women into one group does not give the whole picture, especially in an ethnic community where social norms may not reflect hegemonic conventions. Importantly, investigations of language and solely gender or ethnicity would not reveal that second-generation men use more localized features from the Filipino community, while second-generation women adopt more supra-local features from outside of the Filipino community.

6.2.2 Language transfer

The Filipino community in Winnipeg settled primarily in the northwest area of the city and forms a close-knit social network (see §1.5.2). This geographic settlement provides Filipino speakers more chances to interact with speakers within the community, maintain the usage of heritage languages, and spread the influence of language transfer. The effects of language transfer here are discussed at the community-level, following Labov's (2008:316) definition:

> a change in the language that is the result of a very large number of bilingual speakers transferring some part of the L2 effect to large numbers of their descendants, speakers of L1.

First, the effect of language transfer is stronger among first-generation Filipinos. Based on my results, first-generation Filipinos can be characterized by their lesser or non-participation in local

and national sound patterns, such as /æg/-raising and Canadian Raising, as well as their distinct production of VOT in voiced stops /b, d, g/. The first-generation Filipinos in our corpus migrated to Winnipeg in the 1970s and 1980s when they were in their 20s. This age period poses challenges for the acquisition of phonological rules in a second language, in this case, Canadian English. In addition, first-generation Filipinos are more likely to use their native tongue at home, which may hinder the acquisition of local English dialect norms.

Significant intergenerational differences in the production of VOTs suggest that language transfer does not persist through the second generation. Language transfer was expected to be manifested in VOT, since VOT is below the level of consciousness and the voicing systems in English and Filipino heritage languages differ. However, the results show that first-generation and second-generation FWs have significant differences, particularly in the production of voiced stops. First-generation FWs still show long negative VOTs, patterning with Filipino heritage languages and Philippine English (Lesho, 2018), while second-generation speakers resemble TWs. This finding is in line with Hoffman and Walker (2010), who did not find evidence of heritage language transfer either among the second-generation Chinese or Italian speakers in the variables they studied in Toronto.

One might think that /aʊ/-raising (see Chapter 3 Table 3.20) is a result of substrate transfer, given that second-generation FWs pattern with first-generation FWs, not TWs. However, I argue it should not be regarded as the result of language transfer effects. Since first-generation speakers do not show participation in /aʊ/-raising, it is unlikely that /aʊ/ tokens of second-generation speakers were influenced by first-generation speakers. Besides, it actually corresponds more closely to the second-generation speakers' extra-local orientation, exemplified

by their use of broader regional sound patterns, such as in large urban cities like Toronto and Vancouver.

6.3 Contribution

English variation in Canada has a growing tradition of study (Boberg, 2010; Walker, 2015). However, previous studies have mostly focused on the English spoken in metropolitan or coastal cities such as Vancouver, Toronto, and Montreal, while studies on the English spoken in the Canadian Prairies are limited. By comparing the speech of FWs and TWs, this research enriches the study of Canadian English with another dataset and linguistic description of English in the Prairies. Specifically, this dissertation documents and complements our knowledge of the state of Canadian Raising, /æg/-raising, and VOT.

This dissertation is the first to examine the speech of Filipinos in Winnipeg. The findings of this study showed that the second-generation FWs in general are well integrated into the local linguistic system: second-generation FWs all show significant raising of /aɪ/ and /aʊ/ before voiceless contexts, and their VOT systems are similar to their local counterparts. In addition, the result of VOT is in line with Walker and Hoffman (2010) and shows there is no language transfer effect of Filipino heritage languages to second-generation FWs, which hopefully provides valuable insight for future research on language transfer.

This dissertation examined linguistic outcomes while considering the social structures and social connections among Filipinos in Winnipeg. The findings of this study draw on observations reported in sociological work such as Kelly (2014) and Mais (2012). For instance, the main result of /æg/-raising reflects the fact that second-generation Filipino men are more likely to be more bound to the community than second-generation women. This current study contributes more linguistic materials for future social and cultural studies on Filipinos in Canada.

6.4 Limitations

There are three main limitations in terms of the scope of this project. First, this study works on data extracted from recordings of a wordlist, which might not reveal the robust findings that would occur in a less formal elicitation style, for instance conversational data. Another limitation of this study is the somewhat unbalanced participant distribution among gender and age sub-groups. This especially occurs in the TW dataset, where the middle-aged group has only two participants for each gender, and the older group is not equally distributed by gender. In this case, the conclusion drawn from a small number of participants may not represent the entire population. Lastly, the effects of other social variables were not tested, such as socioeconomic class, heritage language fluency, or ethnic orientation (Hoffman & Walker, 2010), and questions related to these variables would allow us to better understand the social and language landscape of the Filipino community. This dissertation is the first to document the linguistic practices of Filipinos in Winnipeg, setting the groundwork for future studies. A more complete picture of variation patterns among FW and TW speakers should be possible with more varied data and more testing of other social variables. The following section suggests some future directions to extend the current study based on the aforementioned limitations.

6.5 Future directions

This study has reported on the production of several phonetic variables by both Filipino and traditional speakers in Winnipeg. It has answered questions in terms of Filipino participation in national and local phonetic features, and language transfer effects in two generations. These answers certainly do not reveal the whole picture of the linguistic market in the community. Future research could be conducted in several directions to extend the scope of this study.

While this study examines the influence of the broad social categories of generation and gender on the use of particular variants, future research on more external factors, such as socioeconomic class, ethnic orientation (Hoffman & Walker, 2010), and fluency of heritage languages, may provide more information about the linguistic behavior in generation and gender subgroups. In addition, this study removed three Filipino participants from the analyses, as they had immigrated to Canada before or around their early teens, and thus were in between the Gen1s who emigrated as adults and the Gen2s who were born in Canada. Future research could include more participants from this cohort, exploring their participation in Canadian Raising or /æg/-raising. Would the results be in an intermediate position between the first generation and second generation?

Filipinos make up the fourth-largest visible minority population in Canada, and count for 2.3% of the population (Statistics Canada, 2017). Another possible future direction would be to compare the speech of Filipinos in Winnipeg with Filipinos in other metropolitan cities, such as Vancouver and Toronto. The settlement pattern in these cities is different, as the Filipino population spatially concentrates in the North End and West End in Winnipeg, while they are more widely dispersed in Toronto and Vancouver (Kelly, 2014; Umbal, 2016). In addition, a large percentage of Filipino arrivals in Winnipeg used the MPNP and a small percentage used the LICP, while Filipinos in other cities have immigrated to Canada through a mix of the FSWP and the LICP. Comparative analyses between Winnipeg and other cities could provide useful discussion on their participation in regional and supra-regional linguistic variables. One such study is from Wong and Hall-Lew (2014), who compared the speech of second-generation Chinese Americans in New York City and San Francisco. They found that Chinese Americans in each city pronounced BOUGHT vowels more similarly to their local counterparts than to one

another. In this case, a similar study could be conducted to explore the intersection of regional identity and ethnicity.

Finally, future studies could examine the connection between linguistic behavior and identity to study how Filipinos employ linguistic forms to index their identities that are not solely ethnically marked. For instance, /aʊ/-raising was found to index Canadian identity (Niedzielski, 1999). Much like Nycz (2018), future studies perhaps could analyze /aʊ/ tokens extracted from interviews to see whether FWs show a larger degree of raising when they express a positive affect toward Canada, and whether they produce less /aʊ/-raising in other contexts or not.

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Appendix A Full elicitation wordlist

bar	cow	boots
sit	pair	writer
file	Hode	pour
student	proud	dark
collar	tide	llama
off	star	toss
pajamas	sod	Slavic
Ett	Pakistani	dead
stare	charity	side
lasagna	lager	relative
bus	rider	town
heat	how'd	foot
tally	stamp	father
sort	saw	soon
too	horrible	due
sell	sale	barrel
sat	see	sign
fork	coin	foil
heed	Colorado	hide
start	steel	sawed
still	tag	top
sterile	spa	loud
sorry	whine	Don
had	stir	sun
palm	soprano	gown
down	which	sight
drama	tire	foul
hot	stood	egg
south	band	borrow
bother	tin	stain
void	poor	bag
hate	bird	duck
doubt	toe	girl
fool	sack	did
caller	talk	new
bad	lava	awed
caught	cut	state
steer	cot	bang
who'd	tooth	code
dawn	seed	dull
sour	stayed	cool
bold	carry	food
go	step	stone
monitor	mafia	house

hanger
gag
Iraq
hit
whale
cast
sore
care
tan
Hudd
dirt
home
tour
plaza
say
hid
full
tie
ham
car
Hoyt
tube
sure
cold
up
stole
sick
hood
sanity
fight

tap
oat
macho
sad
ought
cook
do
hoot
curry
spirit
tight
kiss
aid
ferry
hall
set
deck
coat
cup
eyes
veto
out
stud
core
seen
hurt
tool
heard
worry
test

pasta
shout
odd
spice
head
facade
berry
taco
height
sock
harp
avocado
short
toy
tip
ten
on
hut
Picasso
boat
hurry
seat
calm
panorama

Appendix B Words for Canadian Raising

/aʊD/	cow, foul, how'd, loud, proud, sour
/aʊT/	doubt, house, out, shout, south
/aɪD/	eyes, file, hide, rider, side, sign, tide, tie, tire, whine
/aɪT/	fight, height, sight, spice, tight, writer

Appendix C Words for /æg/-Raising

/æ/	sack, happy, sat, cast, tap, bad, sad, had
/æg/	tag, bag, gag

Appendix D Words for VOT

/b/	bar, bus, bother, bad, bold, band, bird, boots, barrel, borrow, bag, bang, berry, boat
/d/	doubt, dawn, dark, dead, Don, duck, did, dull, dirt, do, deck, down
/g/	go, gag, gown, girl, goose
/p/	palm, pair, proud, poor, pour, plaza, pasta
/t/	tally, too, tide, tag, tire, tin, toe, talk, tooth, toss, town, top, tan, tour, tie, tap, tight, tool, test, taco, toy, tip, ten
/k/	collar, caller, caught, cow, coin, cut, cot, carry, code, cool, cast, care, car, cold, cook, curry, kiss, coat, cup, core, calm