Tagalog Vowels: A Sociophonetic Study on Possible Shifts

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Abstract

The extensive history of contact between Tagalog and English have brought about many changes to the linguistic landscape of the Philippines. Nowadays, Tagalog and English are used interchangeably in daily speech. This thesis investigates the possible shift in the five vowels of Tagalog, [a], [e], [i], [o], and [u], with the assumption that English is triggering these changes through its influence. The participants of the study consist of Tagalog-English bilinguals who are residing in the Metro Manila area, due to the prevalence of language contact in this area. The participants partook in a wordlist reading task. The F1 and F2 values for the target vowels were collected, and against the participants' ages, gender, and English Language Use (ELU). The results indicated a shift happening for [o] and [u], merging into a single vowel – [ʊ]. The findings agree with previous literature about the Tagalog vowel space changing from a five-vowel system to a four-vowel system.

Acknowledgements

I would like to thank my supervisor, Dr. Cesko Voeten, for his continuous guidance throughout this thesis. His encouragement and passion for his field of sociophonetics inspired me to explore this topic.

To my parents, thank you for your hard work and sacrifice that allowed me to pursue my interest in linguistics. You guys made everything possible. *Mahal na mahal ko po kayo, at salamat para sa lahat.*

Table of Contents

1. Introduction

1.1. Interaction of Tagalog and English in the Philippines

In 1987, the Bilingual Education Policy was passed in the Philippines, which states that "For purposes of communication and instruction, the official languages of the Philippines are Filipino, and until otherwise provided by law, English". According to Sugbo (2003), Tagalog/Filipino has not been given the same privilege of prestige that English has received, as the bilingual policy still favours English over other Philippine languages. In a study conducted by Sicam and Lucas (2016) on adolescent Filipino-English bilinguals, students of higher socioeconomic status correlated with a higher positive attitude towards English. This finding implies that English is the preferred language of the elite class in the Philippines due to English being the main language of instruction in private schools. This creates a divide in proficiency between those who are mainly taught in Tagalog in public schools, with English being offered as a subject (McFarland, 2004). Thus, the socio-economic implications of language are amplified by this divide in education.

However, despite the conflict between these languages, switching between the two is commonplace, resulting in what is known as 'Taglish'. Though its classification as a language is disputed, it is undoubtedly present in daily use. Bautista (2001) simply describes it as code-switching – the seamless integration of both languages into informal speech. The author also distinguishes between two types of code-switching, which she coined as 'deficiency-driven' and 'proficiency-driven' switching. Competent bilingual speakers use proficiency-driven switching, easily jumping from one language to the other in an utterance. Since the implementation of the English language by Americans, its prominence has been felt in mass media, education, and at the government level. Despite its widespread influence, a 2008 survey by the Social Weather Stations on self-reported English proficiency reported that only 8% of the sample regarded themselves as competent users of English.

Even though an equal status of Filipino and English was established at the governmental level through the Bilingual Education Policy (*The 1987 Policy on Bilingual Education*, 1987), attitudes towards their daily use vary among speakers. Extensive language contact allows for the influence of one on the other – in this paper, the focus will be on vowel change in Tagalog due to interaction with English. General attitudes towards both languages will further be discussed, as well as the perception of the Tagalog accent in English, and lastly, the research question will be established.

1.2. Accents in language perception and Tagalog vowels

One aspect of proficiency in second language learning, which is studied in this thesis, is whether an accent from the L1 is detected in L2 speech. This also holds true for Philippine English, as a speaker is closer to being "fluent" when their Filipino accent is undetectable in their speech. Being misunderstood due to their accent is the reality that many immigrants or second language learners face when they are interacting with a native speaker, as Daantos (2024) accounts in her experiences being a Filipino immigrant in Canada. Thus, many learners pressure themselves to erase their accents to appear more competent, credible, and lessen the misunderstandings that they encounter in daily life. Thus, this raises the question of whether the pressure to erase the Filipino accent in English, and the less prestigious status of Tagalog, creates an environment of sound change for Tagalog.

The paper by Umbal and Nagy (2021) studies the variation between the approximant /r/ versus the trilled or tapped /r/ in Tagalog speakers. Their participants included Filipinos who migrated to Canada as an adult, first-generation Filipino-Canadians, and homeland speakers. They hypothesised that heritage speakers (those who learned to speak Tagalog in Canada) were more likely to adopt an approximant /r/ when they used English more. This means that English has a much larger influence on one's pronunciation in Tagalog when a speaker is more English-oriented. The present paper focuses on this influence specifically in Tagalog vowels. This is relevant, because of the historic changes that were made to the Tagalog vowel space after colonisation.

Originally, Tagalog had three vowel phonemes – /a/, /i/, and /u/, until /e/ and /o/ were introduced into the language after the arrival of the Spanish and the Americans. Delos Reyes et. al. (2009) focused on creating a vowel space for Tagalog, citing that the unstable pronunciation of the [i~e] and [o~u] contrasts was due to language contact, for example, through borrowing. In the paper, they found that, in Tagalog speakers, [u] and [o] are similar in their mean F1 and F2 vowels, while there is a noticeable acoustic contrast between [e] and [i]. Thus, they proposed that rather than [o] and [u] being separate phones, they are pronounced as [ʊ] instead. While [ʊ] is a generally accepted phoneme in American English, Tagalog phonology mainly differentiates between [o] and [u]. This could be a possible area of shifting for Tagalog, where [ʊ] shifts towards either [o] or [u]. In the context of the present paper, it is possible that it might shift towards a "truer" [u] for those who identify more with using Tagalog. The same could happen to [o], if the speaker meets the

same condition of Tagalog identification. If we consider the influence that English has had on Tagalog, and the pressure to speak "without an accent" in English, this might be an environment that promotes sound change.

1.3. Laboratory-sociolinguistic approach

The approach of this thesis is based on the principles of laboratory sociolinguistics. The relatively new methods of this field were built from previous knowledge from studies of variationist sociolinguistics, of which there have been three waves so far. The first wave focused on a general understanding of categories which speakers were grouped into (Eckert, 2012). Then, the second wave was based on making connections between social categories at the macrolevel and the local categories which give the macrosocial categories more meaning at the speaker level.

The first two waves held the view that variation came from the social space, which was then rectified by the third wave of sociolinguistic variation research – variation became a signal of social identities and categories that speakers use to categorise themselves within the social landscape (Eckert, 2012). Indexical order is an important factor for the ability of indexical signs to change (Silverstein, 2003, as cited by Eckert 2012). It outlines that, at the initial stage, there is a population that gathers attention, and a particular part of their language can become salient. Then, this salient feature can then become a way to signal membership to this specific population.

The paper by Eckert (2012) gave an example of "Beijing yuppies" who are described as younger managers in the global financial sector, who were considered the new global elites in Beijing. These speakers prefer to use a full tone, a linguistic feature that they use to create a cosmopolitan image of themselves and separate them from their peers who work in state-owned sectors. The full tone is a feature that is present in non-mainland Mandarin, particularly associated with Hong Kong's and Taiwan's global markets. Rhoticisation of finals is a characteristic of Beijing Mandarin speech that yuppies choose to not emulate in their own speech patterns, most notably demonstrated by the female yuppies.

In the context of this thesis, variation in Tagalog speech by Tagalog-English bilinguals can be a way to signal that they are a part of a particular group. Referring to the paper by Umbal and Nagy (2021), they found that speakers who were more English-oriented were more likely to approximate their /r/ rather than use the tap or trill variation. It is possible that these speakers are using it to signal themselves as more globalised or less connected to a concrete Filipino identity.

As such, the same pattern could emerge for the vowels in Tagalog, where [ʊ] replaces [u] and [o] when a speaker is more comfortable with using English. Not only does this highlight the influence that English has on Tagalog, but it could also become a way of identifying with the elite class in the Metro Manila area.

1.4. Refining the research question

The present paper aims to investigate which vowels are undergoing change in Tagalog, particularly in speakers within the Metro Manila area. The aforementioned language environment, which is most present in the Metro Manila area, favours English over Tagalog in terms of prestige and could be a catalyst for speakers to adapt Tagalog as the more desirable language. The dynamics of the relationship between Tagalog and English for Filipinos is complex – the prestige of English creates pressure for speakers to try and adapt to the more "standardised" American accent. English is also regarded as a language of progress, where speakers could treat it as a necessity to learn due to the opportunities it could provide (Berowa, 2016). However, a speaker who does not code-switch to Tagalog can be seen as "snobby" due to the association that people have with English and the upper-class. Due to this complexity, it is difficult to determine what the hierarchical structure is between them. We can argue that English is the majority language, due to its connection to the socio-economic elite of the Philippines, and also its correlation to growth as many Filipinos leave the country to make a better life for themselves and their families. However, in terms of daily interactions, Tagalog and English occur concurrently due to code-switching being so prevalent.

For the purpose of this paper, a hierarchical relationship must be established, thus we can assume that English has a more prestigious status and retains its "majority language" label. Due to the positive association that Filipinos have with English and socioeconomic progress, Tagalog can be considered the "minority language".

This thesis investigates which, if any, of the five vowels are undergoing sound change, and what the possible factors are that contribute to any putative shifts. Delos Reyes et al. (2009) established that [a] is the most acoustically stable in the Tagalog vowel space, while [i~e] and [o~u] have been considered unstable within the vowel space, since [e] and [o] are more recent phonemes introduced by the English colonisation. The mean formant values that they collected will be used as a point of reference for the present study, with the aim of potentially expanding their results on the vowel space of contemporary Tagalog. Furthermore, this study considers the

sociolinguistic implications of bilingual usage of Tagalog and English, especially in regard to sound change. The extensive history of interaction between these two languages has been extensively researched, but not many have explored the significance of this relationship in a phonetic context. Thus, an experiment will be conducted to explore the interaction of Tagalog and English within bilinguals in the Metro Manila area.

2. Methodology

2.1. Justification of methodology in the view of laboratory sociolinguistics

The laboratory sociolinguistic approach of this thesis validates the methods by which the data will be collected, as it is a newer area of sociolinguistic research that does not rely on spontaneous speech data. In the past, spontaneous speech data has been regarded as the standard for data in sociolinguistics, due to the belief that it holds the highest ecological validity, in contrast to speech data collected in a controlled setting (Pinget et al., 2025). The approach allows for control of both language internal and external factors, allowing for a better understanding of the linguistic and social mechanisms that influence language variation and change (Pinget et al., 2025).

Van de Velde et al. (2022) also list justifications for the utilisation of a controlled setting for data collection. While spontaneous speech data allows for a more "natural" production of speech by the participants, it does come with its own shortcomings. A controlled environment negates the frequency problem, as a set number of stimuli allows for there to be an even distribution of the targeted linguistic variable. It is also a time-consuming and laborious task to sift through recordings made in natural conversation. Lastly, spontaneous speech and laboratory speech are not fundamentally different. As such, the following section outlines the methodological choices made that were based on the ideas from laboratory sociolinguistics.

2.2. Participants

The participants were recruited via convenience sampling. They were contacted through social media platforms (such as Instagram and Facebook) and via word-of-mouth. The target demographic for the sample were Tagalog-English bilinguals within the age range of 18–30 years, and also from 31 and above. In total, there were eight participants who at least completed the questionnaire portion of the experiment. However, two participants' data were excluded from

analysis due to the less than satisfactory sound quality of their recordings, thus narrowing down the total number of speakers in the sample to six.

There were four female participants (mean age = 30.5 years, SD = 16.5) and two male ones (mean age = 60.2 years, SD = 8.1) in the study. The younger sample consisted of three participants, all aged 21 years. The mean of the ages of the older sample is 59.6 years (n = 3, SD = 5.9). The participants were fluent in both Tagalog and English. At the time of the experiment, they lived in the Metro Manila area, where language contact is anticipated to occur the most.

2.3. Procedure

The study was conducted online through Experiment Builder that participants ran on a browser on a laptop or a desktop computer. They were informed that their devices were required to have a working microphone. Prior to the experiment, the participants were asked for their informed consent, and were briefed about the experiment. According to the instructions, they were also required to run the programme in a location with as little acoustic interference and distractions as possible. Before the task began, biographical information from the participants was collected, such as age, gender, and language background. They also answered two questions that asked how much they used English in their daily life, and how comfortable they were with using English. Questions from the questionnaire are included in Appendix A.

The participants partook in a self-paced reading task for the experiment. The words were presented on the screen one at a time where recording started automatically at the same time that the word appeared. They then read the word out loud and pressed the spacebar, which stopped the recording and moved on to the next word. The order of the 180 words were randomised, and there was a one-minute break for the participants after the first 90 words. The recordings of the words were collected and stored as separate WAV files for analysis.

2.4. Stimuli

A Tagalog word list corpus was sourced from the Leipzig Corpora Collection (Leipzig Corpora Collection: Tagalog community corpus based on material from 2017, n.d.). The selection of the stimuli was based on the frequency of the word (high versus low). This was done by calculating the logarithm of the frequencies and taking the first quantile (30%) for low frequency and the third quantile (70%) for high frequency. The words chosen occurred in either high or low frequency in

the corpus, with six words for each target vowel, creating a total of 180 words for the task. During the selection process, caution was taken to ensure that the target vowel only appeared once in the word, and that it was in a stressed position to avoid effects of vowel reduction. Additionally, words were excluded if they had a minimal pair based on the syllabic position of stress, as that can be used to distinguish the meaning between two orthographically identical words. This made sure that the participants were producing the target vowel in the proper stressed position, rather than confusing the stress pattern for an orthographically similar, yet differently pronounced word. The extracted stimuli used in the experiment are stored in Appendix B.

2.5. Data analysis

The data collected consisted of each participant's age, gender, English language use and comfort, and the WAV files from the task. Participants were anonymised and given a randomly generated participant number. The single-word recordings were analysed in Praat by concatenating them into a single WAV file via a script, and subsequently, TextGrids were made by manually segmenting the target vowels in each word for identification when running models for their F1 and F2 values. Then, the F1 and F2 values were extracted from each vowel at the 50% time point. In total, 922 vowel tokens were taken from the sample and used for analysis.

The formant values were normalised using the Lobanov method according to the process outlined by Fruehwald (2022). Before standardising the data, the function 'tidy_mahalanobis' from the joeyr package (Stanley, 2025) was used to filter out any vowel tokens that had a mahalanobis distance greater than 2. This reduced the total number of tokens from 922 to 730. The standardisation of F1 and F2 was done by using the function 'scale'. The normalised formants are displayed in Figure 1.

The standardised formant data were analysed using linear mixed-effects models that were run on both F1 and F2 of each vowel. This was done separately per vowel. Interactions were not considered for reasons of parsimony. The models were run by calling the 'mixed' function from the afex package (Singman et al., 2024). The Lobanov-corrected F1 and F2 values were the dependent variables, and gender, age, word frequency, and ELU were the independent variables. A random intercept for each participant was also taken into account in the formula, as it allows the model to consider that every speaker may have their own baseline formant value. P-values were based on parametric bootstrapping in order to avoid the multiple-comparisons problem.

Word frequency was also included in the analysis as a possible predictor for any shifts in the formants, as higher frequency words in Tagalog could undergo change quicker in order to move past the stage of acoustic ambiguity (Todd et al., 2019). As such, this predictor was coded as –0.5 for 'low' and +0.5 for 'high'. Gender was coded as –0.5 for males and +0.5 for females. The answers for the questions asking about English language use and comfort (see Appendix A) were centered to about the middle on the scale, and then the average was calculated to create the combined predictor of "English Language Use" (ELU).

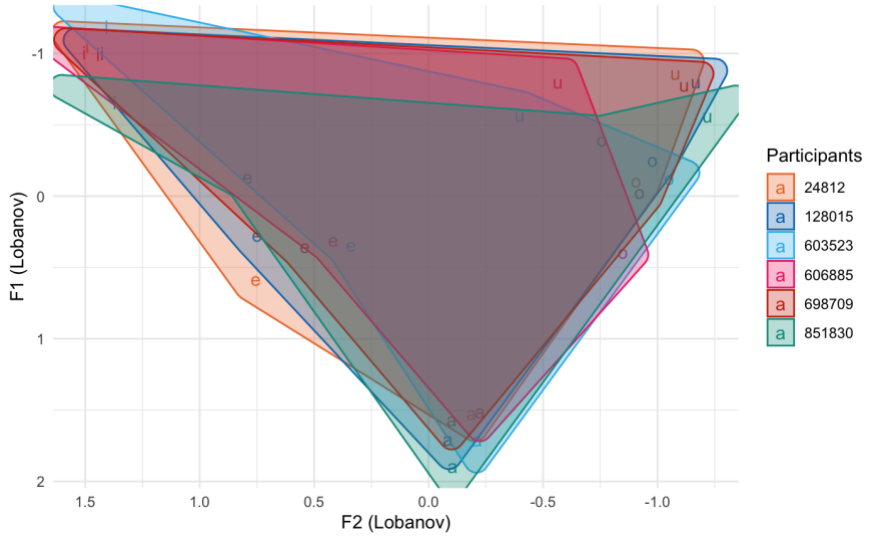

Figure 1. Vowel space of the speaker sample after Lobanov normalisation (R Core Team, 2024).

3. Results

A series of linear mixed-effects models run per vowel on their F1 and F2 values revealed the effects of the predictors Gender, Age, Word Frequency and ELU. Tables 1a and 1b display the results for these models. The code for data processing and the models used are located in Appendix D.

3.1. F1 values

According to the results produced by the models, there is a significant effect of high frequency words on the F1 of [e] ($\hat{\beta}$ = 0.13, SE = 0.05, $p < .001$). This suggests that high frequency words were articulated with a higher F1 value than the low frequency words by the speaker sample. Thus,

it implies that the participants were more likely to articulate the vowel in high frequency words at a lower position in the vowel space.

Gender was also a significant predictor for [o] ($\hat{\beta}$ = –0.81, SE = 0.25, p < .001). As mentioned before, males in the sample were coded as –0.5, and so the result suggests that males had a higher average F1 than the female speakers. As such, it can be assumed that, in this sample, the males produced their [o] at a more lowered position than the females.

A small, but significant effect of age was found for [o] as well ($\hat{\beta}$ = 0.01, SE = 0.01, p = .04). The results indicate that older speakers in the sample tended to produce slightly higher F1 values than the younger speakers. This implies age-related articulatory shifts in the production of [o], where older speakers were more likely to produce the vowel in a lowered manner.

Lastly, ELU had a positive, slightly significant effect on [o] ($\hat{\beta}$ = 0.38, SE = 0.15, p = .02). The positive relationship between ELU and the F1 value means that speakers with a higher ELU score were more likely to produce their [o] with a lower tongue position than those who scored lower in ELU.

The vowels [a], [i], and [u] showed little to no significant influence from the predictors to their F1 values.

Fixed Effects Estimates for F1 Models by Vowel

Predictor	[a]	[e]	[i]	[o]	[u]
Intercept	1.72 (0.45), p < .001***	0.13 (0.69), p = .86	–0.39 (0.45), p = .41	–0.89 (0.33), p = .02*	–1.08 (0.33), p = .01*
Gender	0.26 (0.35), p = .47	–0.05 (0.39), p = .9	0.07 (0.29), p = .8	–0.81 (0.25), p < .001***	0.08 (0.21), p = .69

Word Frequency	0.11 (0.07), p = .16	0.13 (0.05), p < .001***	0.01 (0.05), p = .89	0.1 (0.05), p = .06.	0.02 (0.04), p = .66
Age	0 (0.01), p = .85	0 (0.01), p = .78	–0.01 (0.01), p = .17	0.01 (0.01), p = .04*	0.01 (0.01), p = .27
ELU	–0.06 (0.21), p = .79	0.03 (0.28), p = .93	–0.15 (0.19), p = .44	0.38 (0.15), p = .02*	0.08 (0.14), p = .59

*Table 1a. Results of linear mixed-effects models for F1 values in [a], [e], [i], [o], and [u] across participants. P-values are based on parametric bootstrapping. Significant values are marked with asterisks for clarity ($p < .001$ = ***, $p < .01$ = **, $p < .05$ = *).*

3.2. F2 values

The models for the F2 values in each vowel displayed slightly different patterns than their corresponding F1 values. Gender was solely significant for [e] ($\hat{\beta} = 0.36$, SE = 0.11, $p = .0013$), and according to the estimate, females were showing a shift in this case, as they had a higher average F2 than the males. This implies that female speakers in the sample were possibly producing their [e] with a more fronted positioning of the tongue.

Furthermore, word frequency also had a considerable effect on one vowel, namely [o] ($\hat{\beta} = 0.07$, SE = 0.03, $p = .021$). Tokens which occurred in the high frequency words were more likely to be pronounced with a higher F2 value than those which occur in low frequency words. Thus, [o], in this context, was articulated in a more fronted manner.

Age was a significant predictor for [e] ($\hat{\beta} = –0.02$, SE = 0.002, $p < .001$) and [u] ($\hat{\beta} = 0.04$, SE = 0.01, $p < .001$). [e] and [u] show opposite effects of age – younger speakers produced their [e] with higher average F2 values, while older speakers displayed this pattern in their productions of [u]. These outcomes imply that speakers from the younger age group articulated their [e] in a more fronted manner, and those from the older age group articulated their [u] also more fronted. Slightly significant age effects were also found in the F2 values of [a] ($\hat{\beta} = –0.01$, SE = 0, $p = .025$), which means that younger speakers were producing their [a] more towards the front.

ELU proved to be a significant predictor for both [e] and [u] ($\hat{\beta}$ = –0.32, SE = 0.06, p < .001; $\hat{\beta}$ = 0.81, SE = 0.23, p < .001). For [e], ELU was inversely correlated with F2, suggesting that speakers with a lower score in ELU were articulating their [e] with a more fronted positioning than those who scored higher in ELU. As for [u], there was a significant positive correlation between F2 and ELU, thus implying that those who scored higher on ELU were producing their [u] more fronted.

[i] was the sole vowel that did not show any notable effects of the predictors on its F2.

Fixed Effects Estimates for F2 Models by Vowel

Predictor	[a]	[e]	[i]	[o]	[u]
Intercept	0.2 (0.14), p = .17	1.64 (0.12), p < .001***	1.42 (0.18), p < .001***	–0.65 (0.24), p = .024*	–3.27 (0.46), p < .001***
Gender	0.14 (0.12), p = .22	0.36 (0.11), p = .0013**	–0.1 (0.16), p = .53	–0.08 (0.17), p = .62	–0.73 (0.38), p = .055
Word Frequency	0 (0.03), p = .95	–0.03 (0.02), p = .16	–0.04 (0.04), p = .3	0.07 (0.03), p = .021*	–0.04 (0.1), p = .67
Age	–0.01 (0), p = .025*	–0.02 (0), p < .001***	0 (0), p = .97	–0.01 (0), p = .21	0.04 (0.01), p< .001***
ELU	–0.14 (0.07), p = .05.	–0.32 (0.06), p< 0001***	0.03 (0.09), p = .74	–0.03 (0.11), p = .75	0.81 (0.23), p < .001***

*Table 1b. Results of linear mixed-effects models for F2 values in [a], [e], [i], [o], and [u] across participants. Parametric bootstrapping was used when calculating the p-values for reliability. Significant values are marked with asterisks for clarity (p < .001 = ***, p < .01 = **, p < .05 = *).*

4. Discussion

4.1. Interpretation of results

The main goal of the paper was to answer whether the vowels in Tagalog are shifting due to language contact with English. A hierarchical relationship was established between Tagalog and English, where the latter is considered the majority language due to its prestige and the former is deemed the minority language. The study focused on Tagalog-English bilinguals who live in the Metro Manila area. The procedure was based on a word-list reading task, where participants read words one at a time, outside of a sentential context. The results found in the present paper indicate a potential shift towards an "Americanised" version of the vowel [u] to [ʊ] due to sociolinguistic factors, such as the age of the speaker, and the degree to which a speaker uses English and how comfortable they feel in their usage of it. This is in line with the assumption made earlier in the paper that [u] might shift towards a "truer" [u] for those who are more inclined to speak Tagalog and are more comfortable with it than English.

An analysis of possible diachronic change was done by comparing younger and older speakers; thus, the thesis contains an apparent-time approach to language change. This approach is similar to the study by Voeten (2020), which investigated an ongoing shift in Dutch tense mid vowels shifting to upgliding diphthongs, and the lowering in the nuclei of the original diphthongs. Belgian-Dutch speakers were used as the standard for vowels pre-shift, and Netherlandic-Dutch speakers as those who are displaying the vowel shift.

The findings in the present paper indicate that based on the F1 values of [o] between the two age groups, older speakers were leaning towards a more lowered pronunciation. Furthermore, the F2 values of [e] were significantly higher for younger speakers, which could be because of their tendency to articulate the vowel with a more fronted tongue position. The same pattern was found for older speakers in their production of F2 values of [u], which shows that they produced the vowel in a more fronted manner than the younger speakers did. The variation in pronunciation between the two age groups indicated that there might be a change occurring for the younger generation. It was established earlier on in the thesis that younger people with a higher

socioeconomic class had a higher positive attitude towards English, which would create the idea that English is a language of progress and opportunity (Sicam & Lucas, 2016). It could be the case that younger people would have a higher proficiency in English than older people due to its prevalence in education and media, and the association of English with socioeconomic growth. Thus, English could have an effect on their production of Tagalog vowels due to extensive language contact.

ELU was the second significant predictor for the F1 and F2 values of [o], [u] and [e]. The F1 of [o] had a negative relationship with ELU, indicating that participants who had a higher ELU score produced their [o] lower than those with lower ELU. As for F2 values, the F2 of [e] was negatively correlated with ELU, which means that speakers in the sample who had a lower ELU were more likely to produce a higher F2. On the other hand, F2 of [u] and ELU were positively correlated. Thus, speakers with a higher ELU were producing their [u] more towards the front of the mouth than those who had a lower ELU. The aforementioned hierarchical relationship between Tagalog and English could play a role in this shift, as the majority language (English) may be influencing pronunciation in the minority language (Tagalog). This might be due to the implications of lessening the Filipino accent in English bleeding into the speakers' pronunciation in Tagalog.

The results found in the present paper are also in line with the claim made by Delos Reyes et al. (2009) about the variance that [o] and [u] show in terms of acoustic characteristics. The argument is stronger for [u] shifting towards [ʊ], due to the strong relationship of ELU and its F2. The fronted position of the [u] might indicate that it is starting to shift to becoming [ʊ], a phone which is present in American English, but not Tagalog. The data from the present paper also adds to the findings from Umbal and Nagy (2021) who investigated the approximation of /r/ amongst Filipino-Canadians, and found that those who were more English-oriented had a preference for the approximant rather than the trill or tap. The relationship of high ELU and a fronted [u] could probably explain the shift, as the fronting might be the consequence of higher rates of using English.

One finding that was different from the claim made by Delos Reyes et al. (2009) was the possible age-related shift that was found in the F2 of [a] which shows how the younger speakers in the sample had a higher F2 average compared to the older speakers. This result is not in line with the findings by the authors because they stated that, overall, [a] did not show variance in its

pronunciation in their study. Before the arrival of Spanish and English in the Philippines, [a], [i] and [u] were part of the original vowel space and already fit into existing phoneme categories, whereas [e] and [o] were more recently introduced into the language. By definition, [e] and [o] are not considered structure-preserving and show the possibility of changing phoneme categories. While ambiguity avoidance could be a reason for this instability, there is not enough literature to suggest this as a concrete explanation for what is happening to Tagalog vowels. Further research must be done to establish whether its status as a stable vowel could be changing.

4.2. Limitations of the study

A key issue that the study faced was the lack of diversity in the participants and the amount of participants itself. The data was collected from six speakers, of which four were female and two were male. The imbalance in the sex of the participants could complicate the interpretation of the significant results for F1 of [o], which stated that males produced their [o] at a lower position than the females did. However, this might also be difficult to interpret as a solid relationship due to the larger number of females in the sample. If the participant population were more diverse, it would have been ideal if there were a more or less equal number of males and females, and that there was sufficient variation in ELU between both genders for a fairer comparison.

The same can be said for the diversity in the age of the population and the relationship that age has with ELU. All of the younger speakers in the sample scored the maximum amount for ELU, which does not allow for a proper analysis of whether ELU or Age actually has an effect on the production of vowels. The younger speakers were also all female, which further convolutes the analysis of data as it is unclear which interactions were actually responsible for the variety in pronunciation of certain vowels, such as [u].

The methodology for the experiment also proved to be a challenge, as the online setting meant that participants could opt to stop the experiment of their own free will. This method of collection was fitting due to the study being an experimental phonetic one, however, it is still important to address its downsides. On-site collection of data might have been beneficial as it would have allowed for some of the participants to have completed the task. In total, there were 12 participants who at least started the programme but did not go through with the task. Two out of eight of the participants who had done at least some of the word-list reading task did not have

access to a device with a clearer microphone which affected the amount of participants' data that could have been used for the study.

4.3. Opportunities for future research

The study mainly focused on Tagalog-English speakers who lived in the Metro Manila area. It might be beneficial to investigate different contexts in which sound change could occur, such as language contact between Tagalog and English in the Filipino diaspora community. Many Filipinos are known to migrate for work or other purposes, and are required to use English at a higher rate and perhaps at a higher proficiency than homeland speakers might. There may be a greater chance of English having an effect on Tagalog when the speakers live in a context where they are not surrounded by Tagalog through other speakers or the media that is available to them, which was seen in the findings by Umbal and Nagy (2021). The paper compared the use of the approximated /r/ between homeland speakers, first-generation Filipino-Canadian immigrants, and heritage speakers. Those who had the most exposure to English, the heritage speakers, were more likely to use the approximated /r/. It would be possible to expand on this research by also investigating vowel production between these three groups of speakers.

The paper by Sicam and Lucas (2016) investigated the language attitudes of adolescent Filipinos towards English and Filipino, and found that upper-class Tagalog-English bilinguals had a more positive attitude toward English. There is room to expand upon this finding, such as taking socioeconomic class into account when investigating the sound change of vowels in Tagalog. Since English is primarily associated with the upper class in the Philippines, it is possible that their more positive attitude towards it could make them more English-oriented, which can be a factor for sound change. This idea is supported by the findings in Umbal and Nagy (2021), where heritage speakers had a preference for using the approximated /r/ instead of the trill or tap which is considered to be the standard for Tagalog.

5. Conclusion

The present paper aimed to investigate the vowel productions of Tagalog-English bilinguals in Metro Manila. The target vowels were the five vowels of Tagalog, namely [a], [e], [i], [o], and [u]. A hierarchical relationship between Tagalog and English was established, where Tagalog is the minority language, and English is the majority language due to its reputation as a language of

progress and prestige. The study by Sicam & Lucas (2016) supported this assumption as an association was revealed between socioeconomic status and English among adolescent Filipino-English bilinguals. The paper found that those who had a higher socioeconomic status were more likely to have a more positive attitude toward English than those with a lower socioeconomic status.

The study was conducted online, where participants had to complete a word-list reading task where they read individual words outside of the context of a sentence. The F1 and F2 values of each target vowel were extracted from the words and compared against age, gender, and English Language Use. Mixed linear regression models were used to analyse the relationships between the dependent and independent variables.

The results of the models indicate that [o] and [u] vary in their F1 and F2 values in relation to age and ELU. The F1 of [o] is higher in older speakers than those in younger speakers, and this could mean that there is a shift in the way younger speakers are pronouncing their [o]. Younger Tagalog-English bilinguals might be more likely to produce their [o] at a higher position in the vocal tract, which would be closer to [ʊ] in terms of acoustic patterns. The F2 values of [u] also showed a positive relationship with age, which could mean that older people in the sample were producing their [u] more fronted.

ELU was also a significant predictor for the F1 values of [o], where a higher F1 value was correlated with a higher ELU. Those who feel more comfortable with using English, and also use it more often in daily speech could be producing their [o] in a lower position than those who have a lower ELU. There was also a positive relationship found between the F2 values of [u] and ELU, which could mean that those who have a higher ELU were producing their [u] in a more fronted position.

The similarities of production for [o] and [u] were found in a previous study by Delos Reyes et al. (2009), which proposed that these two vowels were merging into [ʊ]. The results in the present paper replicated this finding. The vowel space in Figure 2 showed that [o] and [u] were not far apart in terms of frequency values, as they clustered towards the same general area. Delos Reyes et al. (2009) did not provide a reason as to why this is happening, but in terms of the results found here, it is possible that there is a historical shift taking place. The vowel [o] was added later on in the language after the arrival of the Spanish and the Americans, but in general, it is differentiated from [u] in terms of orthography and production. However, the contrast in

production might be disappearing due to extensive language contact with English. The differences found between older and younger speakers in the sample could also indicate a diachronic change for [o] and [u]. While it is not yet certain that [o] and [u] will merge into [ʊ], they are showing more acoustic similarities than contrasts. Tagalog might continue to change due to the influence of English, and it may extend beyond the scope of these vowels.

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Appendix A

Questionnaire for collecting biographical information about participants

Questions	**Answers**
What is your age? (in years)	
What is your gender?	Male / Female / Other
Do you currently reside in the Metro Manila area?	Yes / No
Is Tagalog your native language?	Yes / No
Is English your second language?	Yes / No
How often do you use English in your daily life?	Rarely / Not that much / Sometimes / Often / Very often
How comfortable are you with using English?	Not comfortable / Somewhat comfortable / Comfortable / Quite comfortable / Very comfortable

Appendix B

Stimuli used in word-list reading task
Words were selected on a frequency basis (Q1 - low, Q3, high).

ItemNum	Item	Q
1	tugunan	Q1_a
2	bakod	Q1_a
3	aling	Q1_a
4	hilaw	Q1_a
5	sinakop	Q1_a
6	tugunan	Q1_a
7	tumalo	Q1_a
8	bumitaw	Q1_a
9	itak	Q1_a
10	dagok	Q1_a
11	inawit	Q1_a
12	binyag	Q1_a
13	putahe	Q1_a
14	buhangin	Q1_a
15	dumayo	Q1_a
16	dukha	Q1_a
17	punta	Q1_a
18	plato	Q1_a

19	meron	Q1_e
20	pasensya	Q1_e
21	krimeng	Q1_e
22	teka	Q1_e
23	kapareho	Q1_e
24	direkta	Q1_e
25	bodega	Q1_e
26	kumbento	Q1_e
27	kulelat	Q1_e
28	babaero	Q1_e
29	minero	Q1_e
30	sentido	Q1_e
31	bangketa	Q1_e
32	puwersang	Q1_e
33	kuweba	Q1_e
34	porke	Q1_e
35	umento	Q1_e
36	peso	Q1_e
37	iwas	Q1_i
38	ikot	Q1_i
39	alis	Q1_i
40	darating	Q1_i
41	balahibo	Q1_i

42	mapait	Q1_i
43	bitay	Q1_i
44	tanim	Q1_i
45	maruming	Q1_i
46	naulila	Q1_i
47	baliw	Q1_i
48	daig	Q1_i
49	kahawig	Q1_i
50	makalikom	Q1_i
51	abiso	Q1_i
52	anino	Q1_i
53	kalakip	Q1_i
54	hagupit	Q1_i
55	tutok	Q1_o
56	olat	Q1_o
57	obra	Q1_o
58	bugbog	Q1_o
59	sipon	Q1_o
60	kulong	Q1_o
61	tuyong	Q1_o
62	sabon	Q1_o
63	kabuntot	Q1_o
64	unggoy	Q1_o

65	pukol	Q1_o
66	pobreng	Q1_o
67	lubog	Q1_o
68	naupo	Q1_o
69	pakulo	Q1_o
70	pabango	Q1_o
71	yumuko	Q1_o
72	basyo	Q1_o
73	unan	Q1_u
74	malunod	Q1_u
75	upa	Q1_u
76	asunto	Q1_u
77	uling	Q1_u
78	ubod	Q1_u
79	gayun	Q1_u
80	tinuran	Q1_u
81	ibinuhos	Q1_u
82	suhol	Q1_u
83	isuko	Q1_u
84	ginugol	Q1_u
85	sekyu	Q1_u
86	sakupin	Q1_u
87	dudang	Q1_u

88	kumot	Q1_u
89	mamuno	Q1_u
90	bangungot	Q1_u
91	isda	Q3_a
92	akin	Q3_a
93	ikaw	Q3_a
94	ating	Q3_a
95	siya	Q3_a
96	iyan	Q3_a
97	ilan	Q3_a
98	iba	Q3_a
99	amin	Q3_a
100	amo	Q3_a
101	ilang	Q3_a
102	ibang	Q3_a
103	dahil	Q3_a
104	estado	Q3_a
105	namin	Q3_a
106	natin	Q3_a
107	bakit	Q3_a
108	klase	Q3_a
109	konsepto	Q3_e
110	problema	Q3_e

111	pero	Q3_e
112	presyo	Q3_e
113	kumpleto	Q3_e
114	aspeto	Q3_e
115	gobyerno	Q3_e
116	tren	Q3_e
117	kapareha	Q3_e
118	heto	Q3_e
119	puwesto	Q3_e
120	premyo	Q3_e
121	tema	Q3_e
122	petsa	Q3_e
123	poder	Q3_e
124	kuwento	Q3_e
125	pera	Q3_e
126	meron	Q3_e
127	testigo	Q3_i
128	ilog	Q3_i
129	itim	Q3_i
130	damit	Q3_i
131	pansin	Q3_i
132	kagabi	Q3_i
133	dito	Q3_i

134	isyu	Q3_i
135	buntis	Q3_i
136	naging	Q3_i
137	dalhin	Q3_i
138	salarin	Q3_i
139	pamilya	Q3_i
140	malaking	Q3_i
141	kapatid	Q3_i
142	gawin	Q3_i
143	sino	Q3_i
144	pulis	Q3_i
145	oras	Q3_o
146	opisyal	Q3_o
147	manok	Q3_o
148	ngayon	Q3_o
149	tao	Q3_o
150	inyo	Q3_o
151	kotse	Q3_o
152	iyo	Q3_o
153	itong	Q3_o
154	linggo	Q3_o
155	likod	Q3_o
156	bilyon	Q3_o

157	tungkol	Q3_o
158	gusto	Q3_o
159	mundo	Q3_o
160	tuloy	Q3_o
161	dugo	Q3_o
162	pinto	Q3_o
163	upang	Q3_u
164	uri	Q3_u
165	ayusin	Q3_u
166	nung	Q3_u
167	iyun	Q3_u
168	shabu	Q3_u
169	isinulat	Q3_u
170	ulit	Q3_u
171	kunin	Q3_u
172	utang	Q3_u
173	ukol	Q3_u
174	ulat	Q3_u
175	suspek	Q3_u
176	tulad	Q3_u
177	muna	Q3_u
178	tulong	Q3_u
179	kulay	Q3_u

180 mahusay Q3_u

Appendix C

Code in R used to extract the stimuli

```
tagalog_words <- read.csv("tgl_community_2017-words copy.csv", header = FALSE
, sep = "\t")

tagalog_words <- tagalog_words[, -2]
colnames(tagalog_words) <- c("ID", "Word", "Frequency")


tagalog_words <- tagalog_words[grepl("^[A-Za-z]", tagalog_words[, 2]) & tagal
og_words[, 2] != "", ]
tagalog_words <- tagalog_words[!grepl("^[A-Z]", tagalog_words[, 2]), ]
rows_with_empty <- apply(tagalog_words, 1, function(row) any(row == ""))
which(rows_with_empty)

## named integer(0)

tagalog_words <- tagalog_words[!rows_with_empty, ]
tagalog_words <- tagalog_words[tagalog_words$Frequency >= 100, ]

# Convert the Frequency column to log10
tagalog_words$LFrequency <- log10(tagalog_words$Frequency)


# Step 1: Calculate quantiles
tagalog_words$LFrequency <- log10(tagalog_words$Frequency)
Q1_log <- quantile(tagalog_words$LFrequency, 0.3)
Q3_log <- quantile(tagalog_words$LFrequency, 0.7)

# Step 2: Split into Q1 and Q3 groups only
Q1_data <- tagalog_words[tagalog_words$LFrequency <= Q1_log, ]
Q3_data <- tagalog_words[tagalog_words$LFrequency >= Q3_log, ]

# Step 3: Vowel and position check function
specific_vowels <- c("a", "e", "i", "o", "u")

check_vowel_position <- function(word, vowel) {
  word <- tolower(word)
  medial_vowel <- if (nchar(word) > 2) {
    grepl(vowel, substr(word, 2, nchar(word)-1))
  } else {
    FALSE
  }
  c(
    initial = grepl(paste0("^", vowel), word),
    medial  = medial_vowel,
    final   = grepl(paste0(vowel, "$"), word)
```

```
  )
}

# Step 4: Generate vowel-position lists
get_vowel_position_lists <- function(df) {
  result <- list()
  for (vowel in specific_vowels) {
    result[[vowel]] <- list()
    pos_matrix <- t(sapply(df$Word, check_vowel_position, vowel = vowel))
    for (position in c("initial", "medial", "final")) {
      matched_words <- df$Word[pos_matrix[, position]]
      result[[vowel]][[position]] <- df[df$Word %in% matched_words, c("Word",
"Frequency")]
    }
  }
  return(result)
}

# Step 5: Create nested list for Q1 and Q3 only
vowel_positions_by_quartile <- list(
  Q1 = get_vowel_position_lists(Q1_data),
  Q3 = get_vowel_position_lists(Q3_data)
)

# View words in Q1 group starting with "a"
vowel_positions_by_quartile$Q1$a$initial
```

Appendix D

Code for processing data and models used for statistical analysis

```
myData <- read.csv('/Users/indy/Library/CloudStorage/OneDrive-UvA/BA Thesis/result.csv', sep = '\t')
myData$isHigh <- 0
myData$Age <- 0
myData$English <- 0


myData$Age[myData$Subject == 851830] <- 21
myData$Age[myData$Subject == 24812] <- 21
myData$Age[myData$Subject == 128015] <- 21
myData$Age[myData$Subject == 698709] <- 63
myData$Age[myData$Subject == 606885] <- 37
myData$Age[myData$Subject == 603523] <- 59

myData$English[myData$Subject == 24812] <- 2
myData$English[myData$Subject == 128015] <- 2
myData$English[myData$Subject == 603523] <- 1
myData$English[myData$Subject == 606885] <- 1
myData$English[myData$Subject == 698709] <- -1
myData$English[myData$Subject == 851830] <- 2


myData$isHigh <- ifelse(myData$Word < 91, -0.5, +0.5) # code low as -0.5 high as +0.5
myData$Gender <- ifelse(myData$Gender == 'M', -0.5, +0.5) # code M as -0.5, F as +0.5

library(dplyr)

myData_clean <- myData %>%
  filter(trimws(Vowel) != "")

# Data normalisation using the Lobanov method
myData_clean |>
  select(Subject, Gender, Age, English, Word, isHigh, Vowel, F1, F2) -> vowels_focus

vowels_focus |>
  group_by(Subject, Vowel) |>
  mutate(mahal = joeyr::tidy_mahalanobis(F1, F2),
         mahal_sq = sqrt(mahal)) |>
  filter(mahal_sq <= 2) |>
  ungroup() -> vowels_inlie

vowels_inlie |>
  group_by(Subject) |>
```

```
  mutate(F1_z = scale(F1),
         F2_z = scale(F2)) -> vowels_zscore2

vowelA <- subset(vowels_zscore2, vowels_zscore2$Vowel == 'a')
vowelE <- subset(vowels_zscore2, vowels_zscore2$Vowel == 'e')
vowelI <- subset(vowels_zscore2, vowels_zscore2$Vowel == 'i')
vowelO <- subset(vowels_zscore2, vowels_zscore2$Vowel == 'o')
vowelU <- subset(vowels_zscore2, vowels_zscore2$Vowel == 'u')

library(afex)

modelA_F1 <- mixed(formula = F1_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelA, method='PB', return = "full")

modelE_F1 <- mixed(formula = F1_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelE, method='PB', return = "full")

modelI_F1 <- mixed(formula = F1_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelI, method='PB', return = "full")

modelO_F1 <- mixed(formula = F1_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelO, method='PB', return = "full")

modelU_F1 <- mixed(formula = F1_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelU, method='PB', return = "full")



modelA_F2 <- mixed(formula = F2_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelA, method='PB', return = "full")

modelE_F2 <- mixed(formula = F2_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelE, method='PB', return = "full")

modelI_F2 <- mixed(formula = F2_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelI, method='PB', return = "full")

modelO_F2 <- mixed(formula = F2_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelO, method='PB', return = "full")

modelU_F2 <- mixed(formula = F2_z ~ Gender + isHigh + Age + English + (1|Subj
ect), data = vowelU, method='PB', return = "full")



summary(modelA_F1)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: F1_z ~ Gender + isHigh + Age + English + (1 | Subject)
##    Data: data
##
```

```
##      AIC      BIC   logLik deviance df.resid
##    190.1    210.7    -88.0    176.1      135
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.53887 -0.75979 -0.00903  0.59717  2.87333
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  Subject  (Intercept) 0.006621 0.08137
##  Residual             0.197502 0.44441
## Number of obs: 142, groups:  Subject, 6
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   1.724857   0.451837  11.481014   3.817  0.00265 **
## Gender        0.257239   0.351051  53.865321   0.733  0.46688
## isHigh        0.107105   0.074967 137.271433   1.429  0.15536
## Age          -0.001512   0.007596  11.086371  -0.199  0.84587
## English      -0.058370   0.213160  24.522342  -0.274  0.78651
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##         (Intr) Gender isHigh Age
## Gender   0.731
## isHigh   0.054  0.077
## Age     -0.984 -0.690 -0.057
## English -0.935 -0.901 -0.064  0.896
```