THE ACOUSTICS OF BORROWED /ɚ/ IN QUEBEC FRENCH

Massimo Lipari *[1]
[1]Department of Linguistics, McGill University, Montreal, Quebec

1 Introduction

The English rhotic vowel /ɚ/ (as in soccer, /sɑkɚ/), produced with a bunched or retroflexed tongued and characterized by a uniquely low third formant, is a cross-linguistically rare sound. When a word containing it is borrowed into a language which lacks such a phoneme, some repair must take place to adapt the loanword to the donor language's phonology—a wide variety of strategies are known to be available in such cases, with varying degrees of acoustic fidelity to the original form [1]. Speakers of Quebec French have been claimed to variably employ three methods of adapting English /ɚ/ (cf. [2]). First, the donor language pronunciation may be simply ignored, instead using the orthography and the typical grapheme-to-phoneme mapping of the recipient language (e.g. [sɔk**ɛʁ**] for *soccer*, with different spellings resulting in different vowel qualities). Second, the (phonetically or phonologically/featurally) most similar native phoneme may be substituted for the offending sound (typically /œ/, e.g. [sɔk**œʁ**]). Third, the missing phoneme may be borrowed wholesale (e.g. [sɔkɚ]), creating new (marginal) contrasts.

Despite this claim, loanword /ɚ/ in Quebec French has received little attention in the literature (with the notable exception of [3]). In particular, its acoustics have remained entirely unstudied: the degree of success in emulating the rhoticity (low F3) of the English vowel, as well as the borrowed vowel's relationship to the similar native phonemes /œ/ and /ø/, are unknown. The present paper is a pilot study aimed at addressing these gaps.

2 Data & Methods

The data are from a purpose-built expansion of Milne's *AssNat* corpus [4], a collection of recordings of parliamentary proceedings of the National Assembly of Quebec. For ease of data collection and analysis, all 317 tokens of the loanword vowel—henceforth referred to as X, due to its variable realization—are taken from a single word, *Orford* (a place name of English origin), across 26 speakers. From these same speakers, 797 tokens of /œ/ and 1,157 tokens of /ø/ from the most similar licit phonotactic environment (final syllables closed by a rhotic for the former and final open syllables for the latter) are included for comparison. All formant values are normalized using the *Nearey2* method [5] (albeit using the by-speaker mean of phoneme log means instead of the raw log mean). F1 and F2 are measured at vowel midpoint, whereas F3 is measured at its minimum (capturing the point of greatest rhoticity). Overlap in empirical F1 × F2 × F3 distributions between X and each of the two native phonemes of interest (first averaging all tokens of a given word for /œ/ and /ø/) is calculated using Pillai scores, as per [6, 7].

* massimo.lipari@mail.mcgill.ca

3 Results

3.1 Rhoticity of loanword /ɚ/

Averaging first within then across speakers, mean F3 of X (0.475) is significantly lower than that of /œ/ (0.673, $p < 0.001$) and that of /ø/ (0.595, $p < 0.001$), suggesting that the borrowed vowel often preserves its rhoticity. However, the realization of X is subject to much inter-speaker variability (σ of speaker averages = 0.096)—significantly more so than /œ/ ($\sigma = 0.043$, $p < 0.001$) and /ø/ ($\sigma = 0.048$, $p < 0.001$). This is also shown in **Figure 1**. While most speakers have a sizeable difference in F3 between X and the other vowels, and while the general trend of lower F3 in X than in the other vowels is visible for all but two speakers, a minority have little difference between the categories: for all members of this latter group, F3 of X is particularly high.

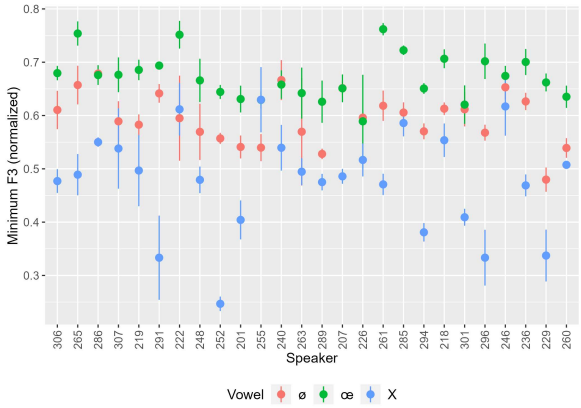


Figure 1: Minimum F3 (μ and σ) by vowel and speaker.

3.2 Relation with /œ/ and /ø/

On average, F2 of X (0.161) is significantly lower than that of /œ/ (0.216, $p < 0.001$) or /ø/ (0.269, $p < 0.001$), indicating a more posterior constriction. Here too, however, X ($\sigma = 0.087$) is significantly more variable than the other vowels: $\sigma = 0.055$ for /œ/ and $\sigma = 0.043$ for /ø/ ($p < 0.001$ in both cases). **Figure 2**, which depicts by-speaker F1 × F2 spaces with 1σ ellipses, shows that the observed variance in F2 is due to a bimodal distribution of speakers, with many producing X with near identical frontness as /œ/ (or even as the slightly fronter /ø/) but some clearly producing a back vowel (consistent with an [ɔ] articulation, which is expected on the orthography-based strategy).

Conversely, in terms of average F1, X (− 0.905) is intermediate between /œ/ (− 0.616) and /ø/ (− 1.12), but significantly different from both ($p < 0.001$ for both tests).

Unlike for F3 and F2, here X is only significantly more variable than /ø/ ($\sigma = 0.12$ vs $\sigma = 0.054$, $p < 0.001$): the difference between X and /œ/ ($\sigma = 0.12$) is negligeable and non-significant ($p = 0.73$). Here (as seen in **Figure 2**), two kinds of speakers can be identified: those who maintain a three-way height distinction between the vowels (the majority) and those who have some degree of overlap between X and /ø/ on the F1 dimension (a minority).

For the average speaker, the F1 × F2 × F3 Pillai score comparing the distributions of X and /ø/ (0.68, $\sigma = 0.17$) is lower than that comparing the distributions of X and /œ/ (0.78, $\sigma = 0.17$), indicating greater overlap between categories in the former case. As seen in **Figure** 3, this holds for most speakers, although a small number exhibit the opposite pattern. In any case, the observed Pillai scores suggest that most speakers maintain a category distinction between X and the other two vowels.

4 Discussion and Conclusions

The present study confirms that the acoustics of English loanword /ɚ/ in Quebec French is subject to much variation across speakers. Nevertheless, the range of variability observed cannot be reduced to the three strategies outlined in Section 1. To be sure, there is evidence for an orthography-based variant (in this case, [ɔ]). A handful of speakers, moreover, show some evidence of substitution of a native phoneme (as reflected in their low Pillai scores)—although interestingly, contrary to traditional descriptions, both [œ] and [ø] are possible variants. Of the remaining speakers, however, the degree of rhoticity observed is variable: while some (e.g., 252) produce X with low F3, others (e.g., 248 and 285) achieve only mild or no rhoticity while still maintaining relatively high distinctness from /œ/ and /ø/ (especially on the F1 dimension). That is, it is possible for speakers to acquire a distinct category for X which does not wholly successfully emulate the acoustic signature of the vowel in the donor language.

While this result is novel and intriguing, further investigation is required to ascertain its robustness. Most notably, more data are needed, with a particular eye to increasing the number of speakers and extending the study beyond the single lexical item *Orford*.

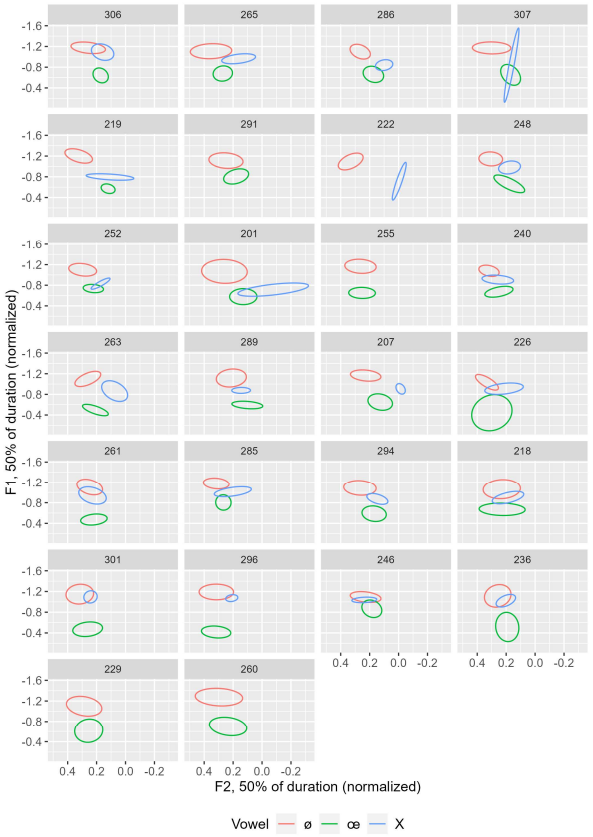


Figure 2: F1× F2 distributions by vowel and speaker.

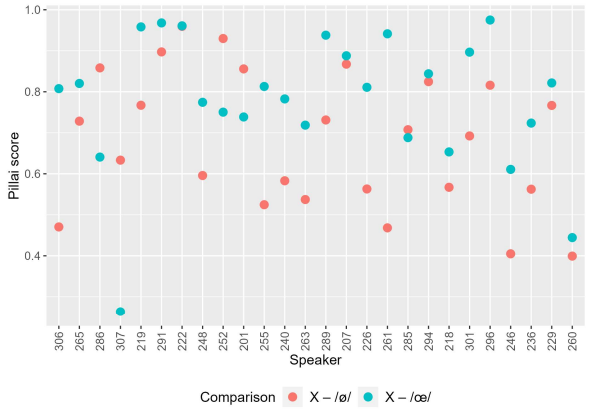


Figure 3: Pillai scores for X – /ø/ and X – /œ/ by speaker.

Acknowledgments

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