The development of rhoticity in the Quebec French vowel system

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Background: Rhoticity in vowels, where a bunched or retroflexed tongue gesture results in low F3 (like in North American English /ɚ/), is a considerably rarer development in sound systems cross-linguistically than other features like tenseness or nasality contrasts [1]: the reasons for this are not well understood. Quebec French (QF), which is reportedly developing rhoticity in the front mid rounded vowels (FMRVs) /ø/ and /œ/ [2], as well as /œ̃/ [3,4], offers a unique opportunity to investigate the reasons for this asymmetry. Rhotacization in QF, however, has remained understudied from a diachronic perspective: existing literature is unclear on the source of the change and the role of social factors. Dumas [2] finds that men, who have more exposure to English than women (through greater participation in the workforce), rhotacize more, pointing to a contact explanation—/ø/ and /œ/ change under the influence of English /ɚ/, with which they alternate in loanwords (e.g., toaster: [tostɚ] ~ [tostø] ~ [tostœʁ]). Conversely, Mielke [3,4] finds no gender effect, and concludes that rhoticity results from system-internal pressures to enhance weak phonological contrasts—the class of FMRVs changes to become more distinct from their unrounded counterparts /e, ɛ, ɛ̃/. This study uses a QF spontaneous speech corpus to (1) provide a more complete description of the development of vowel rhoticity in QF in recent years and (2) evaluate hypotheses (contact and contrast enhancement) as to the source of the change, with the aim of helping explain the typological rarity of rhotacization sound changes.

Data & methods: Data are from an expansion of Milne's force-aligned corpus of parliamentary speech [5], with 106 native speakers (42 F, 64 M) born 1941–1991. 2,591 tokens of /ø/, 2,689 of /œ/, and 2,749 of /œ̃/ from word-final (accented) syllables were extracted. Formant trajectories were measured (sampled every 5 ms, interpolated to 21 points) using *PolyglotDB* [6]'s "refinement" algorithm (described in [7]), and normalized via the Nearey2 method [8]. F3 for each vowel was modelled with separate *generalized additive mixed models* [9]. Non-linear smooths over MEASUREMENT and YEAR OF BIRTH were allowed to vary by GENDER, and appropriate by-speaker and by-word random smooths were included. F3 predictions were obtained at 21 MEASUREMENT points and visualized by (1) taking the minimum value (= point of greatest rhoticity) for ease of interpretation or (2) visualizing the entire trajectory.

Results: F3 of /ø/ begins lowest of the three vowels and decreases across the observed period (**Fig. 1**). The other two vowels begin with similarly high F3 values; however, /œ/ shows no evidence of change, whereas F3 decreases sharply in /œ̃/, ultimately bringing it in line with /ø/. **Fig. 2** reveals marked GENDER differences. Men have relatively low F3 in /ø/ and /œ̃/: /ø/ remains stable over time and /œ̃/ exhibits a shallow decrease, consistent with a change approaching completion. Women begin with high F3 in both vowels and exhibit a decrease throughout the time range (esp. in /œ̃/), overtaking men by ~1970. Examining F3 trajectories by GENDER (**Fig. 3**) confirms these patterns, revealing uniform lowering of the /ø/ and /œ̃/ trajectories for women, with little change for men, and no change in either group for /œ/.

Discussion: These results do not neatly support either account: the spread of rhoticity to /œ̃/ is not predicted by Dumas, and the absence of change in /œ/ is not predicted by Mielke. Instead, we argue for a hybrid account: initial borrowing of rhoticity in /ø/ by men gives way to a change driven by enhancement (of the /ø ~ œ/ and /œ ~ œ̃/ contrasts) led by women. The finding of no change in /œ/ clashes with both Dumas and Mielke—but not, however, Saint-Amant Lamy [10]—and warrants further investigation. The proposed pathway for the development of rhoticity relies on circumstances particular to Quebec French—the presence of rhoticity in some part of the phonological system for independent reasons (in this case, borrowing) in addition to internal phonological pressures. Since this exact combination of factors is itself uncommon, the rarity of rhotacization changes is neatly explained.

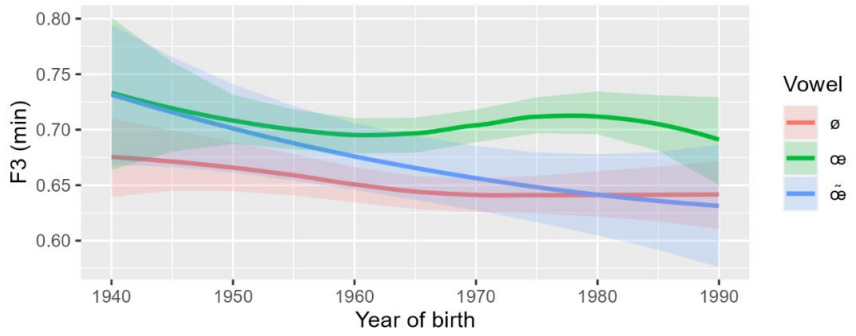

Fig. 1. Predicted change over time in minimum F3 for each vowel.

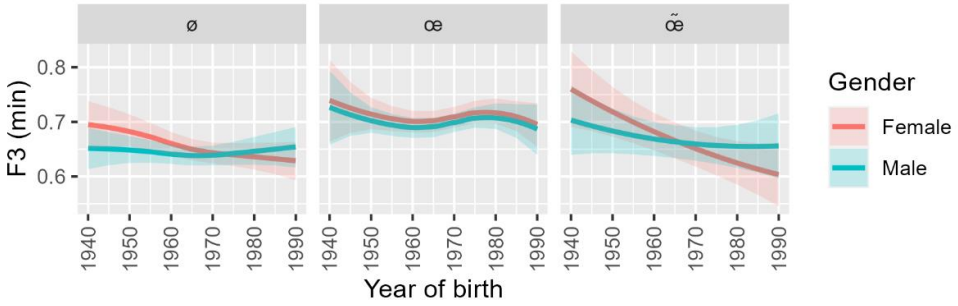

Fig. 2. Predicted change over time in minimum F3 for each vowel, by gender.

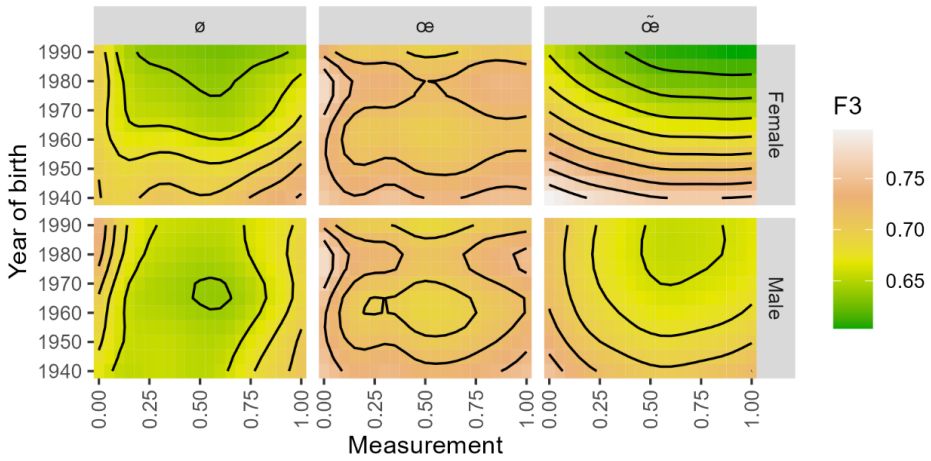

Fig. 3. Predicted change in F3 trajectory shape over time for each vowel, by gender.

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