Deepthi Gopal
Uppsala universitet
deepthi.gopal@lingfil.uu.se

Variation, gradience & categoricity in the Turkish mid vowels

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Stephen Nichols
University of Oxford, University of Essex
sn21014@essex.ac.uk

In a nutshell

- In present-day Turkish, **/e ø/** are lowered before /n l r m (z v?)/.
- **This project**: investigate change in **/e/** across a corpus of 24 speakers with birth years spanning an **84-year period**, 1902–1986.
- Pre-obstruent, pre-sonorant and open-syllable /e/ **diverge in apparent time**; but pre-sonorant realisations of /e/ are **largely self-similar within-category** (so far).
- Implications for the phonetic basis of this sound change…

Introduction & background

In (Standard) Turkish, the front mid vowel **/e ø/** are lowered to **[æ œ]** in syllables closed by (non-vocoid) sonorant codas **/r l m n/**; for some speakers also **/z v/**.

/e ø/ ⟶ [æ œ] / _ {r l m n}]$_\sigma$

/biber-i/	[bi.be.ri]	'pepper-ACC'	/ʃofør-y/	[ʃo.fø.ry]	'driver-ACC'
/biber/	[bi.bær]	'pepper'	/ʃofør/	[ʃo.fœr]	'driver'
/hejkel-e/	[hej.ke.le]	'statue-DAT'	/gøl-yn/	[gø.lyn]	'lake-GEN'
/hejkel/	[hej.kæl]	'statue'	/gøl/	[gœl]	'lake'

For many present-day speakers, these different realisations of **/e/** are **discontinuous in phonetic space** and strongly **sensitive to resyllabification** (above), with a similar effect of smaller size found for **/ø/**. Fig. 1, taken from Gopal & Nichols (in prep.), represents our previous production study of 11 female speakers.

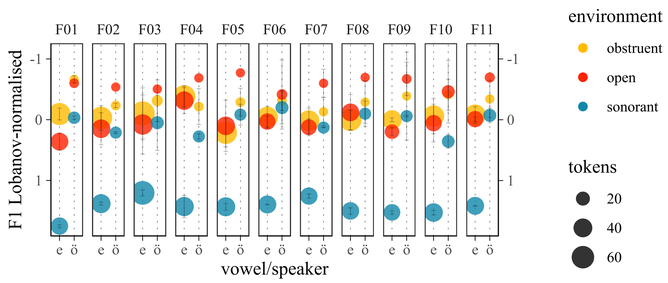

Fig. 1: F1 space for /e/ (left) and /ø/ (right) by coda type for each of 11 female speakers.

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This previous work represented less than 30 years' apparent time (birth years **1980–1997**; little meaningful **diachronic change**, but some **individual variation** in the relative ordering of the three categories (but not in relative ordering within-category).

Diachrony (and what we don't know)

Descriptive work (Lewis 1967, Underhill 1976, Kornfilt 1997, Göksel & Kerslake 2005, 2010, Yavuz & Balcı 2011, Ketrez 2012) notes existence, but **varies**, consistent with the idea that this might be a **relatively recent** development. Lewis (1967) refers *only* to **raising in unstressed open syllables**; later descriptions distinguish **pre-sonorant** realisations, those in **final/stressed open syllables** and remaining environments. However, this is mostly impressionistic: there has been **almost no empirical work** on the realisation of Turkish /e ø/ either synchronically or diachronically (though see Gopal & Nichols 2016/17, in prep.).

The relationship of this pattern to possible phonetic precursors is mismatched.

- Cross-linguistically, it is relatively **unusual** for rules of any type to involve the class of **all sonorants** (Mielke 2008), plausibly due to their **varied phonetic correlates**.
- Articulatory & acoustic properties of rhotics favour **lowering of pre-rhotic vowels** (Recasens 1991, Recasens & Pallarès 1999, Solé 2002, Proctor 2009) and lowering of mid vowels before coda rhotics is widely attested (Bradley 2010, Árnason 2011, Riad 2014, Storme 2017). **However, it is less clear that this holds for the other members of the class.**
- In Turkish, **/l/** is consistently strongly **palatalised** in all environments of this type (= significantly raised F2). The predicted transition into **/l/** from a preceding mid vowel therefore involves a **drop in F1** and a sharp **increase in F2**.
- **For modern speakers (Gopal & Nichols in prep.), however, there is no measurable difference between pre-sonorant realisations in phonetically favourable vs. phonetically unfavourable environments.**

What do we predict about earlier stages in the **phonologisation** of the pattern?

Methodology

We analyse a **corpus** composed of recordings of Turkish poets reading their own work scraped from `lyrikline.org`. All speakers are public figures, so metadata such as birth year and place of origin are readily available.

The corpus

- **24 speakers** (19 male, 5 female; birth years **1902–1986**, median 1957)
- **276 minutes** of (largely) continuous speech (median 10 minutes per speaker), with **12,630 tokens of /e/** in all (3,270 before tautosyllabic sonorants, 1,812 before tautosyllabic obstruents, 7,548 in open syllables).
- **This presentation**: 14 of the 24 speakers, all male.

Word & segment boundaries were manually edited, based on the output of first-pass automatic alignment using Praat. Measurements: average of **F1** and **F2** at the 25%, 50%, 75% points of the vowel; **duration** (in ms).

Results & discussion

There is **clear apparent-time change** across broad categories (Fig. 2), with pre-obstruent and open-syllable realisations diverging from pre-sonorant ones; but **no statistically significant distinction** between the **individual coda sonorants** (although not all speakers so far used all of them; extension required).

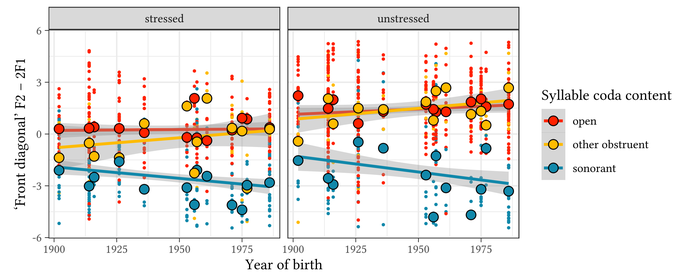

Fig. 2: Apparent-time change in the 'front diagonal' $F2 - 2 \times F1$ for /e/ by coda category.

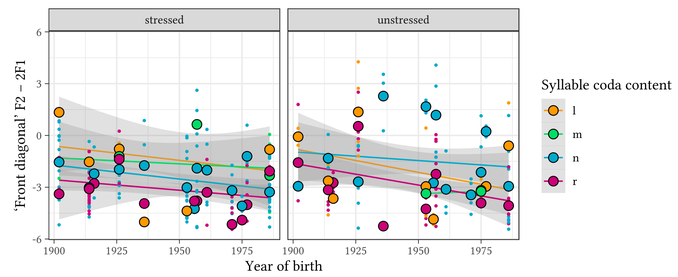

Fig. 3: Apparent-time change in $F2 - 2 \times F1$ for *pre-sonorant* /e/ by individual coda consonant.

Conclusions

- **Discontinuity** in **/e/** remarkably long-standing …
- But clear change over time in extent of patterning & transition from system in which unstressed open vowels *raise* to largely stress-independent system.
- But relatively insensitive to phonetic favourability throughout.

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