Beyond Midpoints: Vowel Dynamics of the Low-Back-Merger Shift
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BYU
BRIGHAM YOUNG
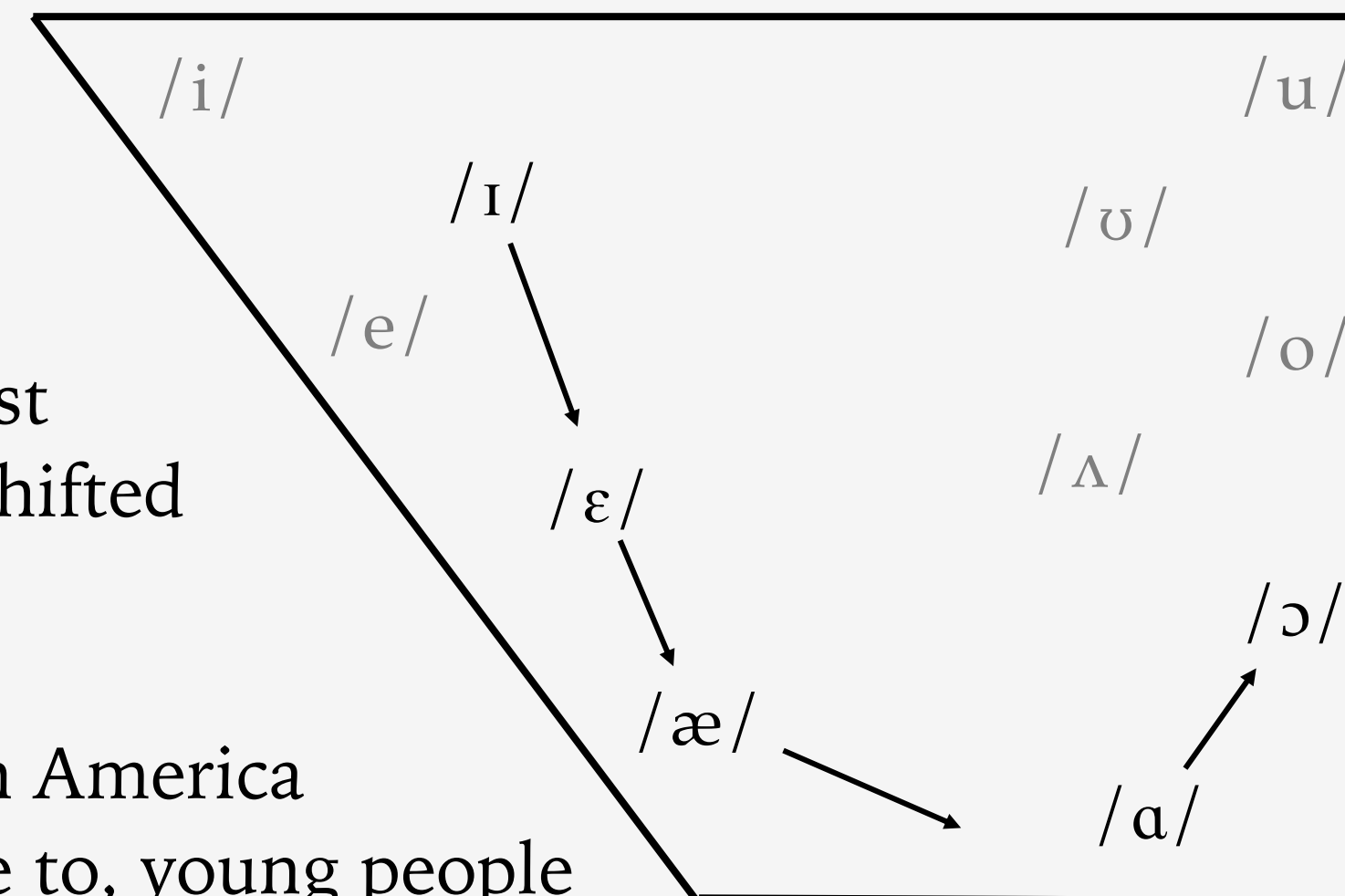UNIVERSITY

The Low-Back-Merger Shift (Becker 2019)

Description
- /æ, ɛ, ɪ/ lower and retract
- Arguably a chain shift
  - triggered by /ɑ/-retraction
  - Typically /æ/ shifts the most
  - /ɛ/ and especially /ɪ/ less shifted

Distribution
- Now widespread across North America
- Common in, but not exclusive to, young people

Lots of other research on indexicality (Adcock & Becker 2016, Becker & Swan 2019; D'Onofrio 2016, 2018; Pratt & D'Onofrio 2017, Van Hofwegen 2017, Villarreal 2016; Villarreal & Kohn 2021, and many others)
- Negative: shallow, materialist, unintelligent Valley Girl
- Positive: educated, formality, business professional
- Other: righteous indignation, Californianess

However!
Previous accounts are based on midpoints only.

This study describes acoustic patterns in vowel trajectories
in the Low-Back-Merger Shift.

Methods

Speakers
- Cowlitz County, Washington ▶
- 54 speakers (29F, 25M):
  - 1928–1946: Silent Generation
  - 1947–1964: Boomer Generation
  - 1965–1980: Generation X
  - 1981–1997: Millennial Generation
- Sociolinguistic interviews

You are here!
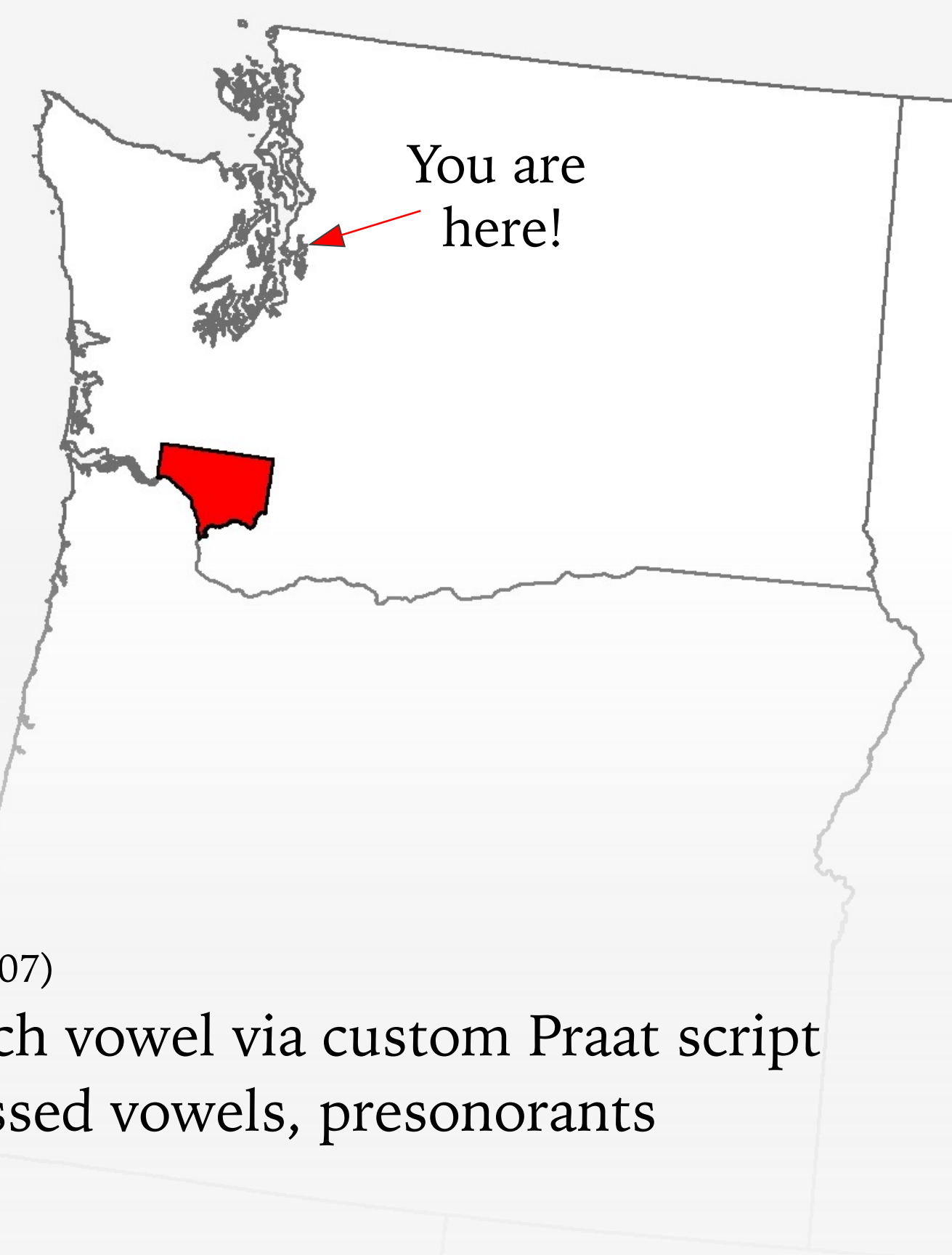
Processing
- Transcribed by hand
- Force-aligned with MFA (McAuliffe et al. 2007)
- F1-F2 extracted at 11 points along each vowel via custom Praat script
- Excluded outliers, stopwords, unstressed vowels, presonorants

Analysis
- Modeled using generalized additive mixed-effects modeling (Wood 2017a,b)
  - Ideally suited for analyzing vowel formant trajectories (cf. Sóskuthy 2017)

```
bam(hz_norm ~ s(percent, by=formant_sex_gen, k=4) +
              formant_sex_gen +
              log_dur * formant_sex_gen +
              s(word, formant, bs="re") +
              s(speaker, formant, bs="re");
    data=df, discrete=TRUE,
    rho=df_rho, AR.start=df$start_event)
```

Dependent variable is ANAE-normalized F1 and F2 measurements for all speakers.
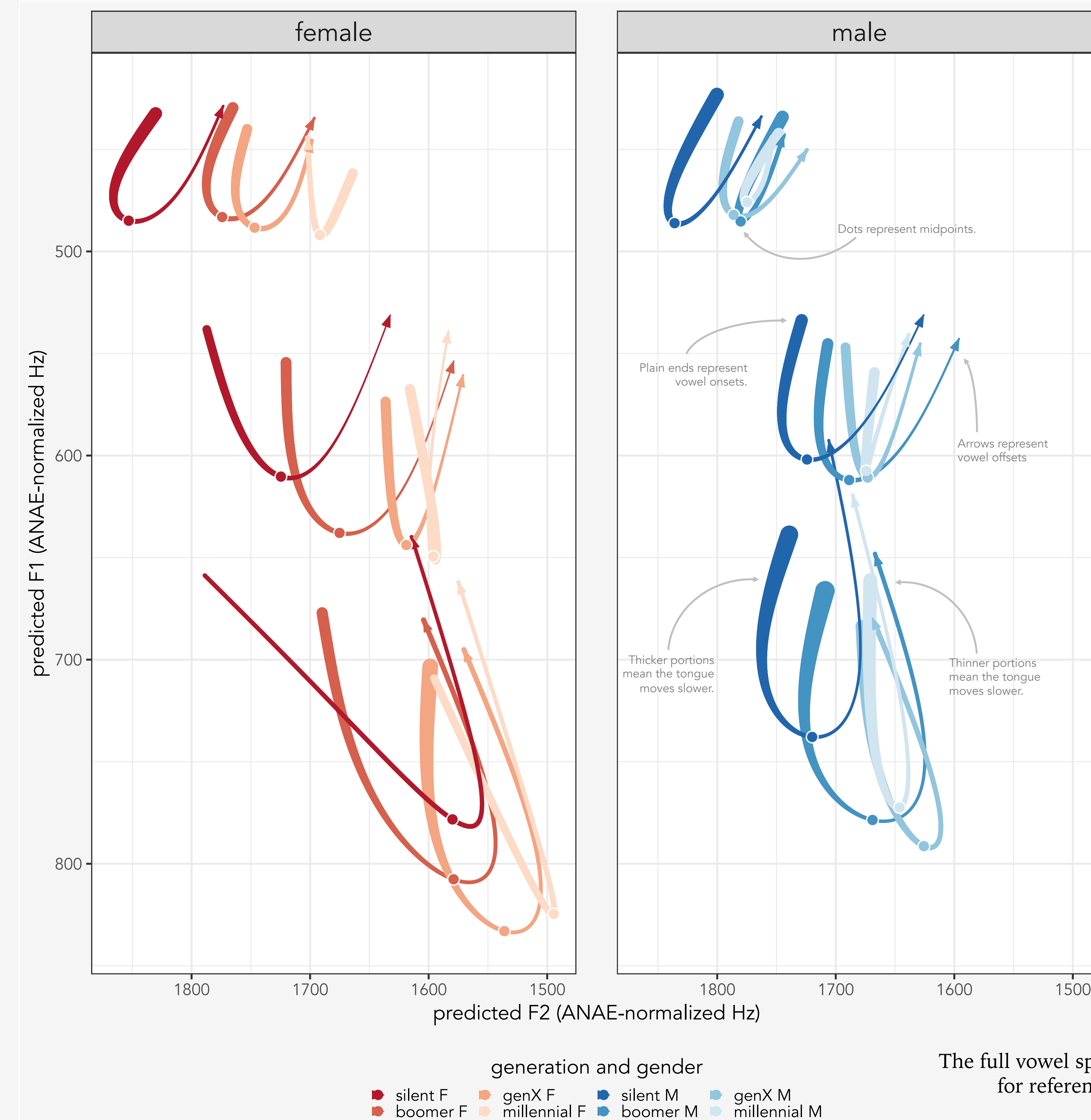Control for duration
Fit independent curves and intercepts for each combination of formant, sex, and generation.
Separate model per vowel
Random intercepts for speaker and word, by formant. I wanted a more complex random effects structure.

- Extracted and plotted predicted measurements per generation per sex

Results

female   male

Dots represent midpoints.
Plain ends represent vowel onsets.
Arrows represent vowel offsets
Thicker portions mean the tongue moves slower.
Thinner portions mean the tongue moves slower.

predicted F1 (ANAE-normalized Hz)
predicted F2 (ANAE-normalized Hz)

generation and gender
silent F   genX F   silent M   genX M
boomer F   millennial F   boomer M   millennial M

The full vowel space, for reference ▶

female   male

Results based on midpoints
- As expected, younger people have lower/retracted vowels.
- Change is more advanced among women.
- /æ/ mostly lowers, /ɪ/ mostly backs, /ɛ/ does both

Results based on trajectories
- Everything that the midpoints show, plus more

1. Trajectory length
   - A general U-shaped pattern for all vowels
   - /æ/ is the most dynamic, then /ɛ/, then /ɪ/
   - Consistent across generations

2. "Angle" of the U-shape
   - /æ/ is towards the front, /ɪ/ is towards the back
   - Consistent across generations and between genders

3. As vowels' global positions shift, so do their trajectories.
   - They get "narrower"—less movement in F2.
   - Narrowing is consistent across vowels and genders
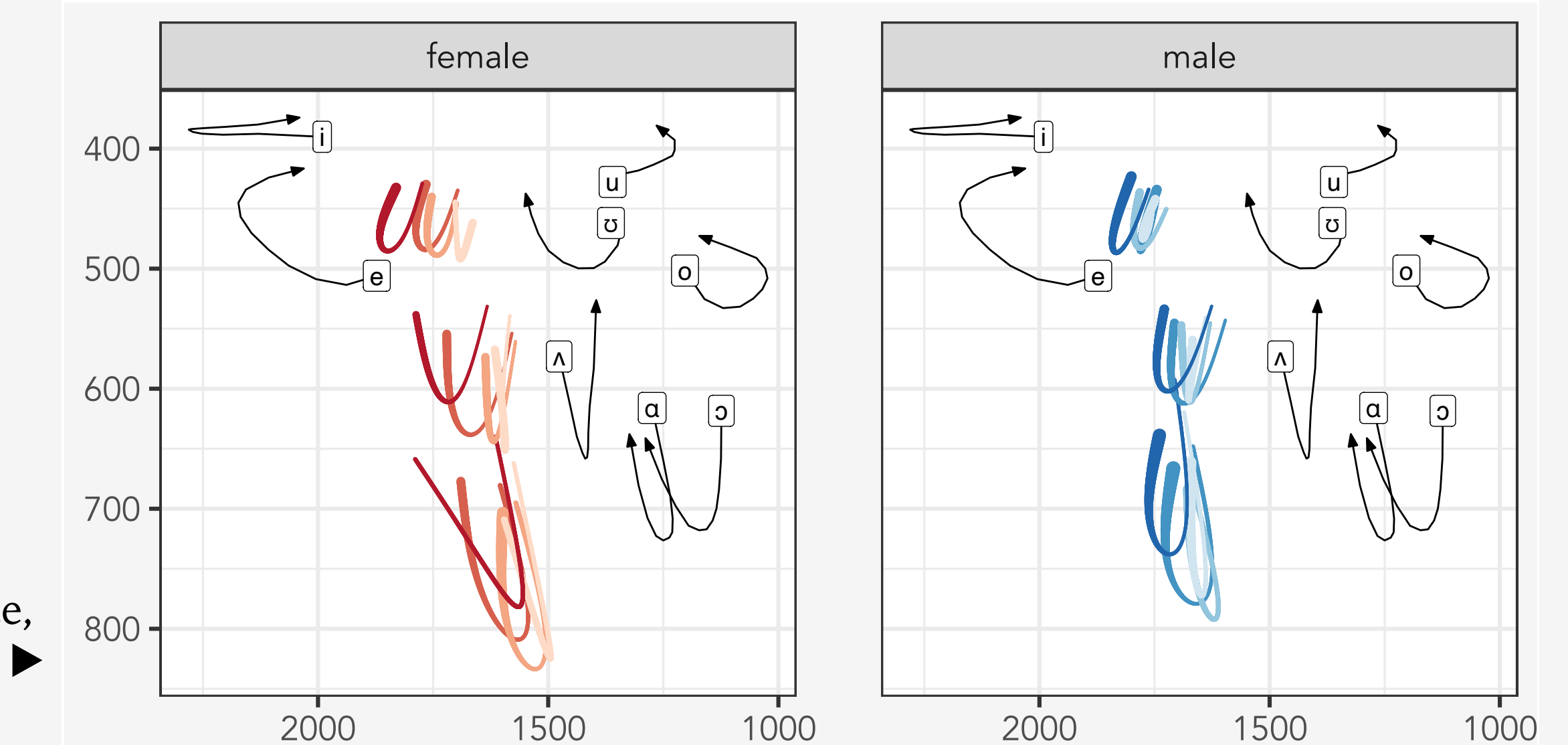
Conclusions

Summary
- Here, as the vowels lowered/retracted, their trajectories changed too.
  - This is not always the case! (cf. Stanley et al. forthcoming)
- Not an artifact of modeling! Each cohort had independent model fits.

Take-away
- There is more to a vowel shift than its midpoints.
- More work needed on vowel trajectories to better describe change.

Sociolinguistics of vowel formant trajectories?
- What kind of sociolinguistic meanings are associated with trajectories?
  - Yes, surrounding consonants affect trajectories
  - They affect midpoints too but they still carry sociolinguistic meaning.
  - Are we comfortable assuming trajectories are 100% phonetic?
- Are these trajectory differences perceptible?
- Stay tuned for experimental work on simulated trajectories!

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