5aSC03. Vowel trajectories of African Americans in Georgia, USA

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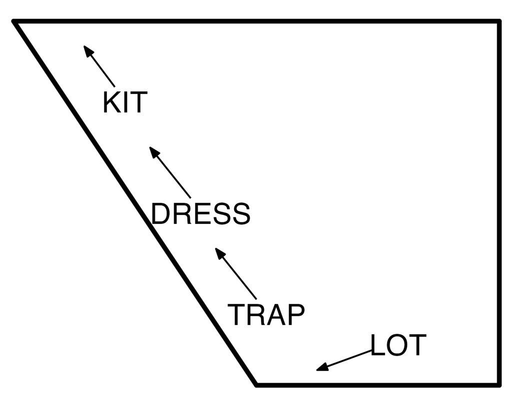
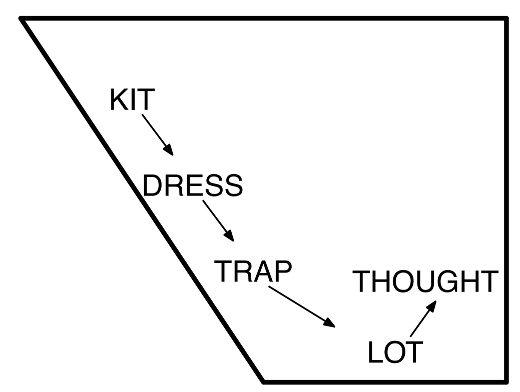
US dialect variation: Vowel Shifts

The African-American Vowel Shift



The Low-Back Merger Shift



- ✧ Vowel shifts: systematic differences in quality and formant dynamics
- ✧ AAVS found in many African-American communities across the US (Thomas 2007)
- ✧ Regionally to the US South, glide-weakening may affect /aɪ/, and /eɪ/ may centralize
- ✧ Elsewhere in the South, regional varieties have retreated as the pan-regional LBMS advances among younger speakers (Dodsworth & Benton 2017)

What systems are used by African Americans in Georgia?

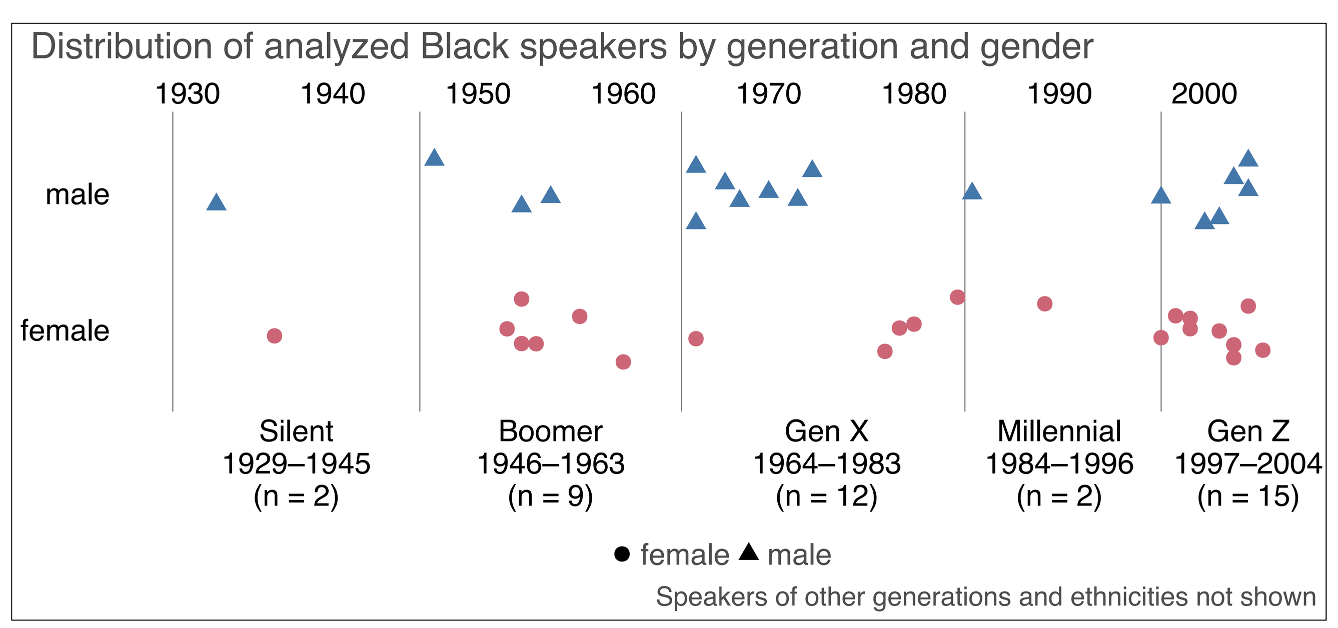
- ✧ We evaluate the AAVS and LBMS in an audio corpus of over 40 Black speakers from the Southern state of Georgia, born across 5 demographic generations from the 1930s – 2004.

Research questions:

- ✧ How do vowels' trajectories, and positions in F1/F2 space, change in generational time?
- ✧ Are vowel positions consistent with the AAVS in older speakers, vs. LBMS in young speakers?
- ✧ Can we identify a "peak" for the AAVS, in Gen X speakers, after which the LBMS takes hold?

Data collections and speaker demographics

- ✧ Linguistic Atlas of the Gulf States (LAGS; Pederson et al. 1986): born 1887–1965
- ✧ Atlanta Speech Project (2003; Lanehart & Kretzschmar): born 1919–1979
- ✧ Roswell Voices Project (2003–2008; Kretzschmar et al. 2007): born 1936–1984
- ✧ University of Georgia, Georgia Tech (2016– ; Stanley, Glass, Forrest): born 1989–2004



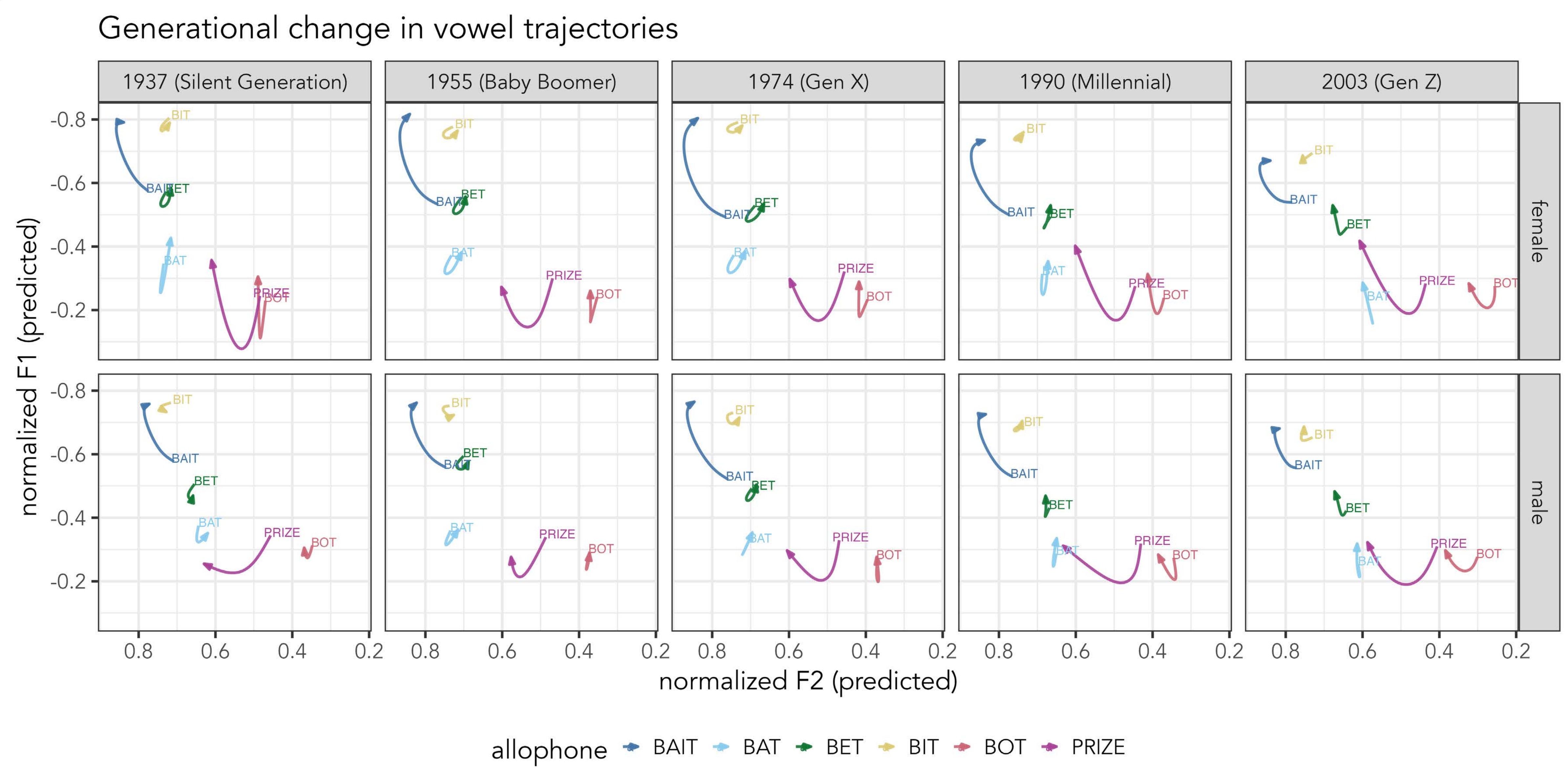
Data preparation

Acoustic analysis	transcription	manual
	forced alignment	Montreal Forced Aligner (McAuliffe et al. 2017) via DARLA (Reddy & Stanford 2015)
	formant extraction	FAVE (Rosenfelder et al. 2014), via DARLA, extracted F1 & F2 at 20%, 35%, 50%, 65%, 80% of vowel duration
Number crunching	remove stopwords	stopwords::stopwords(source = "marimo")
	remove outliers	Modified Mahalanobis Distance (Stanley 2020)
	normalize	Log-means (Barreda & Nearey 2018)
	exclusions	kept pre-obstruent tokens only (for front vowels) For GAMMs: full trajectories For linear models: 35% F1, F2 (80% for PRICE, 50% for BOT)

Data analyzed here

Vowel	Symbol	Tokens
/ɪ/	BIT	3542
/ɛ/	BET	4068
/æ/	BAT	3038
/eɪ/	BAIT	3979
/ɑ/	BOT	3003
/aɪ/	PRIZE	1380
	Total	19010

Results



GAMMs improved by Year of Birth predictor

Vowel	F1 women	F2 women	F1 men	F2 men		Vowel	F1 women	F2 women	F1 men	F2 men
BIT	*n.s.*	*n.s.*	*n.s.*	*n.s.*		BAT	***	***	*	***
BAIT	***	*n.s.*	*n.s.*	*n.s.*		PRIZE	***	*n.s.*	***	*n.s.*
BET	*n.s.*	*n.s.*	**	*n.s.*		BOT	*n.s.*	*n.s.*	*n.s.*	**

Modeling vowel trajectories

with Generalized Additive Mixed Models (GAMMs)

- ✧ Model run for each Allophone x Gender x Formant = 24 total models (`mgcv`; Wood 2017); see **Specification**
- ✧ GAMM predictions extracted (`itsadug`: van Rij et al. 2017), and plotted in normalized F1, F2 space; see **Figure**
- ✧ Significance of YoB tested via model comparison with dropped factor (`compareML`; van Rij et al. 2017)
- ✧ Some models reveal significant differences ($p < 0.05$) in trajectory shape or vowel position across speaker birth years; see **Table** of GAMM improvements

Model Specification in R	Interpretation
1 `mgcv::bam(`	1 Function call.
2 `normalized_formant_data ~`	2 Dependent variable: log-means normalized formant values.

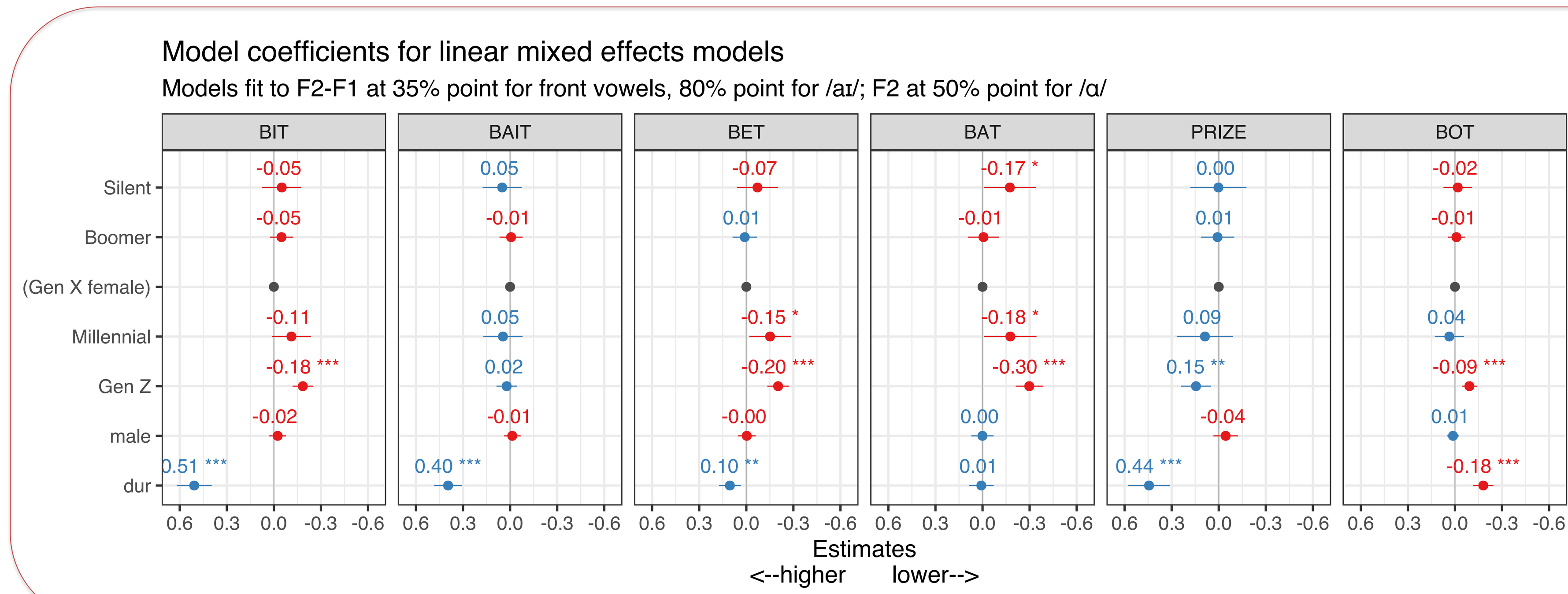
3 `s(percent, k = 4) +`
`s(yob, k = 4) +`
`ti(percent, yob) +`
	3 Smooths for time point and year of birth, including tensor-product interaction term.

4 `duration +`	4 Control for duration.

5 `s(speaker, bs = "re") +`
`s(word, bs = "re") +`
`s(collection, bs = "re") +`
	5 Random intercepts for speaker, word, and collection.

6 `s(speaker, percent, bs = "re") +`
`s(word, percent, bs = "re") +`
`s(collection, percent, bs = "re"),`
	6 Random slopes for speaker, word, and collection.

7 `data = data_from_one_allophone,` `discrete = TRUE)`	7 Data specification (varies by vowel).



Modeling single-point measurements

with linear mixed-effects models

- ✧ Model format: `lmer(Y ~ Generation + Gender + Duration + (1|Word) + (1|Speaker))`
- ✧ Positive coefficients indicate movement *up* the front vowel diagonal (in BIT BAIT BET BAT PRIZE) or *forward* in the vowel space (for BOT), while negative coefficients indicate lowering/retraction.
- ✧ Modeling finds some significant generational changes in vowel position, vs. the Generation reference level of Gen X; see **Figure**

Summary of findings

- ✧ Evidence of significant vowel changes across 5 generations of African Americans in Georgia.
- ✧ Front lax vowels move in the direction of the LBMS among Millennial and Gen Z speakers.
- ✧ Low-back /ɑ/ lowers and, among the youngest speakers, retracts.
- ✧ Diphthong /aɪ/ changes in the youngest speakers via a backer nucleus and fronter offglide.
- ✧ GAMMs capture differences in dynamic change by formant and gender
- ✧ Linear model results capturing holistic movement (i.e., in F1/F2 combined) along the front-vowel diagonal show evidence of generational change, but not gendered change
- ✧ Future work will add more speakers from the Silent and Millennial generations

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