

The typology of American low back systems: Evidence from Baltimore

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Goals

1. Review and expand the typology of American low back systems
2. Revisit common assumptions about low back vowels
3. Present evidence for the diffusion of Baltimore's low back system

Outline

1. Introduction
2. North American low back systems
3. Methods
4. Baltimore's low back systems
5. Dialect contact and diffusion
6. Conclusion

The cast

Wells (1982)	Binary	IPA	Example words
STRUT	/ʌ/	/ʌ/	<i>cut, huff, mum, dull</i>
LOT	/o/	/ɑ/	<i>cot, goth, mom, doll</i>
THOUGHT	/oh/	/ɔ:/	<i>law, caught, cough, pawn, call</i>
PALM	/ah/	/a:/	<i>spa, Bach, father, calm, Mali</i>
START	/ahr/	/aɹ/	<i>bar, cart, hearth, arm, Carl</i>
NORTH	/ɔhr/	/ɔɹ/	<i>for, fork, horse, warn, Orlando</i>
FORCE	/ohr/	/oɹ/	<i>four, fort, hoarse, worn</i>

/oT/: LOT before voiceless consonants

/oD/: LOT before voiced consonants

North American low back systems

“The” low back merger

“a collapse of the phonemic contrast between /a/, as in *cot*, and /ɔ/, as in *caught*” (Majors 2005)

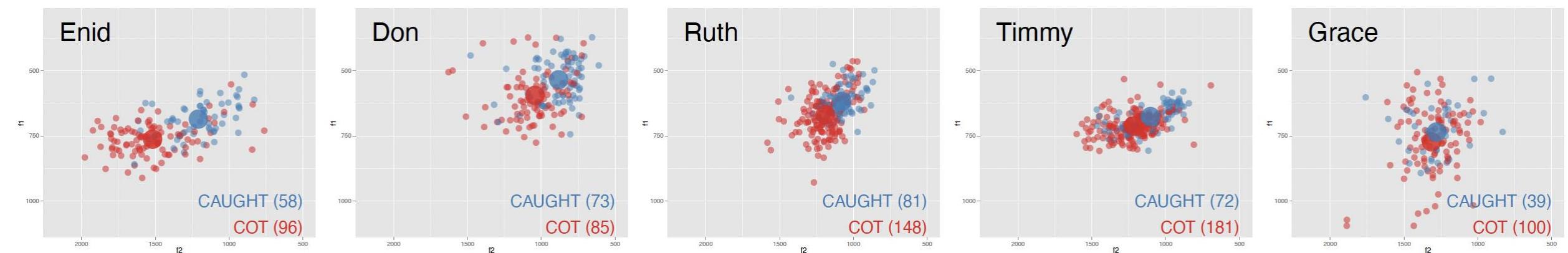


FIGURE 3. Individual tokens of COT and CAUGHT plotted for 5 speakers in the San Francisco data set. Mean values for each word class are plotted in larger circles. Numbers indicate the number of tokens in each group.

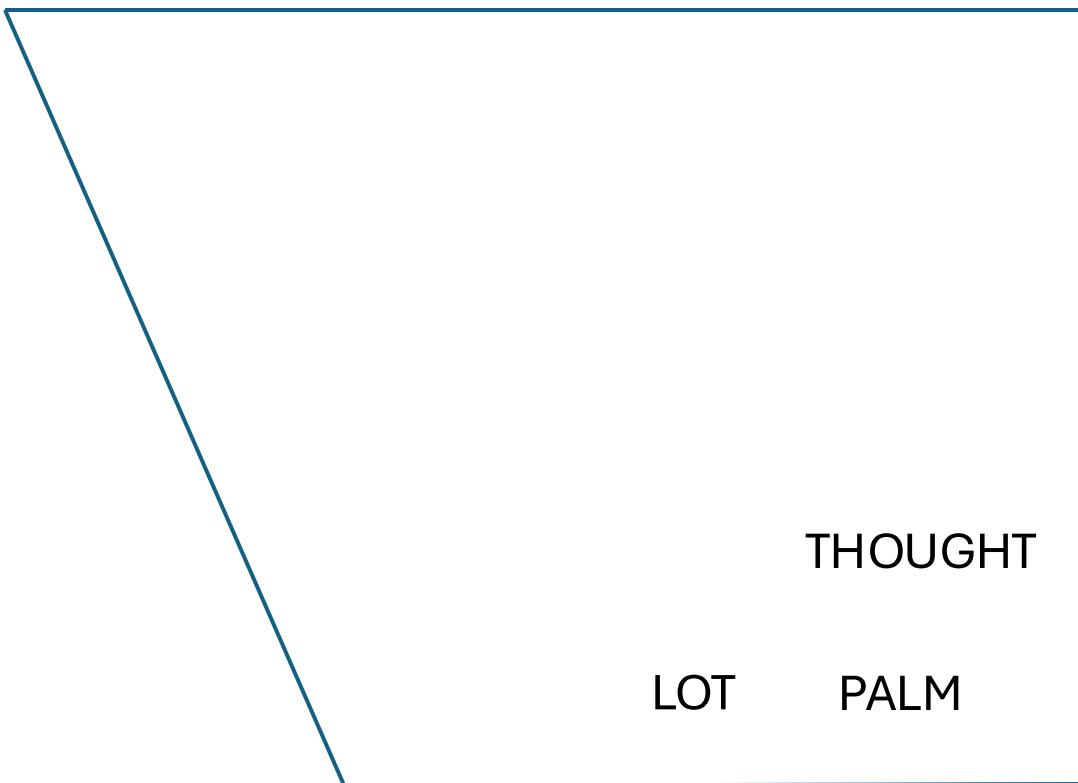
PALM

- Commonly distinguished from LOT and THOUGHT in non-rhotic and variably rhotic dialects (Kurath & McDavid 1961 [henceforth *PEAS*]; Wells 1982; Newman 2016; Johnson & Durian 2017)
- Consists of:
 - some kinship terms: *father, ma, mama, pa, papa*
 - interjections: *ah, aha, hurrah, huzzah, ta-ta*
 - loanwords: *bravado, collage, gala, llama, mafia, spa*
 - broad-a words: *aunt, chance, dance, glass, nasty, rather*

The position of PALM

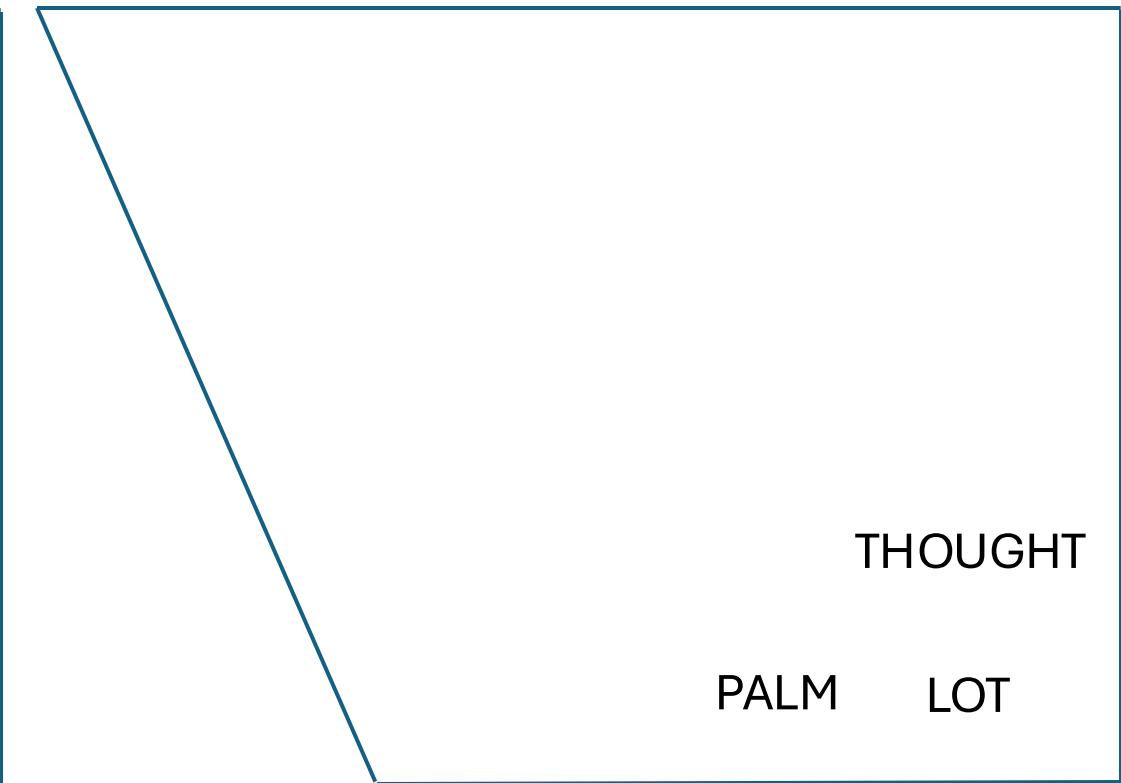
NYC/Upper South/New Orleans

(PEAS; Newman 2016; Dinkin & Carmichael 2024)



General

(PEAS; Wells 1982)



In some places, LOT and PALM are distinguished by length alone, not position (PEAS; Johnson & Durian 2017).

Typology of American low back systems

System	Location
LOT≠PALM≠THOUGHT (3-D)	Widespread in non-rhotic varieties (<i>PEAS</i>)
LOT=PALM≠THOUGHT (MAIN)	Widespread in rhotic varieties
PALM≠LOT=THOUGHT (ENE)	Eastern New England
LOT≠PALM=THOUGHT	Tidewater Virginia (<i>PEAS</i>), Delmarva Peninsula (<i>PEAS</i>), New Orleans (Dinkin & Carmichael 2024)
LOT=PALM=THOUGHT (3-M)	Canada, the West, Western Pennsylvania

Both the ENE and 3-M systems have been described as having “the low back merger,” (e.g., Majors 2005; Becker 2019) but these are different low back systems!

Pre-rhotic vowels in the low back system

- In non-rhotic varieties, the pre-rhotic sets START and NORTH are typically said to merge with PALM and THOUGHT, respectively (*PEAS*; Wells 1982)
- Thus, we must also consider the pre-rhotic sets as part of the low back system

Typology of American low back systems, revised

System	Location
LOT ≠ PALM = START ≠ THOUGHT = NORTH	Widespread in non-rhotic varieties (<i>PEAS</i>)
LOT = PALM = START ≠ THOUGHT = NORTH	Providence, RI? (Johnson 2010)
PALM = START ≠ LOT = THOUGHT = NORTH	Eastern New England
LOT ≠ PALM = START = THOUGHT = NORTH	Tidewater Virginia (<i>PEAS</i>), New Orleans (Dinkin & Carmichael 2024, 2025)
LOT = PALM ≠ START ≠ THOUGHT ≠ NORTH	Widespread in rhotic varieties
LOT ≠ PALM = THOUGHT ≠ START = NORTH	Delmarva Peninsula (<i>PEAS</i>)
LOT = PALM ≠ THOUGHT ≠ START = NORTH	St. Louis
LOT = PALM = THOUGHT ≠ START = NORTH	Utah
LOT = PALM = THOUGHT ≠ START ≠ NORTH	Canada, the West, Western PA

Methods

Caveats

- Still in the middle of fieldwork
- Formants (mainly from elicitation) from 22 speakers
 - 12 white
 - 9 Black
 - 1 Asian

Sociolinguistic interviews

- Reading passage
 - LOT, PALM, THOUGHT, STRUT, and START
- Word list
 - v1: LOT, PALM, THOUGHT, STRUT, START, and reference vowels
 - v2: LOT, PALM, THOUGHT, STRUT, pre-rhotic PRICE (e.g., *fire*), pre-rhotic CLOTH (e.g., *horrible*), START, NORTH, FORCE, CURE, and reference vowels

Minimal pair task

- v1: LOT-START, LOT-STRUT, LOT-THOUGHT, START-STRUT, START-THOUGHT, STRUT-THOUGHT
- v2: **LOT-PALM**, ~~LOT-START~~, ~~LOT-STRUT~~, LOT-THOUGHT, **PALM-START**, **PALM-THOUGHT**, ~~START-STRUT~~, START-THOUGHT, STRUT-THOUGHT
- v3: **CURE-FORCE**, **FORCE-NORTH**, **FORCE-THOUGHT**, LOT-PALM, LOT-THOUGHT, **NORTH-START**, **NORTH-THOUGHT**, PALM-START, PALM-THOUGHT, **PRICE-START**, START-THOUGHT, STRUT-THOUGHT

Data processing

1. Transcribed in Praat
2. Aligned with Montreal Forced Aligner (McAuliffe et al. 2017) using English (US) ARPA model v3.0.0 (McAuliffe & Sonderegger 2024)
3. Formants extracted with new-fave (Fruehwald 2025)
4. Outliers removed using robust variant of the Mahalanobis method (Leys et al. 2018)
5. Formants normalized using ΔF method (Johnson 2020) as implemented in joeyr (Stanley 2021)

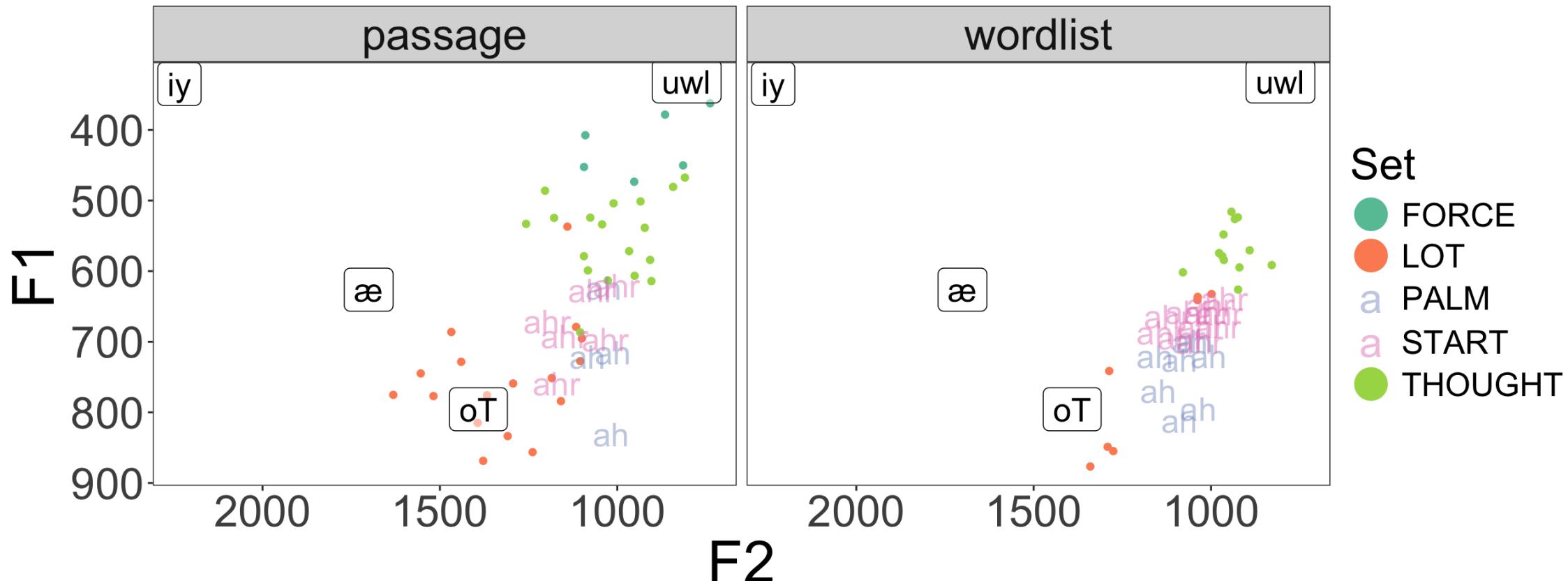
Baltimore's low back systems

Does START really merge with PALM for non-rhotic speakers?

- Usually described as identical or merged in non-rhotic varieties (*PEAS*; Wells 1982)
- However, no hypercorrection of PALM to START in dialects acquiring rhoticity (Michael Newman, p.c.)

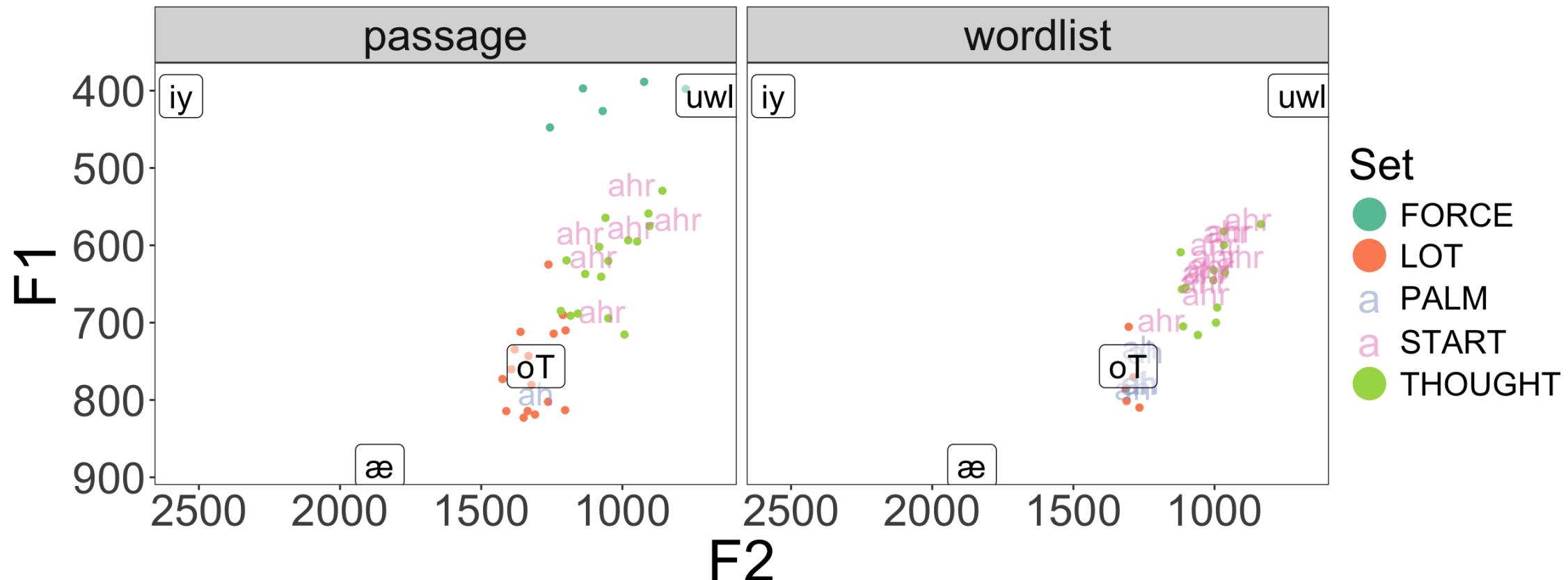
Does START really merge with PALM for non-rhotic speakers?

Francis (Black man, b. 1940)



Does START really merge with PALM for non-rhotic speakers?

Kathy (white Jewish woman, b. 1949)



Does START really merge with PALM for non-rhotic speakers?



PALM-START

Father, farther. Different.



START-THOUGHT

Yarn, yawn. Well, that sounds a lot– alike. Could you not– Yeah that– that “r” is kinda in the “w.”



LOT-PALM

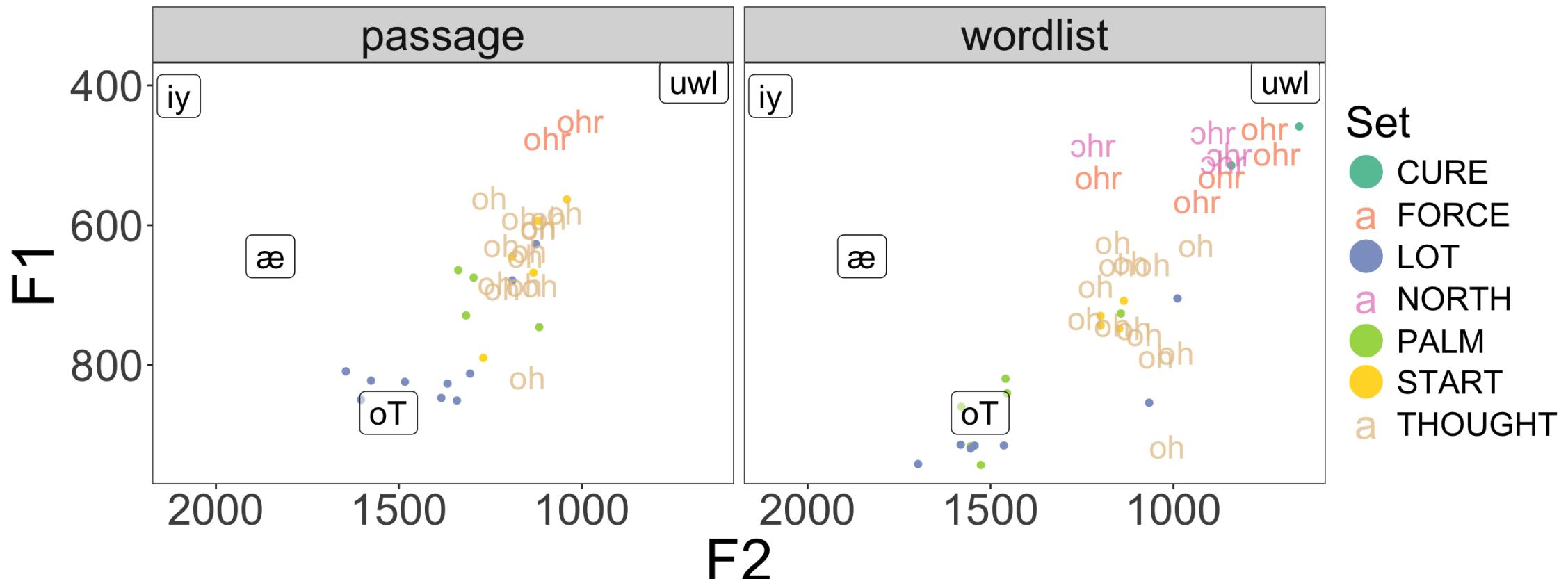
Balm, bomb. Eh, could be [the same].

Does NORTH really merge with THOUGHT for non-rhotic speakers?

- Usually described as identical or merged in non-rhotic varieties (*PEAS*; Wells 1982)
- Near merger found in New York City (Labov, Yaeger & Steiner 1972; Labov, Ash & Boberg 2006)

Does NORTH really merge with THOUGHT for non-rhotic speakers?

Carly (Black woman, b. 1987)



The relationship between rhotic and non-rhotic sets

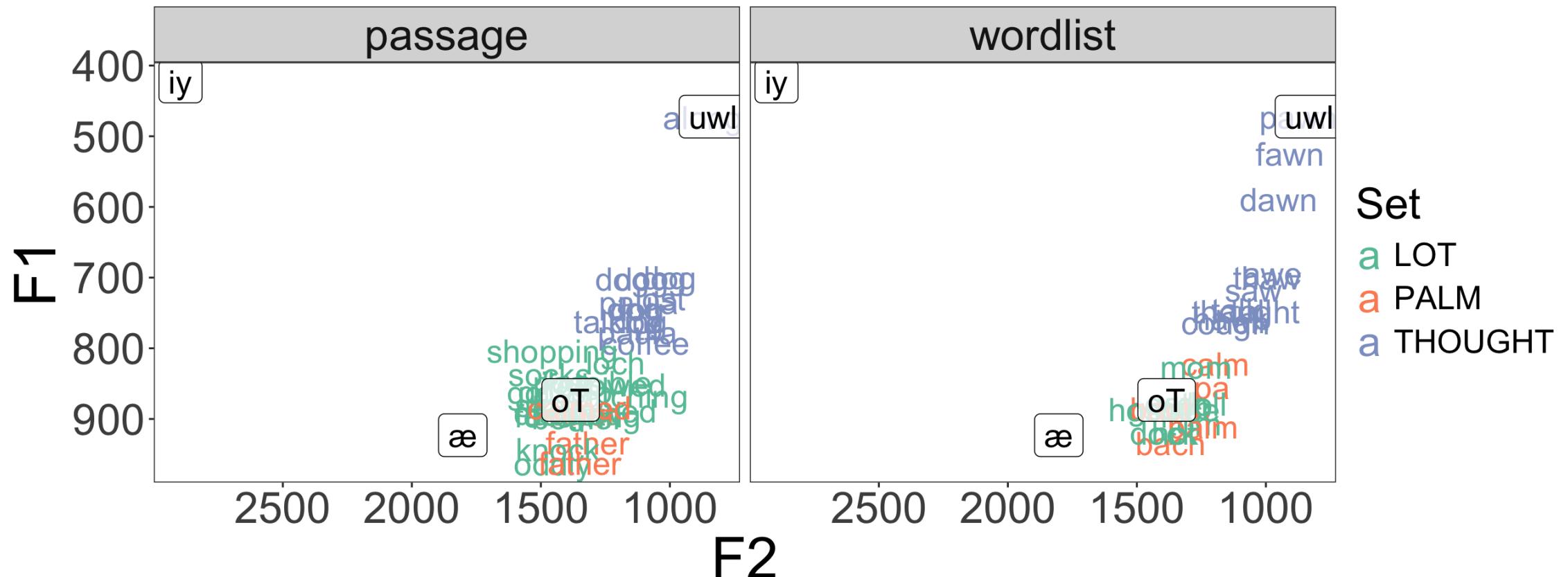
- **Conjecture:** Variable rhoticity prevents merger
- “Free” variation between [ɹ] and [ə] ~ Ø maintains phonological difference between corresponding sets
- Difference reinforced by spelling

More on PALM

- The PALM set is heterogeneous in Baltimore, both across and within speakers

PALM-LOT merger

Fleur (white woman, b. 1961)





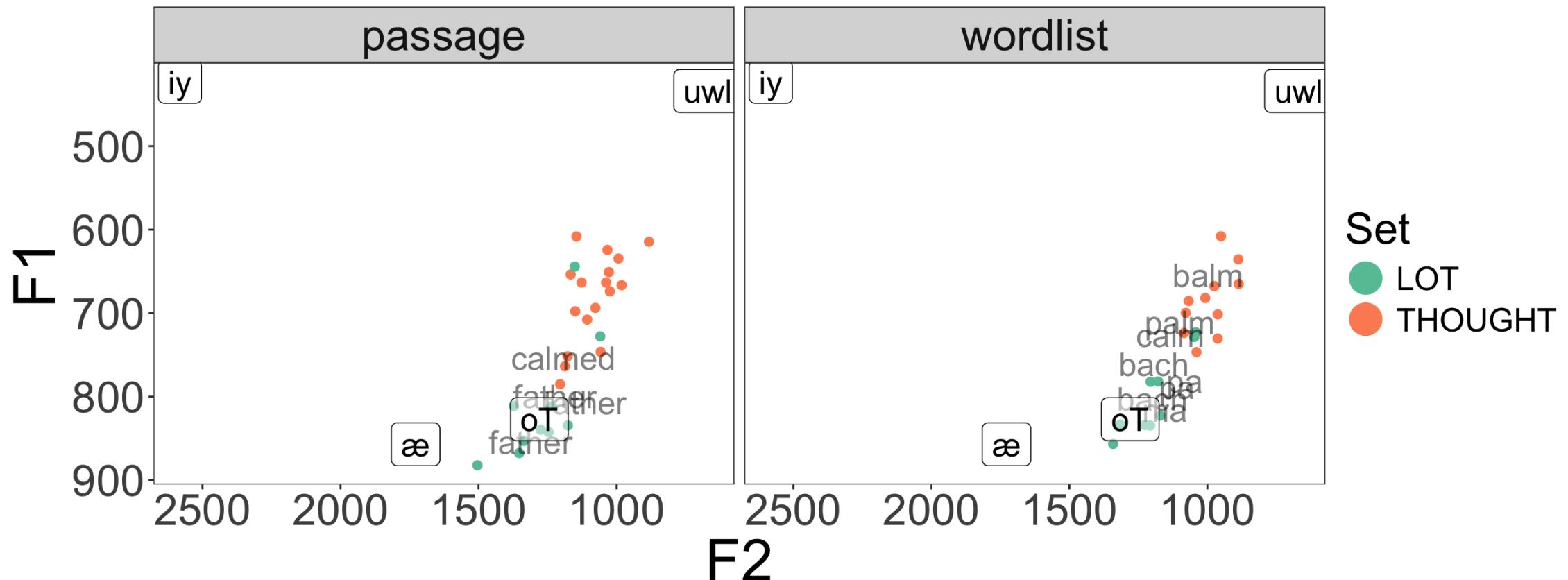
bomb



balm

PALM-THOUGHT merger before nasals

Goon (white woman, b. 1954)





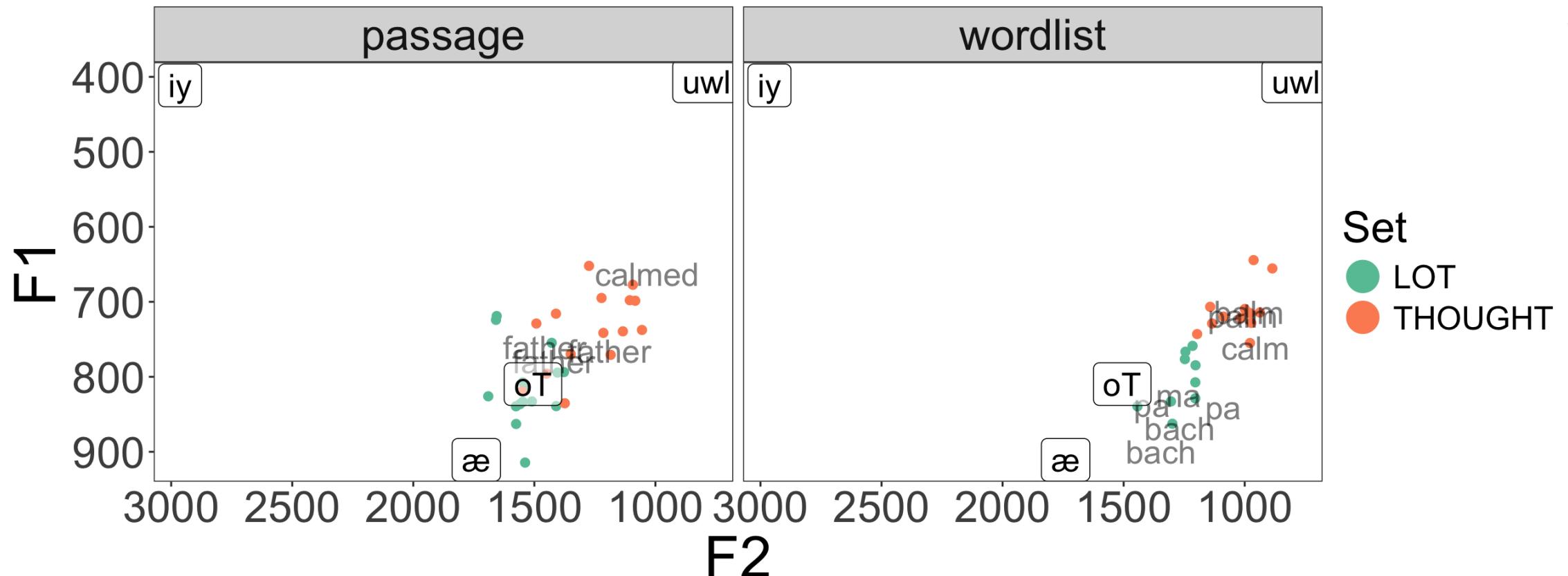
bomb



balm

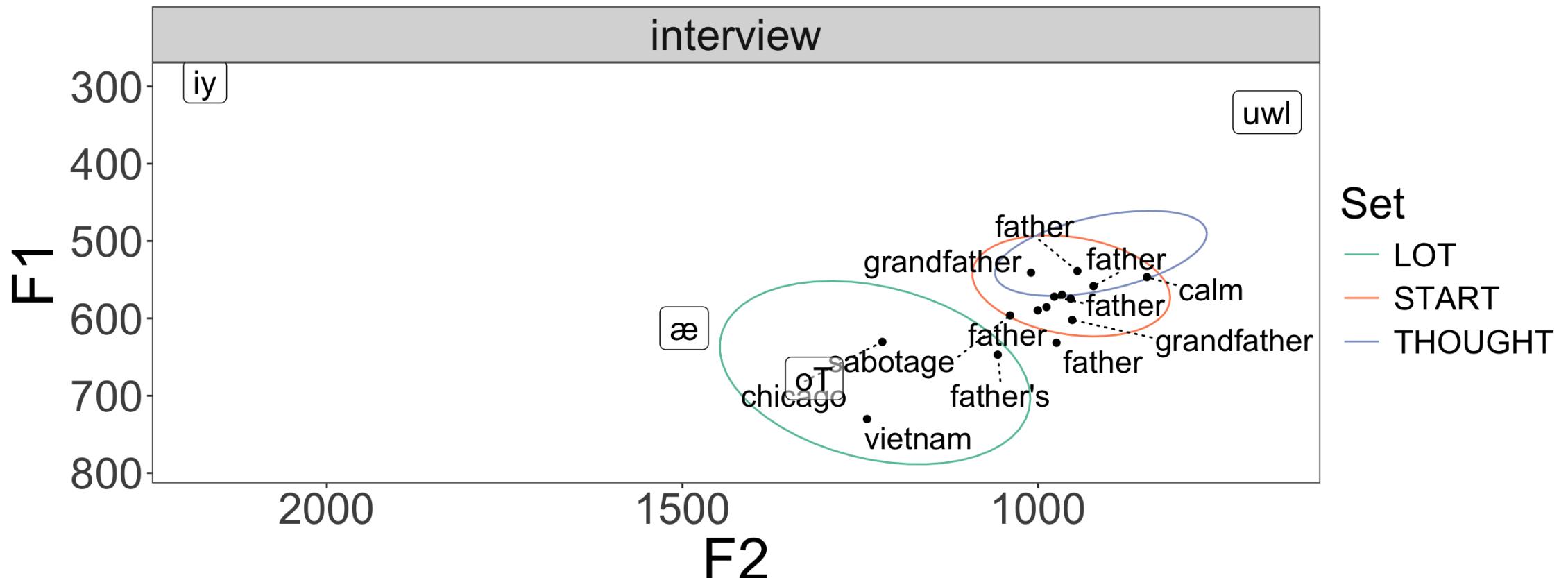
PALM-THOUGHT merger before nasals

Katelyn (white woman, b. 1966)



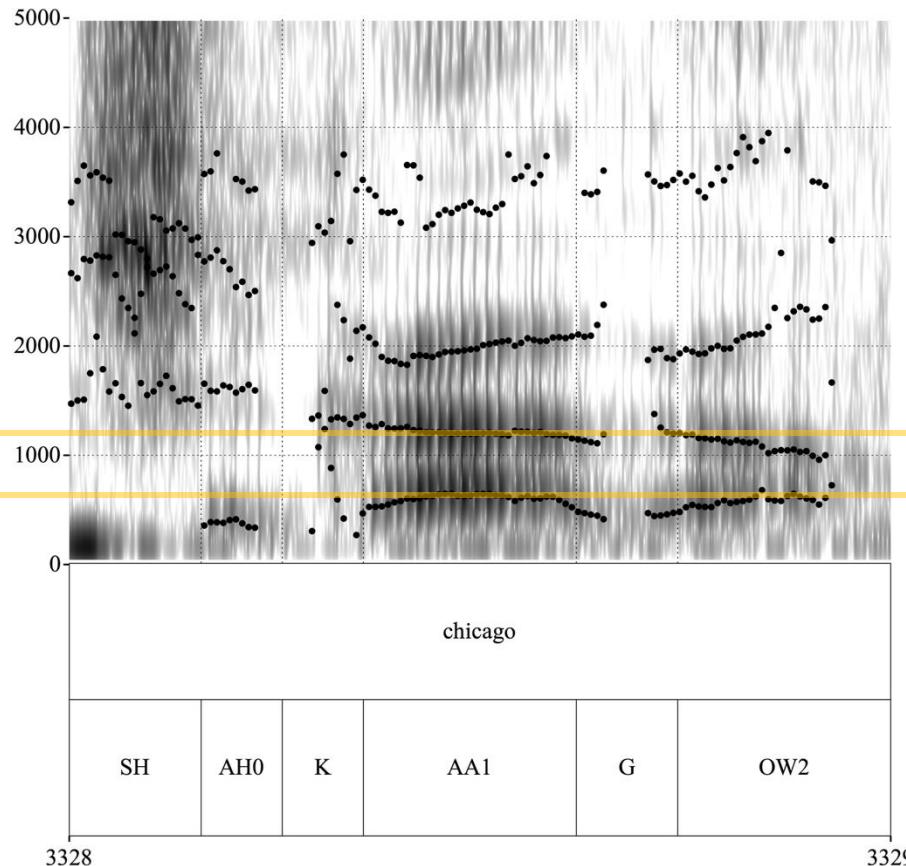
Variation across lexical items

Arnie (Black man, b. 1976)

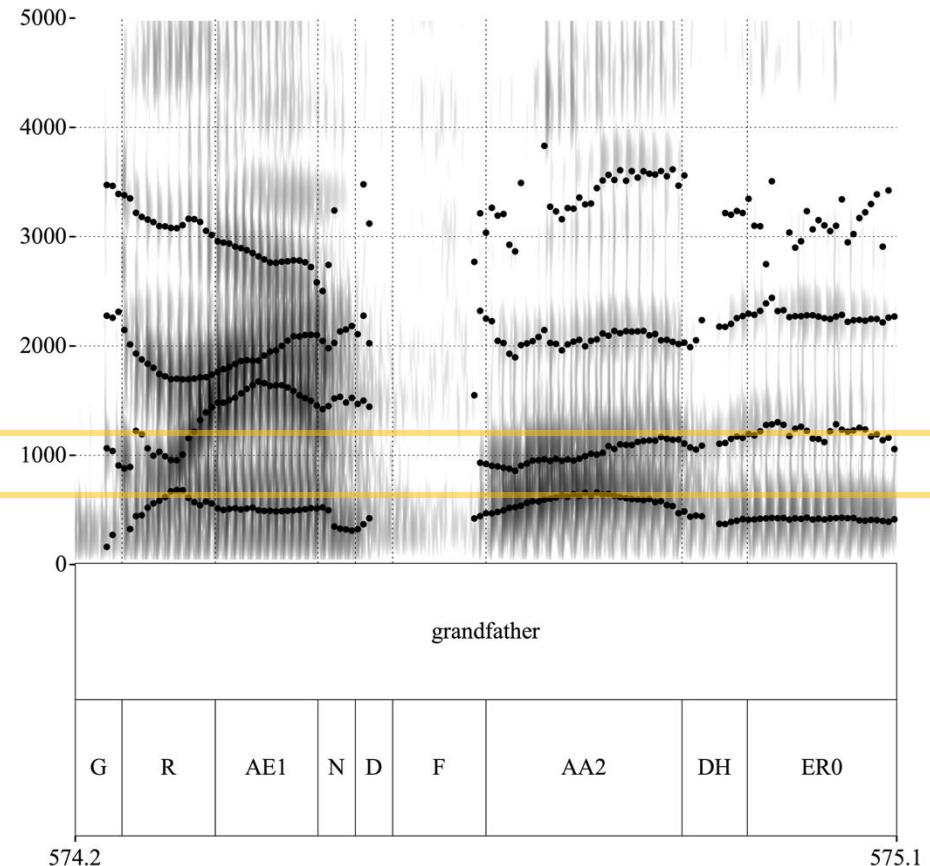




Variation across lexical items

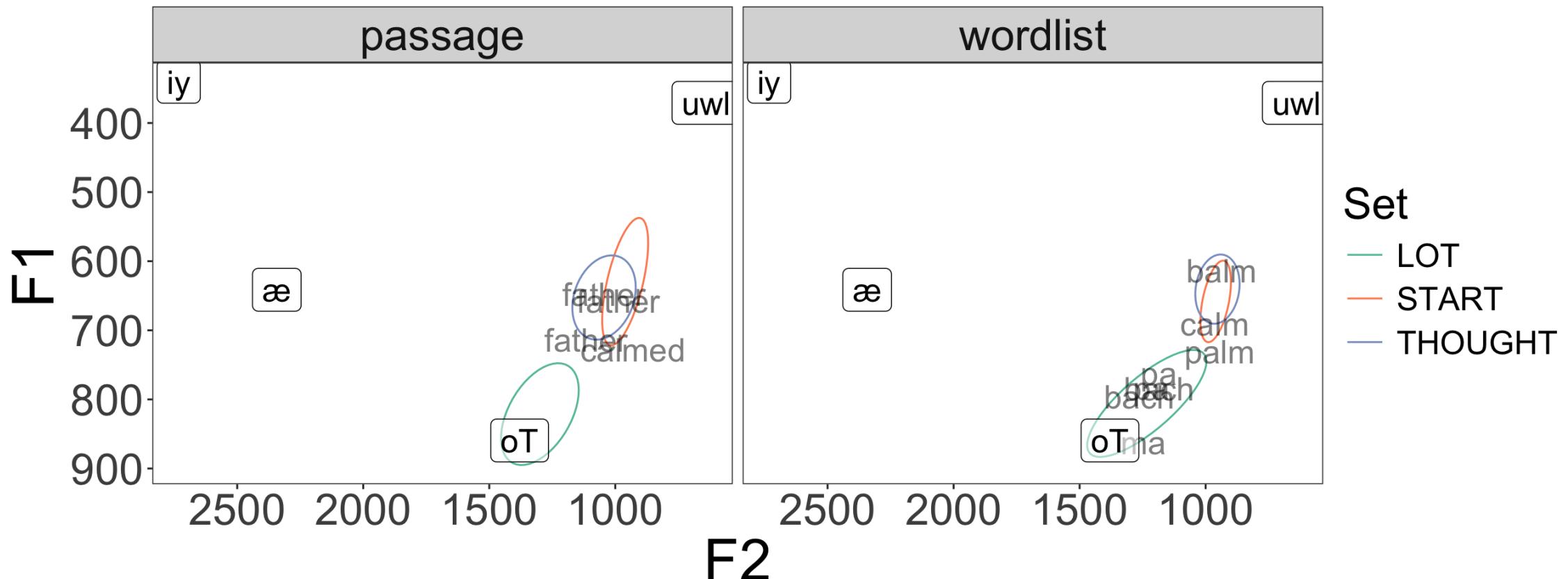


BALTIMORE'S LOW BACK SYSTEMS



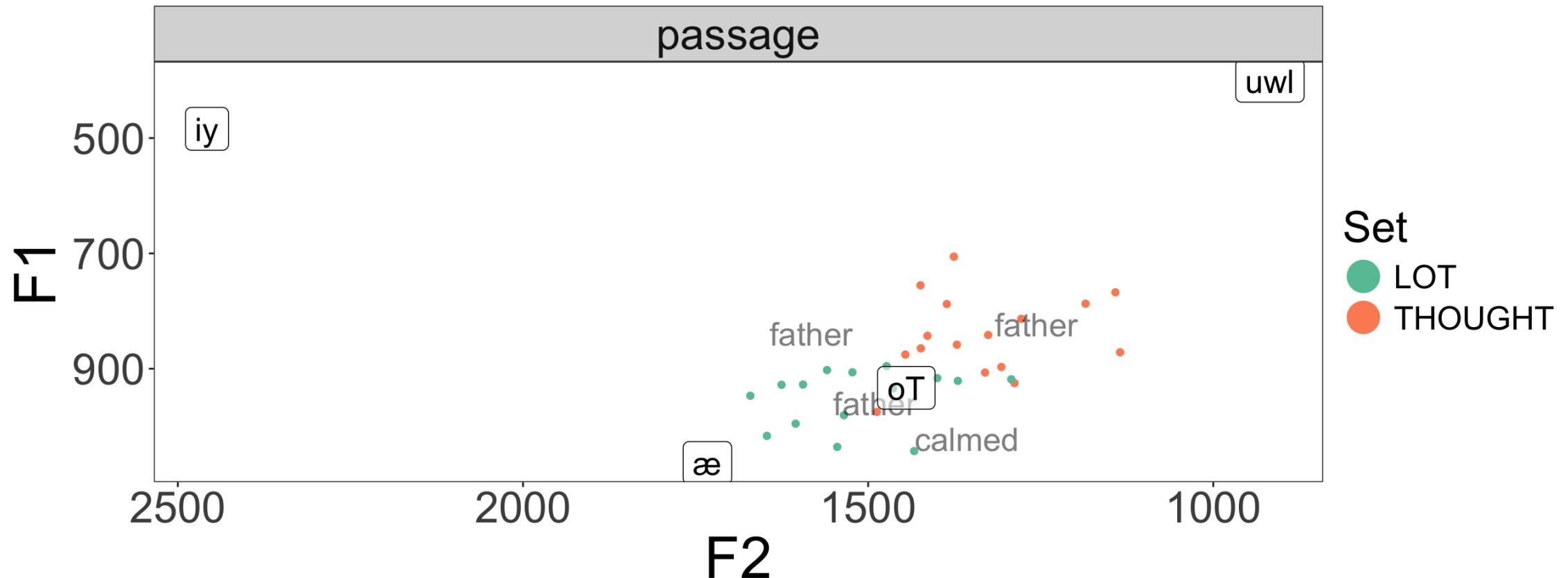
Variation across lexical items

Marilou (Black woman, b. 1984)



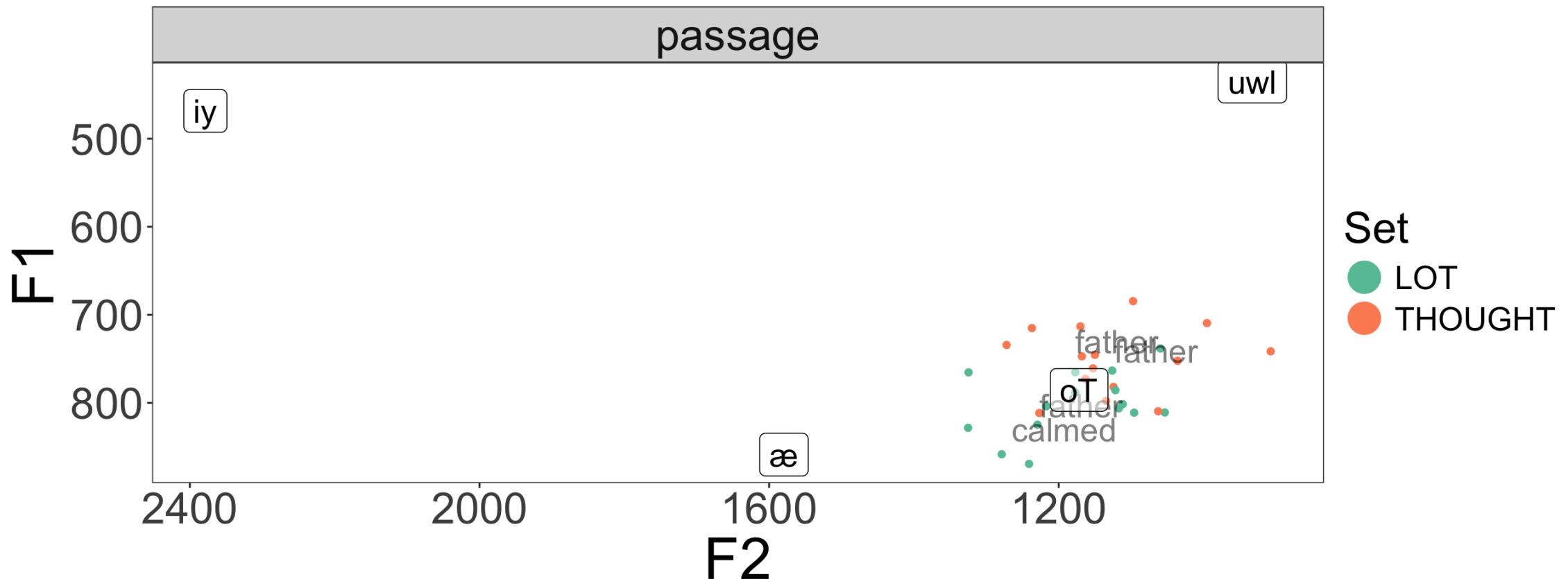
Variation within lexical items

Olivia (white woman, b. 1994)



Variation within lexical items

Maud (white woman, b. 2000)



Multiple processes of merger

- Generally, PALM-LOT merger for white speakers, PALM-THOUGHT merger for Black speakers
- Some lexical transfer (e.g., *Chicago* as LOT for Arnie)
- PALM-THOUGHT merger possibly conditioned by nasals for some speakers
 - Coda nasals also condition LOT-THOUGHT merger (Labov, Ash & Boberg 2006)
 - Coda nasals seem to favor THOUGHT-raising for many speakers (e.g., Fleur)

Does PALM really merge with LOT for rhotic speakers?

- PALM is typically assumed to merge with LOT for rhotic speakers (*PEAS*; Wells 1982)
- We find between- and within-item variability in merger with LOT
- In *PEAS*:
 - LOT is consistently central in Philadelphia but PALM is sometimes back
 - PALM is merged with THOUGHT but apparently not LOT for “cultivated” speakers on the Delmarva Peninsula
- Even for rhotic speakers, PALM does not necessarily merge with LOT across the board

Merger to STRUT?

Man, I don't even like to **talk** for real in here because **y'all** be making me feel like I'm saying something the **wrong** way or something. But Imma do the accent challenge. The ones I put in quotation **marks** for real, that's the ones **y'all** be coming and asking me to say. And then the ones that's just like regular, that's just the ones I'm gonna say for **y'all***. So somebody said, say "two," "avenue," "twenty-two pikachus," "blue," "lip **gloss****," and "**water**." Different people asked me to say that, so I just, you know what I'm saying? And then you got "cereal," "mother," "**father**," "brother," "Wednesday," "Tuesday," "Friday," "dummy," "woe," and "Aaron earned an iron urn." Oh yeah, and then I didn't even put that at the top! If you can't tell where I'm from, I'm from **Baltimore**. (*Could be a reduced form of you).

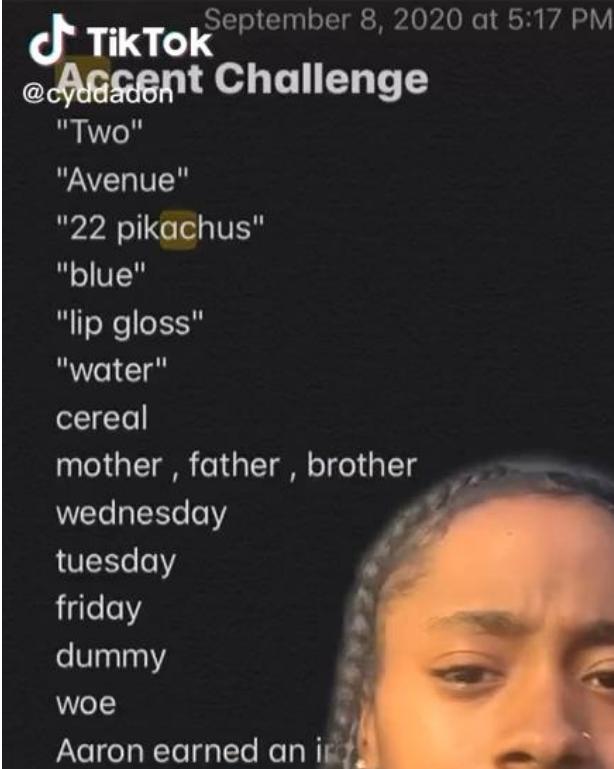
blue: STRUT-like

yellow: THOUGHT-like

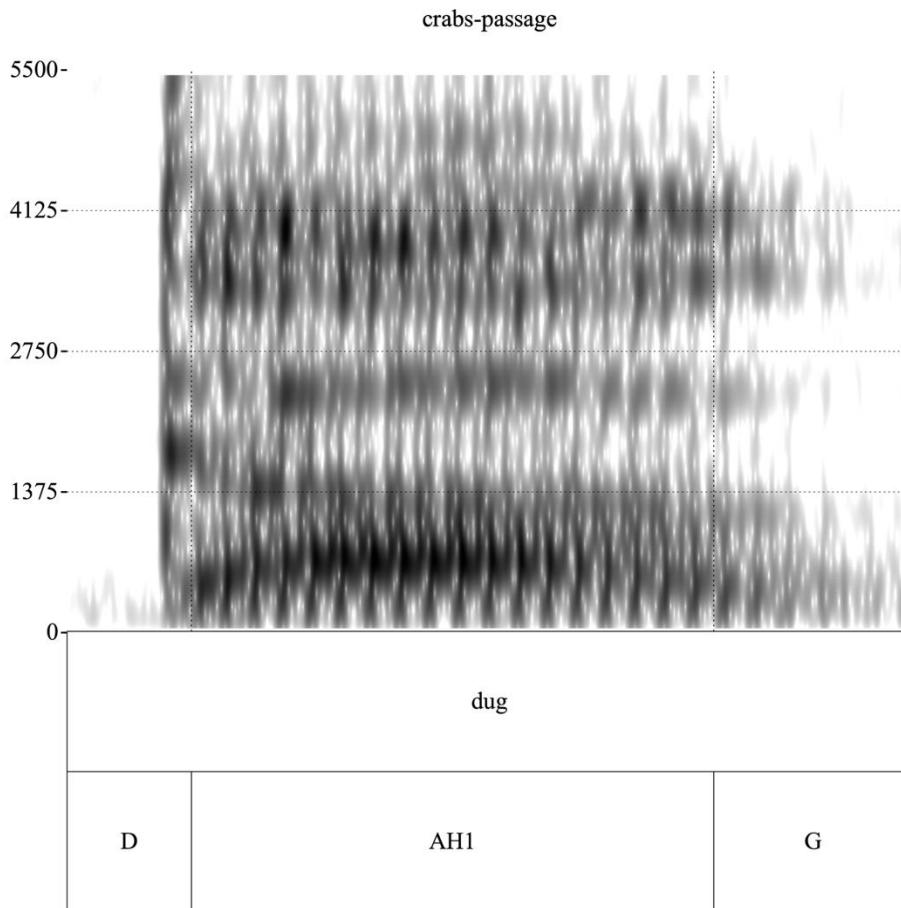
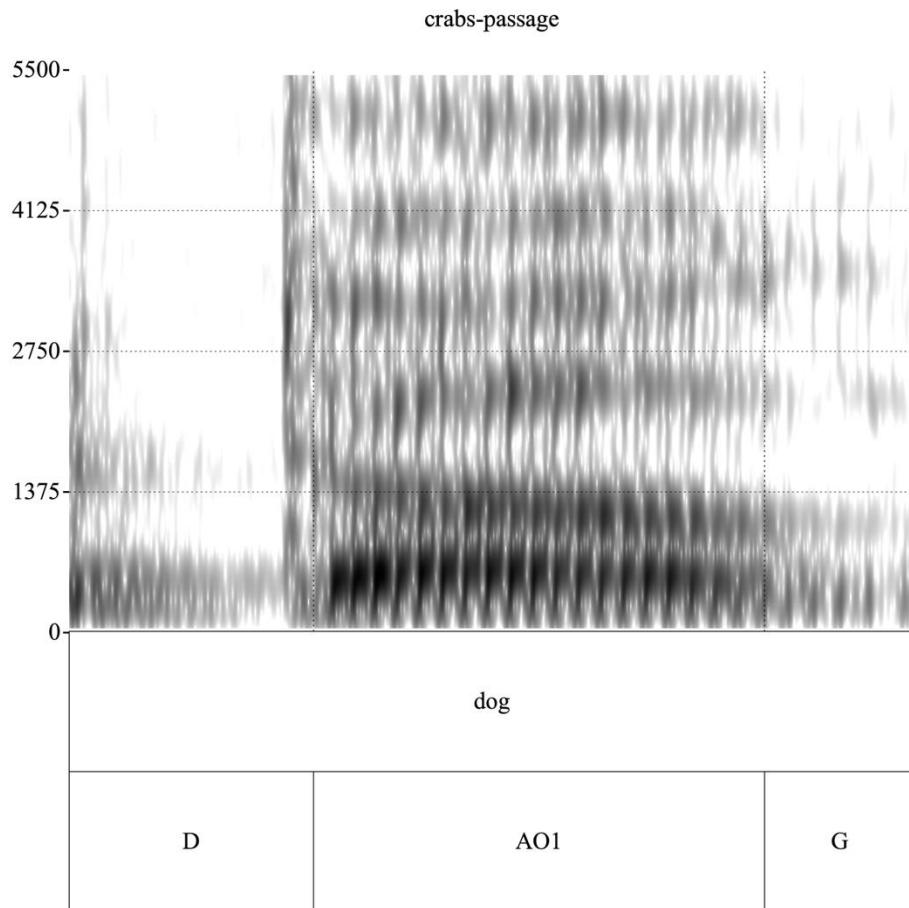
green: intermediate



Merger to STRUT?



Merger to STRUT?



Merger to STRUT?

- Possibly conditioned
 - No merger observed before nasals
 - Rarely observed before laterals
- Highly salient and stigmatized > Difficult to research
 - Underrepresented in elicitation
- Further research is needed

Typology of low back systems, revisited

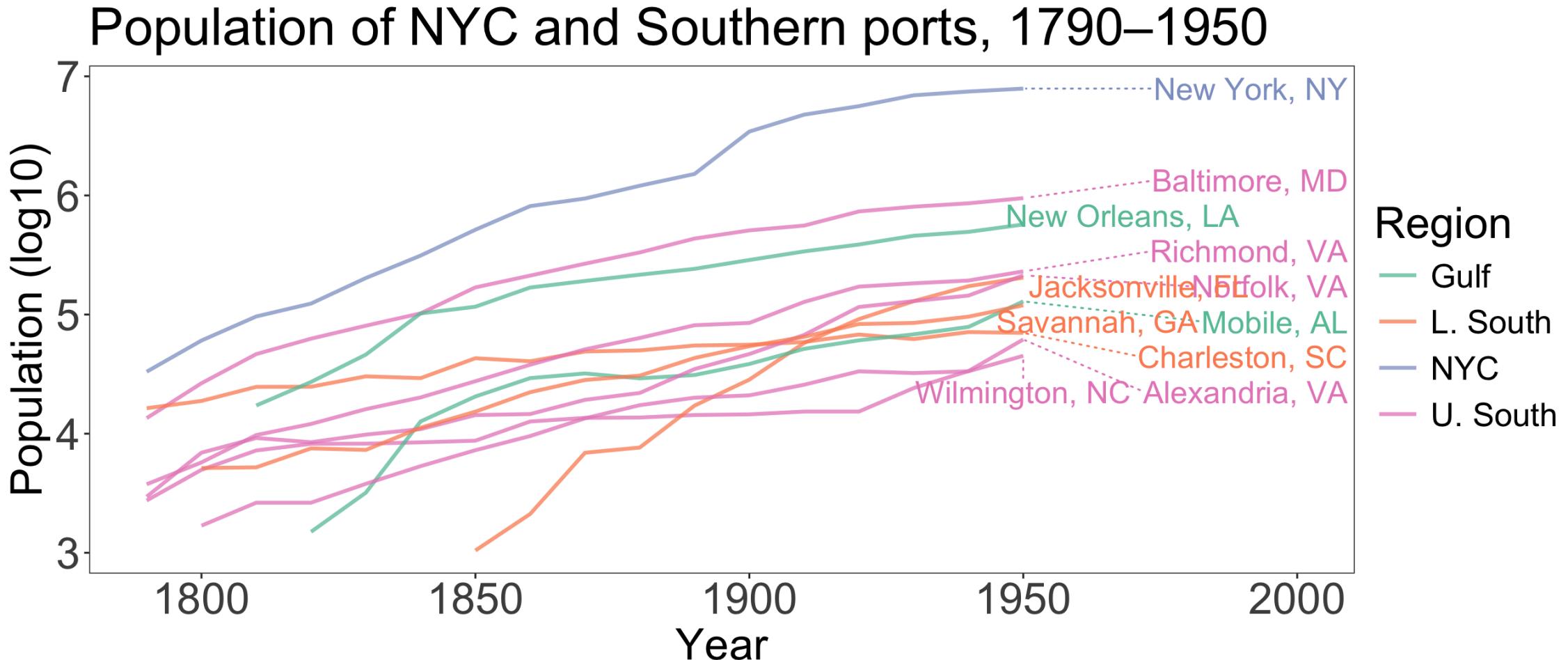
System	Location
LOT ≠ PALM ≠ START ≠ THOUGHT ≠ NORTH	Baltimore (early non-rhotic speech?)
LOT ≠ PALM ≈ START ≠ THOUGHT ≈ NORTH	Widespread in non-rhotic varieties (<i>PEAS</i>)
LOT = PALM ≈ START ≠ THOUGHT ≈ NORTH	Providence, RI? (Johnson 2010)
PALM ≈ START ≠ LOT = THOUGHT ≈ NORTH	Eastern New England
LOT ≠ PALM ≈ START ≈ THOUGHT ≈ NORTH	Tidewater Virginia (<i>PEAS</i>), New Orleans (Dinkin & Carmichael 2024, 2025)
LOT = PALM ≠ START ≈ THOUGHT ≠ NORTH	Baltimore (non-rhotic white speakers?)
LOT ≠ PALM ≈ START ≈ THOUGHT ≠ NORTH	Baltimore (non-rhotic Black speakers)
LOT ≠ PALM ≈ START ≈ THOUGHT = STRUT ≠ NORTH?	Baltimore (non-rhotic Black speakers)
LOT = PALM ≠ START ≠ THOUGHT ≠ NORTH	Widespread in rhotic varieties
LOT ≠ PALM = THOUGHT ≠ START = NORTH	Delmarva Peninsula (<i>PEAS</i>)
LOT = PALM ≠ THOUGHT ≠ START = NORTH	St. Louis
LOT = PALM = THOUGHT ≠ START = NORTH	Utah
LOT = PALM = THOUGHT ≠ START ≠ NORTH	Canada, the West, Western PA

Dialect contact and diffusion

New York-New Orleans contact

- Various authors have argued for dialect contact between New York City (NYC), New Orleans, and sometimes Charleston (Berger 1980; Labov, Ash & Boberg 2006; Labov 2007; Carmichael & Becker 2018; Carmichael 2020; Dinkin & Carmichael 2024)

What about Baltimore?



What about Baltimore?

- Extensive maritime slave trade from Baltimore to New Orleans (Williams 2020)
- Migration of slaveowners from Maryland to Louisiana (Williams 2020)
 - Prominent example: John McDonogh
- Thus, contact across the socioeconomic spectrum:
 - Enslaved people (cf. Picone 2003)
 - Mariners and dockhands
 - Merchants
 - Planters

What about Baltimore?

- Catholic connections
 - Bishop of Baltimore administered the diocese of New Orleans from 1809–1813 (Bishops of archdiocese n.d.)
 - Wealthy Louisianans sent their children to Catholic school in Baltimore (Arnold 2015)
- Demographic parallels:
 - Judaism
 - French
 - German
 - Irish
 - Italian

What about Baltimore?

- Baltimoreans were in contact with New Orleanians
- Baltimore was culturally and demographically similar to New Orleans
 - Arguably more so than Northern NYC or Protestant Charleston (cf. Eble 2016; Dinkin & Carmichael 2024)

NYC low back system

- PALM backer than LOT (Newman 2016)
- In *PEAS*:
 - LOT is (front) central
 - PALM is (back) central
- Pre-voiced LOT merged with PALM (Kaye 2012)
- No PALM-THOUGHT merger (Michael Newman, p.c.)

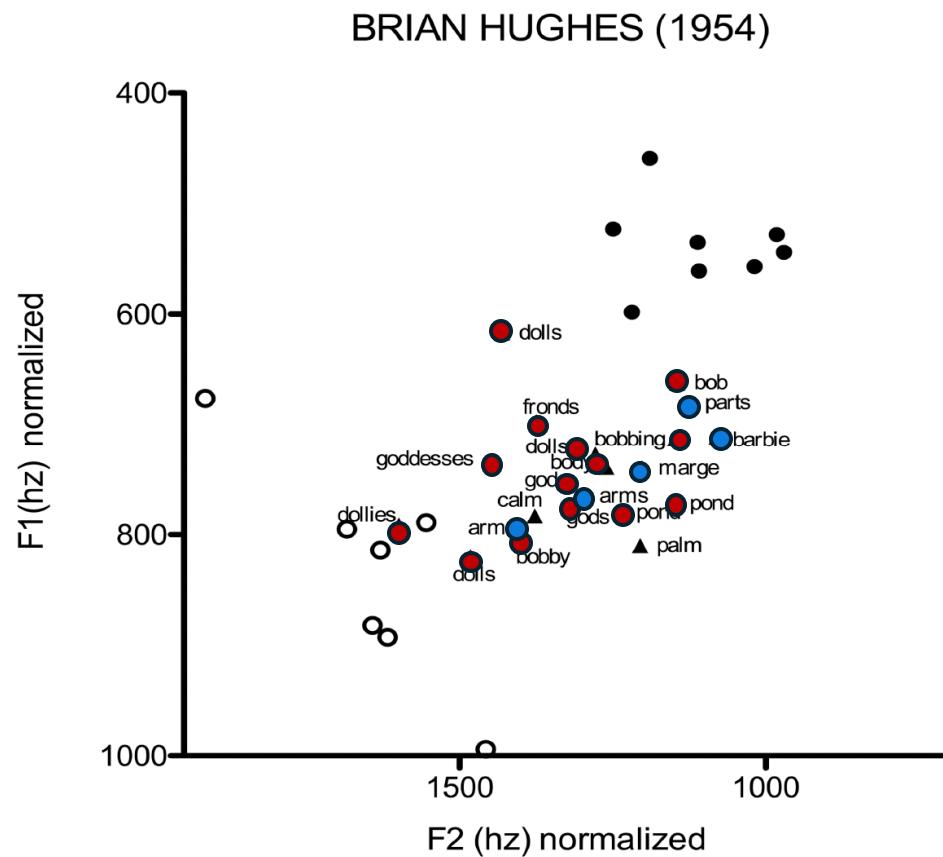
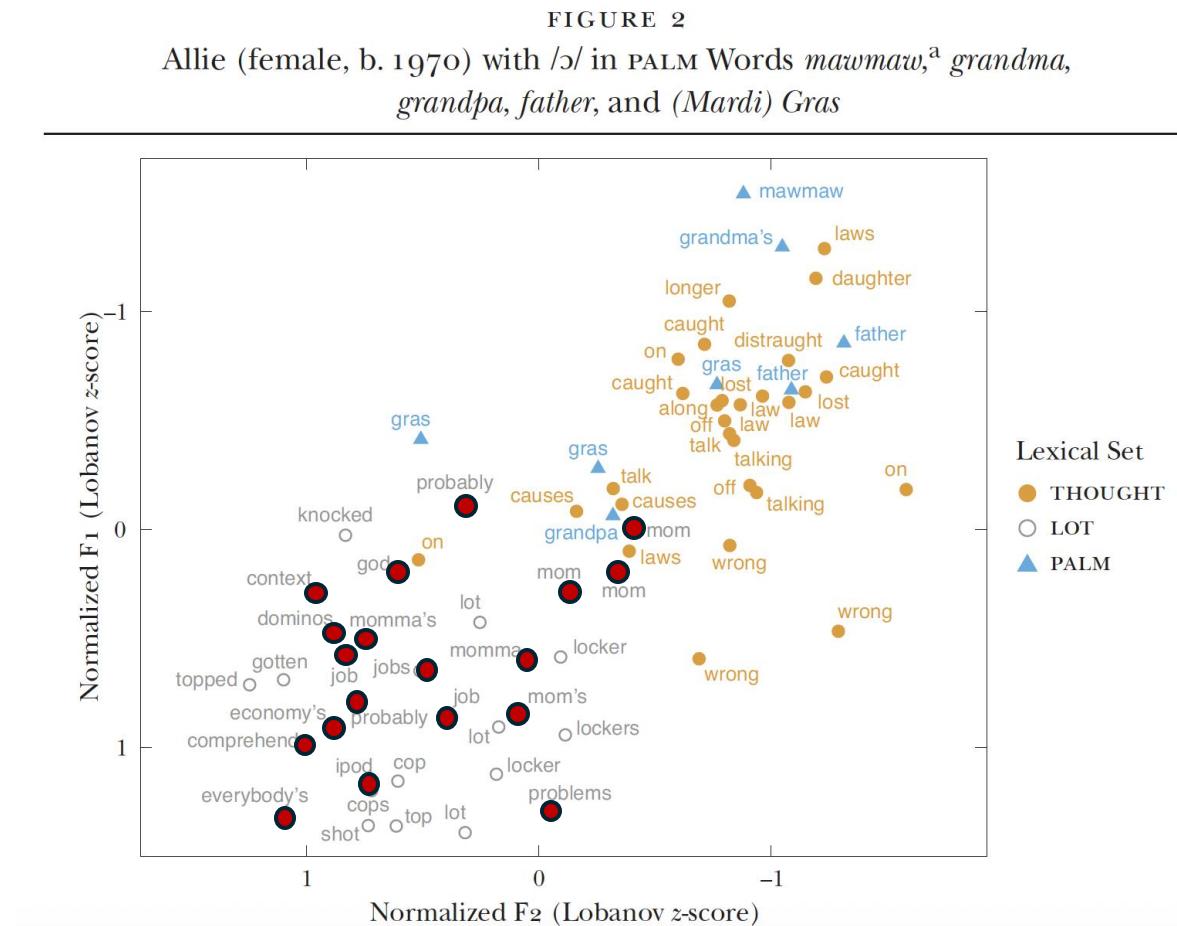


Figure 1: Brian Hughes' vowel chart. THOUGHT, closed circles; LOT, open circles; PALM, triangles. From Newman 2016. Red circles are pre-voiced LOT; blue circles are START.

New Orleans low back system

- PALM merged with THOUGHT (with between-item variation)
- Pre-voiced LOT merged with THOUGHT (with between- and within-item variation)



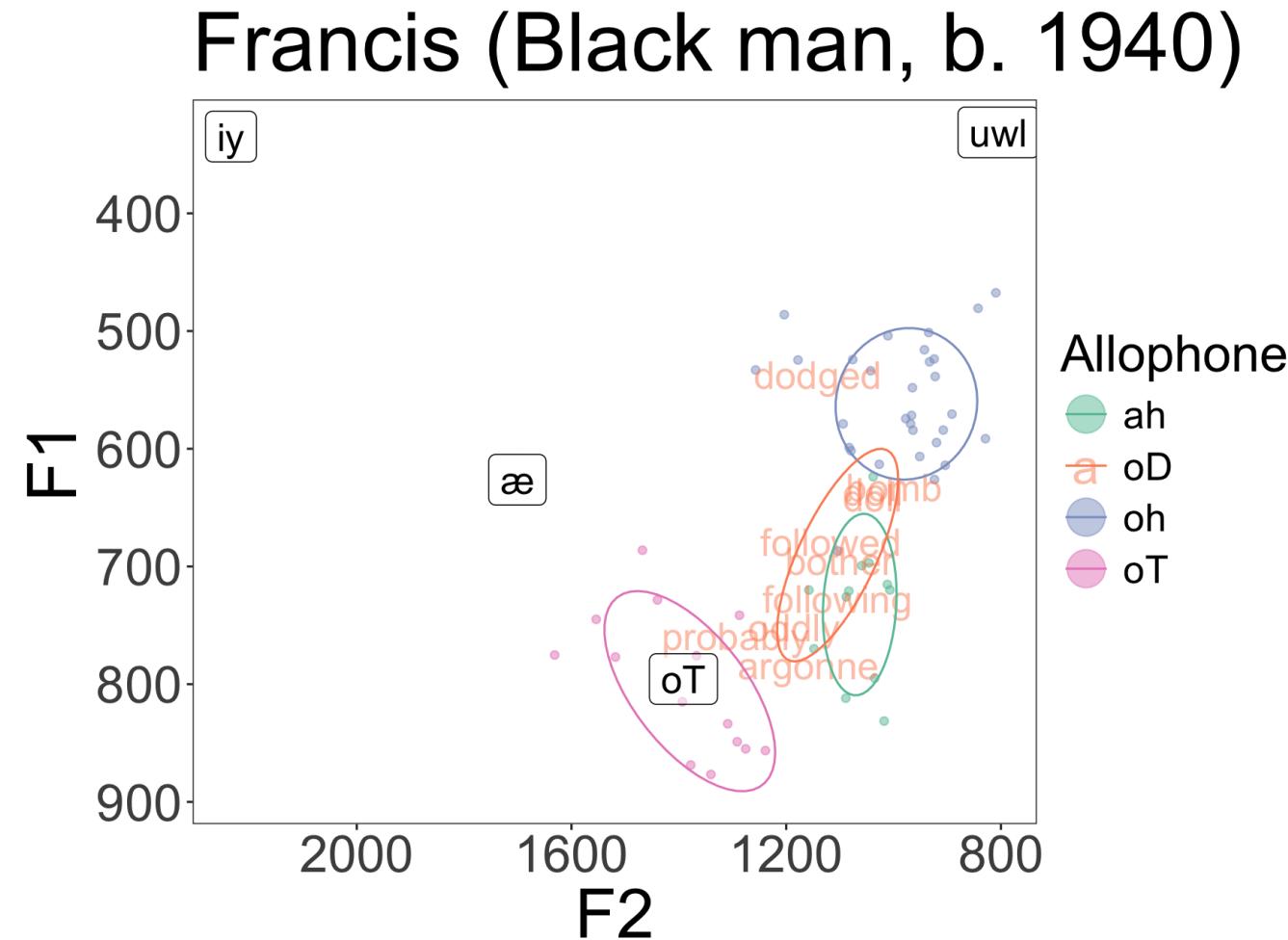
From Dinkin & Carmichael 2024. Red circles are pre-voiced LOT.

Diffusion from NYC?

- Dinkin & Carmichael 2024 argue that:
 - early New Orleans English had the same low back system as NYC
 - this is a result of diffusion from NYC

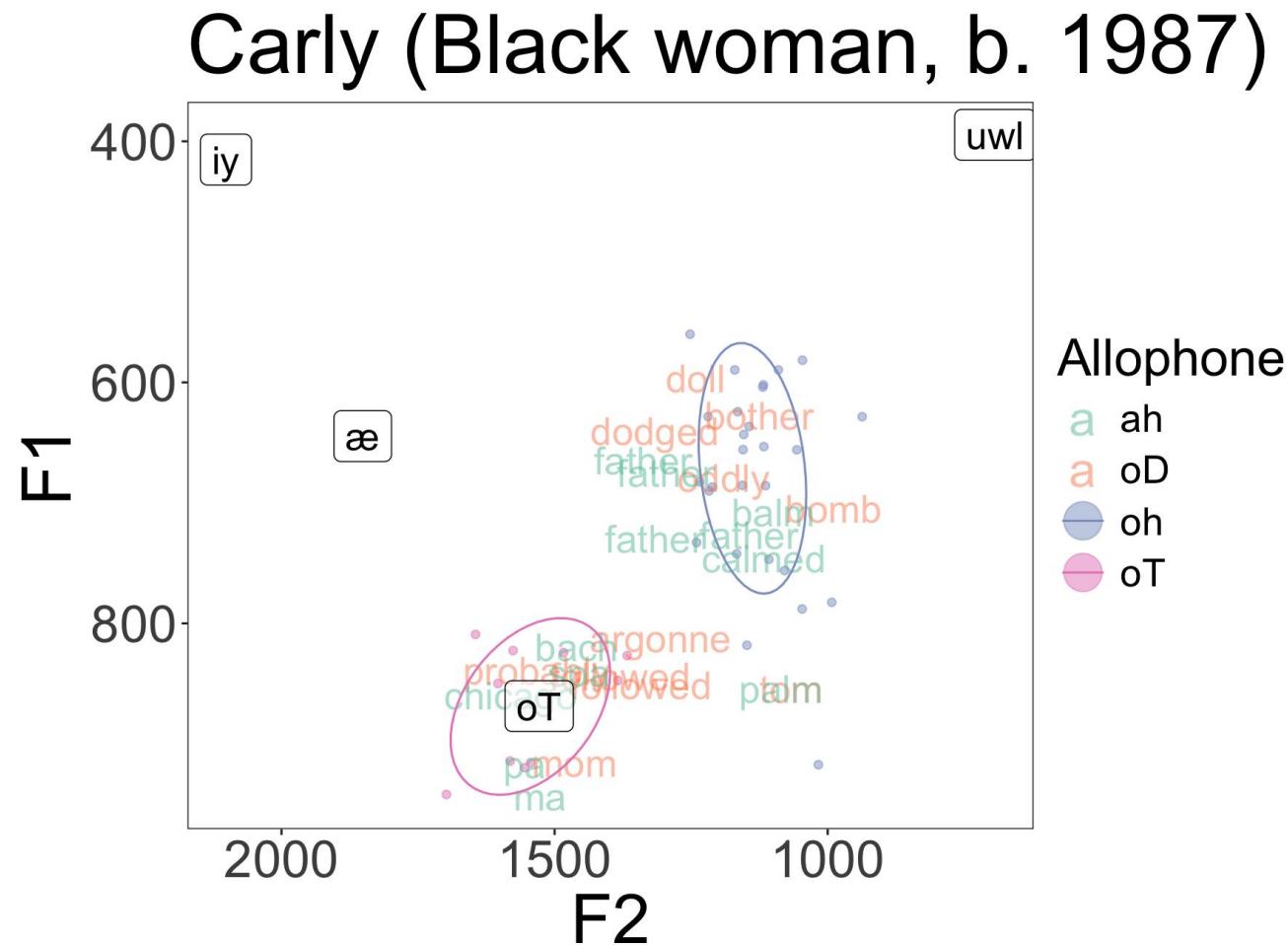
Earlier Baltimore low back system

- PALM backer than LOT
- In *PEAS*:
 - LOT is central
 - PALM is back and sometimes rounded
- Pre-voiced LOT backed and raised (but not clearly merged with PALM)



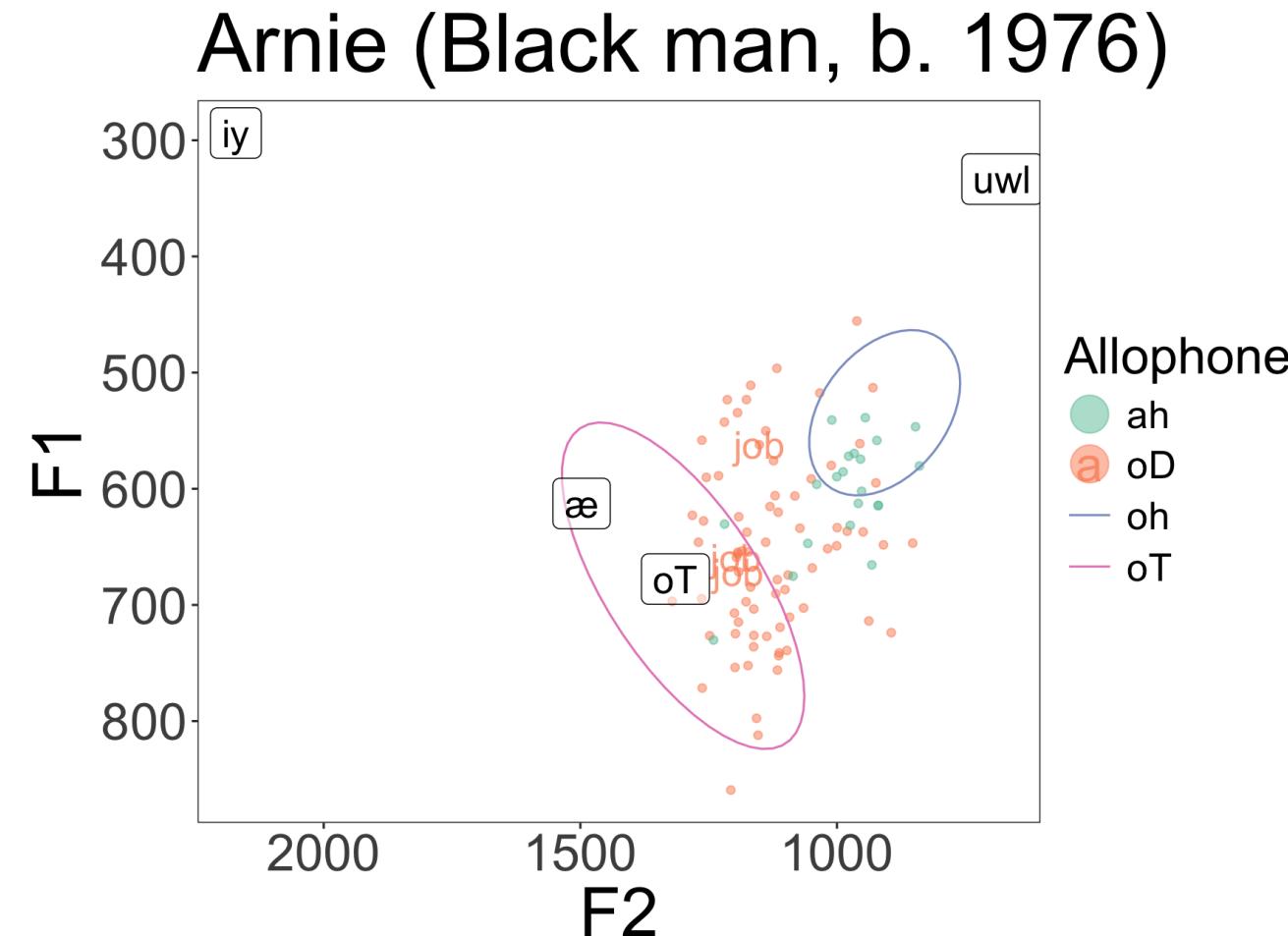
Current Baltimore AAE low back system

- PALM merged with THOUGHT (with between-item variation)
 - Pre-voiced LOT merged with THOUGHT (with between- and within-item variation)



Current Baltimore AAE low back system

- PALM merged with THOUGHT (with between-item variation)
- Pre-voiced LOT merged with THOUGHT (with between- and within-item variation)



Diffusion from Baltimore

- Compared to NYC, Baltimore's earlier low back system had more favorable conditions for PALM-THOUGHT merger
- Baltimore AAE and New Orleans English share PALM-THOUGHT merger
 - PALM-THOUGHT merger is also found in Tidewater Virginia and the Delmarva Peninsula (*PEAS*)
- Baltimore and New Orleans had close historical relations
- Baltimore is likely to have been a stronger influence on the New Orleans low back system

Why don't white Baltimoreans have PALMS in their THOUGHTS (as much)?

- Hypothesis 1: Raising of START generalizes to PALM for non-rhotic speakers (cf. ANAE)
 - Does not account for Kathy
- Hypothesis 2: Dialect contact
 - Great Migration reinforces backer PALM (*PEAS*)
 - Irish and Appalachian migration brings frontier PALM and LOT-PALM merger (*PEAS*; Hickey 2017)

Why don't white Baltimoreans have PALMS in their THOUGHTS (as much)?

- Hypothesis 3: White retreat from Black and/or Southern linguistic norms (cf. Bonfiglio 2002; Van Herk 2008; Labov, Rosenfelder & Fruehwald 2013)
 - “The wartime boom made Baltimore, a relatively placid and culturally southern city, look more like a smoky, congested northern industrial city. Its politics also came to resemble that of other post-New Deal industrial cities” (Durr 2003: 7)
 - “By the 1980s Baltimore had shed most of its southern orientation” (Arnold 1990: 25)

Tangent: Why does THOUGHT raise less in Baltimore and New Orleans?

- In ANAE, NYC, the Mid-Atlantic, and New Orleans are considered to have raised THOUGHT
- In NYC, THOUGHT raises to high mid or high position
- ANAE suggests that this is a generalization of the raising of NORTH/FORCE

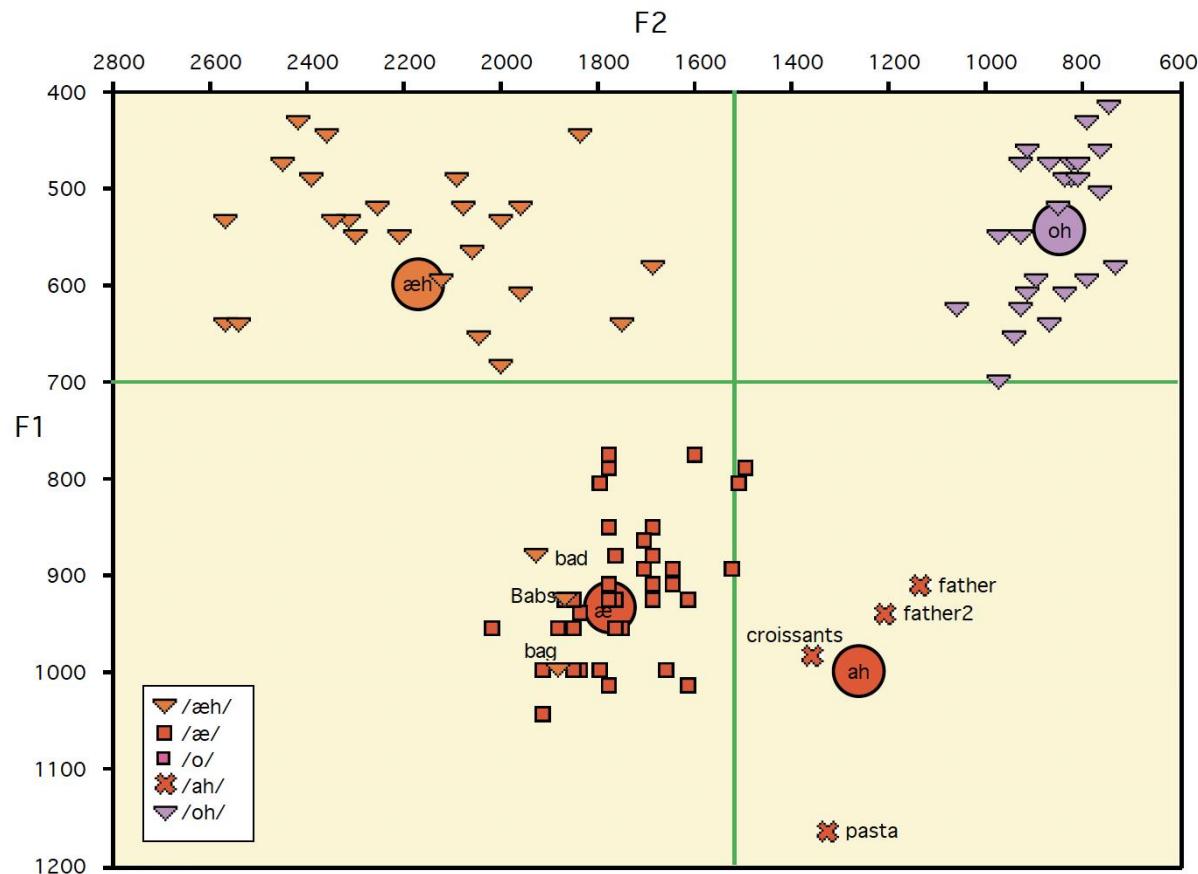


Figure 17.3. Long and ingliding vowels of Nancy B., 65, New York, NY, TS 495

Tangent: Why does THOUGHT raise less in Baltimore and New Orleans?

Baltimore

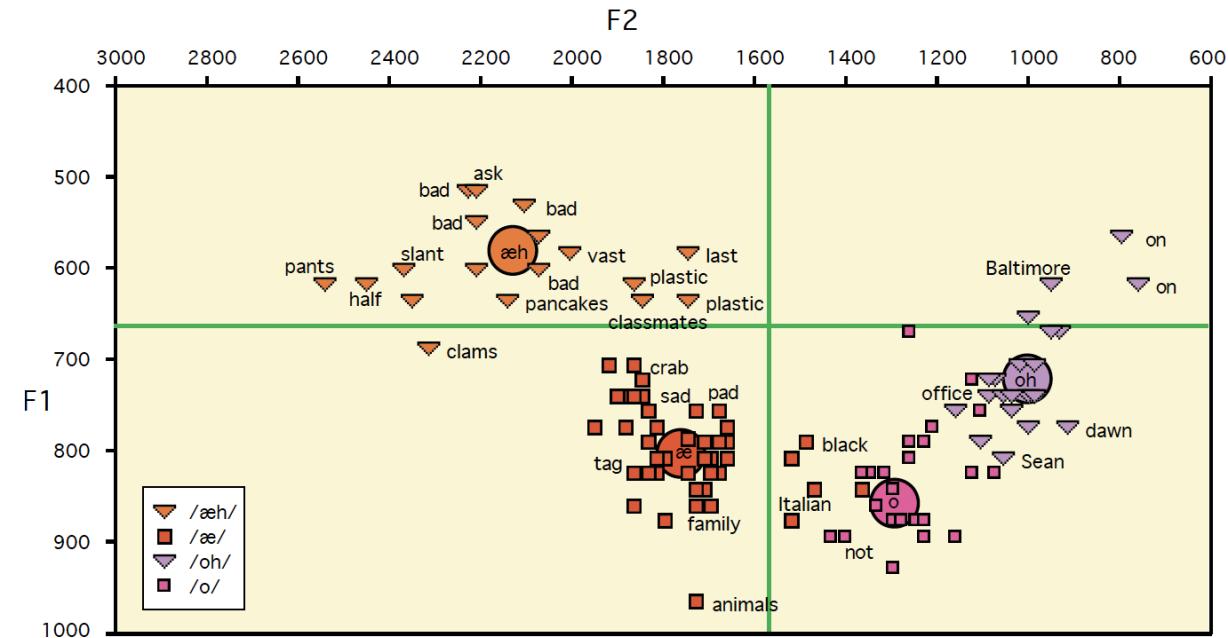


Figure 17.11. Inglid vowel subsystem of Mark D., 43, Baltimore, MD, TS 512

New Orleans

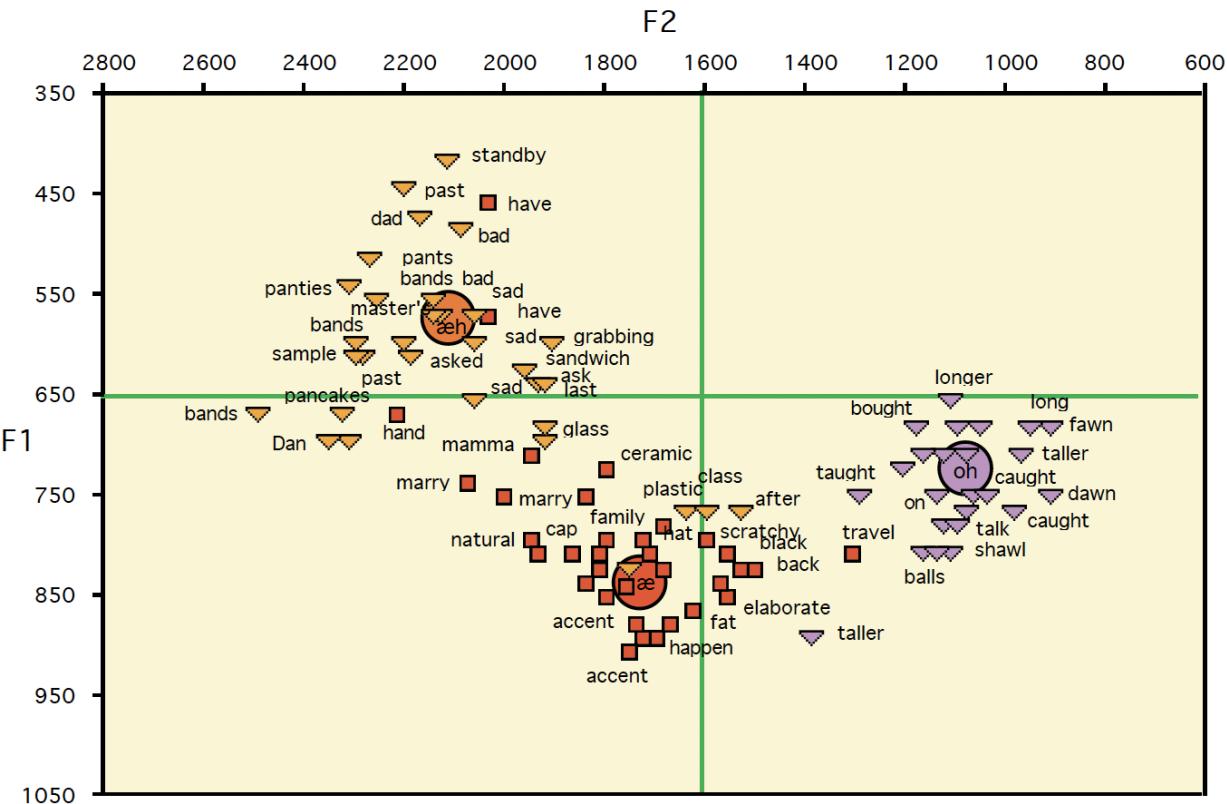


Figure 18.14. Long and ingliding vowels of Edith G., 38 [1996], New Orleans, LA, TS 608

Tangent: Why does THOUGHT raise less in Baltimore and New Orleans?

- In Baltimore and New Orleans, START raises to the position of THOUGHT and rounds
- Hypothesis:
 - After START-raising, START and THOUGHT have the same vowel (i.e., START = /ɔ:/)
 - Clear evidence for START-THOUGHT merger among non-rhotic speakers (e.g., Kathy)
 - Because THOUGHT is identified with START rather than FORCE, THOUGHT does not raise in parallel with FORCE
 - In earlier New Orleans English notably has a NORTH merges with START rather than FORCE anyway (Dinkin & Carmichael 2025)

Conclusion

Summary

1. Review and expand the typology of American low back systems
 - Highlighted PALM, START and NORTH's roles in low back typology
 - Presented four previously unattested low back systems that occur in Baltimore
2. Revisit common assumptions about low back vowels
 - Non-rhotic START and NORTH are not necessarily merged with PALM and THOUGHT, respectively, contra typical assumptions
 - PALM isn't necessarily merged with LOT for rhotic speakers
3. Present evidence for the diffusion of Baltimore's low back system
 - Baltimore is a likely influence on the New Orleans low back system

Summary of Baltimore's low back systems

- Several low back systems appear in Baltimore
- The behavior of the PALM set is variable across and within speakers, but there are certain tendencies:
 - For Black Baltimoreans, PALM words often merge to THOUGHT
 - For white Baltimoreans, PALM words often merge to LOT
- For many Black Baltimoreans, LOT variably merges with THOUGHT before voiced consonants
- Non-rhotic START is usually homophonous with THOUGHT
- For some Black Baltimoreans, THOUGHT merges (conditionally?) to STRUT

Takeaways

- Look at PALM
 - We can't assume it's merged with LOT or START
 - Its patterning can be complex (see Newman 2016; Dinkin & Carmichael 2024)
 - If we ignore PALM, then different low back systems appear the same (see Gardner & Roeder 2022)

Takeaways

- Look at the rhotic sets START and NORTH (and FORCE)
 - We can't assume they're merged with PALM or THOUGHT for non-rhotic speakers
 - But even if they're not merged (e.g., for rhotic speakers), the behavior of START and NORTH may be related to the behavior of LOT, PALM and THOUGHT (ANAE)

Takeaways

- Look beyond F1/F2
 - Rounding (see Havenhill 2018; King & Chatoran 2022)
 - THOUGHT is unrounding in Baltimore
 - Greater rounding of PALM in Baltimore than NYC provided evidence for diffusion from Baltimore
 - Formant trajectories (see also ANAE)

Thanks

- Katie Carmichael
- Connie Eble
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- Michael Newman
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- Research assistants: Adele and Veronica
- Research participants and other people who have helped me with my fieldwork!

References

- Acadians in Baltimore. 2022. *Acadians were here*. <https://acadianswerehere.org/acadians-in-baltimore.html>.
- Arnold, Joseph L. 1990. Baltimore: Southern culture and northern economy. In Richard M. Bernard (ed.), *Snowbelt cities: Metropolitan politics in the Northeast and Midwest since World War II*. Bloomington: Indiana University Press, 25–39.
- Arnold, Joseph L. 2015. *History of Baltimore, 1729–1920, with chapter introductions by Elizabeth M. Nix*. Baltimore: University of Maryland, Baltimore County.
- Becker, Kara. 2019. Introduction. In Kara Becker (ed.), *The low-back-merger shift: Uniting the Canadian Vowel Shift, the California Vowel Shift, and short front vowel shifts across North America*, 1–30. Durham: Duke University Press.
- Berger, Marshall D. 1980. New York City and the Antebellum South: The maritime connection. In Joey L. Dillard (ed.), *Perspectives on American English*, 135–141. The Hague: Mouton.
- Bishops of archdiocese. n.d. *St. Louis Cathedral*. <https://stlouiscathedral.org/bishops-ofarchdiocese>.
- Bonfiglio, Thomas Paul. 2002. *Race and the rise of Standard American*. Berlin/New York: Mouton de Gruyter.
- Carmichael, Katie. 2014. “*I never thought I had an accent until the hurricane*”: Sociolinguistic variation in post-Katrina Greater New Orleans. Columbus: Ohio State University PhD thesis.
- Carmichael, Katie. 2020. (æ)fter the storm: An examination of the short-a system in Greater New Orleans. *Language Variation and Change* 32(1). 107–131.
- Carmichael, Katie & Kara Becker. 2018. The New York City–New Orleans connection: Evidence from constraint ranking comparison. *Language Variation and Change* 30(3). 287–314.
- Dinkin, Aaron J. & Katie Carmichael. 2024. When PALMs are in your THOUGHTs, you head south: New Orleans low-back vowels and diffusion from New York City. *American Speech* 99(4). 385–409.
- Dinkin, Aaron J. & Katie Carmichael. November 7, 2025. *Systems of change: The case of rhotic back vowel systems in New Orleans English* [Paper presentation]. New Ways of Analyzing Variation 53, University of Michigan.

References

- Durr, Kenneth D. 2003. *Behind the backlash: White working-class politics in Baltimore, 1940–1980*. Chapel Hill: University of North Carolina Press.
- Eble, Connie. August 2016. *The role of history in historical sociolinguistics: New York City and New Orleans* [Paper presentation]. Linguistics Association of Canada and the United States, Saint Mary's University.
- Fruehwald, Josef. 2025. new-fave, version 1.1.1 [Python package]. <https://pypi.org/project/new-fave/1.1.1/>.
- Gardner, Matt Hunt & Rebecca Roeder. 2022. Phonological mergers have systemic phonetic consequences: PALM, trees, and the Low Back Merger Shift. *Language Variation and Change* 34(1). 29–52.
- Hickey, Raymond. 2017. Early recordings of Irish English. In Raymond Hickey (ed.), *Listening to the past: Audio records of accents of English*, 199–231. Cambridge, UK: Cambridge University Press.
- Johnson, Daniel Ezra. 2010. *Stability and change along a dialect boundary: The low vowels of Southeastern New England*. Durham: Duke University Press.
- Johnson, Daniel Ezra & David Durian. 2017. New England. In Raymond Hickey (ed.), *Listening to the past: Audio records of accents of English*, 257–297. Cambridge, UK: Cambridge University Press.
- Johnson, Keith. 2020. The ΔF method of vocal tract length normalization for vowels. *Laboratory Phonology* 11(1). Article 10.
- Kaye, Jonathan. 2012. Canadian raising, eh? In Eugeniusz Cyran, Henryk Kardela & Bogdan Szymanek (eds.), *Sound structure and sense: Studies in memory of Edmund Gussman*, 321–352.
- Kurath, Hans & Raven I. McDavid, Jr. 1961. *The pronunciation of English in the Atlantic states*. Ann Arbor: University of Michigan Press.
- Labov, William. 2007. Transmission and diffusion. *Language* 83(2).344–387.
- Labov, William, Sharon Ash & Charles Boberg. 2006. *The atlas of North American English: Phonetics, phonology, and sound change*. Berlin: Mouton De Gruyter.
- Labov, William, Ingrid Rosenfelder & Josef Fruehwald. 2013. One hundred years of sound change in Philadelphia: Linear incrementation, reversal, and reanalysis. *Language* 89(1). 30–65.

References

- Labov, William, Malcah Yaeger & Richard Steiner. 1972. *A quantitative study of sound change in progress* (NSF-GS-3287). Philadelphia: University of Pennsylvania.
- Leys, Christophe, Olivier Klein, Yves Dominicy & Christophe Ley. 2018. Detecting multivariate outliers: Use a robust variant of the Mahalanobis distance. *Journal of Experimental Social Psychology* 74. 150–156.
- Majors, Tivoli. 2005. Low back vowel merger in Missouri speech: Acoustic description and explanation. *American Speech* 80(2). 165–179.
- McAuliffe, Michael, Michaela Socolof, Sarah Mihuc, Michael Wagner & Morgan Sonderegger. 2017. Montreal Forced Aligner: Trainable text-to-speech alignment using Kaldi. In *Proceedings of the 18th Conference of the International Speech Communication Association*, 498–502.
- McAuliffe, Michael & Morgan Sonderegger. 2024. English (US) ARPA acoustic model, version 3.0.0. https://mfa-models.readthedocs.io/en/latest/acoustic/English/English%20%28US%29%20ARPA%20acoustic%20model%20v3_0.html.
- Newman, Michael. 2016. LOTs of THOUGHTs on the endangered PALMs of New York. *University of Pennsylvania Working Papers in Linguistics* 22(2). 131–140.
- Nycz, Jennifer & Lauren Hall-Lew. 2013. Best practices in measuring vowel merger. *Proceedings of Meetings on Acoustics* 20. Article 060008.
- Picone, Michael D. 2003. Anglophone slaves in francophone Louisiana. *American Speech* 78(4). 404–433.
- Stanley, Joseph A. 2021. joeyr, version 0.9.2 [R package]. <https://github.com/Joeystanley/joeyr>.
- Wells, J. C. 1982. *Accents of English I: An introduction*. Cambridge, UK: Cambridge University Press.
- Williams, Jennie K. 2020. Trouble the water: The Baltimore to New Orleans coastwise slave trade, 1820–1860. *Slavery & Abolition* 41(2). 275–303.
- Van Herk, Gerard. 2008. Fear of a black phonology: The Northern Cities Shift as linguistic white flight. *University of Pennsylvania Working Papers in Linguistics* 14(2). 157–161.

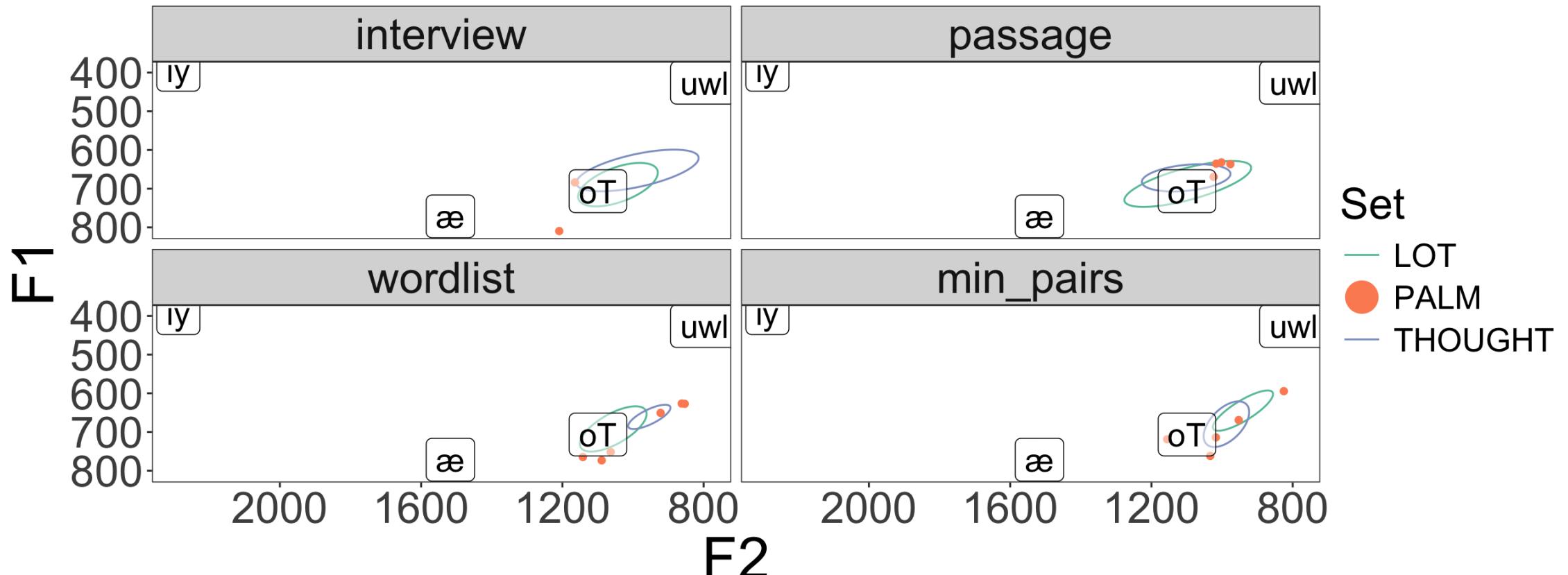
Appendix A: Stigmatization of “dug”

Uh, a staple of Baltimore dialect is *d[ʌ]gs* and *fr[ʌ]gs*. I was not allowed to say *d[ʌ]gs* and *fr[ɔ]gs*. It had to be *fr[ɔ]gs* and *d[ɔ]gs*.



Appendix B: Towards LOT-PALM-THOUGHT merger

Dominic (white Jewish man, b. 2002)



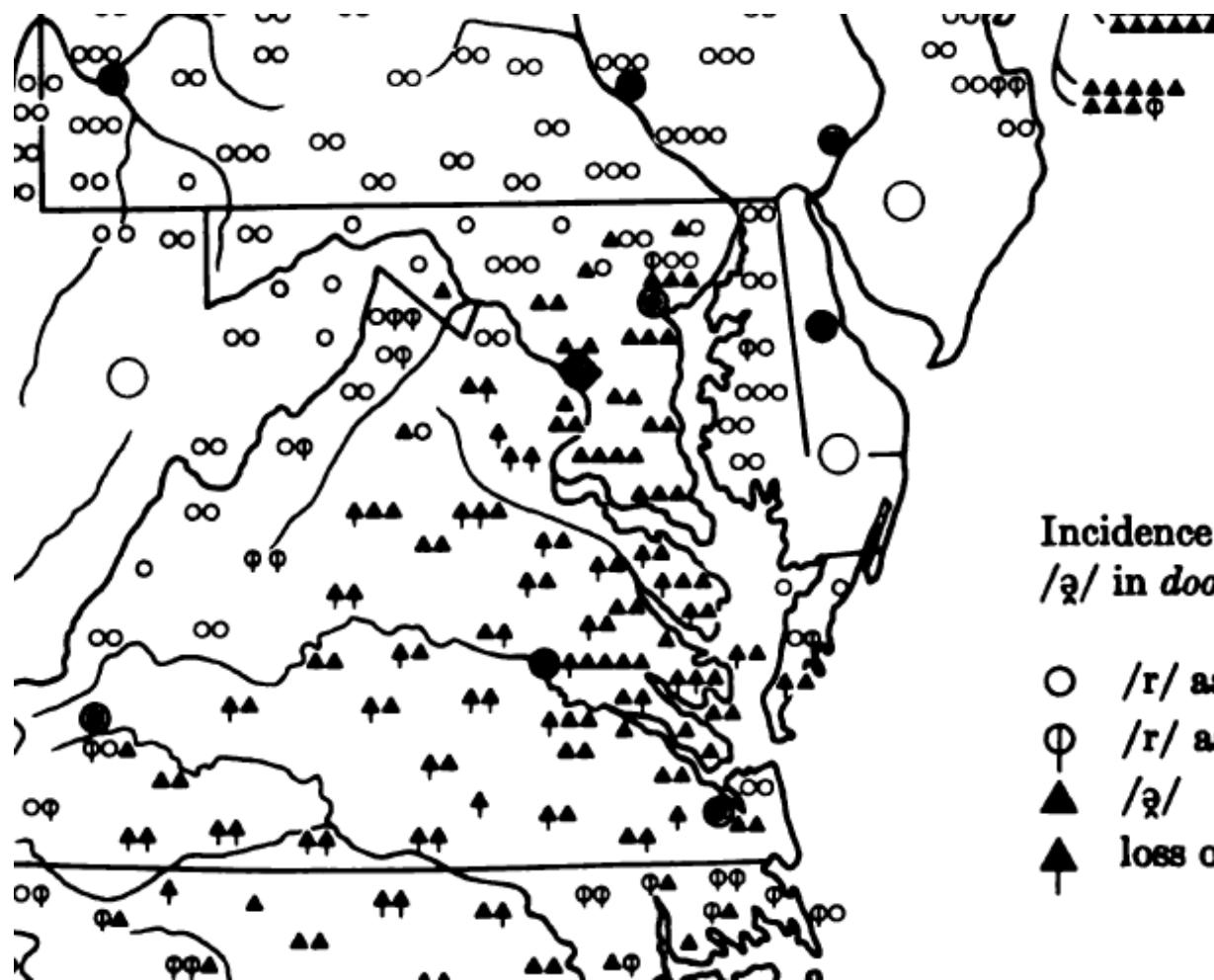
Appendix C: Shared features between NYC, New Orleans, and Baltimore

Feature	Baltimore	New Orleans	New York
Fronted MOUTH ^A	yes	yes	yes
Complex short-a split	yes	yes	yes
PALM backer than LOT	yes	yes (inferred)	yes
/a/ for pre-rhotic CLOTH	yes	yes	yes
Non-rhoticity	yes ^B	yes	yes
Palatalized NURSE	maybe	yes	yes
Monophthongal PRICE	yes	yes	no
Fronted GOOSE	yes	yes	no
Fronted GOAT	yes	yes	no
PALM-THOUGHT merger	yes (mainly AAE)	yes	no
Raised THOUGHT	yes (low-mid to mid)	yes (low-mid to mid)	yes (high-mid to high)

^A Earlier white New Orleanians' speech appears to demonstrate a pattern also found among Black Baltimoreans, wherein MOUTH is fronted dramatically following nasals but not elsewhere. Younger white New Orleanians demonstrate raising and fronting of MOUTH before voiceless consonants (Carmichael 2014).

^B Non-rhoticity used to occur more frequently among white Baltimoreans (*PEAS*). Baltimore appears to have retreated from non-rhoticity much earlier than other areas.

Appendix D: Non-rhoticity in Baltimore

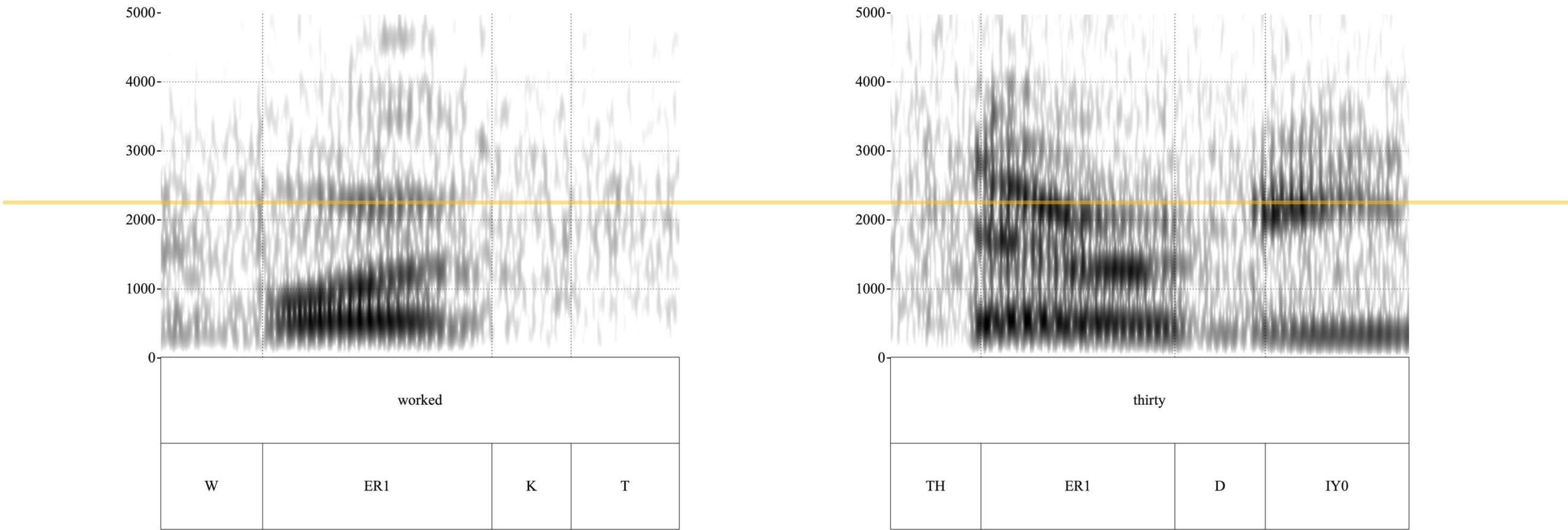


Map 156

Incidence of Postvocalic /r/ and
/ə/ in *door*

- /r/ as [ə] or [r]
- ◊ /r/ as [ə]
- ▲ /ə/
- ↑ loss of /ə/

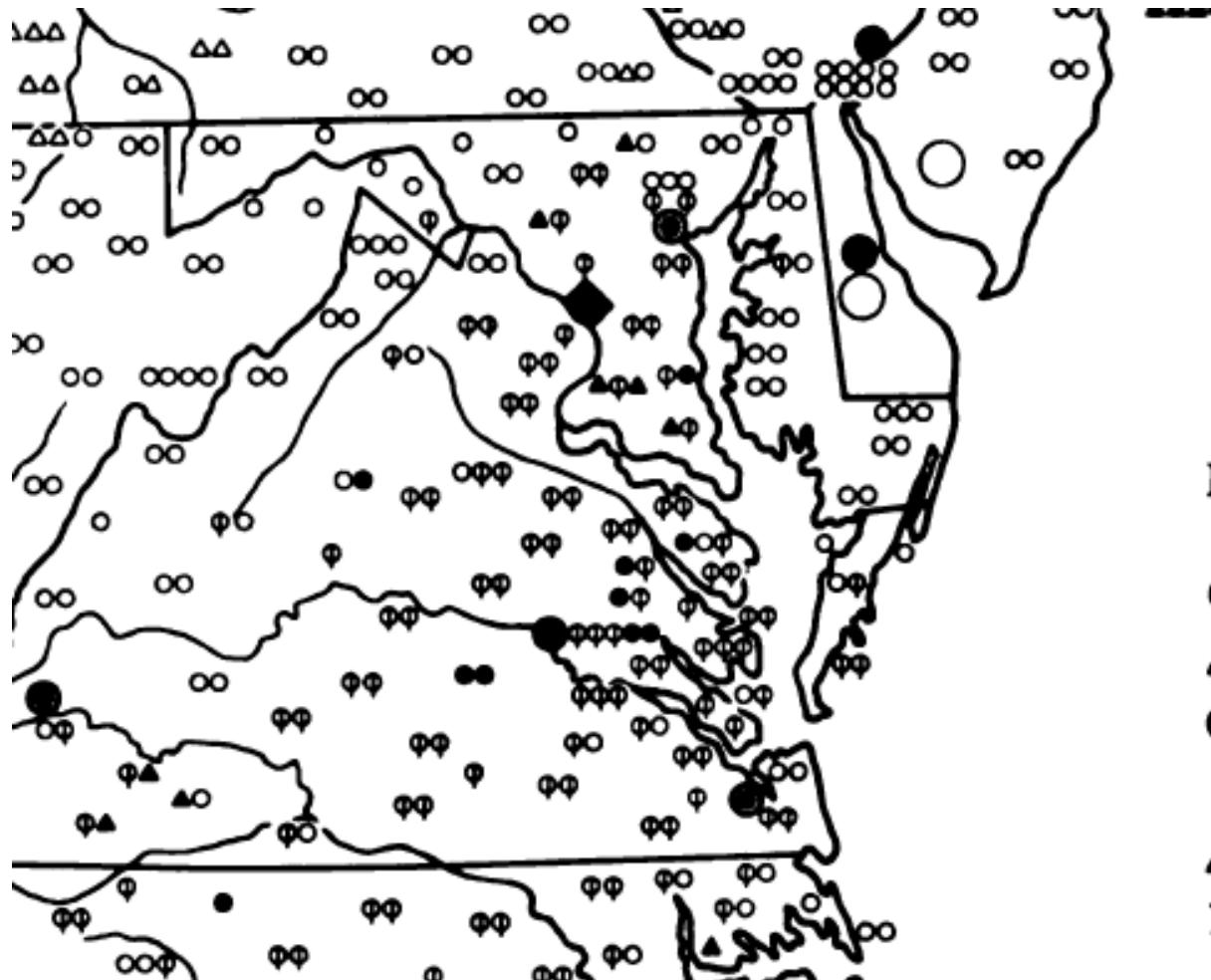
Appendix D: Non-rhoticity in Baltimore



Richard Meads (white man, b. 1910)

I worked down there years and y– years. I worked down there till 1939.

Appendix E: Palatalized NURSE in Maryland



Map 25

Diaphones of /ə/ in *thirty*

- [ə̃ ~ ə ~ ə̃̄ ~ ə̄̄ ~ ə̄̄̄]
- △ [ə̄̄ ~ ə̄ ~ ə̄̄̄]
- ◊ [ə̄̄ ~ ə̄̄̄ ~ ə̄̄̄̄ ~ ə̄̄̄̄̄]
- [ə̄̄ ~ ə̄ ~ ə̄̄̄ ~ ə̄̄̄̄ ~ ə̄̄̄̄̄ ~ ə̄̄̄̄̄̄]
- ▲ [ə̄̄̄ ~ ə̄̄̄̄ ~ ə̄̄̄̄̄]
- × [ə̄̄̄̄]