Vowels can merge because of changes in Trajectory

Prelaterals in rural Utah English

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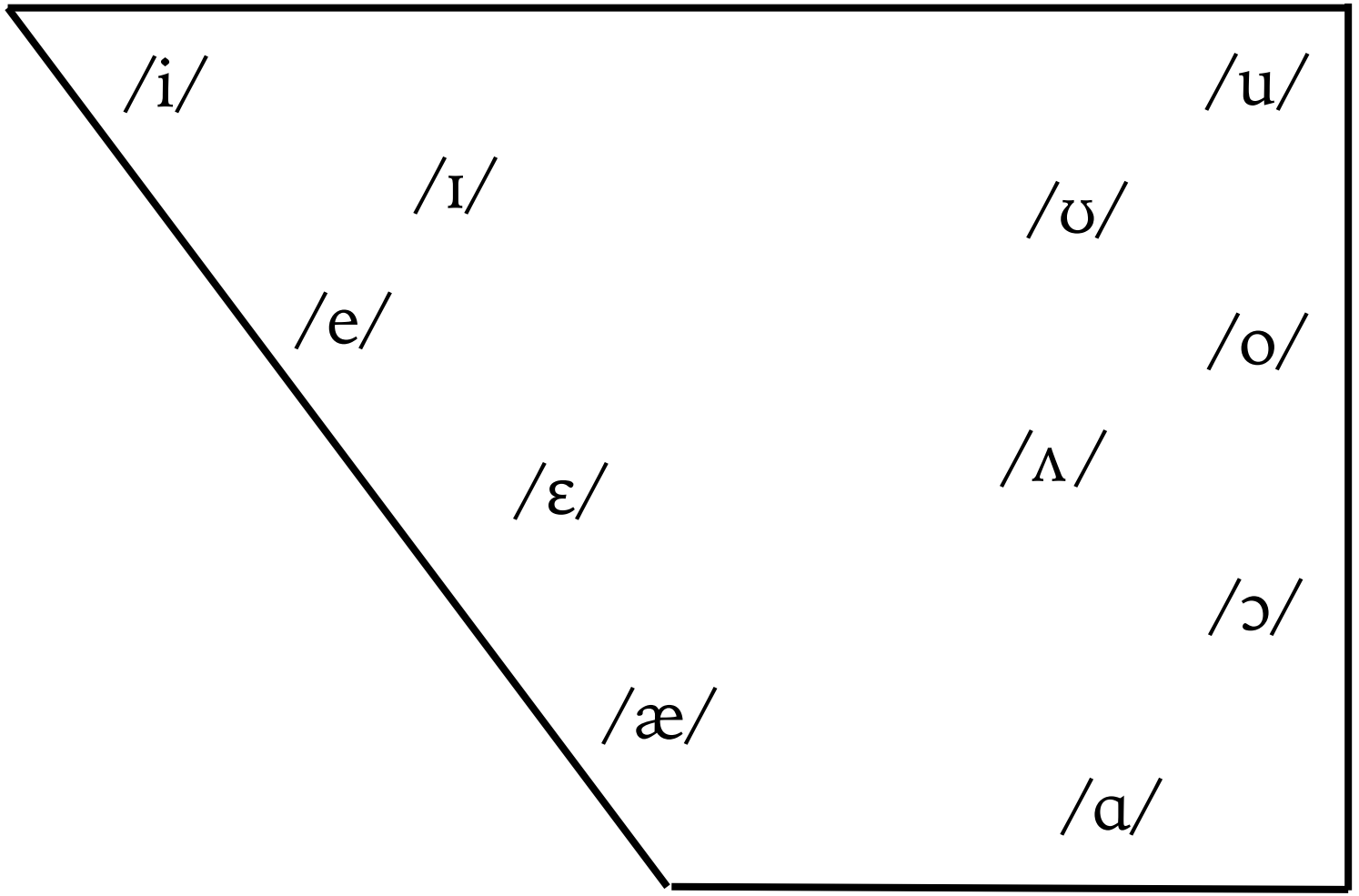
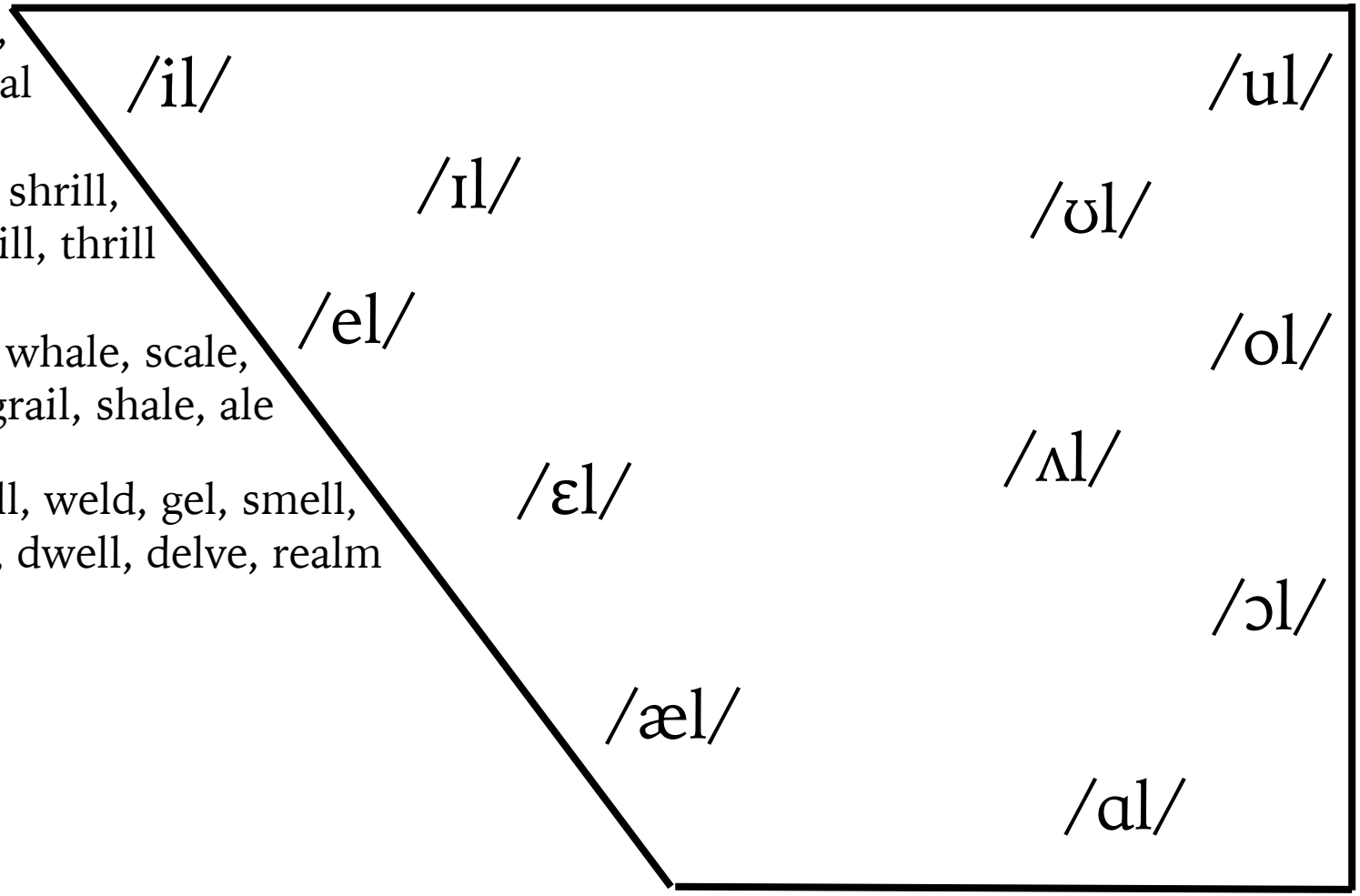
Introduction

Prelateral Mergers



Prelateral Mergers



feel, peel, deal, kneel, meal, seal

ill, pill, dill, gill, shrill, drill, kilt, quill, thrill

fail, tail, whale, scale, jail, trail, grail, shale, ale

fell, bell, weld, gel, smell, swell, dwell, delve, realm

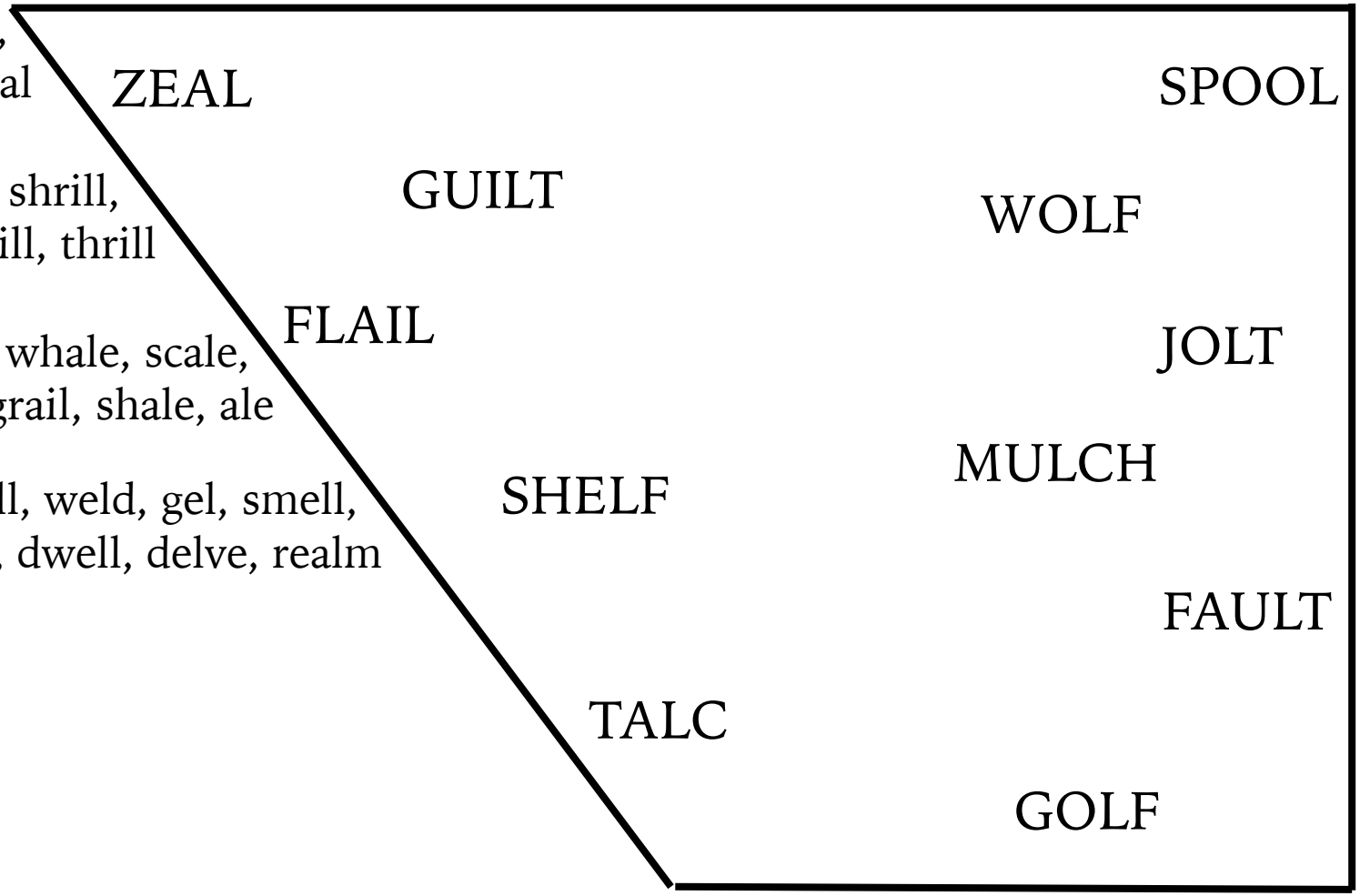
fool, cool, tool, ghoul, stool, school, drool, cruel, Yule

full, pull, bull, wool, wolf

hole, coal, bowl, goal, cold, scold, troll, molt, gold

hull, dull, gull, pulse, skull, cult, gulf, lull, sulk, sculpt

Prelateral Mergers



feel, peel, deal,
kneel, meal, seal

ill, pill, dill, gill, shrill,
drill, kilt, quill, thrill

fail, tail, whale, scale,
jail, trail, grail, shale, ale

fell, bell, weld, gel, smell,
swell, dwell, delve, realm

fool, cool, tool, ghoul, stool,
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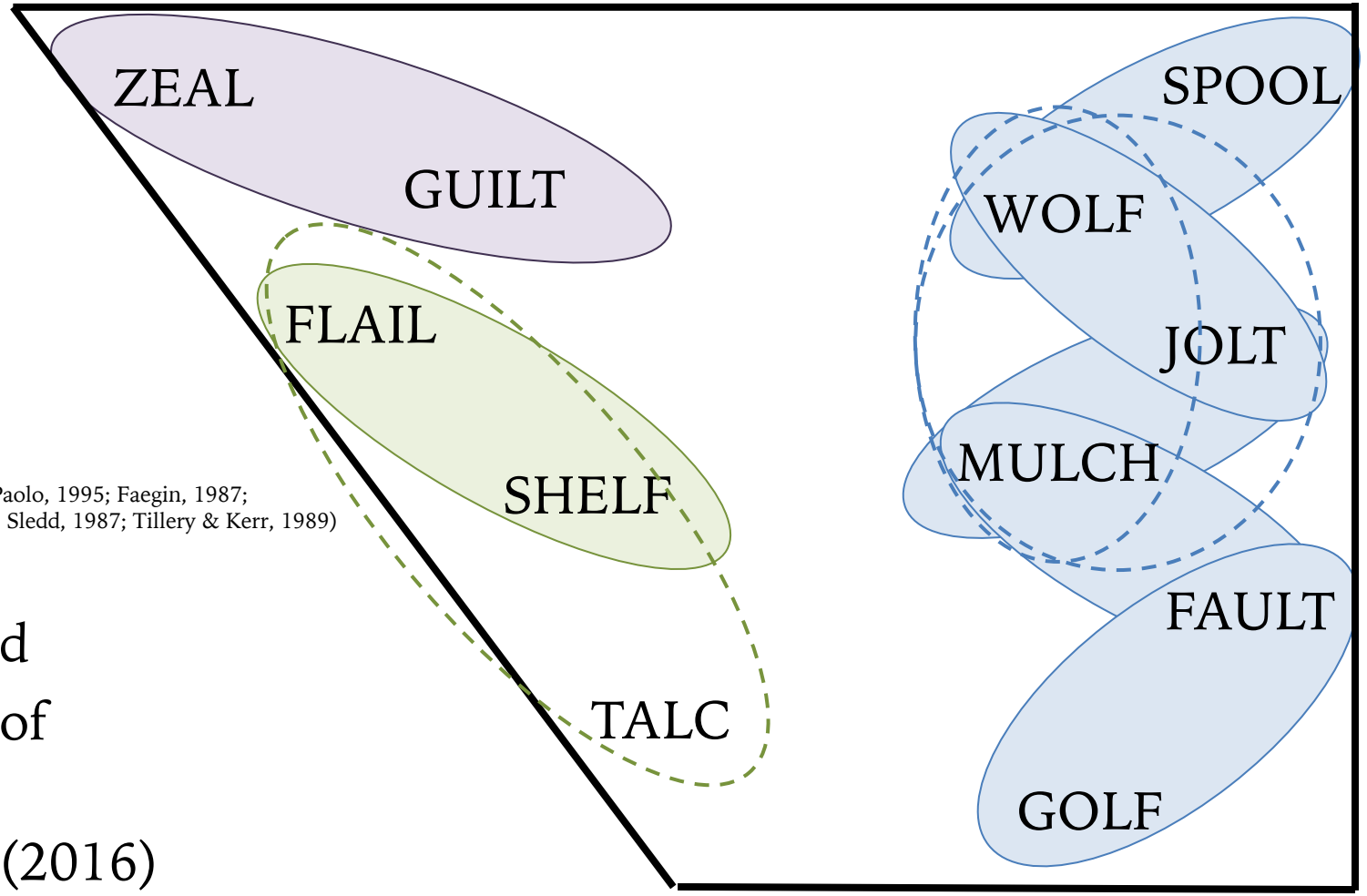
hull, dull, gull, pulse, skull,
cult, gulf, lull, sulk, sculpt

Prelateral Mergers

In front vowels, tense-lax distinction is lost before /l/

- Utah and other Western states
- Texas
- Appalachian Mountain region
- Anniston, Alabama
- Tangier Island, Virginia
- New Zealand
- (Bauer, 1986; Di Paolo, 1988; Di Paolo & Faber, 1990; Faber & Di Paolo, 1995; Faegin, 1987; Hartman, 1984; Labov et al. 2006; Labov, et al., 1972; Shores, 1985; Sledd, 1987; Tillery & Kerr, 1989)



In back vowels, it's complicated

- Basically, all configurations of merger have been attested.
- Excellent review in Strelluf (2016)

Prelateral Mergers

From Labov et al. (2006)

Other mergers before /l/

In several of the vowel charts just given, one can observe a tendency for the merger of /e/ and /ey/ before /l/ in *fell* and *fail*, *sell* and *sail*. In general, this merger is closely associated with the merger of /il/ and /iyl/. There are 49 cases of merger of /il/ and /iyl/, and of these, 27, just over half, showed the /el/ ~ /eyl/ merger also. There are only seven cases of speakers with an /el/ ~ /eyl/ merger who do not have the /il/ ~ /iyl/ merger.

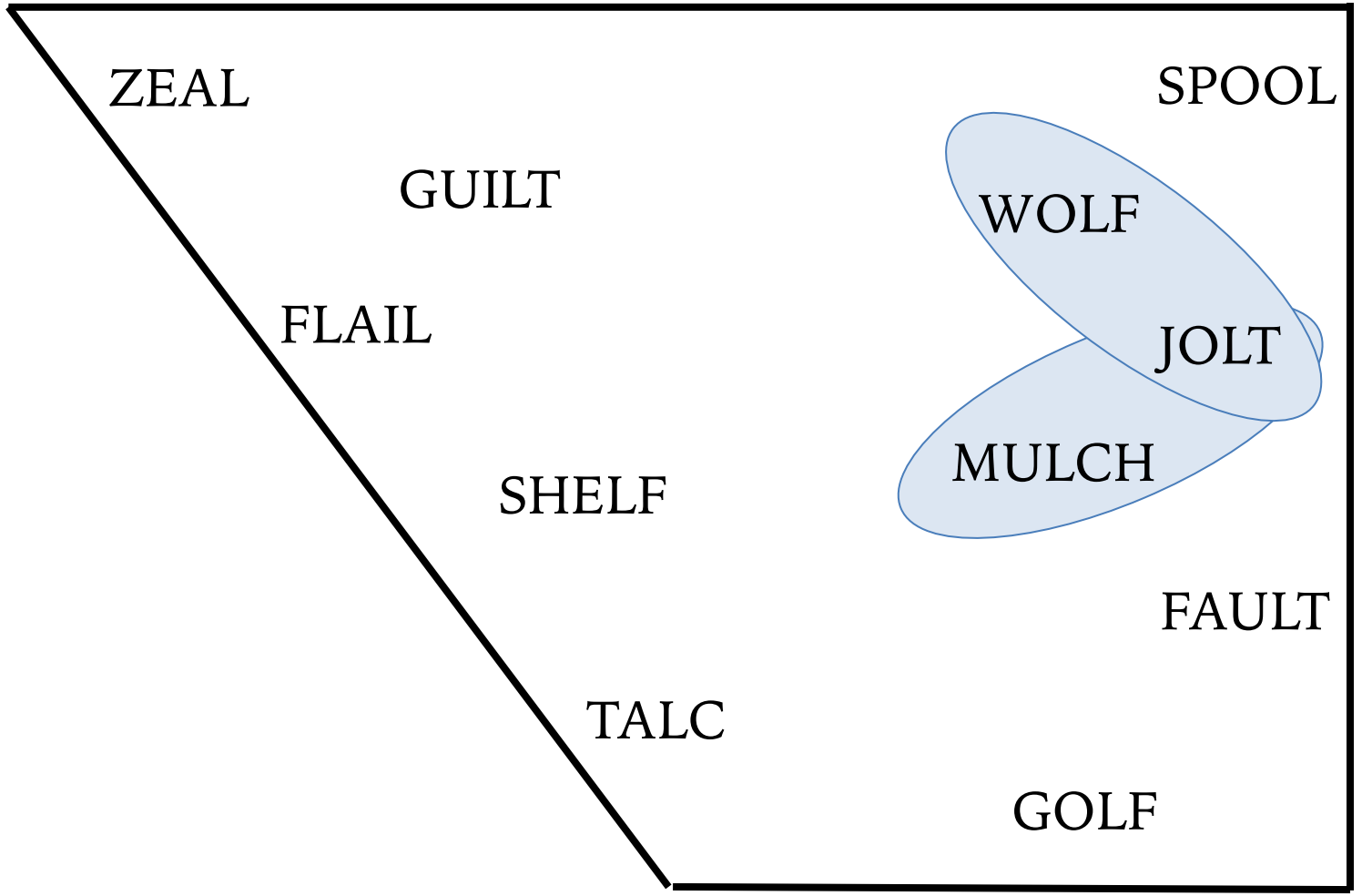
In the course of the study, Telsur found evidence for a number of other mergers of back vowels before /l/ codas. Figure 9.4 shows a merger of /owl/ with /uwl/ and /ul/. Minimal pairs for these contrasts were introduced in the course of the study but not consistently over the whole Telsur sample. In order of frequency of 'same' responses, these items were:

– the merger of /ul/ and /owl/ as in *bull* and *bowl*;
– the merger of /ʌl/ and /ohl/ as in *hull* and *hall*;
– the merger of /ul/ and /ʌl/ as in the rhyming pair *bull* and *hull*;
– the merger of /ʌl/ and /owl/ as in *hull* and *hole*.

The first three of these at least deserve further study.

We will focus on these today

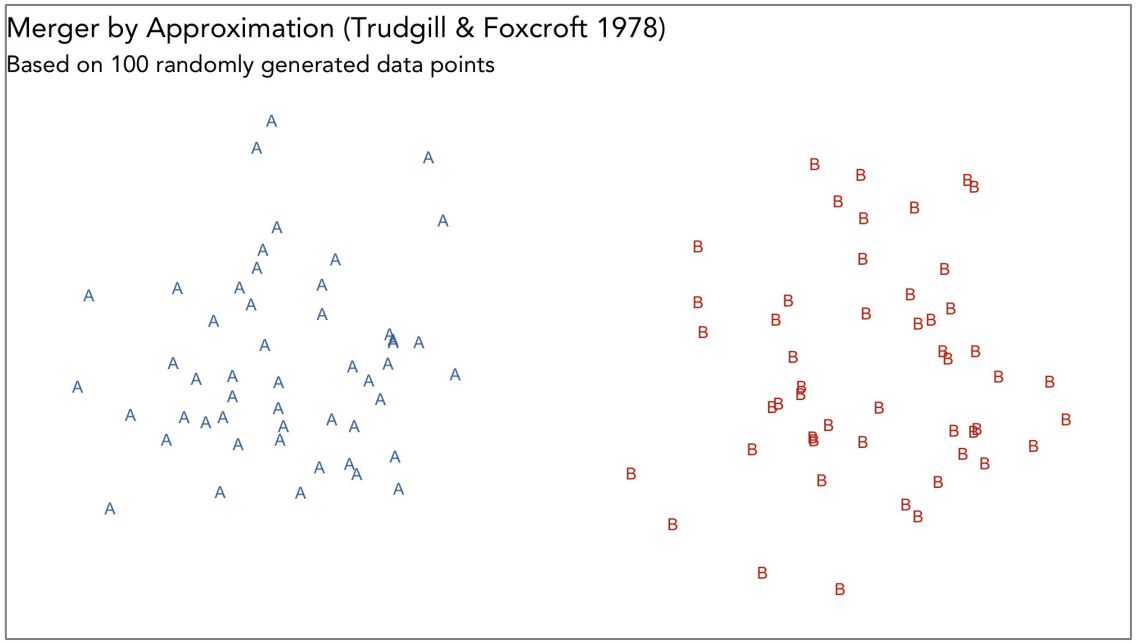
Prelateral Mergers



We will focus on these today

Mechanisms of Merger

- Several have been proposed
  - Merger by approximation (Foxcroft & Trudgill 1978)
  - Merger by transfer (Foxcroft & Trudgill 1978)
  - Merger by expansion (Herold 1990)
  - Merger by phonological transfer (Dinkin 2016)
  - Merger by glide loss (Irons 2007)



Trajectories

Koops (2010) used trajectory analysis to identify two different types of /u/-fronting among Houston Anglos (117)

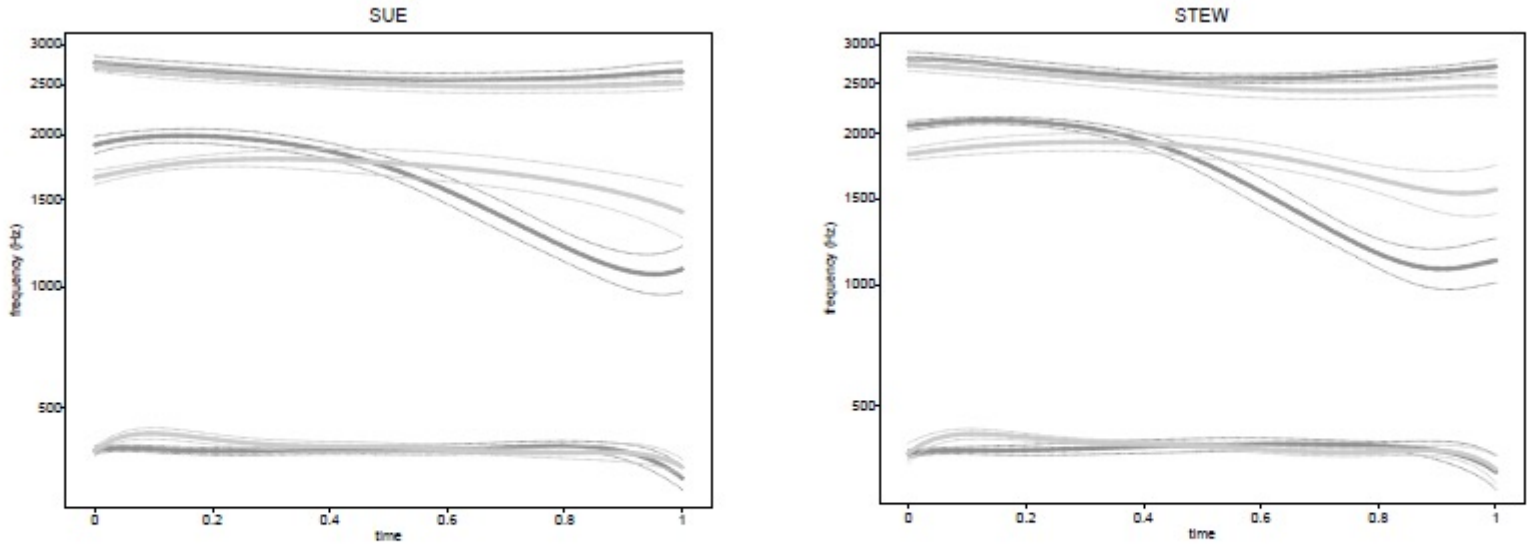


Figure 3: Time-normalized mean F1, F2 and F3 trajectories with 95% confidence intervals for /u/ in *Sue* and *stew*. Formant frequencies Nearey-1 normalized. Bark-scaled to better bring out the differences in F1. Dark gray = NON-SOUTHERN group; Light gray = SOUTHERN group.

Trajectories

Strelluf (2016) saw clear differences in trajectories of overlapping vowels when comparing this father and daughter (393)

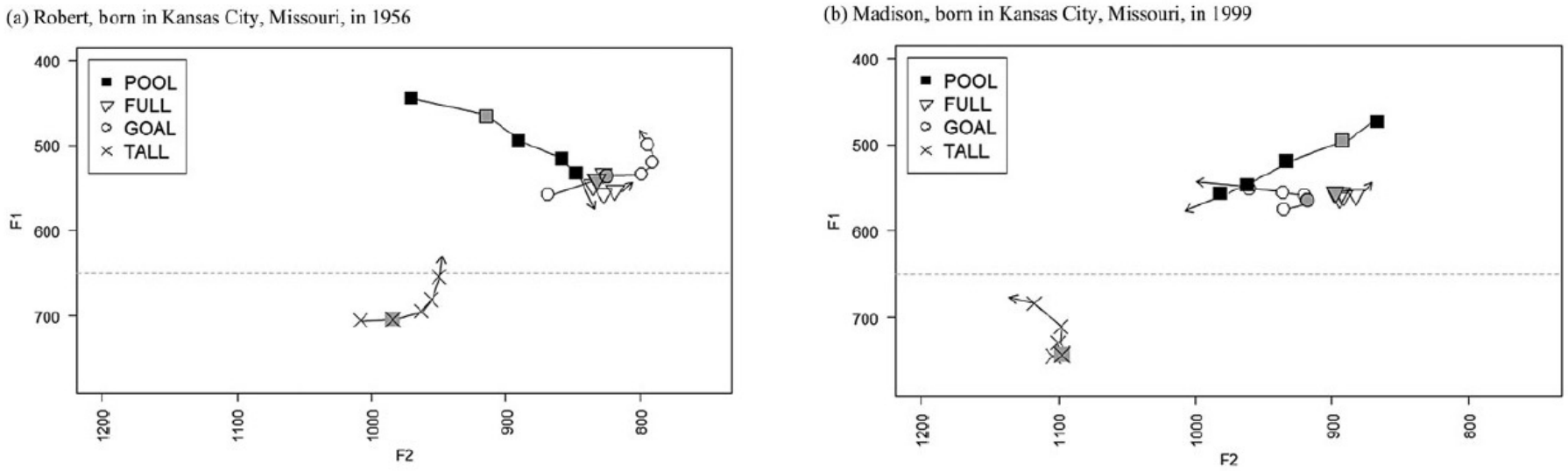
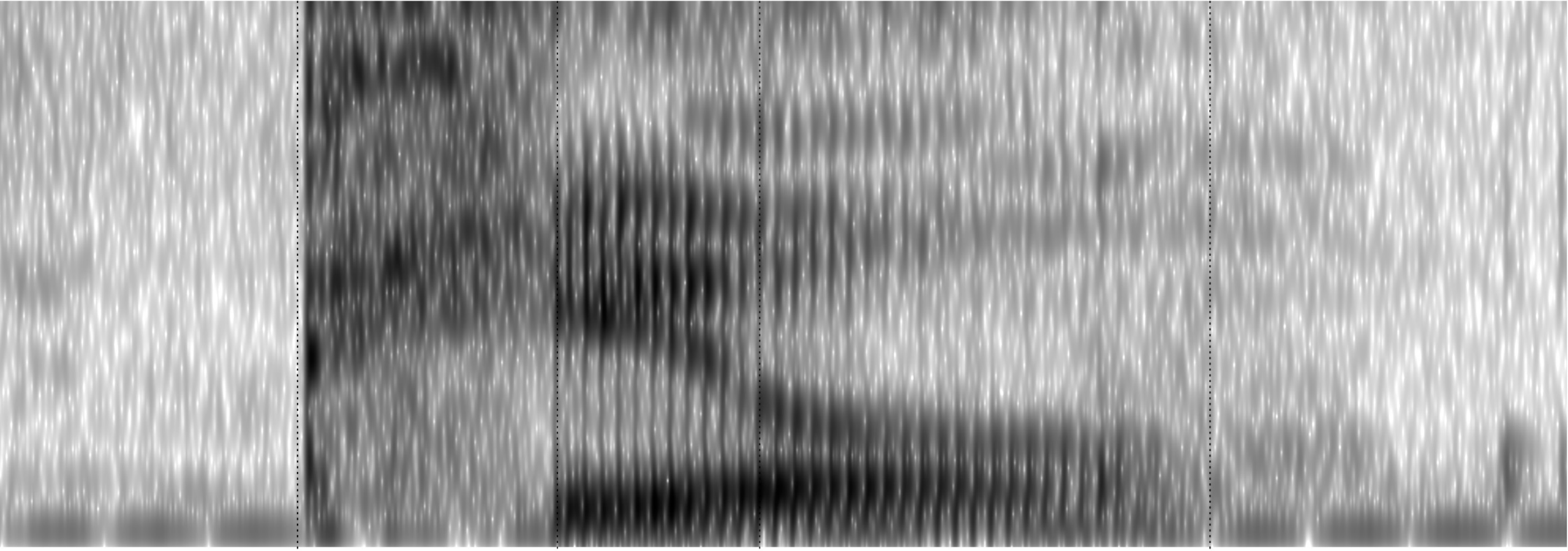


Figure 7. Contour plots of POOL, FULL, GOAL, and TALL

"This is an important dimension to consider in the context of overlap…because distinctions might be maintained across a vowel's trajectory that do not show up in single-point measurements of F1 and F2 that attempt to represent a vowel's central tendency" (383-384)



	p	i	l	
	peel			

Research in Utah

- SPOOL~WOLF said to be most general of the prelateral mergers (LYS, 1972)
- ZEAL and FLAIL both laxing for younger speakers; SPOOL said to be moving towards WOLF; diphthongization as possible intermediate step (Di Paolo, 1988)
- Simple F1 & F2 measurements (at one or two points) may not tell the whole story
  - Distinctions may be made in secondary features even when vowels appear to be merged (Di Paolo & Faber, 1990; Faber & Di Paolo, 1995)
  - Listeners take into account multiple acoustic factors when discriminating between sounds
    (Faber & Di Paolo, 1995)
- WOLF~JOLT and MULCH~JOLT not addressed

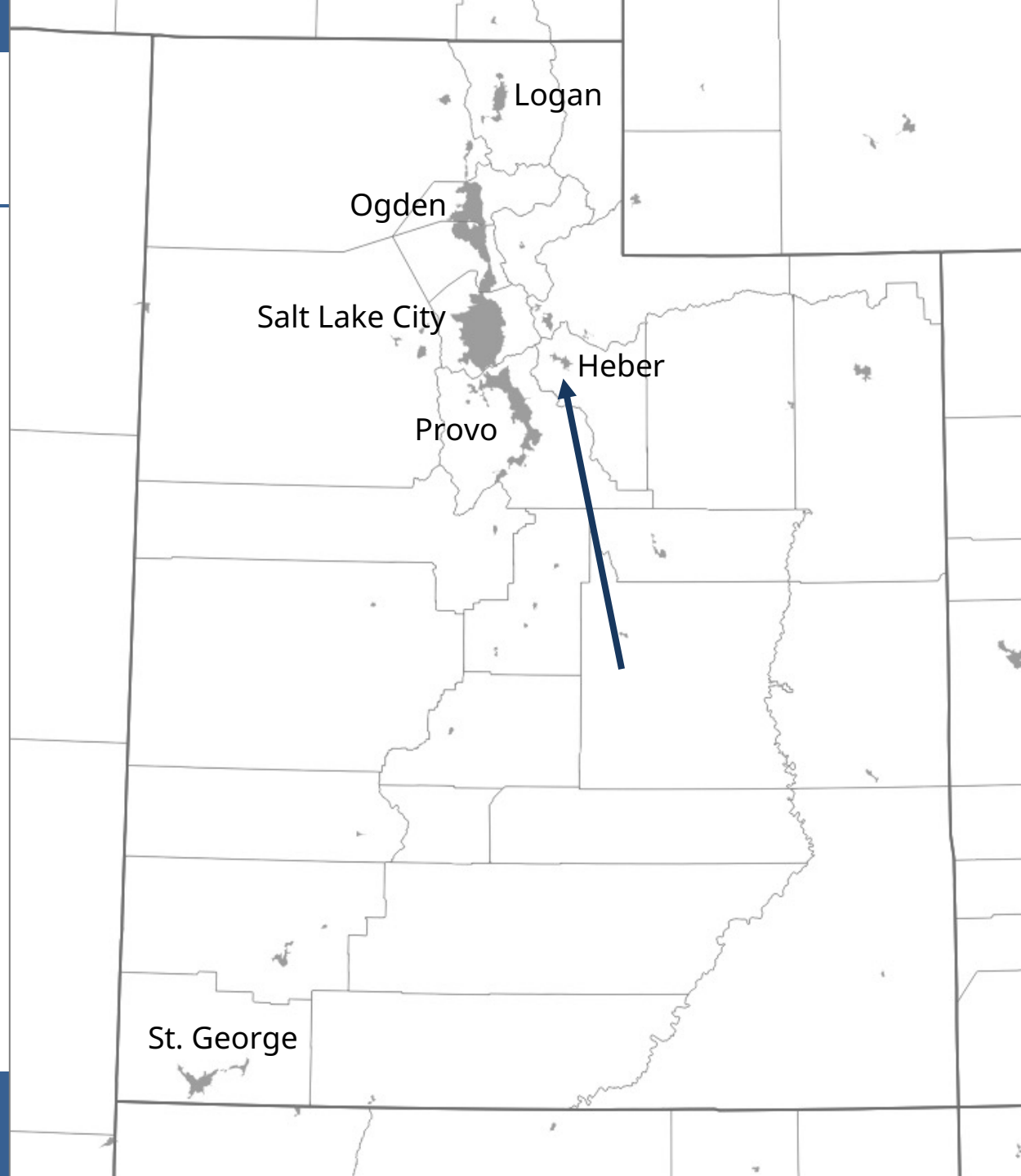
Our research question:

What can trajectory analyses reveal about the process of vowel merger?

Data

Data Collection

When	January 2018
Field Site	Wasatch County, Utah
Recruitment	face-to-face, business cards, snowball, family
Method	Wordlist
Speakers	28
Vowels analyzed	4,514 prelateral vowel tokens



Data Processing

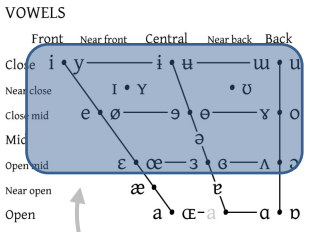
Acoustic analysis	**transcription**	Manual
	alignment	Manual
	formant extraction	Fast Track (Barreda 2021), binned at 11 points per vowel
Number-crunching (in this order, cf. Stanley 2021)	**remove stopwords**	`stopwords::stopwords(source = "marimo")`
	remove outliers	Mahalanobis distance (Mahalanobis 1936)
	normalization	ΔF (Johnson 2020)
	exclusions	only looked at tautosyllabic prelateral vowels
Tools	**statistics**	Generalized additive mixed-effects models (Wood 2017)
	software	R (R Core Team 2018), tidyverse (Wickham et al. 2019); mgcv (Wood 2011)
	visuals	ggplot2 (Wickham 2015), gganimate (Pedersen & Robinson 2020)

Birth year modeled as a continuous, nonlinear variable.

Results

Predicted prelateral vowel trajectories in Heber City, UT

What you should see: Lots of change!



This plot is a zoomed-in view of this region.

No indication of SPOOL merging with WOLF (*i.e.*, no *pool-pull* merger)

ZEAL distinct but moving towards GUILT.

SPOOL

ZEAL

WOLF

JOLT

Lots of merging happening here.

GUILT

FLAIL

Massive amount of raising

MULCH

SHELF

Lines represent the 10%–50% into the vowel + lateral segment

Predicted F1 (normalized)

0.4

0.5

0.6

2.0

1.6

1.2

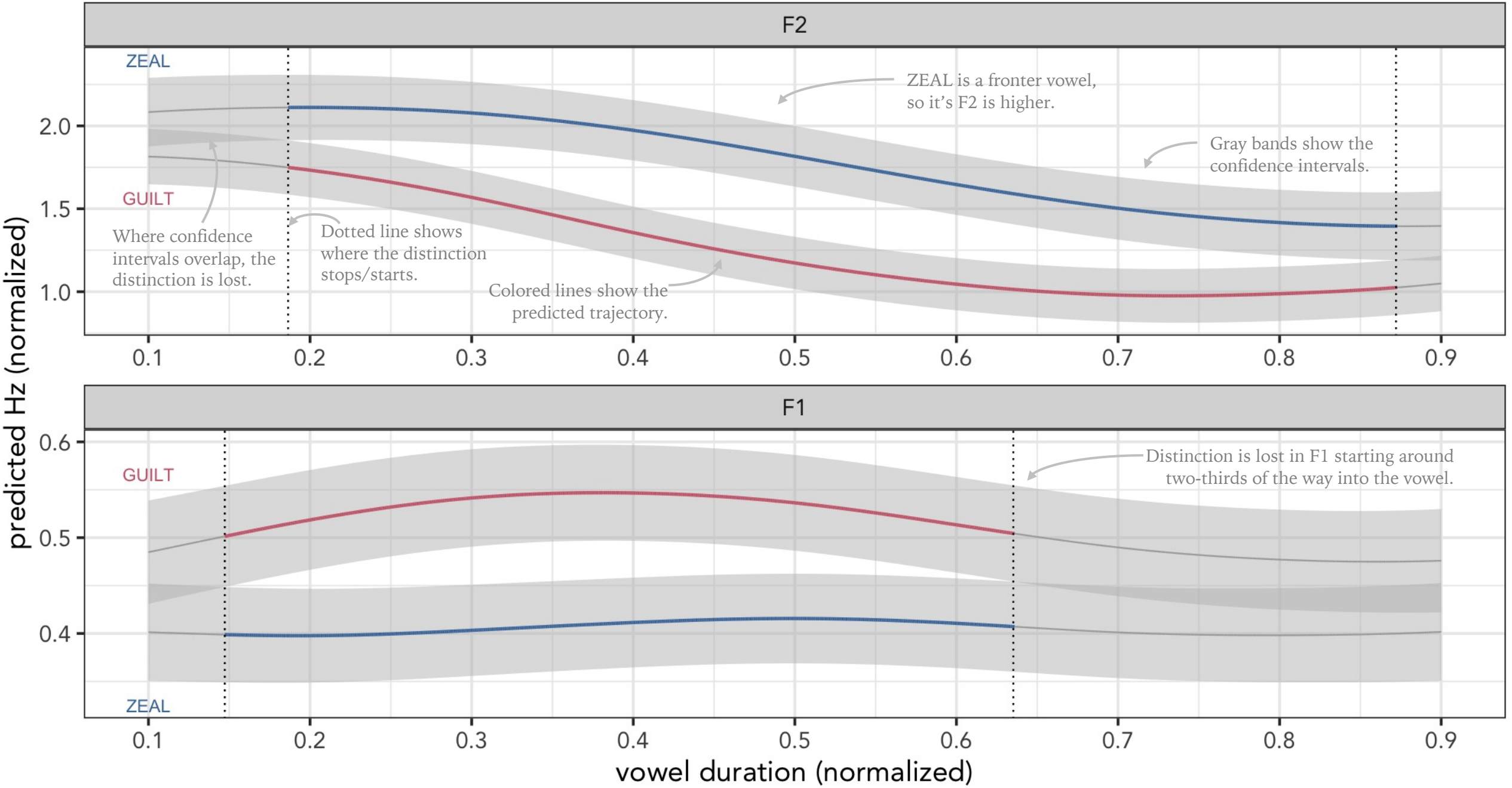
0.8

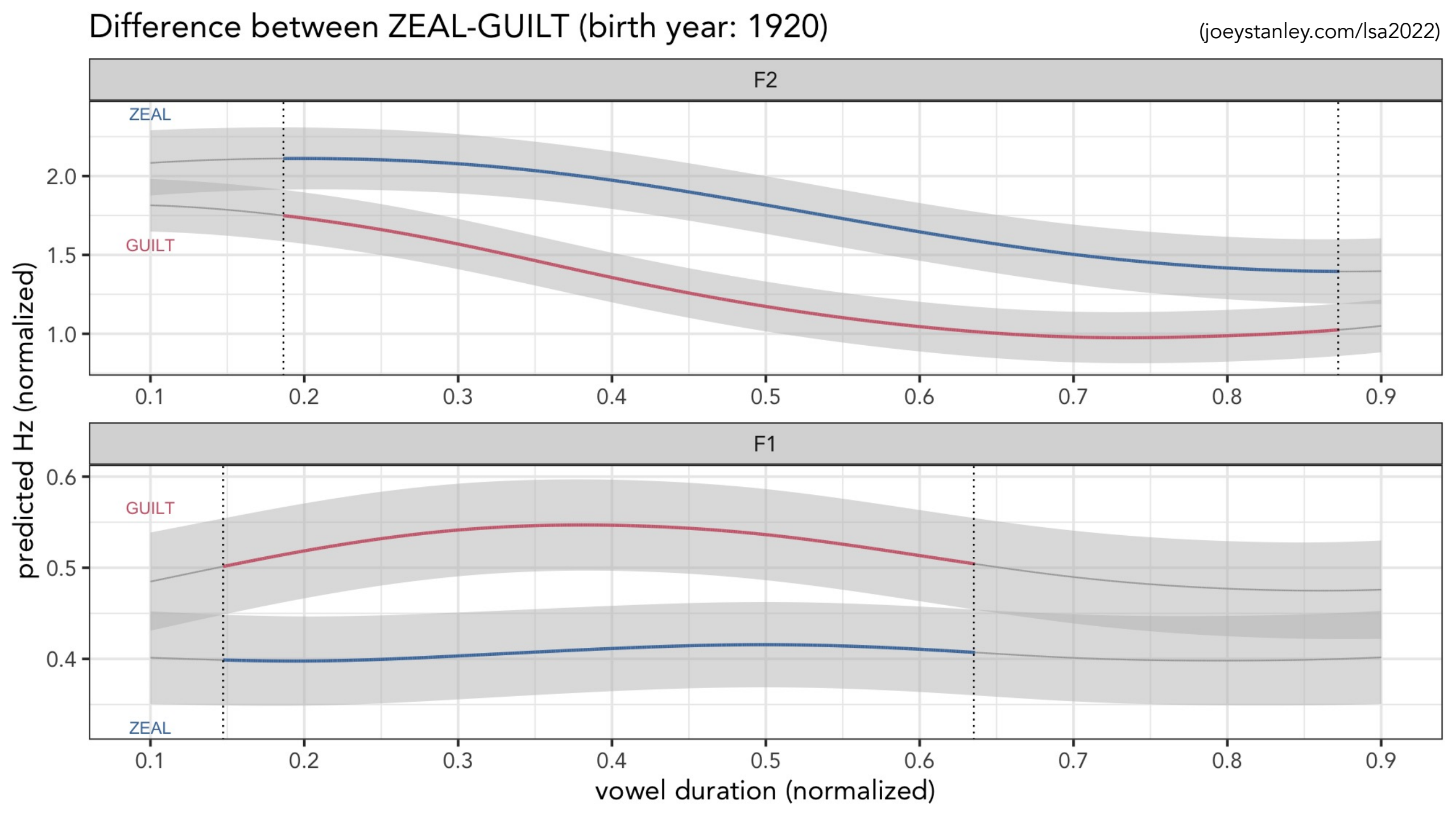
Predicted F2 (normalized)

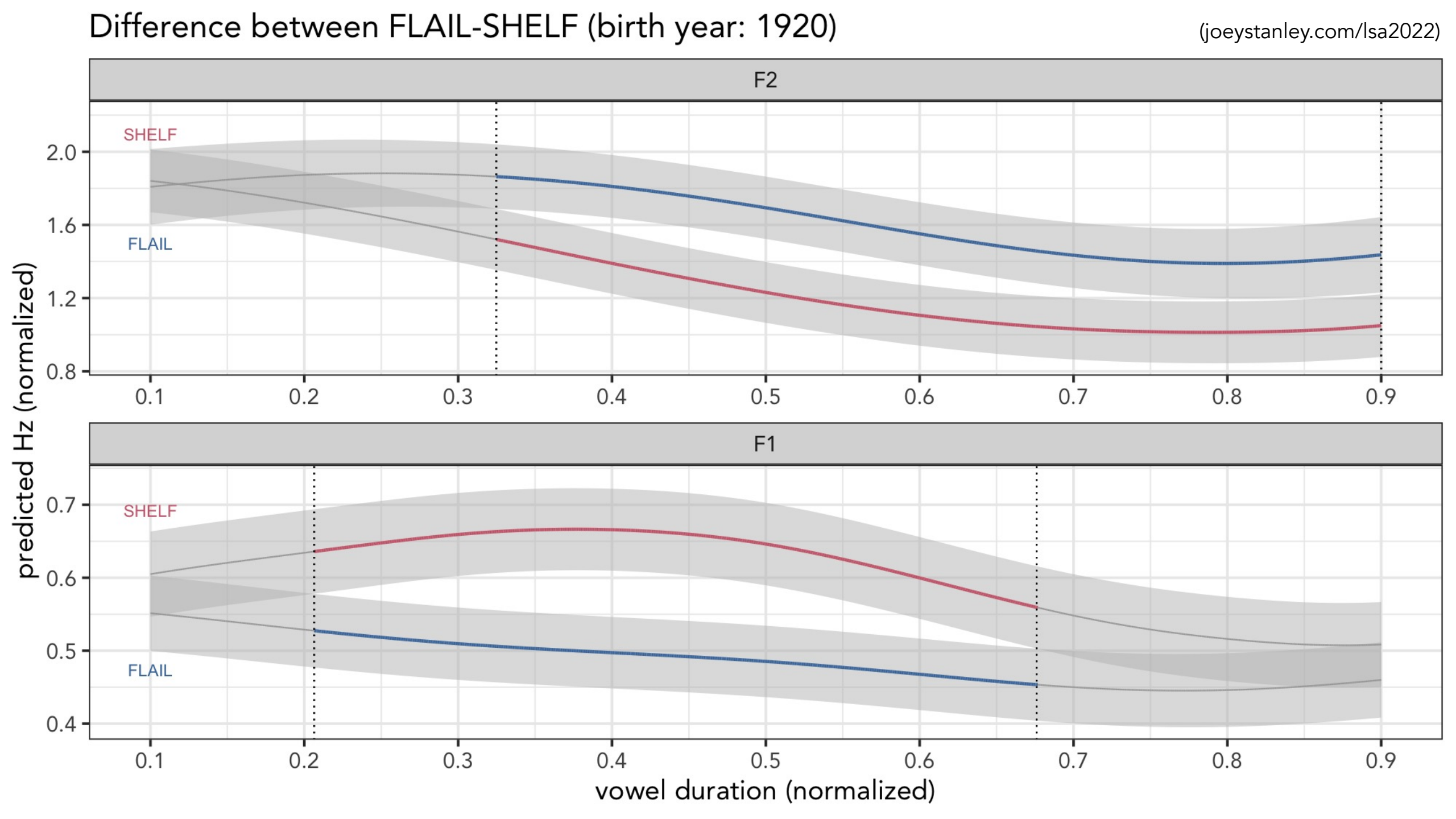
1930 1950 1970 1990 2010

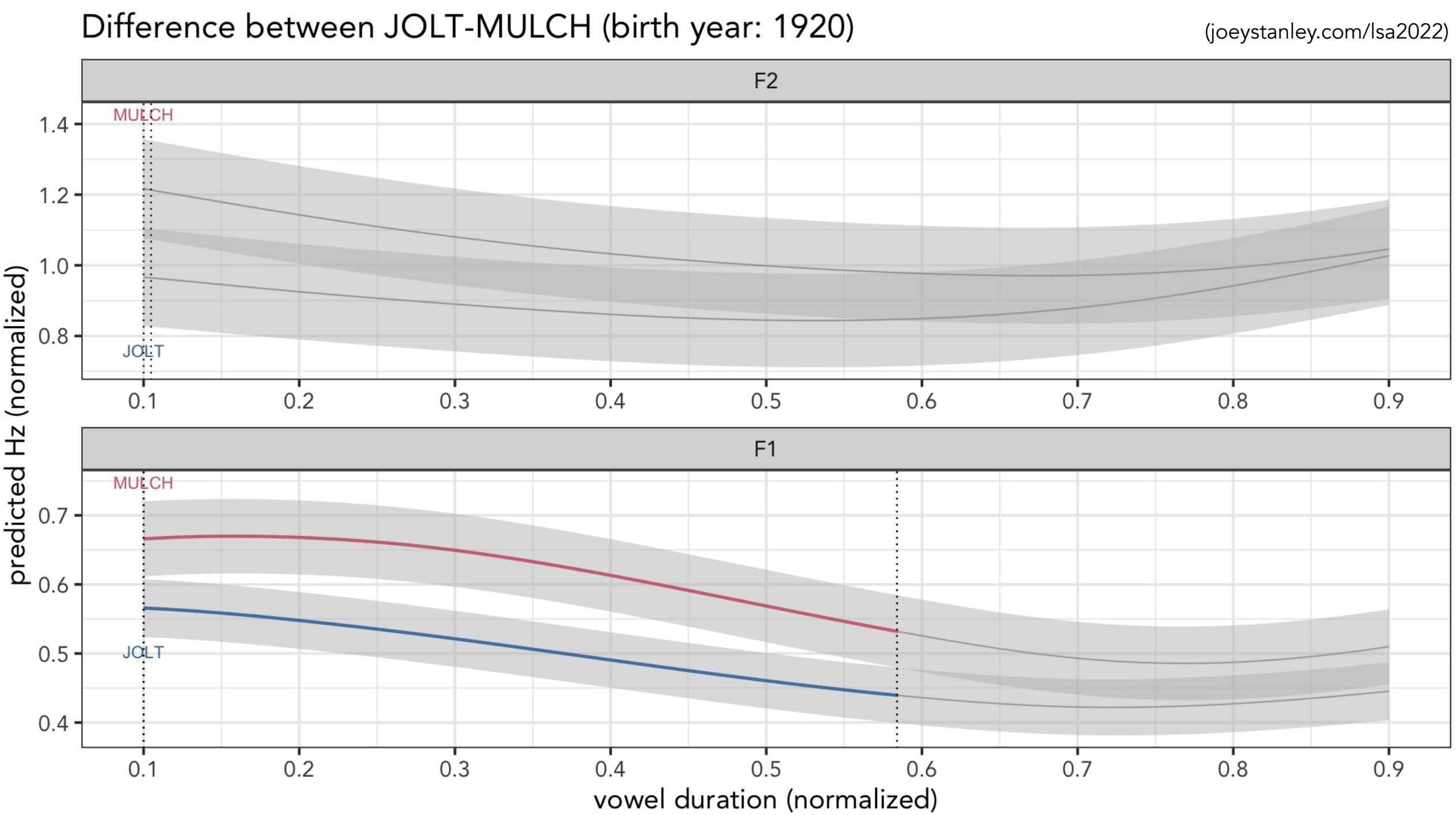
Difference between ZEAL-GUILT (birth year: 1920)

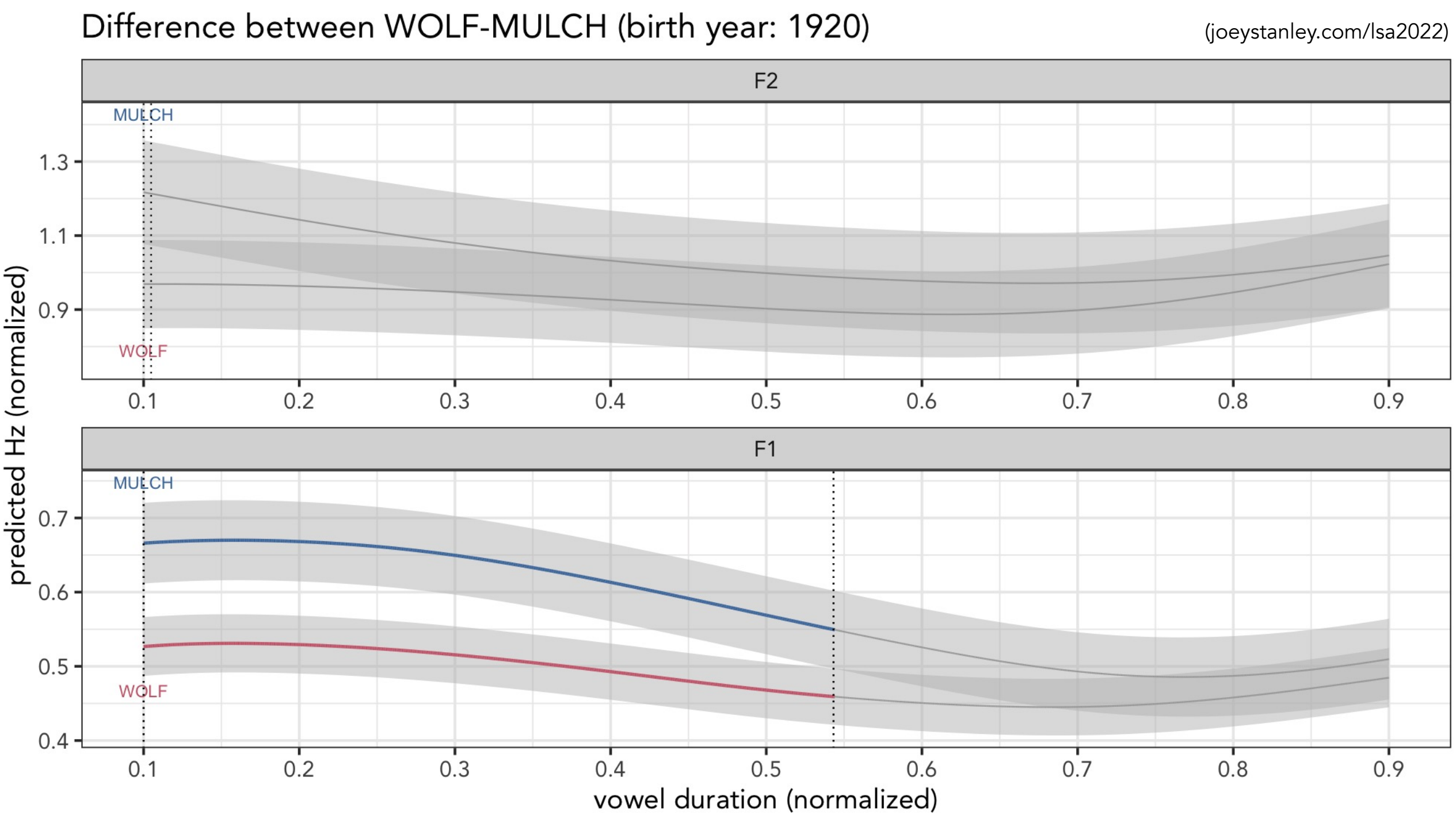
(If these gifs aren't showing up, go to joeystanley.com/today)




Difference between ZEAL-GUILT (birth year: 1920)
(joeystanley.com/lsa2022)
F2
ZEAL
GUILT
2.0
1.5
1.0
F1
GUILT
ZEAL
0.6
0.5
0.4
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
predicted Hz (normalized)
vowel duration (normalized)


Difference between FLAIL-SHELF (birth year: 1920)
(joeystanley.com/lsa2022)
F2
SHELF
FLAIL
2.0
1.6
1.2
0.8
F1
SHELF
FLAIL
0.7
0.6
0.5
0.4
predicted Hz (normalized)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
vowel duration (normalized)


Difference between JOLT-MULCH (birth year: 1920)
(joeystanley.com/lsa2022)
F2
MULCH
JOLT
1.4
1.2
1.0
0.8
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
F1
MULCH
JOLT
0.7
0.6
0.5
0.4
predicted Hz (normalized)
vowel duration (normalized)


Difference between WOLF-MULCH (birth year: 1920)
(joeystanley.com/lsa2022)
F2
MULCH
WOLF
1.3
1.1
0.9
F1
MULCH
WOLF
0.7
0.6
0.5
0.4
predicted Hz (normalized)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
vowel duration (normalized)

Discussion/Conclusion

Summary

- Overview
  - Front vowels: tense-lax pairs getting closer in apparent time.
  - Back vowels: three-way convergence of WOLF, JOLT, and MULCH.
  - This data suggests a merger by approximation.

- Expanding to trajectories gives greater insight into this type of merger.
  - Kinda like a zipper.

Who cares?

- Greater detail in this merger by approximation.
  - The nuclei don't appear to trigger the shift
  - The lateral gradually increases its influence, and the nucleus follows.

- Similar effect on other conditioned sound changes?
  - *pin-pen* merger, *Mary-merry-marry* merger, prevelar raising?
    - Perhaps this suggests some wiggle room at the ends of vowels.
  - May also apply to post-coronal GOOSE fronting (cf. Stanley et al. 2021)
  - Not sure if this applies to unconditional mergers (i.e. *cot-caught* merger)

- Trajectories are potentially important for discovering how vowels shift.
  - More recent techniques can allow us to answer these questions.

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