# The Linguistic Effects of a Changing Timber Industry

## Language Change in Cowlitz County, WA

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# Cowlitz County, Washington

Sparsely populated before 1920s

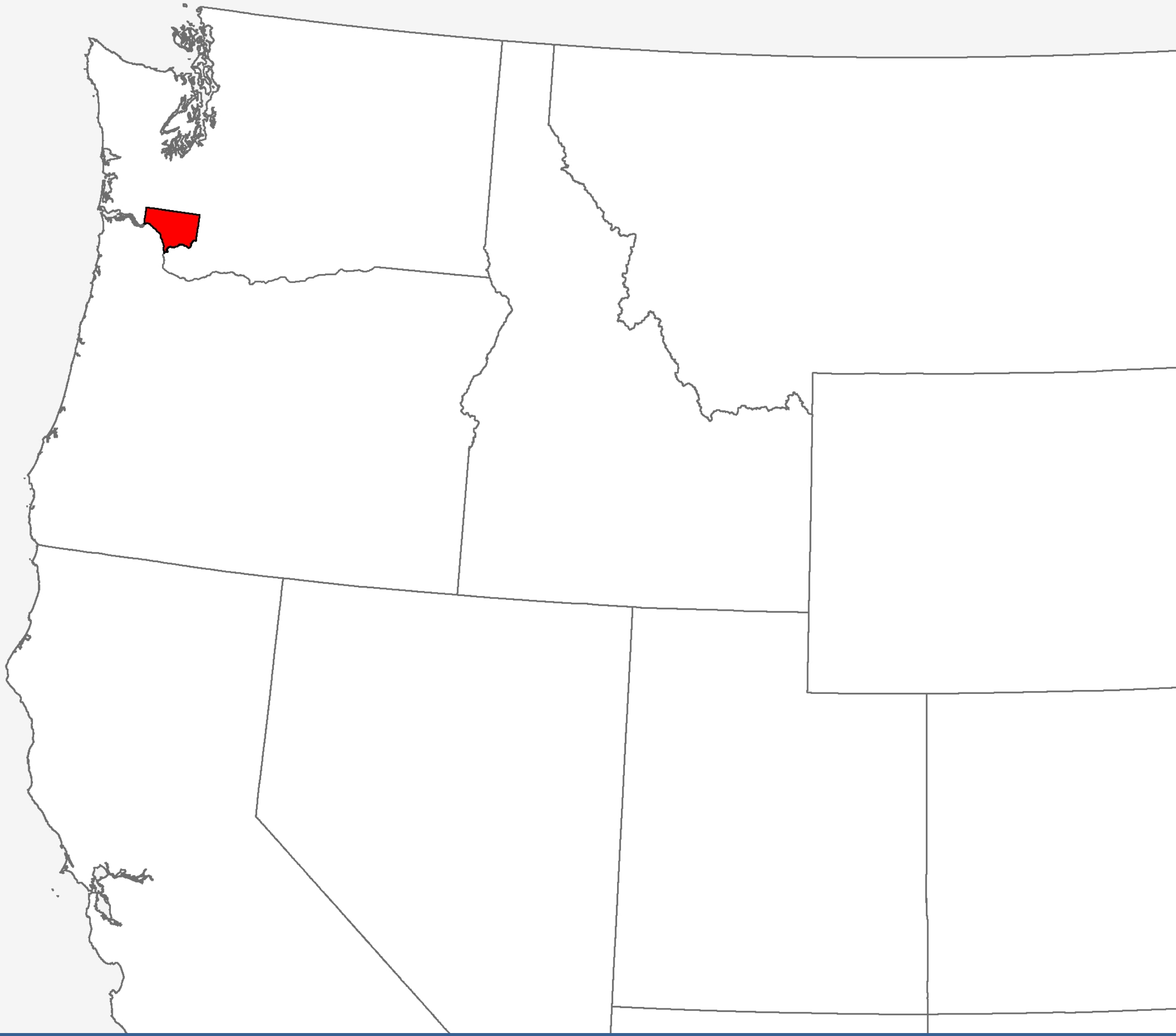
Longview founded in 1923

- R. A. Long
- Two large lumber mills

Population ≈ 35,000

Right off I-5

- Two hours south of Seattle
- One hour north of Portland



# The West

"low homogeneity" and "low consistency"

(Labov, Ash, Boberg 2006:277)

*cot-caught* merger

fronting of /u/

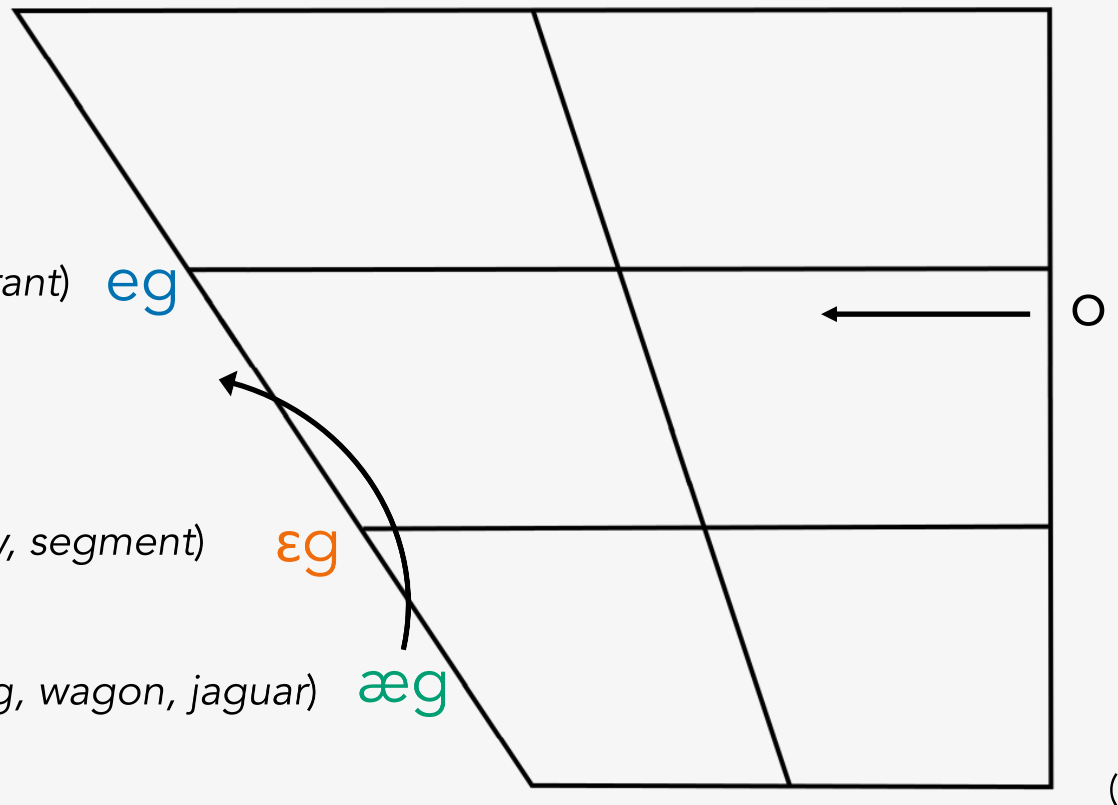
lack of Southern, Midland, and Canadian features

# Pacific Northwest English

(*vague, plague, flagrant*)

(*peg, legacy, integrity, segment*)

(*dragon, snag, agony, brag, wagon, jaguar*)




(*low, sew, row, throw, mow,*
*show, go, toe, know, doe*)

(Wassink *et al*. 2009, Freeman 2014,
Riebold 2015, Wassink 2015, Wassink 2016, etc.)

(Ward 2003, Becker *et al*. 2013,
McLarty & Kendall 2014,
Becker *et al*. 2016, etc.)

# HYPOTHESIS

Linguistic changes happened because of the changing timber industry.

# Methodology

# DATA COLLECTION

41 natives of Cowlitz County, ages 18–70s

| Number of tokens | |
|---|---|
| pre-velars | 549 |
| /o/ | 348 |
| total | 897 |

29-item word list (see appendix slides)

forced aligned with DARLA (Reddy & Stanford 2015), which uses ProsodyLab (Gorman *et al.* 2011) and FAVE (Rosenfelder *et al.* 2014)

A Praat script extracted formants at 15 points along vowel trajectories.

Bark normalized measurements (Traunmüller 1997)

Lobanov transformation not used because I'm not working with the full vowel space (Thomas & Kendall 2015)

# Analysis

Mixed-effects models (Baayen 2008)

`lmer()` in the R package `lme4` (Bates *et al.* 2015)

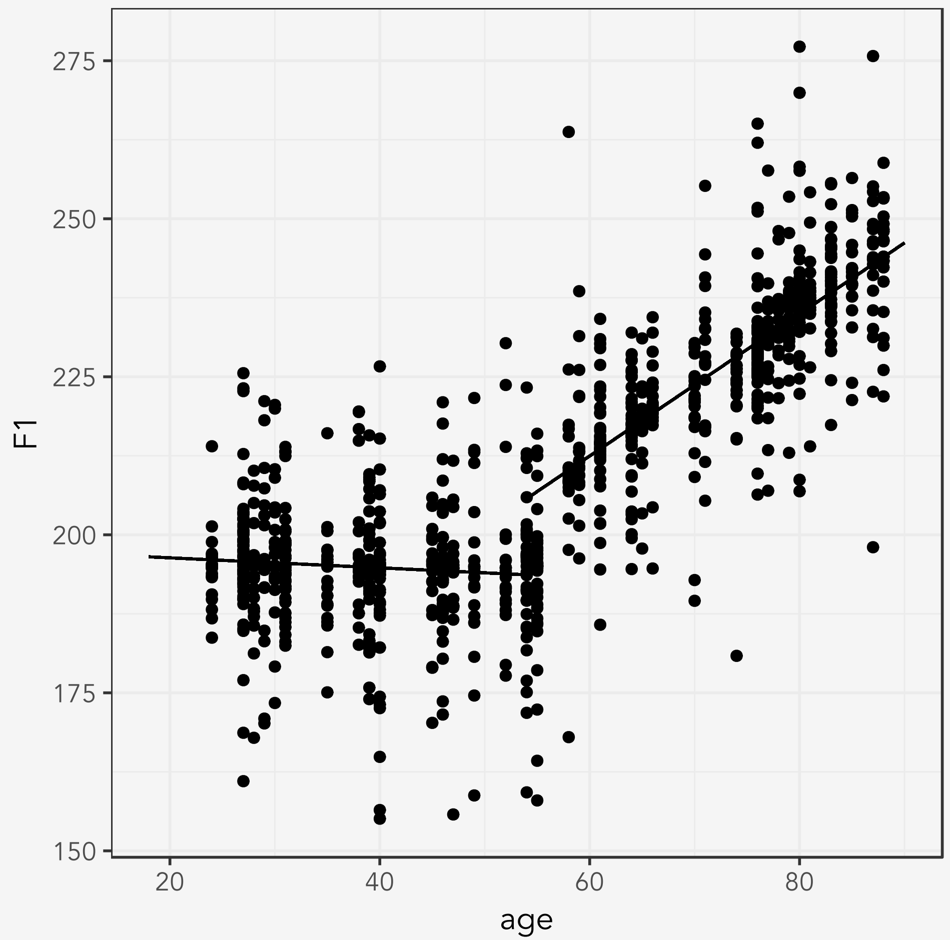
Searched for the best breakpoint.

Appendix slides:

more detailed explanation of statistical methods

all model outputs

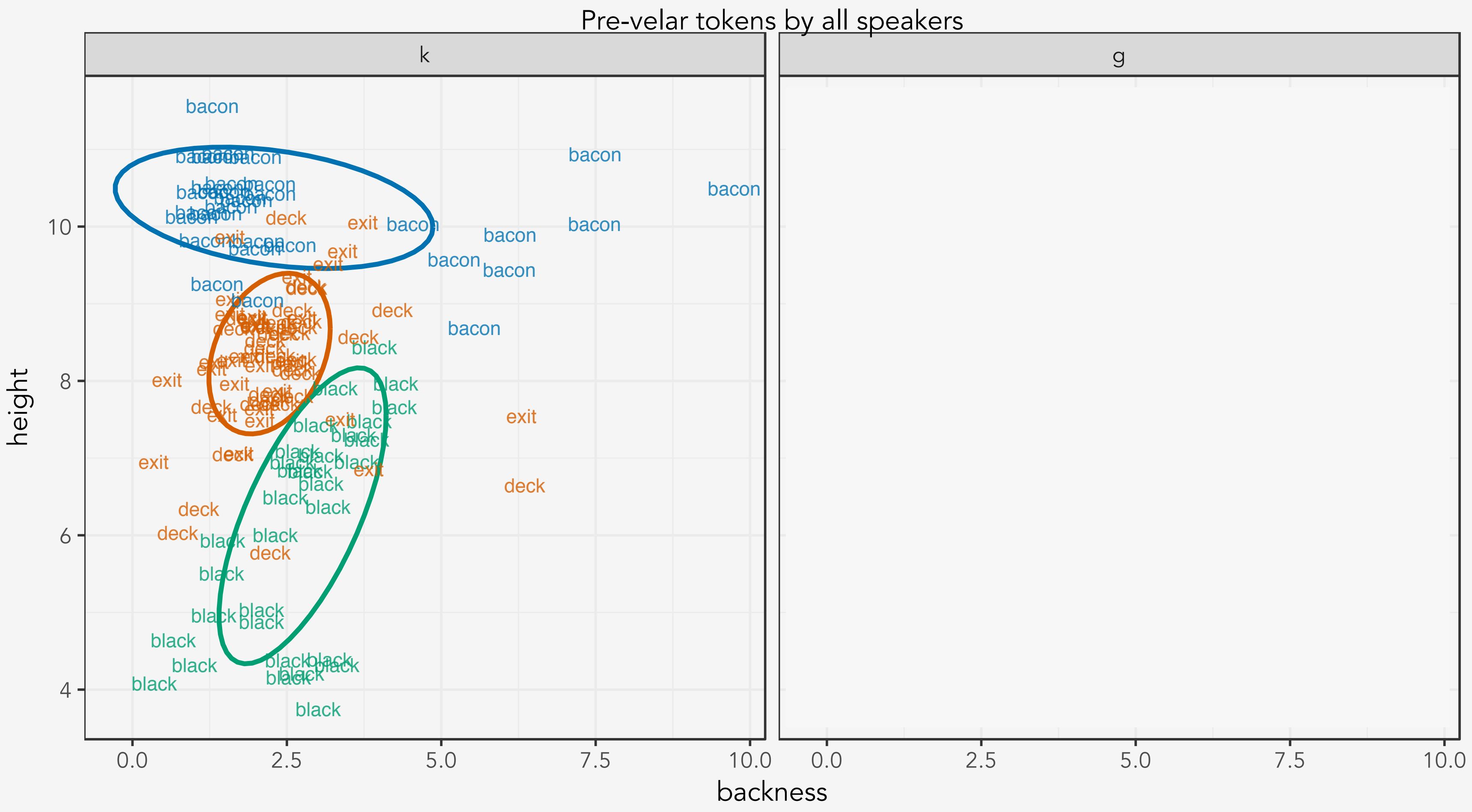
interpretation of each model



# Language Change: Pre-Velars

# PRE-VELARS: DISTRIBUTION

BAG is raised to the /ɛk/ space

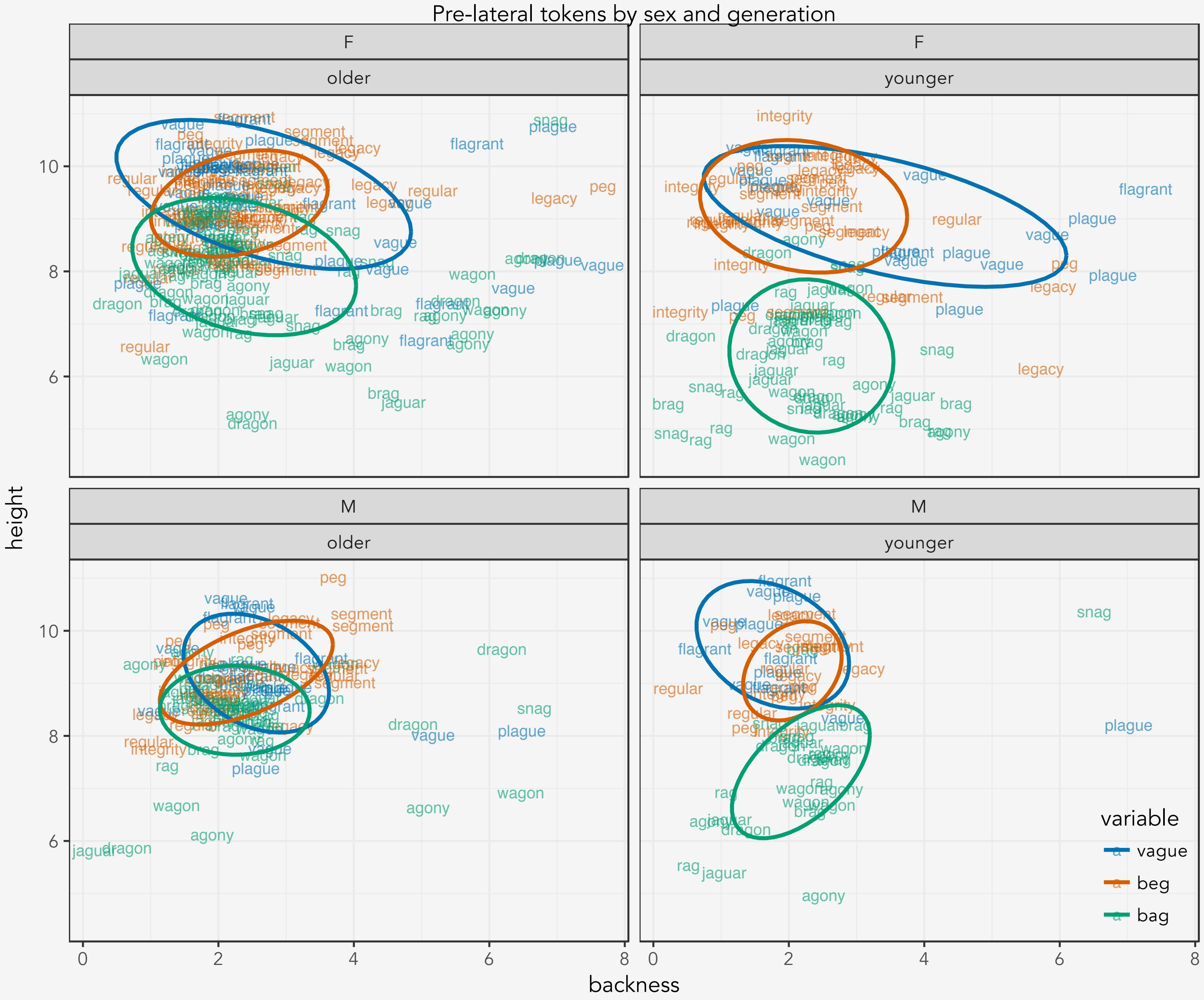


# SEX + GENERATION

high overlap between VAGUE and BEG for all groups

older men raise BAG almost to merge with VAGUE/BEG

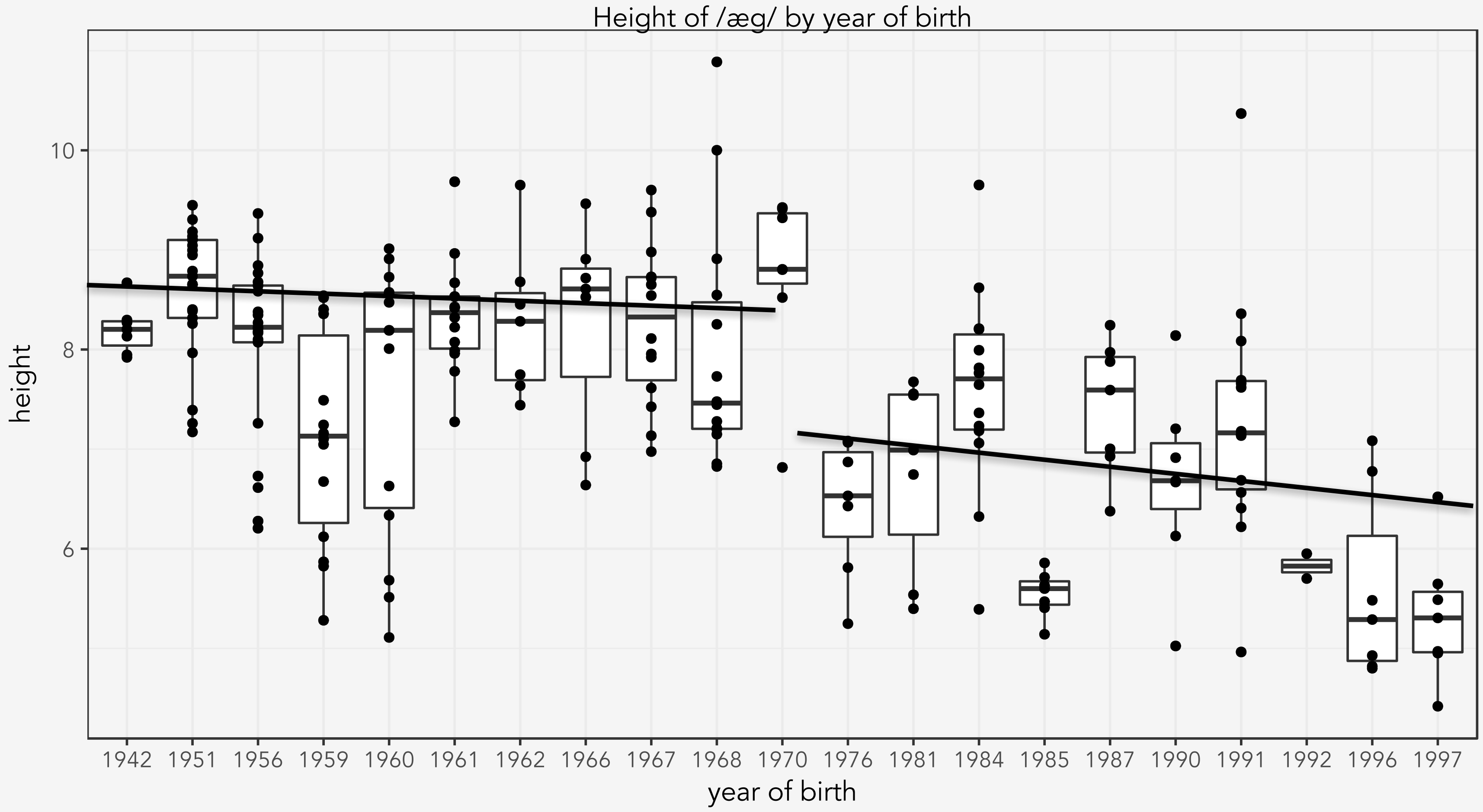
young people didn't raise BAG



# Regression Model

(see model 1 in the appendix)

Best generation split was around 1970 (46 years old)

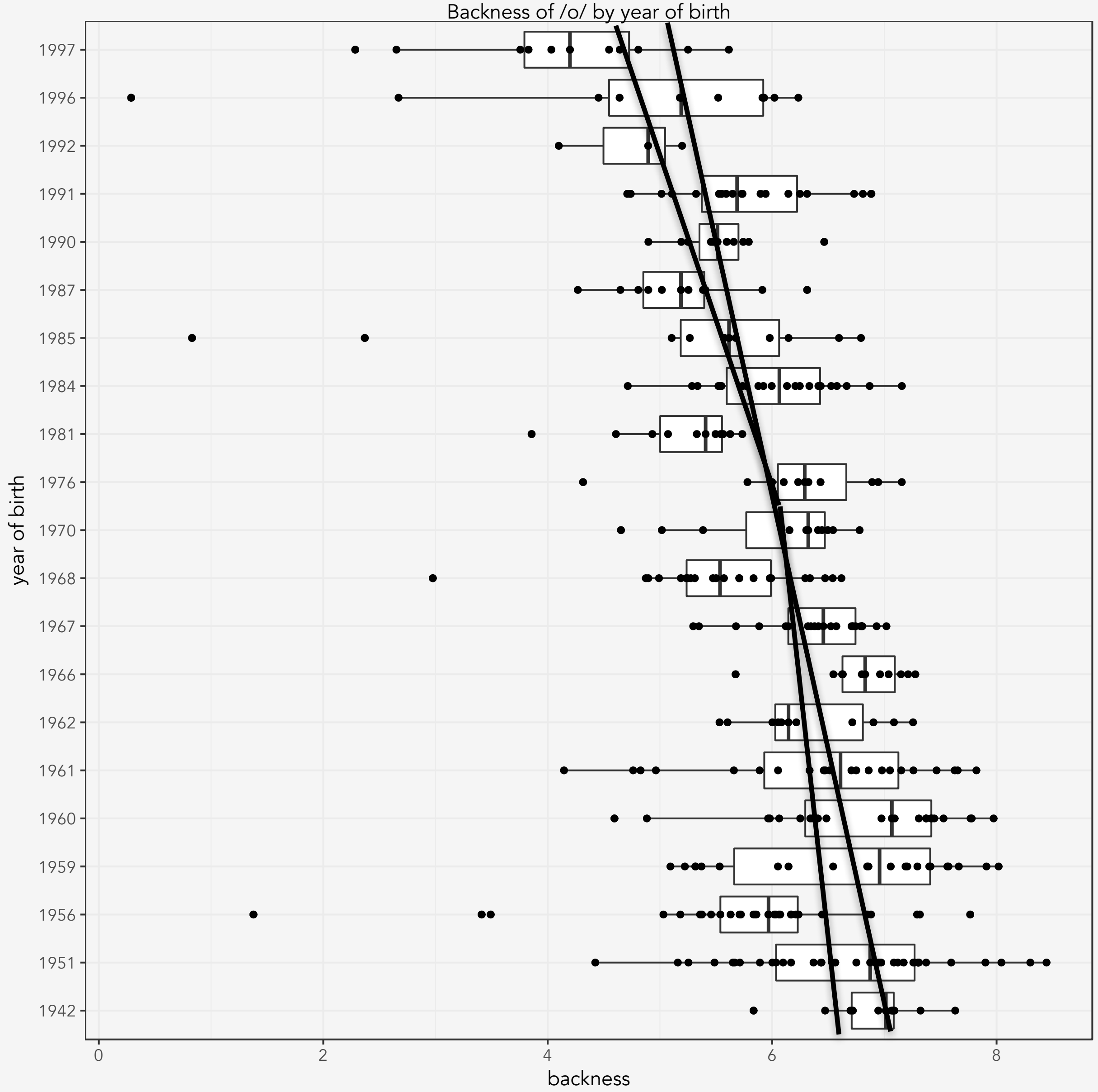


# Language Change: /o/

# /o/ Fronting

/o/ is *gradually* fronting over time (see model 2 in the appendix)

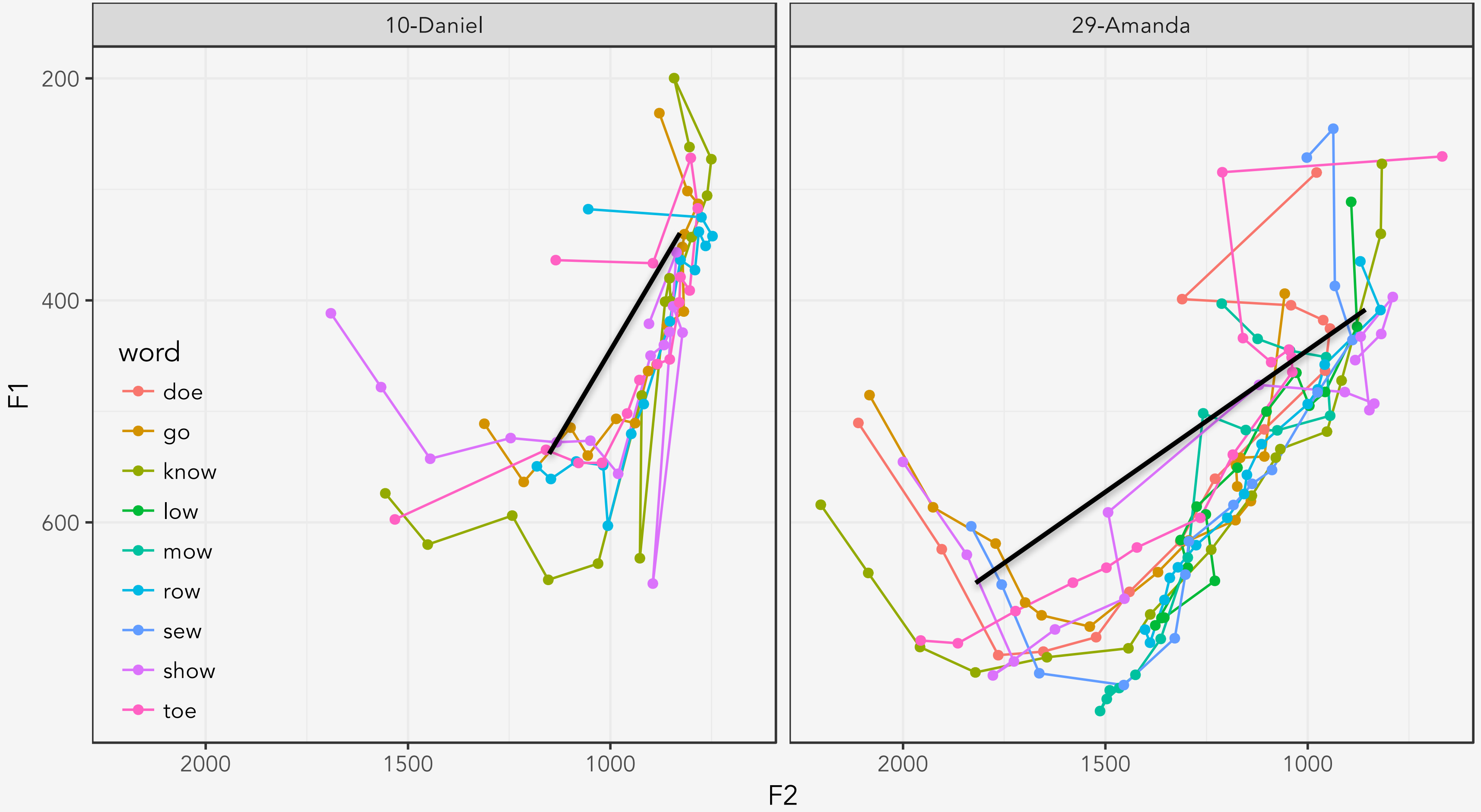
marginally significant *break-point* at 1970 (Baayan 2008 §6.4)



# Trajectories

distance from 20% to 80%

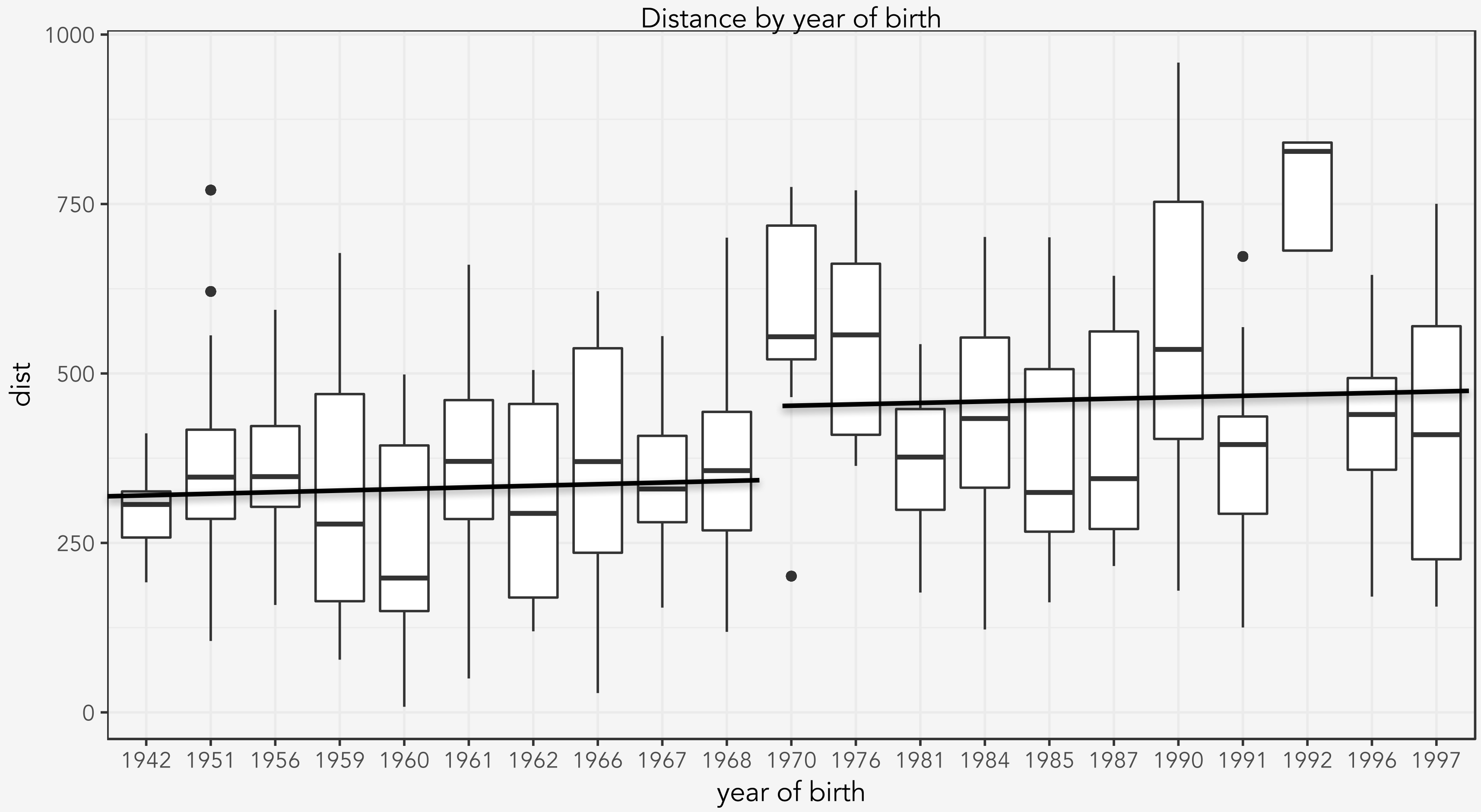
messy data still, but the numbers match my intuition



# Diphthongization of /o/ over time

younger generation = more diphthongal
(see model 3 in the appendix)

jump at 1970



# LINGUISTIC SUMMARY

| | Older (born before 1970) | Younger (born after 1970) |
|---|---|---|
| BAG | raised | lowered |
| /o/ quality | back | fronted |
| /o/ trajectory | monophthongal | diphthongal |

# What happened in 1970??

# "Carol"

It– it really affected the woods becau– there were a lot of people that worked in the woods. And if they didn't work in the woods they– they were like support system, like office people. So if they're not working out in the woods then all these office people—even as far as Tacoma where the headquarters were—were getting laid off because these guys couldn't get in.

And I totally understand but it– A lot of people lost their jobs and a lot of people moved. A lot of people just got out of here. And so you take that kind of income from these people out in the woods—and they made really good money considering, y'know—okay what does that do to the rest of your economy? They're no longer buying as much gas. They're not– They can't afford to go out and go to the movies, and eat out, and groceries, and yeah. So yeah, it hit us especially hard.

# Changes in the Timber Industry

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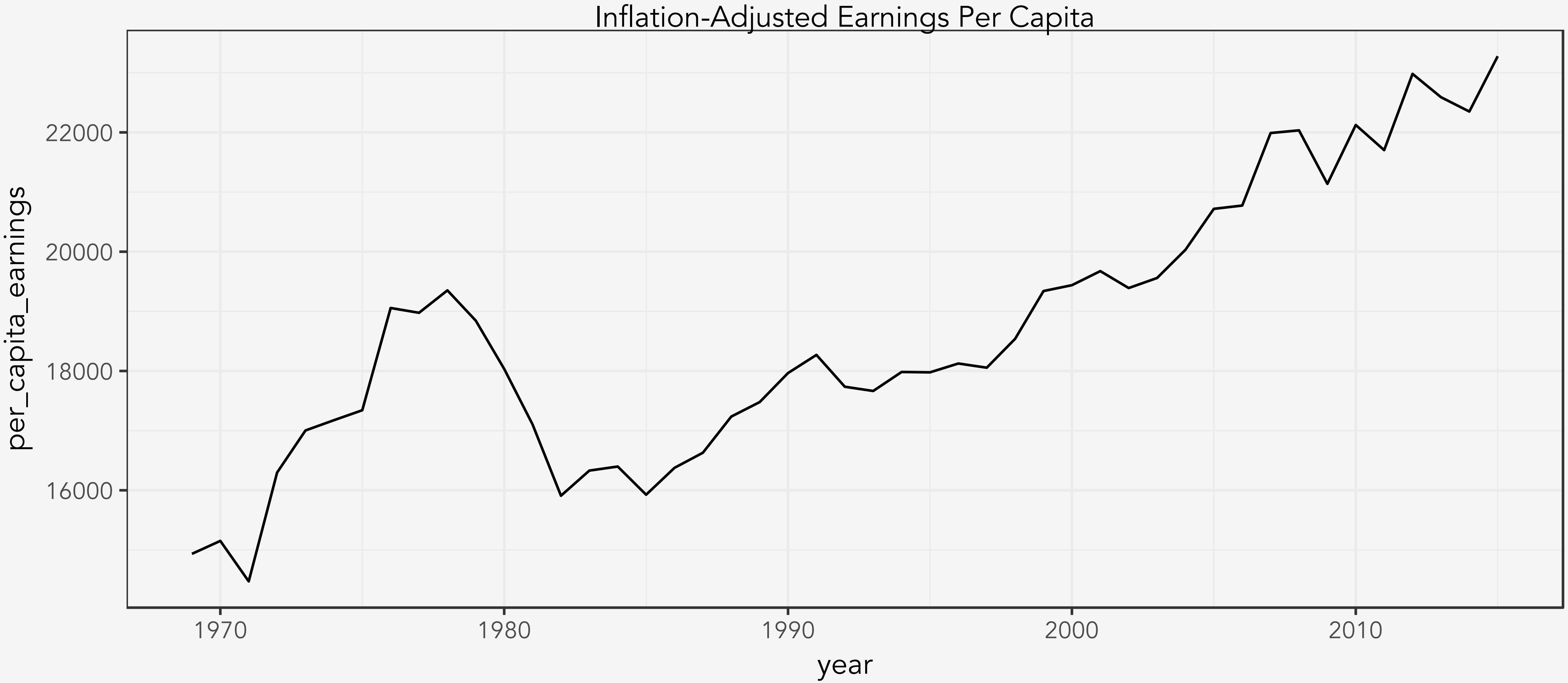
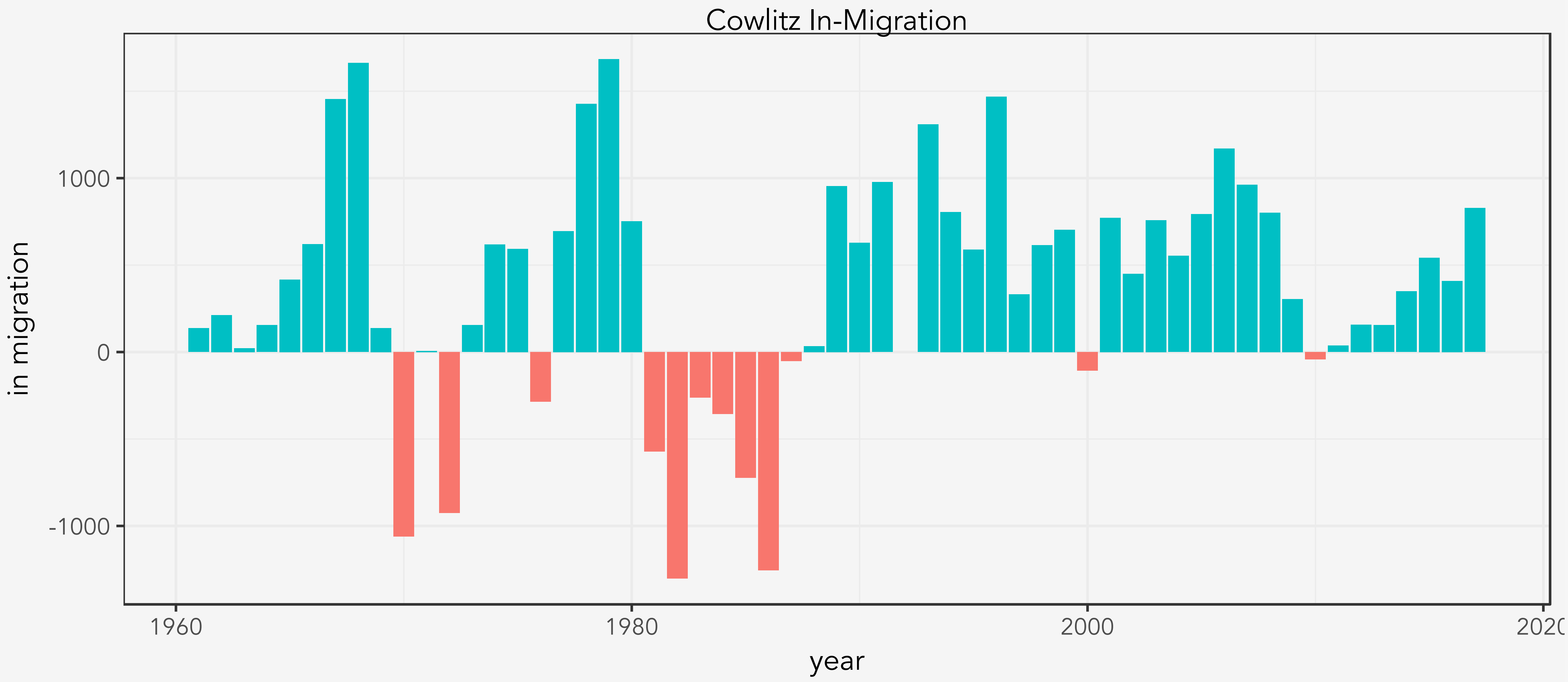
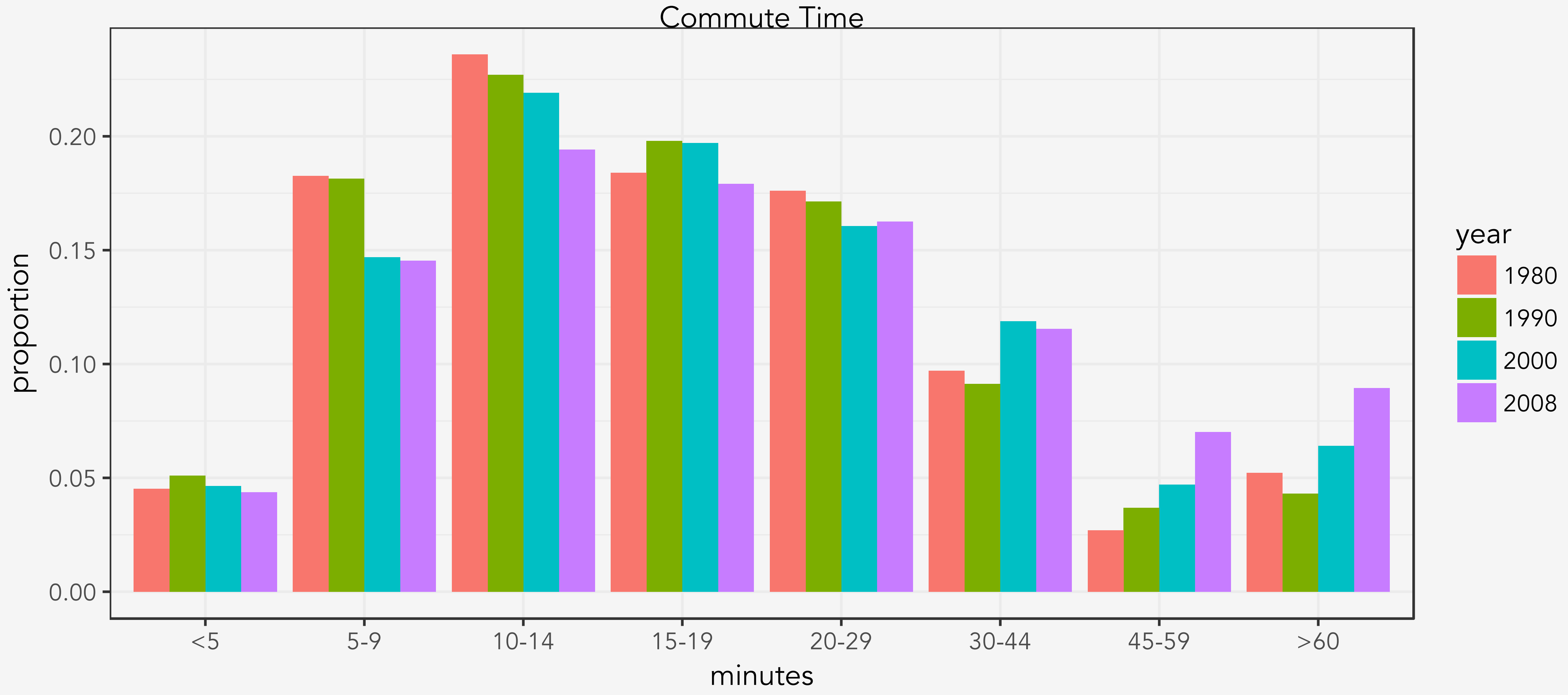


# Changes in the Timber Industry



# Changes in the Timber Industry



# Census Summary

Major changes in late 1970s–1980s

- Fewer logging jobs.
- Less income.
- Less insularity.

More contact with Portland and the rest of the Pacific Northwest.

Local? Regional? National?

- Not sure.

# Conclusion

# Summary

| | Older (born before 1970) | Younger (born after 1970) |
|---|---|---|
| BAG | raised | lowered |
| /o/ quality | back | fronted |
| /o/ trajectory | monophthongal | diphthongal |
| jobs | loggers | diverse |
| economy | booming | recession |
| network | insular | expanded |

# Conclusion

✓ Linguistic changes happened because of the changing timber industry.

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These slides available at
joeystanley.com/lcuga4

# Appendix A: Word List and Minimal Pairs

# Word List Items

These were embedded psuedorandomly in a 160-item word list, with words targeting other research questions acting as fillers.

Participants often commented on how random the words seemed, so they likely did not catch on to the research questions these words targeted.

Words in parintheses were used as pre-voiceless reference points.

| | |
|---|---|
| /eg/ | flagrant, plague, vague (bacon) |
| /ɛg/ | exit, integrity, legacy, peg, regular, segment (deck) |
| /æg/ | agony, brag, dragon, jaguar, rag, snag, wagon (black) |
| /o/ | bow, doe, go, know, low, mow, row, sew, show, toe |

# Appendix B: Statistical Tests

# ANALYSIS

I use generalized linear mixed-effects models (Baayen 2008) using the function `glmer()` in the R package `lme4` (Bates *et al.* 2015), with speaker and word as random effects and sex and some form of age/generation as a fixed effect.

The older generation was defined as those born on or before 1970.

Effects are reported significant if $p<0.01$.

For each hypothesis, three models were tested to see how age should be coded that included either 1) age as a continuous factor, 2) generation as a binary variable, or 3) only the interaction of age and generation to test the breakpoint.

All three models fit using maximum liklihood (ML) and were compared to a model without age at all (a null model) using the `anova()` function. The model with the lowest BIC was chosen and refit using restricted maximum liklihood (REML). The output of these final models is given in the following slides.

See Baayan (2008) for regression with breakpoints, and Levshina (2015) for model comparison.

(1) Linear mixed-effects model fit by REML of bark-normalized height (bark(F3)–bark(F1)) of pre-velar vowels with sex (F*, M) and generation (older, younger) as fixed effects and speaker and word as random effects.

Random effects

| | Variance | Std. Dev. |
|---|---|---|
| word | 0.484 | 0.696 |
| speaker | 0.048 | 0.219 |
| residual | 0.598 | 0.773 |

Fixed effects

| | Value | Std.Error | *t*-value |
|---|---|---|---|
| (Intercept) | 7.886 | 0.212 | 37.16 |
| sex: M | 0.599 | 0.281 | 2.13 |
| generation: younger | –1.455 | 0.278 | –5.24 |

Interpretation: The younger generation produced a lower BAG vowel than the older generation. The effect of sex was only marginally significant based on the small *t*-value (<3).

(2) Linear mixed-effects model fit by REML of bark-normalized backness (bark(F3)–bark(F2)) of /o/ with sex (F*, M) and age (as a continuous variable) as fixed effects and speaker and word as random effects.

Random effects

| | Variance | Std. Dev. |
|---|---|---|
| word | 0.274 | 0.523 |
| speaker | 0.038 | 0.195 |
| residual | 0.662 | 0.813 |

Fixed effects

| | Value | Std.Error | *t*-value |
|---|---|---|---|
| (Intercept) | 4.312 | 0.337 | 12.78 |
| sex: M | 0.326 | 0.215 | 1.52 |
| generation: younger | –0.034 | 0.007 | –5.11 |

Interpretation: The model technically shows that the older someone was the backer their /o/ vowel would be. To put it another way, /o/ is fronting in apparent time. The effect of sex was not significant based on the small *t*-value (<2).

* Underlined values are the reference levels

(3) Linear mixed-effects model fit by REML of trajectories of /o/ with sex (<u>F*</u>, M) and generation (<u>older</u>, younger) as fixed effects and speaker and word as random effects.

Random effects

| | Variance | Std. Dev. |
|---|---|---|
| word | 4767 | 69.04 |
| speaker | 9274 | 96.30 |
| residual | 10082 | 100.41 |

Fixed effects

| | Value | Std.Error | *t*-value |
|---|---|---|---|
| (Intercept) | 387.92 | 34.72 | 11.17 |
| sex: M | –110.88 | 27.95 | –3.967 |
| generation: younger | 96.59 | 27.56 | 3.504 |

Interpretation: The younger generation had longer trajectories than the older generation. Men had shorter trajectories than women.