Affrication as the cause of *s*-retraction

Community-level change in Manchester English

NWAV48

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What is *s*-retraction?

***S*-retraction**: a process which turns **/s/** into a more **[ʃ]**-like sound

- attested in /stɹ/ clusters in various positions:

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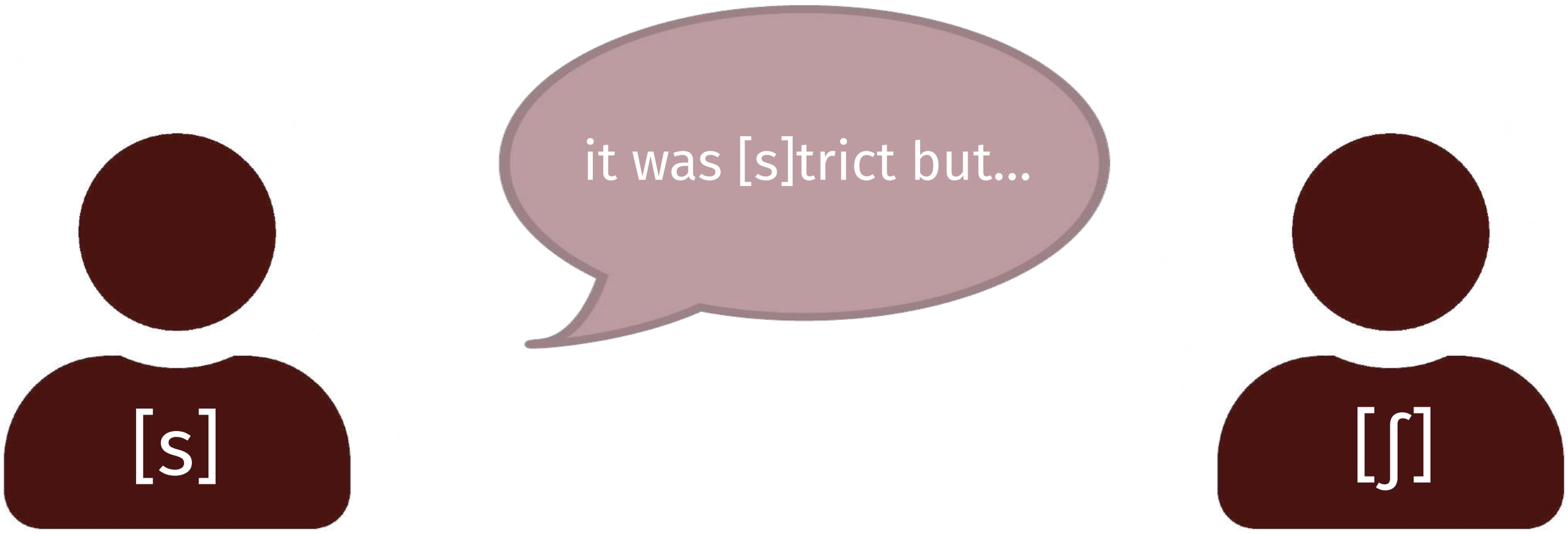

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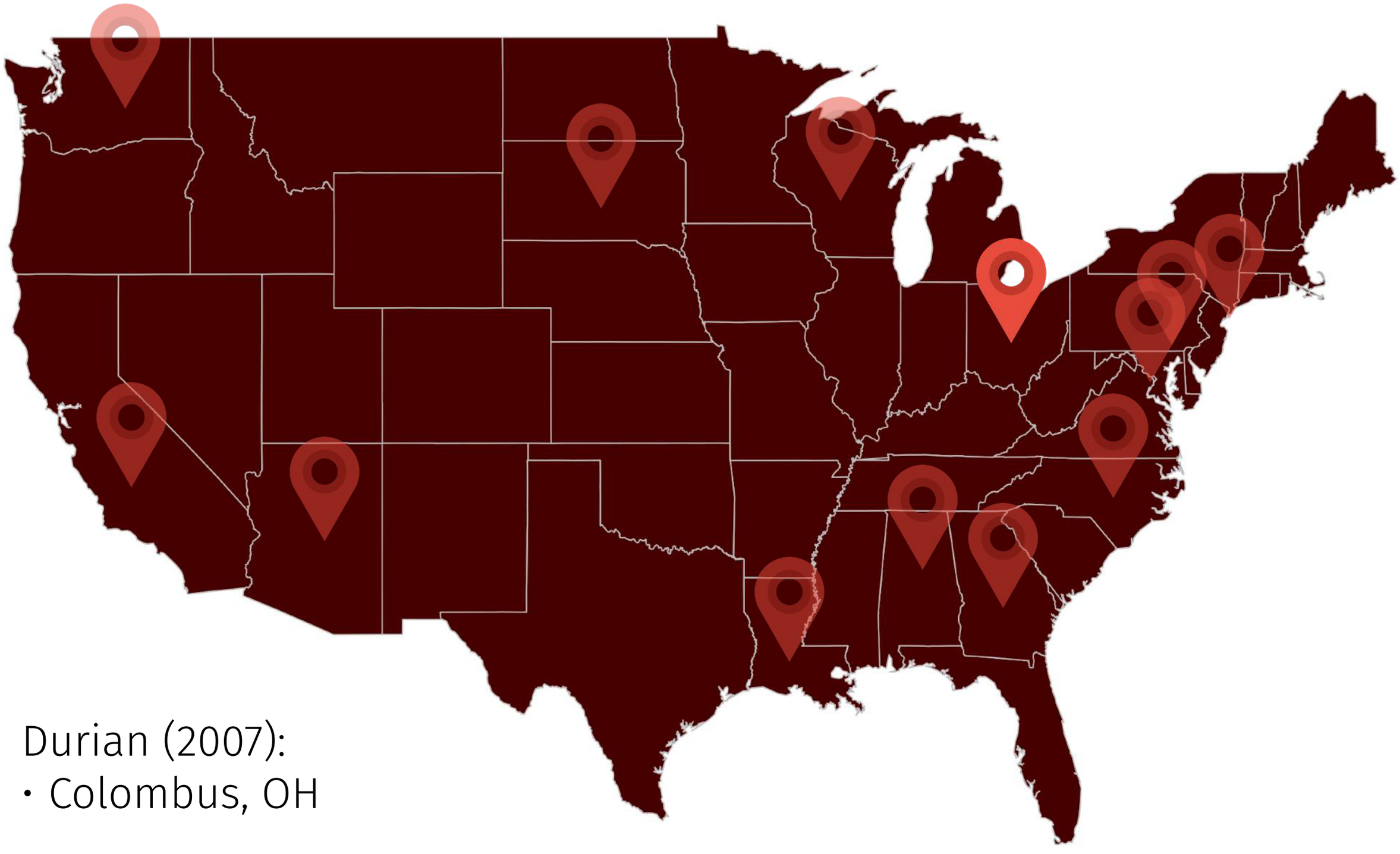
What is *s*-retraction?

2019	Individual differences and sound change actuation: evidence from imitation and perception of English **/str/**	Stevens & Loakes
2019	Large-scale acoustic analysis of dialectal and social factors in English **/s/-retraction**.	Stuart-Smith et al.
2019	Associating the origin and spread of sound change using agent-based modelling applied to **/s/-retraction** in English.	Stevens, Harrington & Schiel
2019	Sound change and coarticulatory variability involving English /ɹ/.	Smith et al.
2019	Listeners' social attributes influence sensitivity to coarticulation in the perception of **sibilants** in nonce words.	Phillips & Resnick
2018	Back to Bins- a mixed-methods reevaluation of categorization in sociophonetics.	Ahlers
2018	Revealing covert articulation in **s-retraction**	Nichols & Bailey
2018	A midsagittal ultrasound tongue imaging study to investigate the degree of **/s/-retraction** in **/stɹ/** onset clusters in British English	Wilson
2017	Social and Structural Constraints on a Phonetically-Motivated Change in Progress: **(str) Retraction** in Raleigh, NC	Wilbanks
2017	In situ perspectives on **retraction** – Austinites on Troublemaker **Shtreet**	Ahlers & Bergs
2017	A corpus and articulatory study of covert articulatory variation and its phonological consequences in Raleigh, NC English	Mielke, Smith & Fox
2016	**Sibilants** and ethnic diversity: A sociophonetic study of **palatalized /s/** in **STR clusters** among Hispanic, White, and African-American speakers of Texas and Pittsburgh English	Hinrichs et al.
2016	The phonetic origins of **s-retraction**: Acoustic and perceptual evidence from Australian English	Stevens & Harrington
2016	An Apparent Time Study of **(str) Retraction** and /tɹ/ - /dɹ/ Affrication in Raleigh, NC English	Magloughlin & Wilbanks
2016	Phonological and prosodic conditioning of **/s/-retraction** in American English	Phillips
2015	**Shtreets** of Philadelphia: An Acoustic Study of **/str/-retraction** in a Naturalistic Speech Corpus	Gylfadottir
2013	**STR-palatalisation** in Edinburgh accent: A sociophonetic study of a sound change in progress	Sollgan
2011	Variability in American English **s-retraction** suggests a solution to the actuation problem	Baker, Archangeli & Mielke
2011	Acoustic analysis of a sound change in progress: The consonant cluster **/stɹ/** in English	Rutter
2010	Variability and homogeneity in American English /ɹ/ allophony and **/s/ retraction**	Mielke, Baker & Archangeli
2009	Street or **shtreet**? Investigating **(str-) palatalisation** in Colchester English	Bass
2007	Getting **[ʃ]tronger** Every Day?: More on Urbanization and the Socio-geographic Diffusion of **(str)** in Columbus, OH	Durian
2003	**/s/-retraction** in the ViC corpus	Armstrong
2000	**/str/ → /ʃtr/**: Assimilation at a distance?	Lawrence
1995	A case of distant assimilation: **/str/ → /ʃtr/**	Shapiro

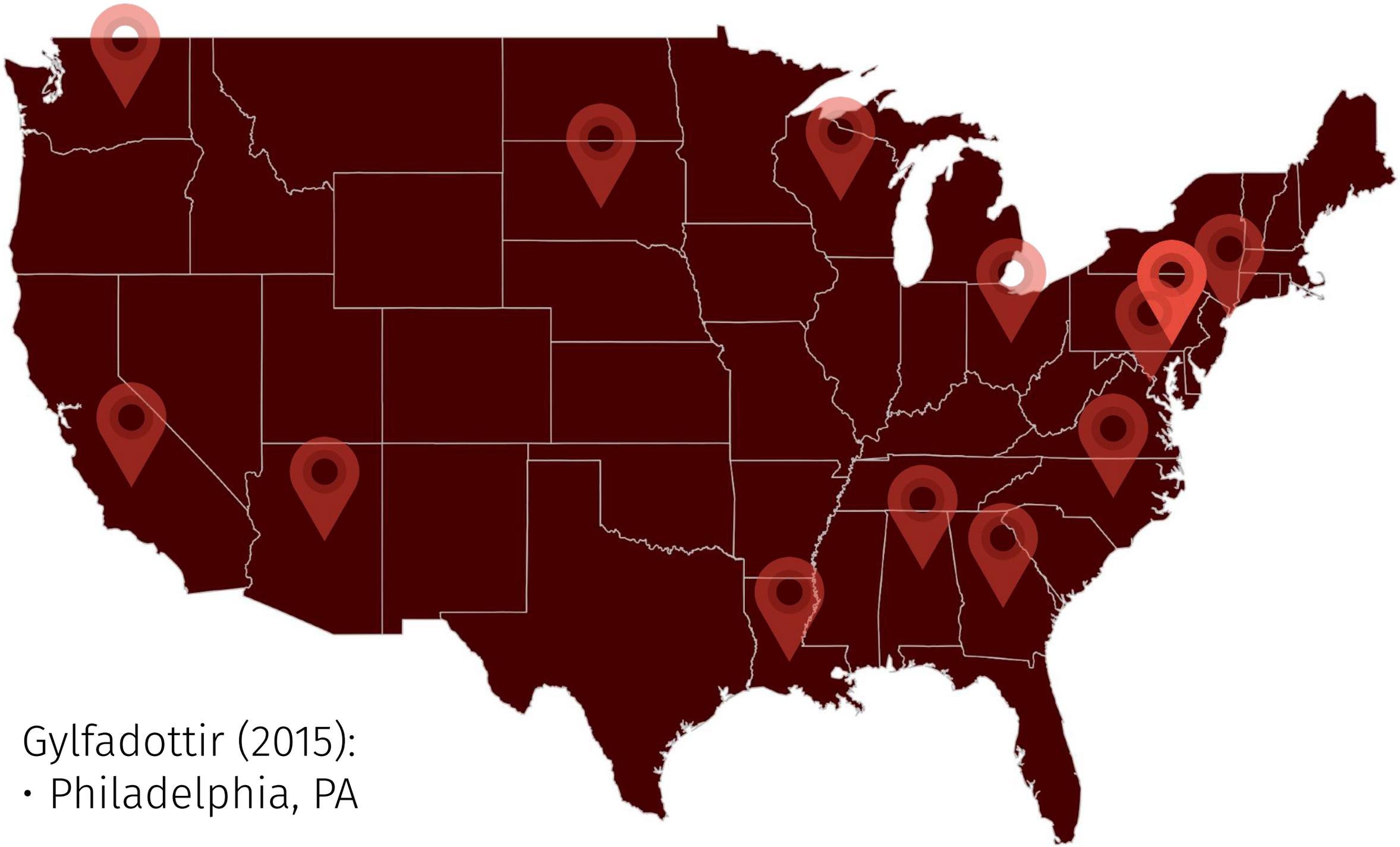
Geographic spread



Durian (2007):

- Colombus, OH

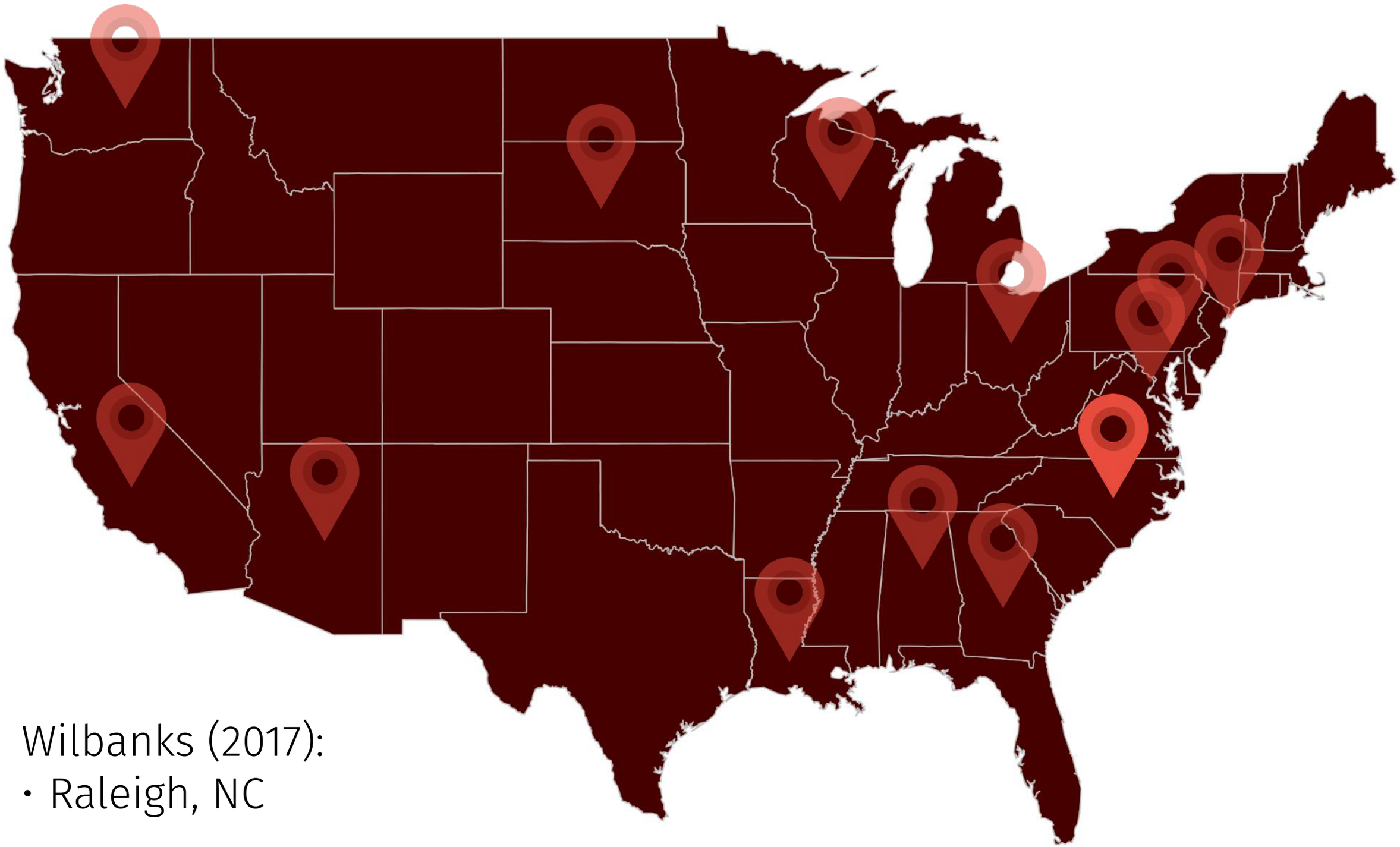
Geographic spread



Gylfadottir (2015):

- Philadelphia, PA

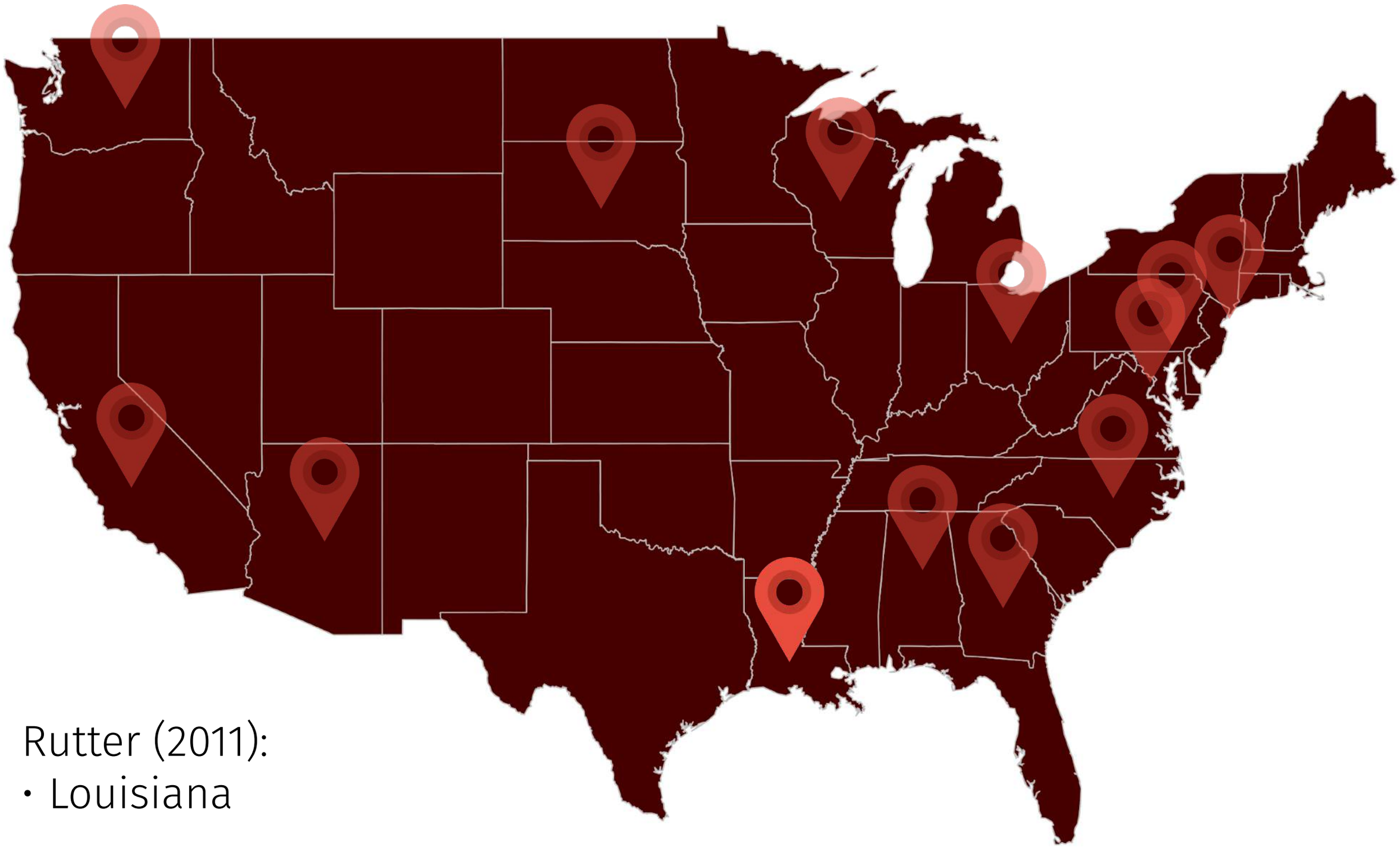
Geographic spread



Wilbanks (2017):

- Raleigh, NC

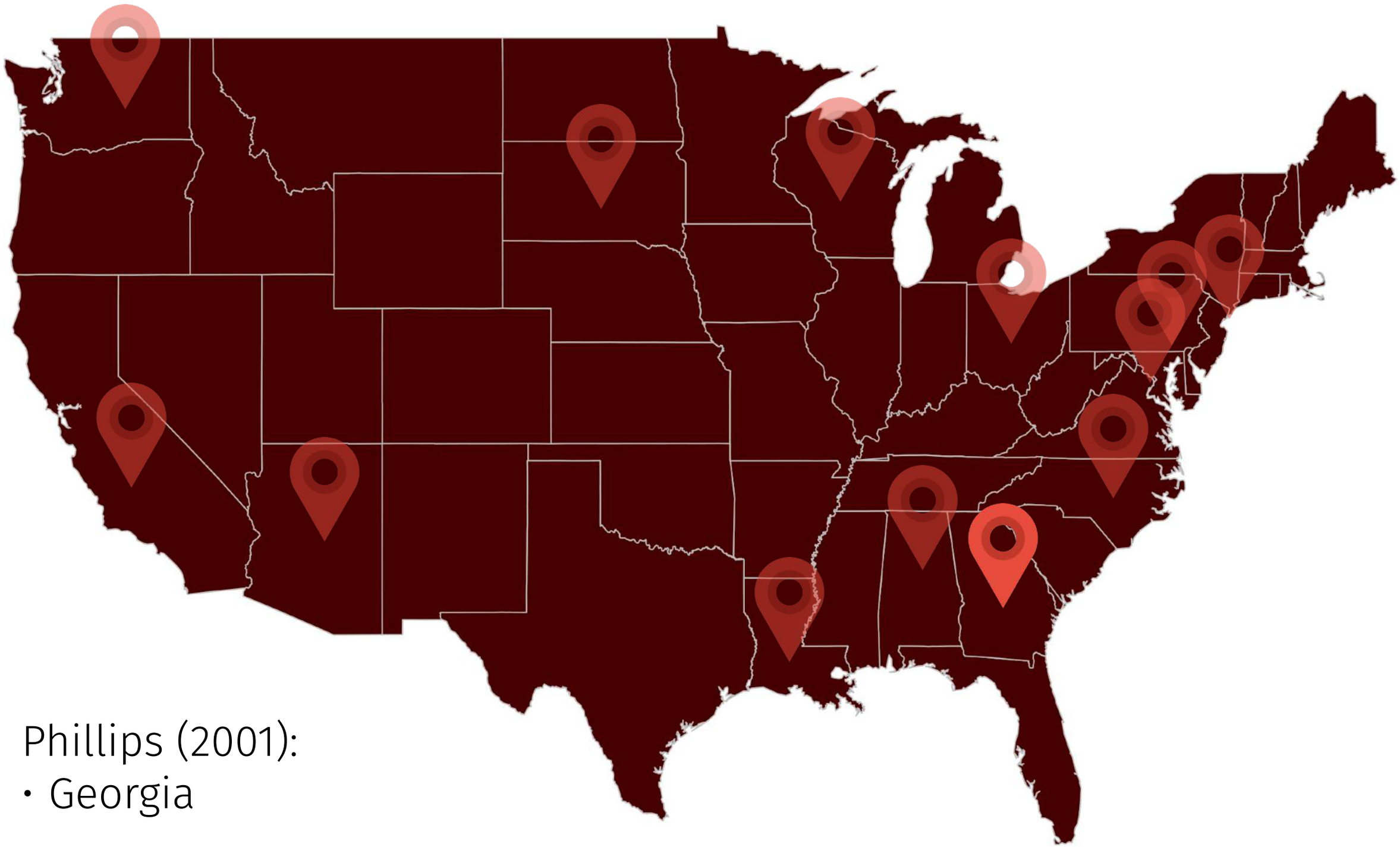
Geographic spread



Rutter (2011):

- Louisiana

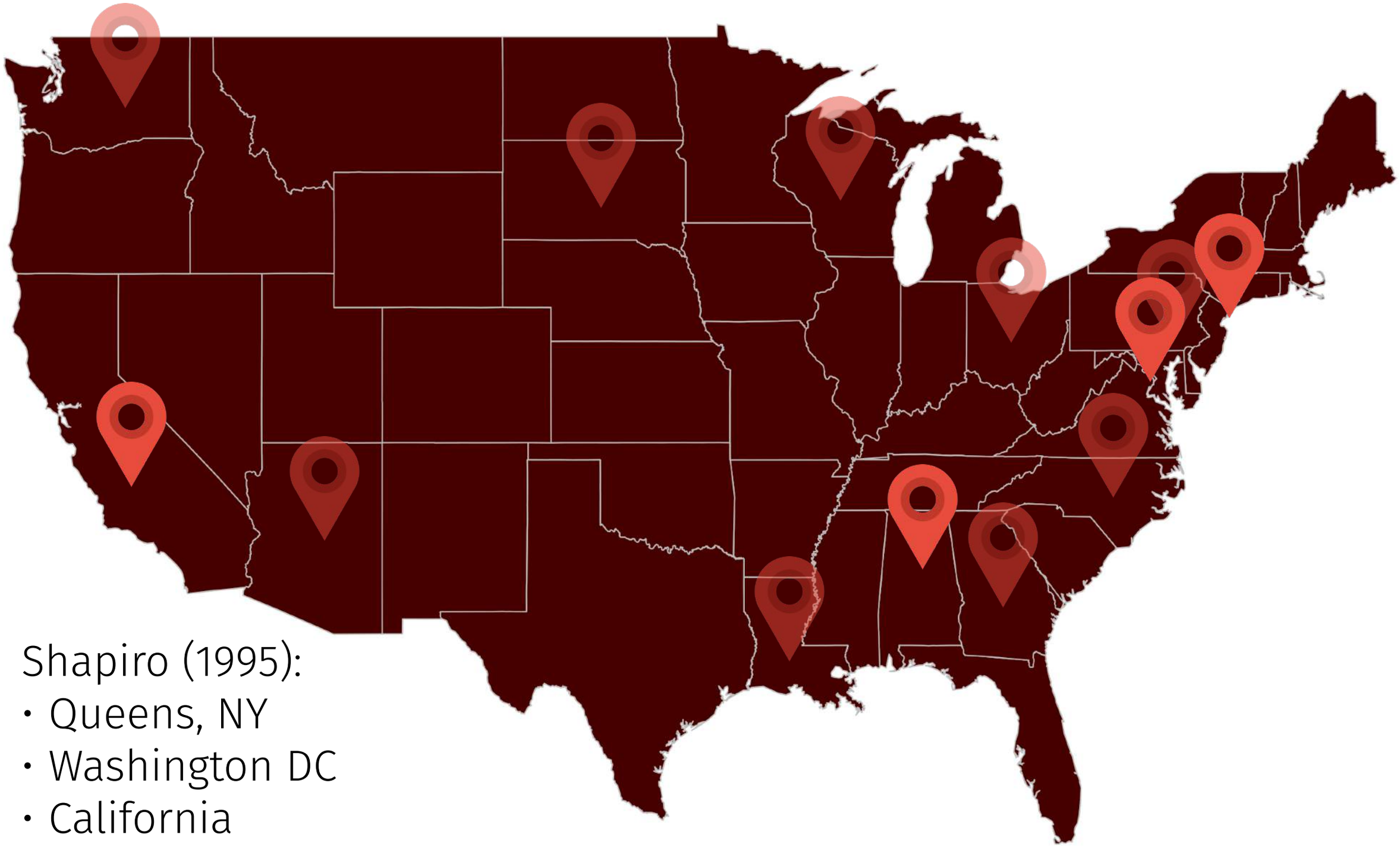
Geographic spread



Phillips (2001):

- Georgia

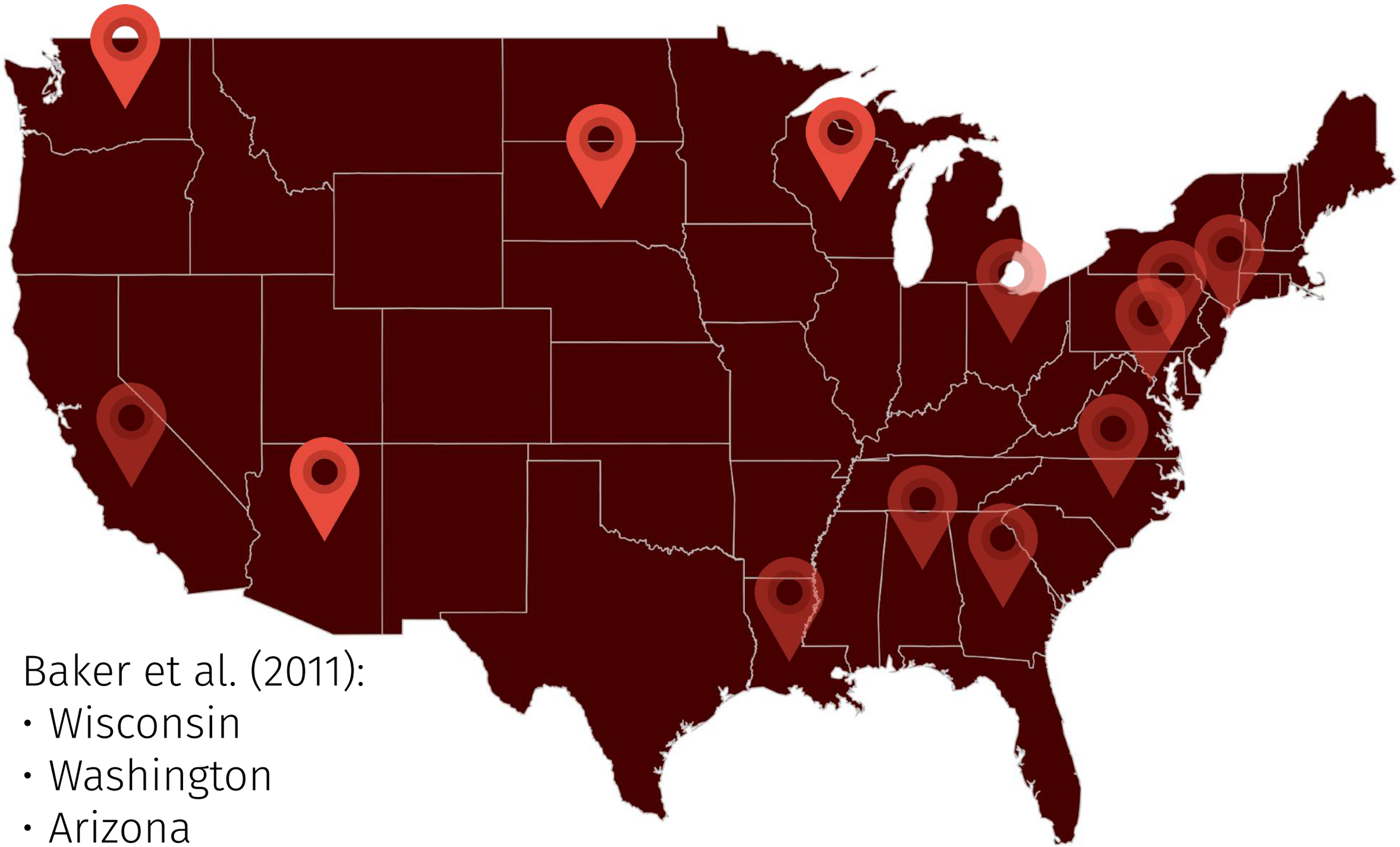
Geographic spread



Shapiro (1995):

- Queens, NY
- Washington DC
- California
- Birmingham, AL

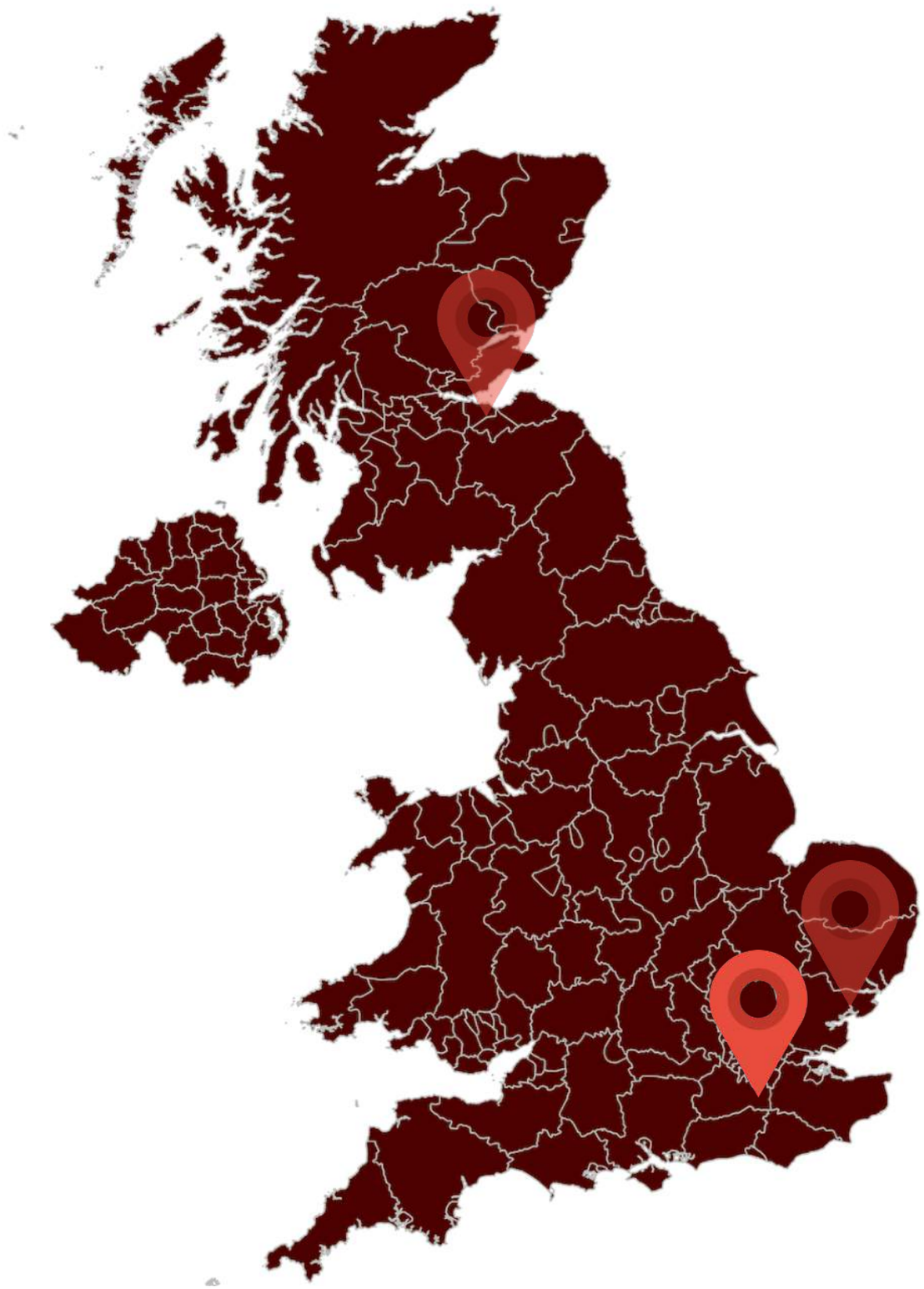
Geographic spread



Baker et al. (2011):

- Wisconsin
- Washington
- Arizona
- South Dakota

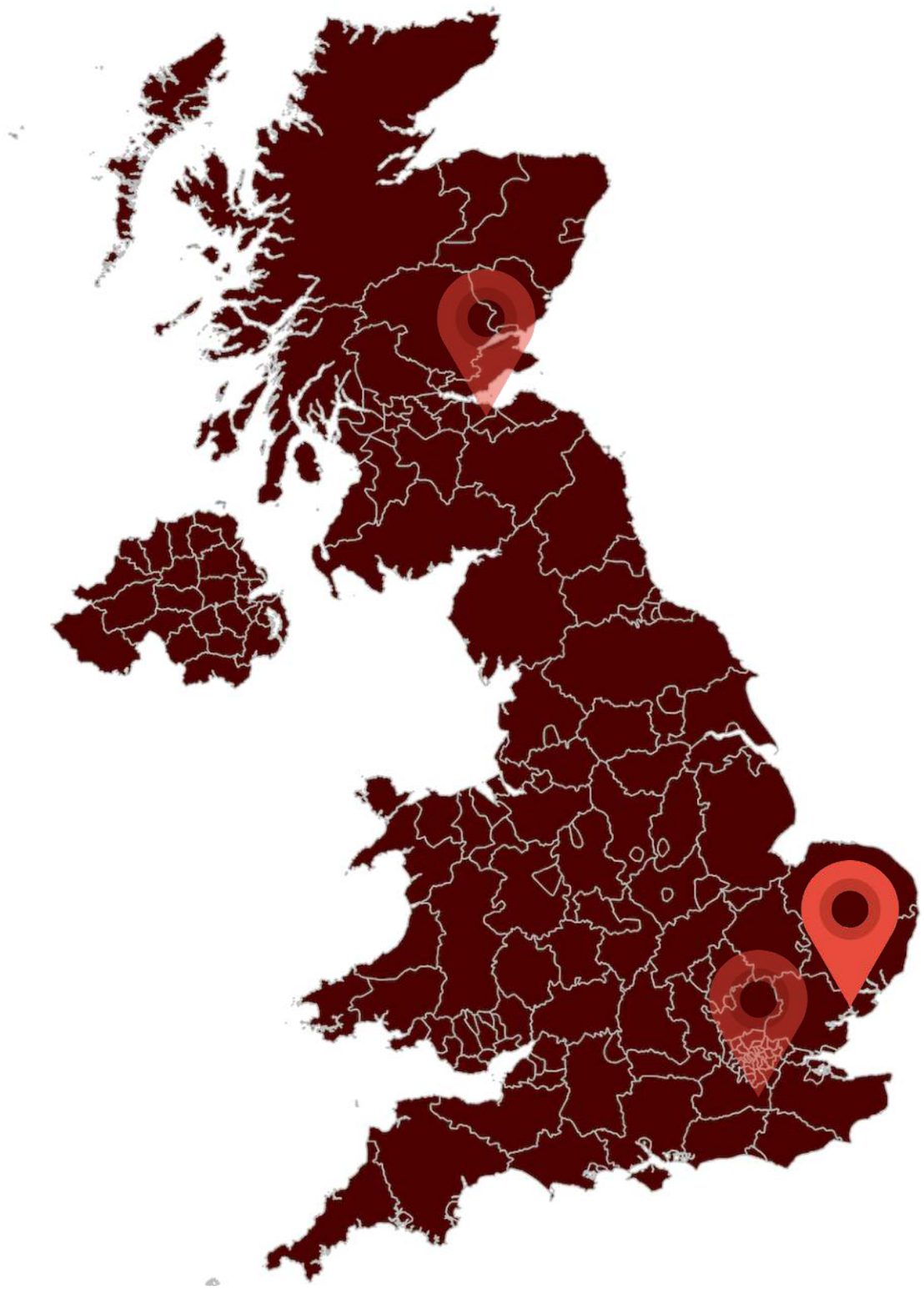
Geographic spread



Altendorf (2003):

- Estuary English

Geographic spread



Bass (2009):

- Colchester

Geographic spread

Sollgan (2013):

- Edinburgh

Geographic spread

This study:

Manchester English

Phonetic motivations

Two competing accounts:

/ ʃ t ɹ iː t /

- **/s/** retracts far less in **/st/** clusters, e.g. *steep* (Shapiro 1995)

Coarticulatory bias towards retraction in other **/sCɹ/** clusters (Baker et al. 2011)

/ ʃ **tʃ** ɹ iː t /

- **/t/** is always affricated when **/s/** is retracted in **/stɹ/** (Lawrence 2000)
- Pre-**/ɹ/** affrication of **/t/** is widespread in varieties of English (Cruttenden 2014: 189-92)

- Inter-speaker variation in the extent of this phonetic bias

"suggests a solution to the actuation problem" (Baker et al. 2011)

Phonetic motivations

Two competing accounts:

“It may prove difficult to tease apart the effects of contact with affricated /t/ and variably-articulated /ɹ/[...] and isolate a single underlying cause...”

Wilbanks (2017: 302)

We can gain insight into this unresolved issue by looking at British English:

- **/stj/** - e.g. *stupid*, *student* - affrication but no rhotic

Which of the two competing accounts finds the most empirical support in BrE?

Methodology

Data collection

- Sociolinguistic interviews with 131 speakers born and raised in Greater Manchester
  - ESRC funded project on Manchester English – interviews conducted by local fieldworkers and students
- **Birth years** spanning almost a century, from 1907 to 2001
- **Socioeconomic status** determined based on **occupation** (3 levels: working class, middle class, upper middle class) and **education** (see Baranowski & Turton 2018)
- ~85,000 tokens of sibilants across all environments, measured using Centre of Gravity (Jongman et al. 2000)

Data processing and analysis

Cleaning:

- Downsampled to 22kHz
- High-pass filtered at 750Hz
- Removed tokens where spectral peak or CoG < 2400Hz
- Removed outliers (1.5*IQR)

Analysis:

- Mixed-effects linear regression using `lme4` (Bates et al. 2011)
- Random intercept of word and random by-speaker slope of cluster type

Processing:

- Normalised into z-scores
- Word frequency counts taken from SUBTLEX-UK corpus (van Heuven 2014)
- Extracted duration of each sibilant
- Position in word and phrase (initial vs. medial)
- Extracted following vowel (to investigate effect of rounding)

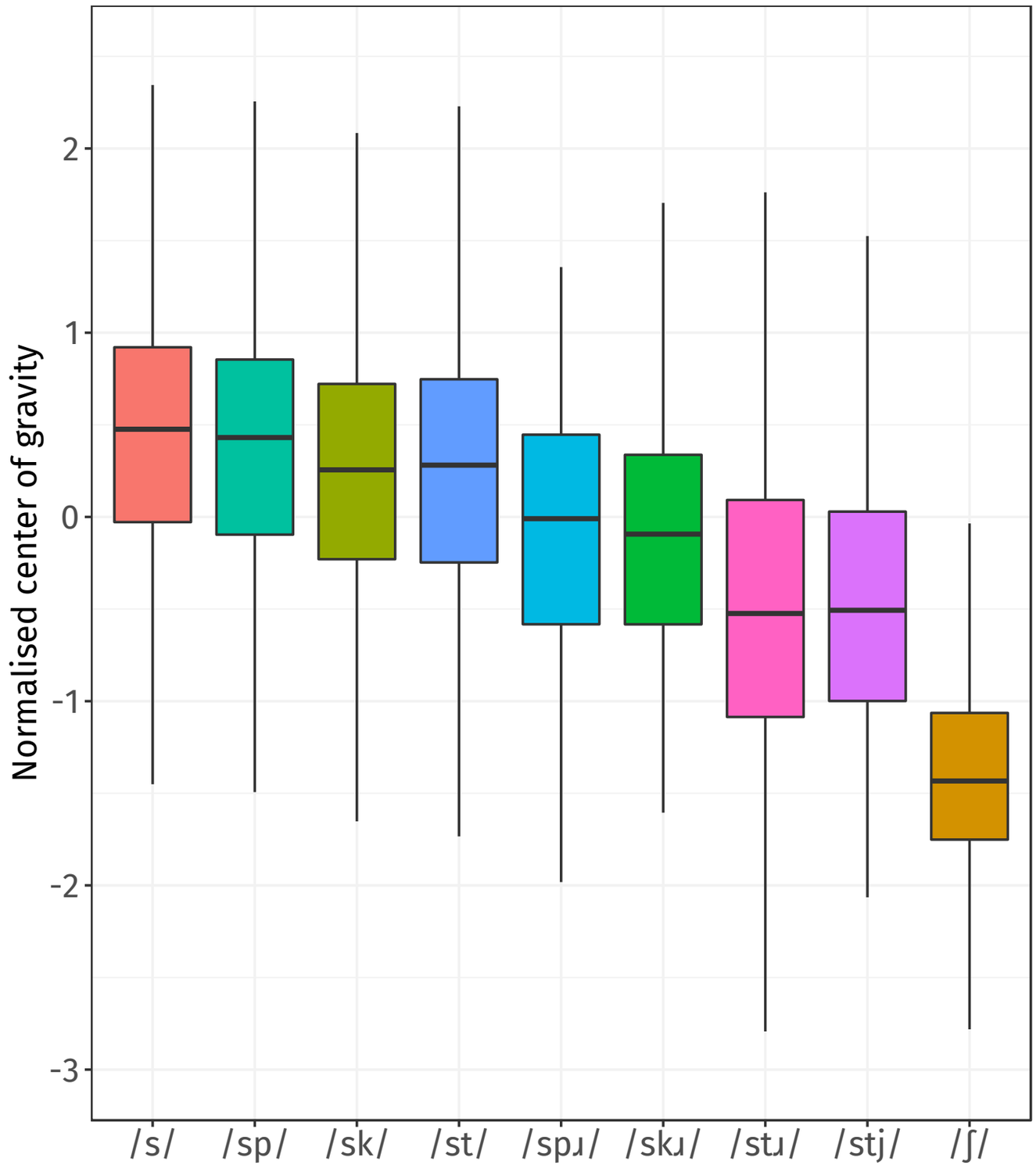
Results

All onset types

- Hierarchy of retraction contexts as attested elsewhere (e.g. Baker et al. 2011)

- /ɹ/ causes some **low-level retraction** even in the absence of affrication, e.g. /spɹ, skɹ/

- First quantitative evidence of **retraction in /stj/** - e.g. *student, stupid* etc.



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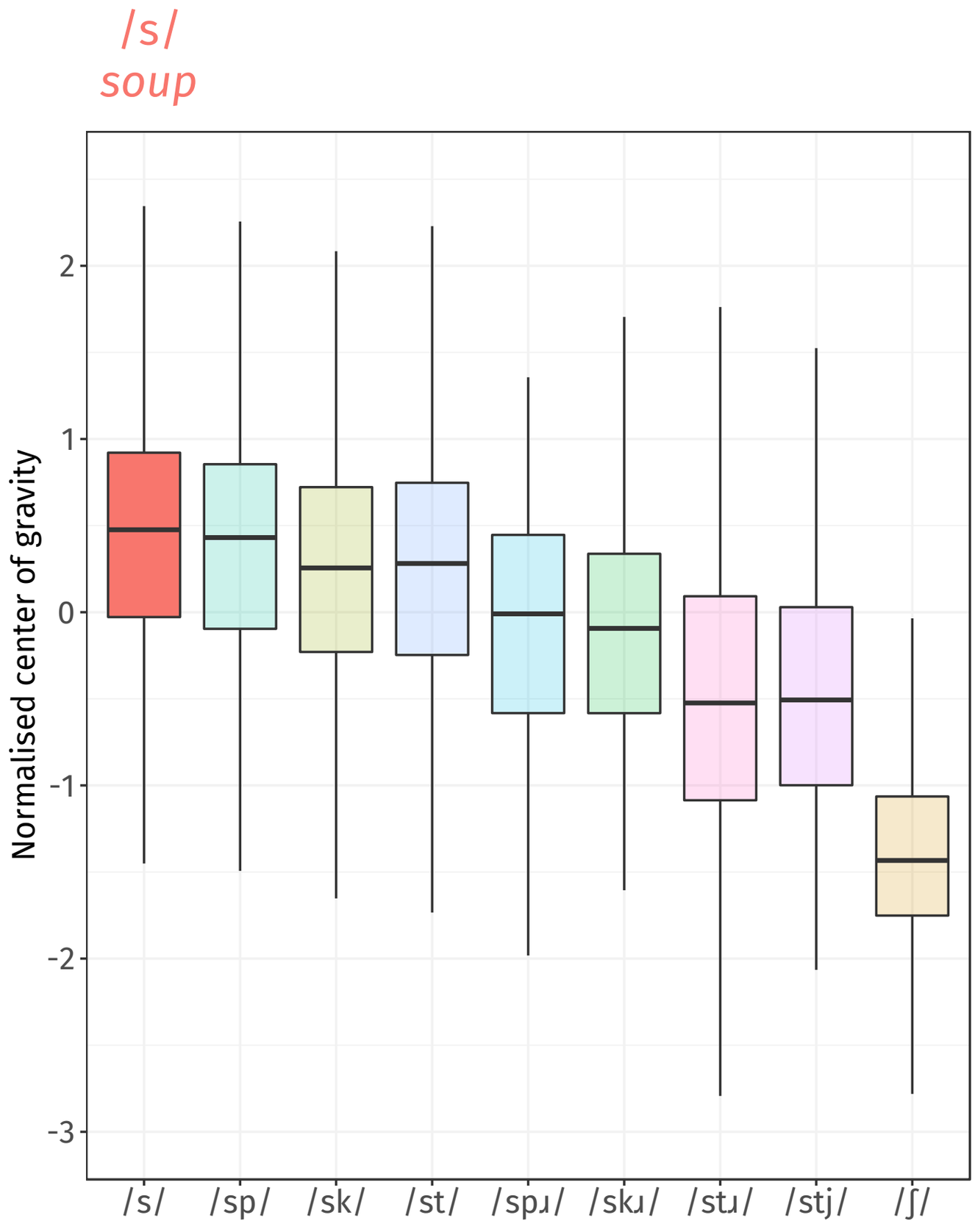

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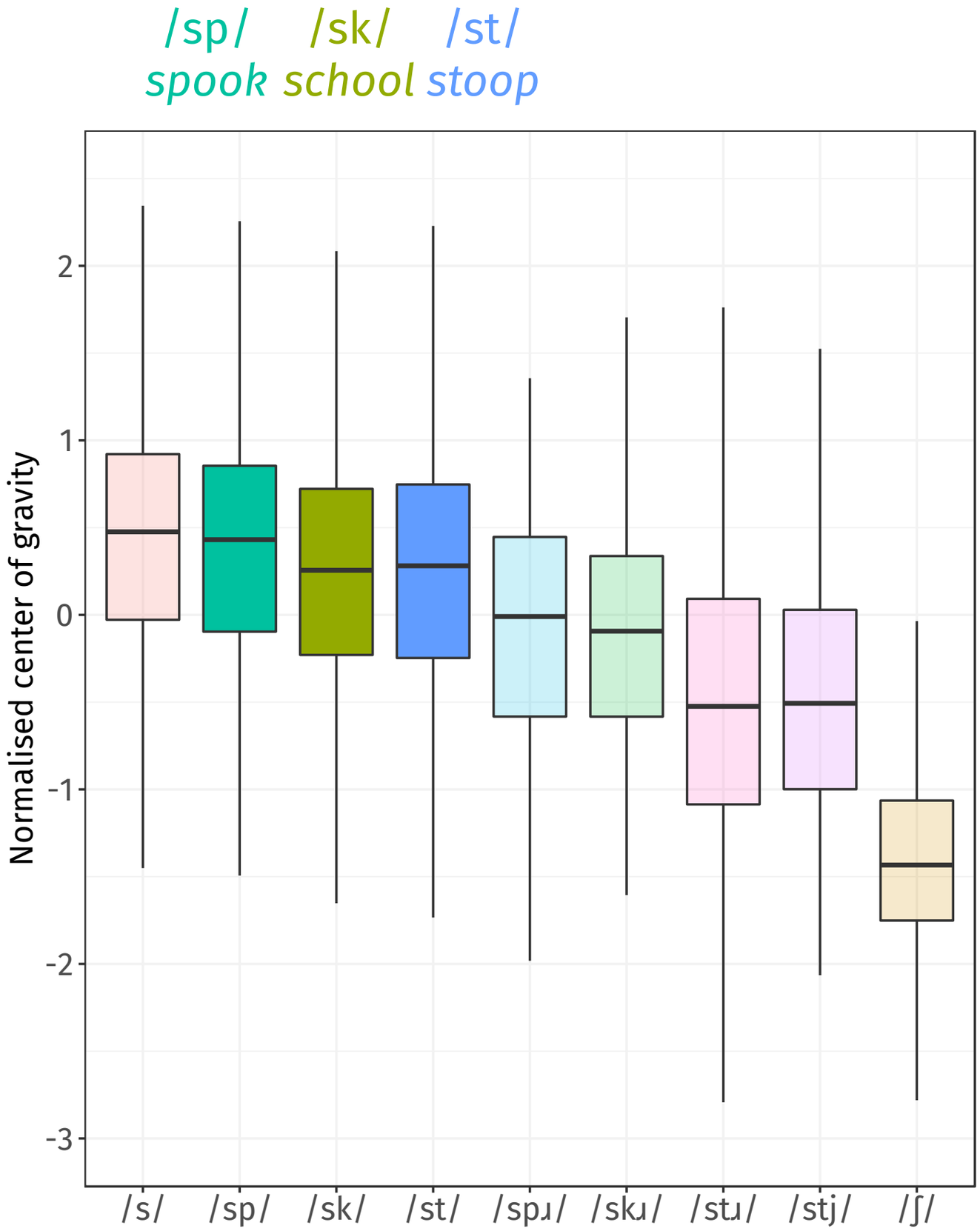

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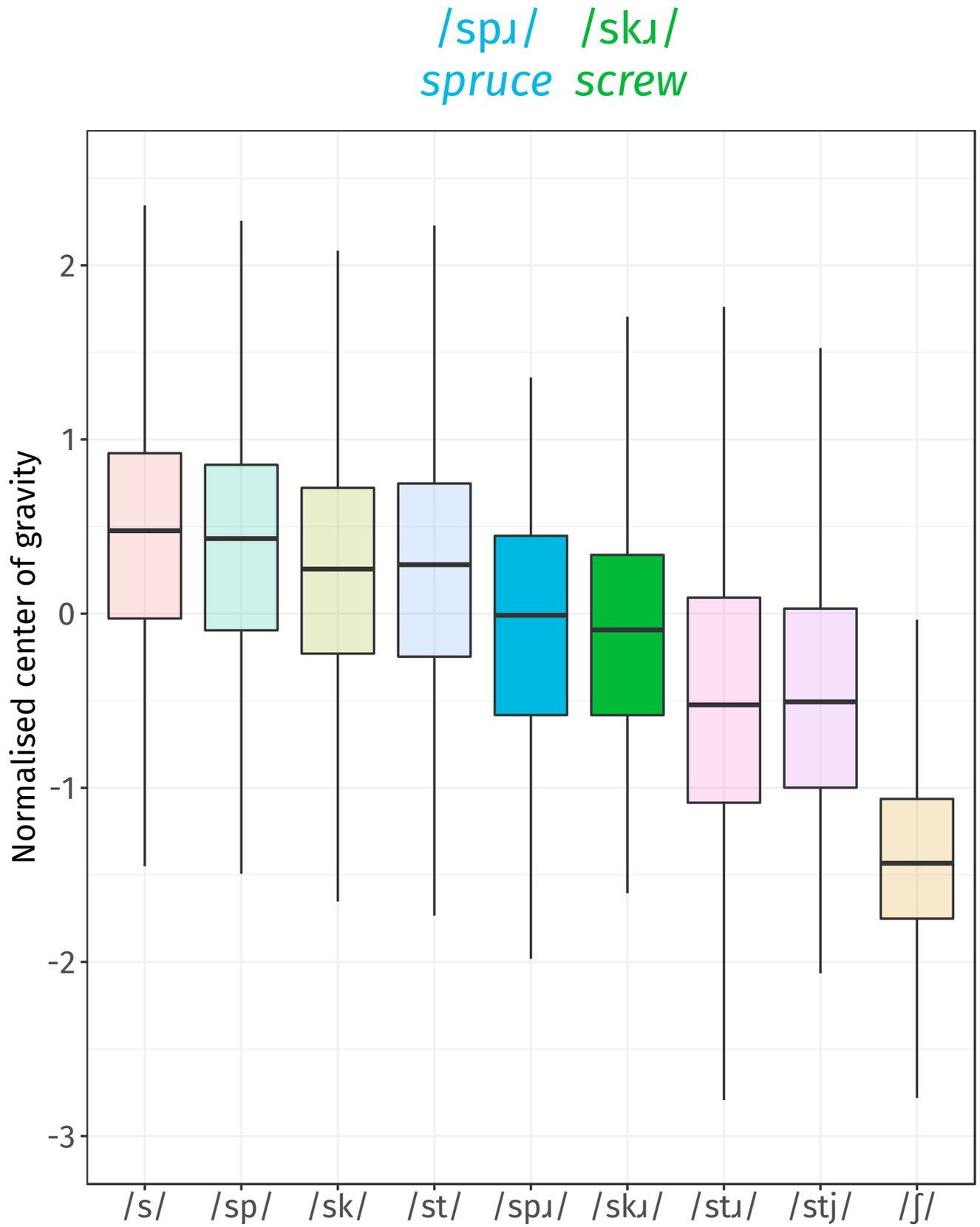

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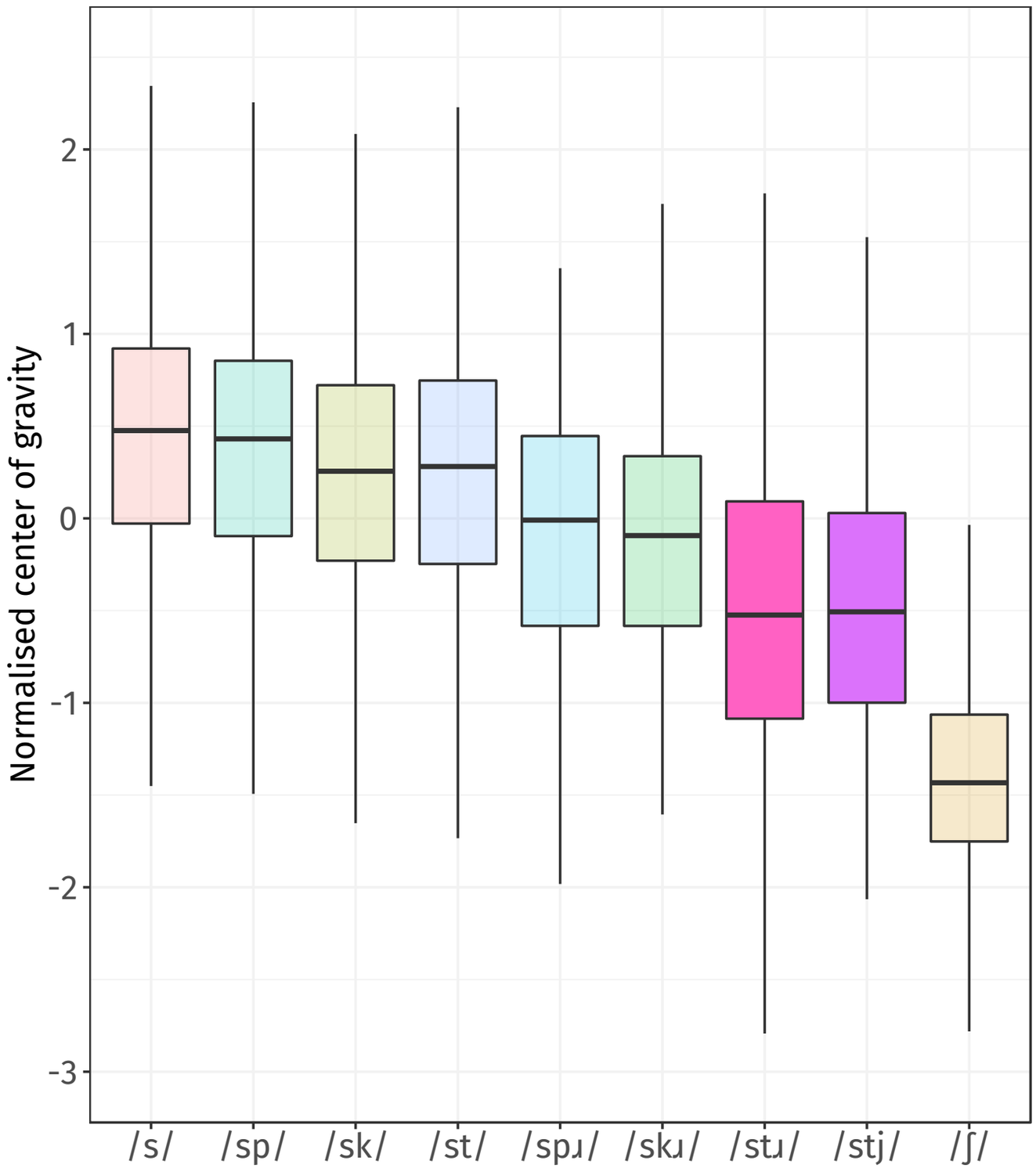

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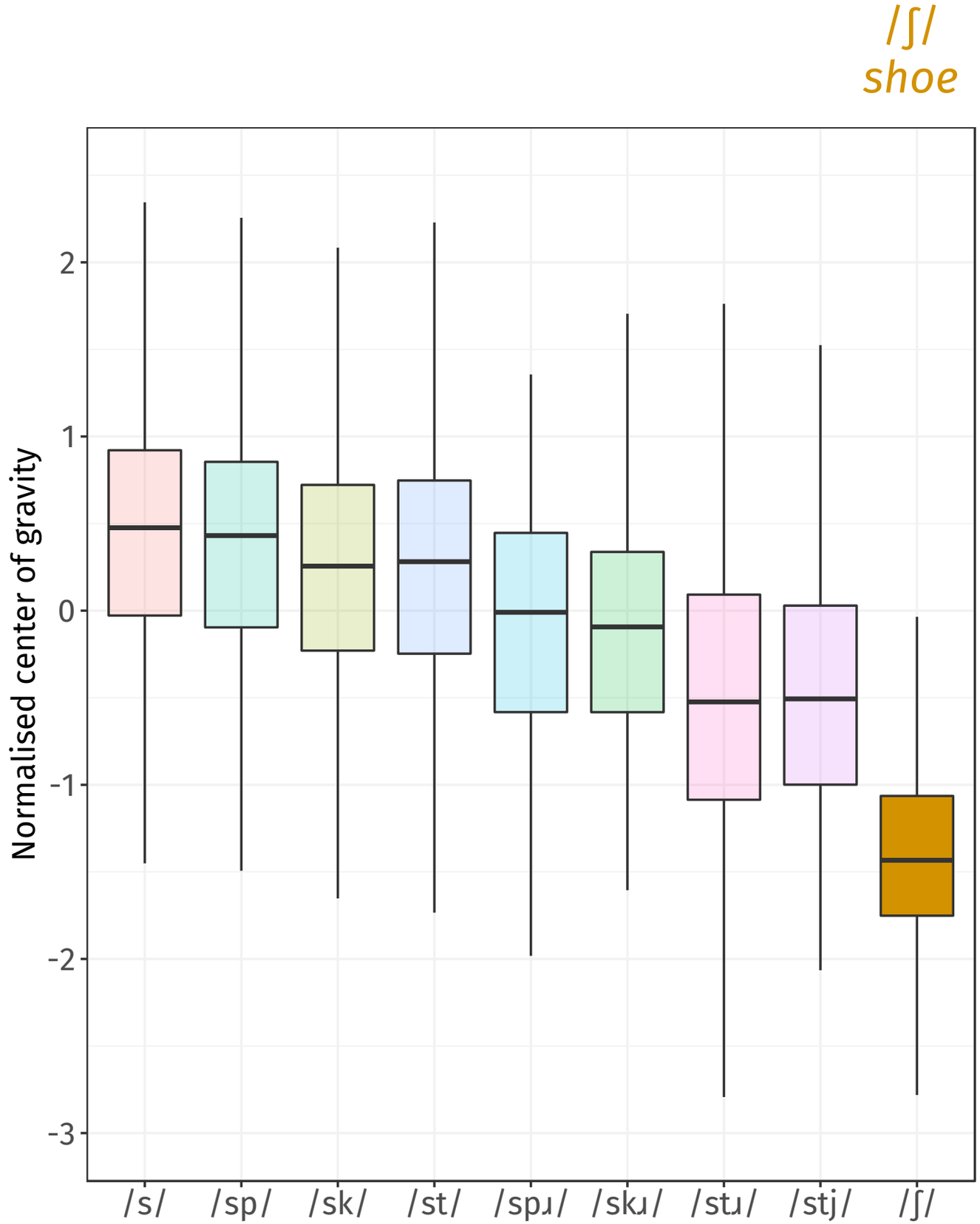
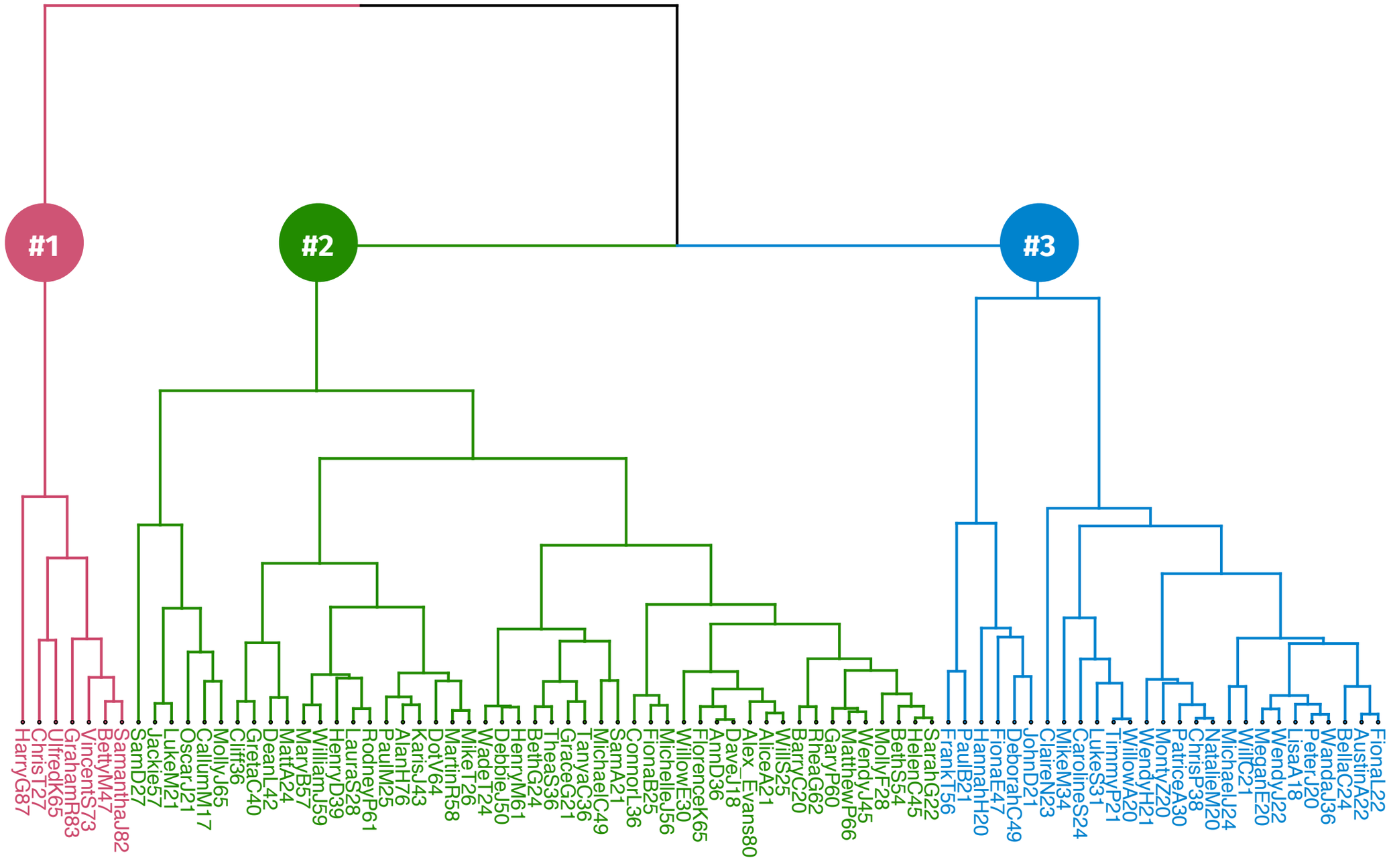


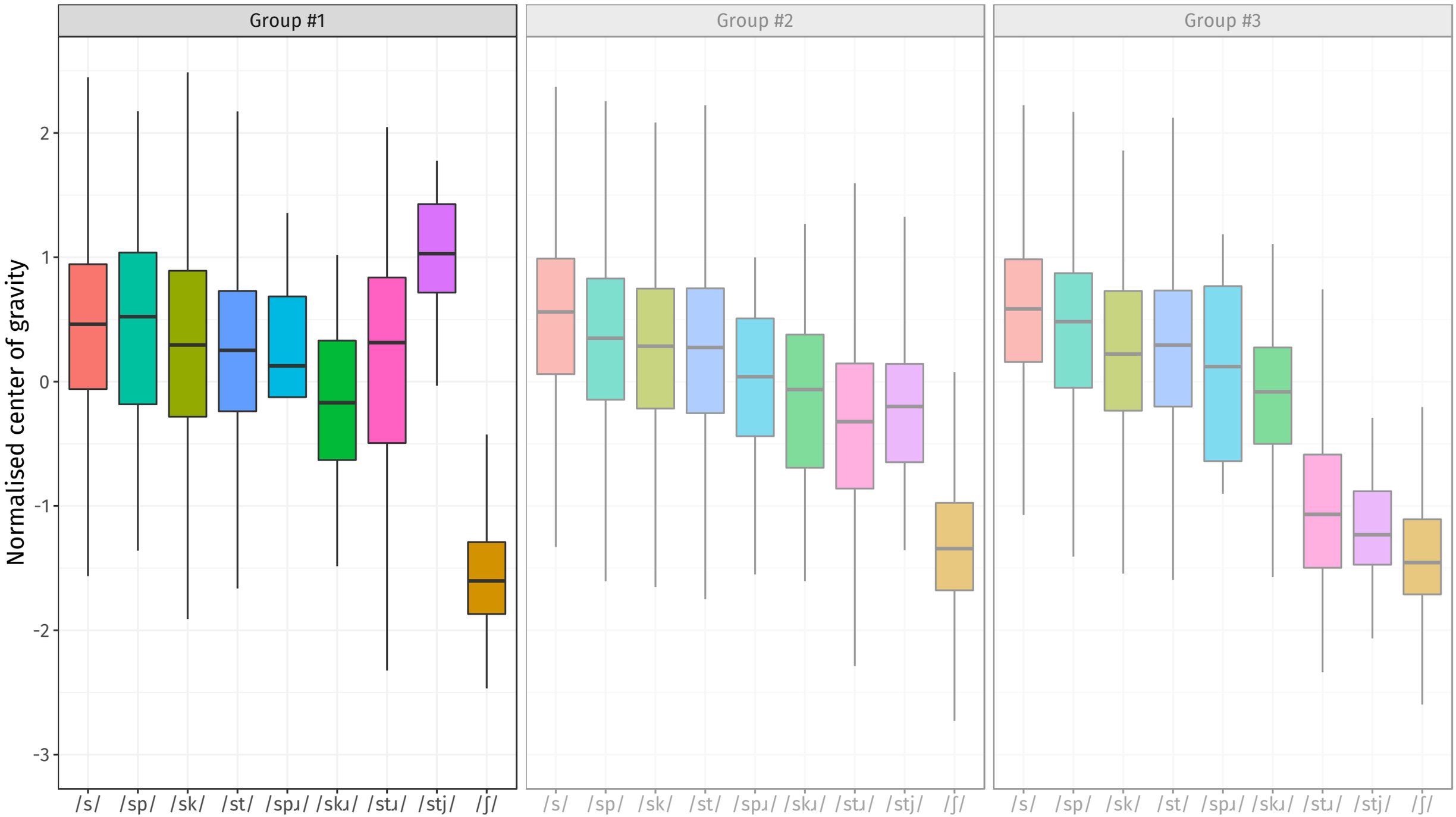
Cluster analysis

- **Hierarchical cluster analysis** - objectively groups speakers based on distribution of CoG values across environments



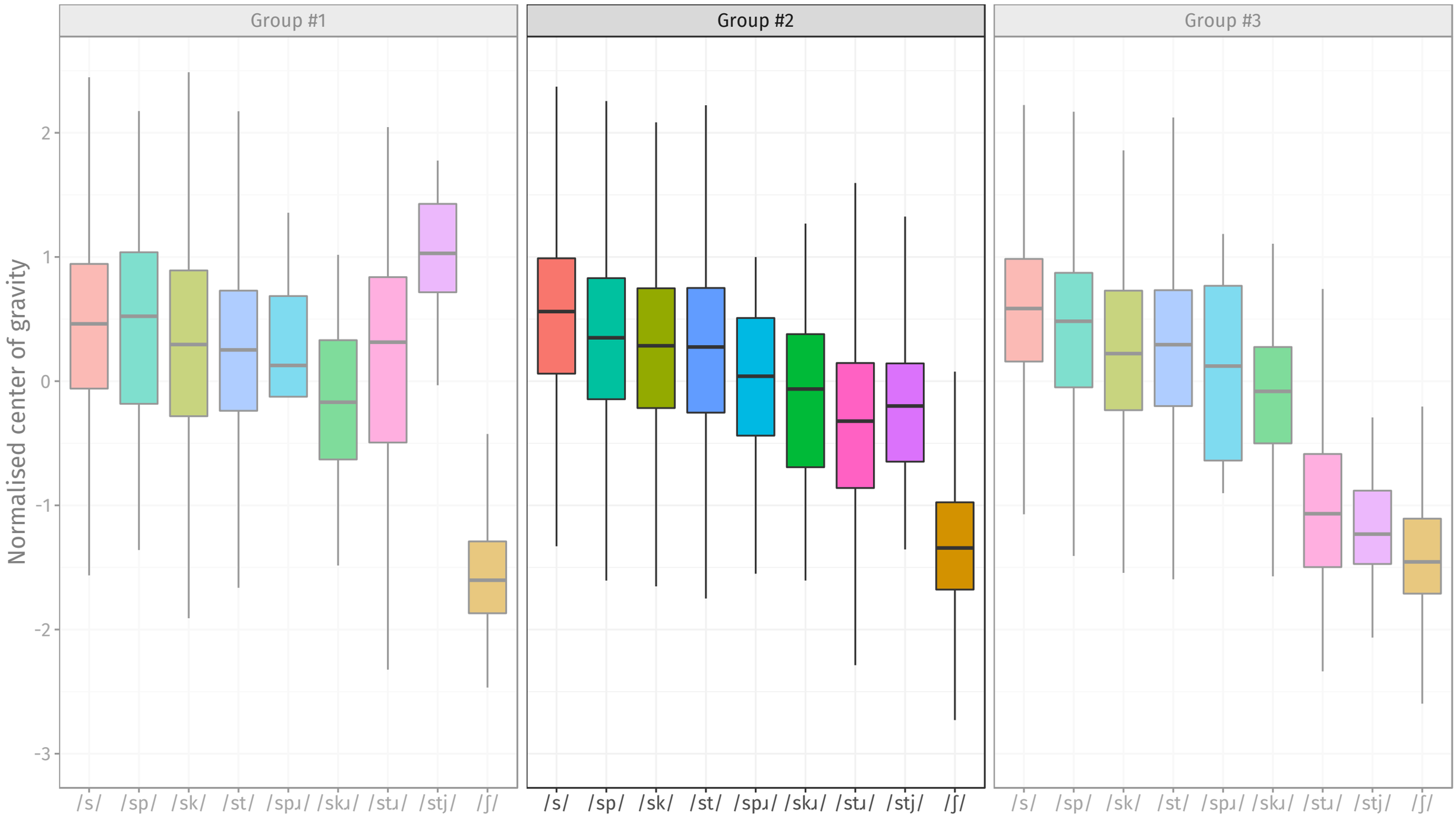
Cluster analysis

Group #1 - no pattern of retraction



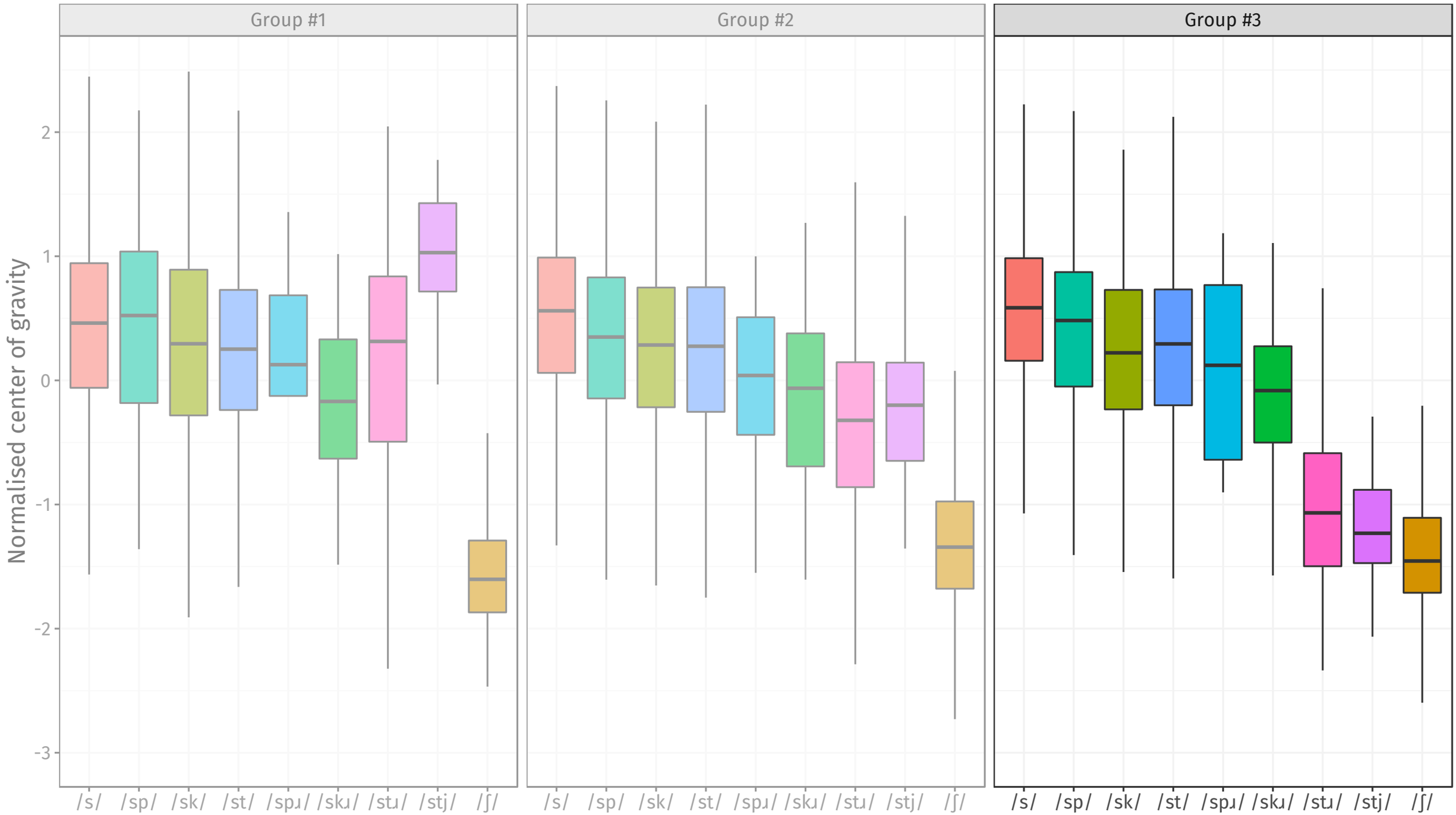
Cluster analysis

Group #2 - emerging pattern of retraction

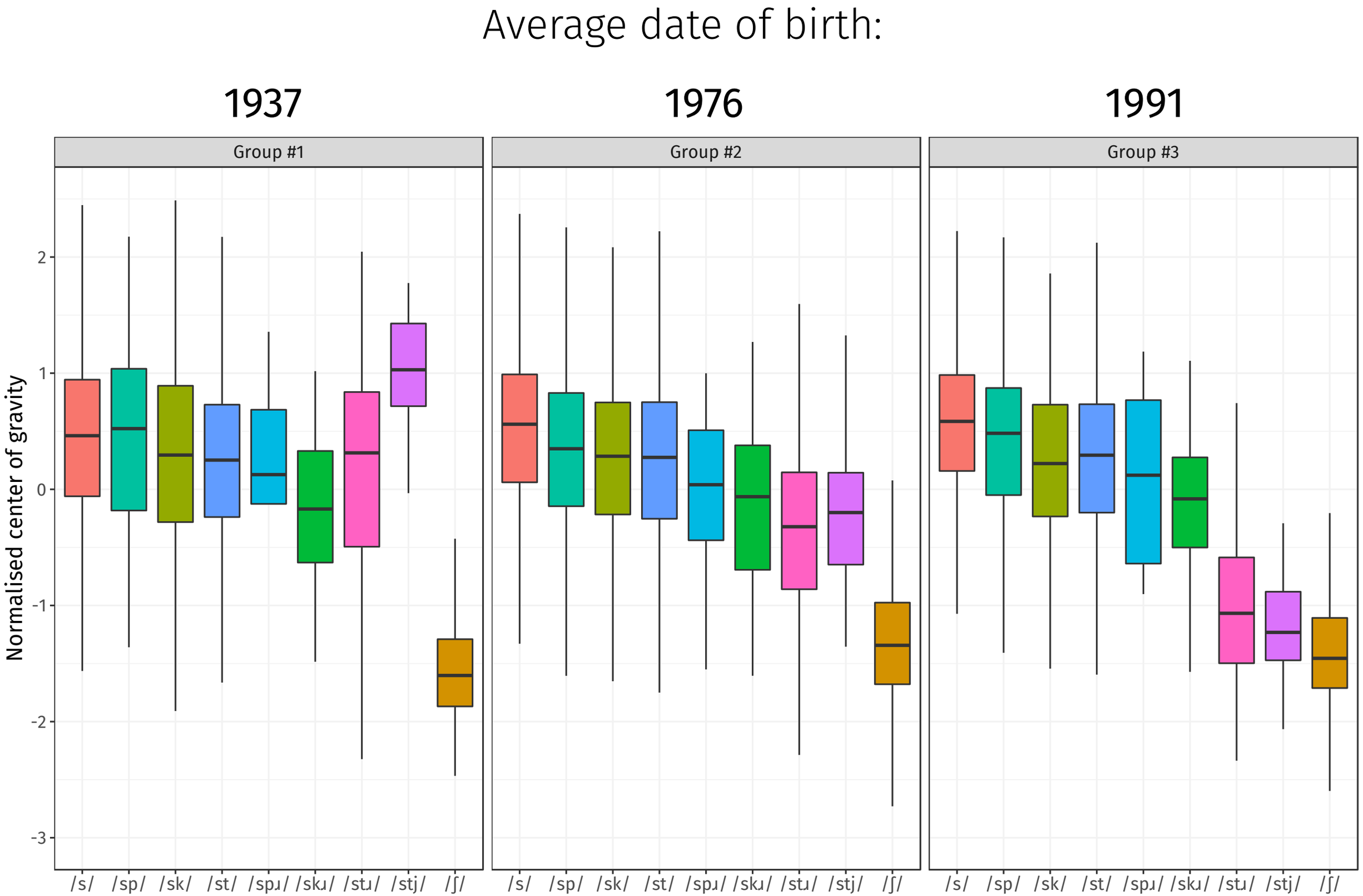


Cluster analysis

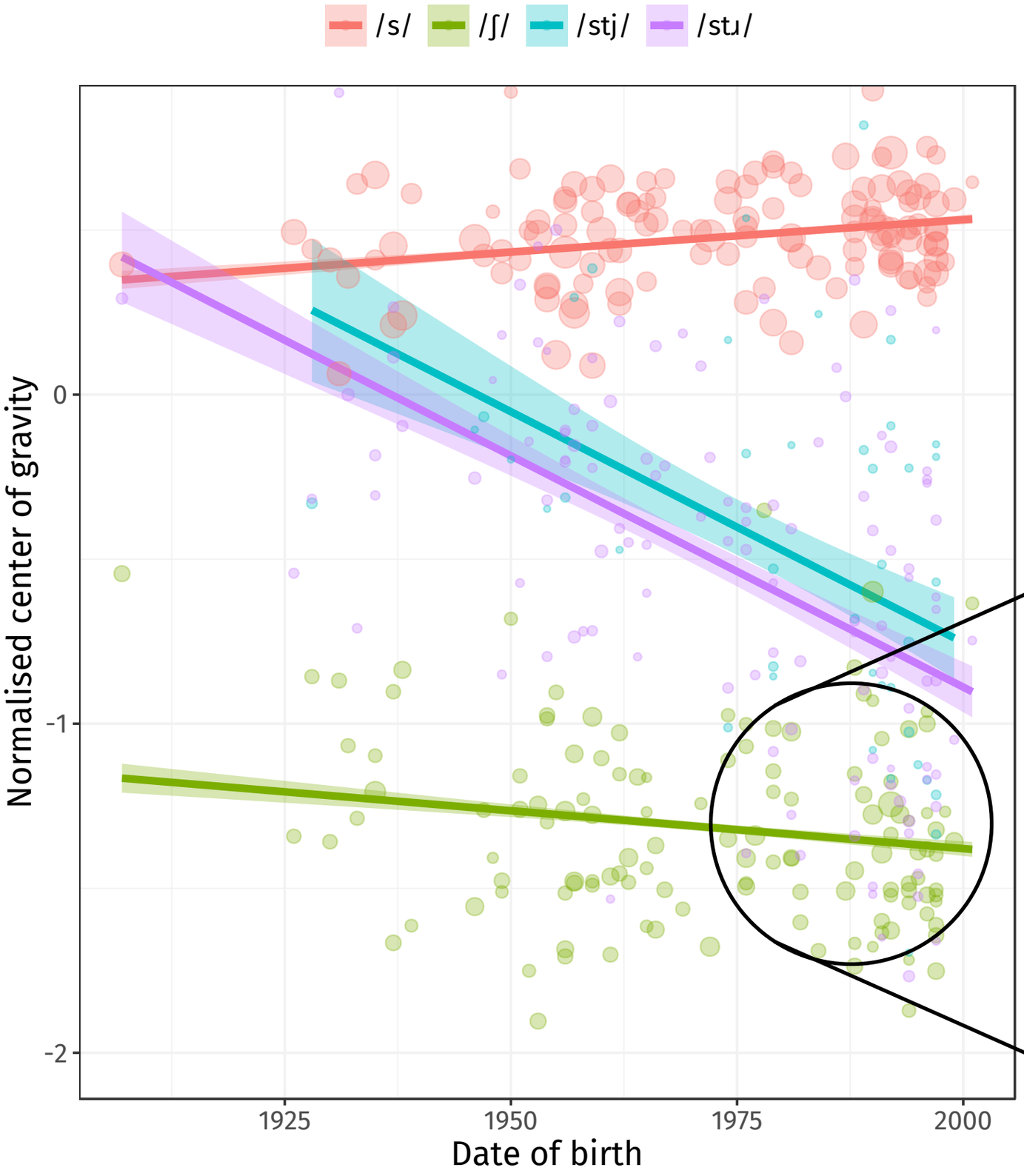
Group #3 - /stɹ/ and /stj/ approaching /ʃ/



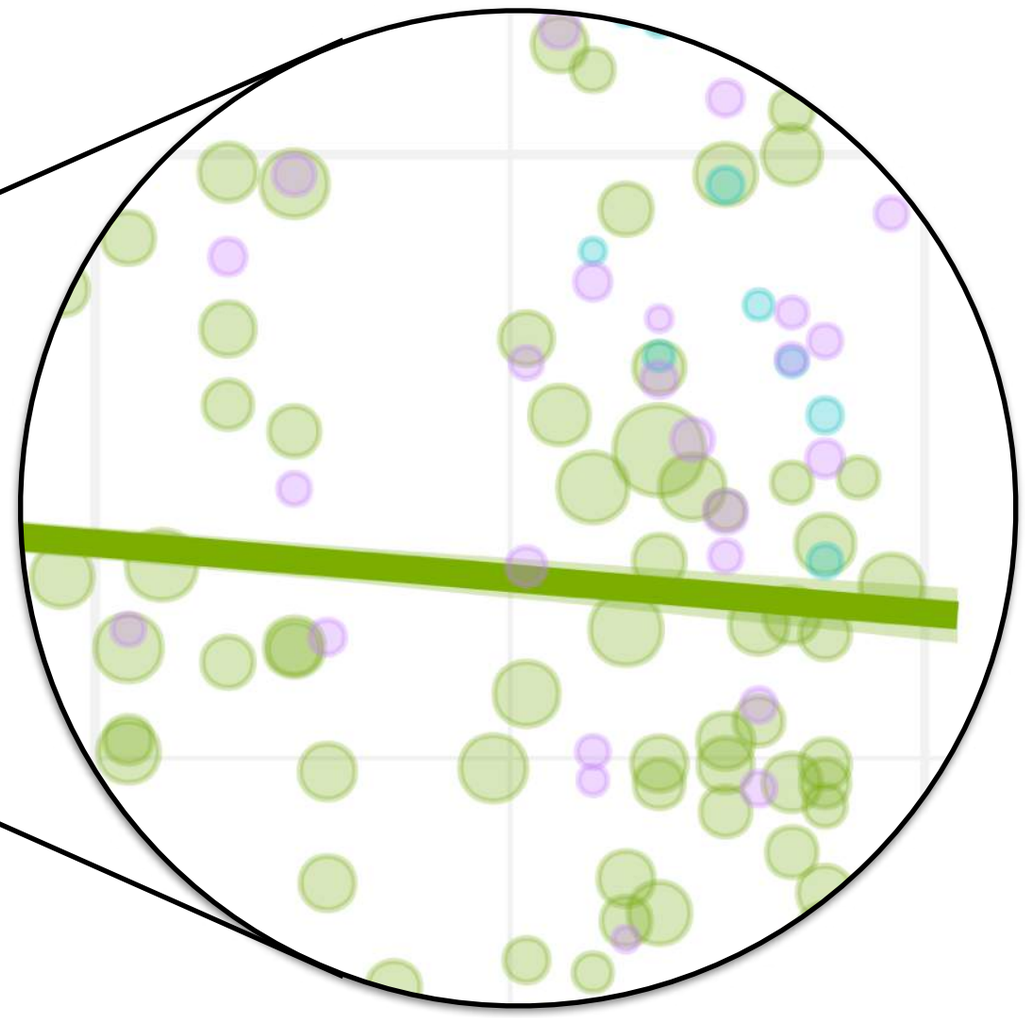
Cluster analysis



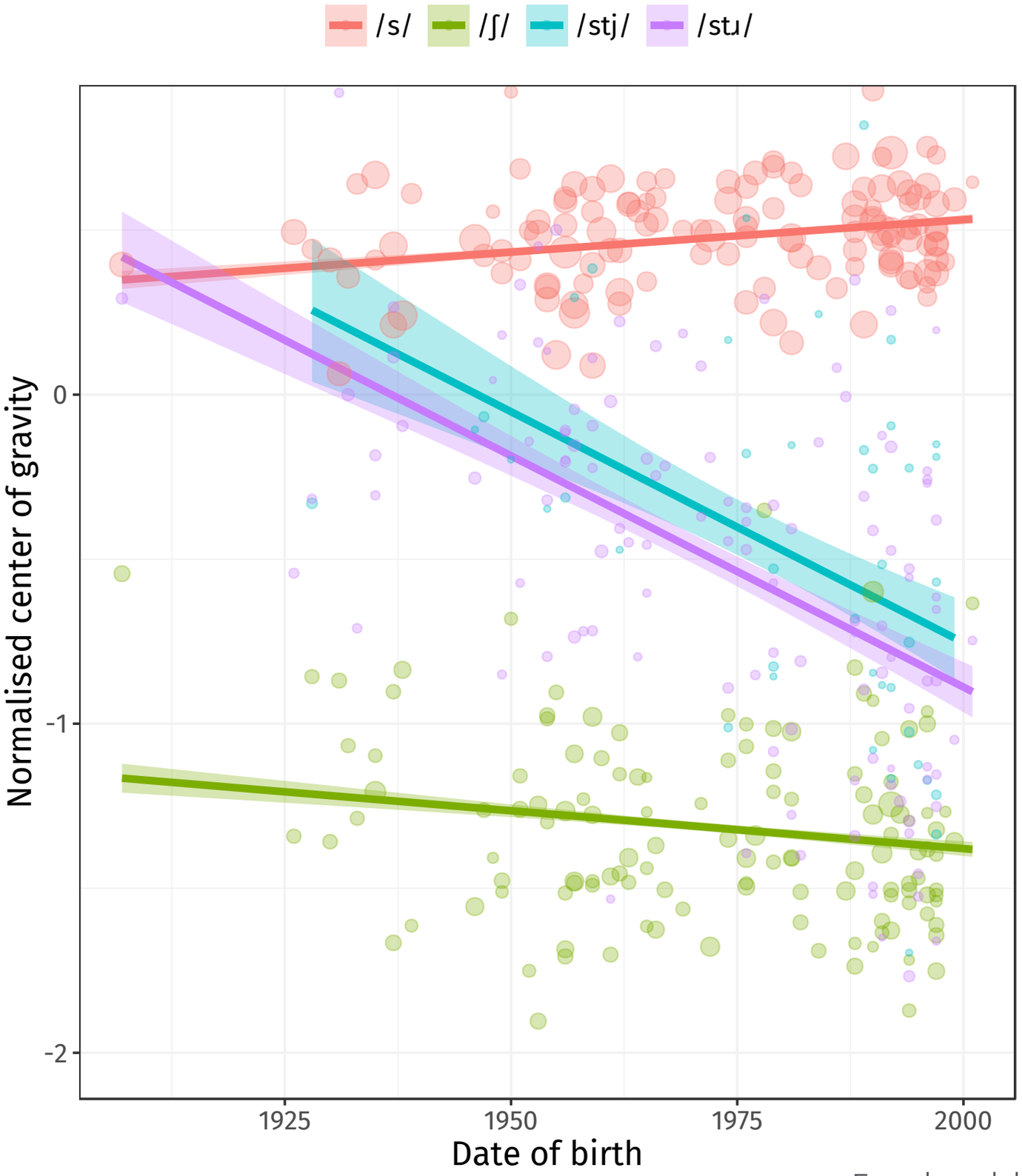
Apparent time change #1



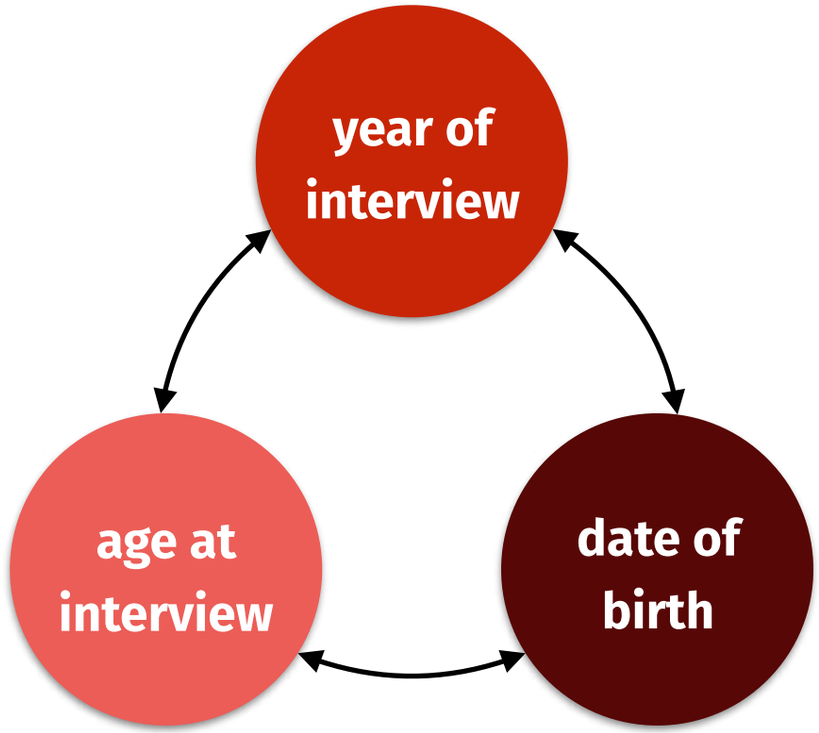
- /stɹ/ and /stj/ **changing in parallel**
- Suggests a single underlying cause



Apparent time change #2

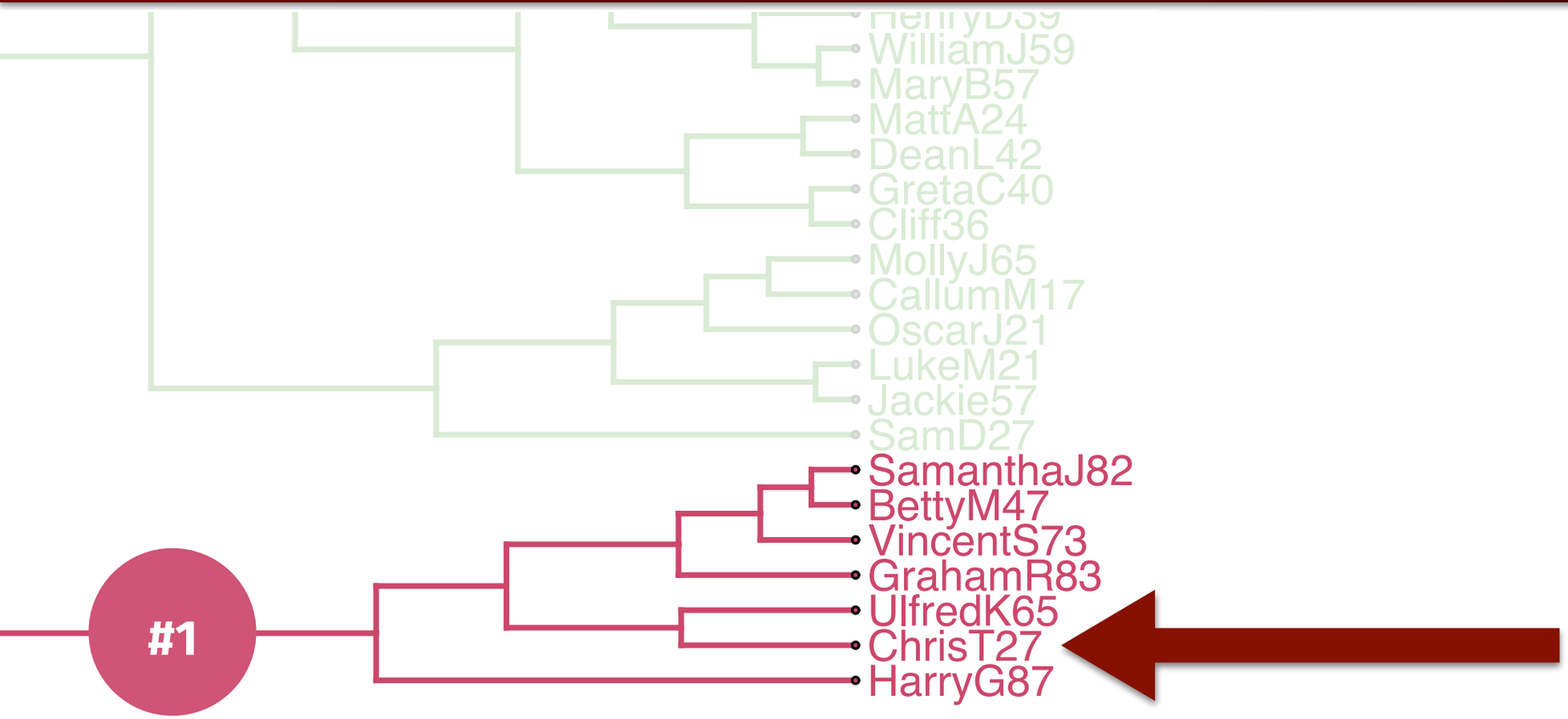


- Pre-vocalic /s/ and /ʃ/ also correlate with date of birth
- Wider fricative space for younger speakers
  - apparent time change?
  - age-graded variation?



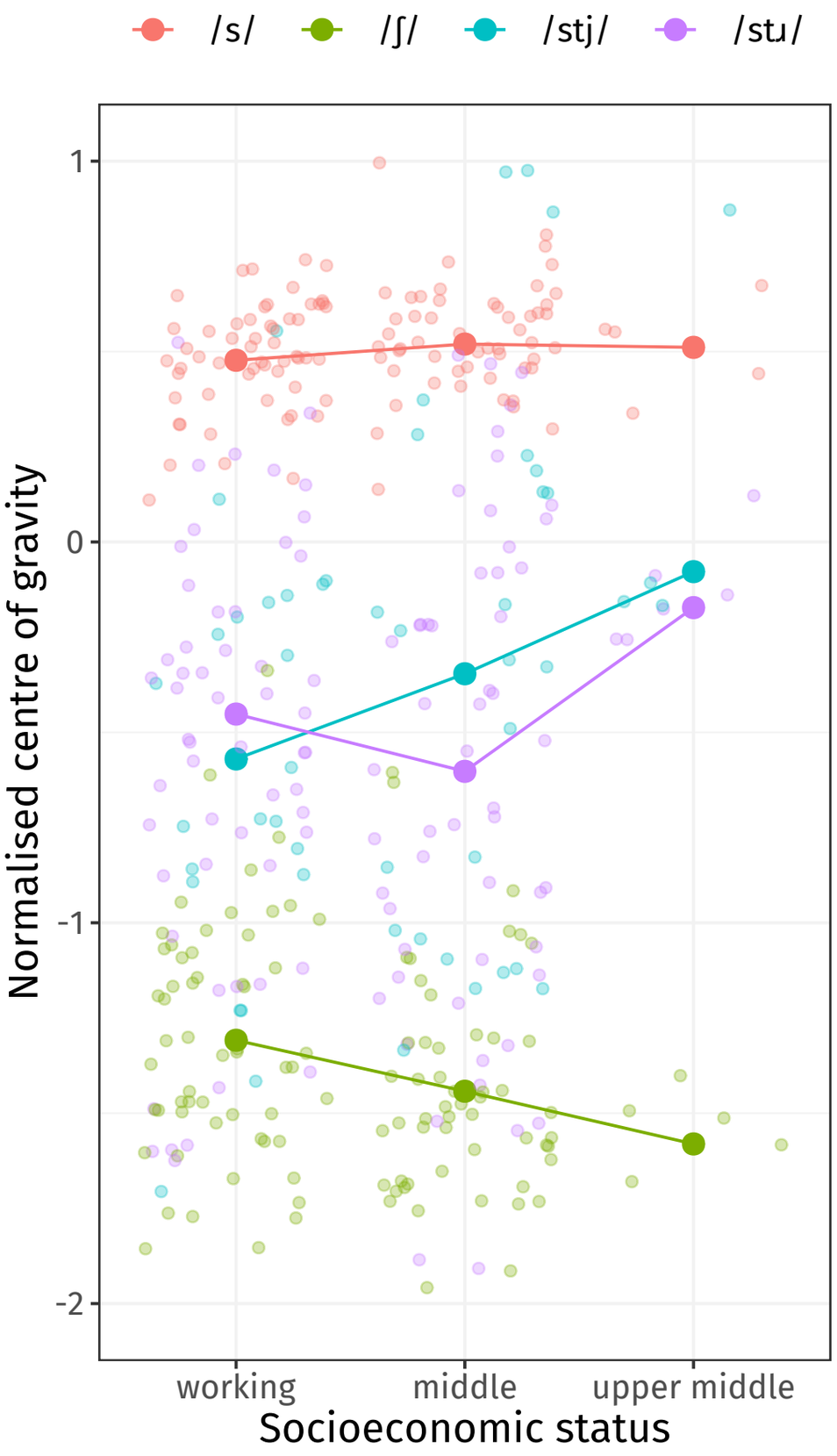
see Fruehwald (2017) - *Generations, lifespans, and the zeitgeist*

Cluster analysis



What's a 27 year-old doing in group #1?

Socioeconomic status



- Based on occupation - found to be best measure of social class in this community (Baranowski & Turton 2018)
  - Suggestion that highest social class is conservative (but p = 0.18)
- Education tells a similar story *and* significant difference between highest and lowest group (but lots of missing data)
- Calls for complementary work on indexical meaning of *s*-retraction (see e.g. Phillips & Resnick 2019)

Social evaluation?

- To what extent are speakers aware of this variation? Is it subject to metalinguistic commentary? If so, how is it evaluated?

> my pet peeve is “shtreet” (street). I’ve noticed recently that a lot of speakers are adding these sounds.

> People that pronounce it SHtreet. There is no h in the word street.

> It makes me apoplectic when the “st” sound gets an “h” added to it like: shtreet, or shtrong or shtraight! Those are not proper words people! Even announcers do it! Stop! Just STOP!

Other factors

- Other significant predictors from the model:

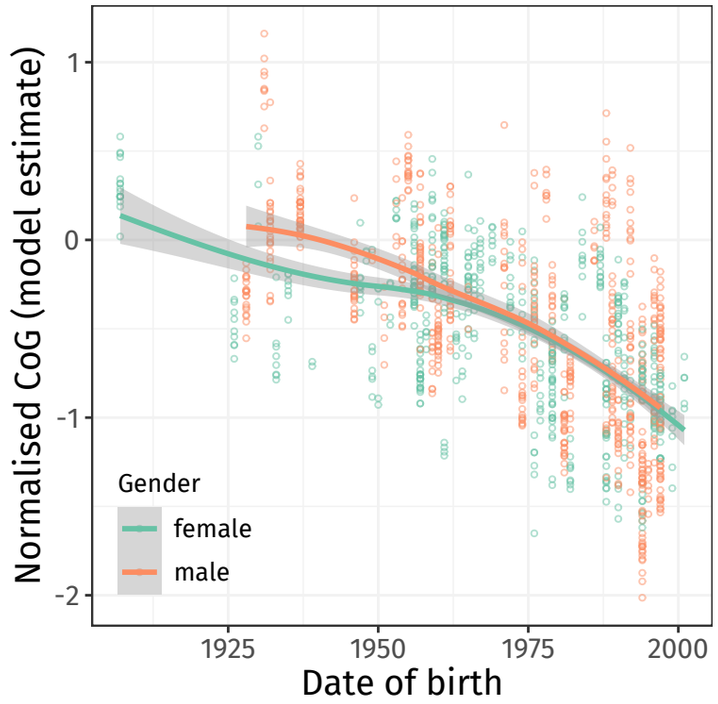
  - **gender**: male speakers lagging behind female speakers (β = 0.233, p = 0.01)

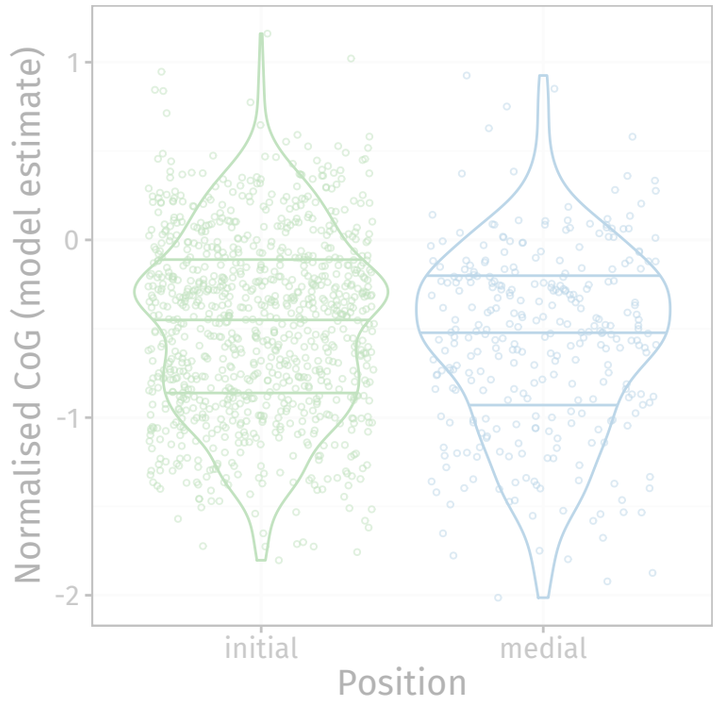
  - **position**: retraction more advanced in word-medial position (β = -0.169, p = 0.002)

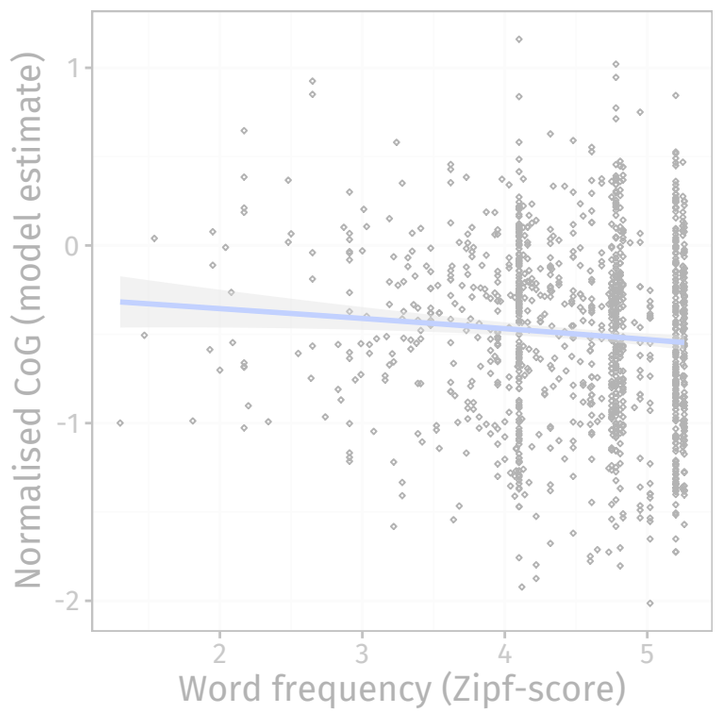
  - **frequency**: higher frequency words leading (β = -0.068, p = 0.028)

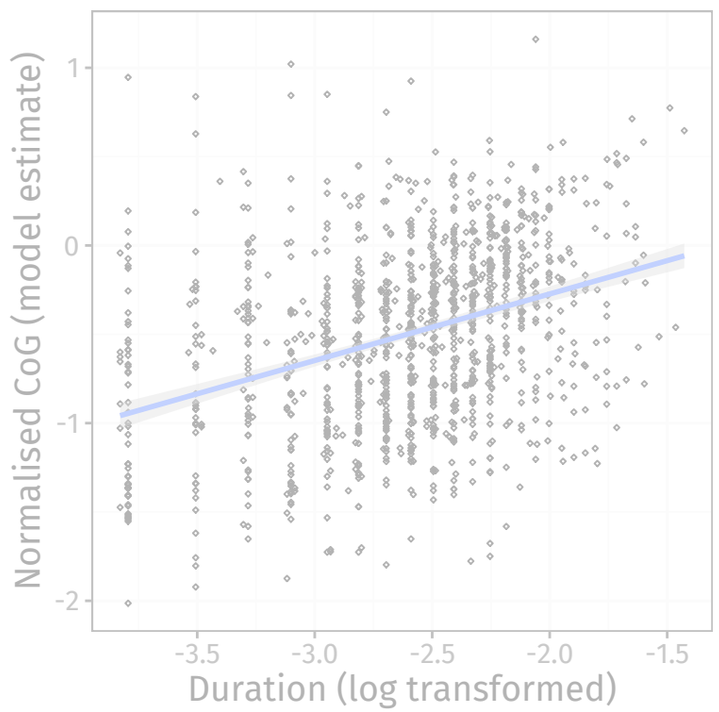
  - **duration**: longer sibilants less retracted (β = 0.121, p < 0.001)

(not sig: social class, vowel, cluster type)









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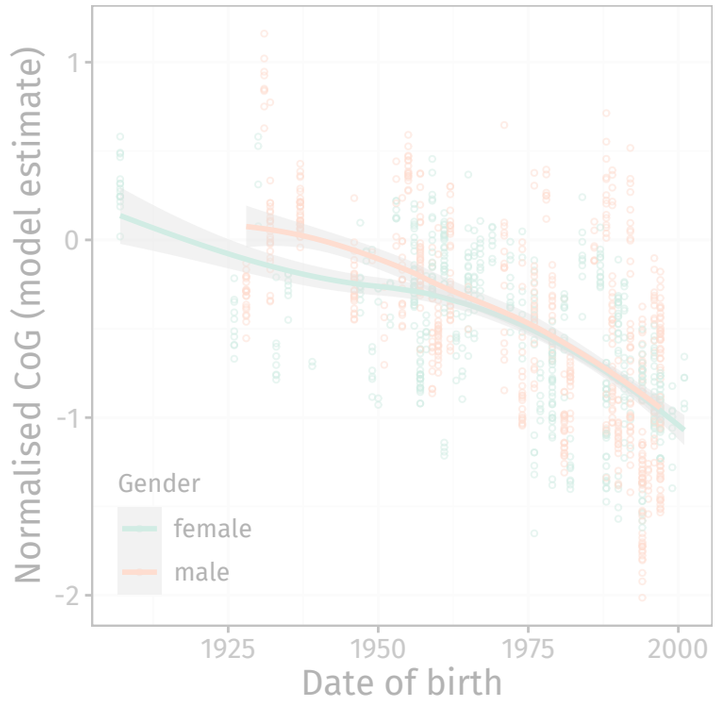

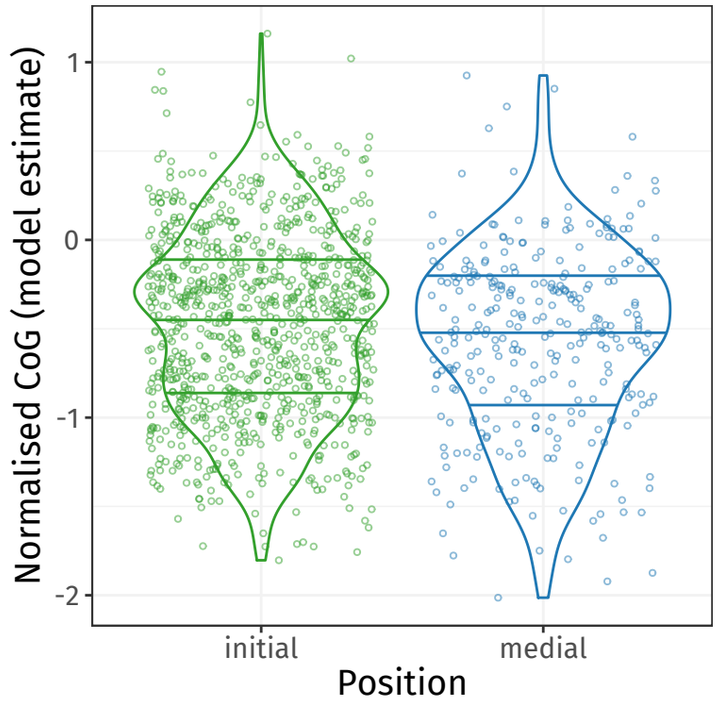

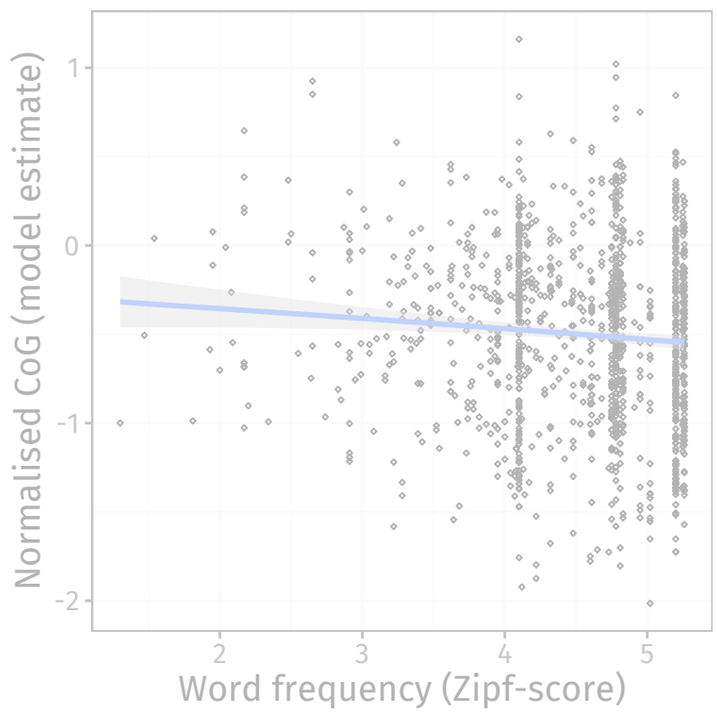

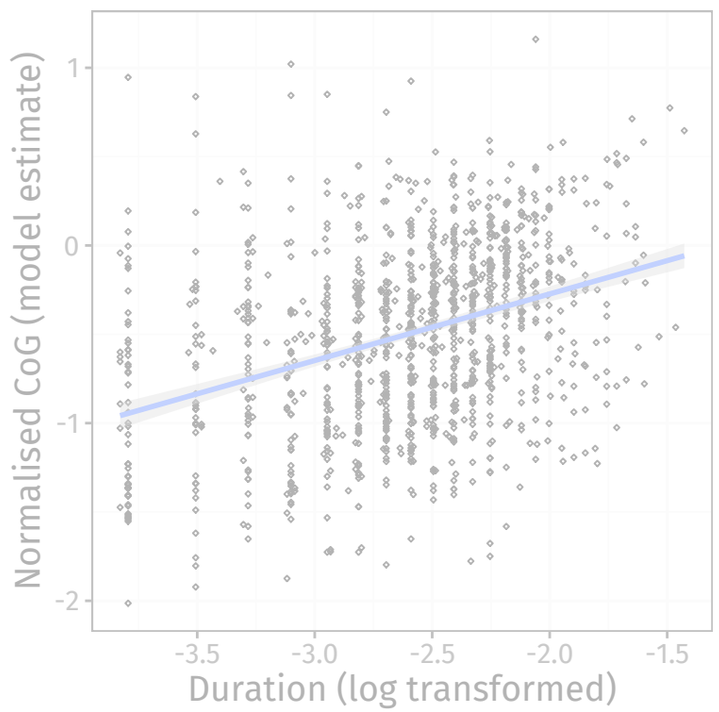

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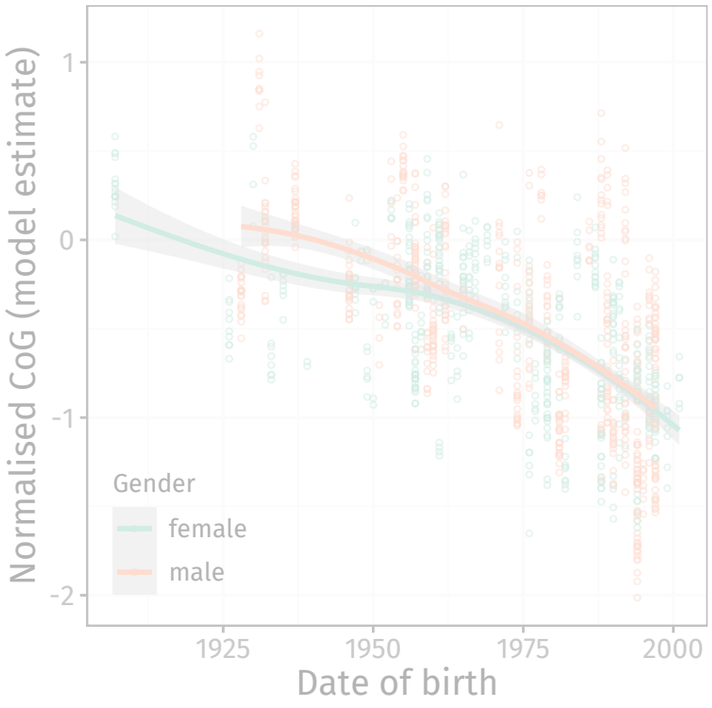
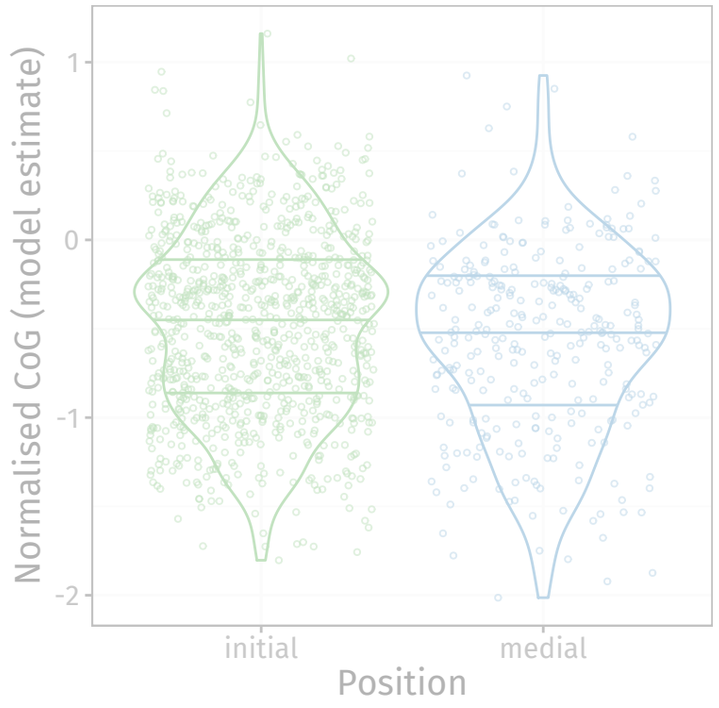
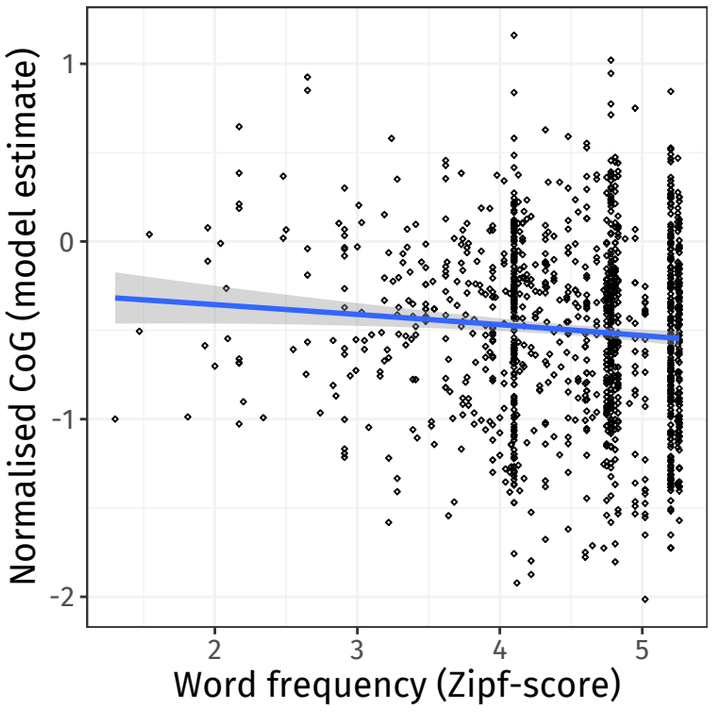
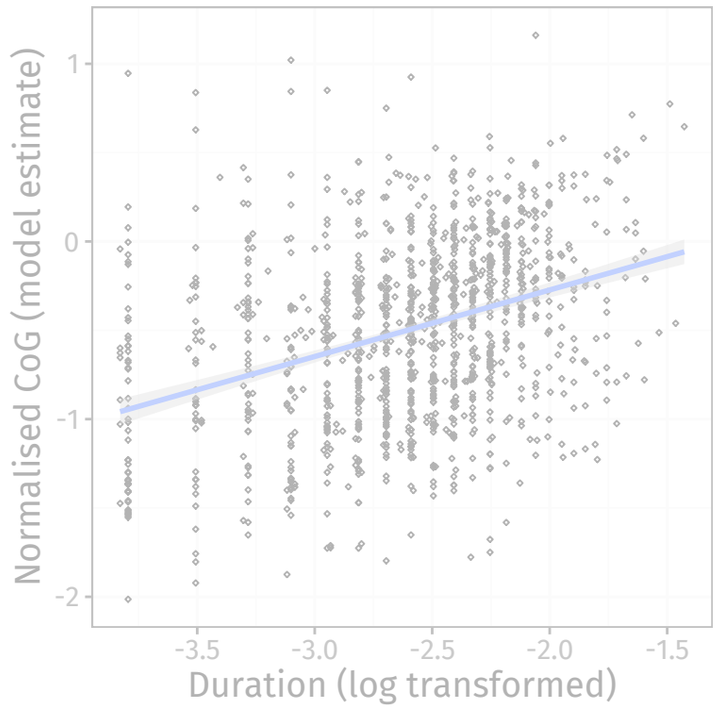






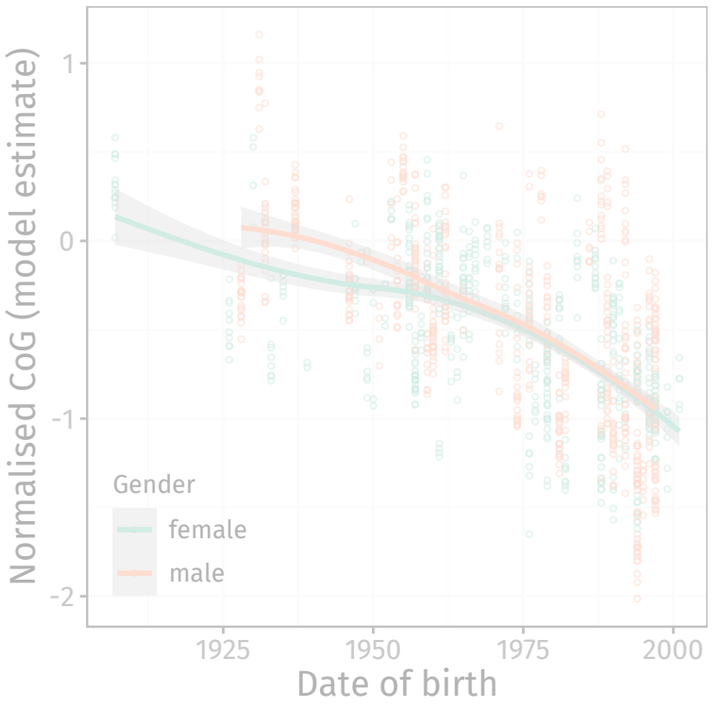


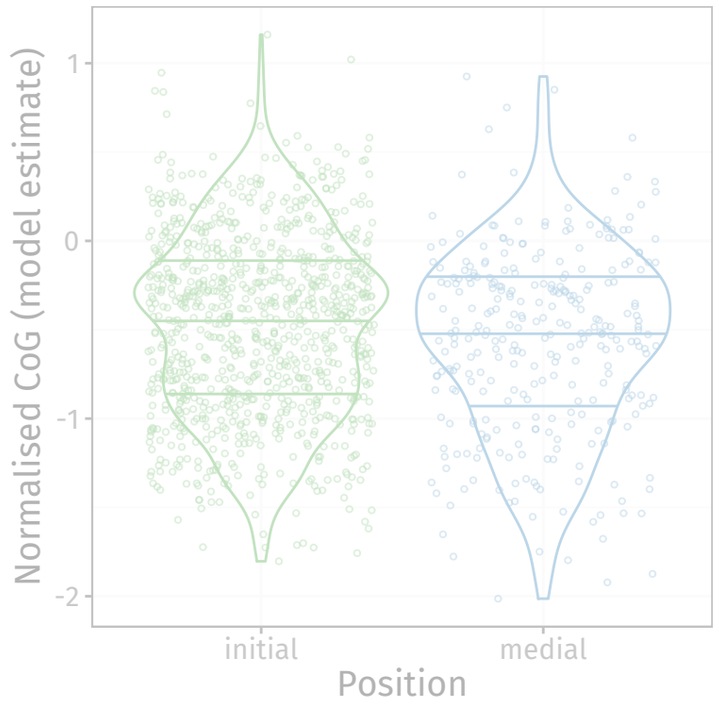
Other factors

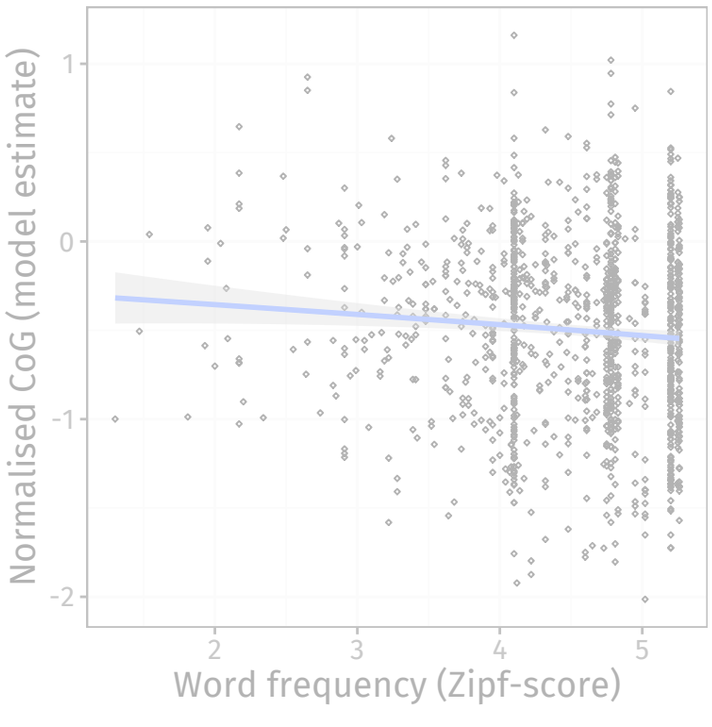
- Other significant predictors from the model:

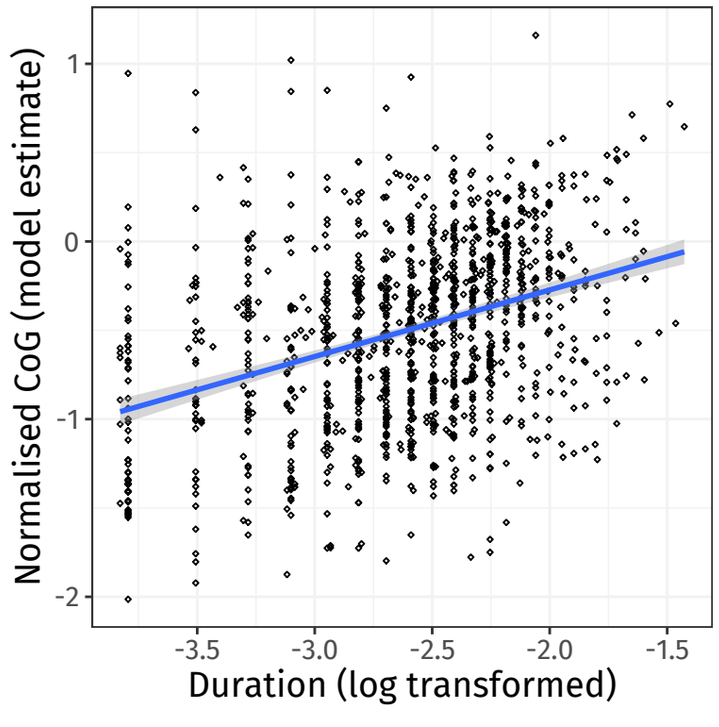
  - **gender**: male speakers lagging behind female speakers (β = 0.233, p = 0.01)
  - **position**: retraction more advanced in word-medial position (β = -0.169, p = 0.002)
  - **frequency**: higher frequency words leading (β = -0.068, p = 0.028)
  - **duration**: longer sibilants less retracted (β = 0.121, p < 0.001)

(not sig: social class, vowel, cluster type)

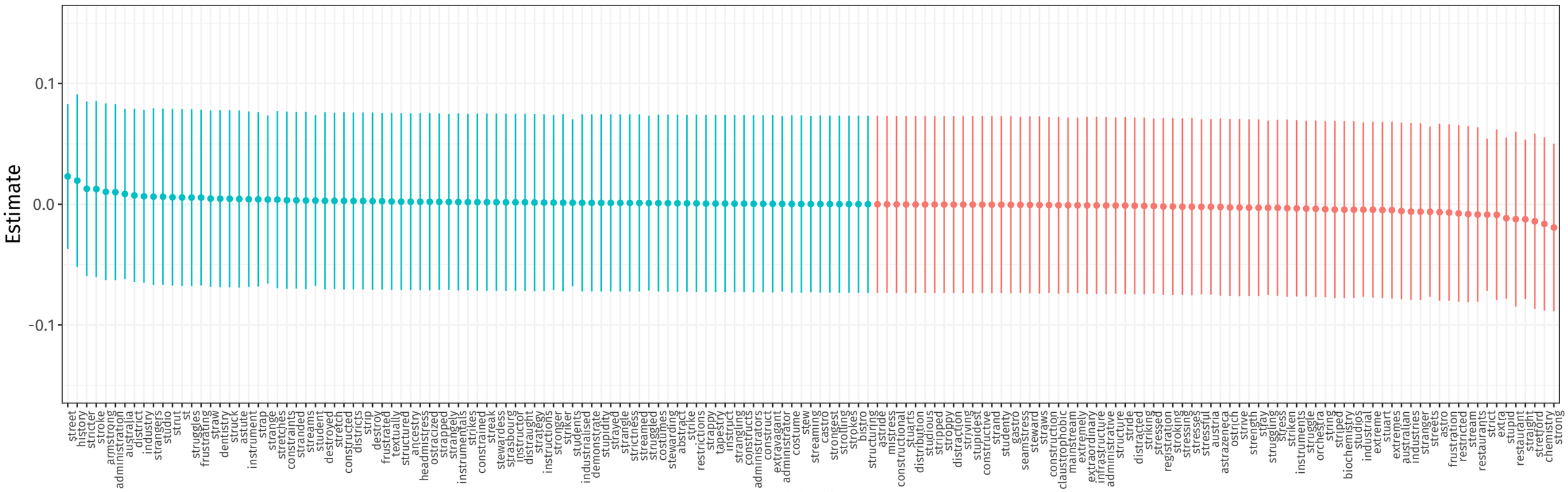


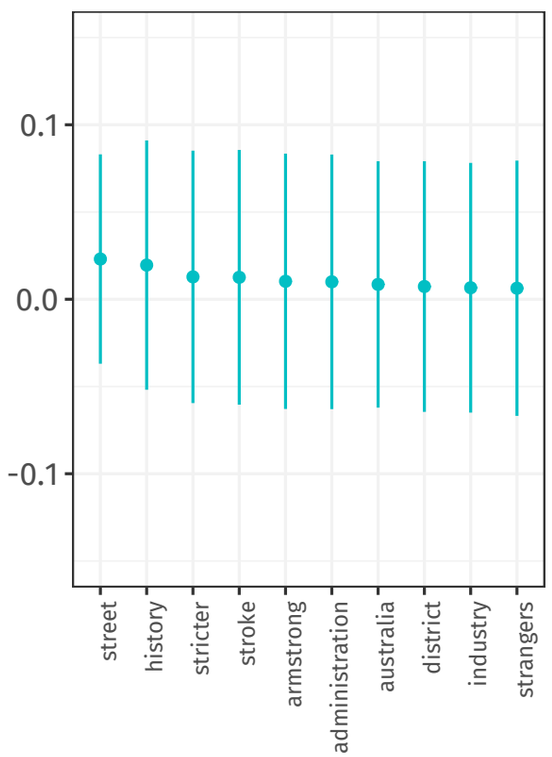




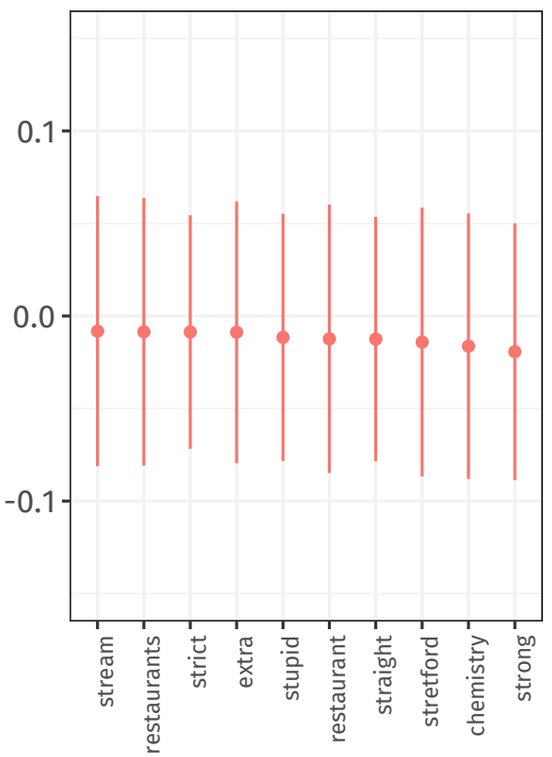


Other factors

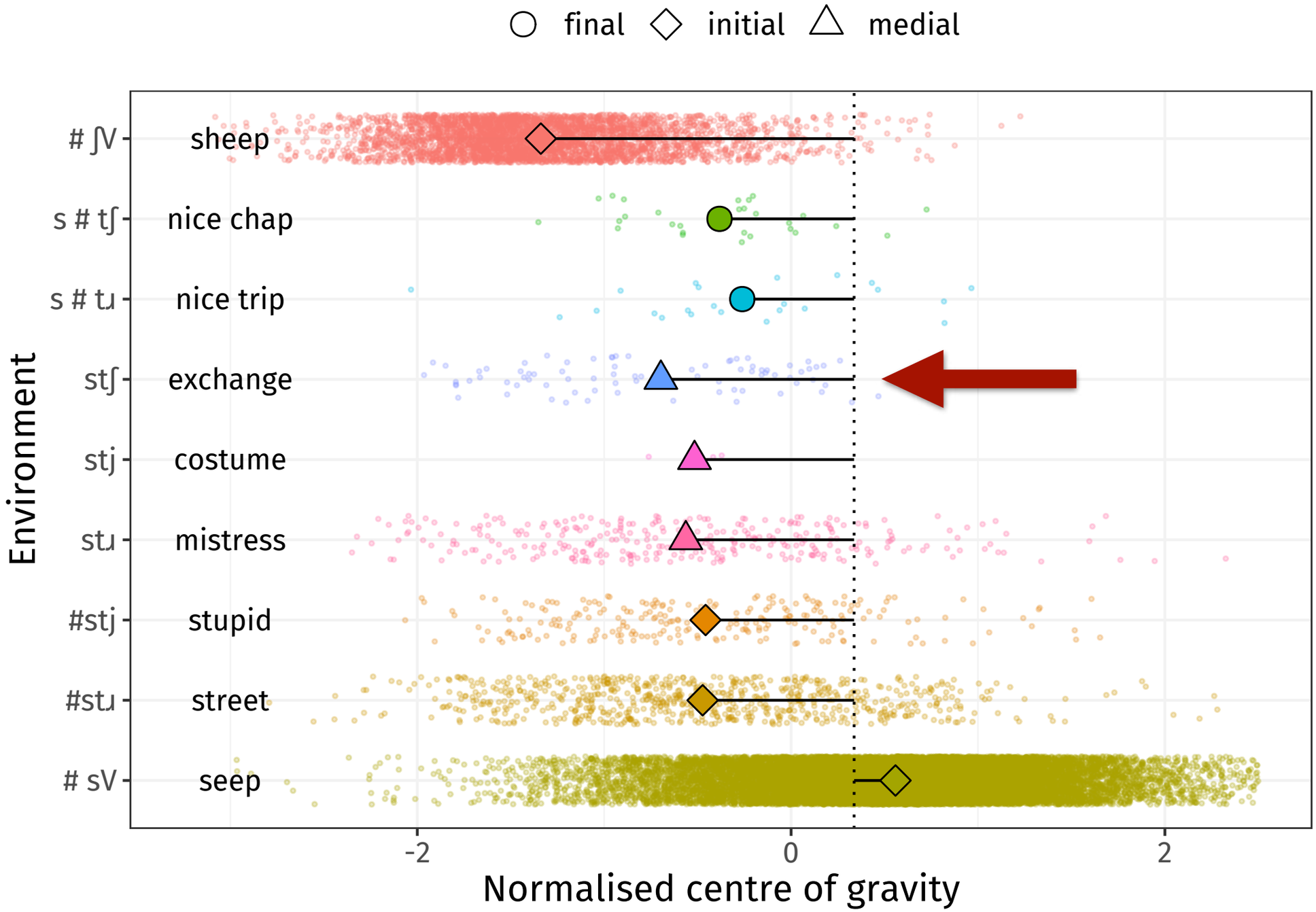




0.023 ⟷ -0.019



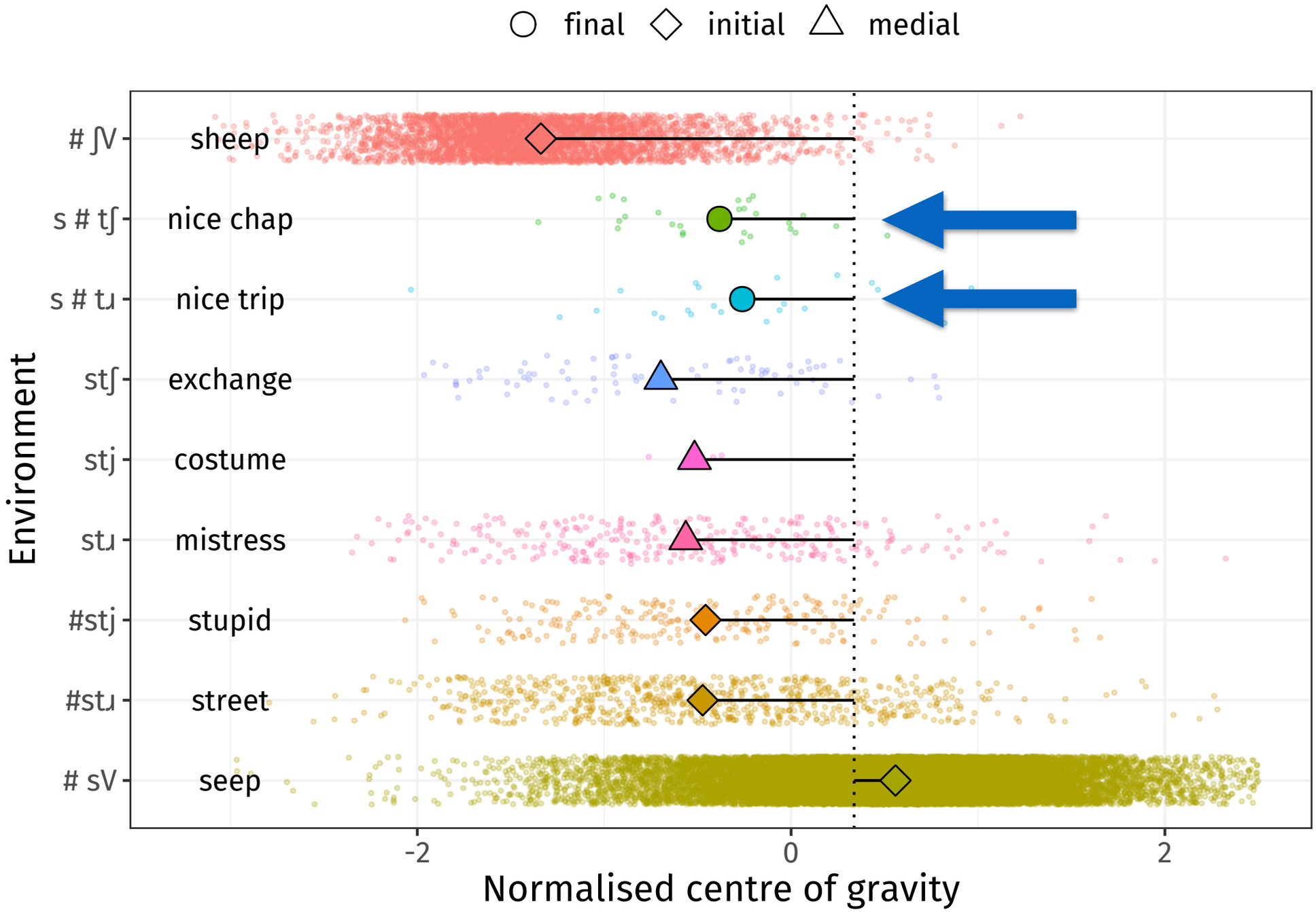
Other environments



Evidence of *s*-retraction before an affricate, even in the absence of /ɹ/ or /j/

Also applies across word boundaries (but to a lesser extent, see Zsiga 1995)

Other environments



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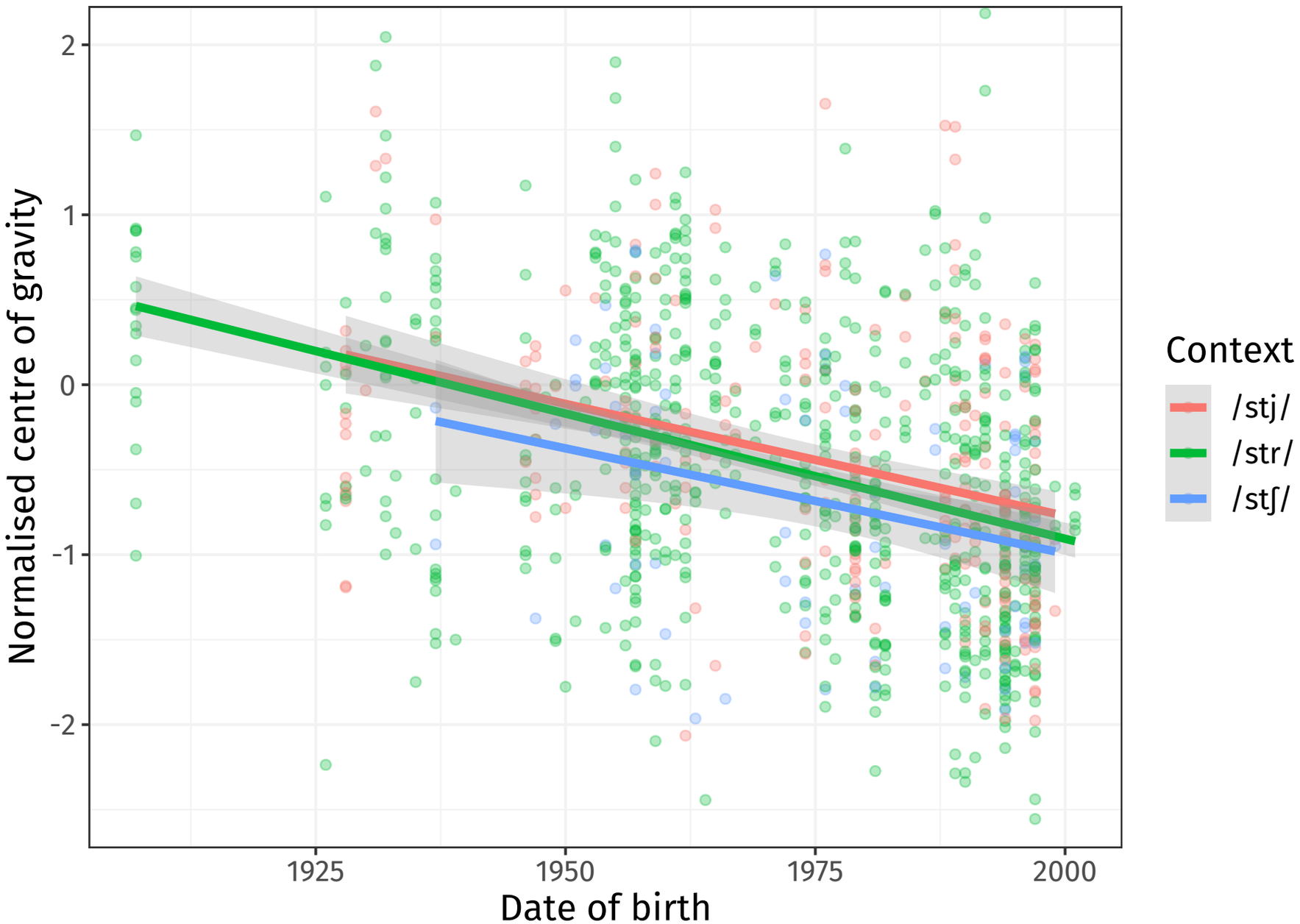
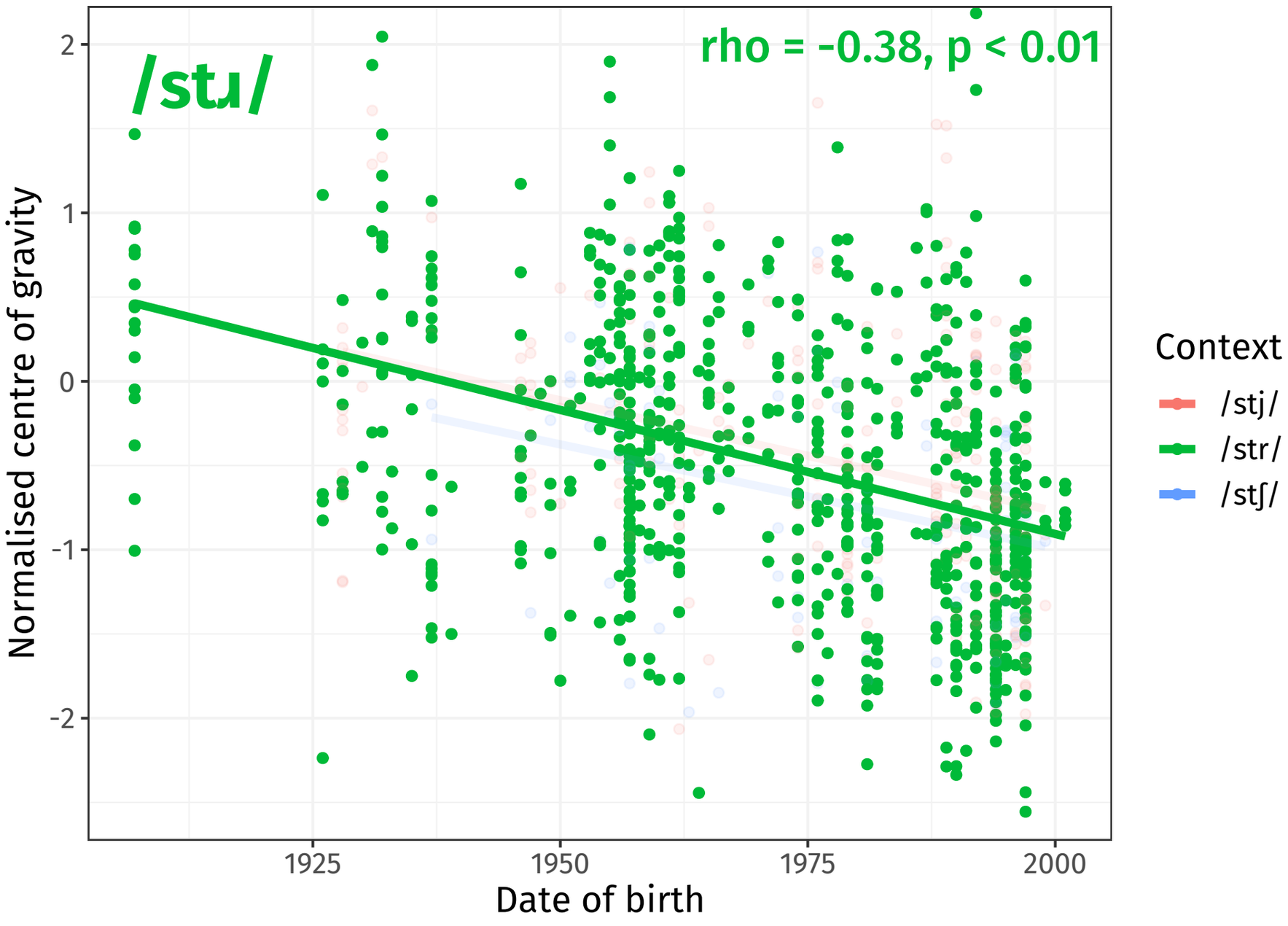


/stʃ/ (e.g. *exchange*) also involved in apparent-time change

Other environments



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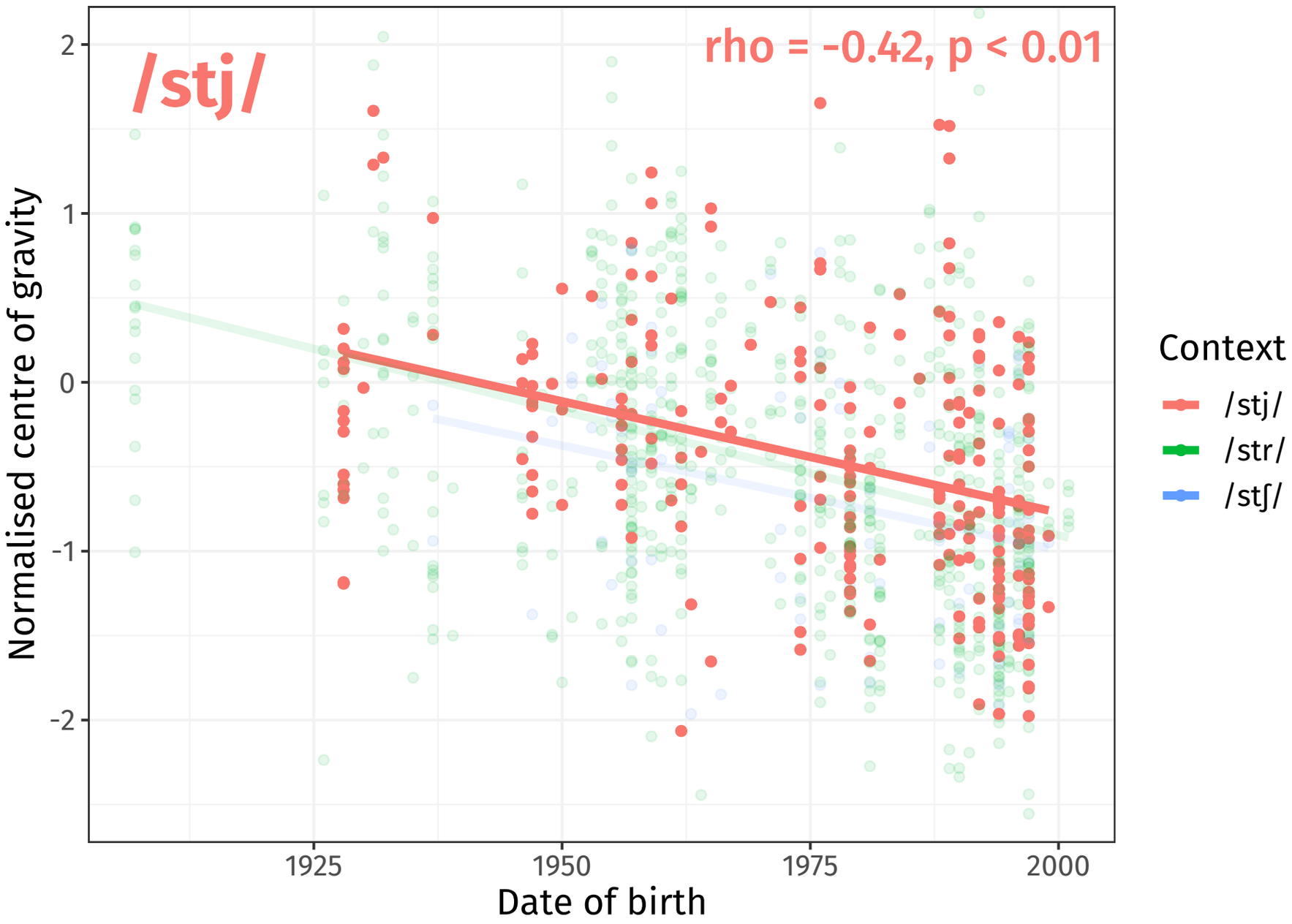

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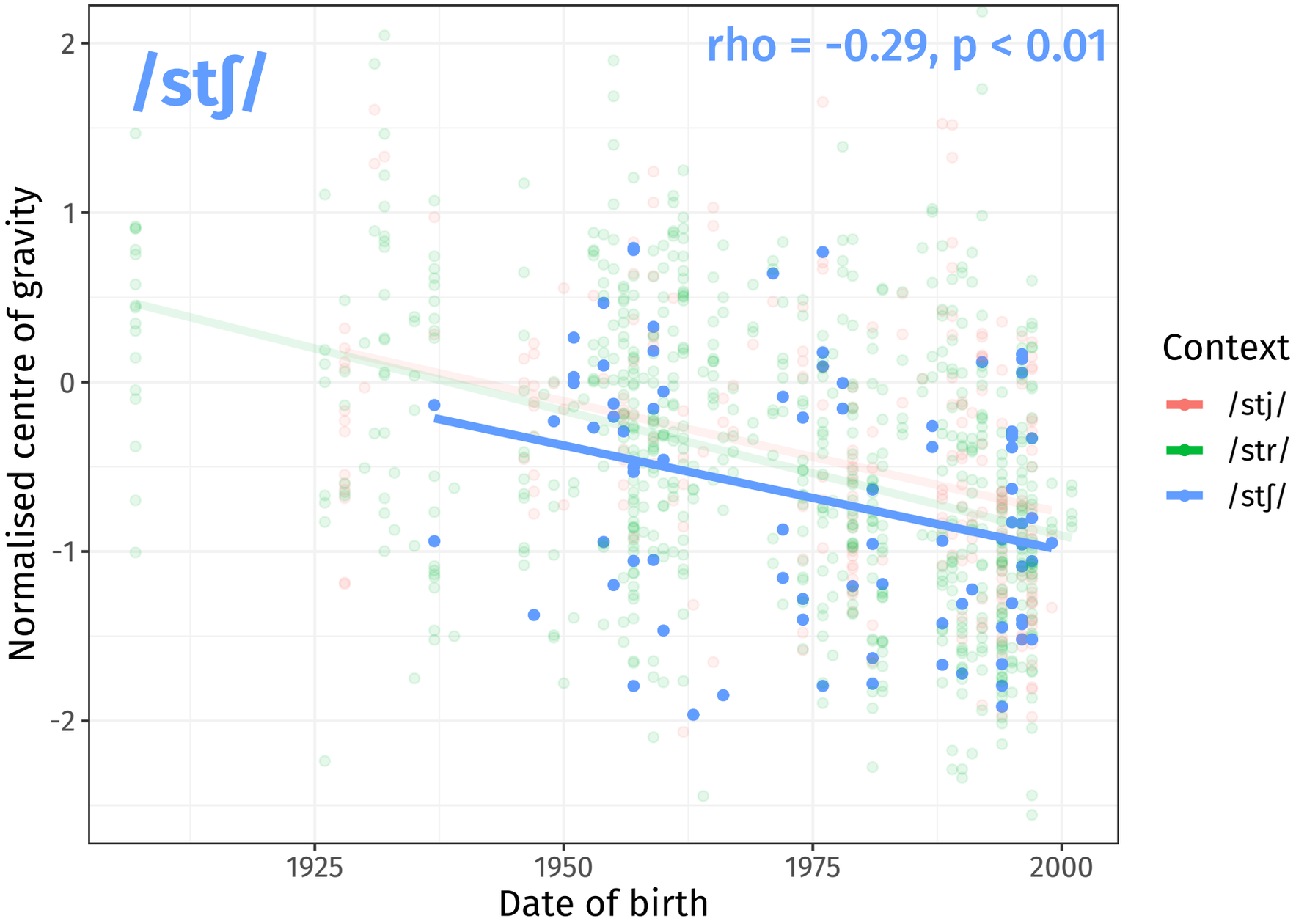

/stʃ/ (e.g. *exchange*) also involved in apparent-time change

Discussion

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/ ʃ t ɹ iː t /

/ ʃ tʃ ɹ iː t /

- The case for non-local assimilation:
  - Baker et al. (2011) on long-distance lingual relationship between /s/ and /ɹ/
  - phonotactic restriction against [sɹ], suggesting again that there's something more phonetically "natural" about [ʃɹ]
  - evidence of local process of /sj/ → [ʃ] (see Zsiga 1995 on *press* vs. *press you* vs. *pressure*)
  - so there's a clear phonetic motivation as to why /ɹ/ and /j/ *could* directly cause an /s/ to take on a "hushier" realisation

Discussion

- The case for local assimilation:
  - affrication occurs in both environments (Nichols & Bailey 2018; see also Magloughlin & Wilbanks 2016)
  - affrication as a single underlying cause is the more parsimonious explanation
  - evidence that /s/ retracts before an affricate even in the absence of /ɹ/ and /j/
    - both word-internally (e.g. *exchange*) and across word boundaries (e.g. *nice chap*)
  - lack of retraction in other (non-affricating) clusters with /ɹ/ and /j/, i.e. /spɹ, skɹ, spj, skj/

CONCLUSIONS

Conclusions

- First robust evidence of community-level change in BrEng /stɹ/:
  - regular coarticulatory sound change: led by young women and more advanced in high frequency words and (possibly) working class speech
- New insight into the mechanisms of s-retraction:
  - first quantitative investigation of retraction in /stj/, which is changing in parallel with /stɹ/
  - although /ɹ/ and /j/ may have *some* direct effect on /s/, this is unlikely to be enough to act as the initiation of this change
- The solution to the actuation problem proposed by Baker et al. (2011) – which relies on covert articulatory variation in /ɹ/ – has not been able to account for this particular instance of s-retraction
- Future: fine-grained phonetic realisation of /tɹ/ and /tj/ affrication and their change over time (covariation between /tɹ/-affrication, /tj/-coalescence and s-retraction?)

Thank you!

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