Speech and society
A sociophonetic journey to Scotland

Jane Stuart-Smith

English Language & Linguistics/
Glasgow University Laboratory of Phonology

Speech and Society: Lecture 4

ILGPA, Sourbonne Nouvelle, Paris 25 May 2022

Speech and Society
A sociophonetic journey to Scotland

- Wed 4th May: Lecture 1 – preliminaries
- Thurs 12th May: Lecture 2 – speech and identity
- Wed 18th May: Lecture 3 – Sound change in a changing city
- **Wed 25th May: Lecture 4 – Speech over space and time, in Scotland and beyond…**

Speech and Society resources

- Lecture powerpoint slides
- Reference lists
- Papers

- on google drive…

https://www.reuters.com/article/us-france-eagle-idUKKBN1WO1RT

Because **macrosocial categories** are fundamental to the social order, they correlate regularly with linguistic variation. This is not because the categories themselves engage directly with linguistic practice, but because their intersections structure the conditions and everyday experiences of life **on the ground**.

Eckert 2021: 751

https://www.reuters.com/article/us-france-eagle-idUKKBN1WO1RT

What are ‘macrosocial categories’ really like phonetically?

https://cdn.download.ams.birds.cornell.edu/api/v1/asset/162799271/1800

(Lawson et al 2019)

Is fronted GOOSE phonetically the ‘same’ across British Isles English?

https://cdn.download.ams.birds.cornell.edu/api/v1/asset/162799271/1800

e.g. Lawson *et al. JASA* (2019)

DYNAMIC DIALECTS

https://dynamicdialects.ac.uk

ArticulatoryIPA YouTube

https://www.youtube.com/user/ArticulatoryIPA

Arts & Humanities Research Council

The Carnegie Trust for the Universities of Scotland

- GOOSE (plus FLEECE, TRAP and /w/) e.g. *goose, smooth*
- 18 speakers from British Isles
- England, Republic of Ireland, Scotland
- 200 tokens
- acoustic, articulatory = UTI, lip movement

‘English’ GOOSE shows variation in tongue body and lip position

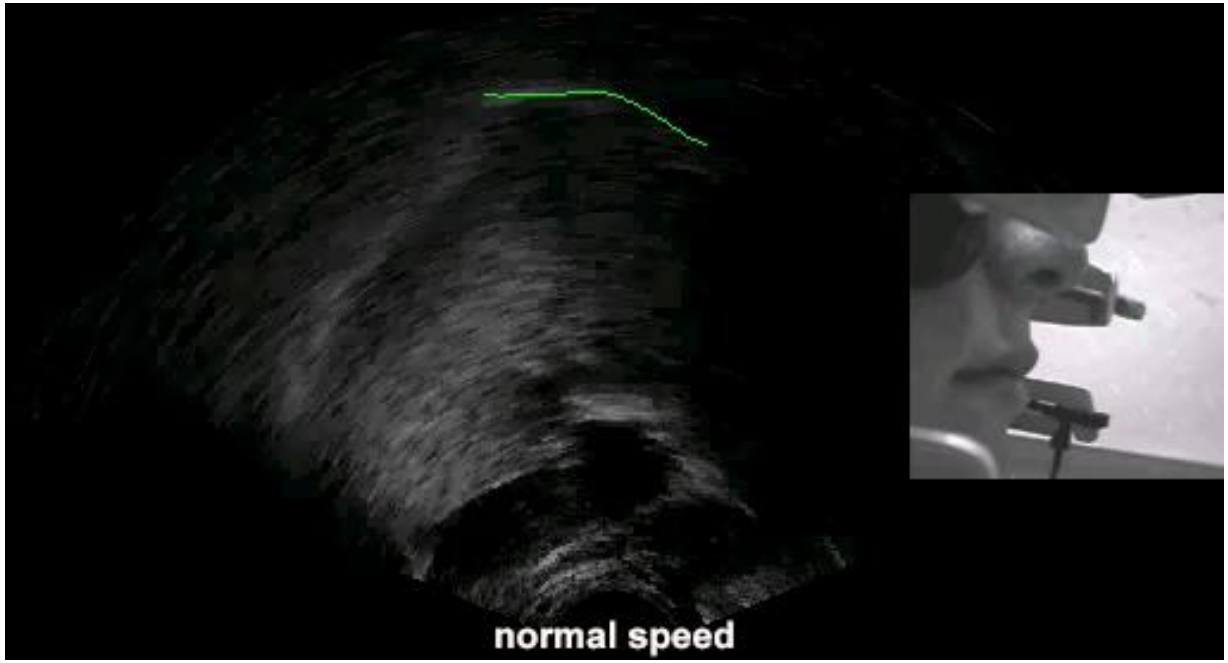
https://www.youtube.com/watch?v=P7DAGEjxMnc

ArticulatoryIPA

1.62K subscribers

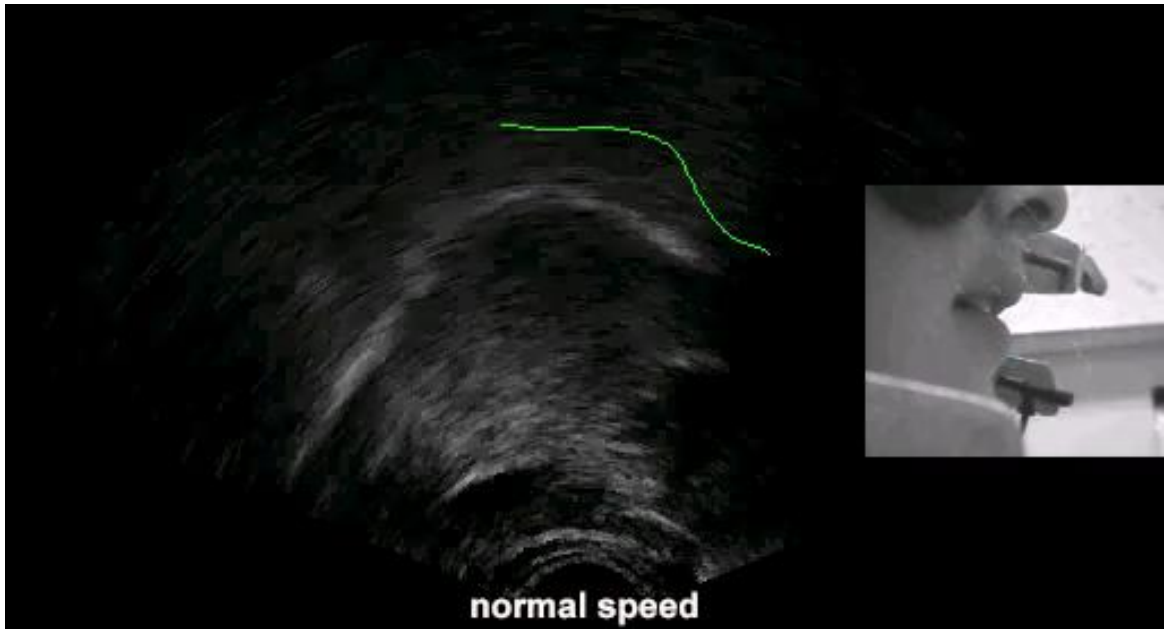
acoustic fronting ~

fronted tongue body + protruded lips



acoustic fronting ~

backed tongue body + no lip protrusion

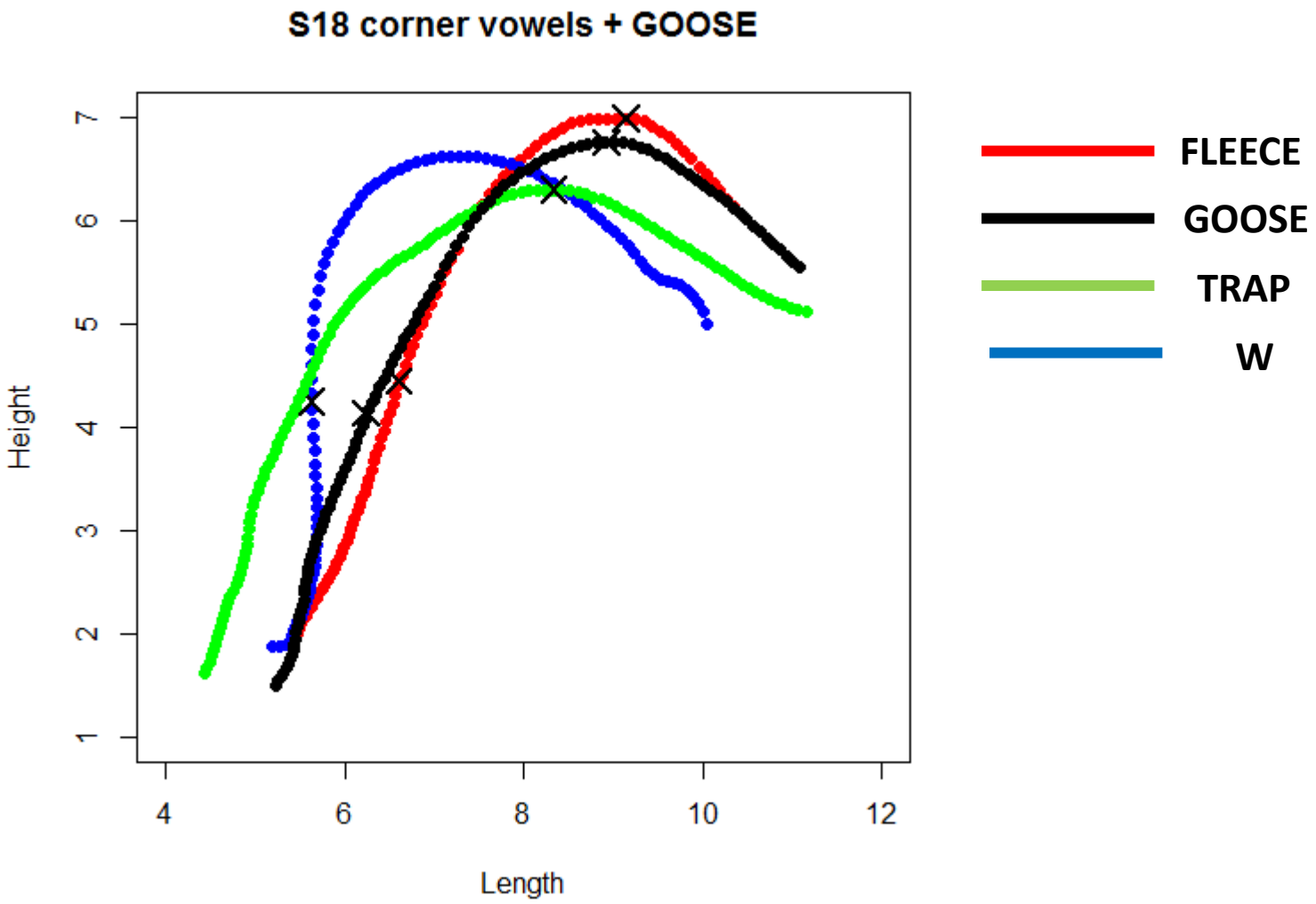


Measures

- acoustic: normalized F1, F2
- articulatory: normalized tongue body position
  - frontness (FLEECE vs **GOOSE**/FLEECE vs /w/)
  - height (FLEECE vs **GOOSE**/FLEECE vs TRAP)
- articulatory: normalized lip protrusion

Lawson *et al. JASA* (2019); after Scobbie et al (2012)

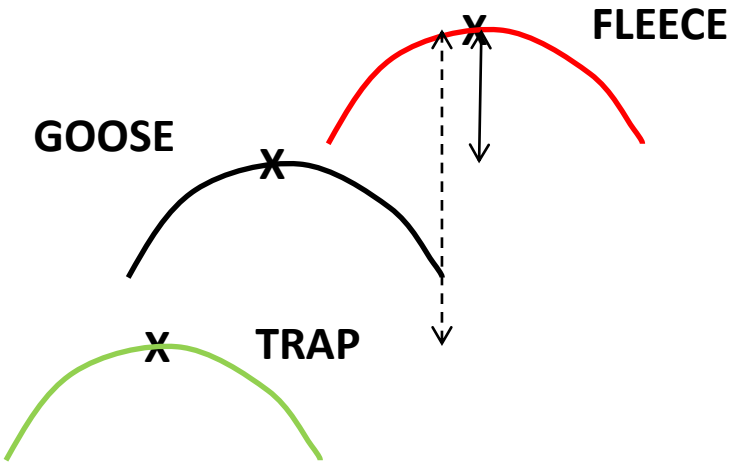
Midsagittal tongue surface plots



GOOSE vowel and corner vowels of Inverness-shire female: mean tongue curves

Normalisation: vertical measure

Raw measure of tongue body lowering of GOOSE from anchor vowel FLEECE

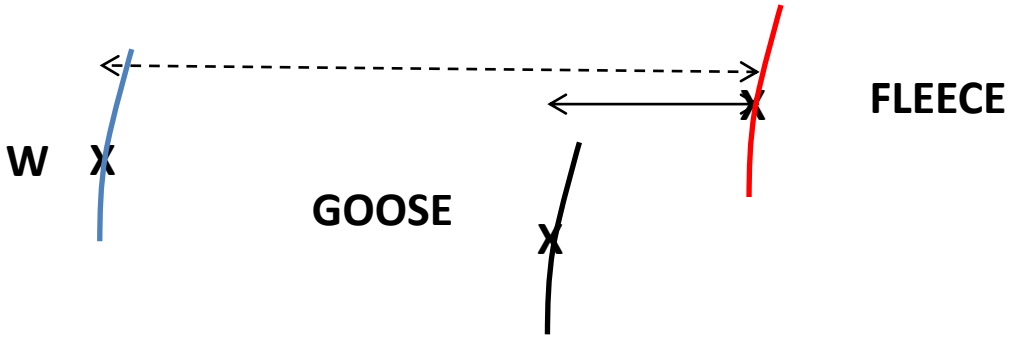


Raw measure of tongue body lowering for TRAP from FLEECE.

FLEECE → GOOSE / FLEECE → TRAP

Normalisation: horizontal measure

Raw measure of tongue body retraction of GOOSE
from anchor vowel FLEECE



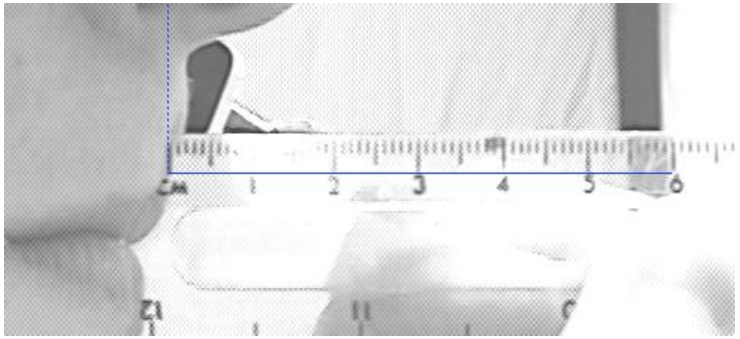
Raw measure of tongue body retraction for W from FLEECE.

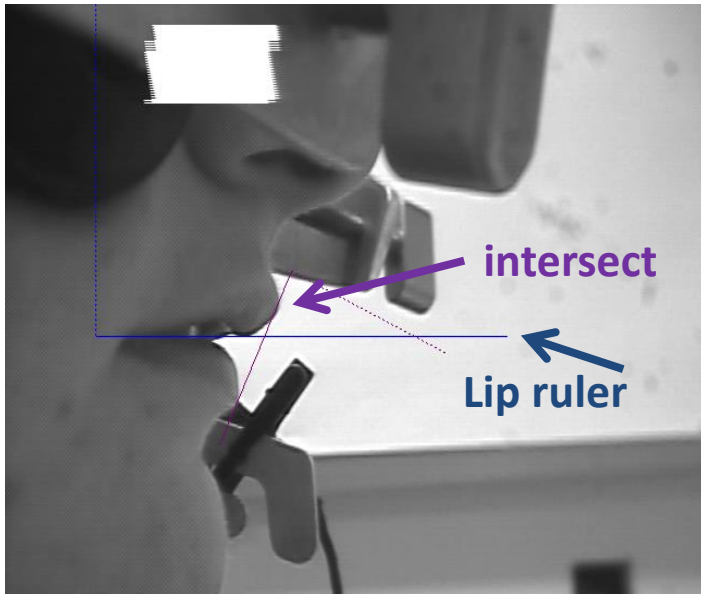
FLEECE → GOOSE / FLEECE → W

Measuring lip protrusion

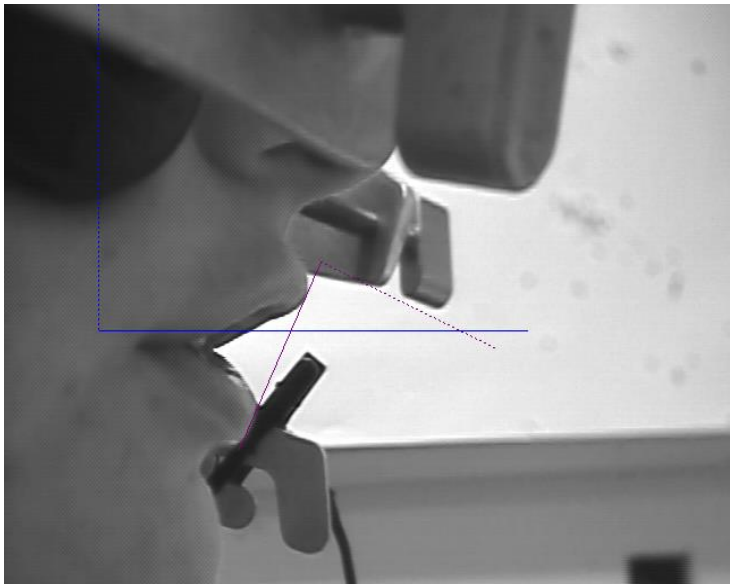
Headset-mounted camera captures lip movement in profile.

Fiducial marker “intersect” measures lip protrusion along a “lip ruler” line.



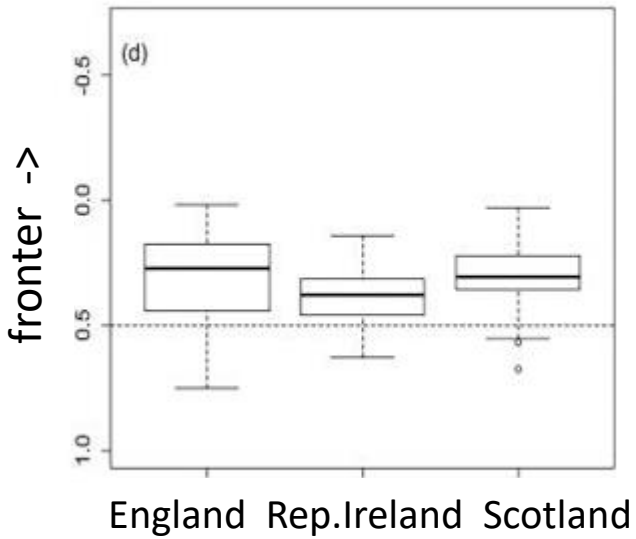


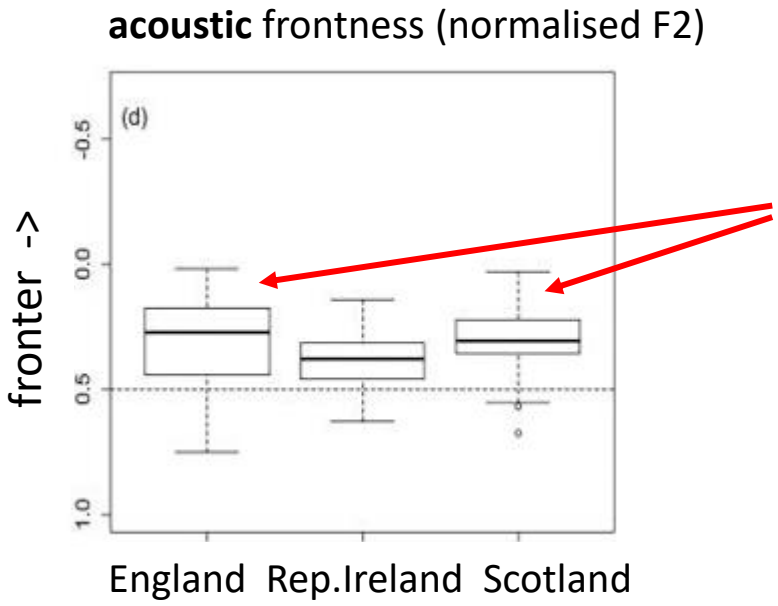
Neutral lip position



Maximum protrusion during GOOSE vowel

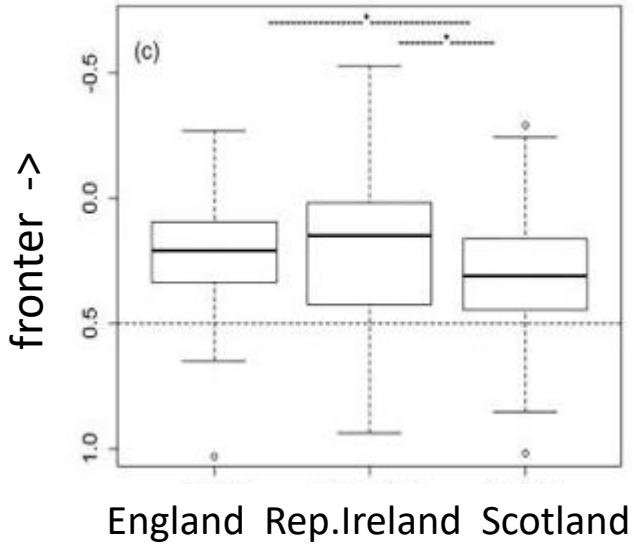
acoustic frontness (normalised F2)



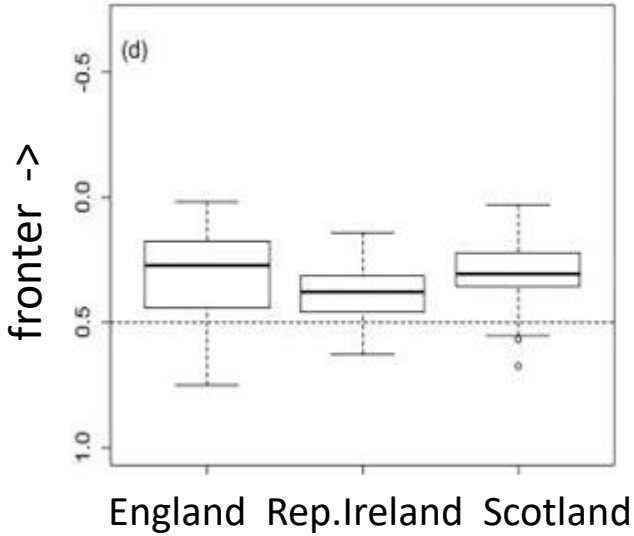


English and Scottish GOOSE shows similar degree of acoustic fronting…

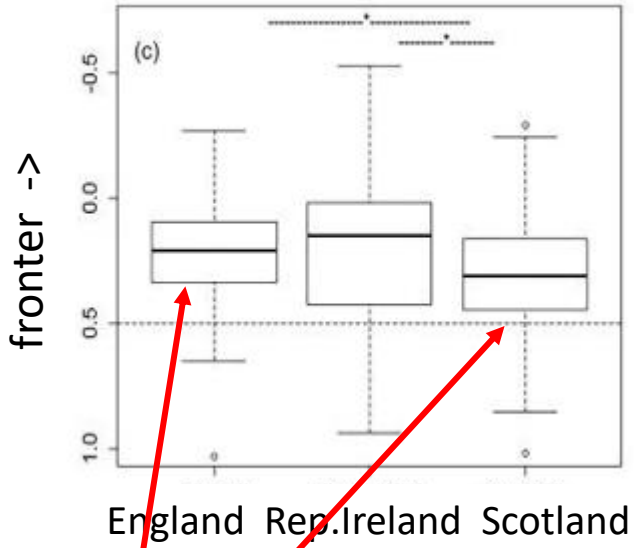
articulatory frontness



acoustic frontness (F2 Lobanov)



articulatory frontness



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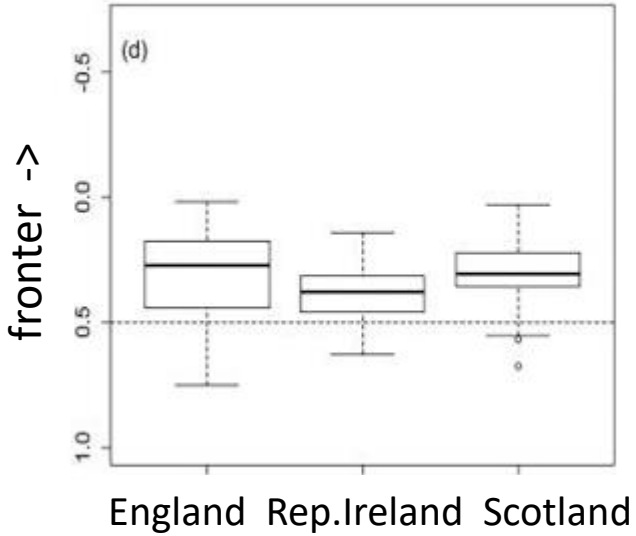
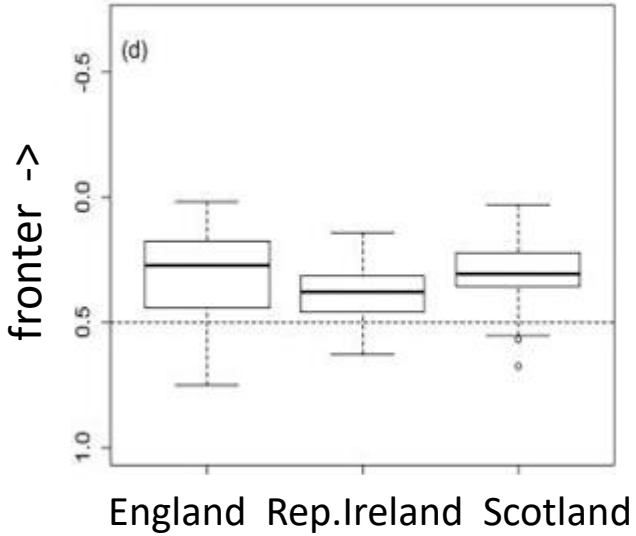
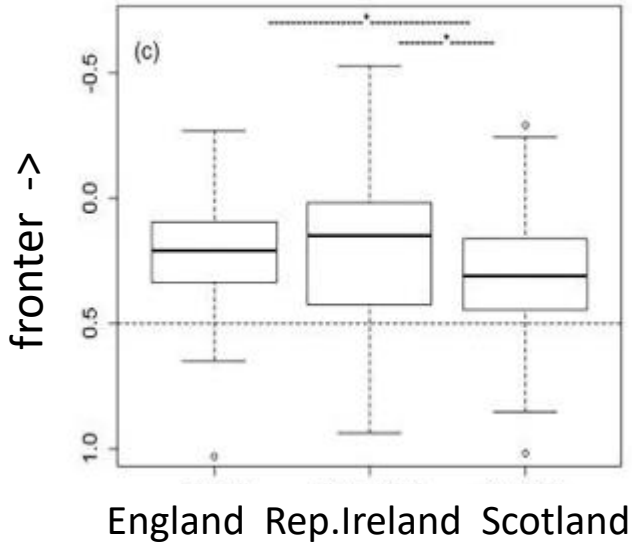


but…
English GOOSE has fronter tongue body and Scottish GOOSE has backer tongue body …

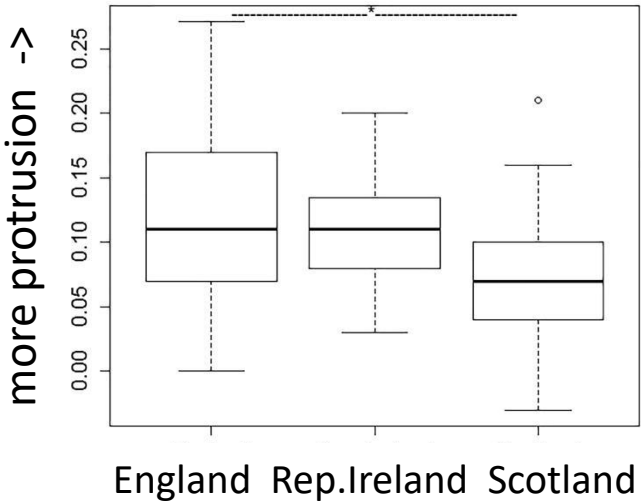
acoustic frontness (F2 Lobanov)



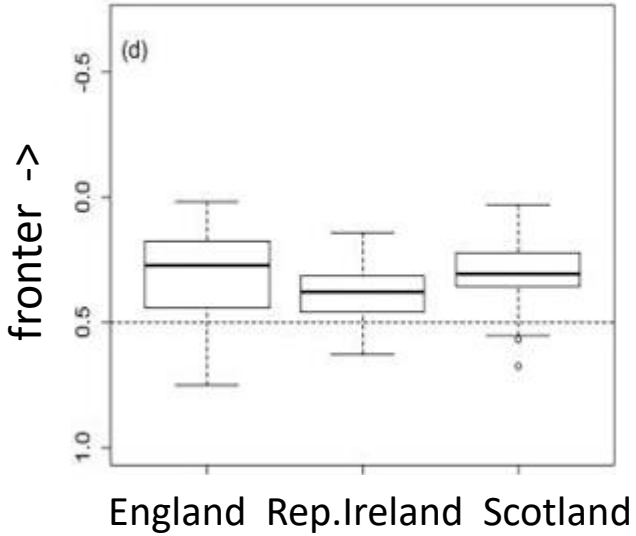
articulatory frontness



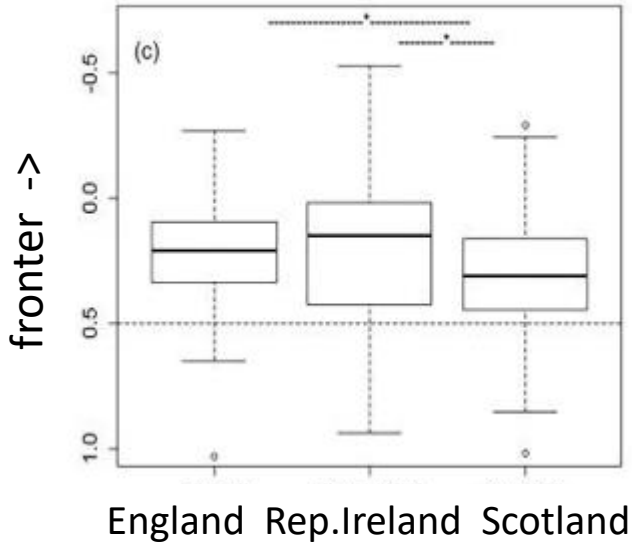
articulatory protrusion



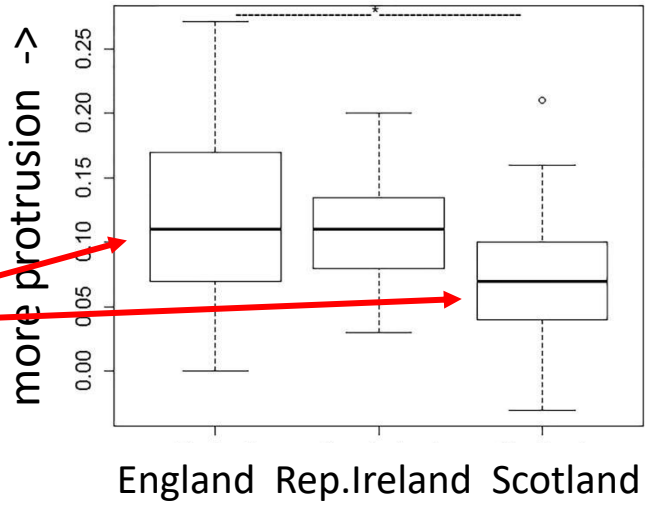
acoustic frontness (F2 Lobanov)



articulatory frontness



articulatory protrusion



… and English GOOSE has more lip protrusion than Scottish GOOSE

SPADE

SPeech Across Dialects of English

August 2017 – July 2020…

http://spade.glasgow.ac.uk/

Trans-Atlantic Platform
Social Sciences and Humanities

DIGGING INTO DATA CHALLENGE

THE UNIVERSITY of EDINBURGH

University of Glasgow

McGill

NC STATE UNIVERSITY

UNIVERSITY OF OREGON

SPADE
SPeech Across Dialects of English

https://spade.glasgow.ac.uk/

Software large-scale speech analysis

Data from 40+ datasets (socio)linguistic surveys

Research
'English' sounds over time and space

Datasets

https://spade.glasgow.ac.uk/the-spade-consortium/

- 42 datasets: public/private, 4 countries, 115 years
- ~8600 speakers, ~2200 hours

Datasets

‘English’ vowel duration, formants, sibilant spectral measures freely accessible for download at SPADE OSF Repository: https://osf.io/4jfrm/

- 42 datasets: public/private, 4 countries, 115 years
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What can we learn about English phonology?

Sibilants: /s/-retraction

Stuart-Smith et al. *Proc. ICPhS 2019*

Sibilants: /s/ vs /ʃ/

Stuart-Smith et al. *LabPhon17 2020*

Vowels: formants

Mielke et al. *Proc. ICPhS 2019*

Vowels: dynamics

Tanner PhD 2020; SIGMORPHON 2022

Vowel duration: voicing effect

Tanner et al. *Frontiers Artificial Int. 2020*

British Isles
North America

Vowels: Scottish Vowel Length Rule

Liquids: rhotics Stuart-Smith et al. *New Camb Hist Eng Lang in prep.*

Scotland

https://spade.glasgow.ac.uk/news-outputs/

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Scottish Vowel Length Rule, e.g.
bead = beat

FLEECE FACE CAT
COT GOAT BOOT

↓

FLEECE BOOT

e.g. Aitken 1981; Scobbie et al 1999

https://www.deadlinenews.co.uk/wp-content/uploads/2012/05/Sunny-Scotland-1.jpg

Scottish Vowel Length Rule, e.g. *bead = beat*

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FLEECE BOOT

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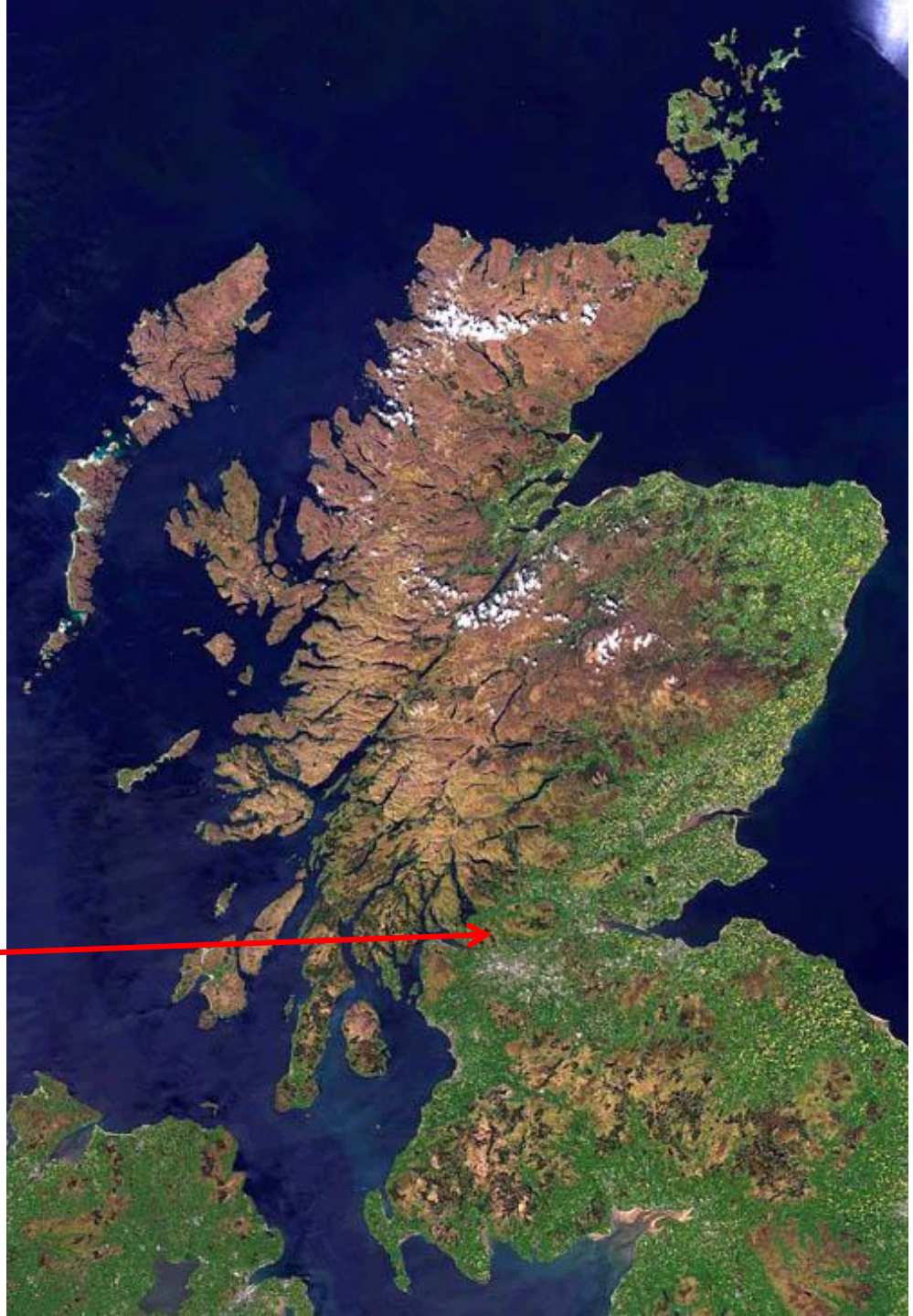

https://www.deadlinenews.co.uk/wp-content/uploads/2012/05/Sunny-Scotland-1.jpg

Scottish Vowel Length Rule, e.g. *bead* = *beat*

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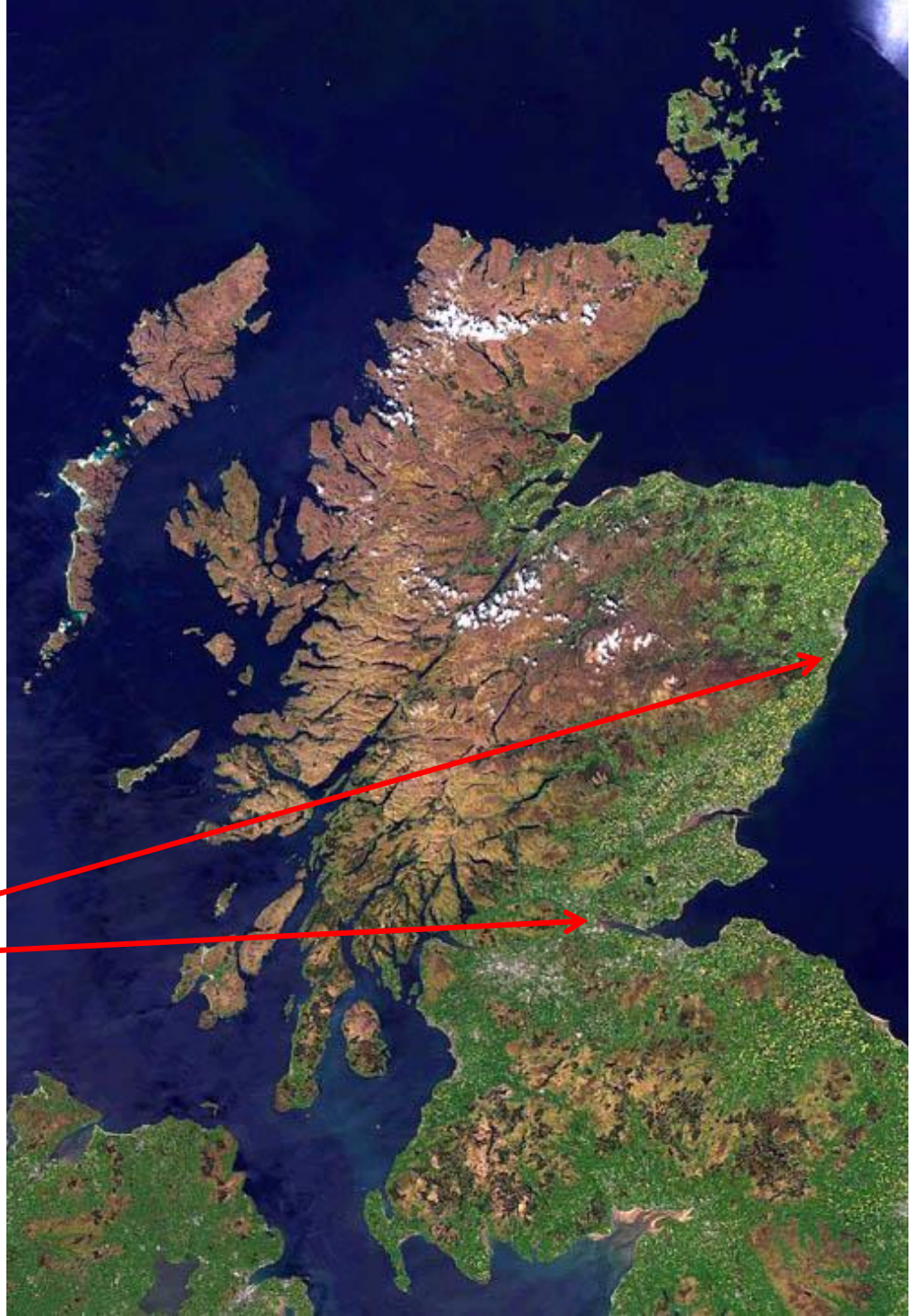

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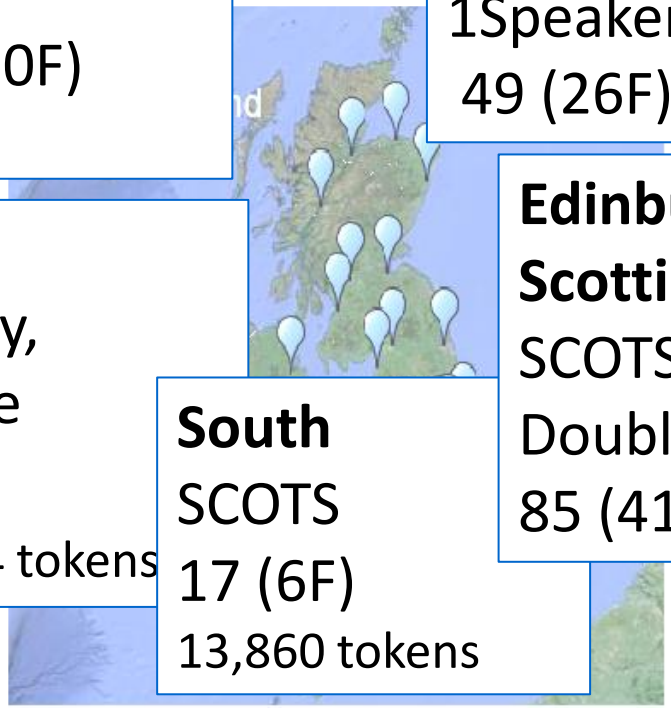
SPADE



Highlands, Islands and Insular
SCOTS 15 (10F)
5,843 tokens

Northern
1Speaker2Dialects, SCOTS
49 (26F) 105,692 tokens

Glasgow
Sounds of the City, Brains in Dialogue
SCOTS
177 (88F) 152,364 tokens

Edinburgh/Standard Scottish English
SCOTS, Edinburgh, Doubletalk
85 (41F) 41,418 tokens

South
SCOTS
17 (6F)
13,860 tokens

343 speakers

FLEECE KIT FACE DRESS CAT COT
STRUT GOAT BOOT /i ɪ e ɛ a ɔ ʌ o ʉ/

www.google.com/maps/

Data analysis using Integrated Speech Corpus Analysis (ISCAN)

- each audio corpus (soundfiles + time-aligned transcripts) imported into ISCAN (McAuliffe et al 2019) https://spade.glasgow.ac.uk/software/
- vowel durations automatically extracted
- removed vowels with durations

  < 49ms (likely to be reduced, e,g, Dodsworth, 2013)

  > 2000ms (likely erroneous) durations

=> 319,177 tokens

Predictions for SVLR by vowel

- **KIT, DRESS, STRUT**: unlikely to show SVLR
- **CAT, COT**: unlikely to show SVLR in most dialects
- **FACE, GOAT**: might show SVLR in some dialects
- **FLEECE, BOOT**: likely to show SVLR in Central Belt, perhaps all dialects

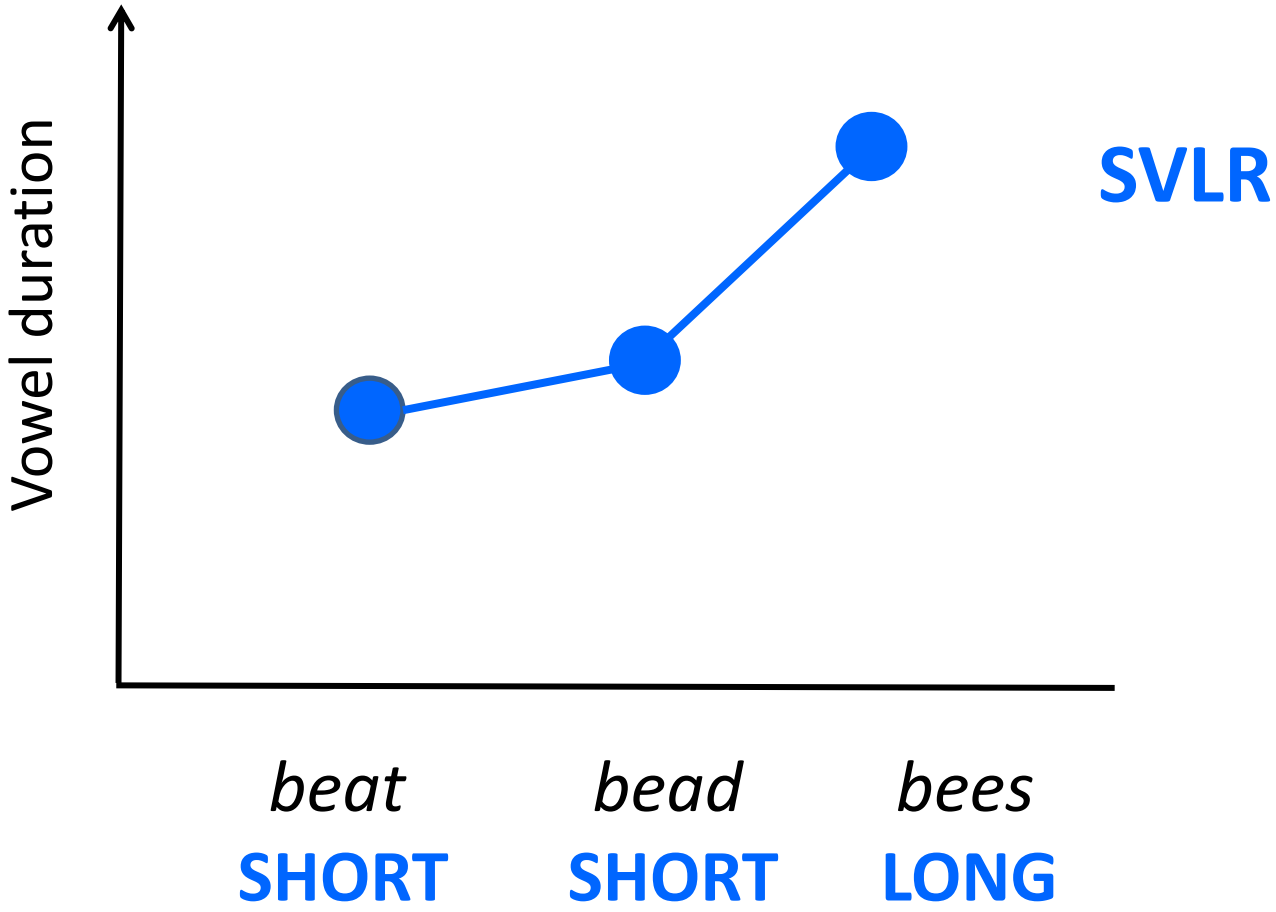
(e.g. Aitken 1981, 2015; Warren 2018; Scobbie et al 1999)

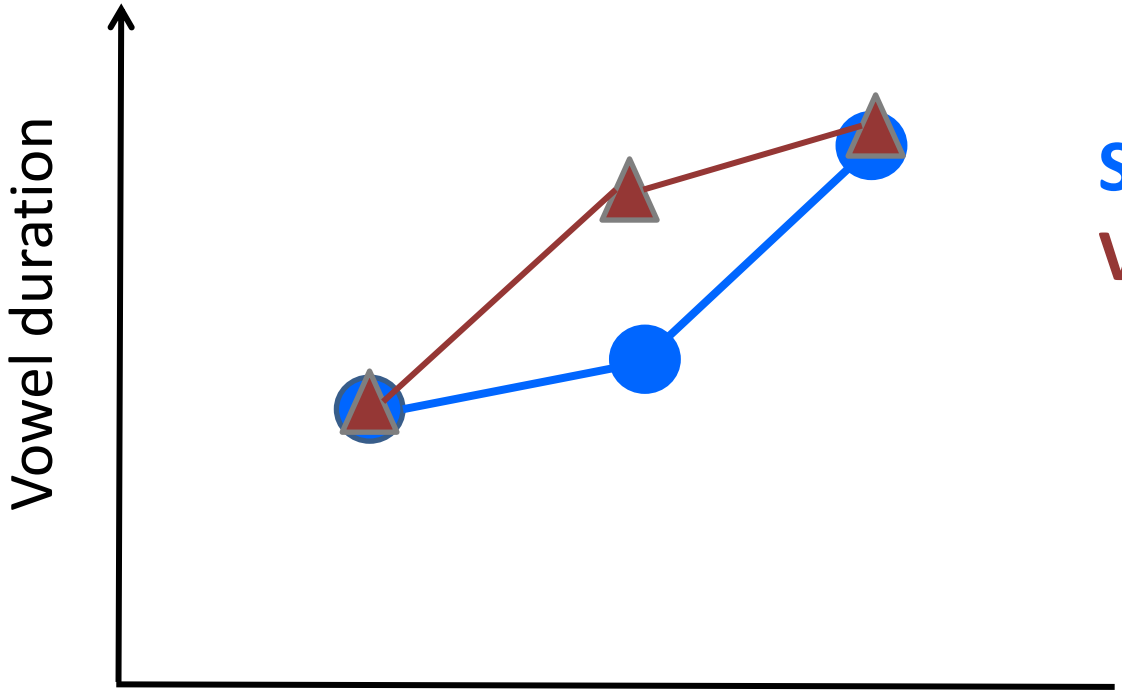
Linear mixed effects modelling
log vowel duration in R

Fixed factors

- Vowel, following Context
- (log) speech Rate deviation, phrase position, (log) word frequency (Subtlex-UK)
- Dialect, Gender, Time (birth Decade)
- all possible interactions

Random intercepts: Word, Speaker


Vowel duration
SVLR
beat
bead
bees
SHORT
SHORT
LONG



SVLR
Voicing Effect

beat	*bead*	*bees*
SHORT	**SHORT**	**LONG**
SHORT	**LONG**	**LONG**

Results – sanity check!

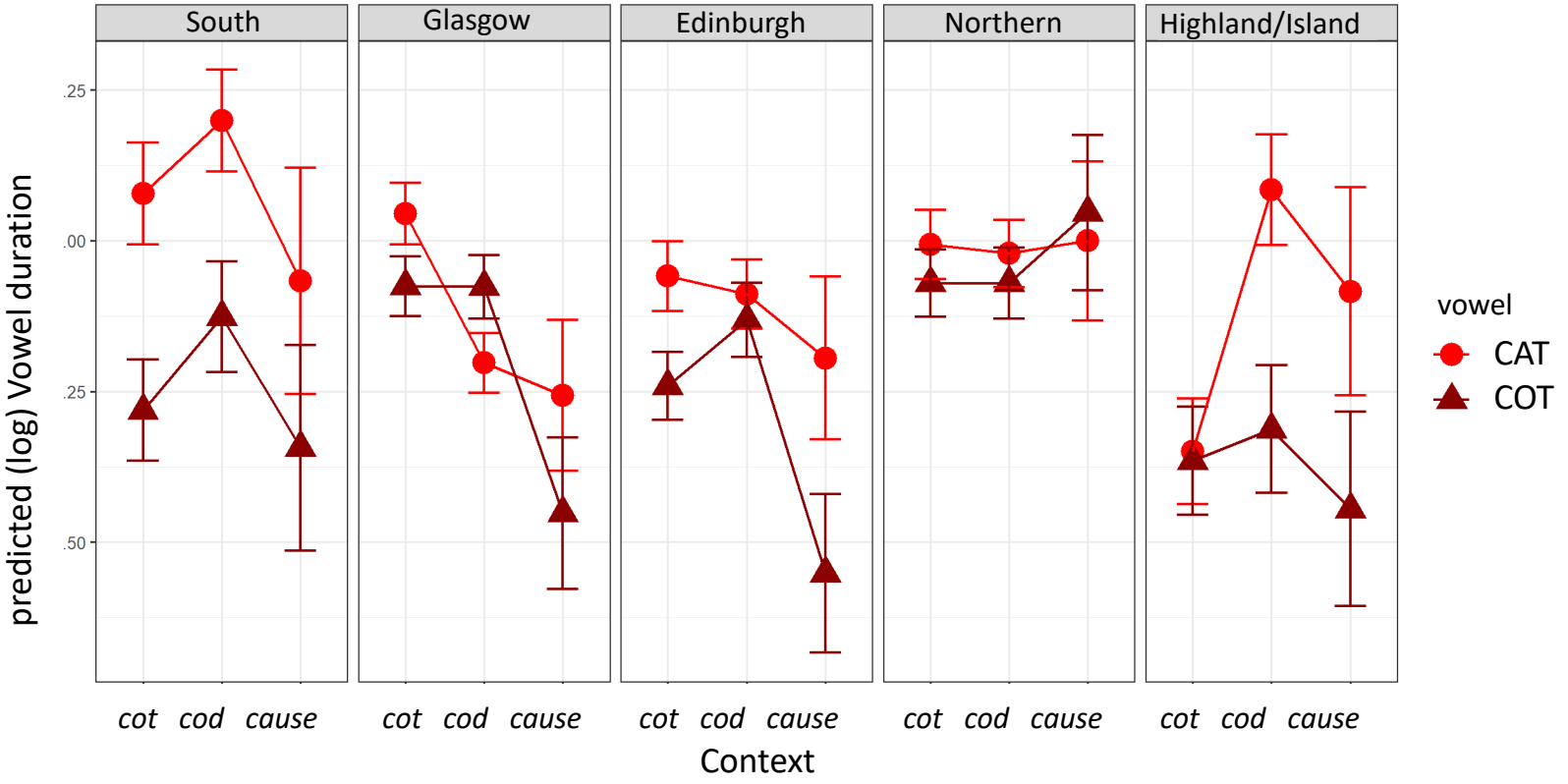
Vowels are:

- shorter at faster speech rates
- shorter in more frequent words
- longer in phrase-final position

No SVLR or Voicing Effect for **KIT DRESS STRUT**

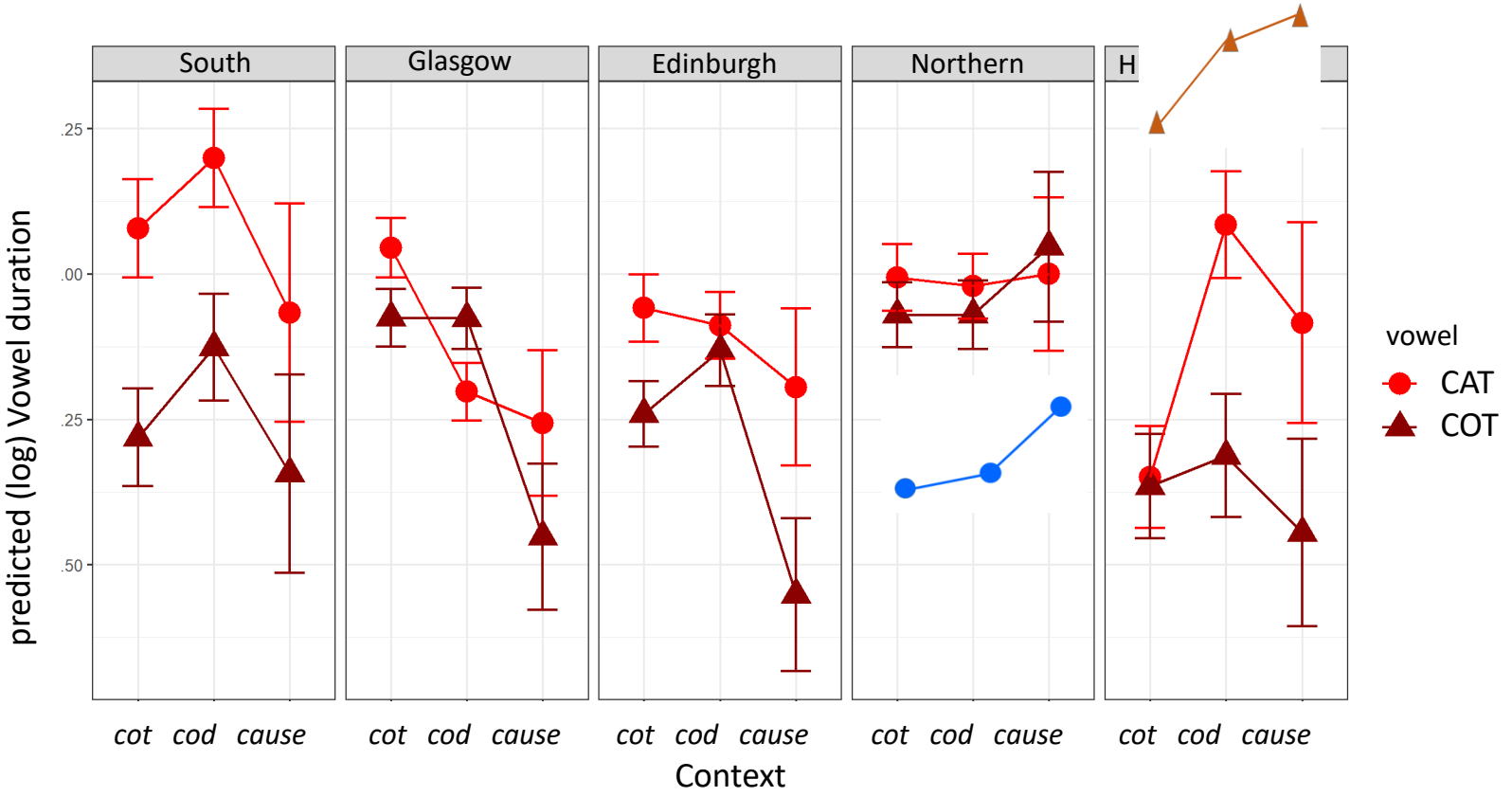
CAT, COT

N = 116,776



CAT, COT

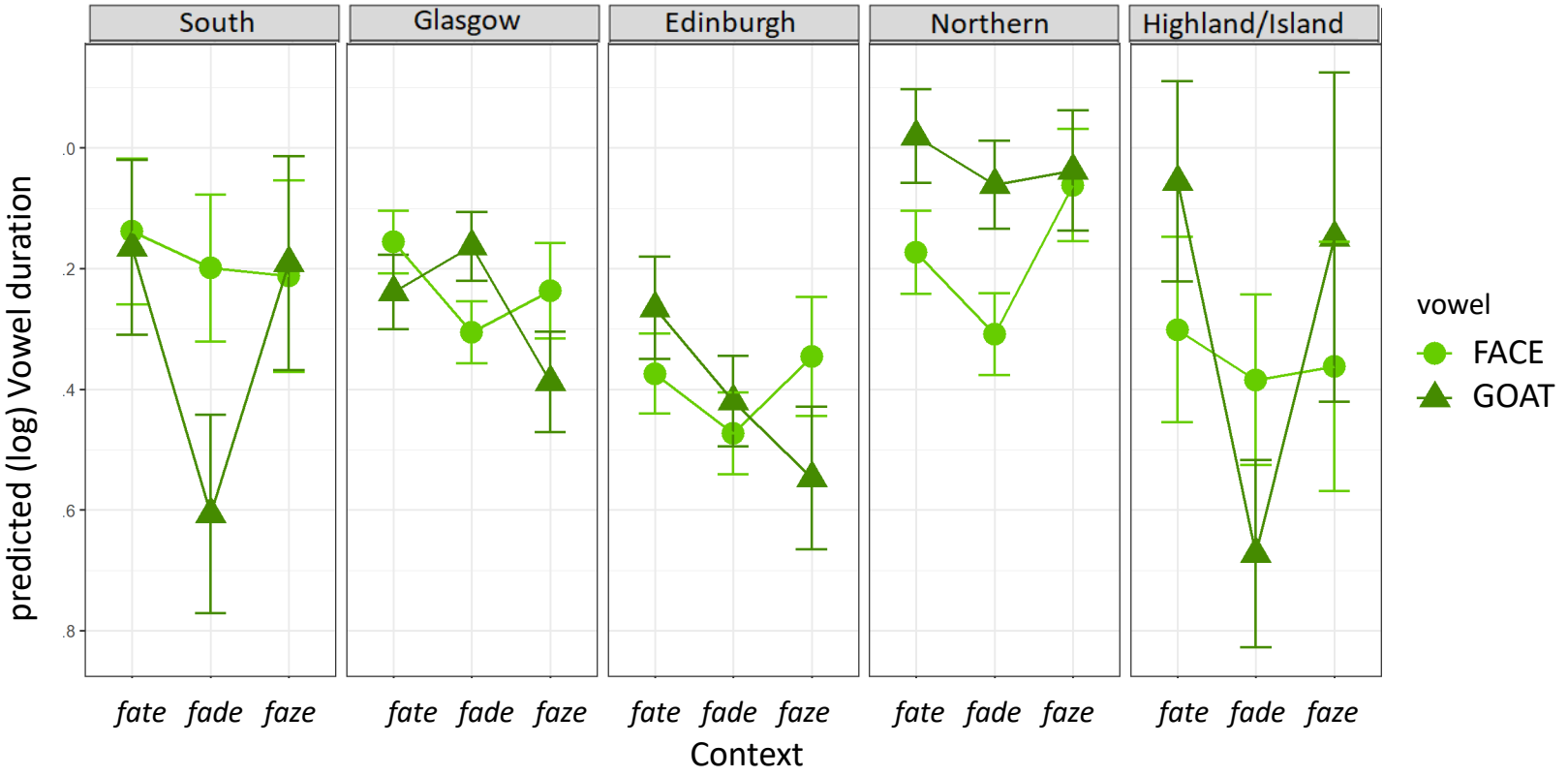
N = 116,776



- SVLR only for COT for Northern
- Voicing Effect only for CAT for Highland-Island-Insular

FACE GOAT

N = 30,968



FACE GOAT

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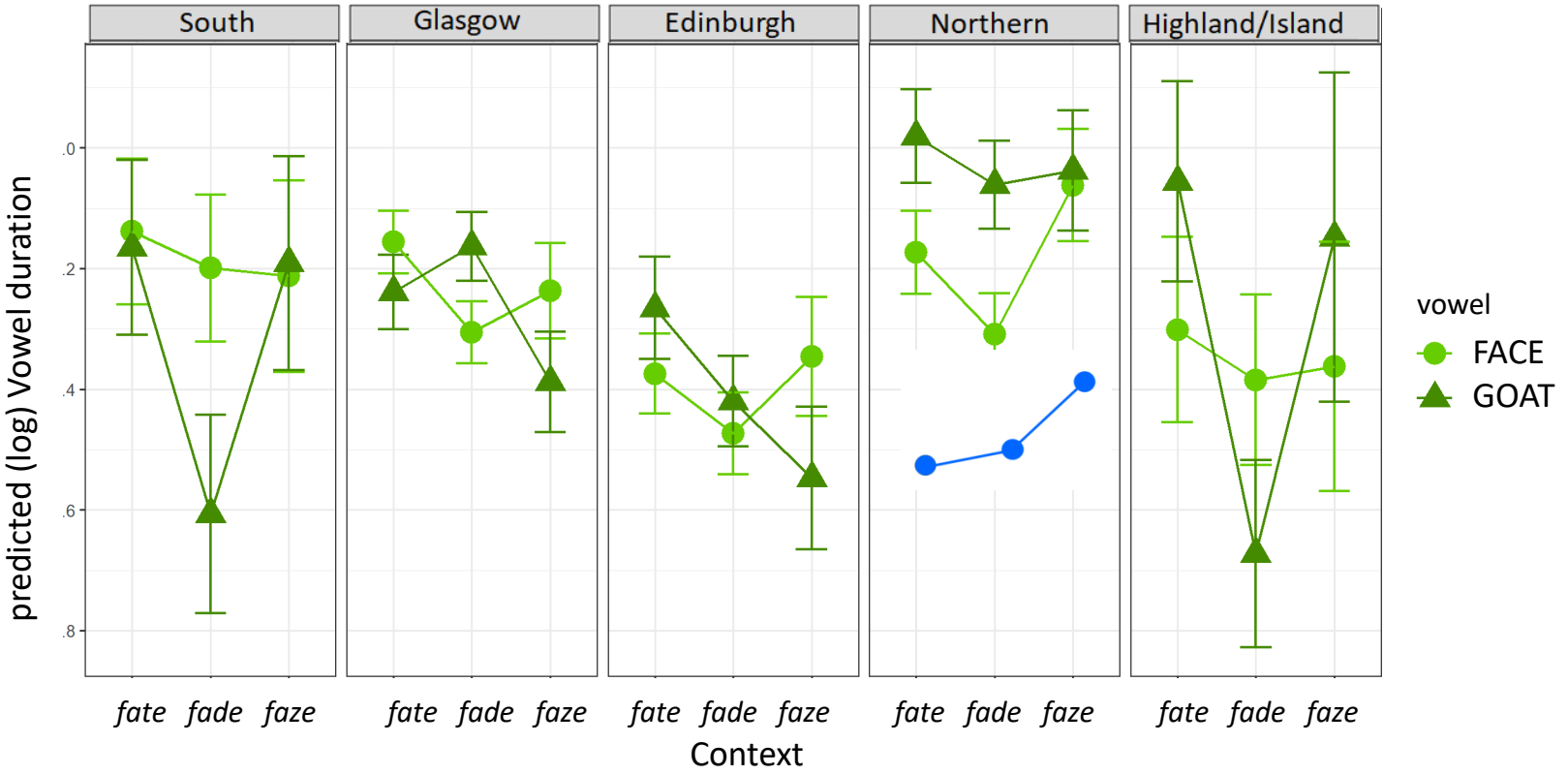
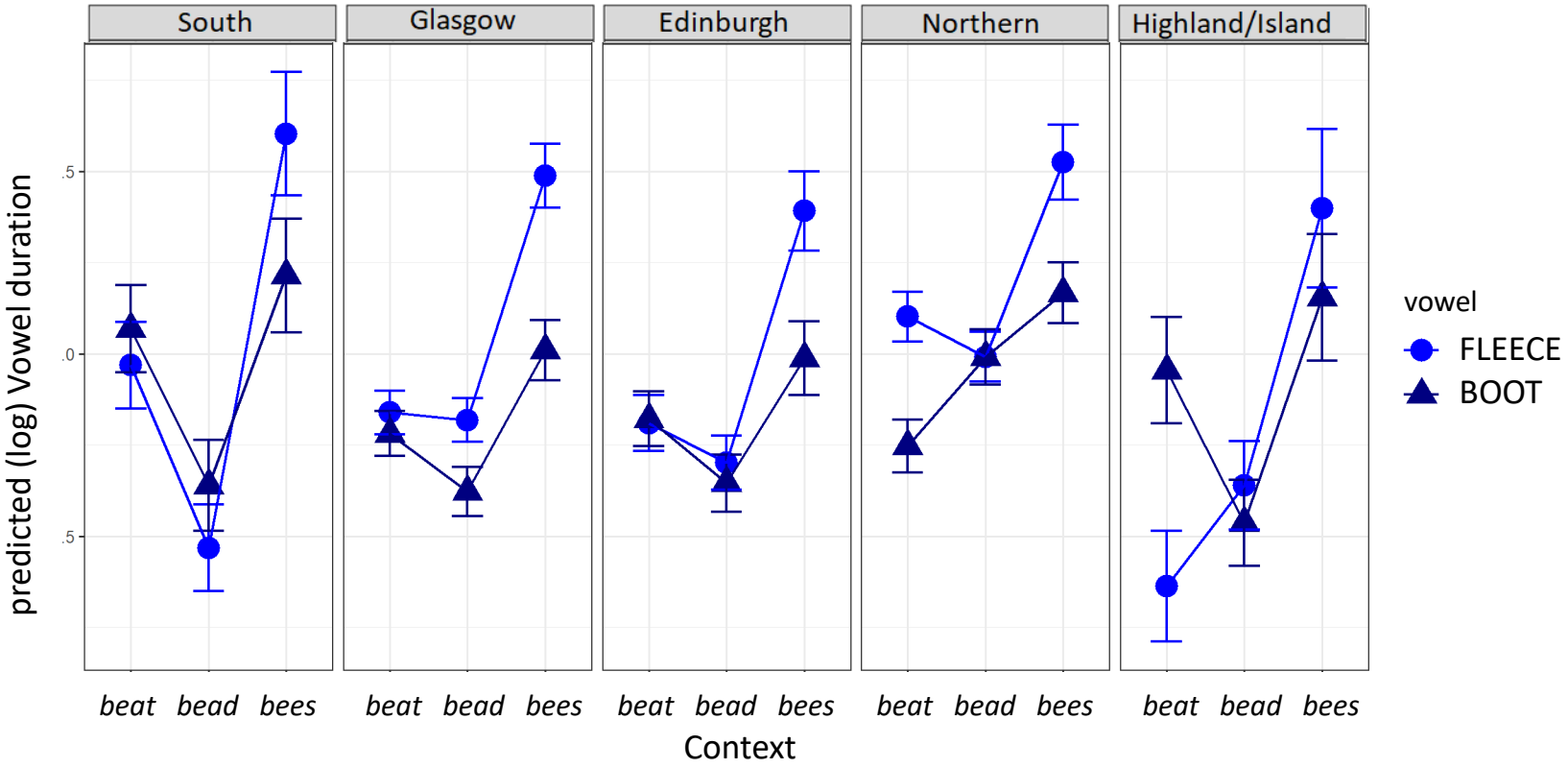


- SVLR only for FACE for Northern dialects
- ‘anti-Voicing Effect’ visible in both vowels

FLEECE BOOT

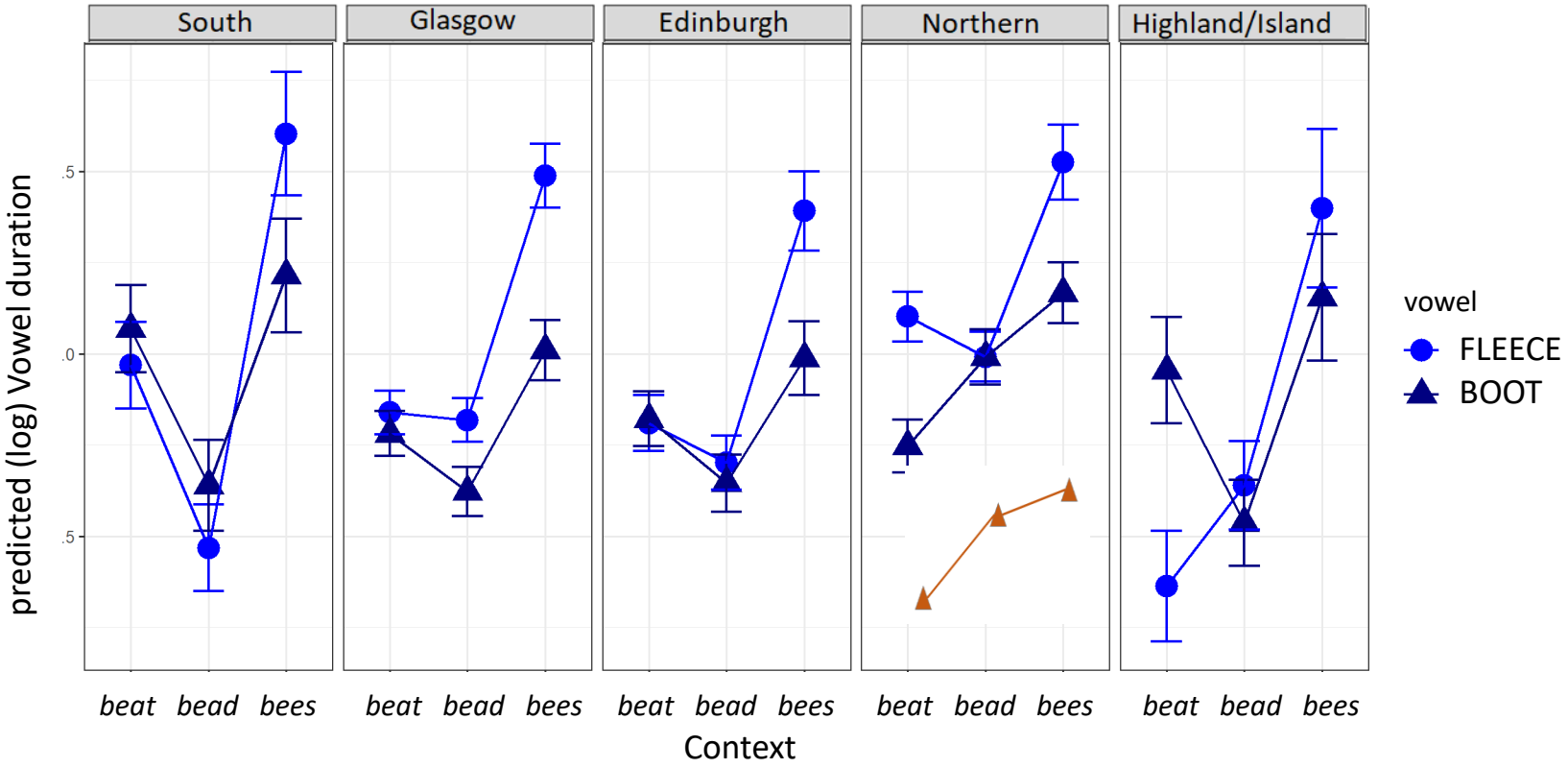
N = 33,679



- SVLR – *bees* always longer than *beat/bead*
- 'anti-Voicing Effect' – *bead* shorter than *beat*

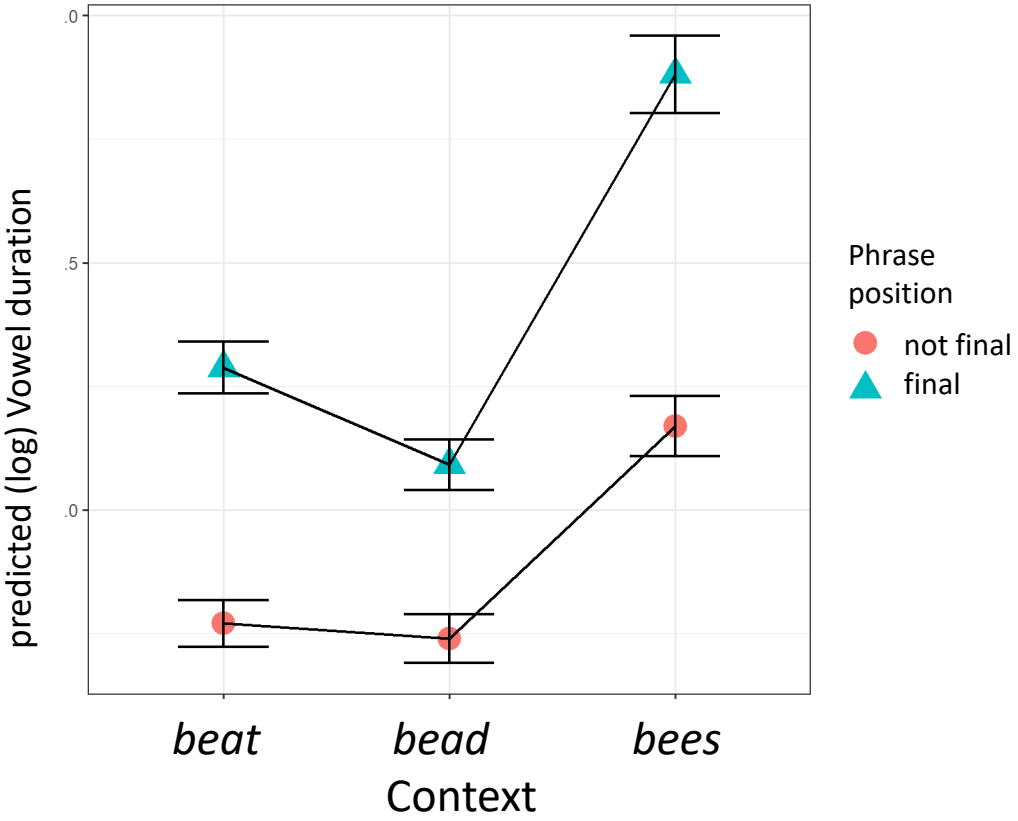
FLEECE BOOT

N = 33,679



- SVLR – *bees* always longer than *beat/bead*
- 'anti-Voicing Effect' – *bead* shorter than *beat*
- Voicing Effect only in BOOT (Northern)

SVLR and prosodic factors **(FLEECE, BOOT)**



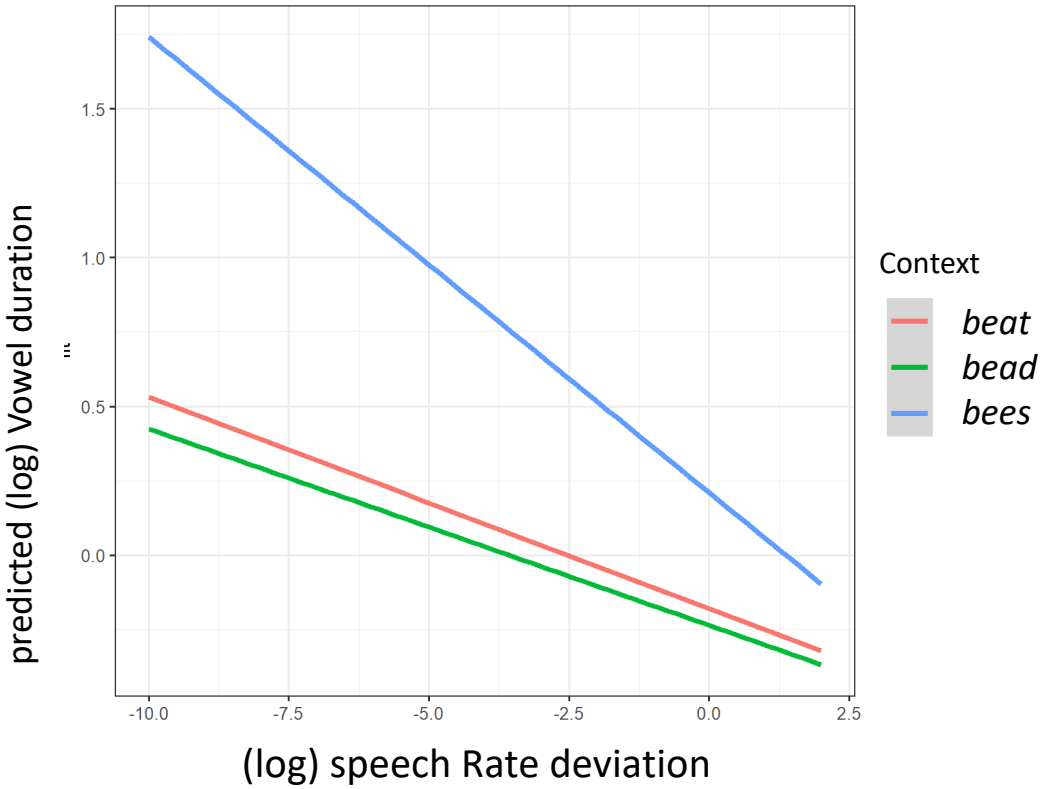
SVLR lengthening more extreme in phrase-final position

SVLR short (*bead*) remains short in phrase-final position

N = 33,679

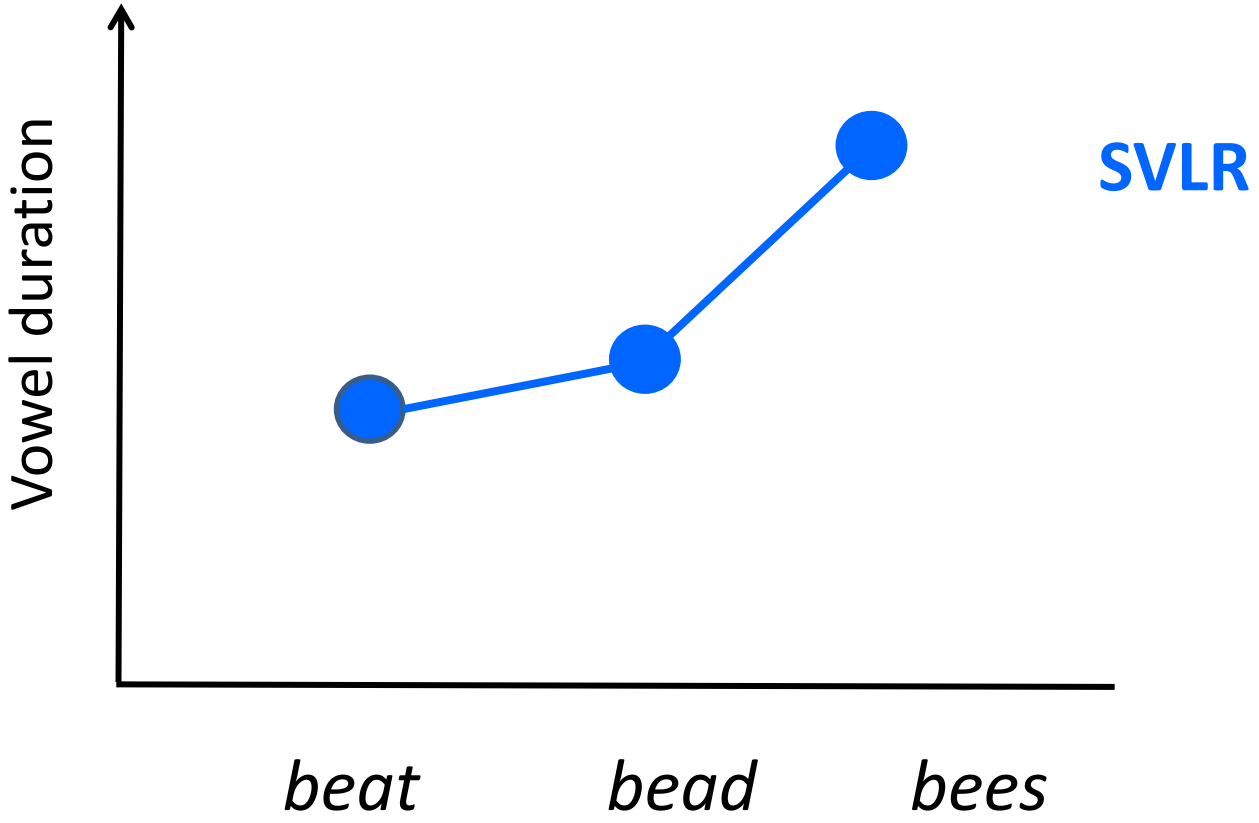
SVLR and prosodic factors **(FLEECE, BOOT)**

SVLR patterning retained despite speech rate

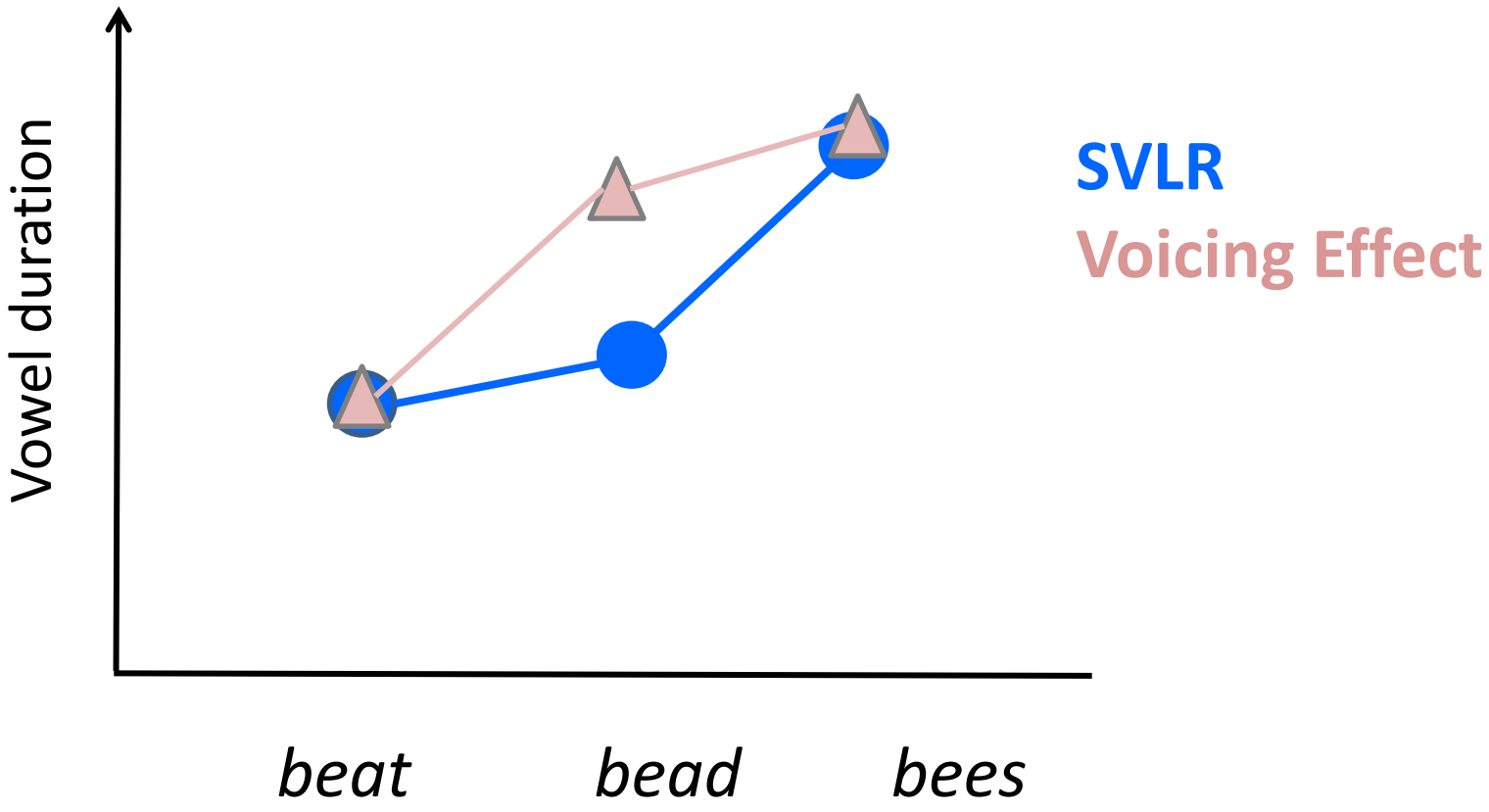


N = 33,679

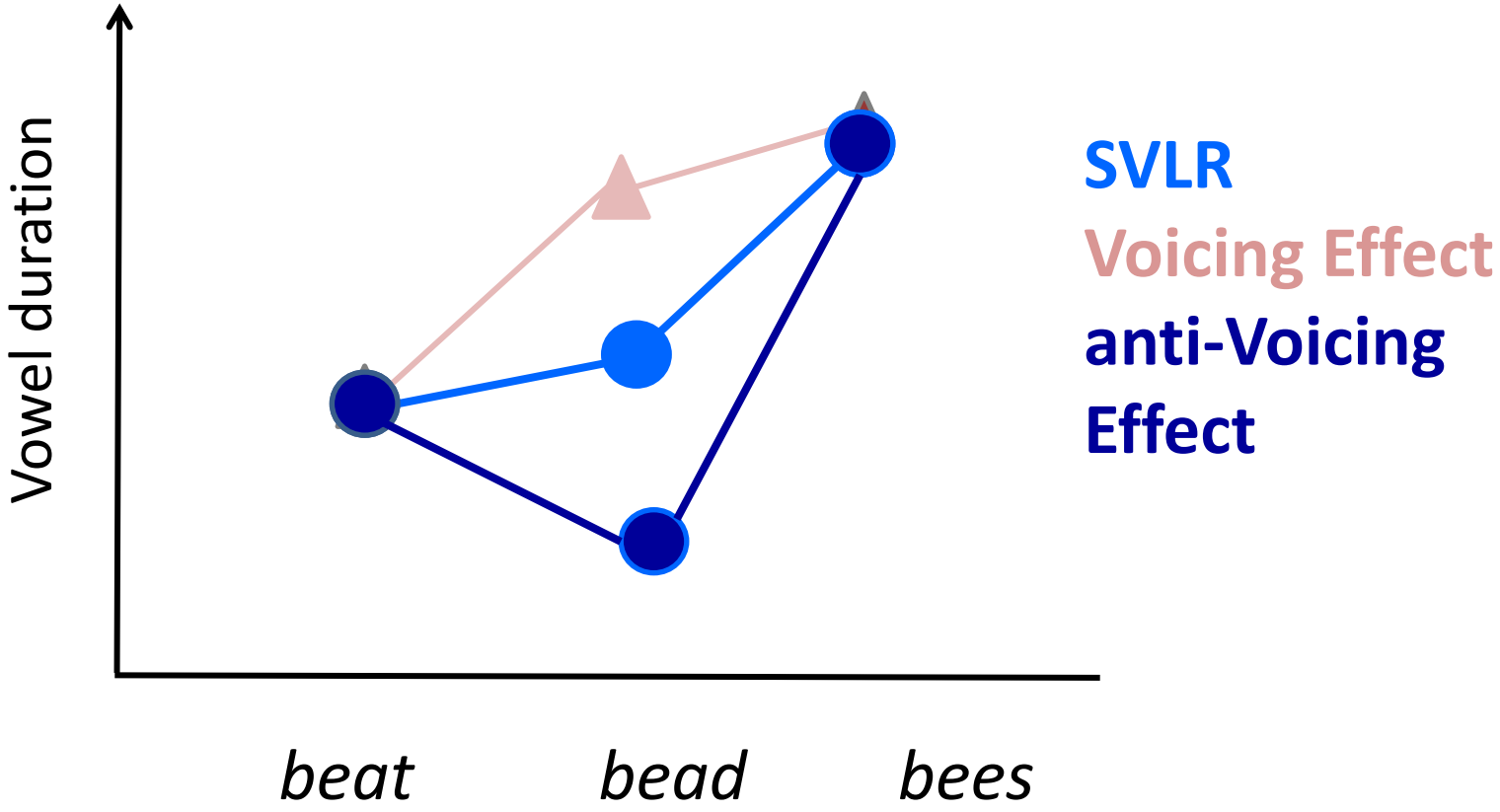
- SVLR in FLEECE, BOOT confirms Scobbie et al 1999 (and in FACE and COT in North East; cf Warren 2018)



- (very) weak evidence for Voicing Effect



- unexpected ‘anti-Voicing Effect’: extreme shortening in SVLR short (VE long) *bead* context



- increased difference between Anglo-English and Scottish English irrespective of social variety
- no interaction with time or gender

Tanner et al. *Frontiers in Artificial Intelligence 2020*

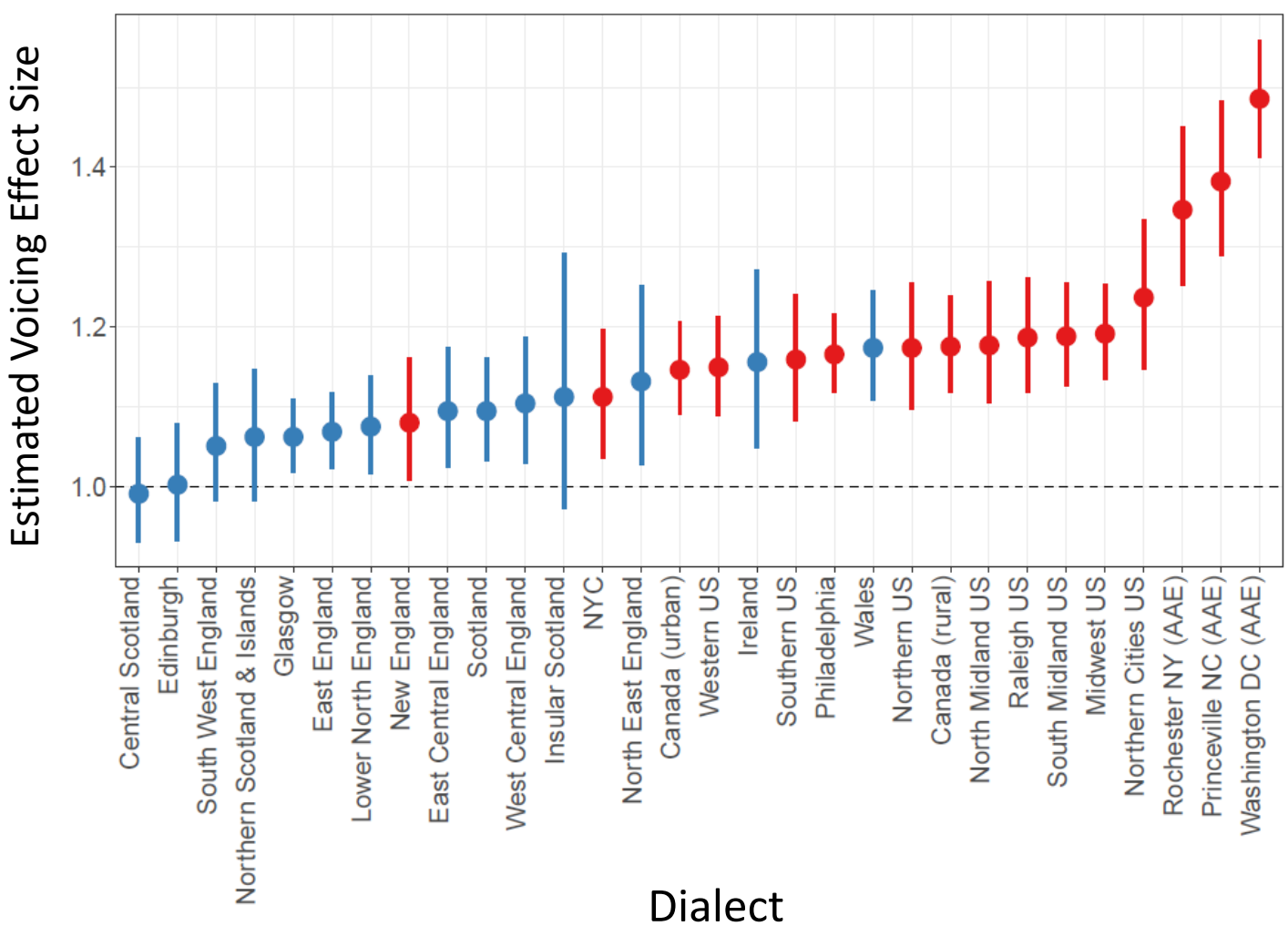
How robust is the ‘English’ Voicing Effect?

Tanner et al. *Frontiers Artificial Intelligence 2020*

Data

- Utterance final, CVC words
  e.g. *beat, bead*
- 1964 speakers
- 15 corpora ~ 30 dialects
- ~230,000 tokens
- Vowel duration (ms)

Voicing Effect differs by English dialect



bead > beat

bead = beat

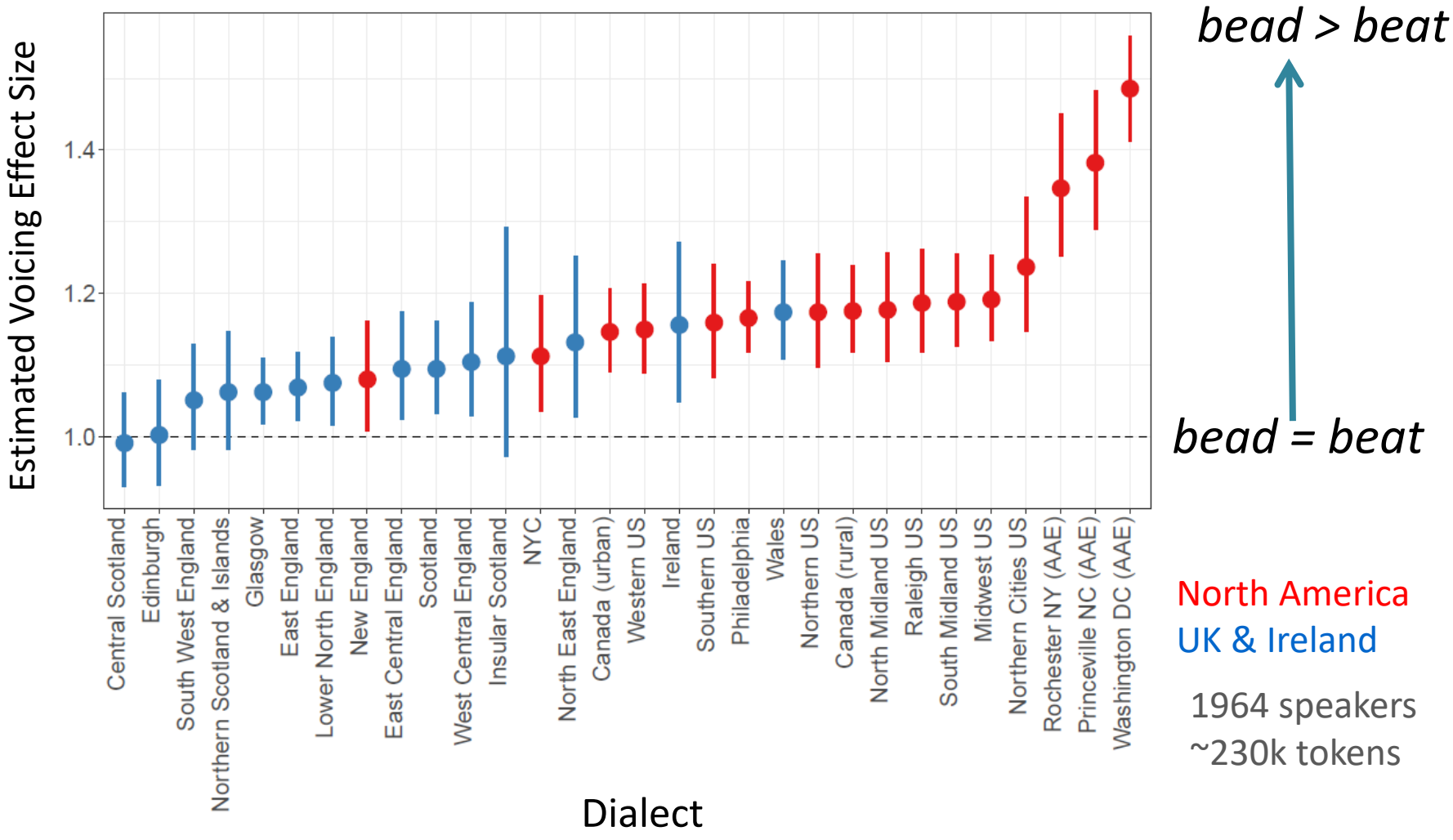
North America

UK & Ireland

1964 speakers

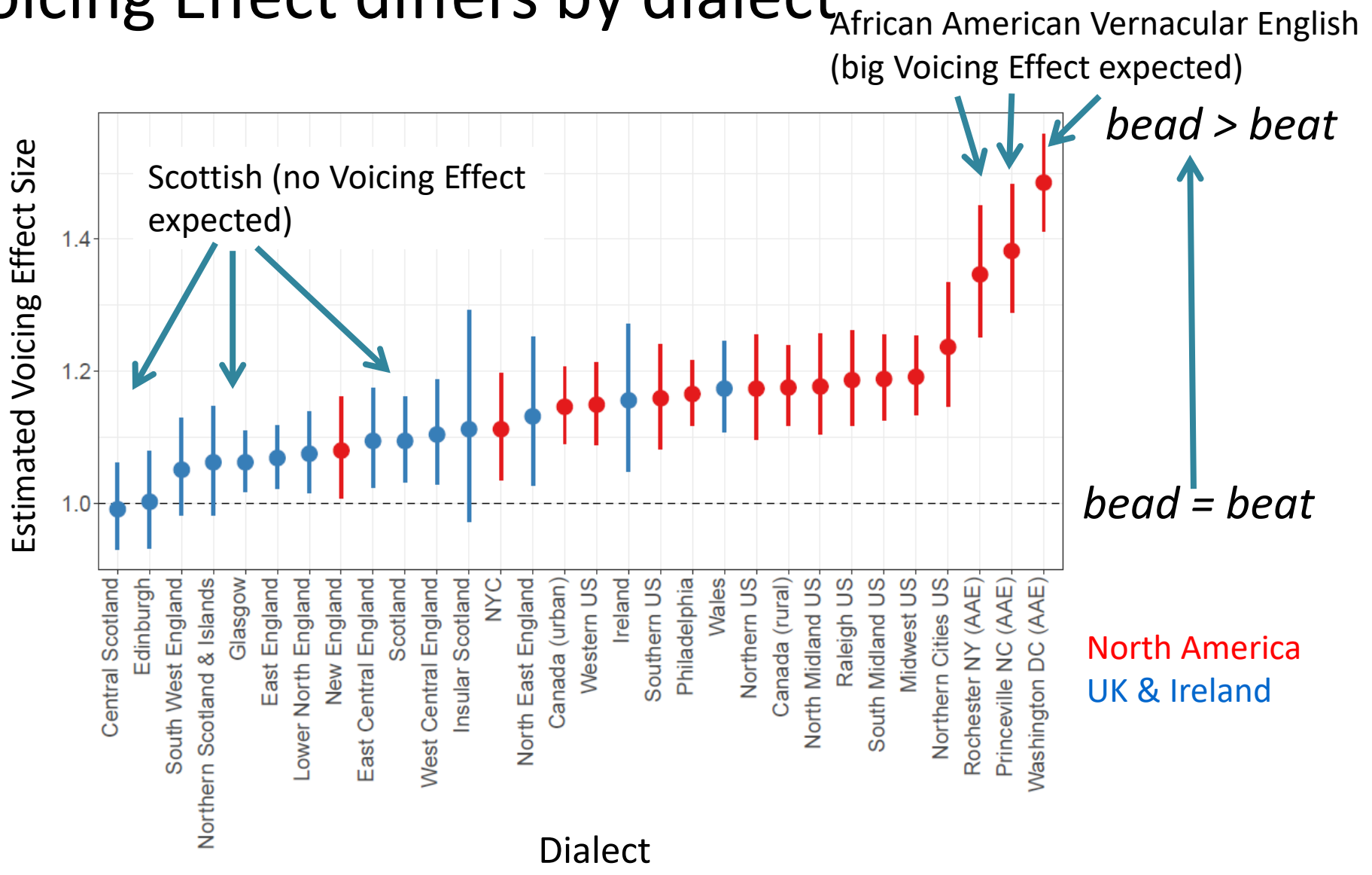
~230k tokens

Voicing Effect differs by English dialect



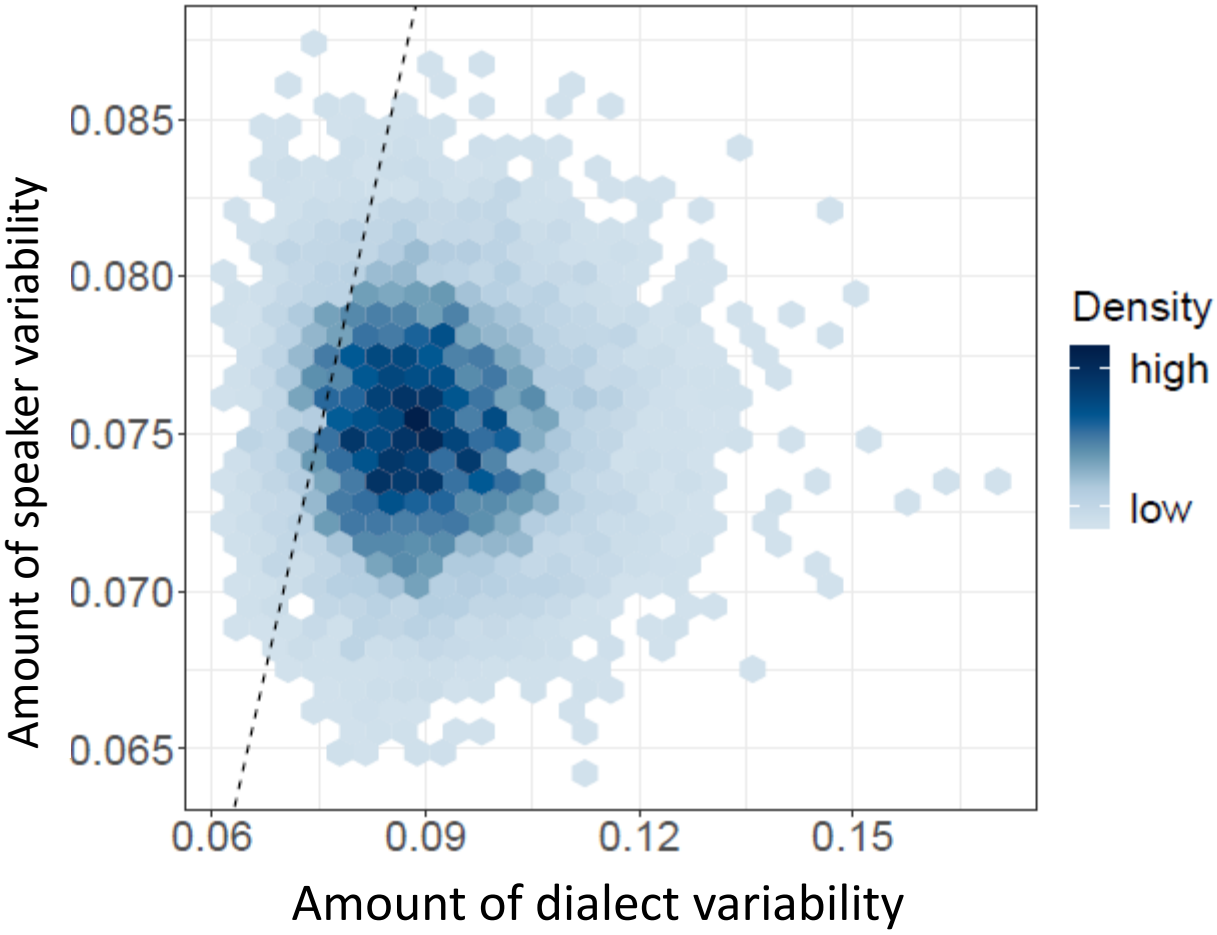
… and is much smaller than in lab speech

Voicing Effect differs by dialect



1964 speakers
~230k tokens

Voicing Effect differs more by dialect than by speakers



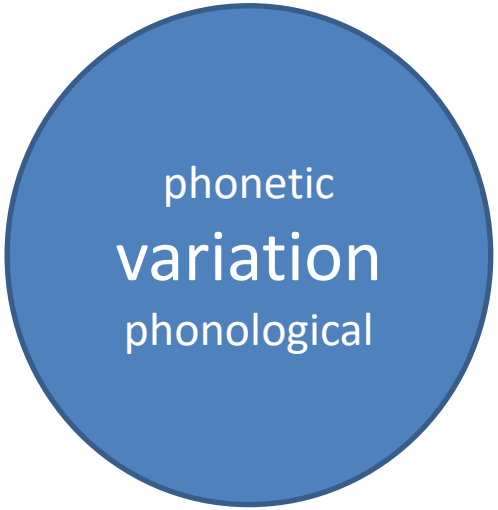
‘English’ phonetics over space and time

- Meet the SPADE Shiny App!

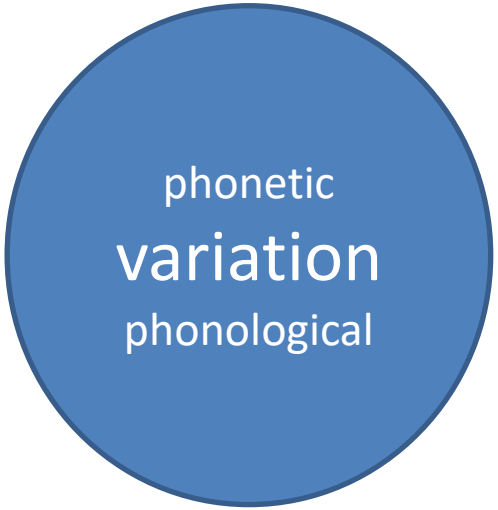
  https://shiny.chass.ncsu.edu/spade/stable/

SPADE

SPeech Across Dialects of English


phonetic
variation
phonological

systematic, structured, informative to speaker and hearer



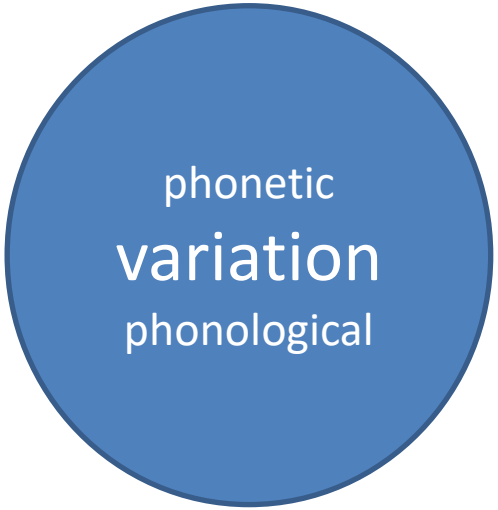
Examples from speech production in these classes; Strand 1999; Staum-Casasanto 2009; Barreda 2020; references on speaker perception for lecture2

systematic, structured, informative to speaker and hearer

phonetic-linguistic

constraints
- aerodynamic
- articulatory
- acoustic
- auditory
- phonotactic context
- prosody

lexical contrast



social-indexical

inter-speaker
- macro-social
- micro-social

factors, identity

intra-speaker
- style
- stance

interaction

pragmatics
conversation management

personal

physical – exertion, size, anatomy…
affective – emotional state

systematic, structured, informative to speaker and hearer

phonetic-linguistic

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- aerodynamic
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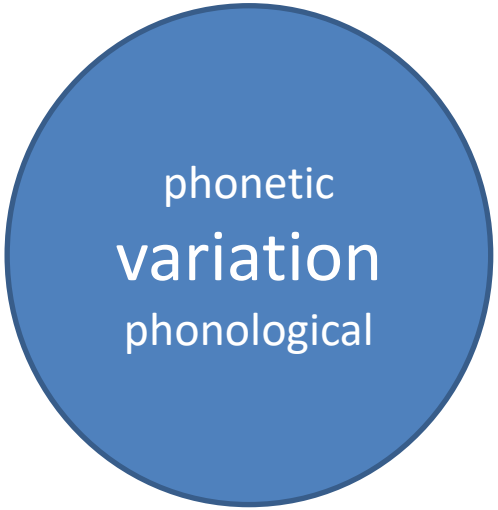

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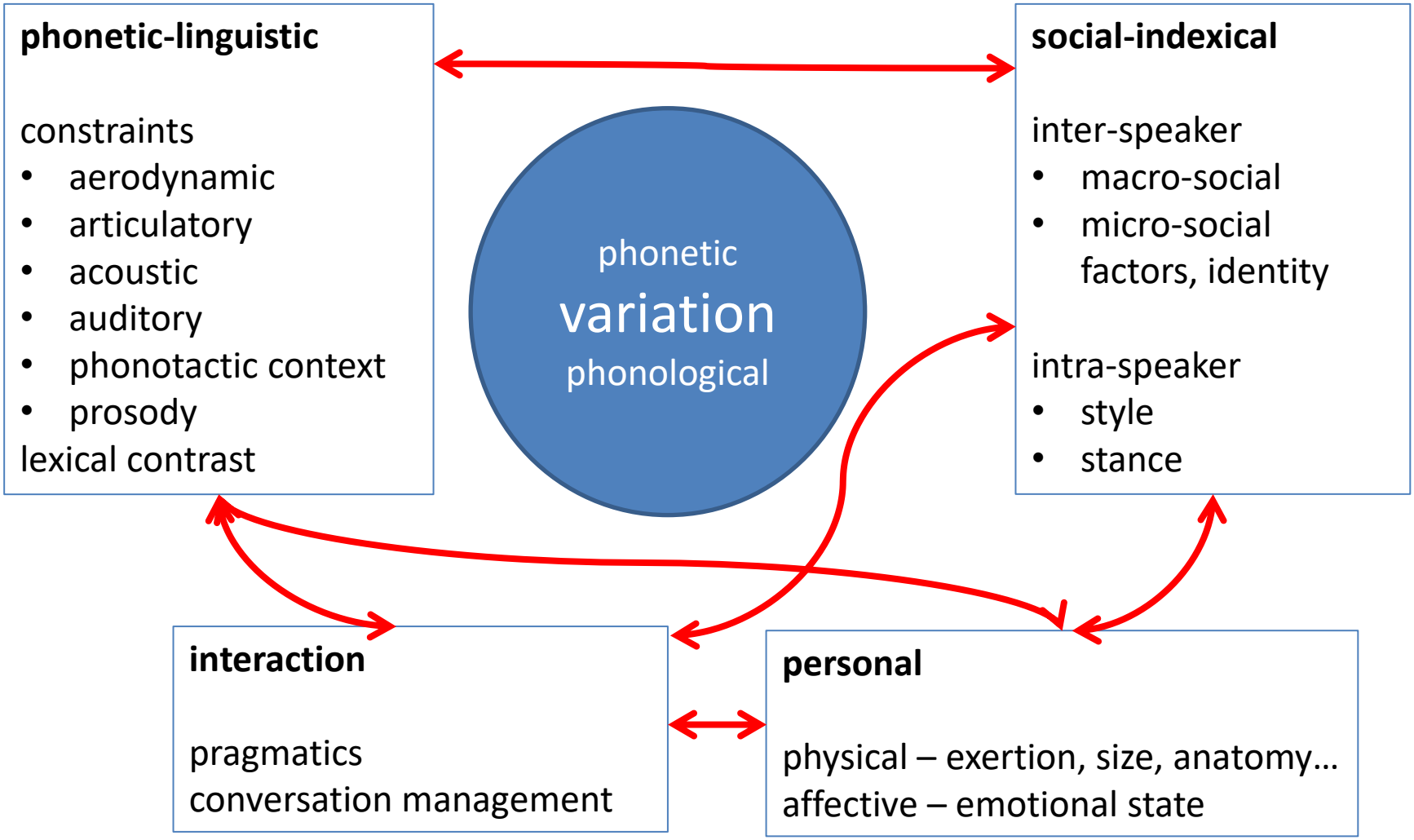


Even usage-based theories, e.g. exemplar theory assume a split between phonology and social knowlege

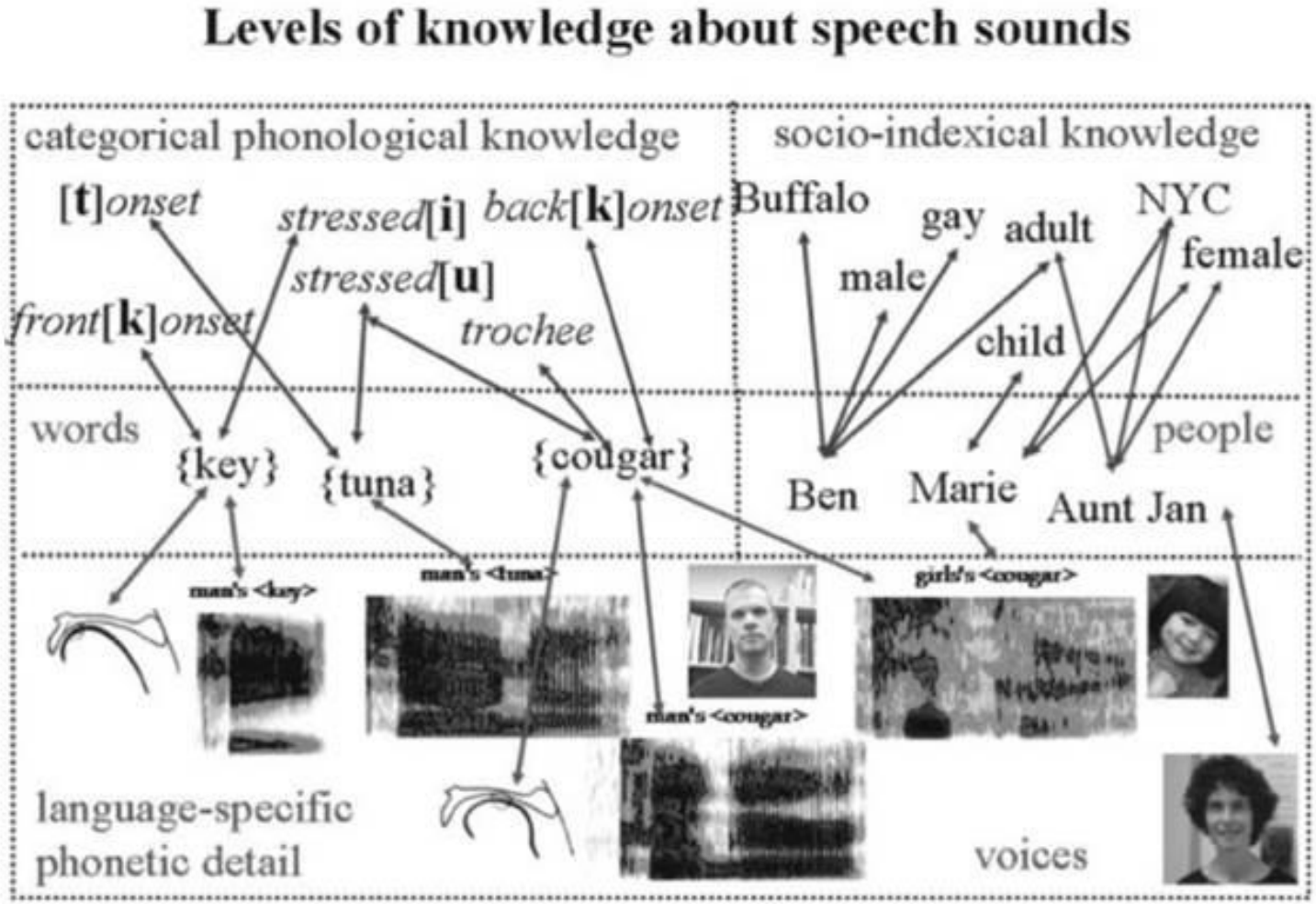
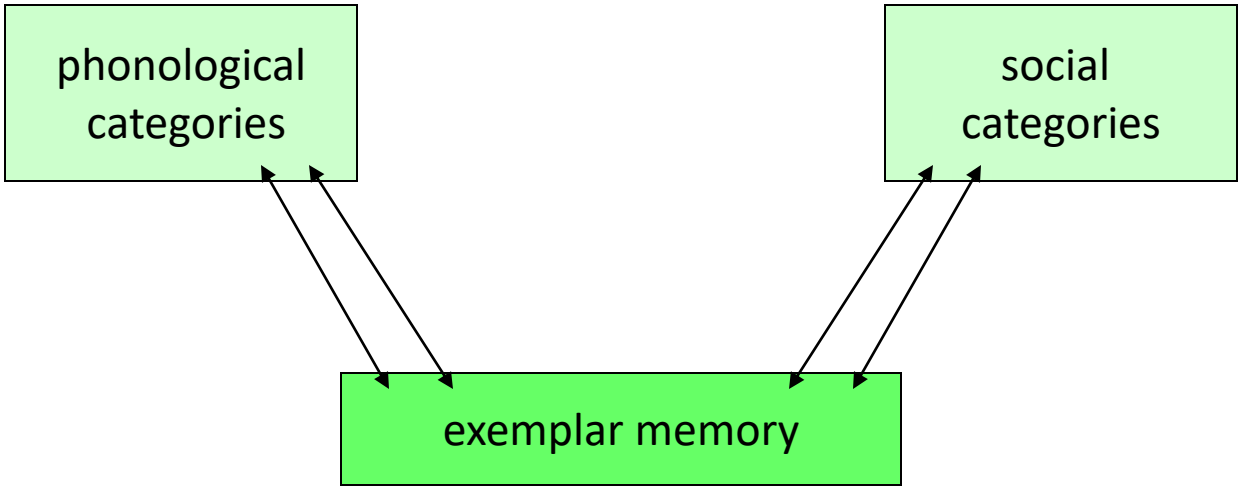


Figure 2. *A proposed model of levels of phonological knowledge.*

Munson 2010; cf Johnson 2006

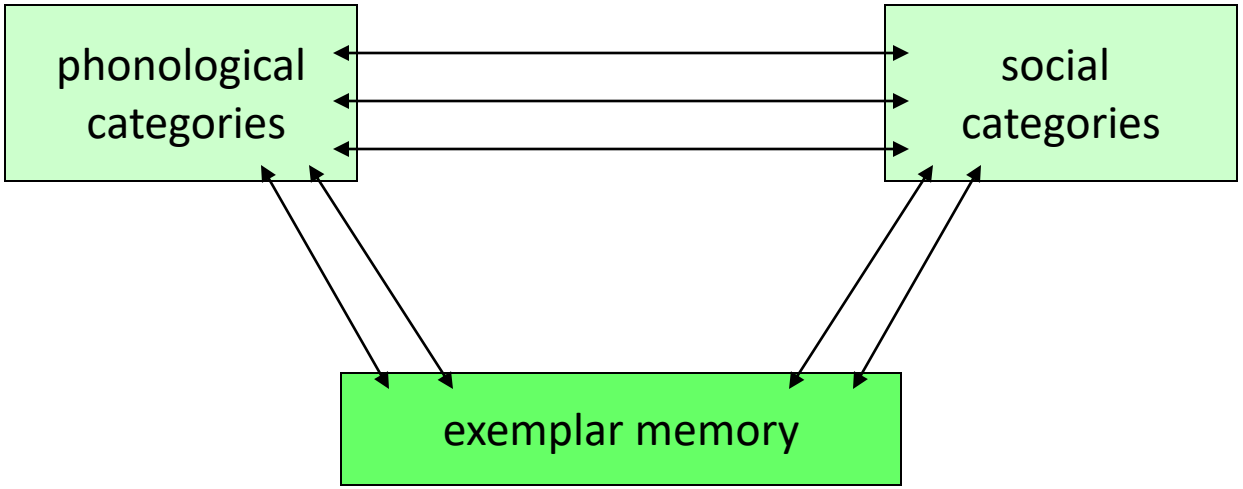
abstraction



detail

Stuart-Smith et al 2014

abstraction



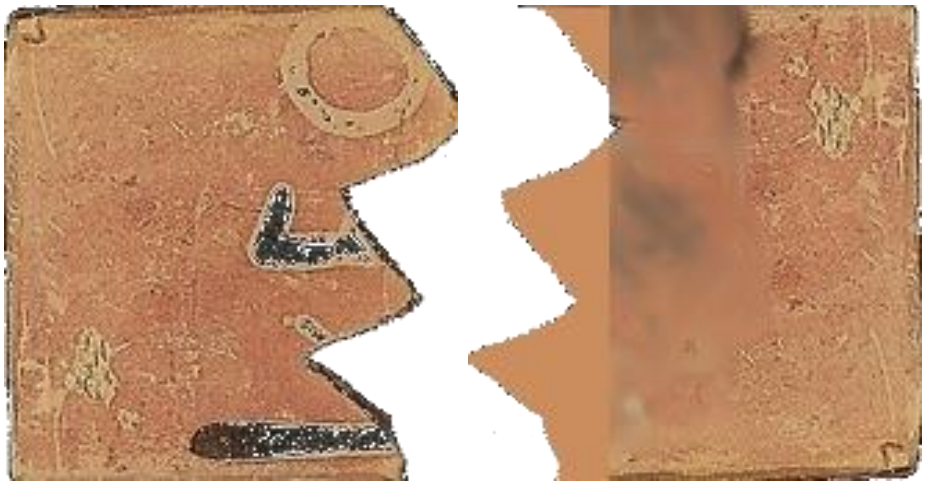
detail

Stuart-Smith et al 2014

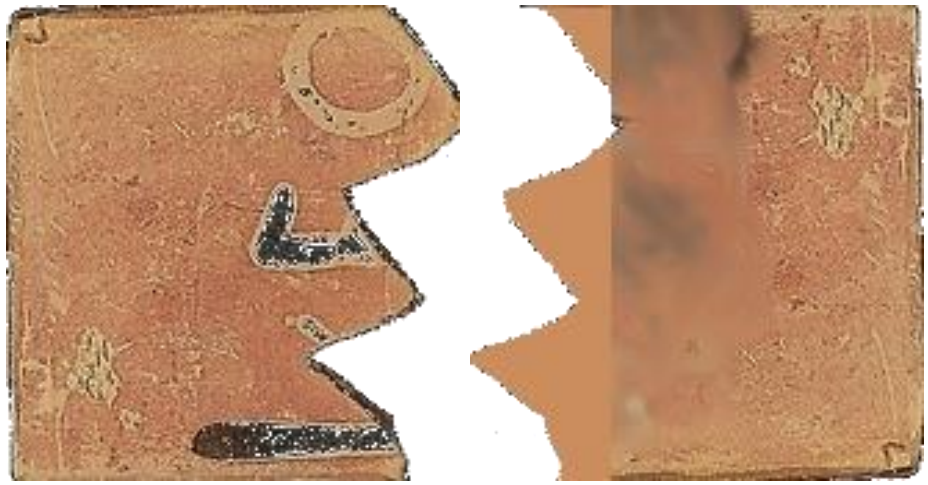
a possible analogy from ancient Greek society: *symbolon*

- half of an object (e.g. bone) which had been broken and kept by two parties for recognition (Herman 1987)
- a clay tile was made, cut irregularly, then both halves fired, and used for identification, probably for Athenian administration
- later a token used like a ticket, in exchange for goods

symbola = symbolon + symbolon



- each *symbolon* could exist separately – members of a dispersed family could keep them for a long time
- but a *symbolon* was only meaningful when joined with its partner (*symbola)*



- the social and phonological systems could be likened to *symbola* – they can and do exist separately – for analysts, and for speakers under particular conditions
- but usually for speakers, the social and phonological systems function in the *symbola* relationship, so that 'each is significant … as a counterpart of the other' (Harris 2000: 23)

Speech and Society – wrap-up

What's missing?

Lots!

- Speech/speaker perception [refs in Lecture2]
- Individuals
- Region/urban dialectology
- Bilinguals/multilinguals
- Age: from acquisition to aging

Speech and Society resources

- Lecture powerpoint slides
- Reference lists
- Papers

- (will be) on google drive…

Any questions?
and …Thank you!