Material and Methodological Advances in Sociolinguistics as Applied to a Study of Glaswegian Vernacular English Vowels

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NWAV 42

18 October 2013

- Material Advances
- Methodological Advances
- Glaswegian Vernacular English

- Material Advances
  - Real-time data
    - Increasing availability & use
      - e.g., Sankoff's Thurs PM plenary
      - e.g., Sankoff & Blondeau (2007)
      - e.g., Gregersen (2009)
      - e.g., Blake & Josey (2003)
      - e.g., Gordon & Maclagan (2001)
      - e.g., ...

- Methodological Advances
  - Automated procedures
    - Increasing availability & use
      - e.g., Labov et al (2013)
      - e.g., Hay (2013)
      - e.g., Stuart-Smith et al (2013)
      - e.g., ...

- Glaswegian Vernacular English
  - Glasgow

(supposed to be a map, here; but technical difficuties)

- Glaswegian Vernacular English
  - The *Sounds of the City* Project
  - or : *Fine Phonetic Variation and Sound Change: A Real-Time Study of Glaswegian*

Fine phonetic variation and sound change: A real-time study of Glaswegian

http://soundsofthecity.arts.gla.ac.uk/

Oct 2011-Sept 2014

The Leverhulme Trust

- The *Sounds of the City* Project
  - or : *Fine Phonetic Variation and Sound Change: A Real-Time Study of Glaswegian*
    - Interest in both change and stability
    - 4 decades; 30 years of real time
    - A cross-sectional (trend) approach
    - Working-class speakers
    - Balanced for age and sex (in design)

Targeted Structure of the Corpus		‘Age’ and Sex of Speakers					
		Old 67-90 yrs		Mid 40-55 yrs		Yng 10-17 yrs	
		M	F	M	F	M	F
Time Period	70s	6	6	6	6	6	6
	80s	6	6	6	6	6	6
	90s	6	6	6	6	6	6
	00s	6	6	6	6	6	6

- The *Sounds of the City* Project
  - Among our previous research

    e.g. NWAV 41, *etc*

    BOOT & FLEECE & CAT

    70-Os & 70-Ms & 00-Os & 00-Ms

    A sub-sample of 4x4=16 men

    BOOT has long been well advanced (refs)

    Seems, now, to be lowering & backing

- The *Sounds of the City* Project
  - Among our previous research

    e.g. NWAV 41 (Rathcke et al 2012)

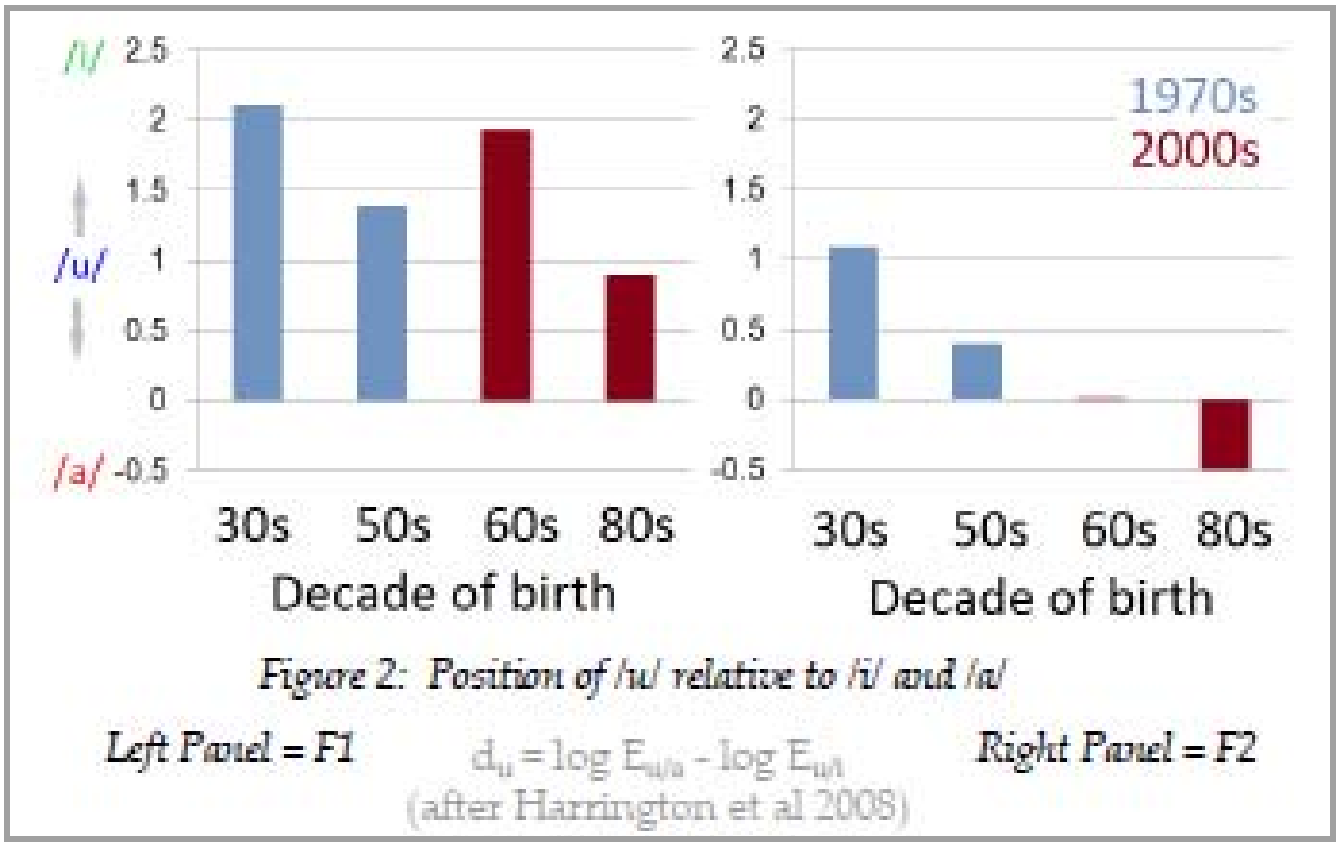

Figure 2: Position of /u/ relative to /i/ and /a/

Left Panel = F1 $d_u = \log E_{u/a} - \log E_{u/i}$ *Right Panel = F2*

(after Harrington et al 2008)

- The *Sounds of the City* Project
  - Now, here, a wider view: the "six bimoraic monophthongs" of Scottish English (Scobbie et al 1999: 1617)

/ i e a ɔ o ʉ /

FLEECE

BOOT

FACE COAT

COT

CAT

The Current Sub-Sample		‘Age’ and Sex of Speakers					
		Old 67-90 yrs		Mid 40-55 yrs		Yng 10-17 yrs	
		M	F	M	F	M	F
Time Period	70s	4	3			4	4
	80s						
	90s						
	00s	4	4			4	4

- The *Sounds of the City* Project
  - The recordings (current sub-sample)

70s	Old	SLX + O-H interviews
	Young	SLX interviews
00s	Old	O-H interviews
	Young	peer pair conversations

- The *Sounds of the City* Project
  - Current (exploratory) research questions

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    - Can a broader view of the vowel space and/or a wider window of apparent time clarify previous findings?

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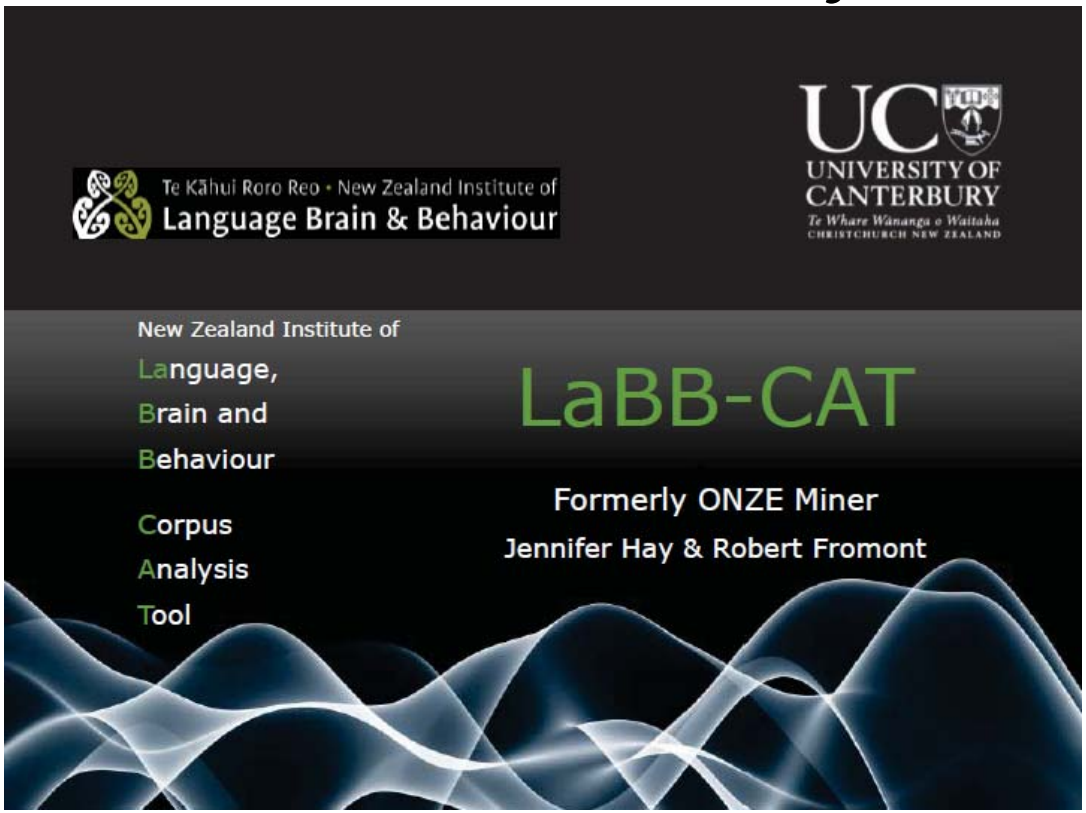
  - Current (exploratory) research questions
    - Can a broader view of the vowel space and/or a wider window of apparent time clarify previous findings?
    - Are there any consequences of a front /ʉ/ for this vowel (sub-)system?

- Methods

- Methods: Alignment & Extraction
  - Time-aligned transcriptions using Transcriber software (Barras et al 2001)

http://trans.sourceforge.net

- Methods: Alignment & Extraction
  - Loaded and stored into the LaBB-CAT database (Fromont & Hay 2012)



http://onzeminer.sourceforge.net/

- Methods: Alignment & Extraction
  - Phonemic transcriptions via CELEX English dictionary (=British English)
    - And as supplemented by user

- Methods: Alignment & Extraction
  - Forced alignment of segmental boundaries with digital audio recordings

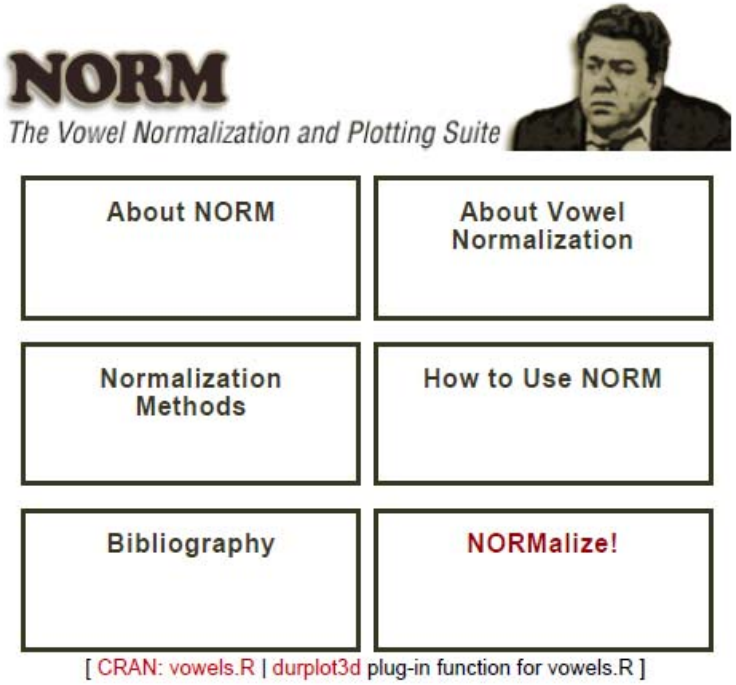
- Methods: Alignment & Extraction
  - Forced alignment of segmental boundaries with digital audio recordings
    - LaBB-CAT's (HTK) aligner not pre-trained
    - Starts fresh each time

- Methods: Alignment & Extraction
  - Automatic extraction of lexically stressed targeted vowels
    - LaBB-CAT is a searchable database

- Methods: Alignment & Extraction
  - Automatic extraction of lexically stressed targeted vowels
  - Initial yield
    - Approximately 21,500 tokens
    - Per speaker per vowel:
      - Avg ≈ 100
      - Min = 17
      - Max = 362
      - Std dev = 64

- Methods: Alignment & Extraction
  - Automatic measurement of LPC formant tracks via integration of Praat with LaBB-CAT
    - Here, 3 measurement points stipulated: 25% ~ 50% ~ 75%

- Methods: Normalization
  - NORM suite (Thomas & Kendall 2007)
    - Lobanov (1971) method



http://ncslaap.lib.ncsu.edu/tools/norm/index.php

- Methods: Data reduction
  - Forced alignment
    - A wonderful tool, but...
      - Sometimes very good results
      - Other times more troubling results

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  - Forced alignment
    - A wonderful tool, but...
      - Sometimes very good results
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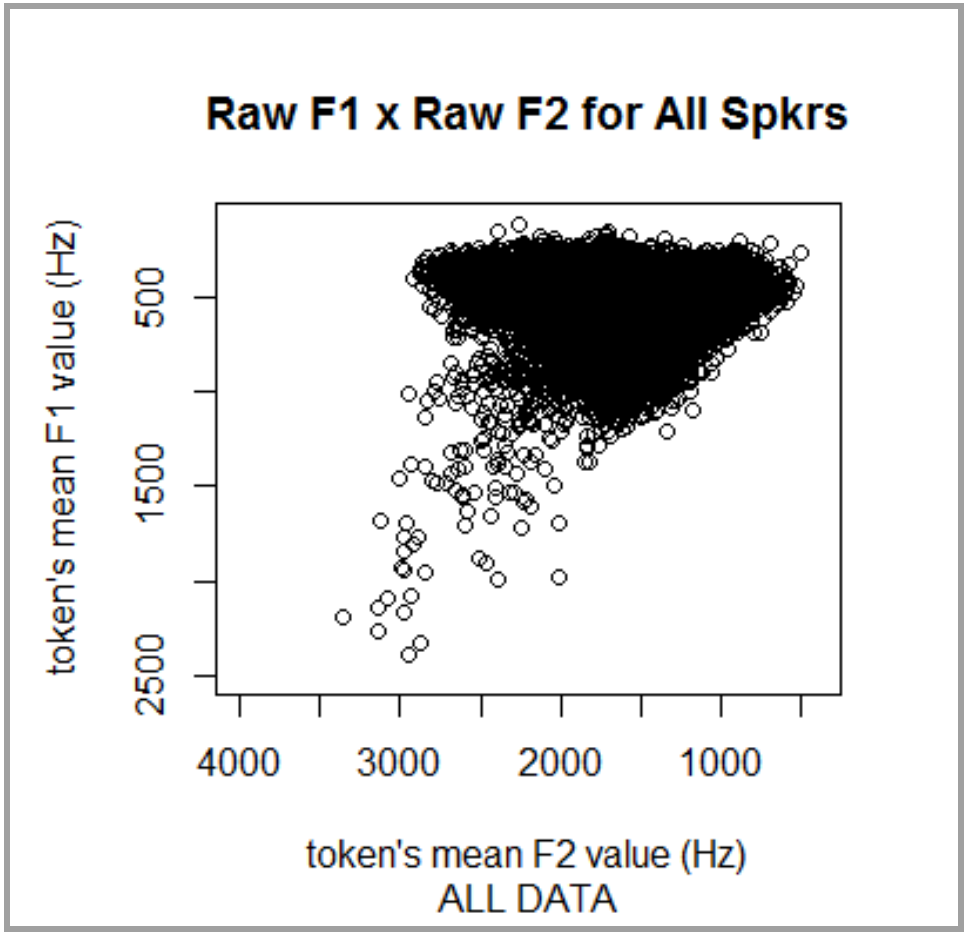
  - LPC formant tracking
    - A wonderful tool, but...
      - Sometimes very good results
      - Other times more troubling results

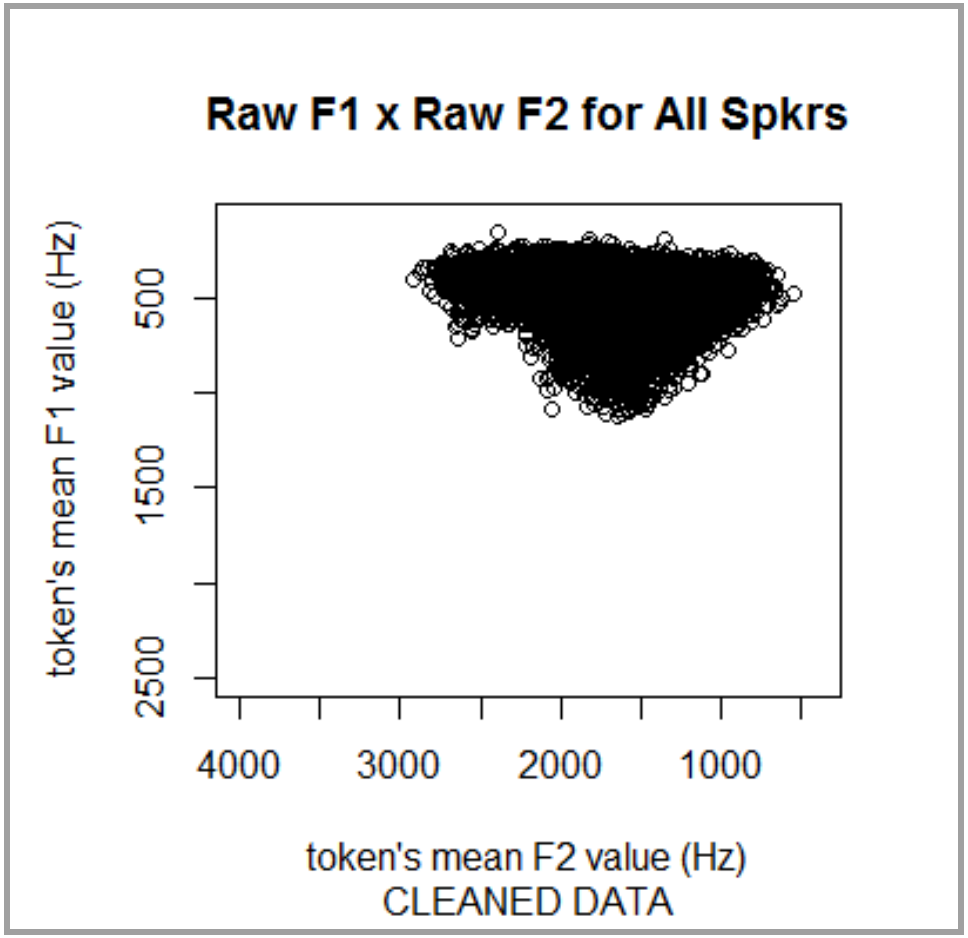
- Methods: Data reduction
  - Removal of any tokens with a following /r/ or /l/ that slipped though during the data collection phase

- Methods: Data reduction
  - Removal of unambiguous outliers
  - Likely cause: formant tracking errors

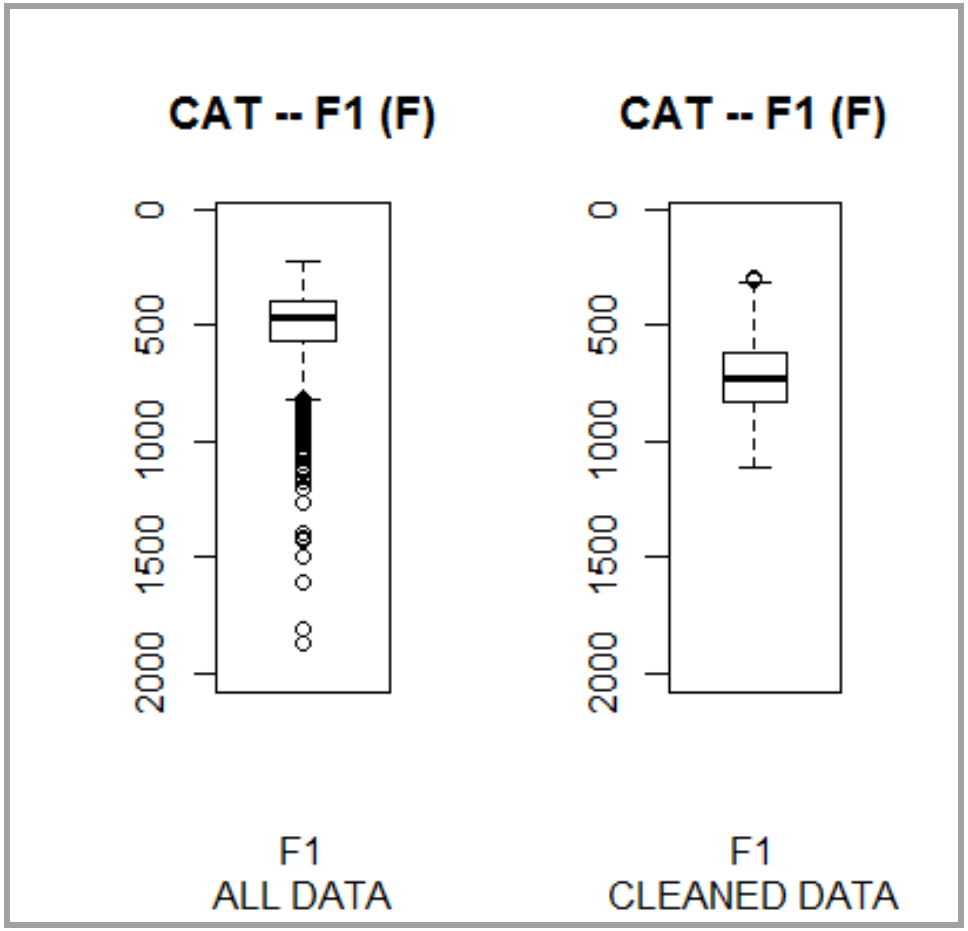
- Methods: Data reduction
  - Obvious outliers
  - Before cleaning



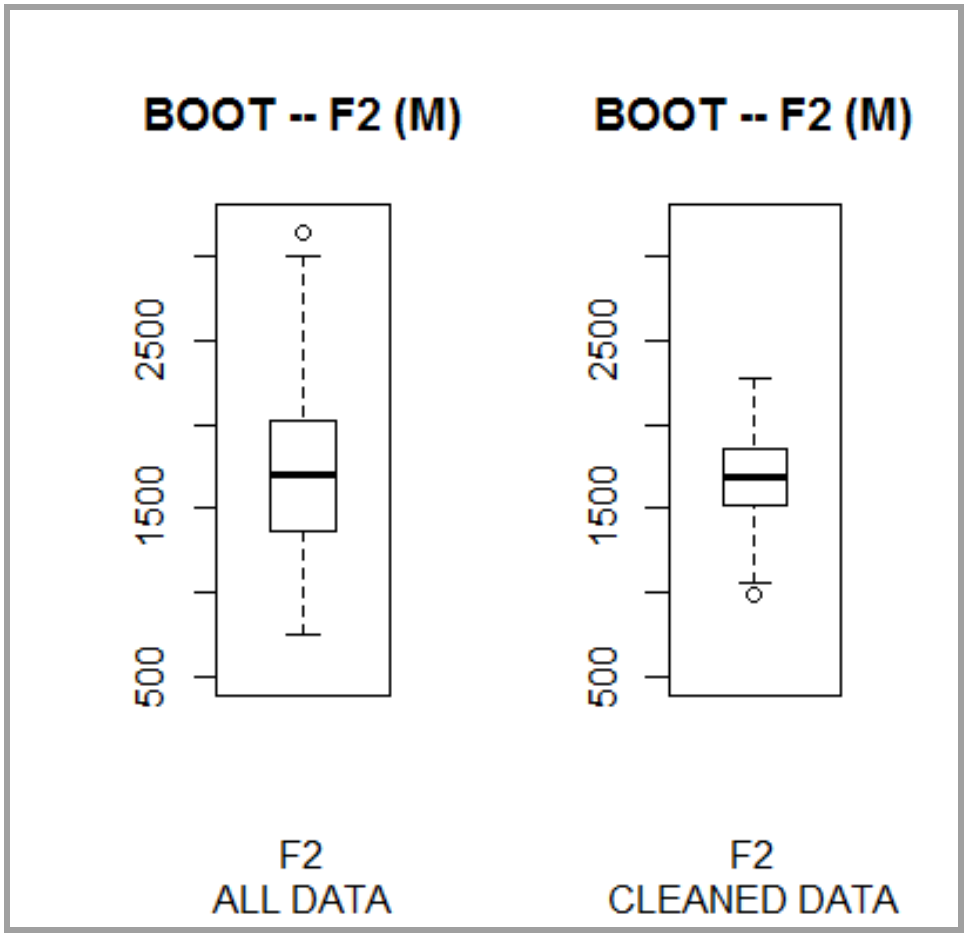
- Methods: Data reduction
  - Obvious outliers
  - After cleaning



- Methods: Data reduction
  - Outlier removal
  - An F1 example
    - The (median) formant value: changed

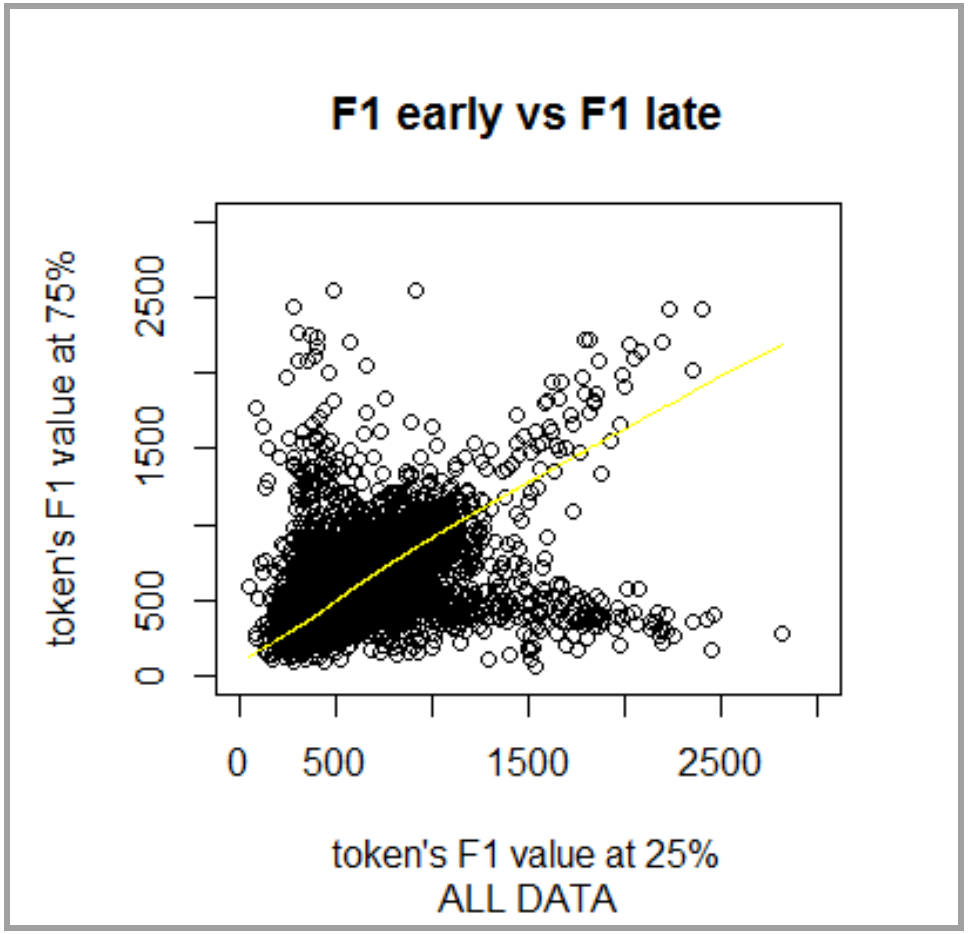


- Methods: Data reduction
  - Outlier removal
  - An F2 example
    - The (median) formant value: unaffected

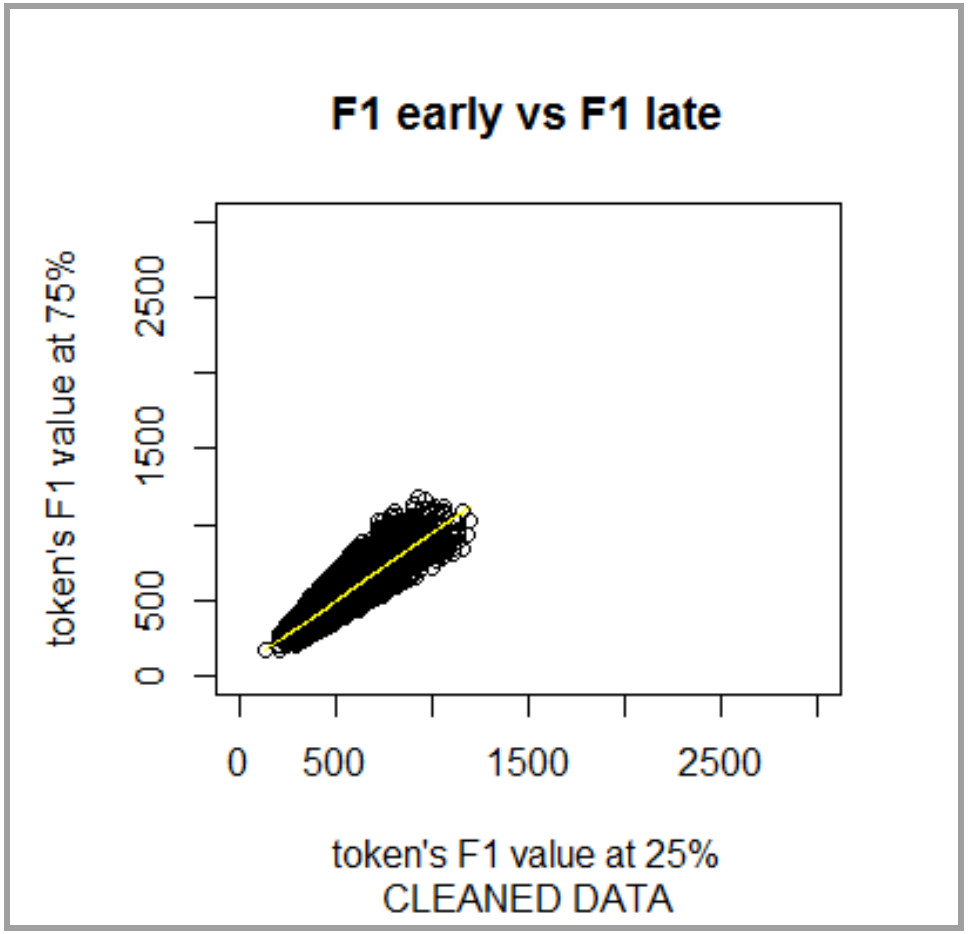


- Methods: Data reduction
  - Removal of tokens with inconsistent formant values (25% ~ 50% ~ 75%)
  - Likely cause: sub-optimal forced alignments or formant tracking errors (or both)

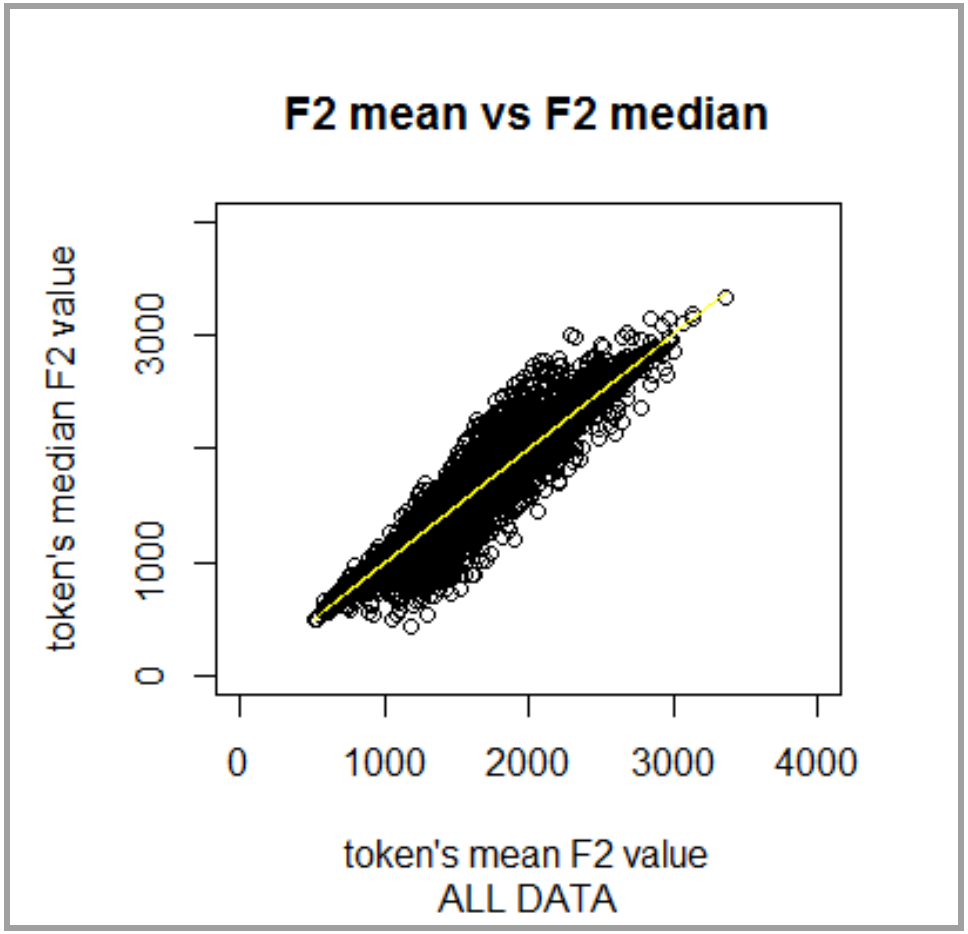
- Methods: Data reduction
  - F1 at 25% vs F1 at 75%
  - Before cleaning



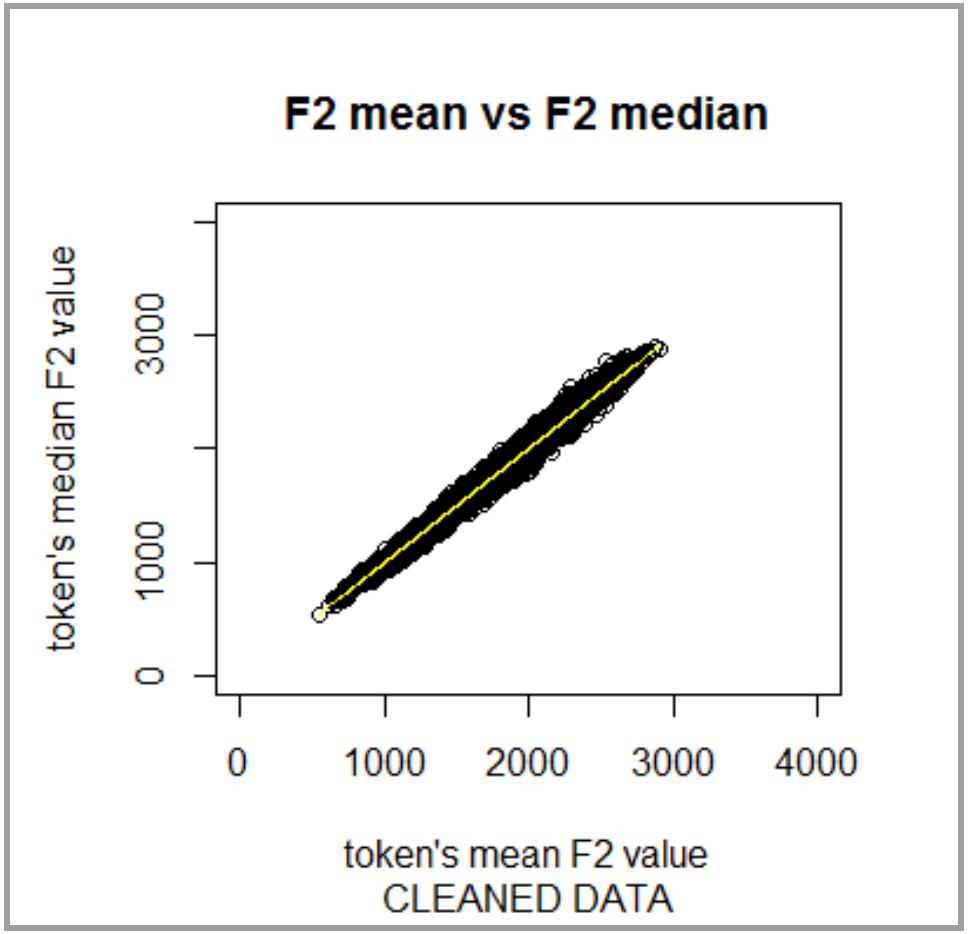
- Methods: Data reduction
  - F1 at 25% vs F1 at 75%
  - After cleaning



- Methods: Data reduction
  - Mean F2 vs Median F2
  - Before cleaning



- Methods: Data reduction
  - Mean F2 vs Median F2
  - After cleaning



- Methods: Data reduction
  - In the end...
    - 14,298 tokens
    - Per speaker per vowel:
      - Avg ≈ 75
      - Min = 8
      - Max = 260
      - Std dev = 50

} cf. Labov et al (2013: 37)

- Methods: Comparisons
  - Each age/time group isolated

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    - For vowel-to-vowel comparisons

      70-O 70-Y

      00-O 00-Y

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  - Each age/time group isolated
    - For vowel-to-vowel comparisons

      70-O 70-Y

      00-O 00-Y
  - Each vowel isolated

- Methods: Comparisons
  - Each age/time group isolated
    - For vowel-to-vowel comparisons

      70-O 70-Y

      00-O 00-Y
  - Each vowel isolated
    - For age/time group comparisons

      FLEECE FACE BOOT

      CAT COT COAT

- Methods: Comparisons
  - Linear mixed effects modeling in R
    - Fixed factors
      - {Age/Time Group *or* Vowel}
      - Speaker's sex
      - Following POA
    - Random factors
      - Speaker
      - Word

- Methods: Comparisons
  - Significance level set at 0.001
    - Multiple comparisons
      - Between 5 of 6 vowels
      - Between 3 of 4 age/time groups
      - For each of 2 formants
      - 0.05 / (5*3*2) ≈ 0.001
  - With more efficient modeling in R, may (?) be able to revert to 0.01 or 0.05

- Results

- Results: Sex

- Results: Sex
  - No significant M-F differences at the designated 0.001 level
  - Some marginal differences on F1 in the 00s (00-O, 00-Y) if the 0.05 level can be maintained

- Results: Following POA

- Results: Following POA
  - No significant POA differences at the designated 0.001 level

    -0- coronal dorsal glottal labial labiovelar palatal syllabic vowel
  - Some differences among the older spkrs (70-O, 00-O) if the 0.05 level can be maintained

- Results: Among the Vs at one pt in “time”

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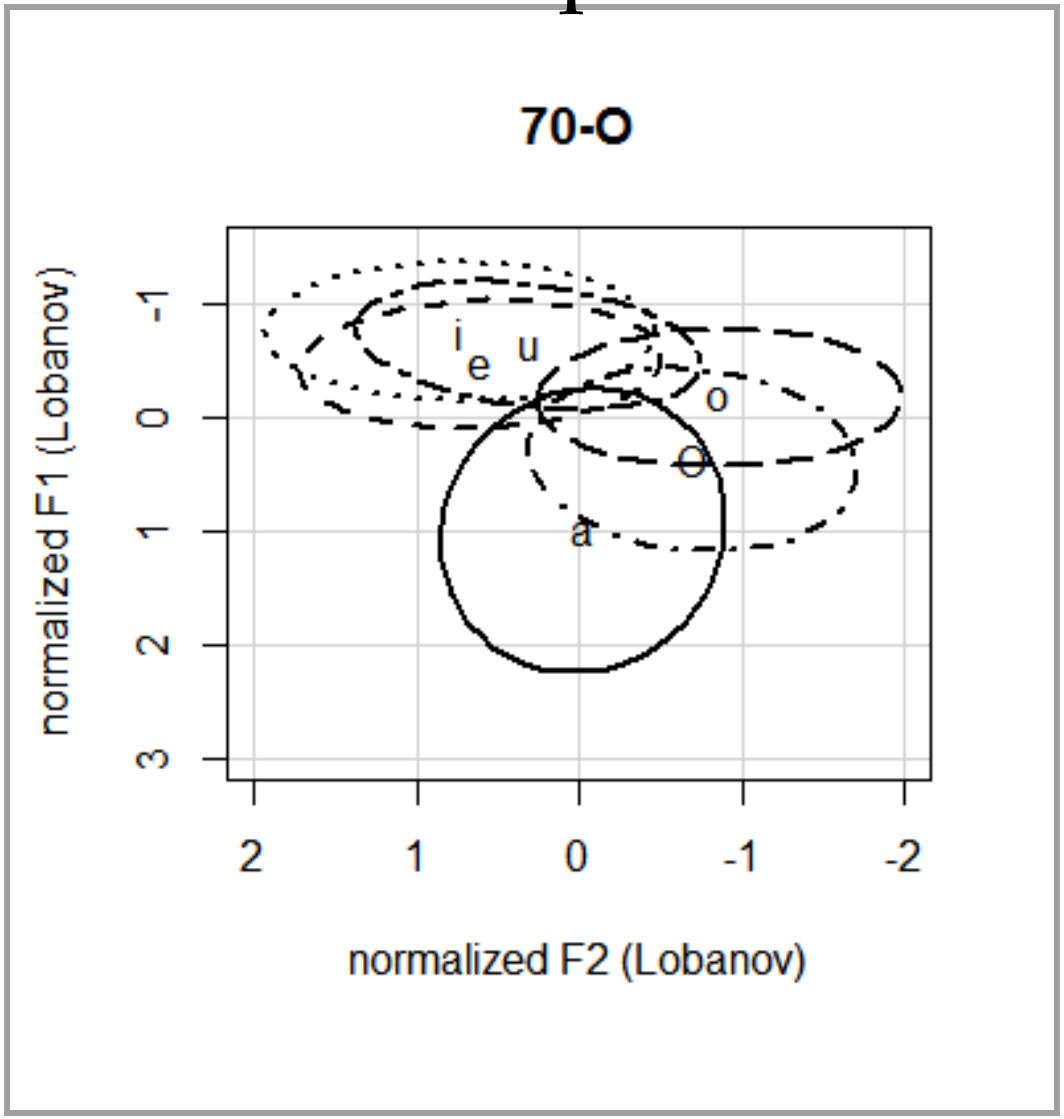
  - 70-O:

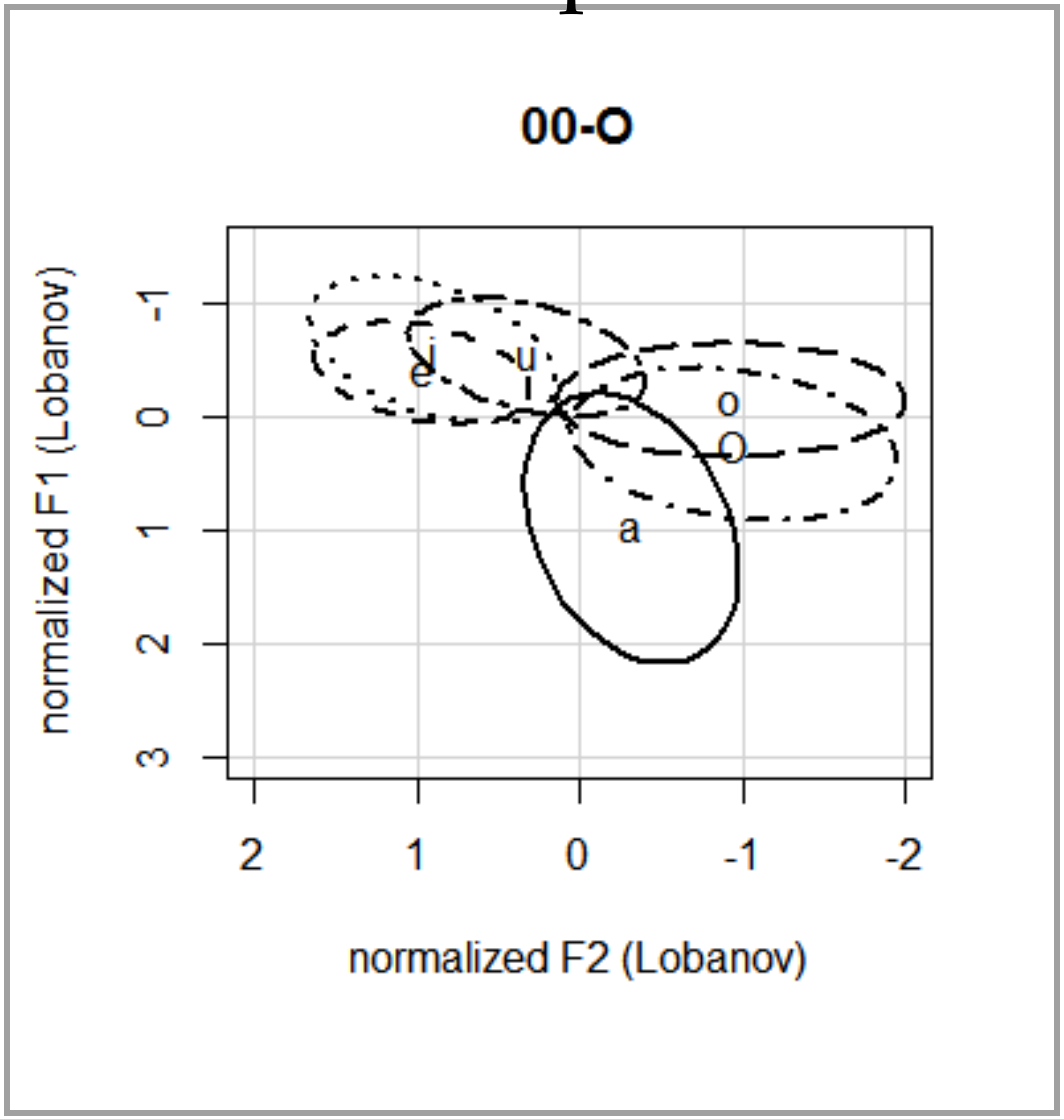
    FLEECE & FACE; COAT & COT not significantly distinguished on F2.



- Results: Among the Vs at one pt in "time"
  - 00-O:

    FLEECE & FACE; COAT & COT not significantly distinguished on F2.

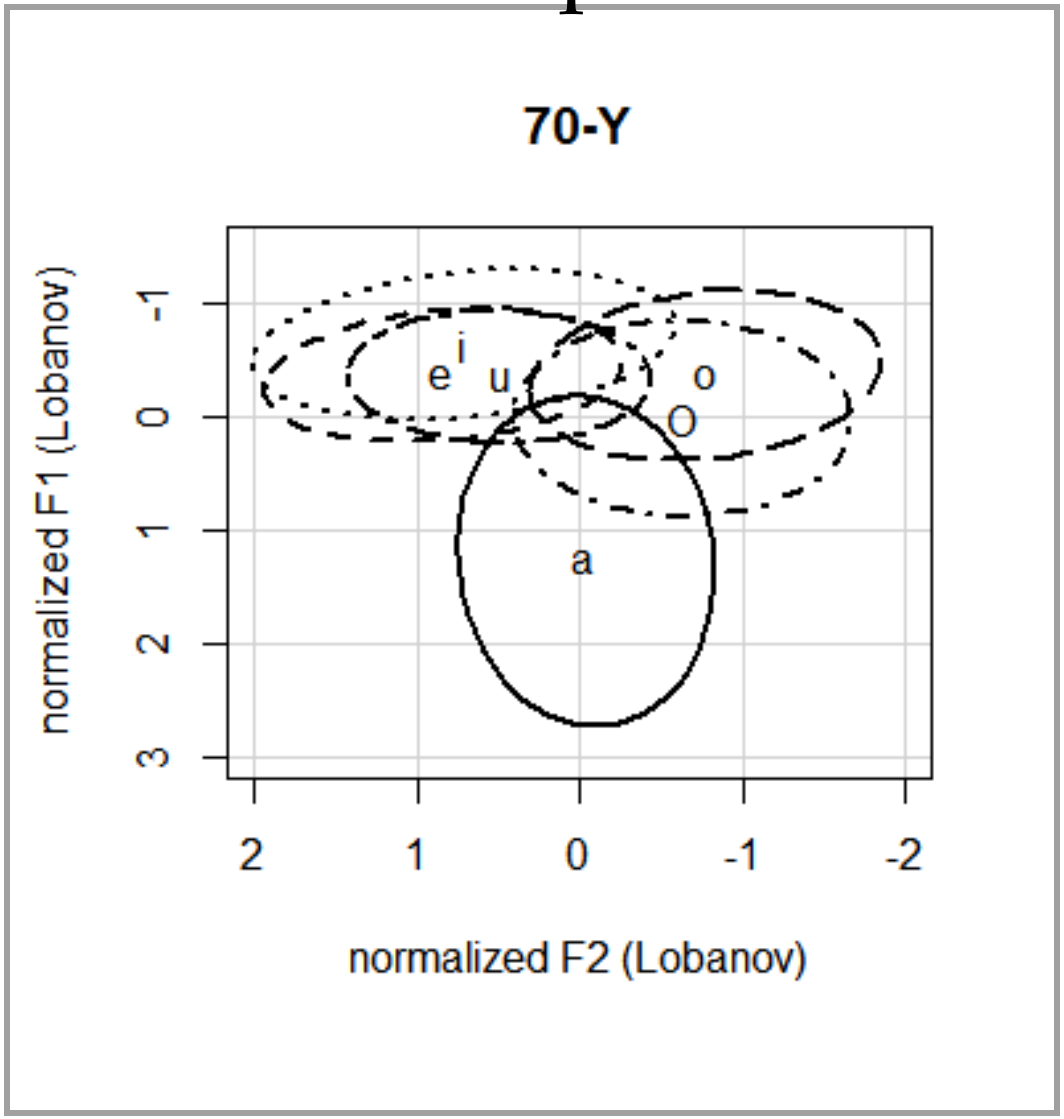
    But with reversal of /i/ & /e/



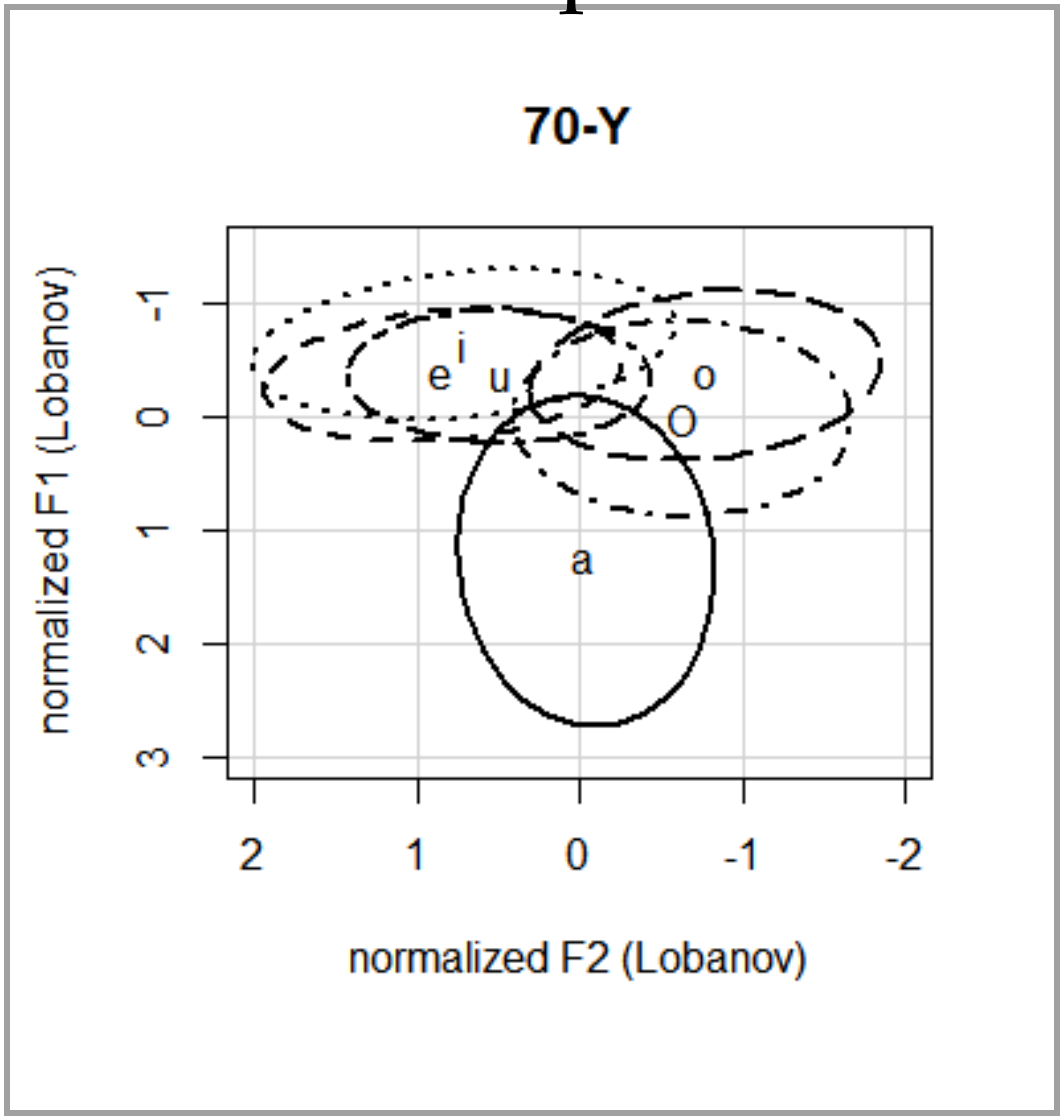
- Results: Among the Vs at one pt in "time"
  - 70-Y:

    FLEECE & FACE; COAT & COT not significantly distinguished on F2.

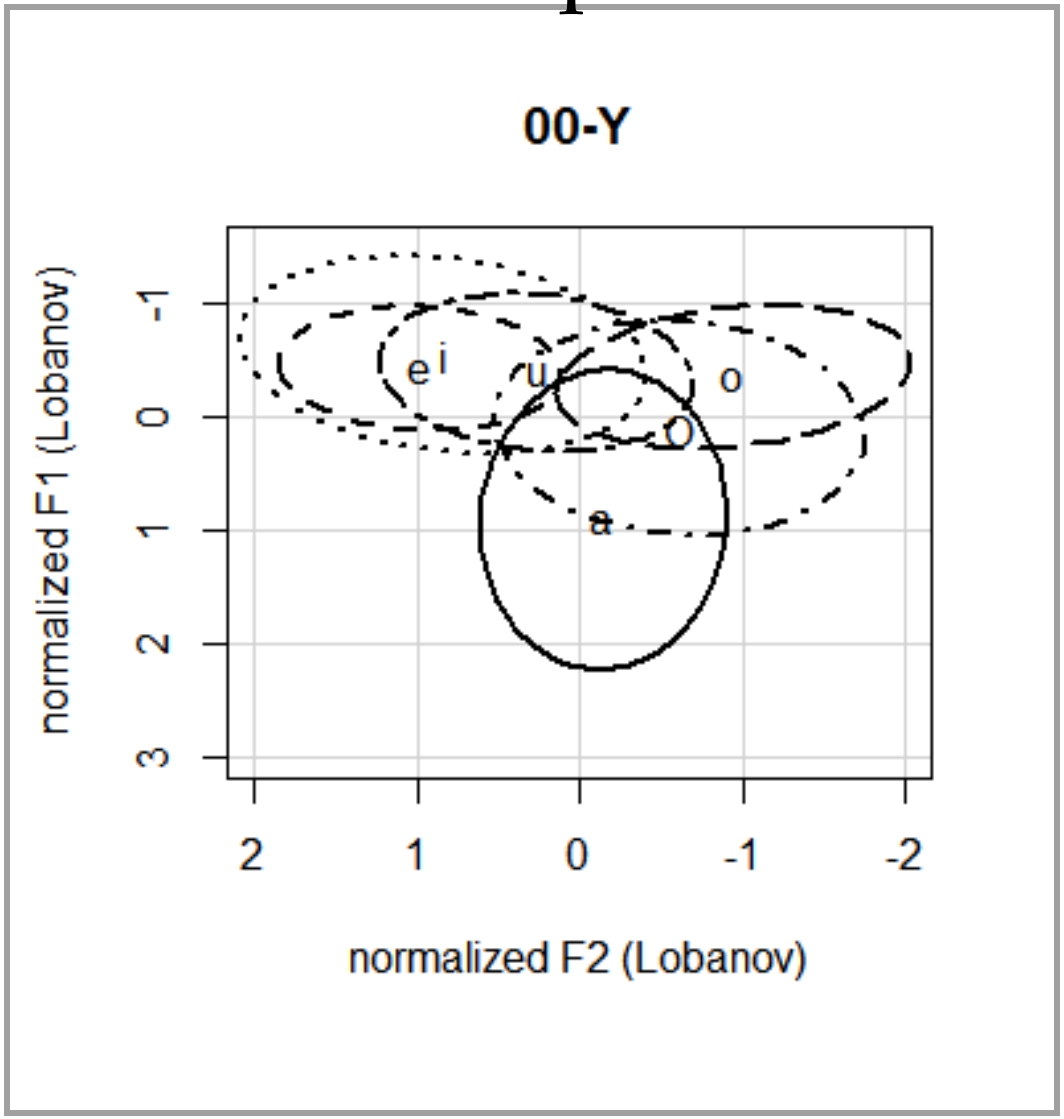
    + Maintained reversal of /i/ & /e/



- Results: Among the Vs at one pt in "time"
  - 70-Y: Additionally, distinctions among FACE, BOOT, and COAT on F1 have been lost.



- Results: Among the Vs at one pt in "time"
  - 00-Y: Persistence of patterns in force at 70-Y.

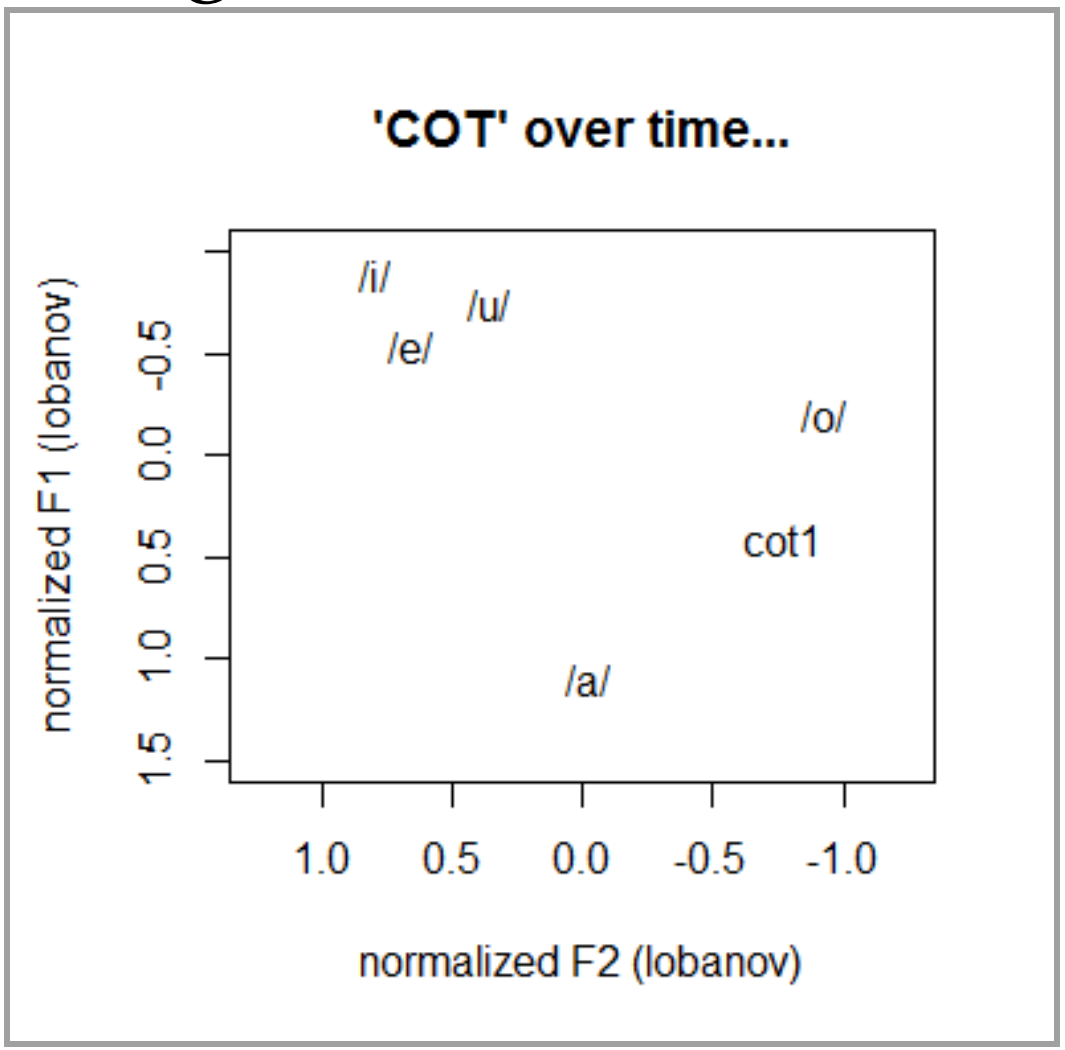


- Results: For any one given V over “time”

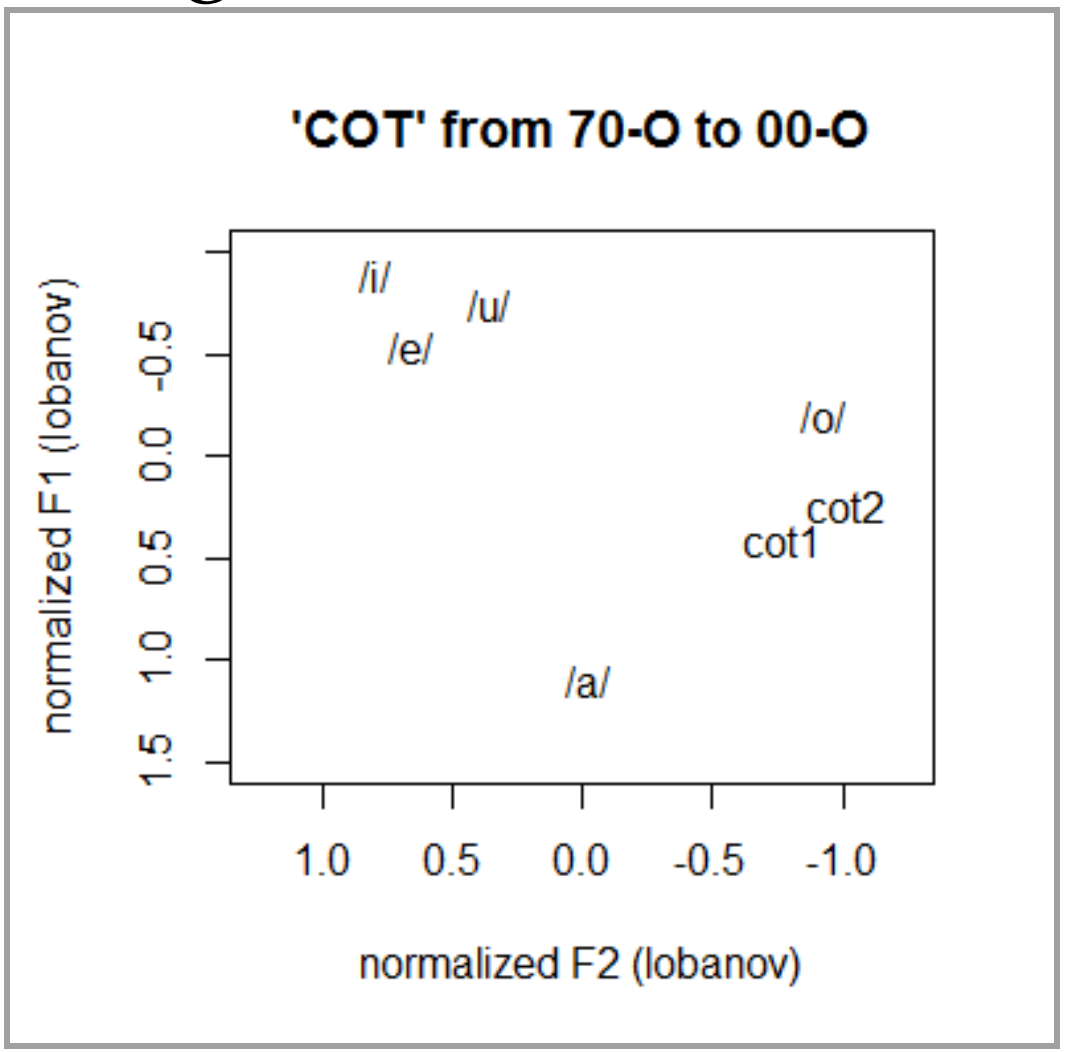
- Results: For any one given V over “time”
  - COT

F1	70-O vs 70-Y	*raising*
F2	00-O vs 70-Y	*fronting*

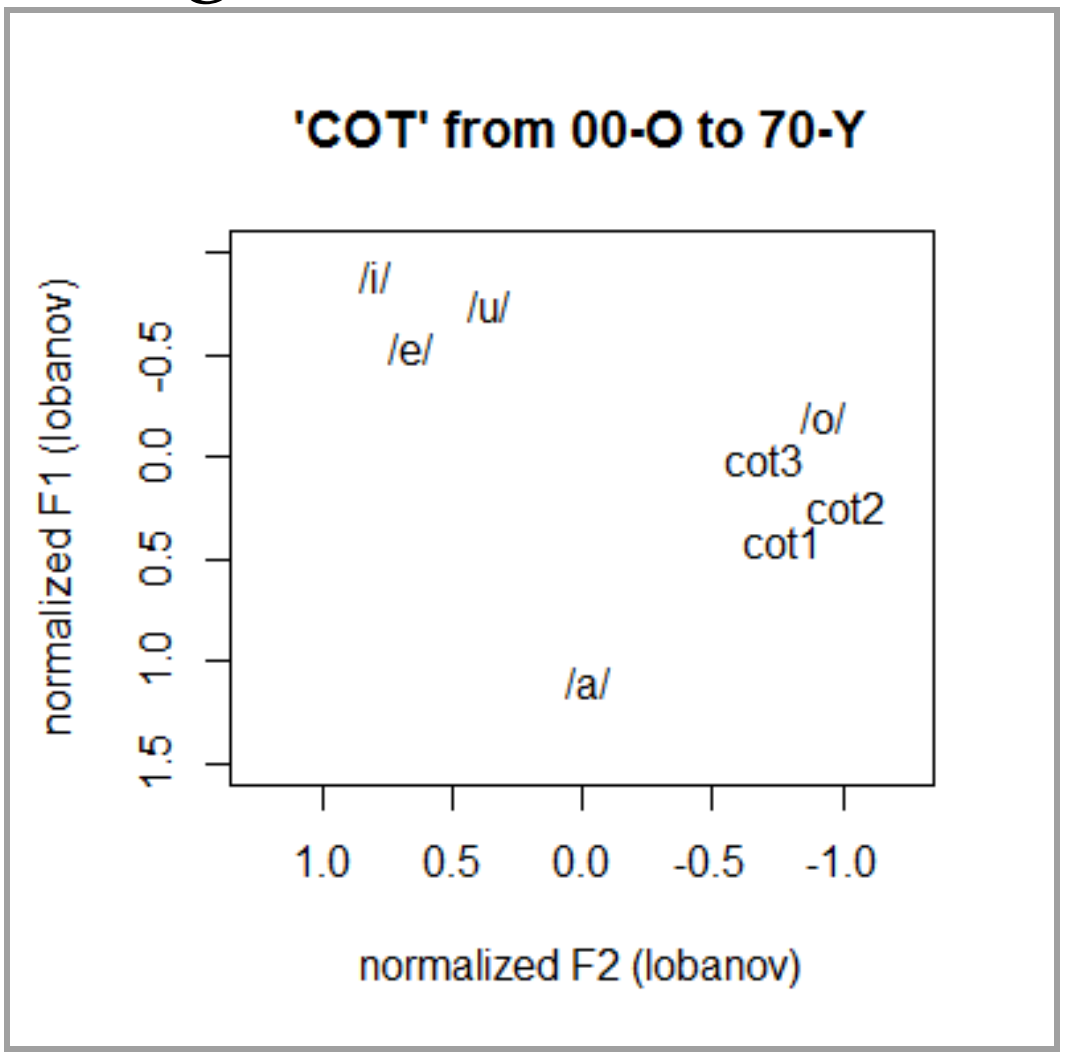
- Results: For any one given V over “time”



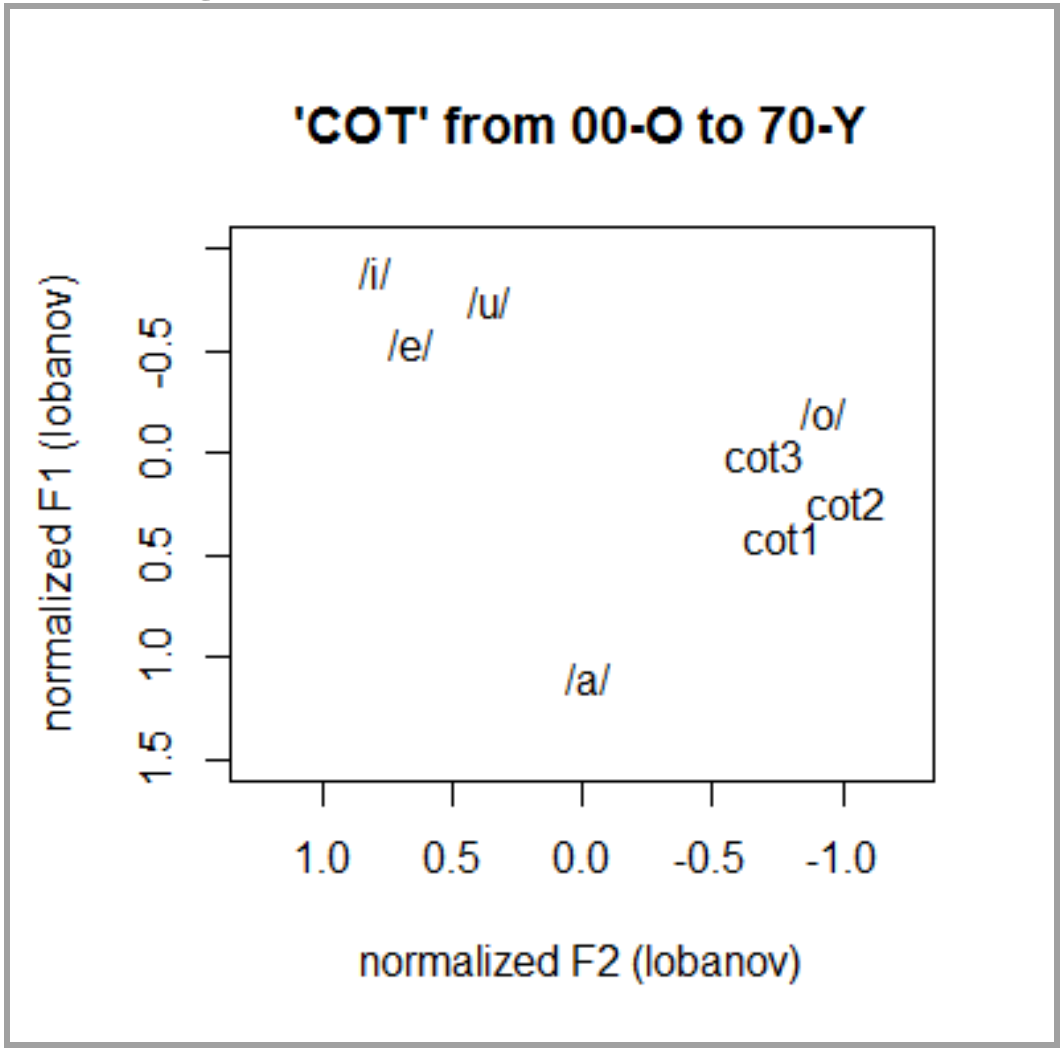
- Results: For any one given V over “time”



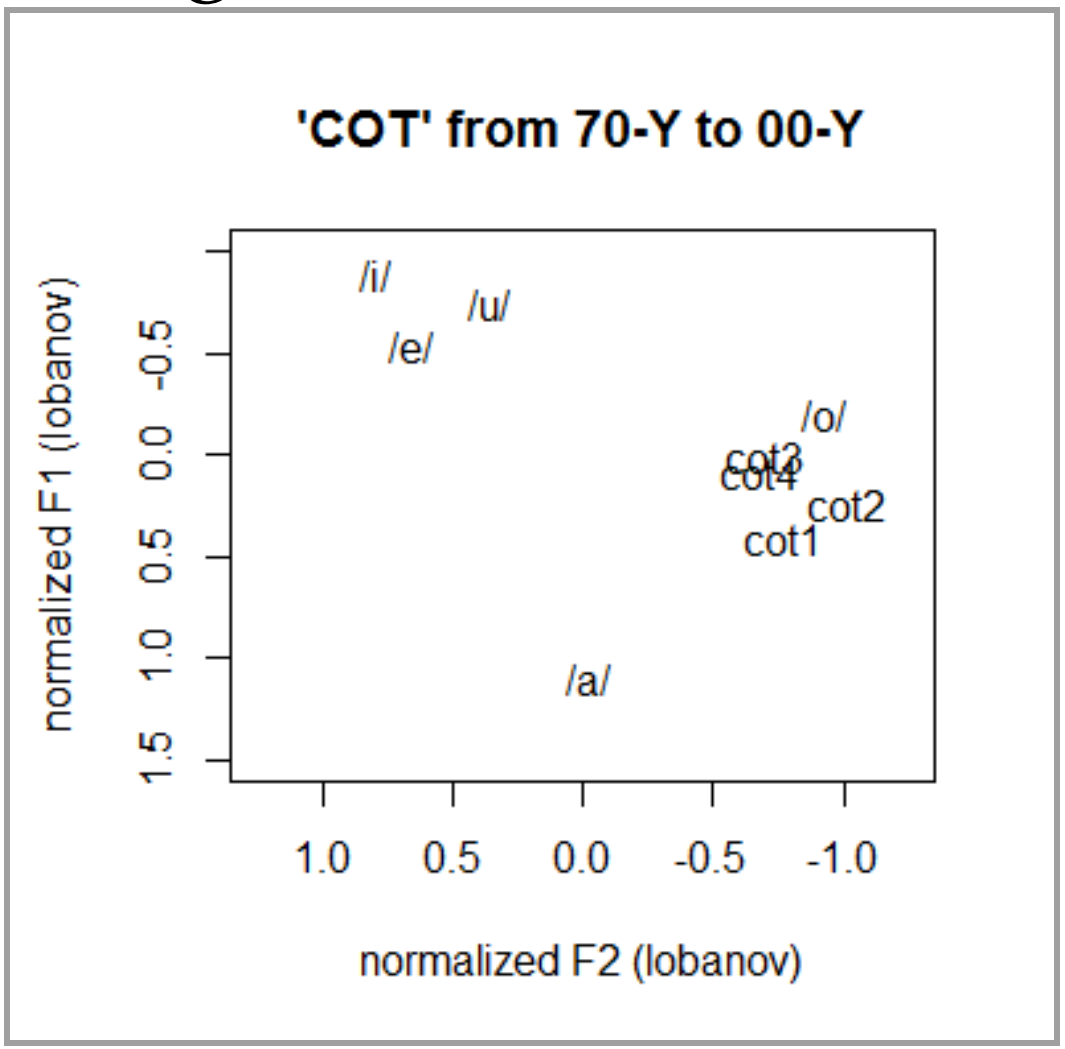
- Results: For any one given V over "time"
  - COT 1 vs COT 3 = *raising*



- Results: For any one given V over "time"
  - COT 1 vs COT 3
    = *raising*
  - COT 2 vs COT 3
    = *fronting*



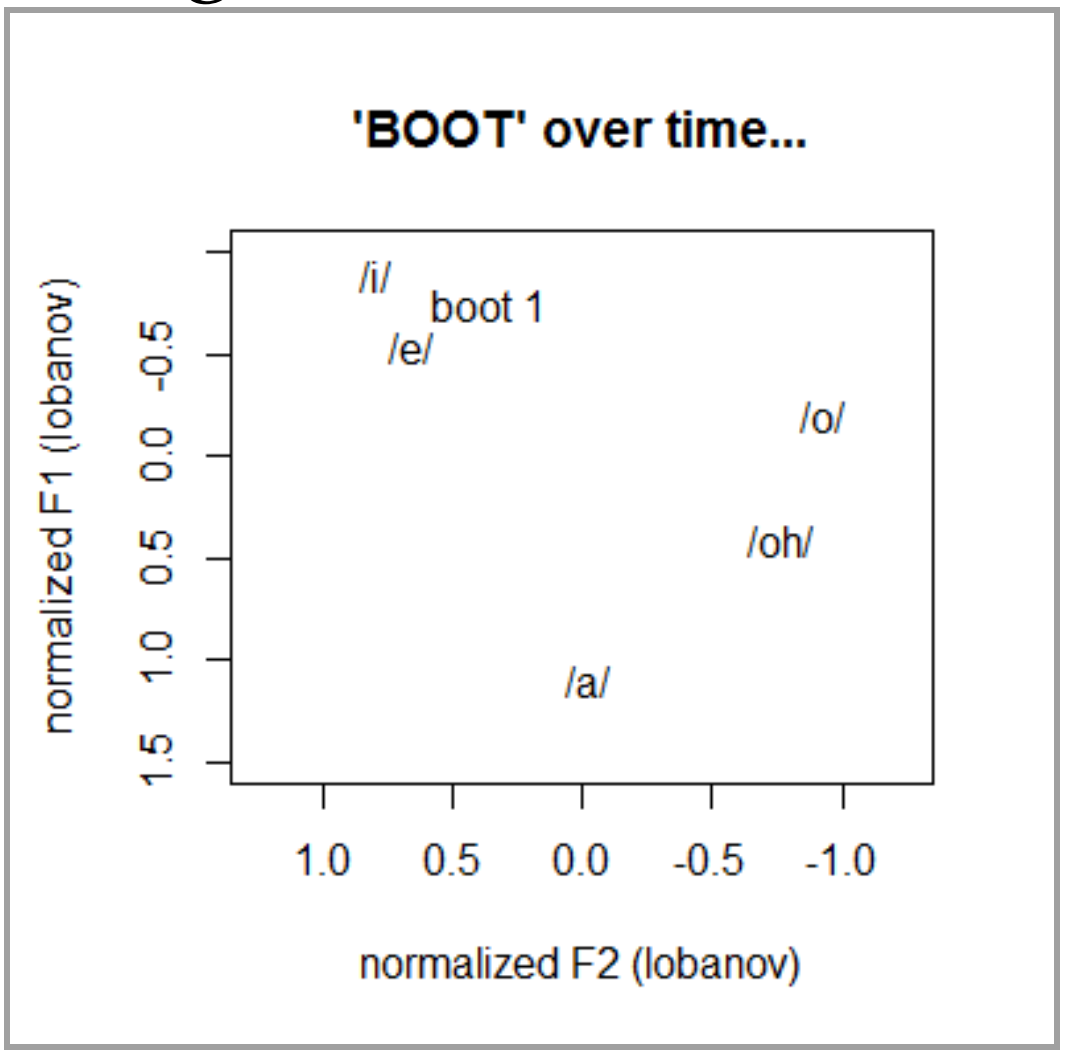
- Results: For any one given V over “time”



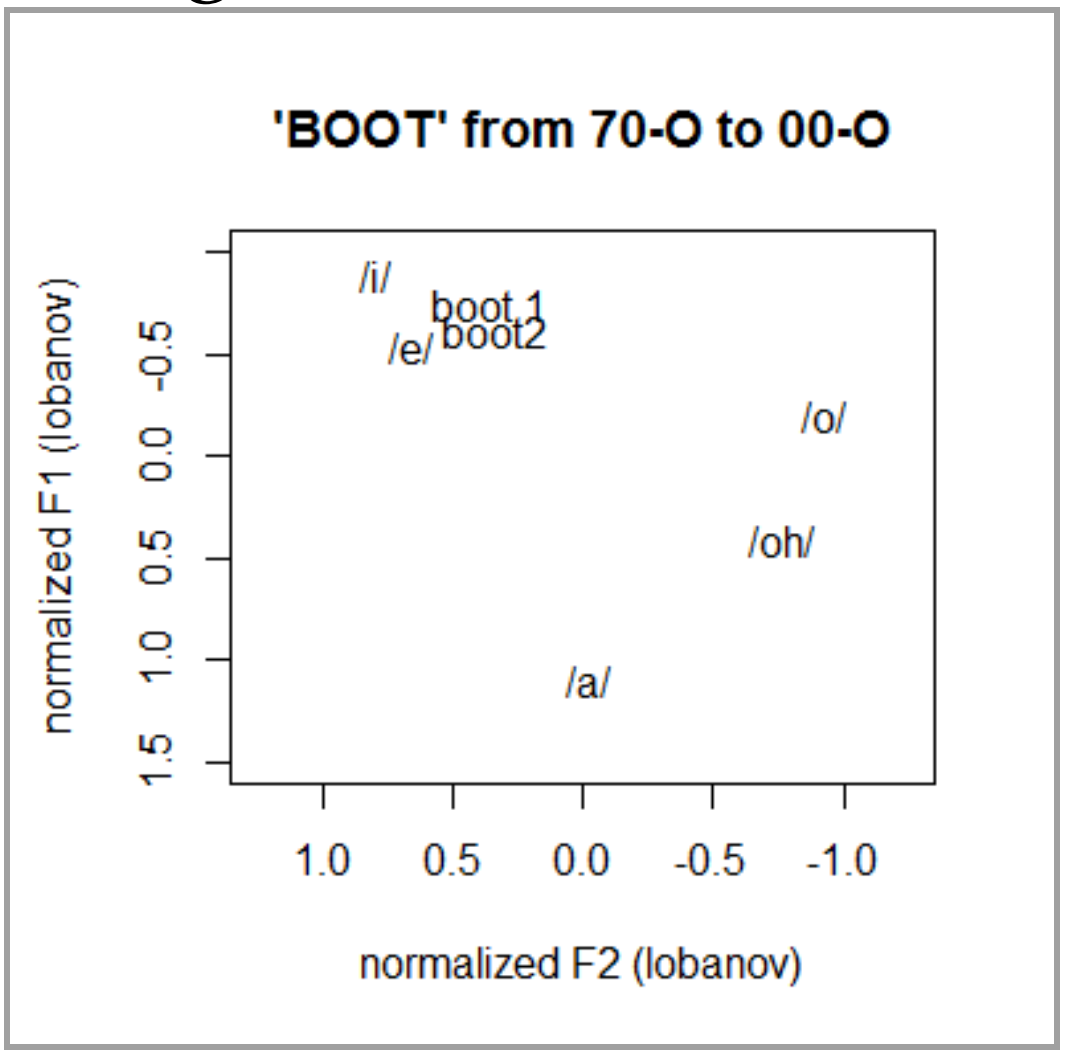
- Results: For any one given V over “time”
  - BOOT

F1	70-O vs {70/00}-Y	*lowering*
	00-O vs {70/00}-Y	*lowering*

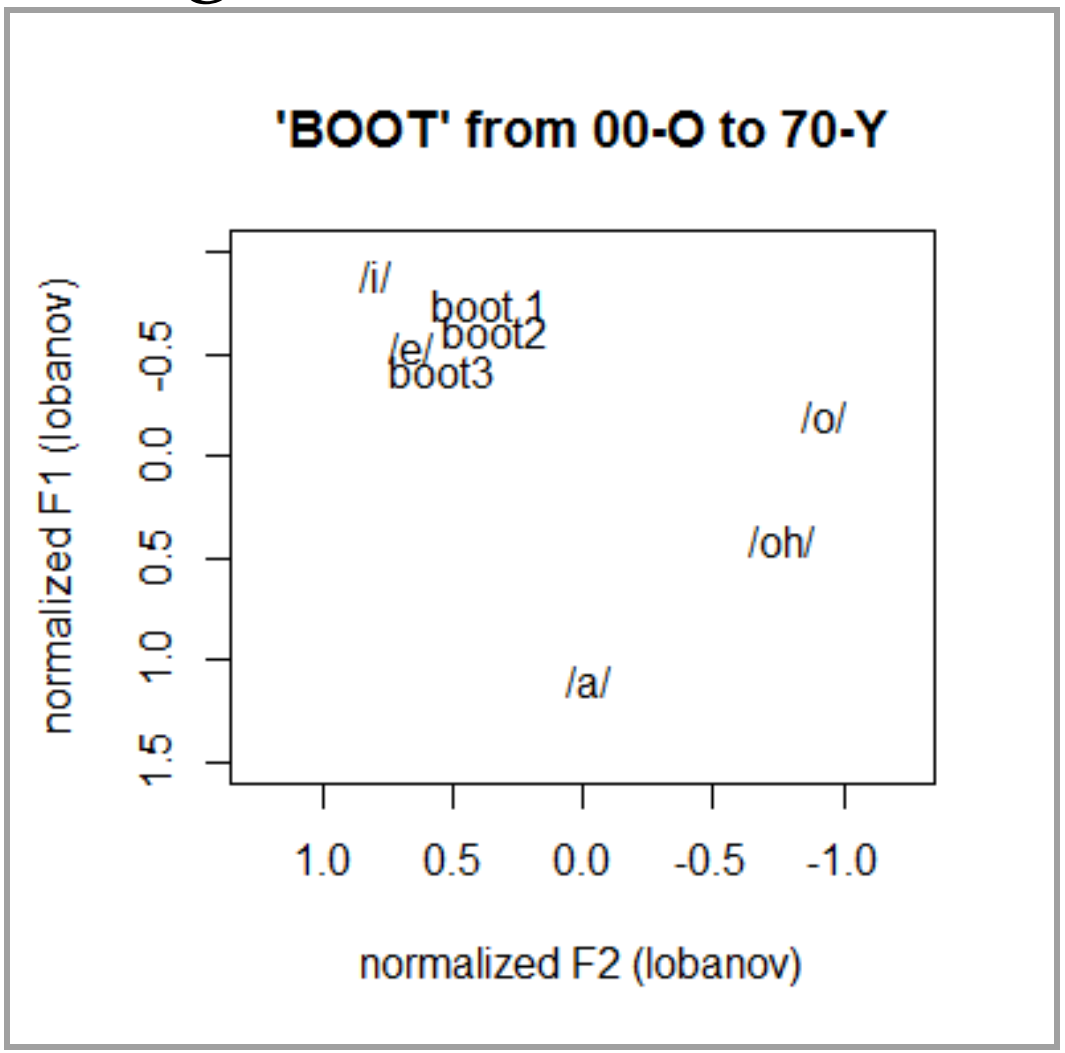
- Results: For any one given V over “time”



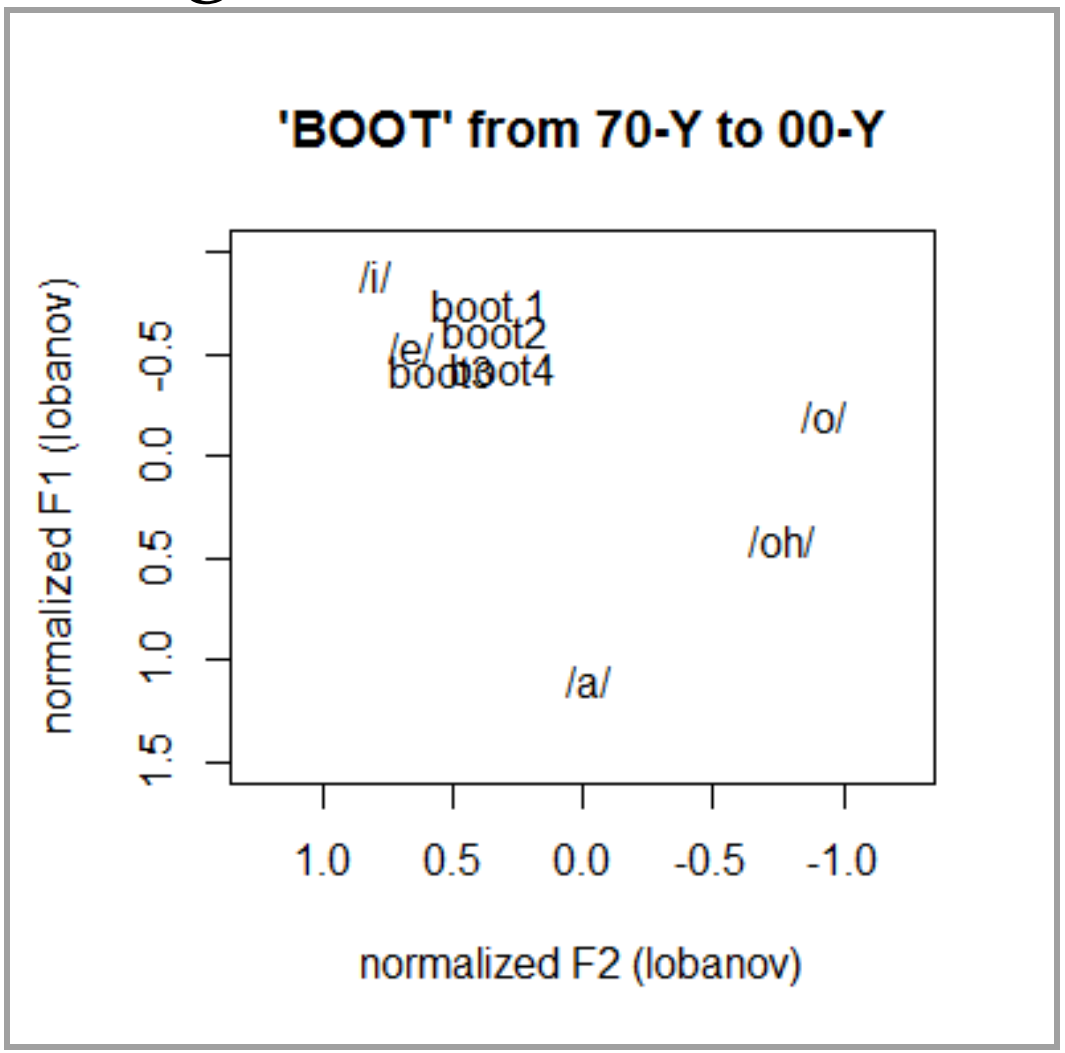
- Results: For any one given V over “time”



- Results: For any one given V over "time"
  - BOOT 1 vs BOOT 3 = *lowering*
  - BOOT 2 vs BOOT 3 = *lowering*



- Results: For any one given V over "time"
  - BOOT 1 vs BOOT 4 = *lowering*
  - BOOT 2 vs BOOT 4 = *lowering*



- Conclusion(s)

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  - Glaswegian Vernacular English
    - Already for 70-Os (b.≈1890s+) /u/=/ʉ/
    - Confirmation of BOOT /ʉ/ lowering
    - Contra, e.g., CAT /a/ raising
    - No confirmation of BOOT retraction
    - New findings: shifting of COT
    - New findings: FLEECE ~ FACE (F2 flip)

- Conclusion(s)
  - Real-time data in SLX research
    - merits
    - pitfalls
  - Automated methods in SLX research
    - merits
    - pitfalls

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- Our deep appreciation to
  - **the Leverhulme Trust**
  - everybody with the Glasgow Phonetics Lab
  - Robert Fromont for expert technical support and advice with LaBB-CAT
  - Ellen Gallagher for so much prep work towards the forced alignments
  - Ludger Evans & Tereza Neocleous for valuable statistical advice

- Our deep appreciation to
  - You

    ...for your attention and any feedback.