

A dynamic acoustic view of real-time change in word-final liquids in spontaneous Glaswegian

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Word-final liquids /r l/ over time

- show weakening and/or vocalization
 - e.g. vocalization of postvocalic /r/ in history of English (e.g. Dobson 1968)
 - e.g. vocalization of syllable-final /l/ in many varieties of English (e.g. Horvath and Horvath 2002)
- evidence? historical record; auditory phonetic analysis of e.g. sociolinguistic surveys (cf Hall-Lew and Fix 2012)

Liquid /r l/ resonance in English

- variation in auditory resonance/secondary articulation as ‘clearness/darkness’ (e.g. Heid and Hawkins 2000; Carter and Local 2007)
- position in syllable
 - e.g. *like* (onset, clear), *hill* (coda, dark)
- regional variety (e.g. *light/right, belly/berry)
 - e.g. RP English: clear /l/ vs dark /r/
 - e.g. Leeds English: dark /l/ vs clear /r/*
- and rhotic varieties, e.g. Scottish English? (Carter 2009)

Acoustics of liquids

- Formants reflect cavities arising from complex sequences of articulatory gestures

/r/: lowered F3: approximant /r/

high F3: uvular /r/; dental trills/approximants

(e.g. Ladefoged and Maddieson 1996; Lennon et al this conf.)

/l/: lowered F1, high F3 (e.g. Recasens 2012)

Clear/darkness: higher/lower F2 (Carter and Local 2009)

Liquids in Scottish English

/r/: from apical taps to approximants

- auditory weakening noted since 1970s,
e.g. *car*, *hurt*, *better* (e.g. Romaine 1978; Lawson et al 2014)
~ high/rising F3 (e.g. Stuart-Smith 2007)

/l/: denti-alveolar, typically very dark

- auditory vocalization to high, back, (un)rounded vowel noted since 1980s (e.g. Stuart-Smith et al 2006)

Research questions

- What are the dynamic acoustic characteristics of word-final /r/ and /l/ in Glaswegian?
- What evidence is there for acoustic change over real-time in Glaswegian?
- Do Glaswegian word-final liquids show any evidence for polarity in resonance?



SOUNDS OF THE CITY



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

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



Oct 2011-December 2014

The Leverhulme Trust

Sample for this paper

<i>Decade of Recording</i>	<i>Old</i> <i>67-90</i> <i>(Decade of Birth)</i>	<i>Middle-aged</i> <i>40-55</i> <i>(Decade of Birth)</i>	<i>Young</i> <i>10-15</i> <i>(Decade of Birth)</i>
1970s	2 male (oral history)		
1980s	2 male (oral history)		
1990s	2 male (oral history)		
2000s	2 male (oral history)		

Acoustic analysis of word-final /r l/

- first 35 usable tokens of singleton /r l/ (280/283)
- parametric analysis of the rhyme/vowel+liquid sequence, e.g. *dear, tell* (e.g. Plug and Ogden 2003)
 - onset of periodicity for vowel –
 - end of visible formant structure
- formant tracks for F1, F2, F3 taken in Praat
- manually corrected using Formant Editor

https://github.com/soskuthy/formant_edit

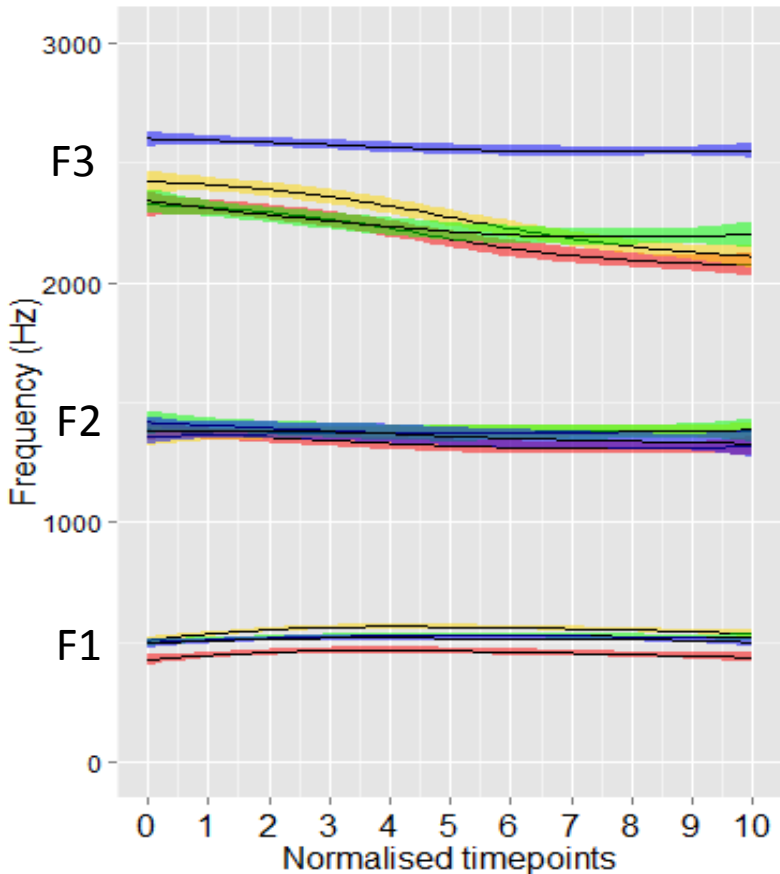
Statistical analysis

- display formant tracks (`stat_smooth` in R)
 - linear Mixed Effects (LME) modelling (`lmer` in R)
 - formant (Hz) \sim normalized timepoint in interaction with other factors:
 - preceding vowel front/backness
 - preceding vowel height/stress
 - following context
 - duration of rhyme
 - decade of recording
- Random factors:
- Speaker (intercept)
 - Decade | word (slope)

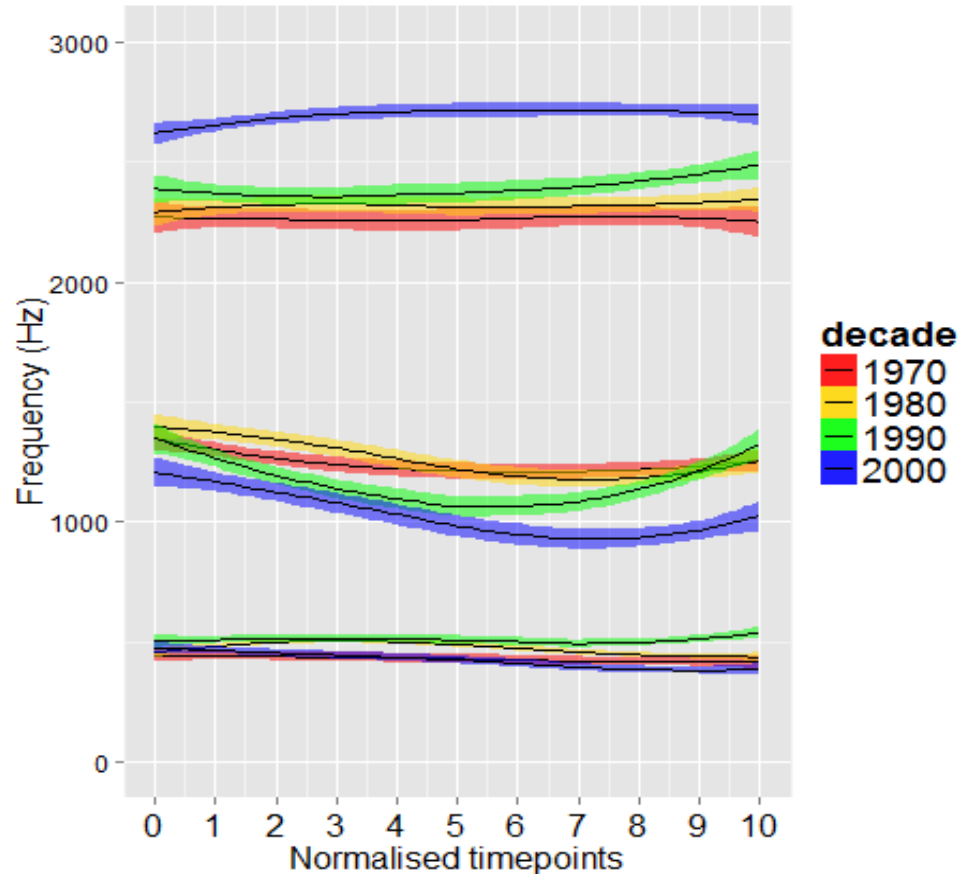
Statistical analysis

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 - **decade of recording**
- Random factors:
Speaker (intercept)
Decade | word (slope)

word-final /r/
e.g. dear

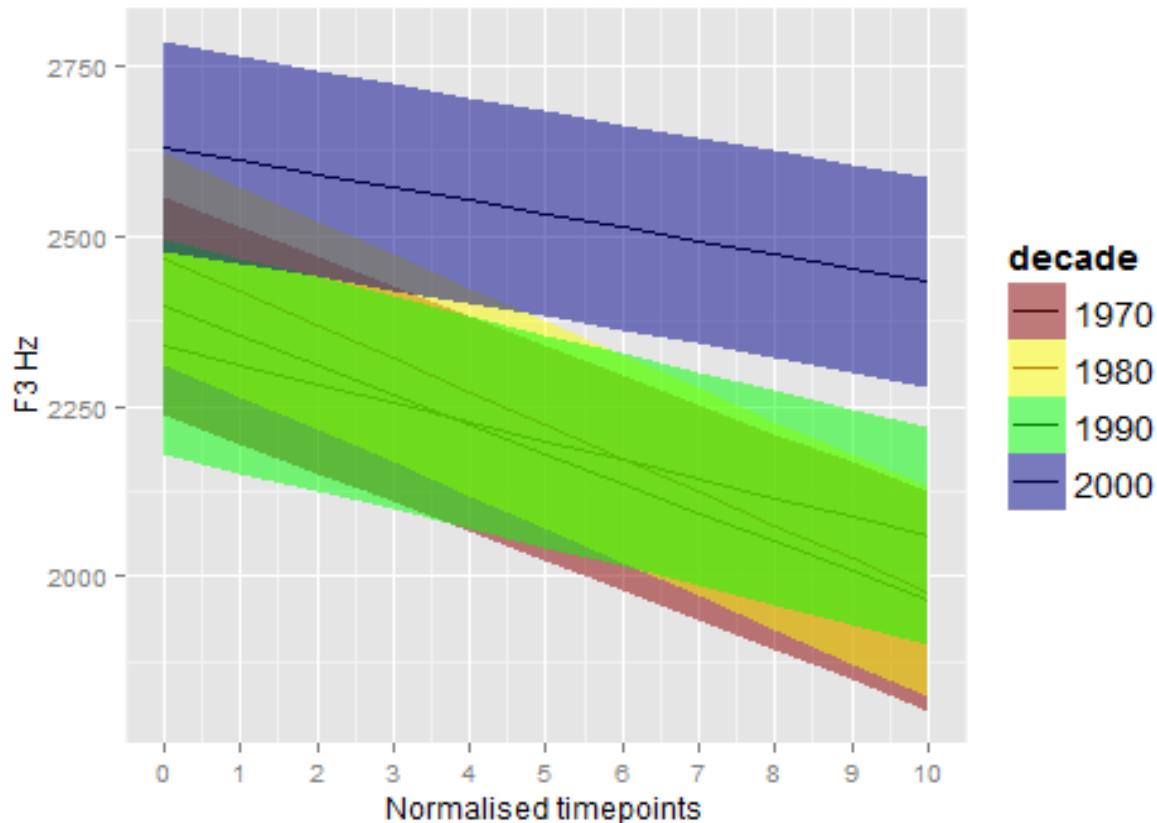


word-final /l/
e.g. deal



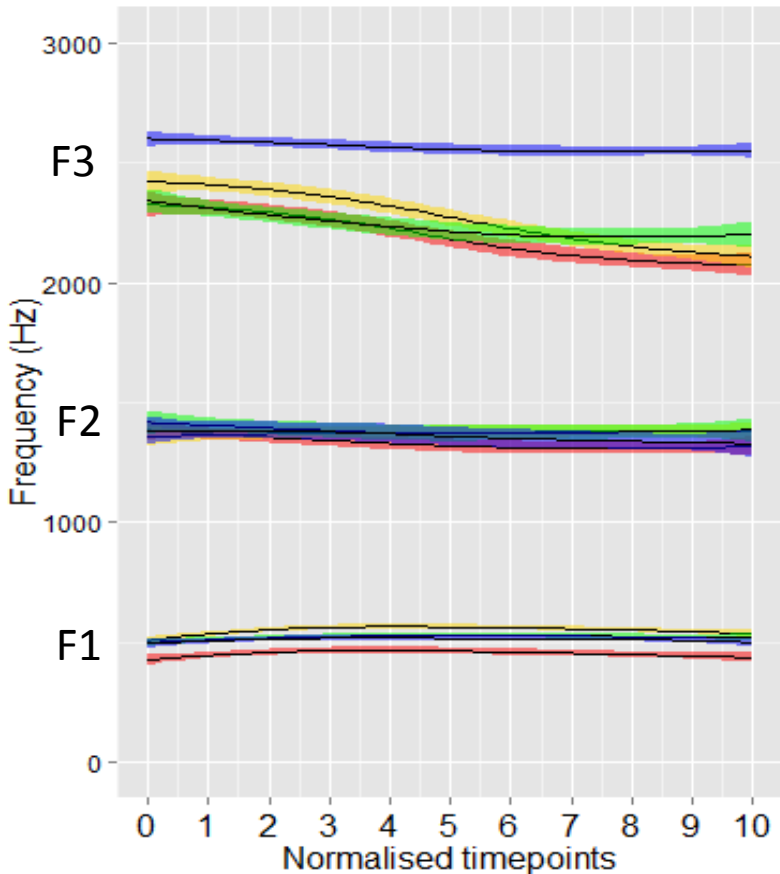
11-point formant tracks across entire rhyme, all phonetic contexts displayed using `stat_smooth` in `ggplot` in R

Change in word-final /r/: F3

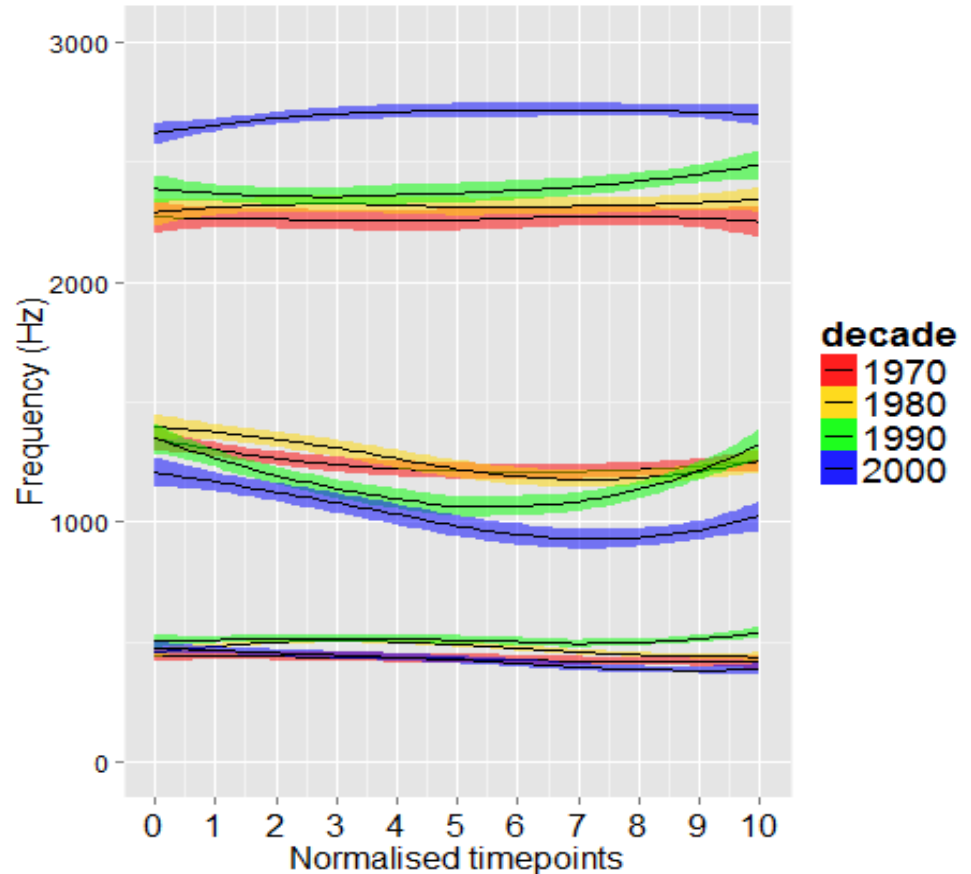


F3 shows much shallower descent into /r/ for speakers recorded in the 1990s (green) and 2000s (blue)

word-final /r/
e.g. dear

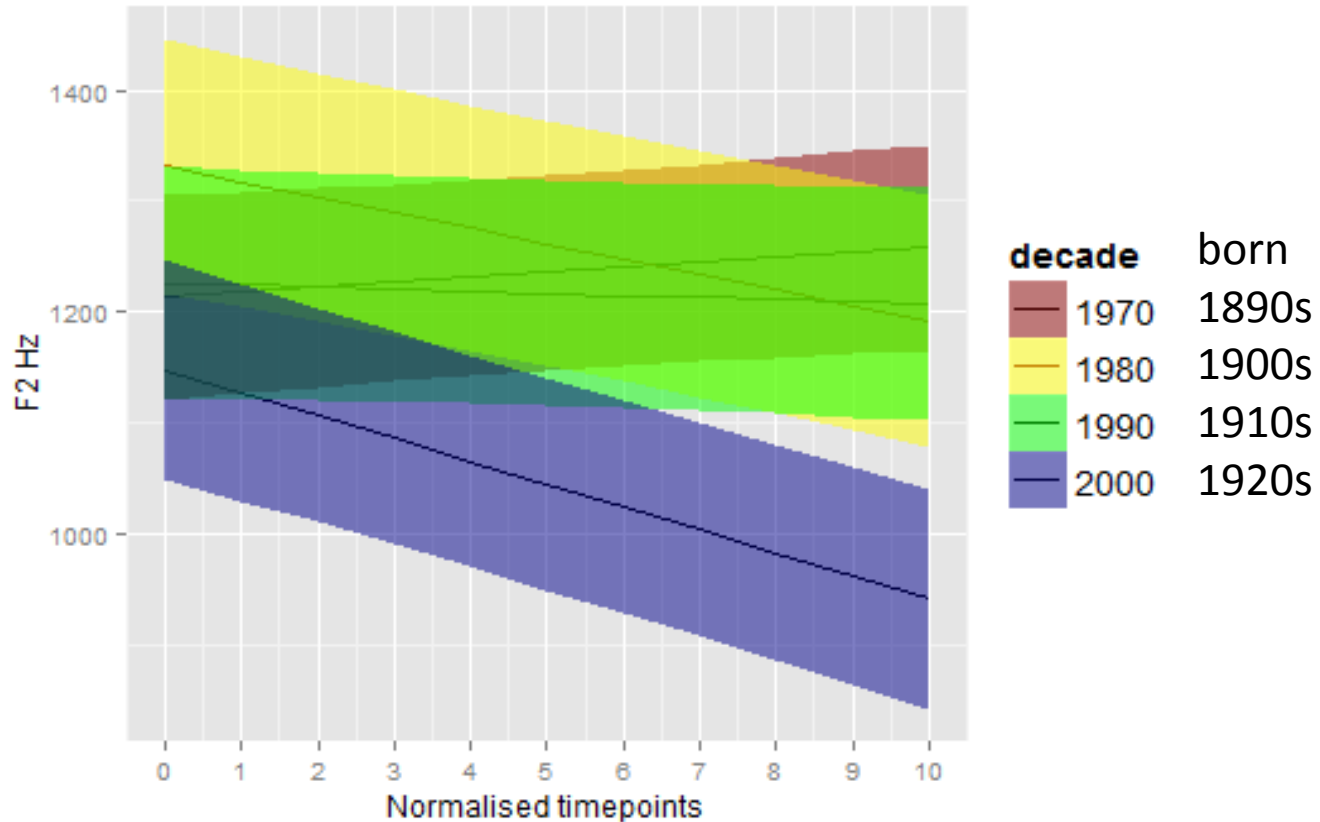


word-final /l/
e.g. deal



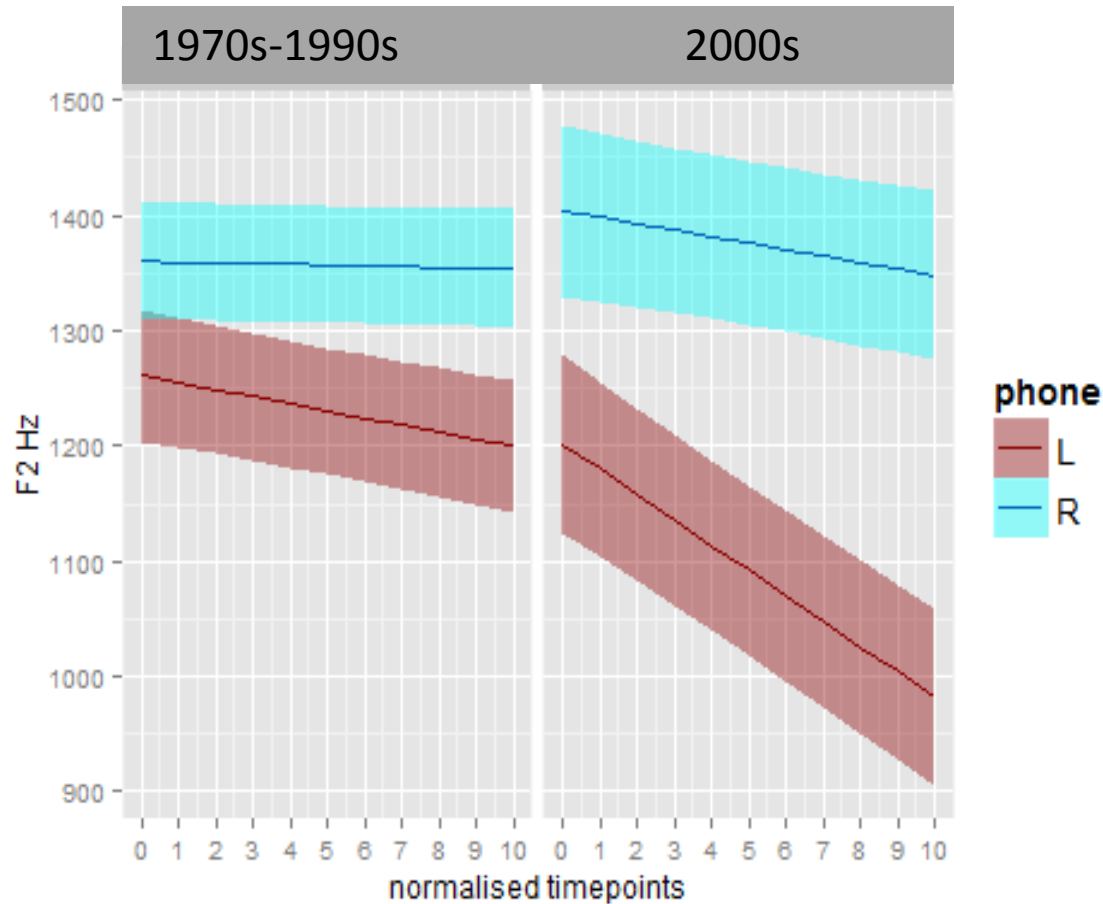
11-point formant tracks across entire rhyme, all phonetic contexts displayed using `stat_smooth` in `ggplot` in R

Change in word-final /l/: F2



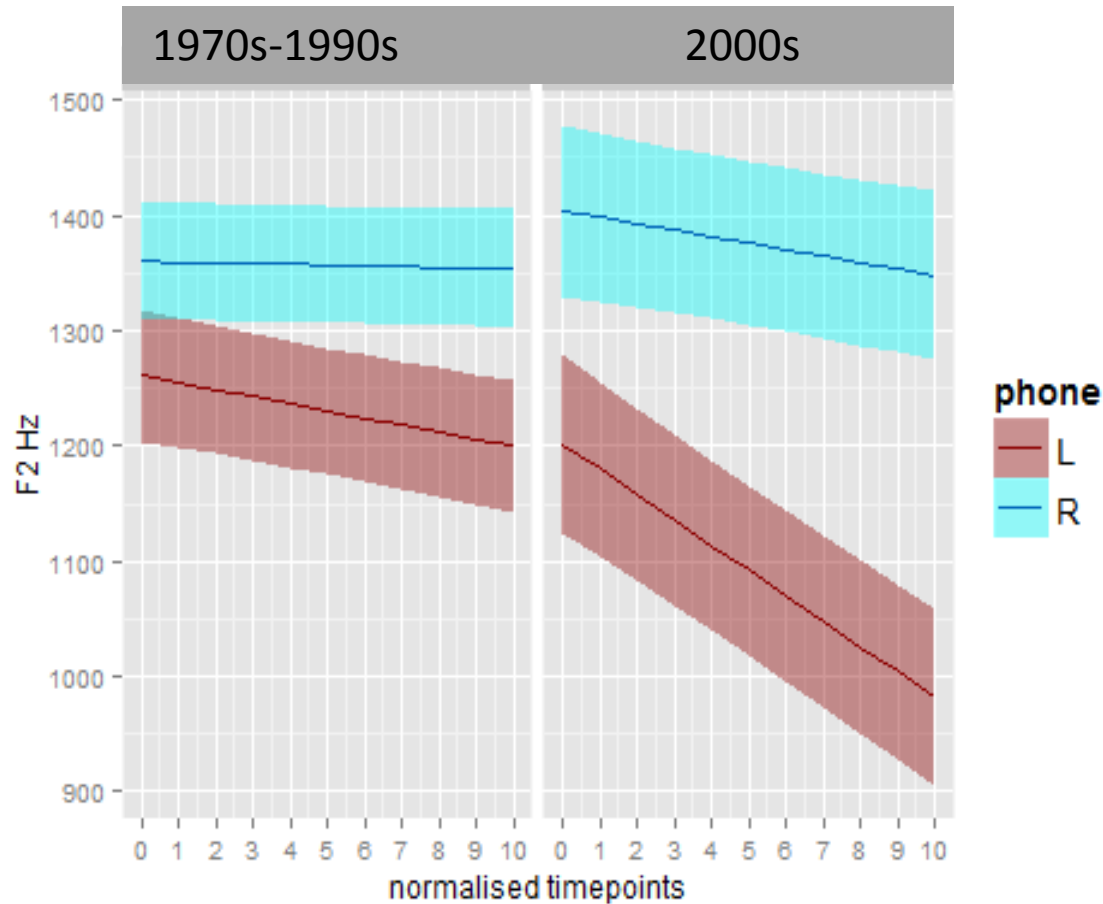
F2 lowers into /l/ for speakers recorded in the 2000s

Change in word-final /r l/: F2



F2 of /r/ consistently higher (clearer)

Change in word-final /r l/: F2



F2 of /l/ is lower, and drops over time (dark and getting darker)

Discussion

- Acoustic evidence consistent with auditory impressions of change in /r/ (Lawson et al 2014)
- Higher F3 for /r/ for speakers born in 1890s/1990s
 - auditory phonetic study of postvocalic /r/ in soldiers recorded during First World War
 - 30% of their variants heard as weak/derhotic
(Stuart-Smith and Lawson in press; cf Stuart-Smith 2007)
- Has the anterior gesture fronted? (e.g. Lindau 1985)

Discussion

- Acoustic evidence consistent with darkening of word-final /l/ over time
- Is 'new'/Cockney L-vocalization observed since the 1980s, a shift away from 'old' Glaswegian?
(cf Stuart-Smith et al 2006)
- Darkening of /l/ also enhances contrast in resonance over time

Next steps

- Small-scale study: more speakers needed
- challenge for /r l/
 - mapping the relationships between
acoustics – auditory categories – articulation



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GULP

Thank you!



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University



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(target) corpus for a real-time study of Glaswegian Vernacular

<i>Decade of Recording</i>	<i>Old 67-90 (Decade of Birth)</i>	<i>Middle-aged 40-55 (Decade of Birth)</i>	<i>Young 10-15 (Decade of Birth)</i>
1970s	6 f, 6 m (1890s)	6 f, 6 m (1920s)	6 f, 6 m (1960s)
1980s	6 f, 6 m (1900s)	6 f, 6 m (1930s)	6 f, 6 m (1970s)
1990s	6 f, 6 m (1910s)	6 f, 6 m (1940s)	6 f, 6 m (1980s)
2000s	6 f, 6 m (1920s)	6 f, 6 m (1950s)	6 f, 6 m (1990s)

Private, force-aligned, electronic corpus of spontaneous speech, available for academic researchers, covering 100 years of Glaswegian in apparent- and real-time, stored in LABB-CAT (Fromont and Hay 2012).