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Sound perspectives? Speech and speaker dynamics over a century of Scottish English

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1. Introduction¹

The impact of perspective on scientific description, thinking and theories, has been recognized for a long time. Baird's (2004) reflections on 'thing knowledge' chart the role of instruments on scientific theory and thought. More recently, Huggett (e.g. 2017), uses the example of shifts in archaeological survey tools, from tape measures and dumpy levels to digital total stations (theodolites), and the accompanying digital visualization mapping tools, not only to illustrate the transformative impact of digital archaeology, but also to point to the cognitive constraints which the same tools and software introduce for archaeologists more generally (following Dijkstra, 2012: 129 on the influence of computer software on cognition). In linguistics too, many different aspects of perspective matter.

This paper is concerned with two aspects of analytical perspective which relate to our understanding of linguistic variation. Structured variability in language occurs at all linguistic levels and is governed by a large range of diverse factors. One aspect of perspective concerns linguistic variation in time and social space: viewed through a synchronic lens, linguistic variation informs our appreciation of language in general, and linguistic and social-cognitive constraints on particular languages at particular points in time; a diachronic lens expands the focus across time. As Weinreich et al (1968) point out, structured variability is integral to linguistic description and explanation as a whole, by being at once the stuff of the present, the

¹ The research summarized here has been carried out in collaboration with a number of colleagues, including: Eleanor Lawson, Brian Jose, Rachel Macdonald, Tamara Rathcke, Jim Scobbie, Morgan Sonderegger, Márton Sóskuthy, and Claire Timmins. I am very grateful to the Leverhulme Trust for their major grant awards, F/179/AX (Accent change in Glaswegian) for my initial survey of Glaswegian, and more recently, RPG-149 (The role of phonetic variation in sound change), which supported the construction and initial analyses of the Sounds of the City corpus. The ultrasound research has been supported by ESRC grants RES-000-22-2032 and RES-06-23-3246. I am very grateful to the editors of this volume, and in particular to Raj Mesthrie, for their invitation to participate, and their friendly support.

reflexes of the past, and the potential for changes in the future. The other aspect, which is often not explicit, is the role of analytical perspective on linguistic variation itself.

My observations are based on a particular kind of structured variability, phonetic and phonological variation, within the sociolinguistic context of the recorded history of Glaswegian vernacular across the 20th century. These two aspects of perspective frame the key research questions for this short paper:

RQ1: What are the ‘things’ which we observe? How do different analytical perspectives on phonetic variation affect how we interpret that variation? Specifically, how do different kinds of observation – within segment/across a phonological contrast/even beyond segments – auditory/acoustic/articulatory phonetic – shape our interpretations?

RQ2: How are these ‘things’ embedded in time and social space? Specifically, how is this variation linked to shifts in social events and spaces over the history of the city of Glasgow? How do we know whether, or when, these ‘things’ might be sound changes (following Milroy, 2003)?

I consider these questions by reviewing a series of studies (including some ongoing and still unpublished) on two segments in Glaswegian English, the first thought to be stable and not undergoing sound change (/s/), the second thought to be changing (postvocalic /r/).

2. Context

2.1. The city of Glasgow

Glasgow is Scotland’s largest city, located on the west of the populous Scottish ‘Central Belt’, its population including the conurbation is approaching 1.6 million (*Scotland’s Census*, 2011). By the end of the 19th century, Glasgow was immensely wealthy and was close to her peak (Gibb, 1983). The city’s fortune derived originally from transatlantic trade in goods and slaves, and came to rely on heavy industry, such as shipbuilding, foundries, locomotive and other engine building, with all the supplying industries (e.g. Reed 1999). Glasgow’s economic decline was slowed by the two World Wars, both of which generated essential business. But even as early as the late 1950s, competition first from America, and then Eastern Europe led to sharp industrial decline. Urban regeneration was promoted in 1990

when Glasgow was designated European City of Culture. The city reinvented itself as a home of service industries, especially call centres, apparently banking on the ‘trustworthy’ and ‘friendly’ accent, but mainly the available workforce (Paddison 1993).

The economic boom in Glasgow resulted in the construction of large numbers of tenement blocks, especially from the 1890s (Edwards, 1999). The population of the city centre increased exponentially as whole families lived in either two rooms, or a ‘single end’ (Horsey, 1990). The structure of the buildings and Glaswegian families meant that tenements housed entire extended families, sustaining substantially close-knit social networks (Milroy, 1980). By the end of World War II, Glasgow’s overcrowded slums were infamous. Glasgow’s City Corporation tackled the problem with two partly completed urban redevelopment plans (Smith and Wannop, 1985). Between the late 1950s and 1974, 70% of the tenements were demolished (Markus, 1999). Poor quality housing ‘schemes’ were built on the edge of the city, without amenities or transport links. Extended families who were used to living together, were either moved to the schemes, sometimes at different ends of the city, or into blocks of flats which led to intense isolation; Horsey (1990).

The changes in urban housing over the 20th century constitute internal factors relevant for language change. Social network structures shifted from (a) very dense close-knit networks, likely to function as a social ‘norm enforcement mechanism’, probably preserving linguistic patterns and resisting innovations (Milroy, 1992), via (b) fragmented networks which would fail to exert such a strong enforcing influence, and also be vulnerable to incoming variation, to (c) close-knit networks once more, now able to enforce existing and new variation (Milroy, 1987). Ideological social stratification was also sharpened. During the urban redevelopment between the 1950s and 1970s, over 250,000 working-class Glaswegians were dispersed through the (well-intentioned) actions of the Glasgow Corporation, mainly middle-class. Aspirational upper-working and lower-middle class Glaswegians were encouraged to occupy garden suburbs and new towns. There was – and still is – demonstrable resentment about the implementation of the resulting housing policies, which is reflected in jokes, stories, poems and songs.

Key external factors, in terms of the impact on mobility, both inward and outward, were the two World Wars. Glasgow sent a substantial number of men to fight in the First World War, and as an important transatlantic port and industrial base, also witnessed substantial numbers of visitors, workers, and traders (GCC, 2014). The Second World War also incurred more

substantial social and geographical mixing. Glaswegians at home were exposed for the first time to other dialects. In 1923, the BBC opened its first broadcasting station outside London, in Glasgow. From the 1960s, television was introduced and swiftly became widespread. The impact of TV on social behaviours was less immediately obvious than had been anticipated, but was discernible also for language in Glasgow (Stuart-Smith *et al.*, 2013).

2.1. Language in Glasgow

Scottish English, spoken in Glasgow, is after (Aitken, 1979) recognized to be a sociolinguistic continuum consisting of the confluence of two distinct linguistic varieties. ‘Glaswegian vernacular’ (also called ‘Glasgow Scots’) is spoken by working-class communities, continues West Central Scots, itself derived from a Northern form of Old English (Macafee, 1983). Scottish Standard English continues a more recent variety of Southern English, first imported into Scotland after James VI of Scotland and I of England moved his court to London, which gained impetus after the Union of the Parliaments in 1707. The aristocracy, and then the emerging middle-classes, sought to eradicate vulgar Scotticisms and to speak English especially for education, the law and the church. Scottish Standard English is spoken by the middle-classes to distance themselves from Glasgow ‘slang’ (Corbett and Stuart-Smith, 2012).

Overt discourses of linguistic correctness and ‘talking properly’ circulate in Glasgow, especially amongst school teachers and professionals (e.g. Macaulay, 1977). This contrasts with pejorative views of Glasgow vernacular as ‘slang’ and ‘bad language’. Both varieties are ‘enregistered’ in Agha (2003)’s sense of being systematically associated with clusters of social and cultural ideologies relating to communities and their stereotypes. Aspects of linguistic enregisterment are shared across Glasgow, such that many can put on either ‘voice’, and both are parodied in local comedy (see e.g. this sketch from a local comedy show: <https://www.youtube.com/watch?v=xk0sS4IFGXA>).

Glasgow was one of the first dialects to be scrutinised using Labov’s variationist methods by Macaulay (1977); the variables he observed (vowels and glottal stop) appeared to be stable. Macafee (1983) was the first to observe some ‘sporadic’ innovations and levelling of traditional features (e.g. [f] for /θ/ in e.g. *tooth*, [k] for /x/ in e.g. *loch*). Subsequent work in the 1990s and 2000s established the integration of innovative phonetic variants, levelling of

some traditional variants, but also maintenance of non-standard Scots variation, resulting in an altered yet still clearly distinctive early 21st century Glasgow vernacular (e.g. Stuart-Smith, Timmins and Tweedie, 2007).

3. Data

The language data are from several sources. The *Sounds of the City* (SoTC) project developed an electronic corpus of spontaneous, naturally-occurring speech with orthographic transcription, and utterance, word and phone-level segmentation from 138 speakers, stored in a LABBCAT database (Fromont and Hay, 2012), allowing fast search and extraction. The corpus covers over 100 years of Glaswegian in real- and apparent time (e.g. Labov, 1994); see Table 1.

<i>Decade of Recording</i>	<i>Old (67-90 yrs) (Decade of Birth)</i>	<i>Middle-aged (40-55 yrs) (Decade of Birth)</i>	<i>Young (10-17 yrs) (Decade of Birth)</i>
<i>1970s</i>	3 f, 3 m (1890s)	7 f, 7 m (1920s)	4 f, 6 m (1960s)
<i>1980s</i>	6 f, 6 m (1900s)	4 f, 12 m (1930s)	2 f, 5 m (1970s)
<i>1990s</i>	6 m, 6 f (1910s)	6 f, 6 m (1940s)	6 f, 6 m (1980s)
<i>2000s</i>	6 m, 6 f (1920s)	6 m, 5 f (1950s)	6 m, 6 f (1990s)

Table 1: The real- and apparent time structure of the Sounds of the City corpus

The real-time construct assumes that recordings made at different points in time can be compared to infer change over time (here from different members of the same city). The apparent-time construct assumes that speakers fundamentally acquire their language system around the age of 7/8 years old, and that this largely travels with them as they age. Thus examining the speech of a 70-year old offers an effective window onto her speech some 60 years earlier. Few have tested the validity of the apparent time construct, but Sankoff and Blondeau (2007)'s panel study of rhotics in Montreal French suggests that it is valid for many members of a community, but not all.

The SoTC recordings are amenable to auditory and acoustic phonetic analysis, and provide the data for /s/. The data for /r/ are from the SoTC corpus and three other corpora: (1) the Berliner Lautarchiv corpus (BL), a set of 6 short recordings of Scottish soldiers made in German prisoner-of-war camps in 1916/17 (Stuart-Smith and Lawson, 2017); (2) the West Lothian 2007 audio-Ultrasound-Tongue-Imaging (UTI) corpus (WL07), spontaneous conversations from 14 working-class boys (12-13 years) in Livingstone (Lawson, Stuart-Smith and Scobbie, 2008); and (3) the Western Central Belt 2012 audio-UTI corpus (WCB12), elicited speech from 16 working- and middle-class girls and boys (12-13 years) made in Glasgow (Lawson, Stuart-Smith and Scobbie, 2018). Full details of the phonetic and statistical analyses summarized in sections 4 and 5 are given in the publications, or are available on request for work in progress. Statistical results reported were significant with p-values < 0.05, if not subjected to further correction.

4. /s/: stable gender marker or change in progress?

4.1. Sex and gender in /s/ in the 1990s (Stuart-Smith, 2007b)

By the late 1990s, phoneticians were questioning whether sex-induced physiological differences in vocal tract size were entirely responsible for female English speakers consistently showing higher frequency /s/ than male speakers. Female speakers might also signal social gender through using more fronted /s/ articulations (Flipsen *et al.*, 1999). At the time, as in many phonetic and sociolinguistic studies until very recently, 'sex' was taken to refer to physiological/biological sex, whereas 'gender' referred to social presentation of gender identity, assuming two gender categories, '(presenting as) male', and '(presenting as) female'.² Socially-constructed gender differences relating to social class are clearly evident in Glasgow society; English in Glasgow offered an ideal context to discover whether /s/ was governed by sex or gender or both.

² There are now numerous studies of /s/ which take a theoretically more nuanced view of sexuality and gendered identities, including now on Glaswegian English.

Stuart-Smith (2007b) analysed all instances of /s/ from a read wordlist (e.g. *seven, ice, icy*) recorded in 1997 from 32 speakers, stratified by gender, social class, and age (older, 40-60 years; younger, 13-14 years). Following Jesus and Shadle (2002), spectral measures of peak and front slope were calculated from Long Term Average Spectra as illustrated schematically in Figure 1.

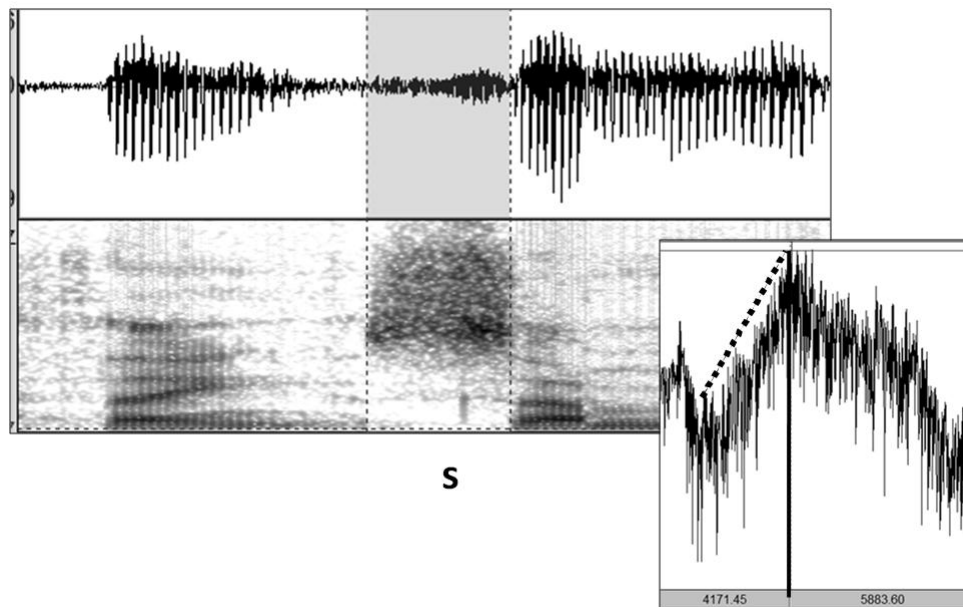


Figure 1: Long Term Average Spectrum (lower right panel) showing peak (solid line) and front slope (dashed line) for /s/ said by a working-class woman in the phrase, I think some of the. /s/ is shaded on the waveform and spectrogram (back panel).

Spectral peak mainly reflects differences in front cavity size/length; smaller/shorter cavities will show higher peak frequencies. Slope differences will shift with cavity differences, but also in response to the shape and degree of constriction.

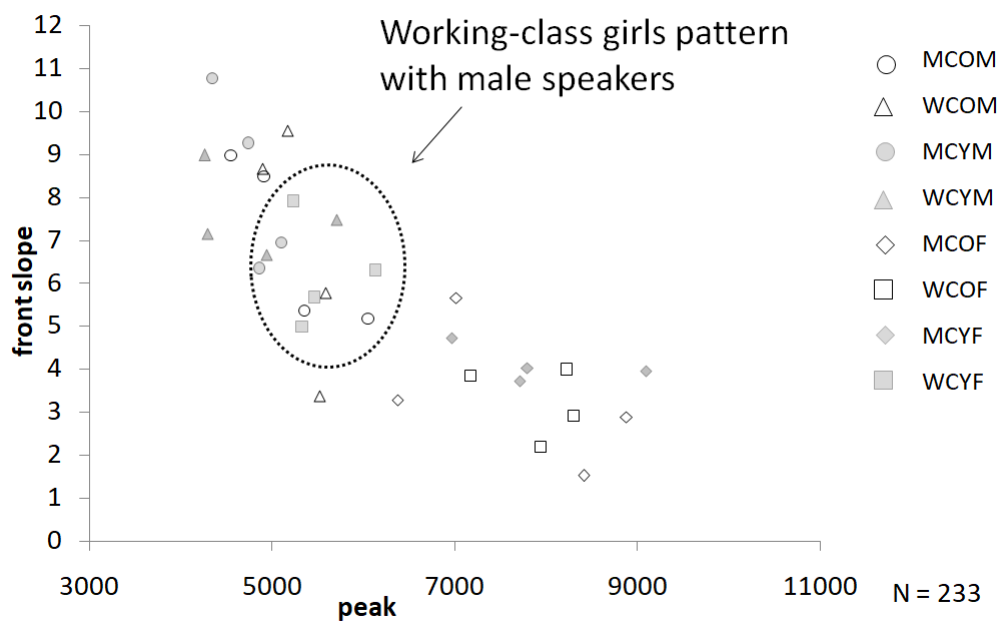


Figure 2: Average spectral peak (Hz) and front slope (transformed dB) for /s/ in 32 Glaswegian speakers recorded reading wordlists in 1997 (MC = middle-class; WC = working-class; O = older; Y = younger; M = male; F = female); adapted from Stuart-Smith (2007b, Fig.3)

Figure 2 shows that both sex and gender affect Glasgow /s/. Female speakers have overall higher peaks than males, but working-class girls' peak measures are much lower, and pattern with those of male speakers. The study confirms /s/ as a stable variable governed by both sex and socially-constructed gender in read speech in the 1990s. The most striking result is the stark distancing of working-class girls from their middle-class counterparts to the extent that they cluster with men. Such sociolinguistic polarization is reminiscent of Eckert's (2000) 'burned-out' Burnout versus Jock girls in Detroit, and likely relates to both the reformed close-knit social networks in the inner-city and the accompanying entrenched class-based ideologies. The read wordlists may have enhanced the differentiation further; Stuart-Smith, Timmins and Tweedie (2007) found that reading the wordlist to the university fieldworker lead to working-class adolescents taking the stylistic opportunity to use more, rather than less, non-standard variants for almost all variables.

4.2. Gender in /s/ and /ʃ/ over time (Stuart-Smith, in progress)

In 2016, I returned to /s/ in Glasgow, changed observational and temporal perspectives, and asked a new set of questions. If a city and its society change over time, to what extent should we anticipate linguistic shifts too? Being kids in the 1970s was different to being adolescents in the 1990s; if social constructions of gender have shifted over time, are these reflected in gendered changes in /s/? In particular, were the 1990s working-class girls' lowered /s/ variants in 4.1. a recent development? And if /s/ is changing, does this also entail a shift in /ʃ/ too? Is /s/ more socially informative than /ʃ/ as I had assumed before (cf Eckert and McConnell-Ginet 2003)? How do our measures affect what we can interpret? Here I report the preliminary results from this new real- and apparent-time study on sibilants in Glasgow.

The new sample comprises spontaneous speech from 32 working-class speakers recorded at two time points, in the 1970s and the 1990s, stratified by gender and age; the 1990s speakers are the same as the previous study. Spectral measures of peak and front slope were calculated in Praat from Long Term Average Spectra, from all possible instances of stressed word-initial /s ʃ/, giving 5095 tokens.

4.2.1. The view from the peak

The main result for peak is a significant three-way interaction for *sound*, *gender*, and *decade of birth* (Figure 3).

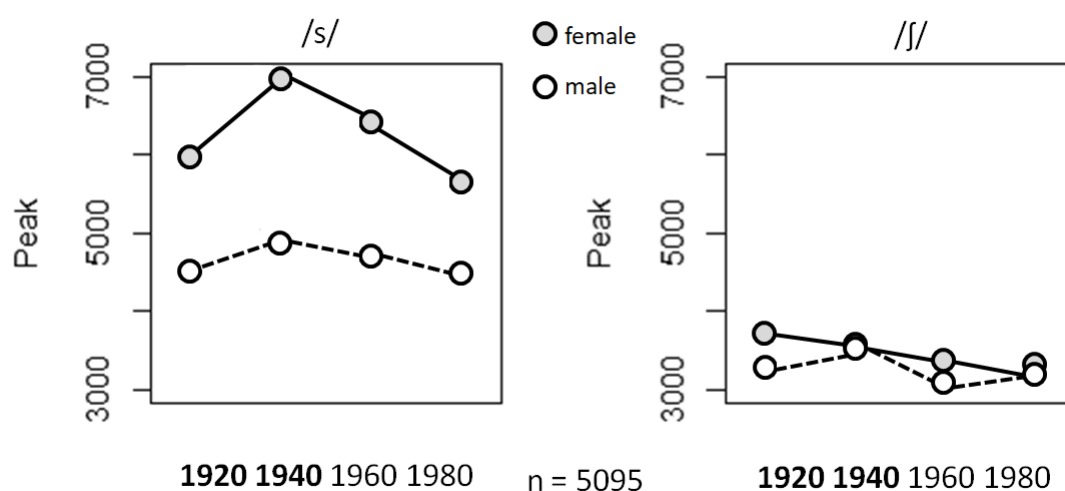


Figure 3: Linear Mixed Effects model (LMEM) estimates of spectral peak (Hz) for initial /s/ /f/ for 32 Glaswegian vernacular speakers by decade of birth (dark font = older; light font = younger), sound and gender.

Female speakers show overall higher peaks than males, but only for /s/. Over time, real-time differences can be seen only for /s/ and for female speakers. Women born in the 1940s show higher peaks than those born in the 1920s, but the reverse is seen in girls. Girls born in the 1980s and recorded in the 1990s show lower peaks than those born in the 1960s and recorded in the 1970s. The 1990s girls show similar peak frequencies to the women born in the 1920s, and show the least difference from male speakers.

Thus far, the peak results reconfirm those of the first study, showing that the acoustic realization of /s/ is governed by social gender (if the differences were only sex-induced, the girls of similar age and vocal tract size should show similar peak frequencies, but they don't). They also add information about /f/, showing that the production of this sound also overrides any physiological constraints – all speakers irrespective of sex show the same low peak frequencies. They also partly confirm the prediction that shifts in social gender might be reflected in speech: the 1990s girls produce lower frequency /s/ than the 1970s girls, and in doing so, they reduce the male/female gender difference in /s/ in spontaneous speech over time. But we can also observe that the 1990s girls seem to be not so much matching male norms, but reverting to older vernacular female Glaswegian norms. This kind of reversal has also been found for other non-standard Scots variables, in the increased use of e.g. *hoose* for *house* in the same speakers (Stuart-Smith, 2003).

4.2.3. The view from the slope:

The main result for slope is also a significant three-way interaction for *sound*, *gender*, and *decade of birth* (Figure 4). /f/ generally shows higher values than /s/, but not for the boys born in the 1980s and recorded in the 1990s, who show a real- and apparent-time increase with respect to the all male speakers. The girls recorded in the 1990s also show significantly higher slope values than the other female speakers. Slope values for /f/ show real-time increases all speakers bar girls.

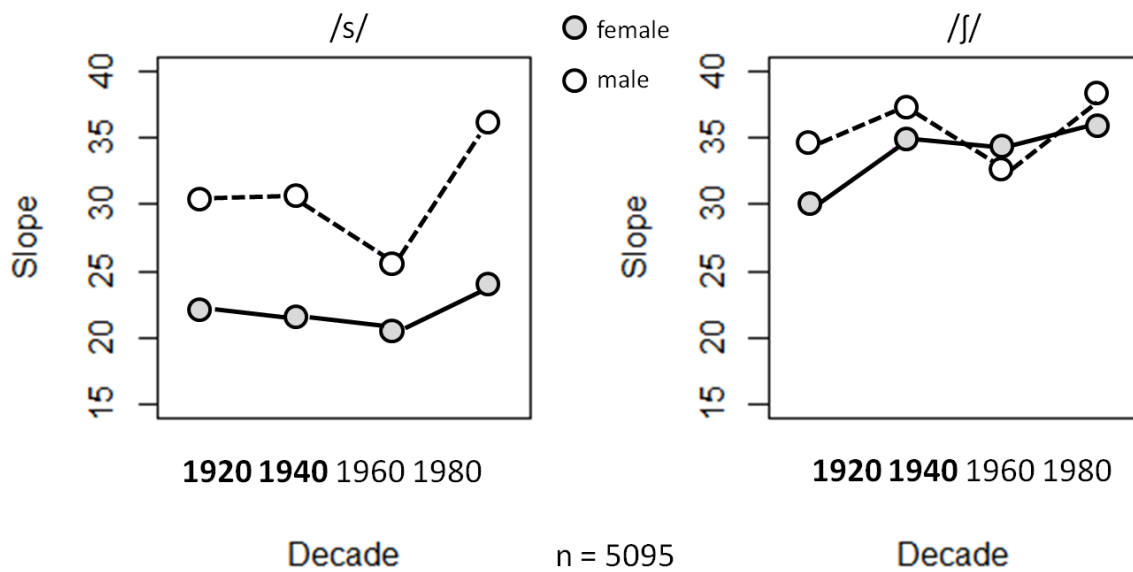


Figure 4: Linear Mixed Effects model estimates of spectral front slope (dB) for initial /s/ /ʃ/ for 32 Glaswegian vernacular speakers by decade of birth (dark font = older; light font = younger), sound and gender.

Adding slope enables new inferences not available from considering peak alone. We see for the first time that boys too show real-time shifts; changes in working-class male identity from the 1970s to the 1990s seems also to entail subtle but significant changes to /s/ production. Specifically they altered their /s/ production so that a key aspect of their acoustic energy distribution, and so auditory quality – sounding more ‘retracted’, is much more like that of /ʃ/. And, for the first time, /ʃ/ production emerges as both socially variable, presumably socially informative, and possibly undergoing change.

4.3. Changing perspectives on /s/ in Glasgow: Implications

These two studies of Glasgow /s/ show several differences in analytical perspective which are rewarding. Expanding focus from /s/ to the sibilant /s ʃ/ contrast, allows us to observe for the first time linguistic and social constraints on the production of both sibilants (not just /s/), and possible change in both sibilants over real- and apparent-time. Inspection of spectral peak confirmed the influence of sex and gender on the synchronic and diachronic acoustic production of /s/, but only for girls. Adding the measure of spectral slope showed that boys are also changing their /s/ production, albeit differently from girls. It also uncovered likely

change in progress for /ʃ/, and showed that for this variety at least, /ʃ/ also appears to be socially informative.

Standing back, expanding the temporal window to an effective real- and apparent-time span of 60 years suggests that Glasgow vernacular sibilants may not be as stable as previously assumed. The real- and apparent-time differences in sibilant acoustics are most evident in the speech of adolescents born in the 1980s and recorded in the 1990s. Their childhoods in turn coincided with the reformation of close-knit networks in the inner-city and peripheral estates, following the period of substantial urban destruction and redevelopment. The first study showed these same working-class girls frozen in a snapshot, polarized from the middle-class girls to the extent that they patterned with men. Now we can infer that this was the result of a fairly recent change in /s/ production, likely enhanced by additional persona construction for reading the wordlist in the presence of the university fieldworker.

5. Postvocalic /r/: long-term change in progress (with a twist)

5.1. Postvocalic /r/ at the end of the 20th century (e.g. Stuart-Smith, Lawson and Scobbie, 2014)

Scottish English is classically observed to be ‘rhotic’, showing consonantal /r/ in coda position in words such as *car* or *card* (Wells, 1982). But even by 1901, there were reports of weak rhoticity as characteristic of the urban speech of the ‘degenerate Glasgow-Irish’ (Trotter in Johnston, 1997: 511); refined speakers of the same period used apical trills, taps, or postalveolar approximants (e.g. Grant and Dixon 1921). The first sociolinguistic studies on Scottish postvocalic /r/ were in Edinburgh, and showed erosion of the audible consonantal /r/ (‘derhoticisation’), to plain vowels, or vowels with pharyngealisation, especially in working class male speakers. Female speakers preferred postalveolar approximants (e.g. Speitel and Johnston, 1983). At the same time, Macafee (1983) reported similar auditory weakening in Glasgow. Subsequent sociolinguistic studies in the 1990s and 2000s confirmed extensive derhoticisation in working-class speakers (male and especially female), alongside postalveolar or retroflex approximants in middle-class speakers (e.g. Stuart-Smith 2003).

In the early 21st century, there is now a clearly polarized sociolinguistic continuum for Scottish rhoticity, from audibly non-rhotic or weak rhoticity in working-class speech to

auditorily strong rhoticity in middle-class speech, with most advanced derhoticisation in Glasgow. The continuum seems to combine the reflexes of two changes in progress. The first appears to be a long-term change from below, likely dialect internal, towards derhoticisation, which may or may not ultimately lead to non-rhoticity. Anglo-English non-rhoticity doesn't seem to be relevant mainly because the phonetic outcomes of derhoticisation are so different from Anglo-English non-rhotic cognates. The second seems to be a change from above, led by middle-class female speakers, exploiting the postalveolar approximant to mark confidence in a specifically Scottish (not British), middle-class (not working-class) identity; Johnston (1985).

5.2. The variants of postvocalic /r/ (Lawson, Stuart-Smith and Scobbie, 2008; Stuart-Smith, Lawson and Scobbie, 2014; Lawson, Stuart-Smith and Scobbie, 2018)

Establishing the auditory and acoustic phonetic variants for postvocalic /r/ has posed major challenges. The first sociolinguistic studies used narrow auditory transcription, translating the responses to systematic repeated listening in terms of IPA symbols reflecting quasi-articulatory categories (Ogden, 2009). Different approaches to transcribing derhoticisation entailed different theoretical perspectives. Recognizing a large number of phonetic variants emphasises the process of variation and change as gradient ('R-vocalisation', e.g. Stuart-Smith, 2003). Coding the outcome as categorically 'rhotic' or 'non-rhotic' (e.g. Romaine, 1979), suggests a final outcome of 'R-Loss'. Auditory categories for weakly articulated consonantal /r/ have also been hard to assign, especially distinguishing between instances where no articulation was audible at all (no /r/, 'plain vowel') and those where the vowel was produced with some residual secondary articulation, such as velarisation, uvularisation or pharyngealisation (derhoticised, 'velarised', 'uvularised', 'pharyngealised' 'vowels').

The acoustic characteristics of approximant rhotics with an anterior constriction are well known from studies of American English /r/. The expected acoustic signature is a drop in frequency of the third formant (F3) (Stevens, 1998). The acoustics of weak rhotics, especially those produced with a veryweak dorsal articulations, have received far less attention. Contrary to anterior approximant /r/, uvular and dorsal approximant /r/ typically shows a high or rising F3 (Ladefoged and Maddieson, 1996). Weak, derhoticising /r/ can also be tricky to segment acoustically, because there may be little visible acoustic energy corresponding to an

'r' on the spectrogram. It may also be difficult to obtain F3 measures because weak /r/ also shows attenuation of acoustic energy above the second formant (F2) (Stuart-Smith, 2007a).

Shifting our observational phonetic perspective to articulatory investigation using Ultrasound Tongue Imaging (UTI) has resolved some of these difficulties. UTI uses medical ultrasound technology to produce visual dynamic representations of tongue configuration and tongue movement (for information on UTI, see www.seeingspeech.ac.uk).

Lawson, Stuart-Smith and Scobbie (2008) show how UTI data from the WL07 corpus reveal a likely mechanism for derhoticisation through gestural asynchrony. Specifically, we found derhoticised variants to show (1) an early tongue root retraction gesture, and (2) a tongue tip raising gesture, delayed with respect to the offset of voicing (see Figure 5). This articulatory pattern helps account for the difficulty in fixing an auditory percept for derhoticising /r/, as the delayed anterior gesture may be partly or fully masked by a following consonant, or it may be partly or fully inaudible if voicing has ceased. The early tongue root retraction gesture accounts for auditory impressions of pharyngealisation or uvularisation being produced in pre-rhotic vowels. The shifts in cavities resulting from this complex gestural interplay may also account for the weakened acoustic energy during the rhotic, and the ambiguous acoustic signal which requires listener experience to parse accurately (Lennon, 2017).

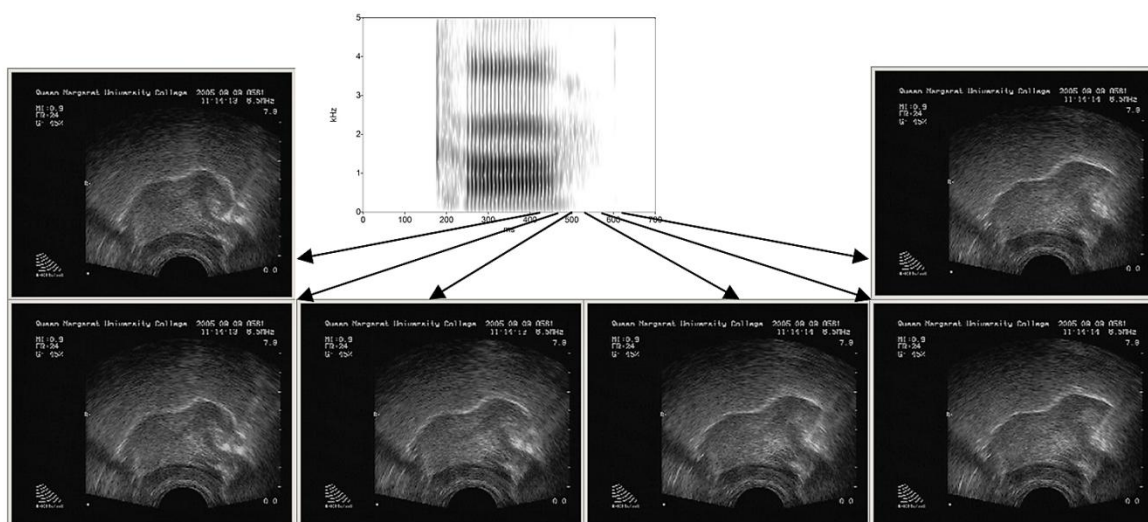


Figure 5: Key UTI frames of an adult male speaker from West Lothian, saying car with a covert tip-raising gesture in the production of coda /r/. The ultrasound images correspond to the time point of the spectrogram. (Tongue root is to the left and tongue tip to the right of the

UTI frame.) Moving through the frames, it is clear that the tongue front and tip begins to rise after voicing has ceased, and achieves its maximum raising well after (Fig.9 in Stuart-Smith, Lawson and Scobbie, 2014)

Our most recent study, Lawson, Stuart-Smith and Scobbie (2018), provides the first empirical confirmation for the articulatory ~ acoustic ~ auditory relationship pertaining for the entire sociolinguistic continuum of postvocalic /r/, from derhoticising speakers through to those who show auditorily very strong /r/. We analysed 44 /r/-ful words elicited from 15 speakers from the WCB12 corpus to consider the links between auditory /r/-fulness (using an auditory r-index), acoustic characteristics (F1 to F4 values) and articulatory timing (relationship of the maximum anterior tongue gesture with respect to the offset of voicing). Figure 6 shows the plots for the strongest correlations.

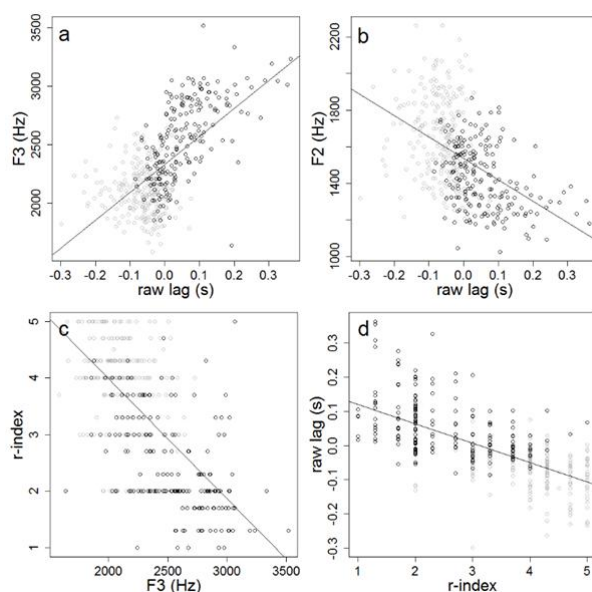


Figure 6: Scatterplots of strongest correlations for 15 adolescent speakers of Glaswegian: (a) raw lag ~ F3 (b) raw lag ~ F2 (c) F3 ~ r-index (d) r-index ~ raw lag. r-index runs from 1 = weakest (no /r/) to 5 = auditorily strongest ('schwar', a vowel with tongue bunching throughout; Lawson, Scobbie and Stuart-Smith, 2013); positive raw lag indicates time of tongue maximum after offset of voicing, negative lag time of tongue maximum before offset of voicing. Working-class datapoints are black, middle-class datapoints are grey. (Fig. 3 in Lawson, Stuart-Smith, and Scobbie 2018)

From the derhoticisation pole, the results show: the greater the tongue gesture lag, the weaker the auditory percept, and the higher the F3 value; conversely from that of auditory /r/

strengthening, they show: the earlier the tongue gesture, the stronger the auditory percept, and the lower the F3 value. We could only uncover these phonetic relationships for derhoticisation because we used a socially-stratified speaker sample, which is still unusual for laboratory phonology (Scobbie and Stuart-Smith, 2012).

These changing analytical perspectives on phonetic characterisations of postvocalic /r/, have substantially influenced our thinking and interpretation (reciprocally) as we have carried out our research together over the past 20 years. For example, as our auditory constructs shifted from categorical ‘present’/‘absent’ to fine-grained detailed phonetic variants, so did our conceptualization of the phenomenon we were observing. The articulatory data revolutionised our understanding of what the variation might ‘be’, at last letting us understand why their acoustics were so difficult to capture, and why they were so ambiguous and hard to transcribe.

5.3. Postvocalic /r/ across the 20th century (Stuart-Smith and Lawson, 2017)

I now move from these contemporary synchronic data to consider the results – and possible inferences – from two rather different real-time studies of derhoticisation. The first is reported in Stuart-Smith and Lawson (2017), who compare auditory data from the World War I soldiers with results from selected speakers from the SoTC corpus to achieve a perspective on postvocalic /r/ in Glasgow vernacular across the 20th century. All possible instances of postvocalic /r/ were transcribed: (1) from the 6 BL men, born in the 1890s and recorded in 1916/17 (361 tokens); (2) from 32 speakers from the SoTC corpus, middle-aged men born in the 1940s and 1950s, and adolescent boys born in the 1980s and 1990s.

The results are shown in Figure 7. The most visually obvious result is that the adolescent speakers, born in the 1980s and 1990s, show much higher rates of absent or weak postvocalic /r/ (on average 70%) than the other three speaker groups. By the 1980s, derhoticisation had joined the raft of consonant changes, including TH-fronting, which took off after gaining social-indexical meanings including urban toughness and ‘street smarts’ (Speitel and Johnston, 1983, 27). This result is a repeat of those presented in Stuart-Smith, Timmins and Tweedie (2007) and Stuart-Smith, Lawson, Scobbie (2014); which show extensive derhoticisation in working-class adolescents in the 1990s and 2000s, especially in read

speech. Their impact is derived from being viewed within the new temporal perspective of the whole century; it is immediately clear how weak /r/ took off in the 1980s.

The second striking result concerns the early decades of the 20th century. Even in 1916/17, the soldiers are already showing, on average, 35% of their postvocalic /r/ tokens, as weak or audibly absent. They also pattern with the middle-aged speakers, born 5 decades later, in the 1940s and 1950s. The occurrence of weak /r/ in the BL speakers also shows clear phonotactic conditioning, with some phonological contexts inducing more weakening than others (e.g. weakening is most likely in word-final, unstressed syllables, e.g. *butter*). Such phonotactic constraints can be explained by gestural delay (5.2), which may contribute at least part of the mechanism for derhoticisation as a phonetically-induced, dialect-internal, change. This finding suggests that phonotactically-conditioned derhoticisation is very likely to have been present in Glasgow dialect when the soldiers acquired their vernacular as children in the 1890s, and likely in the decades before then, thus stretching back the window for the early phases of this sound change.

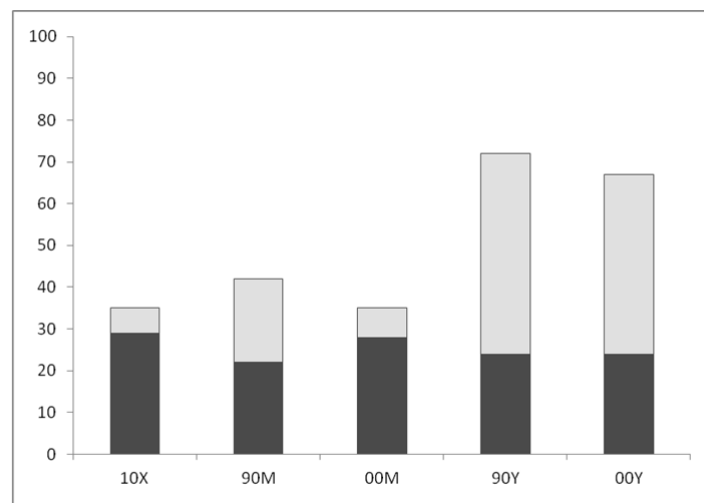


Figure 7: Percentage of weak rhotic variants of coda /r/ in the six Western Central Belt BL men (10X) and in the SOTC corpus for middle-aged (M) men and adolescent (Y) boys recorded in the 1990s (90) and 2000s (00). Derhotic variants are dark; non-rhotic/plain vowels are light; n = 4048.

5.4. How segmental is derhoticisation in the early 20th century? (Sóskuthy and Stuart-Smith, in progress)

Finally, I present some preliminary results from an ongoing real-time study of derhoticisation in the early decades of the 20th century, which prompts a radical rethinking of the phonetic mechanisms for this change. Specifically, we have to recognise that the segmental derhoticisation observed at the end of the century, may have been triggered by a non-segmental phonetic factor at the start of the century, voice quality, or the ‘quasi-permanent quality running through all the sound that issues from [a speaker’s] mouth’ (Abercrombie, 1967: 91). Voice quality arises from physiological factors, but is also acquired as an integral part of a speaker’s dialect, indexing regional and social groups. Trudgill (1974) became convinced that the sociolinguistic variation he had observed in Norwich would be far better explained in terms of specific vocal settings, than considering segments in an ‘atomistic’ way. My early study of voice quality in Glasgow (Stuart-Smith 1999) had found more instances of ‘velarized’ voice (raised and backed tongue body) in working-class speakers, than the expected pharyngealised ‘Glasgow voice’. I also wondered then about the extent to which secondary articulations of especially laterals and rhotics might influence overall impressions of voice quality. Our hypothesis was that Glaswegian might have experienced a real-time change in voice quality over the century, and that this in turn, might have helped trigger and/or spread /r/-weakening.

Our sample was drawn from the SoTC spontaneous speech recordings from 24 older speakers (67-90 years), male and female, recorded in the 1970s, 1980s, 1990s, 2000s and born respectively in the 1890s, 1990s, 1910s, and 1920s. F3 tracks were taken for the V+/r/ sequence, e.g. *dear*, and hand-corrected. Our analysis had five steps:

1. Generalized Additive Mixed Modelling analysis of the formant tracks showed that male and female speakers born in the 1920s showed significantly high, and rising, F3, across the V+/r/ sequence consistent with an interpretation of weakened /r/ (cf Figure 6).
2. A ‘blind’ auditory analysis of the /r/ variants did not show strong support for segmental /r/-weakening in these older speakers, though a trend to use weaker variants is visible in female speakers.
3. Acoustic analysis of F3 for all stressed tokens of the BOOT, CAT, COT, FACE, FLEECE, GOAT, STRUT vowels for all speakers (14,393 tokens) shows a significant real-time rise in F3 over the four decades (Figure 8).

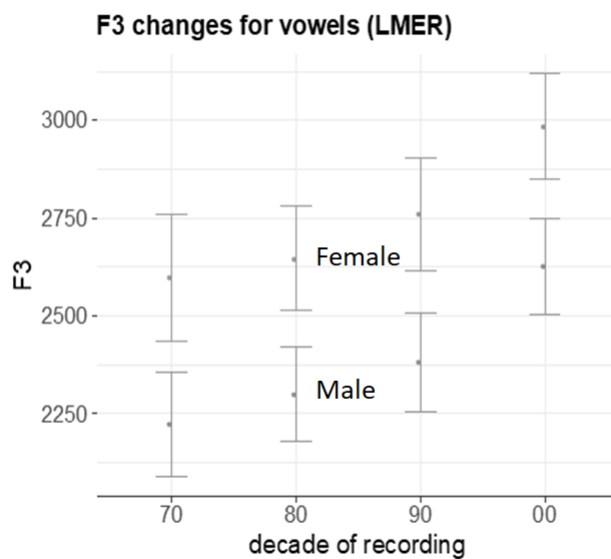


Figure 8: Linear Mixed Effects model estimates for change in F3 (Hz) in 7 stressed monophthongs from 24 older speakers of Glaswegian by gender and decade of recording. Women show consistently higher F3 values than men; F3 rises over the decades for all speakers.

4. A ‘blind’, auditory, Vocal Protocol Analysis (Laver, 1991), focussing on lingual tip/blade, lingual body, and pharyngeal settings, on randomised 3 minute segments, showed a shift in auditory tongue body height over time. This is consistent with my judgements of velarized voice in working-class speakers reported in Stuart-Smith (1999).
5. Finally, the V+/r/ formant tracks were analysed again, but with F3 average for each speaker’s vowels included as a predictor. This allowed us to discover whether /r/ would show rise in F3 above and beyond that already taking place in the speaker’s vowels. For male speakers, the F3 rise for /r/ was no longer significant; for female speakers, the F3 rise is still significant, but much reduced.

The key novel finding is the evidence for an acoustic and auditory real-time change in voice quality in Glaswegian, which effectively cancels out the acoustic segmental /r/ weakening for male speakers.

5.5. *Rethinking the mechanism of postvocalic /r/ weakening over the 20th century*
(*Sóskuthy and Stuart-Smith, in preparation*)

What we have always considered to be a segmental change, now may have begun as a change in voice quality. I draw together some observations arising from these new observational and temporal perspectives:

- A steady shift in voice quality, evidenced through rising F3 and auditory shift in tongue body height, was in progress by the 1890s, or began in the 1890s and continued. This may be related to the very substantial economic boom in Glasgow towards the end of the 19th century, which entailed substantial activity and trade in the city's ports which were directly in the heart of the city. We note that Liverpool and Glasgow were in close nautical contact, and Liverpool's distinctive voice quality includes velarization.
- The WW1 soldiers' data shows phonotactically-induced derhoticisation of postvocalic /r/ by 1916/17, especially in unstressed prepausal syllables, e.g. *faithr#* (Scots for *father*). Certain phonological contexts are more likely to incur gestural delay, and so audibly absent or audibly weak /r/. The articulatory data from WL07 show not only gestural delay, but also an early tongue root retraction gesture. Weak /r/ in these phonotactic environments are likely to have a weakened anterior gesture and audible secondary articulation on the pre-rhotic vowel from the early dorsal gesture. But we must also note that these speakers do even at this stage, show some instances of weak/absent /r/ which are less phonotactically likely, showing some indications of more general segmental change in these younger adult speakers during World War I.
- The auditory similarity between the voice quality setting and weak /r/ may have led to the voice quality setting being misparsed as a segmental property of coda /r/. In other words, a longer domain suprasegmental setting may have become associated with specific segmental variant given some auditory, acoustic, and articulatory similarities, which in turn helped trigger increased use of weak /r/ variants in these contexts. The voice quality results suggest that women may have led the segmental shift, which would be consistent with the finding at the end of the century that working-class girls showed the most instances of no audible /r/ (Stuart-Smith 2003).
- The middle-aged speakers from SoTC data pattern with the BL speakers, suggesting that for several decades Glaswegian vernacular experienced both a gradual shift in voice

quality and phonotactically-induced /r/-weakening, with perhaps more segmental weakening for some (?female) speakers than others. (This interpretation rests on an evidence gap for the 1920s and 1930 which still needs to be filled.)

- Derhoticisation then took off as a segmental change in the 1980s, as one of a group of non-standard, socially-salient, consonantal features affording their speakers to maximally distance themselves from the ‘posh’, respectable, middle-class Glaswegians, especially when given the stylistic opportunities to do so (such as reading a wordlist to a university researcher; passing posh people on the street in the city, and so on; Stuart-Smith, Timmins and Tweedie, 2007).

6. Concluding remarks

Even this brief discussion shows how much analytical perspective matters for understanding linguistic variation within and across time for a community. For /s/, shifting the perspective from /s/, to /s/ and /ʃ/, did not result in /ʃ/ as a dull foil against which /s/ sparkled. Rather – supported by the extended temporal perspective, and enhanced phonetic observation – both sibilants emerged as socially informative, both play a role in synchronic and diachronic gender construction for both boys and girls, and both are not stable but appear to be changing, likely at least partly in response to shifts in the city’s societal norms. What the new study currently lacks is the crucial comparison over time by social class; achieving an accompanying real-time Scottish Standard Glasgow corpus to parallel the SoTC corpus is an essential ongoing goal, in order to properly observe and understand linguistic variation in the context of the social dynamics of the city over time.

For postvocalic /r/, basic phonetic observation was extremely challenging during the early years when auditory and acoustic analysis lacked the powerful and insightful beam of articulatory data. Now we have made substantial progress by being able to establish for the first time, the key links between articulatory ~ acoustic ~ auditory data both for a derhoticising variety of any language, and for the entire sociolinguistic continuum for postvocalic /r/ in Scottish English in the early 21st century. Expanding the temporal perspective on derhoticisation with the comparison of speakers across the 20th century, from World War 1 to the 1990s, allows us the luxury of a sketchy view of the distribution of weak /r/ over time and social space. At this stage, like Milroy (2003), I find myself wondering just at what point in time this sound change can be assigned to, and if indeed it can be pinned

down successfully. After all, the loss of rhoticity in Anglo-English took place over several centuries (Dobson, 1957). And that was probably an appropriate reflection, because the findings of the new study changed our observational perspective to encompass not only /r/ but also long-domain voice quality (i.e. redefine what the ‘thing’ is), and then demonstrated a likely important role for voice quality for understanding derhoticisation as a ‘change’ (i.e. how these ‘things’ are embedded in time and social space).

More generally, for both segments, and indeed for other aspects of phonetic and phonological variation, changing these analytical perspectives has pushed, and continues to push us out of our comfort zone. We are forced to think hard and differently about structured variability. In so doing, our reward is that we are then able to revisit key fundamental assumptions and interpretations for our linguistic data.

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