THE GLASGOW SPEECH PROJECT

Accent change in Glaswegian (1997 corpus)
Results for Consonant Variables

Claire Timmins*, Fiona Tweedie+,
and Jane Stuart-Smith*

**Department of English Language,*
University of Glasgow
+Department of Statistics,
University of Edinburgh

7 September 2004

Department of English Language,
University of Glasgow,
Glasgow G12 8QQ

0. Introduction

This document presents the main results from the first project of the long-term research programme which we call *The Glasgow Speech Project*. Here we give selected results from the formal statistical analysis of the 11 consonantal variables which were auditorily transcribed from the set of socially-stratified recordings made in the spring and summer of 1997 in Glasgow. 32 informants were involved, divided equally according to age (older: 40-60 years; younger: 13-14 years old), gender, and socio-economic background (middle-class and working-class). Further details of the data collection including informant sample and general methodology may be found in Stuart-Smith (1999); (2003); Stuart-Smith and Tweedie (2000). The main analysis of these data was carried out as part of the project, *Accent Change in Glaswegian: A sociophonetic investigation* (1999), funded by the Leverhulme Trust, and subsequent analysis was supported by the AHRB (2002).

Variables from the wordlists were auditorily transcribed by Claire Timmins from segmented word files which had been digitized into a PC running Entropic's xwaves+ with a sampling rate of 16kHz at 16 bits. Variables from the conversations were auditorily transcribed by Claire Timmins from DAT recordings using Panasonic headphones on a Sony desktop DAT recorder. Around 30% of the transcriptions were cross-transcribed by Jane Stuart-Smith.

The data were statistically analysed by Fiona Tweedie to test for the main factors of CLASS, AGE, and GENDER using log-ratio linear modelling, a technique that takes account of the potential difficulties caused by multivariate data of this type. Subsequent testing with Bonferroni-corrected p-values was carried out to test differences across groups, and within variants. Results given here as significant showed a p value of less than .05. The numbers in tables given here result from the transformation of the data by log-ratio linear modelling, and can be considered similar to percentages. Social grouping of the data in the tables are determined by the results of the statistical analysis. We assumed that reading and speaking are different activities, and made no attempt at a quantitative comparison between the two types of data.

Results for the following variables are given:

TH-realization
DH-realization
L-vocalization
T-glottalling
S-retraction
X-loss
HW-loss
R-vocalization
K-realization
W-realization
R-realization

For each variable we give: a brief introduction; the phonetic environments in which variants were transcribed; the range of phonetic variation and their subsequent categorization for display and analysis;[1] and tables of results for all phonetic environments for read and spontaneous speech, and for all speakers across phonetic environments, together with a brief summaries of the statistical results. For more detailed analysis and presentation of results, the reader is referred to specific publications dealing with each variable at the end of each introductory section.

[1] We use orthographic as opposed to IPA symbols throughout. Hence, e.g. [th] = [θ], [dh] = [ð], [hw] = [ʍ] and so on.

1. *TH-realization*

1.1. *TH-realization:* Background

The pronunciation of /th/ in Glasgow is generally reported to be [th], with a traditional vernacular variant of [h] (e.g. Macafee 1983: 33). In general, TH-fronting, the use of [f] for /th/, a feature which like DH-fronting is associated with regional dialect levelling in other accents of English English, is not expected here, although Macafee (e.g. 1983: 34) did note some sporadic instances in her questionnaire data from the early 1980s. Thus more extensive use of [f] for /th/ was a surprise finding in the pilot study (Stuart-Smith 1999), and one which motivated a deeper investigation of the speech data overall.

We had only intended to confirm traditional variation in /th/, and so the wordlist was not constructed to include a particularly balanced set of words for this variable. We wondered whether the variation might correlate with position in word, and especially whether incoming [f] might favour particular positions in the word, and so the data analysis was divided according to position in word. In the conversations, all instances of /th/ were transcribed for all speakers.

For discussion of the role of position in word in the diffusion of [f] for /th/, and more generally about *TH-realization*, see Stuart-Smith, Timmins, Lawson and Tweedie (under review).

1.2. *TH-realization*: phonetic environment

word-initial, e.g. *think*
word-internal, e.g. *enthusiasm*
word-final, e.g. *tooth*

1.3. *TH-realization*: variant categories

[th]: a range of voiceless dental fricative variants varying in degree of approximation, and with some secondary articulation/release characteristics.
[f]: a range of voiceless labiodental fricatives varying in degrees of lip-rounding and fronting.
[thf]: an 'inbetween' category' where auditorily we felt that the sound had elements of both [th] and [f], and was difficult to assign unilaterally to one or the other category.
[h]: voiceless glottal fricative, sometimes with nasalization.
[t]: voiceless plosive, usually dental, but sometimes more retracted.
[s]: voiceless alveolar fricative (most common preceding /s/, in e.g. *maths*).
[m]: A miscellaneous category consisting of a group of unrelated phonetic variants including the odd glottal stop, a voiced bilabial nasal [m], and certain tokens which were difficult to assign any specific transcription.

1.4. *TH-realization:* read speech (all environments)

	[th]	*[f]*	*[thf]*	*[t]*	*[s]*	*[m]*
MCO	95.45	0.00	2.27	0.00	2.27	0.00
MCY	91.95	0.00	0.00	3.45	4.60	0.00
WCO	85.23	1.14	1.14	6.82	3.41	2.27
WCY	53.49	30.23	10.47	1.16	4.65	0.00

Note n = 349. The factors of AGE, CLASS and the interaction AGE*CLASS were found to be significant reflecting the polarization of working-class adolescents with a range of variation other than [th] from middle-class adults who largely use [th]. Within variants this difference holds for [th] and [f]. [f] is predominantly used by working-class adolescents.

1.5. *TH-realization:* read speech (phonetic environment)

	[th]	*[f]*	*[thf]*	*[t]*	*[s]*	*[m]*
word-initial	88.27	4.69	0.78	6.25	0.00	0.00
word-internal	74.53	15.62	0.00	9.83	0.00	0.00
word-final	76.77	8.44	6.36	0.52	6.88	1.04
overall	79.85	9.58	2.38	5.53	2.29	0.35

Note n = 349. There are clear differences in variation across position in word, but these only become statistically significant for working-class adolescents (see Stuart-Smith, Timmins, Lawson, and Tweedie, under review). The widest variation is found in word-final position. [f] is most likely in word-internal position.

1.6. *TH-realization:* spontaneous speech (all environments)

	[th]	*[f]*	*[thf]*	*[t]*	*[s]*	*[h]*	*[m]*
MCOF	98.40	0.00	0.00	0.80	0.00	0.27	0.53
MCOM	97.60	0.00	0.00	1.20	0.00	0.60	0.60
MCYF	93.33	0.00	0.00	0.89	0.00	5.78	0.00
MCYM	88.89	0.00	0.00	4.58	0.00	6.21	0.33
WCOF	81.68	0.00	0.26	0.26	0.00	16.54	1.27
WCOM	74.39	0.00	0.81	1.63	0.00	12.60	10.57
WCYF	21.21	32.90	0.00	0.43	0.43	44.59	0.43
WCYM	33.62	22.41	0.86	0.86	0.00	41.38	0.86

Note n = 2021.[2] All factors and all their interactions were significant. Middle-class speakers use little variation other than [th]. Working-class speakers, and particularly working-class adolescents, have a much wider spread of variation, showing both non-

[2] The reduction of the total *n* in comparison to that given in Stuart-Smith and Tweedie (2000) is due to the exclusion of *with*, which in Scots tends to be *wi'*, where /th/ was deleted historically.

local [f] and local [h]. Across variants working-class adolescents are significantly different from their middle-class counterparts. Working-class girls are polarized from all middle-class speakers in their high use of [f] and low use of [th].

1.7. *TH-realization:* spontaneous speech (phonetic environment)

	[th]	*[f]*	*[thf]*	*[t]*	*[s]*	*[h]*	*[m]*
word-initial	77.35	7.79	0.10	1.48	0.00	13.05	0.22
word-internal	64.19	2.21	0.11	0.83	0.18	31.06	1.44
word-final	88.57	3.79	0.00	0.71	0.00	0.00	6.93
overall	76.71	4.60	0.07	1.01	0.06	14.70	2.86

Note n = 2021. Only [h] shows a statistically significant differences in distribution according to position in word, though tendencies are apparent in [th] and [f]. [h] is most likely in word-internal position, and [f] appears to be so in word-initial position, though in working-class adolescents, who only use [th] and [f], the preference is word-final then word-initial position (see Stuart-Smith, Timmins, Lawson and Tweedie, under review).

2. *DH-realization*

2.1. *DH-realization*: Background

The pronunciation of /dh/ with an alveolar tap [r] in words such as *brother* has long been noted as a feature of working-class Glasgow speech, as has complete elision of the sound (Macafee 1983: 33). What was not expected were the instances of [v] found in working-class adolescents during the pilot study (Stuart-Smith, 1999: 209). This, together with a similar finding for /th/, helped motivate further analysis of the 1997 data.

/dh/ was transcribed in all possible words from the wordlist. Since the traditional tapped variant for /dh/ tends to be occur word-internally, we analysed all the data separately according to phonetic environment (position in the word). Word-initially /dh/ occurs in the pronouns *the, they, there* etc. Since these words are so frequent, we transcribed all instances of word-initial /dh/ for only 20% of the duration of the conversations. Words showing word-internal/word-final /dh/ are far less common, and so these were transcribed for the entire length of all the conversations for each speaker.

DH-realization is discussed in more detail in Stuart-Smith, Timmins, Lawson and Tweedie (under review), and in particular the role of position in word as a factor in the diffusion of [v] and maintenance of traditional variants such as [r].

2.2. *DH-realization*: phonetic environment
word-initial, e.g. *this*
word-internal, e.g. *brother*
word-final, e.g. *smooth*

2.3. *DH-realization*: variant categories
[dh]: a range of voiced dental fricatives, varying in degree of approximation and degree of voicing.
[r]: voiced tap variants, some relatively open.
[0]: complete elision of the consonant.
[v]: voiced labiodental fricatives.
[h]: voiceless glottal fricatives, including glottal friction with extremely open oral articulation.
[m]: Variants grouped as 'miscellaneous', including the odd voiced alveolar or dental stop.

2.4. *DH-realization*: read speech (all environments)

	[dh]	*[r]*	*[v]*	*[0]*	*[m]*
MCO	100.00	0.00	0.00	0.00	0.00
MCY	90.83	7.08	0.00	0.00	2.08
WCO	89.58	10.42	0.00	0.00	0.00
WCY	65.42	15.42	15.00	2.08	2.08

Note n = 188. The factors of AGE, CLASS and their interaction were significant, reflecting polarization of middle-class adults with categorical [dh] from working-class adolescents with a range of variation. This difference persisted statistically across variants, and for [r]. [r] is typical of working-class speech, but also found in middle-class adolescents.

2.5. *DH-realization*: read speech (phonetic environment)

	[dh]	*[r]*	*[v]*	*[0]*	*[m]*
word-initial	96.83	0.00	0.00	0.00	3.13
word-internal	86.19	12.24	0.78	0.00	0.78
word-final	78.09	0.00	18.74	3.13	0.00
overall	87.04	4.08	6.51	1.04	1.30

Note n = 188. No statistical analysis was carried out for position in word due to low numbers of data. There is a clear tendency for variation to occur outside word-initial position, where /dh/ is almost categorical [dh], with a single stopped realization ([m]) in a working-class girl. Variation in word-internal position is largely found in working-

class speakers, and in word-final position, [v] only occurs in working-class adolescents (see Stuart-Smith, Timmins, Lawson and Tweedie, under review).

2.6. *DH-realization*: spontaneous speech (all environments)

	[dh]	*[r]*	*[v]*	*[0]*	*[h]*	*[m]*
MCO	99.09	0.39	0.00	0.39	0.13	0.00
MCY	93.33	3.34	0.00	2.98	0.36	0.00
WCO	91.44	3.74	0.00	2.14	2.67	0.00
WCY	79.71	7.06	0.00	9.12	3.82	0.29

Note n = 2325. AGE and CLASS were significant factors. As in read speech, a similar statistically significant pattern of social polarization between middle-class adults and working-class adolescents is found, though the amount of variation other than variants classed as [dh] is rather low. Within variants the use of [r] and [0] distinguishes the two groups, with [0] emerging as a particular feature of working-class adolescents. [v] does not occur in spontaneous speech.

2.7. *DH-realization*: spontaneous speech (phonetic environment)

	[dh]	*[r]*	*[0]*	*[h]*	*[m]*
word-initial	96.91	0.10	1.96	1.03	0.00
word-internal	87.12	11.37	0.46	1.04	0.00
word-final	n/a	n/a	n/a	n/a	n/a
overall	92.02	5.73	1.21	1.04	0.00

Note n = 2325. /dh/ is not found at all in word-final position.[3] Most variation occurs in word-internal position (and this is particularly so for working-class adolescents; see Stuart-Smith, Timmins, Lawson and Tweedie, under review).

3. *L-vocalization*

3.1. *L-vocalization*: Background

The loss - and vocalization - of /l/ was a historical process in Scots, and accounts for common forms such as *aw/a'* (all). 'Scots' L-vocalization affected Older Scots syllable-final /al, ol, ul/ in most environments, but could be blocked by /d/ (e.g. *aul(d) - old*). The quality of the outcome was dependent on the preceding vowel; Macafee (1983: 38). We use the past tense to describe this process, since we assume that Scots L-vocalization led to new lexical representations without /l/, and it seems unlikely that it is still productive in Glaswegian today.

[3] In Glaswegian the final consonant of *with* is /th/, not /dh/.

L-vocalization here refers to the process typically found in Cockney English (e.g. Wells 1982: 259), resulting in e.g. [pipo] *people*, [miok] *milk*, another feature which has been said to be diffusing into urban accents of the UK. This kind of vocalization affects syllable-final /l/ in all environments, usually resulting in a high back (rounded/unrounded) vowel.[4] Macafee (e.g. 1994: 29) reports sporadic instances in her data from the early 1980s, and cases were found in the pilot analysis of the 1997 corpus.

All possible cases of *L-vocalization* were transcribed from the wordlists and for the duration of all conversations for all speakers. All instances of Scots vocalization (e.g. *fitbaw - football*) were excluded from the analysis and considered separately.

Both types of l-vocalization are discussed in some detail in Stuart-Smith, Timmins and Tweedie (under review).

3.2. *L-vocalization*: Phonetic environment

preconsonantal, e.g. *milk*
(word-final) prepausal, e.g. *well*, with subdivisions into
- sentence/utterance final, e.g. *well#*
- prevocalic, e.g. *well and*
- preconsonantal, e.g. *well could*

(word-final) postconsonantal, e.g. *people*, with subdivisions into:
- sentence/utterance final, e.g. *peoplel#*
- prevocalic, e.g. *people and*
- preconsonantal, e.g. *people could*

3.3. *L-vocalization*: Variant categories

[l]: various types of aveolar/dentalized laterals all showing various degrees of auditory 'darkness'.
[V]: vowel variants. A range of high back/central, usually rounded, vowels were found arising from /l/ and categorized together as [V]. The quality of the vowel varied according to a number of factors, including the quality of the preceding vowel and the resonance of the articulated /l/.
[l/V]: a third category of in between variants, which were difficult to assign easily to [l] or [V]; see further Timmins and Stuart-Smith (2004).
[m]: a small category of miscellaneous variants which comprise one instance of [β] in *bible* in the wordlist, and a small number of apparently fully deleted variants in prepausal position. These were not particularly surprising given the frequency of fully deleted variants for other consonants in the same speakers (e.g. /θ ð/). Despite an apparent similarity, they do not seem to be related to Scots vocalization since deletion was most common in the word *well* which is not an environment where we would expect the Scots process were it still to be productive.

[4] Particularly postconsonantally (e.g. *people*) and preconsonantally (e.g. *milk*). Prepausally (e.g. *well*), the vowel tends to be largely coloured by the preceding vowel.

3.4. *L-vocalization*: Read speech (all environments)

	[l]	*[V]*	*[l/V]*	*[m]*
MCO	81.55	13.69	4.76	0.00
MCY	79.39	13.94	6.67	0.00
WCO	84.34	12.05	3.61	0.00
WCY	46.50	47.13	5.73	0.64

Note n = 656. There are no significant factors or interactions in read speech, though there is a clear tendency towards more vocalization in working-class adolescents.

3.5. *L-vocalization*: Read speech (phonetic environment)

	[l]	*[V]*	*[l/V]*	*[m]*
preconsonantal	54.14	39.24	6.61	0
prepausal	75.81	17.64	6.54	0
postconsonantal	74.29	21.42	4	0.28
overall	75.05	19.53	5.27	0.14

Note n = 656. Vocalization is more likely in preconsonantal position than in postconsonantal or prepausal position.

3.6. *L-vocalization*: Spontaneous speech (all environments)

	[l]	*[V]*	*[l/V]*	*[m]*
MCO	99.61	0.10	0.20	0.10
MCY	99.53	0.00	0.47	0.00
WCO	96.78	0.42	0.17	2.62
WCY	85.74	8.83	0.68	4.75

Note n = 3420. Only around 5% of the variation is not [l], but nevertheless even this small amount is socially stratified, with AGE, CLASS and AGE/CLASS emerging as significant factors resulting in working-class adolescents as a distinct group from the other three.

3.7. *L-vocalization*: Spontaneous speech (position in word)

	[l]	*[V]*	*[l/V]*	*[m]*
preconsonantal	94.09	5.25	0	0.66
prepausal	96.06	0.73	0.6	2.61
postconsonantal	96.03	3.57	0.4	0
overall	94.09	5.25	0.00	0.66

Note n = 3420. Vocalization tends to be most likely in preconsonantal position, then postconsonantally, and is least likely in prepausal position. This hierarchy is significant for working-class boys (see Stuart-Smith, Timmins and Tweedie, under review).

4. *T-glottalling*

4.1. *T-glottalling*: Background

Glasgow has been dubbed the original home of the glottal stop (Macafee 1997: 528), and T-glottalling, or the use of [?] for /t/ in certain phonetic environments, mainly non-initial, unstressed position, is regarded as a primary characteristic of vernacular Glaswegian consonant pronunciation (see Macaulay 1977, Stuart-Smith 1999a).

The wordlist contained a large number of words where /t/ could be realized as a glottal stop. Thirty-eight words were selected for analysis, divided according to environment. The wordlists were transcribed by Eleanor Lawson and Barbara McGinley, and subsequently cross-transcribed by Jane Stuart-Smith. All relevant instances of (t) were transcribed from the conversations by Jane Stuart-Smith.

For discussion of an initial analysis of these data, see Stuart-Smith (1999a).

4.2. *T-glottalling*: Phonetic environment

prepausal, i.e. word final before a pause, e.g. *but#*
prevocalic, i.e. word final before a word beginning with a vowel, e.g. *hate it*
intervocalic, e.g. *butter*

4.3. *T-glottalling*: Variant categories

[t]: range of voiceless alveolar stops, many of which were dental or dentalized.
[ht]: preaspirated voiceless dental/alveolar stops.
[ts]: voiceless dental/alveolar stops with affricated release.
[?t]: preglottalized voiceless dental/alveolar stops.
[T]: voiceless dental/alveolar stops with some voicing.
[r]: voiced alveolar taps.
[0]: complete deletion.
[?]: glottal stops, which can simply be a few creaky pulses.

4.4. *T-glottalling*: Read speech (all environments)

	[t]	*[ht]*	*[ts]*	*[?t]*	*[?]*
MCO	81.32	0.00	0.00	17.95	0.73
MCY	72.09	9.63	10.30	3.32	4.65
WCO	86.18	0.00	0.00	6.91	6.91
WCY	23.03	0.66	0.00	0.00	76.32

Note n = 1212. AGE, CLASS and their interaction were significant. Working-class adolescents mainly use [?] even in read speech, and are polarized from all middle-class speakers in doing so. [?t] is largely the preserve of middle-class adults.

4.5. *T-glottalling*: Read speech (phonetic environment)

	[t]	*[ht]*	*[ts]*	*[?t]*	*[?]*
prepausal	60.48	2.91	3.14	8.01	25.46
prevocalic	88.53	2.08	2.08	3.13	1.04
intervocalic	82.29	1.04	0.00	0.00	16.67
overall	77.10	2.01	1.74	3.71	14.39

Note n = 1212. The tendency for [?] to occur least in prevocalic position (as opposed to intervocalic position) is surprising, but arises from averaging across all speakers. The higher average for intervocalic position is skewed by the results from the working-class adolescents who alone use [?] a good deal in this position (two-thirds of their variation).

4.6. *T-glottalling*: Spontaneous speech (all environments)

	[t]	*[T]*	*[r]*	*[0]*	*[?]*
MC	40.55	0.32	1.29	1.29	56.56
WC	6.83	0.44	0.26	0.00	92.47

Note n = 2385. CLASS is the only significant factor, with working-class speakers using a high degree of [?].

4.7. *T-glottalling*: Spontaneous speech (phonetic environment)

	[t]	*[T]*	*[r]*	*[0]*	*[?]*
prepausal	15.44	0.00	0.00	1.03	83.53
prevocalic	19.75	1.67	1.30	0.00	77.28
intervocalic	49.03	0.00	1.52	0.00	49.44
overall	28.08	0.56	0.94	0.34	70.08

Note n = 2385. There are no significant differences according to phonetic environment, but this time the pattern looks more expected, with intervocalic [?] tending to be least

likely. In fact working-class adolescents show very high usage of [?] intervocalically, but this is countered by much less frequent use in other speakers. It is absent from middle-class women.

5. *S-retraction*

5.1. *S-retraction*: Background

A particular pronunciation of /s/ in Glasgow dialect is noted by Macafee (1983: 34). She, following Paul Johnston, suggests that phonetically, this sound might be 'cacumenical', or apico-alveolar, i.e. /s/ produced with the tongue tip raised. Auditorily, this type of /s/ sounds 'retracted', and rather similar to /ʃ/.

/s/ is a very frequent phoneme in English, and was thus well-represented in the wordlists. Given the high frequency of /s/, we transcribed on a subset of tokens from the conversations, with a limit of /s/ in all possible sites for up to 20% of the duration of each conversation for each speaker. The data were transcribed by Claire Timmins and a substantial portion cross-transcribed by Jane Stuart-Smith, because auditory transcription of this variable was so difficult.

We present the results of the auditory transcription below, partly because this variable was entered into the multivariate analysis, and partly because these results motivated further analysis. More informative results have come from subsequent acoustic analysis of these data, which show clear effects of GENDER, but also of specific gendered productions of /s/ signalling particular social groups, especially amongst female speakers; see Stuart-Smith, Timmins and Wrench (2003); Stuart-Smith (2004).

5.2. *S-retraction*: Phonetic environment

/s/ was transcribed in all possible phonetic contexts, and no distinction was made for context for the statistical analysis.

5.3. *S-retraction*: Variant categories

[s]: a range of voiceless alveolar fricatives, with slight variations in place of articulation.
[sr]: voiceless alveolar fricatives produced with raised tongue tip (apical).
[sj]: palatalized voiceless alveolar fricatives.
[sw]: voiceless alveolar fricatives with accompanying whistle (tip-raised).
[sh]: postalveolar fricatives.
[m]: miscellaneous category where variants were rather different from other (s) variants.

5.4. *S-retraction*: Read speech (all environments)

	[s]	*[sr]*	*[sj]*	*[sw]*	*[m]*
F	95.39	4.33	0.14	0.14	0.00
M	88.10	7.44	2.08	1.93	0.45

Note n = 1388. Only a relatively small proportion of the variation consists of variants other than [s], but despite this, there is a significant factor of GENDER, with male speakers using less [s] than female speakers.

5.6. *S-retraction*: Spontaneous speech (all environments)

	[s]	*[sr]*	*[sj]*	*[sw]*	*[sh]*	*[m]*
F	98.48	0.38	0.53	0.23	0.30	0.08
M	91.99	5.37	0.64	0.82	0.73	0.45

Note n = 2414. Again, only a small proportion of the variation was not heard as [s], but again, there was a significant effect of GENDER. The only variant apart from [s] to occur more than a few times was [sr], and this in male speakers.

6. *X-loss*

6.1. *X-loss*: Background

Like /hw/, the phoneme /x/ is not generally found in accents of English other than Scottish English (Wells 1982: 408). Glaswegian is assumed to show /x/, pronounced as a voiceless velar fricative, although recent descriptions (e.g. Macafee 1983: 32) suggest a tendency for /x/ to merge with /k/.

/x/ was transcribed from two words in the wordlist (*loch, Docherty*) and then in all words containing /x/ which arose for all speakers during the conversations. /x/ emerged as a very rare phoneme indeed in spontaneous speech, with a quarter of our informants failing to use words containing /x/ at all. If /x/ did occur, it was found mainly in place and personal names the entirety of the conversation. The transcription of the adolescents' data was carried out earlier by Eleanor Lawson as part of a Carnegie Trust funded project; see Lawson (1998), Lawson and Stuart-Smith (1999).

For more discussion of /x/, and in particular the acoustic confirmation of the auditorily 'inbetween' variants [kx], see Lawson and Stuart-Smith (1999), Stuart-Smith, Timmins, Lawson, and Tweedie (under review).

6.2. *X-loss*: Phonetic environment

/x/ only occurs word-internally (e.g. *Docherty*) and word-finally (e.g. *loch*). We did not distinguish position in word in our analysis.

6.3. *X-loss*: Variant categories

[x]: a range of voiceless guttural fricatives, usually velar, but sometimes uvular.
[k]: voiceless velar stops with varying degrees of aspiration.
[kx]: an auditorily 'inbetween' category where the sounds seemed to have characteristics of both stop and fricative. (A few preaspirated velar stops found in middle-class girls are included in this category.)
[m]: a miscellaneous category where the variants were quite phonetically variable and include a voiceless labiodental fricative, a voiced velar stop, a glottal stop, and complete deletion.

6.4. *X-loss*: read speech (all environments)

	x	*k*	*kx*
MCOF	100.0	0.0	0.0
MCOM	75.0	12.5	12.5
MCYF	25.0	37.5	37.5
MCYM	75.0	12.5	12.5
WCOF	50.0	12.5	37.5
WCOM	87.5	0.0	12.5
WCYF	62.5	37.5	0.0
WCYM	37.5	37.5	25.0

Note n = 64. The data were too sparse for statistical analysis. This is a fairly complex picture though we can see that middle-class women use [x] categorically, and working-class adolescents favour [k]. Middle-class girls also prefer [k] and [kx], though note that for these speakers [kx] refers to preaspirated variants.

6.5. *X-loss*: spontaneous speech (all environments)

	N	*x*	*k*	*kx*	*m*
MCOF	5	12.50	0.00	75.00	12.50
MCOM	32	91.66	5.95	2.38	0.00
MCYF	3	33.30	33.30	0.00	33.30
MCYM	2	50.00	0.00	0.00	50.00
WCOF	27	100.00	0.00	0.00	0.00
WCOM	44	95.42	0.00	2.08	2.50
WCYF	7	0.00	66.60	0.00	33.30
WCYM	6	0.00	100.00	0.00	0.00

Note n = 126. Raw totals for each group are given under *N*. The data were too sparse/uneven for statistical analysis. Again there is a rather messy picture, made more complex by so few instances. What is clear, however, is the tendency for working-class adolescents to use [k].

7. *HW-loss*

7.1. *HW-loss*: Background

Alongside /x/, /hw/ is the other 'extra' consonant phoneme in the Scottish English - and Glaswegian - consonant inventory. /hw/ is usually assumed to be a voiceless labial-velar fricative (e.g. Wells 1982: 408). Recent descriptions of Glaswegian suggest that /hw/ may be merging with /w/ in younger speakers (e.g. Macafee 1983: 32).

Every instance of /hw/ in the conversations was transcribed for all speakers. The three words in the wordlists were also transcribed. These form a common subset of the minimal pairs existing with /w/: *where/wear; whether/weather; whine/wine* (see *W-realization*). Initial transcription of the adolescents' data had already been carried out by Eleanor Lawson as part of her Carnegie project; see Lawson 1998, Lawson and Stuart-Smith 1999. The rest of the transcription was done by Claire Timmins and cross-transcribed by Jane Stuart-Smith.

Acoustic confirmation of 'intermediate' variants for *HW-realization* is discussed, together with the process as a whole, in Stuart-Smith, Timmins, Lawson and Tweedie (under review).

7.2. *HW-loss*: Phonetic context

The incidence of /hw/ is restricted to syllable-initial position (usually word-initial, rarely word-internal). We did not analyse the data separately according to position in word.

7.3. *HW-loss*: Variant categories

[hw]: a range of voiceless labial velar fricatives.
[w]: voiced labial velar approximants varying in degree of approximation.
[wh]: a category of variants which sounded as if they were neither properly [w] nor [hw], best described as breathy-voiced labial velar approximants.
[m]: a miscellaneous category of variants including a glottal stop, a pre-aspirated voiced bilabial nasal, a labialized voiceless labiodental fricative and complete deletion.

7.4. *HW-loss*: Read speech (all environments)

	[hw]	*[w]*	*[wh]*
MCOF	66.67	0.00	33.33
MCOM	91.67	0.00	8.33
MCYF	75.00	16.67	8.33
MCYM	91.67	0.00	8.33
WCOF	33.33	25.00	41.67
WCOM	50.00	16.67	33.33
WCYF	41.65	41.65	16.50
WCYM	36.36	36.36	27.27

Note n = 95. Data too sparse for statistical analysis. Tendency for more variation other than [hw] in working-class speakers, and more [w] in working-class adolescents.

7.5. *HW-loss*: Spontaneous speech (all environments)

	[hw]	*[w]*	*[wh]*	*[m]*
MCOF	92.61	3.98	1.70	1.70
MCOM	96.61	1.69	1.69	0.00
MCYF	60.32	35.71	3.97	0.00
MCYM	75.40	23.81	0.79	0.00
WCOF	82.78	12.92	2.87	1.44
WCOM	44.74	44.36	6.77	4.14
WCYF	27.59	62.07	10.34	0.00
WCYM	22.33	72.82	4.85	0.00

Note n = 1328. There were significant factors of AGE and CLASS, and the AGE*GENDER interaction. Across variants this emerges as a differences between working class adolescents from middle-class speakers, especially middle-class men. Within variants, working-class boys are polarized from middle-class men in their low use of [hw], whilst working-class girls use more [wh] than working-class women.

8. *R-vocalization*

8.1. *R-vocalization*: Background

Like other forms of Scottish English, Glaswegian is assumed to be 'rhotic', i.e. that written <r> is pronounced in postvocalic position, in words like *card, car,* and *better*. Loss of postvocalic /r/ was noted in working-class children in Edinburgh by Romaine (1978), with boys leading the change. Phonetic environment was also noted to be a factor, with loss most likely before a pause or in utterance-final position. Macafee (1983: 32) remarks that such loss can also be heard in 'adult speakers in Glasgow'. The pilot analysis of the 1997 data hinted at the possible loss of postvocalic /r/ in working-class adolescents, and hence *R-vocalization* was selected as a variable for consideration.[5]

All instances of postvocalic /r/ were transcribed in the wordlists, and for all speakers for the duration of all conversations. We suspected that phonetic environment could be important in the process of *R-vocalization*, and so analysed our data separately according to phonetic environment, predicting that phonetic and phonological constraints would lead to a hierarchy such that *R-vocalization* would be most likely in preconsonantal position, unstressed prepausal position, and least likely in stressed prepausal position. For the conversational subcategories, we predicted most *R-vocalization* in final position, then preconsonantal position, and least in prevocalic position (e.g. *car and*, cf. the feature of 'linking r' persisting even in non-rhotic accents.)

At first the transcription of this variable proved difficult for Claire Timmins, who as a rhotic speaker with no appreciable *R-vocalization* herself, found it difficult to discern vocalized variants. (Other Scots/non-Scots were equally sceptical on first hearing of our data, and needed to listen hard to shift their preconceived perceptions).

The complex sociolinguistic patterning of *R-vocalization* is discussed in some detail in Stuart-Smith (2003).

8.2. *R-vocalization*: Phonetic environment

preconsonantal, e.g. *card*
prepausal, e.g. *car*, *better*, which was further subdivided according to the stress condition of the syllable which /r/ closes:
- stressed, e.g. *car*
  - with subdivisions in conversational data into phonetic environment within the utterance - prepausal/turn-final, e.g. *car#*
    - prevocalic, e.g. *car and*
    - preconsonantal, e.g. *car could*.

[5] Labelling this variable was awkward. We began with *R-loss*, but moved to *R-vocalization* in order to capture the important role of different kinds of vocalized variants in this change in progress.

prepausal (cont.)
unstressed, *e.g. better*
with subdivisions in conversational data into phonetic environment within the utterance - prepausal/turn-final, e.g. *better#*
prevocalic, e.g. *better and*
preconsonantal, e.g. *better could*.

8.3. *R-vocalization*: Variant categories

[r]: types of articulated /r/ (cf *R-realisation*).
[V]: vowel variants, [V]: a range of monophthongs and diphthongs without obvious auditory secondary articulation
[r/V]: an 'inbetween' category: variants which were difficult to assign to either [r] or [V]
[V^]: 'velarised' vowel variants: vowels produced with (or at least heard as produced with) some accompanying secondary articulation, which we felt to be largely caused by secondary raising and backing of the tongue body, though some slight auditory pharyngealization was also audible. These variants could also be described as very open uvular approximants.
[Vr]: rhotacised vowel variants, which are common in rhotic accents (e.g. Ladefoged and Maddieson 1996: 313).

8.4. *R-vocalization*: Read speech (all environments)

	[r]	*[V]*	*[r/V]*	*[V^]*	*[Vr]*
MCO	88.21	1.43	0.36	1.43	8.57
MCY	81.41	6.32	0.00	5.58	6.69
WCO	62.91	17.45	2.55	9.82	7.27
WCY	17.56	50.54	2.15	25.81	3.94

Note n = 1103. There is a significant effect of CLASS. Working-class adolescents are significantly different from all middle-class speakers, and this difference persists for [V] and [V^] given the substantial use of vocalic variants in these speakers.

8.5. *R-vocalization*: Read speech (phonetic environment)

	[r]	*[V]*	*[r/v]*	*[V^]*	*[Vr]*
preconsonantal	51.57	9.1	19.08	20.24	0
prepausal (stressed)	69.84	19.94	0.78	9.18	0.2
prepausal (unstressed)	63.54	26.56	1.56	6.25	2.08
overall	61.65	18.53	7.14	11.89	0.76

Note n = 1103. There are no significant differences according to phonetic environment. It is immediately clear that initial predictions for phonetic environment were too simplistic, since different variants work differently according to environment. Hence

[V^] is most likely in preconsonantal position (e.g. *card*), whilst [V] is most likely in unstressed prepausal position (e.g. *better*); see Stuart-Smith (2003).

8.6. *R-vocalization*: Spontaneous speech (all environments)

	[r]	*[V]*	*[r/V]*	*[V^]*	*[Vr]*
MCOF	94.33	4.12	0.14	0.07	1.35
MCOM	92.02	3.71	0.00	2.23	2.04
MCYF	93.03	2.92	0.16	0.00	3.89
MCYM	89.39	4.22	0.22	4.65	1.52
WCOF	69.07	22.45	0.86	2.42	5.20
WCOM	75.38	12.94	0.51	6.85	4.32
WCYF	5.82	76.33	1.50	15.15	1.20
WCYM	22.13	50.50	2.21	17.51	7.65

Note n = 8170. All main effects and their interactions are significant. The group and variant differences are complex. Across groups working-class girls are different from all others bar working-class boys and women, whilst working class boys are polarized from middle-class men and girls.

8.7. *R-vocalization*: Spontaneous speech (phonetic environment)

	[r]	*[V]*	*[r/v]*	*[V^]*	*[Vr]*
preconsonantal	64.6	19.5	0.56	7.69	7.65
prepausal (stressed)	70.71	21.45	0.87	5.91	1.06
prepausal (unstressed)	67.84	27.13	0.9	3.34	0.79
overall	67.72	22.69	0.78	5.65	3.17

Note n = 8170. There are no significant effects according to phonetic environment for all speakers, but the same tendency found in read speech is found in spontaneous speech, and is significant for working-class boys ([V^] is most likely in preconsonantal position, e.g. *card*, whilst [V] is most likely in unstressed prepausal position, e.g. *better*; see Stuart-Smith 2003).

9. *K-realization*

6.1. *K-realization*: Background

The original scope of the project did not include (k) as a variable for consideration. There have been no reports either anecdotally or in the literature to suggest that /k/ may be changing in Glaswegian speech. However our finding that /x/ seems be merging with /k/, at least for younger working-class speakers, prompted the need to understand better the variational space for /k/.

We restricted our analysis of /k/ to selected instances of the sound in the wordlists which would as far as possible match the phonetic environment of /x/ (i.e. unstressed, postvocalic, word-final). This resulted in: *lock*, which forms a minimal pair with *loch*; *beak, leak (it), peak*, unstressed, word-final, postvocalic, but following a high front vowel; and *occur, occurrence*, postvocalic but stressed. We anticipated that fricated variants of /k/ would be most likely in the *beak* words from coarticulation with the close vowel.

6.2. *K-realization*: Phonetic environment
word-internal, e.g. *occur*
word-final, e.g. *lock, beak*

6.3. *K-realization*: Variant categories
[k]: a range of voiceless velar stops with varying degrees of aspiration (including some preaspirated variants in middle-class girls).
[kx]: variants which have characteristics of both a stop and a fricative, including palatalized velar stops with affricated release after /i/.

6.4.. *K-realization*: Read speech (all environments)

	[k]	*[kx]*
MCOF	100	0
MCOM	100	0
MCYF	95.33	4.16
MCYM	100	0
WCOF	95.83	4.16
WCOM	95.83	4.16
WCYF	83.33	16.6
WCYM	87.5	12.5

Note n = 192. No factors were significant. [kx] variants are restricted to working-class speakers and middle-class girls. In the latter, this represents palatalized velar stops with affricated release in one girl in the *beak* words. This was also the usual site/variant for working-class speakers, though more typical 'inbetween' [kx] variants were used for /k/ in *lock* in two working-class adults, possibly as a result of hypercorrection.

10. *W-realization*

10.1. *W-realization*: Background

Like *K-realization*, this variable was identified after the project had started. The results from *HW-realization* confirmed a change of /hw/ > /w/ in progress, and so it became necessary to see what, if anything, might be happening to /w/.

All instances of /w/ were auditorily transcribed from the wordlists. There were three words existing in minimal pairs with /hw/ items: *wear/where, weather/whether, wine/whine*, and *word*.

10.2. *W-realization*: Phonetic environment

We did not analyse the data accordingly to phonetic environment.

10.3. *W-realization*: Variant categories

[w]: voiced labial velar approximants.
[hw]: voiceless labial velar fricatives.
[wh]: as for *HW-realization*, a category where the sound seemed to be neither [w] nor [hw].

10.4. *W-realization*: Read speech (all environments)

	[w]	*[hw]*	*[wh]*
MCOF	100	0	0
MCOM	100	0	0
MCYF	68.75	6.25	25
MCYM	62.5	18.75	18.75
WCOF	62.5	0	37.5
WCOM	100	0	0
WCYF	75	12.5	12.5
WCYM	81.25	6.25	12.5

Note n = 128. The data were too sparse for statistical analysis. Nevertheless there are tendencies. Middle-class adults are categorical in using [w]. Younger speakers, both working and middle-class, use [hw] and [wh].

11. *R-realization*

11.1. *R-realization*: Background

In her study of postvocalic /r/ in working-class children in Edinburgh, Romaine (1978) reviews previous accounts of the phonetics of /r/ in Scottish English resulting in the following possibilities: apical trills, apical taps, sporadic uvular variants, as well as the expected approximant associated with Highland English, Scottish Standard English and 'girls of fee-paying schools as a marker of "polite" Edinburgh speech'. Her results revealed social, in particular, sex differentiation in patterning, with boys using more taps and r-lessness, and girls using more approximants. The pilot study of the 1997 data also suggested a range of variation with a social dimension, though with no indications of any kind of labial /r/ (Stuart-Smith 1999).

All words containing /r/ in the wordlist were transcribed for all speakers. Claire Timmins began by transcribing all instances of /r/ in the conversations, but the high frequency of the sound forced us to reduce this to all instances for the first 10% of the duration of all conversations for all speakers.

Considering the realization of /r/ as a variable in its own right was not included in the original research schedule for the project. However the complexity of the variation that emerged from looking at the loss of postvocalic /r/ was so great (11 variant categories) that two /r/ variables were created:

(r1) R-realization: a summary overall picture of the sociolinguistic patterning of the articulatory possibilities for /r/ (across all phonetic environments, reducing all vocalic variation to a single category [V])

(r2) R-vocalization: a detailed investigation of variation and change of postvocalic /r/ (separating phonetic environments, reducing all variation to a single category [r])

Articulated [r] variants in *R-vocalization* can be expanded by reference to *R-realization*, vice versa for [V] variants, though note that the two variables do not map exactly onto each other. *R-realization* refers to the realization of /r/ in all phonetic environments, not only postvocalic position.[6]

11.2. *R-realization*: Phonetic environment

No attempt was made to separate the data according to phonetic environment.

[6] Note that the percentages of tokens vary across the two variables as they are based on different original numbers of instances of /r/.

11.3. *R-realization*: Variant categories

[r]: central approximants.
[R]: retroflex approximants, varying in degree of approximation.
[rt]: mainly voiced alveolar taps, some very open.
[Rt]: voiced and devoiced retroflex taps.
[Ru]: voiced uvular fricative.
[rtt]: voiced alveolar trill.
[V]: Under this category fall all variants of rhotacized and velarized vowels, and vowels without obvious secondary articulation which are detailed under the variable *R-vocalization*.
[m]: a miscellaneous category consisting of a couple of dental/alveolar stops and complete deletion.

10.4. *R-realization*: Read speech (all environments)

	[r]	*[R]*	*[rt]*	*[Rt]*	*[Ru]*	*[V]*	*[m]*
MCOF	13.42	58.87	21.64	0.87	0	5.19	0
MCOM	11.25	44.15	29	7.36	0	8.22	0
MCYF	6.64	64.6	23.45	0	0	5.31	0
MCYM	5.17	41.38	30.6	0	0	22.84	0
WCOF	13.85	20.78	44.59	4.76	0	16.02	0
WCOM	12.61	0.43	60.87	0	0	26.09	0
WCYF	12.66	0	29.69	0	0.44	56.33	0.87
WCYM	7.92	2.2	37.44	0	0.44	51.54	0.44

Note n = 1834. The factors of CLASS, AGE and their interaction were significant, as were the interactions of AGE/GENDER and AGE/CLASS/GENDER. Across variants working-class girls differentiate significantly from all four groups of middle-class speakers. Not surprisingly, working class girls are significantly different from all middle-class speakers, and working-class women in their absence of [R].

10.5. *R-realization*: Spontaneous speech (all environments)

	[r]	*[R]*	*[rt]*	*[Rt]*	*[Ru]*	*[rtt]*	*[V]*	*[m]*
MCOF	23.10	52.71	21.66	0.00	0.00	0.00	2.53	0.00
MCOM	12.37	64.21	10.37	0.00	0.00	0.00	13.04	0.00
MCYF	13.71	60.48	22.58	0.00	0.00	0.00	3.23	0.00
MCYM	14.71	52.21	28.68	0.00	0.00	0.00	4.41	0.00
WCOF	11.00	39.23	26.79	2.39	0.00	0.00	20.57	0.00
WCOM	18.39	44.44	23.75	0.00	0.00	1.15	11.88	0.38
WCYF	14.84	4.52	20.00	0.00	0.00	0.00	60.00	0.65
WCYM	2.17	19.57	28.26	0.00	2.17	0.00	45.65	2.17

Note n = 1474. The effect of CLASS emerged as significant, as did the interaction between all three effects, AGE/CLASS/GENDER. There were no significant differences within or across variants. Interestingly what characterizes sociolinguistic difference in the realization of /r/ is not the use of a single variant but clusters of variants. Thus both working-class and middle-class speakers use [R] and [rt], but in different proportions with respect to the variation as a whole.

Acknowledgements

Jane Stuart-Smith and Fiona Tweedie are grateful to the Leverhulme Trust for financial assistance to support the main analysis of these data (*Accent change in Glaswegian: A sociophonetic investigation*, grant no. F/179/AX). Jane Stuart-Smith is grateful to the Arts and Humanities Research Board for a Research Leave grant which enabled further analysis, interpretation, and the writing up of these results.

References

Corbett, John, Derrick McClure, and Jane Stuart-Smith (eds.) (2003) *The Edinburgh Companion to Scots*. Edinburgh: Edinburgh University Press.

Foulkes, Paul and Docherty, Gerard (eds.) (1999) *Urban Voices: Accent studies in the British Isles*. London: Arnold.

Jones, C. (ed.) (1997), *The Edinburgh History of the Scots Language.* Edinburgh: Edinburgh University Press.

Lawson, Eleanor (1998), The 'Scottish' consonants in the speech of Glaswegian school children - a sociophonetic investigation. Final Report on a Vacation Scholarship from the Carnegie Trust.

Lawson, Eleanor and Stuart-Smith, Jane (1999) A sociophonetic investigation of the "Scottish" consonants (/x/ and hw/) in the speech of Glaswegian children. In:

Proceedings of the14th International Congress of Phonetic Sciences, San Francisco, 2541-4.

Macafee, Caroline (1983) *Varieties of English around the World: Glasgow*. Amsterdam: Benjamin.

Macafee, Caroline (1994) *Traditional dialect in the modern world: A Glasgow case study*. Frankfurt: Peter Lang.

Macafee, Caroline (1997) Ongoing change in modern Scots: The social dimension. In: Charles Jones (ed.), 514-48.

Macaulay, Ronald (1977) *Language, Social Class and Education: A Glasgow Study*, Edinburgh: Edinburgh University Press.

Romaine, Suzanne (1978) Postvocalic /r/ in Scottish English: sound change in progress? In: Peter Trudgill (ed.), *Sociolinguistic patterns in British English*, 144-57. London: Edward Arnold

Stuart-Smith, Jane (1999) Glasgow: Accent and voice quality. In: Paul Foulkes and Gerard Docherty (eds.), 203-222.

Stuart-Smith, Jane (1999a) Glottals past and present: A study of T-glottalling in Glaswegian. *Leeds Studies in English*, 30, 181-204.

Stuart-Smith, Jane (2003) The phonology of Modern Urban Scots. In: Corbett et al (eds.), 110-37.

Stuart-Smith, Jane (2004) Empirical evidence for gendered speech production: /s/ in Glaswegian. Paper presented at Laboratory Phonology 9, 24-26 June 2004, University of Illinois at Champaign/Urbana.

Stuart-Smith, Jane, Timmins, Claire, Lawson, Eleanor, and Tweedie, Fiona (under review) Changing consonants: Insights from a contemporary spoken corpus.

Stuart-Smith, Jane, Timmins, Claire, and Tweedie, Fiona (under review) Conservation and innovation in a traditional dialect: L-vocalization in Glaswegian.

Stuart-Smith, Jane, Timmins, Claire, and Wrench, Alan (2003) Sex and gender differences in Glaswegian /s/. In: *Proceedings of the 15thInternational Congress of Phonetic Sciences,* Barcelona, 1851-4.

Stuart-Smith, Jane and Tweedie, Fiona (2000) *Accent change in Glaswegian: A sociophonetic investigation*. Final Report to the Leverhulme Trust (Grant no. F/179/AX): http: //www.arts.gla.ac.uk/SESLL/EngLang/research/accent/accent1.htm

Timmins, Claire, and Stuart-Smith, Jane (2004) An acoustic analysis of L-vocalization in Glaswegian adolescents. Paper presented at BAAP 2004, 24-26 March 2004, University of Cambridge.

Wells, John (1982) Scotland. In: *Accents of English,* 393-417. Cambridge: Cambridge University Press.