The trajectory of changing rhoticity in Bristol English

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0 Abstract

This study presents data on rhoticity in Bristol English. Through an investigation into the speech of 30 Bristol speakers the study demonstrates that this traditional feature is declining in apparent time. In concert with the status of this variable known from earlier studies of closely related varieties, this is taken as strong evidence for ongoing change: rhoticity is receding in Bristol English. Setting the specific rates for different age-groups in the context of the model for community change proposed by Baxter & Croft (2016), it is suggested that this change is happening relatively slowly, largely below the level of speaker awareness and with consequently high rates of inter-speaker variation.

The study also investigates internal factors conditioning the occurrence of rhoticity in the variety, finding that the strongest effect is from the preceding vowel, but that word class, a following pause, and style (indicated by time in the interview) also have an effect. These findings are placed in the context of previous research: all are very typical of findings for other varieties with variable rhoticity.

1 Introduction

Bristol, the tenth largest city in the UK and the largest urban centre in the South West of England, has received strikingly little attention in the linguistics literature, belying the constellation of interesting features presented by Bristol English.[1] The traditional dialect has several features found in West Country varieties more generally, including a long front BATH vowel (but a short vowel for certain lexical items), stopping of the voiced dental fricative, *he/him/his* for inanimate count nouns and do-support in non-emphatic habitual affirmative clauses, as well as idiosyncratic features of its own, including the famous epenthetic *l* (for a thorough review of the literature on Bristol English, see Coates (2018)). Perhaps its most salient feature in the English English context, however, is that it is a rhotic variety, retaining historical nonprevocalic /r/.

A great deal of evidence has been presented in the literature showing that most English English varieties have been subject to rapid levelling processes over the last several decades. Any salient feature which differs from the Standard Southern British English (SSBE) variety associated with middle class speakers in the south-east is a potential target for this attrition. In this light, we can expect to find rhoticity declining in Bristol English. This change has already taken place in varieties in other parts of England and in Southern Hemisphere Englishes; in North America, the sociolinguistic situation is reversed, and traditionally non-rhotic varieties are undergoing levelling towards the rhotic standard.

This paper presents data on rhoticity from 30 speakers of Bristol English. After summarising data collection methodology (2), the first half of the paper (3) explores the changing status of rhoticity in Bristol English. Other studies of rhoticity in English English varieties are reviewed to place Bristol in context (3.1) before the findings for Bristol are reported (3.2). Issues around apparent time and lifespan change are discussed (3.3.1), and a model taken from Baxter & Croft (2016) contributes to developing a narrative for the historical trajectory of change (3.3.2). The second half of the paper (4) investigates internal conditioning of rhoticity. Internal factors influencing rate of rhoticity in 34 studies of English varieties around the world are surveyed and a subset of these are explored in the Bristol English data.

1 Acknowledgements are made to the Bristol Centre for Linguistics (BCL) which funded and coordinated this project. Beeching, Coates, Murphy and Robinson are affiliated to BCL at the University of the West of England, Bristol. Thanks go to Sali Tagliamonte and to the audience at *Language Variation and Change in the South of England 2017* for helpful comments on earlier versions of this paper.

2 METHODOLOGY

2.1 Speakers

21 speakers were recorded in unstructured sociolinguistic interviews. All speakers had lived the vast majority of their lives in Bristol; for most, their parents and even grandparents had also been born and lived in the city. Information on these speakers is given in Table 1, below[2]. Of these, speakers 1-11 and 19-25 were interviewed by Emily Robinson, 26-27 by Blaxter and 28 by Murphy. Note that speakers 19 and 20, 21 and 22, 26 and 27 and 28 and 29 were interviewed in pairs (speaker 29 was later excluded since it was discovered that they were not born in Bristol); all other speakers were interviewed individually. Where possible, individual interviews lasted 45 minutes and pair interviews 90 minutes.

2 All speaker names are pseudonyms.

id	name	year of birth	gender identity	job	mother's job	father's job	age leaving education
1	Connie Miller	2002	female	n/a	headteacher	locksmith	n/a
2	Esther Farrell	2003	female	n/a	creche worker	bus driver	n/a
3	William Dudley	2000	male	n/a	hairdresser	plumber	n/a
4	Rebecca Evans	2001	female	n/a	admin/cashier	post office worker	n/a
5	Claire Bevan	2002	female	n/a	barlady/cleaner	carer	n/a
6	Callum Moore	2001	male	n/a	dinner lady	lorry driver	n/a
7	George Baker	2000	male	n/a	pre-school manager	engineer	n/a
8	Nicole East	2001	female	n/a	healthcare worker	lorry driver	n/a
9	Sam Tasker	2003	male	n/a	admin at school	civil servant	n/a
10	Marcus Johnson	2001	male	n/a	call centre worker	handyman at hospital	n/a
11	Rachel Newton	2000	female	n/a	teaching assistant	salesman	n/a
19	Steven Thompson	1941	male	engineer	tobacco worker	tobacco worker	16
20	Sandra Jackson	1946	female	secretary	telecommunications	engineer	17
21	Leon Roper	1947	male	operations manager	office clerk	butcher	15
22	Lesley Gates	1947	female	hairdresser	caretaker	painter and decorator	15
23	Barbara Perkins	1932	female	machinist	chocolate maker	painter and decorator	14
24	Sheila Atkins	1920	female	factory worker	chocolate maker	railway worker	14
25	Elsa Green	1924	female	admin assistant	seamstress	railway worker	14
26	Gale Jackson	1925	female	businesswoman	none	shoe factory worker	15
27	Ivan Bell	1934	male	civil servant	none	shoe factory worker	16
28	Penny Vale	1930	female	teacher	none	stationer	21

Table 1: Speakers

2.2 Supplementary data

These data were supplemented with data from nine speakers collected by Blaxter for an unpublished BA dissertation study in 2009-2010. In that study the same interview technique was used and thus a similar quantity of data collected; however, fewer metadata about each speaker were recorded. These speakers are listed in Table 2, below. Of these speakers, b5 and b6 were recorded in a pair interview and all other speakers in individual interviews.

id	name	year of birth	gender identity	job	mother's job	father's job
b1	Rochelle Cheldon	1983	female			
b2	John Coaley	1984	male			
b3	Jessica Sherwill	1940	female			soldier
b5	Debbie Brewer	1927	female			soldier
b6	Penelope Horwood	1932	female			soldier
b7	James Dolton	1939	male			pub landlord
b8	Thomas Lynton	1942	male	various manual and delivery jobs		factory worker
b12	Kate Kennerleigh	1989	female	veterinary nurse		
b13	Jack Shebbear	1986	male		nurse	plumber

Table 2: Supplementary speakers

2.3 Tokens

Tokens potentially containing nonprevocalic /r/ were identified and classified according to the preceding vowel on the basis of Wells' lexical sets: CURE, FIRE, HOUR, lettER, NEAR, NORTH/FORCE, NURSE, SQUARE and START. Tokens were excluded from consideration for the following reasons:

- the /r/ was word-final and the following word began with a vowel (thus a linking /r/ would be expected even in non-rhotic varieties);
- the /r/ was word-final and the following word began with an /r/;
- the syllable in question was deleted by fast speech processes;
- the word was effectively inaudible due to background noise.

A sample of 20 tokens per vowel/speaker combination were then extracted for the main dataset; wherever, after these exclusions, there remained fewer than 20 tokens for a given vowel/speaker combination, all relevant tokens were extracted. All relevant tokens were extracted from the supplementary dataset.

2.4 Judgements

A judgement was then made by Blaxter for each token about whether nonprevocalic /r/ was retained or deleted. This judgement was primarily perceptual, made on the basis of auditory examination of the token, but backed up by visual inspection of the spectrogram. Where the token was clearly perceived as rhotic, it was coded as rhotic; where it was perceptually indeterminate but there was a visible drop in f3 over the course of the preceding vowel, it was coded as rhotic. Only where *both* the evidence of the spectrogram and auditory perception were indeterminate (typically, as indicated above, due to excess of background noise) was the token excluded.

2.5 Interim summary of dataset

Table 3, below, shows the number of tokens extracted for each speaker/vowel combination.

speaker	CURE	FIRE	NORTH/FORCE	START	NEAR	lettER	SQUARE	NURSE	HOUR	total
1	1	2	20	20	15	20	20	20	0	118
2	0	1	20	20	17	20	20	20	5	123
3	0	2	20	12	20	20	13	20	1	108
4	0	4	20	20	20	19	20	20	7	130
5	0	0	20	20	16	20	20	20	0	116
6	0	2	20	12	9	20	20	20	0	103
7	1	1	20	12	6	20	17	20	0	97
8	0	3	20	20	15	20	20	20	11	129
9	2	0	20	20	8	19	20	19	0	108
10	11	4	20	20	10	20	20	20	4	129
11	2	2	20	20	20	20	20	20	11	135
19	0	0	20	20	15	20	20	20	7	122
20	1	2	20	20	20	20	20	20	18	141
21	1	2	20	20	13	20	20	20	4	120
22	0	3	20	20	20	20	20	20	20	143
23	0	0	20	16	12	20	20	20	1	109
24	0	0	20	16	14	20	11	20	1	102
25	0	0	20	8	10	20	14	19	0	91
26	0	2	20	20	20	20	20	20	4	126
27	0	2	20	20	17	20	20	20	13	132
28	0	1	20	20	20	20	20	20	19	140
b1	2	3	129	49	50	111	104	102	10	560
b2	1	6	123	47	37	86	56	71	2	429
b3	4	1	65	27	37	118	51	74	13	390
b5	0	3	171	90	43	213	108	133	122	883
b6	0	2	77	25	29	87	68	54	34	376
b7	2	1	101	54	18	115	98	69	3	461
b8	2	6	138	40	67	149	108	72	17	599
b12	4	3	128	61	26	118	92	141	9	582
b13	8	2	170	53	42	143	91	135	6	650
total	42	60	1522	822	666	1558	1171	1269	342	7452

Table 3: Tokens per speaker

3 THE LOSS OF RHOTICITY IN BRISTOL ENGLISH

3.1 Rhoticity in English Englishes

At the time of the Survey of English Dialects (Orton & Dieth 1962), an area including the whole of the south coast of England and stretching in the west as far north as Wolverhampton apparently retained rhoticity. The sampling methodology of the SED aimed to access the most conservative speech possible, interviewing only elderly, rural, non-mobile, male speakers. Accordingly, we can hardly regard it as a representative picture of the speech of the population in the mid-fifties, and a casual observer in modern Britain would not expect to find rhoticity across such a large area of the south of England. Nevertheless, rhoticity remains strongly associated with the speech of the West Country in the public imagination, manipulated in well-known comic portrayals and stereotypes such as those of the sketch show Little Britain.

No systematic survey with methodology similar to the SED has been undertaken for English Englishes in the decades since 1962 from which we could take a more up-to-take estimate of the distribution of rhoticity. However, a large-scale crowdsourced study, as well as smaller, single-locality studies, can give us a suggestive picture of the state of affairs. Leemann, Blaxter & Li (2016) present results of self-reporting data from 31k speakers crowdsourced through a smartphone app. In this sample, rhoticity has receded drastically compared with the geographical distribution seen in the SED: in England, it is almost entirely absent outside the counties of Cornwall, Dorset, Devon, Somerset and Gloucester and the city of Bristol, with another small remnant area around Blackburn in Lancashire. Even within these areas, rates of rhoticity are nowhere higher than 50%, as can be seen in Table 4[3]. Thus the picture of rhoticity offered by this study is one of considerable decline since the SED. However, caution must be taken with these data. As self-reporting data, they may not match real usage data, especially given the possibility of <r> spellings influencing speakers to report /r/ pronunciations. They are not based on a balanced sample, but highly overrepresent educated and young people compared with the general population, implying a bias towards innovative speakers.

Region	**Rhoticity**
Cornwall	28.71% - 40.00%
Devon	22.12% - 36.00%
Dorset	12.39% - 31.09%
Somerset, North Somerset	9.22% - 37.86%
Bristol, South Gloucestershire	17.52% - 38.69%
Gloucestershire	8.26% - 34.65%
Wiltshire	8.49% - 29.00%
Blackburn	13.33% - 39.00%
Lancashire	4.95% - 37.12%

Table 4: Rates of rhoticity by county in the English Dialect App

Other studies have examined single varieties. Jones (1998), reported in Britain (2002) and Dudman (2000), finds that “younger speakers still retained some degree of rhoticity in some linguistic environments in rural east Devon and West Somerset but there was a clear trend towards erosion” (Britain 2002: 52). Piercy (2006; 2007; 2012) reports that rhoticity has declined to near

3 Each speaker was asked just one question on rhoticity. These percentages are derived by kernel smoothing of data across regions and so should be interpreted as estimations of the proportions of the population who self-report that they retain rhoticity.

zero for young speakers in Dorset English based on interviews with sixteen speakers from four localities (2006: 62–63; 2007: 201–202); female speakers and urban localities appear to be leading this change (2006: 63–64, 66–67; 2007: 202–204). Sullivan (1992), reported in Dudman (2000: 18–19) and Vivian (2000: 17), studied rhoticity in the speech of 20 Exeter adolescents, finding an overall rate of 4% rhoticity in word-final position and 13% in word-medial position, with just 8% of speakers still maintaining some rhoticity. Male, rural and lower working-class speakers favour rhoticity compared with female, urban and upper middle class speakers; she finds higher rates in conversational than formal reading style (Dudman 2000: 18; Vivian 2000: 17). Hollitzer (2013) examined rhoticity in a small study in Newbury (Berkshire), Swindon (Wiltshire) and Taunton (Somerset), finding loss of rhoticity in apparent time in all three locations. The change was least advanced in Taunton, where one 29-year-old speaker still exhibited 68% rhoticity, and most advanced in Newbury, where all speakers under 60 were (near) categorically non-rhotic (interestingly, the Newbury data gives the impression of a quite abrupt generational change). Outside the West Country but in the same connected area of rhoticity at the time of the SED, Williams (1991) reports that on the Isle of Wight younger speakers are categorically non-rhotic but older speakers still show mean rates of rhoticity over 60% (1991: 62) on the basis of interviews and reading tasks with 29 speakers (1991: 57–58). Simpson (1996), reported in Dudman (2000: 17–18), examines rhoticity in the New Town of Telford, Shropshire, a region at the northern edge of the West Country rhotic region in the SED. She finds rhoticity declining sharply in apparent time, with categorical non-rhoticity in speakers born after the mid 1970s (2000: 17–18).

Asprey (2007) investigates rhoticity in Black Country English, a region, like Bristol, whose traditional variety was rhotic, on the basis of Ellis (1889), the SED (Orton & Dieth 1962) and unstructured dyad interviews with 39 speakers undertaken between 2003 and 2006. She finds that rhoticity in the modern data is restricted to a small number of elderly speakers, stating that "the speech of the overwhelming majority is non-rhotic" (Asprey 2007: 99). Barras (2010) investigates rhoticity and linking- and intrusive-r in Lancashire English, on the basis of reading and elicitation task data and conversational data from 30 speakers across five locations (2010: 93–95). Rhoticity had dropped to well below 20% in the three localities closest to Manchester, but was retained at between 40 and 50% in the two more rural locations (2010: 117–119). Vivian (2000) reports on rhoticity in Lancashire English on the basis of reading passage and wordlist data from 23 working-class speakers who had lived in the area for their entire lives. She finds that rhoticity is extremely robustly maintained, with younger speakers averaging 98% rhotic; there appears to be change *towards* rhoticity in apparent time, although Vivian sounds a note of caution regarding the oldest age category, which is represented by just two speakers (2000: 29–30). Male speakers favour rhoticity compared with female speakers (2000: 29–30). The different localities studied also vary, with the most easterly, Burnley, showing the lowest rate of rhoticity (2000: 30). French (1988) examines remnant rhoticity in the largely non-rhotic variety of North-East Yorkshire on the basis of interviews with a single retired farm-labourer (1988: 126). He finds some traces of rhoticity maintained only in word-final prepausal position, suggesting that it has a pragmatic function in this position in this variety (1988: 128–132).

Overall, then, we have a clear and consistent picture of sharp decline in rates of rhoticity in English English varieties from the earliest studies to the present day, with population rates of rhoticity of up to 40% maintained in the most conservative areas (with some outliers). Generally speaking, varieties further west seem to retain rhoticity better, no doubt simply because they were further from the historical isogloss. In studies that have made the distinction, rural varieties seem to retain rhoticity better than urban varieties, and male and working class speakers better than female and middle class speakers. These then are the patterns we might expect for Bristol English.

3.2 Rhoticity in Bristol English

The proportion rhoticity per speaker and vowel in this study is given in Table 5, below; cells are

filled only if at least 10 tokens were tagged. Average rate of rhoticity across all vowels by speaker year of birth and gender is visualised in Figure 1, below.

Several observations jump out from these data. First is the degree of intraspeaker variation visible in Table 5: there are within-speaker differences of up to 80% depending on lexical set (compare NURSE and CURE for speaker 1). The issue of intraspeaker variation will be returned to in the final section of this paper; for now, suffice it to say that we must keep in mind that estimating overall rates of rhoticity per speaker abstracts away from a complex underlying pattern of variation.

Second, it is important to note the degree of interspeaker variation, both in the dataset as a whole and within social groups. Splitting the dataset by gender and into two age categories (speakers born before 1950 and speakers born after 1980) we find huge ranges in every group: from 12.3 to 96.7% rhoticity in older female speakers; 2.0 to 97.8% in older male speakers; 0 to 85.1% in younger female speakers; 1.0 to 71.3% in younger male speakers. This huge within-group variation should caution us against drawing strong conclusions about the differential behaviours of different groups of speakers.

speaker	CURE	FIRE	NORTH/FORCE	START	NEAR	lettER	SQUARE	NURSE	HOUR	mean	all
1	0.0	50.0	5.0	30.0	13.3	10.0	20.0	80.0		26.0	27.1
2		0.0	55.0	60.0	82.4	50.0	45.0	80.0	60.0	54.0	61.0
3		50.0	65.0	91.7	75.0	70.0	46.2	80.0	0.0	59.7	70.4
4		25.0	5.0	15.0	25.0	5.3	0.0	20.0	0.0	11.9	11.5
5			30.0	90.0	68.8	55.0	40.0	90.0		62.3	62.1
6		50.0	0.0	0.0	0.0	5.0	15.0	35.0		15.0	11.7
7	0.0	0.0	0.0	0.0	50.0	5.0	0.0	55.0		13.8	15.5
8		100.0	10.0	45.0	20.0	35.0	10.0	70.0	9.1	37.4	31.8
9	0.0		5.0	0.0	0.0	0.0	0.0	0.0		0.7	0.9
10	0.0	75.0	30.0	45.0	20.0	50.0	10.0	80.0	25.0	37.2	38.0
11	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.7
19			45.0	90.0	46.7	75.0	65.0	100.0	100.0	74.5	73.0
20	100.0	0.0	15.0	35.0	10.0	10.0	10.0	30.0	33.3	27.0	20.6
21	100.0	50.0	75.0	95.0	92.3	100.0	95.0	100.0	75.0	86.9	91.7
22		33.3	0.0	10.0	5.0	10.0	20.0	70.0	30.0	22.3	21.0
23			75.0	81.3	66.7	40.0	40.0	85.0	100.0	69.7	64.2
24			40.0	31.3	100.0	50.0	72.7	95.0	100.0	69.9	63.7
25			40.0	50.0	80.0	45.0	64.3	89.5		61.5	60.4
26		50.0	40.0	45.0	35.0	65.0	25.0	95.0	75.0	53.8	51.6
27		100.0	60.0	65.0	88.2	80.0	70.0	100.0	84.6	81.0	78.0
28		0.0	5.0	0.0	30.0	0.0	20.0	5.0	26.3	10.8	12.1
b1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
b2	0.0	0.0	0.8	4.3	2.7	0.0	0.0	2.8	0.0	1.2	1.4
b3	100.0	100.0	75.4	100.0	89.2	83.1	64.7	97.3	100.0	90.0	84.6
b5		100.0	97.1	100.0	100.0	86.4	94.4	100.0	99.2	97.1	95.4
b6		100.0	89.6	96.0	100.0	81.6	88.2	92.6	97.1	93.1	89.9
b7	100.0	100.0	93.1	100.0	100.0	93.9	96.9	98.6	100.0	98.1	96.1
b8	100.0	100.0	92.8	100.0	100.0	94.6	97.2	100.0	100.0	98.3	96.5
b12	100.0	66.7	84.4	82.0	88.5	77.1	82.6	95.7	100.0	86.3	85.6
b13	25.0	100.0	30.0	64.2	97.6	53.8	76.9	83.0	66.7	66.4	60.5
mean	44.6	54.2	38.8	50.9	52.9	44.4	42.3	67.6	57.6	50.4	

Table 5: Proportion rhoticity per speaker and vowel

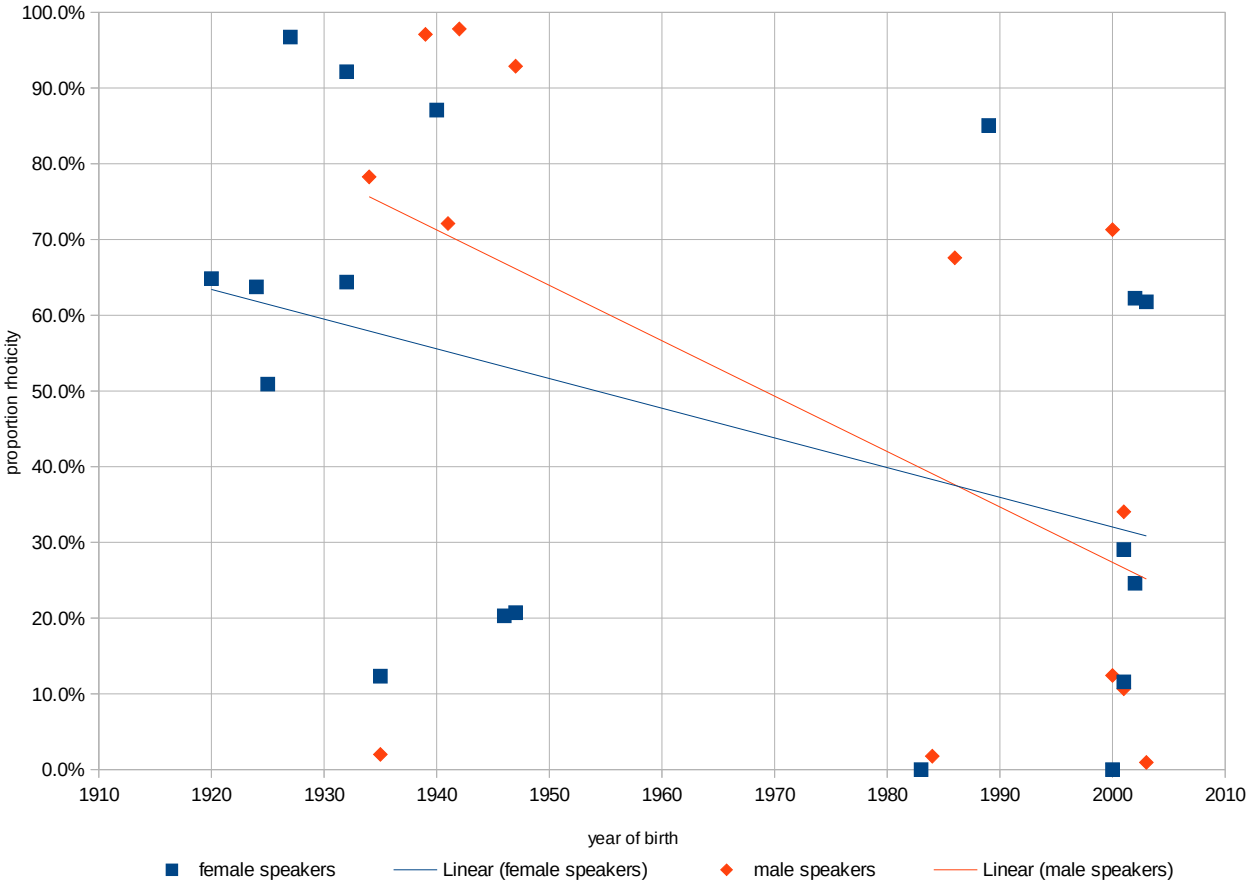

Figure 1: Proportion rhoticity per speaker by year of birth and gender

These caveats made, there does appear to be a trend in apparent time; linear trend lines have been added to Figure 1 to highlight this. There is no immediately obvious effect of gender.

In order to investigate the effect of occupation, it was necessary to simplify the long list of occupations given by speakers into a simple, categorical variable that could be used in statistical analyses. Two classifications were tested. Firstly, the occupations of speakers and their parents were placed in the ONS multi-purpose classification of occupations. Secondly, following the 'linguistic marketplace' theory (Sankoff & Laberge 1978), occupations were classified according to the value they place on legitimised speech: 'high' for occupations which primarily involve speaking (public facing customer service, education), 'medium' for those in which involve speaking is a secondary skill, and 'low' for those which are not focused on speaking. These classifications are given in Table 6.

Associations between rhoticity and age, gender and job type were then investigated using mixed-effects regression analysis: the dependent variable was whether or not a token was rhotic; the independent variables included as fixed effects were (scaled) year of birth, gender, job type, mother's job type and father's job type; speaker and lexical item were included as random effects. Gender, job type and mother's job type (by either classification) were found to have no significant effect and so were dropped; the model with the more complex classification of fathers' jobs could not converge, so the simpler linguistic marketplace measure was used. The model specification and output including just the remaining two predictors, year of birth and father's job type, is given as Figure 2; the reference value for the father's job type factor is 'unknown'.

As can be seen from the figure, the model confirms the effect of age: speakers with a later year of birth are less likely to produce rhotic tokens. There is also an effect of linguistic

marketplace: speaker’s whose fathers did jobs which put a low value on normative language use show higher use of rhoticity than other speakers.

Major group	Occupation self-description	Linguistic marketplace
1 Managers, directors and senior officials	operations manager	medium
2 Professional occupations	headteacher, pre-school manager, teacher	high
2 Professional occupations	engineer, healthcare worker, nurse	medium
3 Associate professional and technical occupations	soldier	low
4 Administrative and secretarial occupations	civil servant, post office worker, office clerk, admin assistant, admin, admin at school, secretary	medium
5 Skilled trade occupations	locksmith, plumber, painter and decorator, butcher	low
6 Caring, leisure and other service occupations	teaching assistant, crèche worker, veterinary nurse, carer, hairdresser, caretaker	high
7 Sales and customer service occupations	cashier, salesman, stationer, call centre worker, telecommunications, retail businesswoman	high
8 Process, plant and machine operatives	chocolate maker, tobacco worker, shoe factory worker, factory worker, machinist, seamstress, handyman at hospital, lorry driver, manual and delivery jobs, bus driver, railway worker	low
9 Elementary occupations	cleaner, dinner lady	low
9 Elementary occupations	barlady, pub landlord	high

Table 6: Occupations by ONS major group

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Generalized linear mixed model fit by maximum likelihood (Laplace Approximation)
['glmerMod']
 Family: binomial  ( logit )
Formula: perceptually.rhotic ~ scale(year_of_birth) + fathers_job_LM +      (1 |
speaker) + (1 | word)
   Data: data_prepped

     AIC      BIC   logLik deviance df.resid
  4873.4   4921.8  -2429.7   4859.4     7445

Scaled residuals:
    Min      1Q  Median      3Q     Max
-7.4303 -0.1386  0.1357  0.3278 19.2561

Random effects:
 Groups  Name        Variance Std.Dev.
 word    (Intercept) 1.353    1.163
 speaker (Intercept) 4.582    2.140
Number of obs: 7452, groups:  word, 1086; speaker, 30

Fixed effects:
                     Estimate Std. Error z value Pr(>|z|)
(Intercept)           -2.3336     1.3110  -1.780   0.0751 .
scale(year_of_birth)  -0.8941     0.3873  -2.308   0.0210 *
fathers_job_LMhigh     2.0065     1.6933   1.185   0.2360
fathers_job_LMlow      3.2565     1.4109   2.308   0.0210 *
fathers_job_LMmedium   0.3742     1.6655   0.225   0.8222
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Figure 2: Mixed-effects regression model investigating external factors

3.3 The overall trajectory of the change

3.3.1 Synchrony and diachrony

Most variationist research is synchronic, investigating datasets which reflect usage at a single point in time. The standard method of making inferences to diachrony from such data is the ‘apparent time’ method. This method assumes that people tend largely to retain the patterns of language use of their youth (‘vernacular stability’), so that patterns against age in synchronic data can be read as change over time. In recent years, various studies have interrogated this assumption and tested the apparent time method against real time data.

In simple terms, these studies have generally confirmed the apparent time method. Studies which have returned to and resampled previously studied communities, such as Bailey (1991; 2008), Buchstaller (2006), Sankoff & Blondeau (2007), have usually found that the apparent time method correctly identified the direction of change: where there was a positive correlation between a variant and year of birth in synchronic data, later resampling showed increased community use of that variant; where there was negative correlation, later resampling showed decreased use; and where there was no correlation, resampling showed similar rates of use. On this basis, we can be relatively confident that the change in apparent time identified in this study indicates that Bristol English is losing rhoticity; this is reinforced by how well this finding fits into known patterns from related varieties.

This is not the entire story, however. Panel studies examining the speech of the same individuals over the course of decades have shown that, contrary to the prediction of vernacular stability, some individuals do make substantial changes to their language use over their lifespans. Such change is normally in the direction of the community change (Buchstaller 2006; Sankoff & Blondeau 2007; Raumolin-Brunberg 2009): this phenomenon would have the effect of minimising change in apparent time, making it appear to be taking place more slowly than it really was. There are occasional examples of lifespan change in the opposite direction (Bowie 2005; Sankoff & Wagner 2006; Wagner & Sankoff 2011), which would have the effect of exaggerating change in

apparent time. In the most extreme cases, patterns in apparent time may be entirely explained by lifespan change: most typically this might reflect the classic 'age-grading' pattern in which speakers decrease their use of non-standard variants during their working adulthood only to increase them again after retirement. The reader is referred to reviews in Wagner (2012) and Sankoff (2013) for more details on the evidence and theory around lifespan change, age-grading and apparent time.

Thus, in order to get a better idea of the trajectory and time-scale of the loss of rhoticity in Bristol English, we need to go beyond apparent time data. A crucial question is whether rhoticity is a variable which can be subject to lifespan change. There is one previous study which deals with lifespan change in rhoticity: Elliott (2000)'s study of rhoticity in speech in American films from the 1930s to the 1970s, which examines real-time change in individual speakers' rates of rhoticity by examining 24 speakers who appear in different films across multiple decades. Elliott finds that ten of the twelve female speakers and five of the male speakers exhibited substantial increase in rhoticity over time, with just three speakers changing contrary to the direction of the population change (2000: 54–55). Female speakers showed more drastic rates of lifespan change, with one-decade changes as large as 50%, lifetime changes as large as 89%, and a mean per-decade increase of 20% (compared with 41%, 52% and 13.5% for male speakers) (2000: 54–56). This should be set in the context of Elliott's observation that throughout female speakers show higher in-group variability, with categorical non-rhoticity more common for female than male speakers in the first three decades but categorical rhoticity more common for female than male speakers in the final decade (2000: 45–47).

The parallel is not perfect for two reasons. Firstly, the direction of change in Elliott's study is opposite that in Bristol English. However, since losing rhoticity should in principle be *easier* than gaining it (gaining rhoticity involves learning a very long list of lexical contrasts, whereas losing rhoticity can be implemented by simply gaining a low-level phonetic rule), this does not interfere with the conclusion that it is possible for speakers to exhibit dramatic lifespan change in this variable. Secondly, since Elliott's study is based on the performed speech of actors, it might be objected that it only reflects changes in stylistic norms over time and not truly 'language change'. However, I would suggest that the two cases are comparable: both lifespan change of speakers in a changing speech community and the changing speech of actors in response to the evolving requirements of their profession reflect individual changes in response to changing community norms.[4] Accordingly, it seems reasonable to conclude in principle that speakers can exhibit dramatic lifespan change in rhoticity.

A second important question regards the starting point of the change. What rate of rhoticity would we expect from a truly traditional speaker, before any change towards non-rhoticity had begun? Although no work has been done on rhoticity in historical recordings of Bristol speakers, recordings of West Country speakers in the SED have been investigated. Piercy (2012: 79) finds around 97% rhoticity in five recordings of Dorset speakers from the SED; these speakers were born between 1871 and 1886. This, then, appears to be the baseline level of rhoticity in a fully rhotic variety: we can assume for simplicity's sake that Bristol speakers born in the period before the change away from rhoticity began would have had similar rates of rhoticity to these Dorset speakers, with 0-3% non-rhoticity resulting from normal fast-speech processes.

Given this baseline, we can see that the most rhotic of the Bristol speakers studied here retain the traditional vernacular virtually unchanged: b7, with 96.1% rhoticity and born in 1939, and b8, with 96.5% rhoticity and born in 1942. Assuming that children acquiring language are always relatively effectively able to approximate the community average, we must assume that the change had not yet started or was at an incipient stage when these speakers were young children.

4 A related objection is that the differences Elliott observed might reflect the different types of roles actors are asked to play over the course of their careers. This is possible, but would fail to account for the fact that in the later decades it is not only the older actors whose rates of rhoticity are higher, but also younger actors who were too young to feature in the samples from earlier decades.

Accordingly, we can assume that the change started in the latter part of the interwar years or during the Second World War, with these highly rhotic speakers representing (in this respect) the language of their childhood while the usage of less rhotic older speakers in this dataset is the result of adult change.

3.3.2 Relating the change to Baxter & Croft's model

Baxter & Croft (2016) suggest a mathematical model of individual and community change capable of describing various different trajectories of change. By modifying the weighting of linguistic variants (*b*) and the degree to which speakers accommodate to other speakers (*H*), they produce models of changes taking place with different speeds and patterns of individual variation.

If *H* is high, speakers tend towards the community average at any given point; if *H* is low, speakers are more polarised, being either basically innovative or basically conservative. If *H* is high, younger speakers will be more diverse and older speakers more homogeneous than the population as a whole. Generally speaking, peak standard deviations of above 0.29 are 'high' (that is, broadly speaking polarising changes) whereas peak standard deviations of below 0.29 are 'low' (that is, broadly speaking consensus changes). If *b* is high, the variance will also tend to be higher. Both variables affect the speed of the change: high *b* promotes quick change and low *H* promotes quick change (although there is a value of *H*, dependent on the value of *b*, below which decreasing *H* slows the change).

It is interesting to ask: does the trajectory of rhoticity change in Bristol English fit into the typology suggested by their model? Examining our change, we find a mean of 47.70% rhoticity and a standard deviation of 0.3375. As the change has just passed the 50% mark, we can assume that the standard deviation is marginally lower than its peak. Peak standard deviation can thus be estimated as 0.3375–0.3875. If we look at just the speakers born after 1980, we find a standard deviation of 0.2932; if we look only at the speakers born before 1950, we find a standard deviation of 0.2899. Thus there is no evidence that younger speakers are more diverse and older speakers more homogeneous than the population as a whole.

Taking into account the proposed trajectory of the change in real time, we estimate that the change has made progress of 48.77%, from 3.53% to 52.3%, over the course of 71 years (1939–2010, when b7 was recorded). This would correspond to a cumulative normal distribution function (S-curve) with $\sigma \approx 38$ years. Baxter & Croft define the length of time taken for a change as the time taken to advance from 15% to 85% (personal communication). The time taken for a cumulative normal distribution with $\sigma \approx 38$ years to progress from 15% to 85% is approximately 79 years. If we assume that the earliest possible point in time for the beginning of the change is the beginning of the interwar years, this would indicate that it has taken 98 years to progress from 3.53% to 52.3%; this corresponds to a cumulative normal distribution with $\sigma \approx 51.5$ years, meaning that the time to progress from 15% to 85% is approximately 109 years. Thus our range of possible length of change is 79–109 years.

Taking these ranges and comparing to Baxter & Croft's Figure 15 (2016: 161), we can determine possible values for *H* and *b*. Using the power law decay function, we find possible values of (*H*, *b*) range from (0.004, 0.004) to (0.007, 0.007). This would indicate a lower value of *b* than any of the changes Baxter & Croft examine except *-ing* and a value of *H* similar to three of the changes examined (*-ing*, *you/ye* and Montreal) and much lower than one (*s/th*).

Overall, then, this suggests that this is a change which is relatively difficult to adopt as an adult (low *H*) and in which the desirable variant is relatively weakly favoured (low *b*), resulting in a relatively slow change with relatively high population variance at any one time and no greater variance among younger speakers than among older speakers.

These suggestions are highly plausible. There is good structural reason to expect this change to be relatively difficult for adults to adopt. Simply comparing fully rhotic and fully non-rhotic varieties, we find radically different systems. Non-rhotic varieties have more restrictive

phonotactics, a larger number of distinct vowel phonemes, quite different distributions of these phonemes and some distinctive phonetic processes for resolving vowel hiatus (i.e. linking and intrusive r). Rhotic varieties have less restrictive phonotactics, a smaller number of vowel phonemes and a different distribution of those phonemes, and phonologies incompatible with intrusive r. Thus truly acquiring a fully innovative system requires a level of systemic change that is probably impossible for adults. Furthermore, the existence of linking r will interfere with the evidence needed for speakers to truly lose rhoticity: to a rhotic speaker, non-rhotic speech with linking r is easily interpreted as still retaining an underlying /r/ which surfaces only in specific contexts. So we can assume that adults who acquire the change actually acquire surface-level phonetic rules which only approximate the surface output of true non-rhotic speakers (with some surface differences, such as failing to consistently maintain the START/TRAP/BATH distinctions and lacking intrusive r). Overall, then, it is quite plausible to suggest a model in which this change is difficult to acquire.

In order to assess the suggestion that the incoming variant is only weakly weighted, we must consider its sociolinguistic status. The interviews suggested that speakers are well aware of the distinctiveness of the local accent and do not regard it positively. Speakers characterised the local variety (and/or people who use it) as “rough” (speaker 2), “loud” (speaker 4) and “lazy” (speakers 4 and 5), “slap-dash” (speaker 26), “slovenly” (speakers 26 and 27) and “low grade” (speaker 27); they contrasted it with trying or wanting to speak “properly” (speakers 4 and 5) and trying “to use the end of your words” (speaker 22). One speaker (2) talked about feeling embarrassed whenever her grandmother spoke in front of her friends due to her speech; another (speaker 22) recounted her mother's embarrassment at her speech; yet another (speaker 23) anxiously asked for reassurance when asked whether she *felt* Bristolian: “I don't talk Bristolian do I?” These negative attitudes towards regional speech, although striking, are entirely unsurprising in the English context. Also striking were speakers' descriptions of others' policing of the way they spoke and of their own conscious efforts to lessen distinctive regional features. Speaker 1 described being criticised by her parents for speaking “with an accent,” stating that it “annoyed” them. Speaker 22 recalled that her parents “drummed into me you are Bristolian but you don't have to speak like it.” Speaker 27 mentions that he once used a certain dialect feature but “I schooled myself out of it.” Speaker b1 recounts that both her dad and people at her school had strong Bristolian accents but that she “managed [… not] to pick up on it so much.” Speaker b13 states: “you'll never really be able to take the […] Bristolian out of […] our family really (.) I mean they've tried (.) for god knows how long my dad (.) never (.) managed to (.) even (.) alter his accent,” and suggests that this failure accounts for his father's difficulty in finding work.

This evidence unequivocally demonstrates negative attitudes towards Bristol English and consequent attempts to avoid the use of Bristol features of which speakers were conscious. However, no speaker ever explicitly mentioned rhoticity. Older speakers’ explicit metalinguistic comments and stereotype performances were focused on the Bristol L and on vocabulary. One younger speaker mentioned prepositions in locative questions (“where’s it to?”) and two (7 and 11) reproduced the stereotype phrase “gert lush”[5]. The fact that these produced rhoticity in the word ‘gert’ (and were otherwise not consistently rhotic speakers) is somewhat suggestive of awareness of rhoticity; clearly, though, the main focus was again on the local vocabulary.

Rhoticity is highly salient to outsiders. However, the equivocal evidence here is consistent with the suggestion that it is not at all salient to Bristol speakers, who instead tend to use local vocabulary and the Bristol L to stereotype the dialect. Accordingly, it is plausible to suggest that social pressure to change is relatively low and so the different variants are not highly differentially weighted.

5 Note that although strongly stereotyped, both individual words in this phrase were used in natural speech by other interviewees.

4 FACTORS CONDITIONING VARIABLE RHOTICITY

4.1 Previous studies

Several of the studies mentioned under 3.1 provide evidence for the internal conditioning of rhoticity. For such evidence we can also turn to studies on the decline of rhoticity in the Englishes of other parts of the UK and other parts of the world. Studies on Scottish English and the English of the Scotland-England border report declining rhoticity. Watt, Llamas & Johnson (2014) investigate rhoticity on the Scottish-English Border on the basis of interviews with 40 speakers in each of Berwick-upon-Tweed, Carlisle, Eyemouth and Gretna; with a total of around 55,000 tokens, this is an extremely large study. They find a very large difference between the English and Scottish localities and a significant trend of decreasing rhoticity in apparent time in three of the four localities (2014: 88–90). Schützler (2010) reports a study of variable rhoticity in Scottish English based on elicitation and reading data with 27 middle-class Edinburgh speakers, finding a declining trend led by female speakers.

Historical studies on Southern Hemisphere varieties can also inform us about the loss of rhoticity. Sudbury & Hay (2002) investigate rhoticity and linking- and intrusive-r in early New Zealand English on the basis of historical audio corpora, looking at 67 speakers born between 1890 and 1930 who produced a total of 13,760 tokens with potential nonprevocalic /r/ (2002: 285). They find year of birth and geography are significant predictors, with rhoticity decreasing over time earlier in North Island than South Island speakers (2002: 285–287). Trudgill & Gordon (2006) investigate variable rhoticity in early Australian English on the basis of recordings of twelve Australian speakers born between 1889 and 1899, finding rates of rhoticity ranging from 0% to 20% (2006: 239).

We also find variable rhoticity in varieties undergoing the opposite change. In North America we find a reversal of the English sociolinguistic situation: traditional regional varieties which were non-rhotic and African American Vernacular English are undergoing levelling towards the rhotic prestige norm. As cited above, Elliott (2000) studies the increase in rhoticity in speech in American films from the 1930s to the 1970s, examining the speech of 202 subjects in 268 different roles (2000: 26–27). Rhoticity increases very consistently over time, with female speakers using a higher proportion of the then-prestige non-rhotic variant in early decades but the gendered effect disappearing as the locus of prestige changed (2000: 33–37).

Becker (2014) investigates the oft-discussed topic of rhoticity in New York City English using ethnographic interviews with 65 speakers born between 1924 and 1990 from the Lower East Side. She clearly demonstrates that the introduction of rhoticity in this variety is a change from above, favoured by younger speakers, women and middle-class speakers (2014: 156–157); however, this is dependent on ethnic group, with African American speakers showing stable variation, Chinese speakers showing a near-completed, gradual change and Puerto-Rican speakers showing only a non-significant trend, whilst white and Jewish speakers exhibit the ongoing change more clearly (2014: 159–161).

Feagin (1990), reported in Irwin & Nagy (2007: 136), studied rhoticity in the English of Anniston, Alabama, a traditionally non-rhotic variety gaining rhoticity under the influence of the prestigious standard.

Hinton & Pollock (2000) report a study of rhoticity in African American speakers in Davenport, Iowa, based on word elicitation task data and short interviews with nine children and four adults (2000: 63–65). They find that the change is very advanced: within 1% of completion for adults and over 90% for all but one of the children (2000: 65–66).

Irwin & Nagy (2007) examine rhoticity in the traditionally non-rhotic Boston English on the basis of reading data from 24 white speakers (2007: 137). They find an overall rate of rhoticity of 38% (2007: 140), with significant change in apparent time and some indication of a gendered effect in the oldest age group (2007: 143–145). Nagy & Irwin (2010) complement this study with speakers from New Hampshire and with African American speakers from Boston. This latter paper also

summarises unpublished past work by Villard (2009) on Upper Valley (Vermont and New Hampshire), Baxter (2008) on Stanstead (Quebec) and Pollock & Bernie (1997) on Memphis (Tennessee).

Ellis, Groff & Mead (2006) report a study of rhoticity in Philadelphia English using methodology similar to Labov's famous department store survey; they obtained tokens of one or both of the words 'Market' and 'Girard' from 790 speakers (2006: 58). They find that African Americans disfavoured rhoticity compared with other ethnic groups (2006: 59–60). There is some change in apparent time for African American speakers (2006: 61–62) and, surprisingly given the extremely short timespan covered by the study, a slight trend towards greater rhoticity in real time (2006: 62–63).

Myhill (1988) presents a study on rhoticity in Philadelphia English based on interviews with 34 speakers; the total dataset is relatively small at just 1698 tokens (1988: 205). Myhill finds an overall rate of rhoticity of 60.13% (1988: 205) and, exceptionally among the American studies discussed here, decline in rhoticity in apparent time (1988: 206). Ethnicity features centrally in this study, with integration into the white community representing an important predictor of rate of rhoticity and ordering of constraints.

Finally, we can turn to studies of previously non-rhotic World Englishes which are gaining rhoticity under the influence of American English. Hartmann & Zerbian (2010) investigate rhoticity in the traditionally non-rhotic variety of South African English on the basis of a survey of 39 participants aged between 17 and 25. They find a substantial presence of rhoticity, with the three most rhotic speakers producing rhoticity in slightly more than 50% of tokens; women and more affluent speakers were more likely to be rhotic, although there was considerable in-group variation (2010: 139–140). They produce no real or apparent time data to confirm the reality of change. Sharbawi & Deterding (2010) investigate rhoticity in Brunei English on the basis of reading data from 30 speakers, making comparisons to Singapore English; they assume that rhoticity is increasing in these varieties, but do not provide apparent or real time evidence for this.

Many of these studies examined the effect of internal factors, with relatively consistent results where studies have examined the same factors. Phonological context plays a substantial role in conditioning rhoticity, regardless of the direction of change. The presence of a following tautosyllabic consonant (making a closed syllable in non-rhotic varieties or a cluster in rhotic varieties) was found to favour rhoticity by Becker (2014: 155), Feagin (1990: 132), Irwin & Nagy (2007: 140–142; 2010: 256–257), Asprey (2007: 96, 99), Piercy (2012) and Hollitzer (2013: 35,51) but to have no significant effect by Hartmann & Zerbian (2010: 140) and Myhill (1988: 207). Watt, Llamas & Johnson (2014: 90–92) found that a following tautosyllabic consonant favoured rhoticity for speakers in Carlisle, disfavoured it for older speakers in Gretna, and had no effect elsewhere.

The preceding vowel was examined in several different studies, with variable results; these are reproduced in Table 7, below. In order to maintain comparability across studies of varieties with different vowel systems, these are quoted in terms of Wells' lexical sets (Wells 1982). Just two of the studies that examined this factor found that it had no significant effect. As can be seen from this table, there are some commonalities in the positive findings. The NURSE vowel is usually the most favouring environment for rhoticity; Barras' study of Lancashire and Dudman's study of Cornish English differ in finding it a favouring context but not the strongest one. NORTH and FORCE are usually disfavouring environments; in this regard, Barras' study of Lancashire English, Nagy & Irwin's study of New Hampshire English, the older speakers in Nagy & Irwin's study of Boston English and Baxter's study of Quebec English are the exceptions, as are studies in which no significant differences were found between most of the peripheral vowels (Miller and Myhill's studies of Philadelphia English, Labov's study of New York City English). Where it is included, the unstressed lettER vowel is typically a disfavouring context (and often the most disfavouring context); by contrast. Piercy's study of Dorset English finds that this is a neutral context and Asprey's study of Black Country English and Hollitzer's study find that it is a favouring context. It

is hard to identify any consistent trends regarding the NEAR, SQUARE and START vowels. In summary:

NURSE: always favouring
lettER: usually disfavouring
NORTH/FORCE: usually disfavouring
NEAR, SQUARE, START: no trend

Some authors coded the variable differently, making comparison difficult; in particular, Jones' choice to further distinguish words of the NURSE lexical on the basis of etymological vowel quality and Dudman's distinctions on the phonetic quality of specific START tokens (rather than categorising purely on the basis of lexical set) make these findings harder to place relative to others. Sudbury & Hay's finding that back vowels favour rhoticity compared to front vowels is similarly difficult to relate to the more nuanced hierarchy of contexts used in other studies.

A final comment should be made about the effect of preceding vowel. In two cases, we have two analyses of the same or similar datasets: Piercy (2006; 2012) and Irwin & Nagy (2007) vs. Nagy & Irwin (2010). In both cases, the hierarchy of effects of preceding vowels differs between analyses. In the case of Piercy's study, a change in statistical approach results in a change from START > NURSE > NEAR > lettER > NORTH/FORCE > SQUARE (Piercy 2006: 61) to NURSE > NEAR > START > lettER > CURE[6] > SQUARE > NORTH/FORCE (Piercy 2012: 82). In the case of Irwin & Nagy, a change in coding and an expansion of the dataset results in a change from NURSE > START > CURE > FUR > NORTH/FORCE > NEAR > lettER > SQUARE (Irwin & Nagy 2007: 141) to NURSE > START > SQUARE > CURE > NEAR > NORTH/FORCE > lettER. In each case, we should clearly take the later, more sophisticated analysis as canon. However, this makes painfully clear the fact that small differences in decisions about research design can result in substantially different findings, even for identical datasets.

6 Note that not all vowels are included in every study: certain vowels, such as FIRE, CURE and HOUR are often too infrequent to be included and so appear in the results from some studies but not others; some studies make distinctions between vowels which are collapsed in other studies (most obviously NORTH vs. FORCE, but also FUR vs. FIR, etc.).

Study	Variety	Effect of preceding vowel
Sullivan (1992: 82–83)	Exeter	(NEAR) > NURSE > START > SQUARE > FORCE > lettER > NORTH
Piercy (2012: 81–82)[7]	Dorset	NURSE > NEAR > START > lettER > CURE > SQUARE > NORTH/FORCE
Jones (1998)	Devon, West Somerset	START > FUR > 'farmer, darning', NORTH/FORCE > FIR
Dudman (2000: 36)	Cornwall	CURE > START(f) > NURSE > NEAR > SQUARE > NORTH/FORCE > START(b) > lettER (?)
Hollitzer (2013)	Berkshire, Wiltshire, Somerset	NURSE > lettER > other vowels (?NURSE > NEAR > lettER > START > SQUARE > NORTH/FORCE)[8]
Asprey (2007: 96–98)	Black Country	NURSE > lettER > SQUARE > NEAR > NORTH > START
Barras (2010: 115,175)	Lancashire	back vowels > front vowels FORCE > NURSE > START > NORTH > SQUARE > NEAR > lettER
Sudbury & Hay (2002: 289–290)	New Zealand	back vowels > front vowels[9]
Trudgill & Gordon (2006: 240)	Austalian English	NORTH/FORCE, lettER > others[10]
Feagin (1990: 132)	Alabama	NURSE > NEAR > SQUARE > START > NORTH > FORCE > lettER
Becker (2014: 155–156)	New York City	NURSE > NEAR > START > SQUARE > NORTH/FORCE[11]
Labov (1972)	New York City	NURSE > lettER back vowels > front vowels

7 The analysis of Piercy (2012) is used rather than the less statistically sophisticated analysis of the same data in Piercy (2006: 55).

8 Hollitzer's analysis divides the data up into three towns: Newbury, Swindon and Taunton; although rates of rhoticity per vowel are calculated for each town (2013: 34–35), several categorically non-rhotic speakers are included in these calculations for Newbury and Swindon, making the hierarchies suspect. Hollitzer's only strong conclusion is that NURSE and lettER favour rhoticity, since this is consistent across the three towns (2013: 35).

9 Sudbury & Hay's finding applies only to linking r and not coda r.

10 No statistical evidence of the relative effect of the different contexts is offered and the sample is relatively small; the authors suggest that the mismatch with other studies is the result of the fact that this "must represent the last surviving traces of earlier, fuller rhoticity" (2006: 240).

11 However, Becker states that when the data is broken down into ethnic groups only the effect of NURSE is consistent and that "no overall pattern for preceding full vowels is evident" (2014: 158–159).

Irwin & Nagy (2007: 140–142), Nagy & Irwin (2010: 256–257)	Boston & New Hampshire	NURSE > START > SQUARE > CURE > NEAR > NORTH/FORCE > lettER
Nagy & Irwin (2010: 258–259, 277)	Boston	NURSE > START > CURE > FUR > NORTH/FORCE > NEAR > lettER > SQUARE (older speakers) CURE > START > NURSE > SQUARE > NEAR > NORTH/FORCE > lettER (younger speakers)
Nagy & Irwin (2010: 260,277-278)	New Hampshire	NURSE > SQUARE > NEAR > START > NORTH/FORCE > lettER (older speakers) START > SQUARE > NORTH/FORCE > NURSE > NEAR > lettER (younger speakers)[12]
Villard (2009)	Upper Valley (New Hampshire, Vermont)	NURSE > lettER
Baxter (2008)	Stanstead (Quebec)	NURSE > back vowels > front vowels > lettER
Parslow (1967; 1971)	Boston	NURSE > other vowels
Myhill (1988)	Philadelphia	NURSE > all other vowels > lettER (more integrated into white community) NURSE > START > all other vowels (less integrated into white community)
Miller (1998)	Philadelphia	NURSE > all other vowels > lettER
Hinton & Pollock (2000)	Davenport (Iowa)	no effect[13]
Pollock & Bernie (1997)	Memphis (Tennessee)	NURSE > front vowels > back vowels > lettER
Sharbawi & Deterding	Brunei, Singapore	no effect[14]

12 Nagy & Irwin point out that disagreements in constraint rankings between the younger New Hampshire speakers and all other groups might be the result of the fact that the change is almost gone to completion in this group and that constraints must necessarily fade as the conservative variant becomes vanishingly rare (2010: 259–260).

13 As with Trudgill & Gordon's study of Australian English and Nagy & Irwin's of New Hampshire English, we might hypothesise that the lack of effect here is due to the fact that the change had almost gone to completion: either because conditioning systems tend to disappear in the final stages of change, or because the very low frequency of one variant inevitably makes it hard to detect significant effects without an extremely large sample.

14 Sharbawi & Deterding examine only START, NORTH and NURSE. Comparison of their data for these vowels shows no significant difference in rates of rhoticity for either variety studied: for Brunei English, 10/18 START, 24/54 NURSE and 25/54 NORTH tokens were rhotic (χ^2=0.68, p=0.7118); for Singapore English, 1/12 START, 4/36 NURSE and 2/36 NORTH tokens were rhotic (χ^2=0.727, p=0.6952). However, as the sample size is tiny, no strong conclusions should be drawn from this.

Table 7: Effect of preceding vowel on rhoticity in previous studies

The effect of prepausal position was studied by Becker (2014: 155), Barras (2010: 115), Piercy (2012: 81–82), French (1988: 128–132), Schützler (2010: 154) and Nagy & Irwin (2010: 257) all of whom found that it favoured rhoticity; it was also examined by Myhill, who found that it *dis*favoured rhoticity (1988: 207–208)[15]. The effect of stress was examined by Becker (2014: 156), Barras (2010: 115), Vivian (2000: 30–31), Piercy (2012: 81–82), Simpson (1996; reported in Dudman 2000: 41), Dudman (2000: 35), Hinton & Pollock (2000: 66), Myhill (1988: 206–207), Sudbury & Hay (2002: 289–290) (for linking r) and Schützler (2010: 154), all of whom found that stressed syllables favoured rhoticity compared with unstressed syllables; contrastive emphasis was examined by Hartmann & Zerbian (2010: 140) who found that it too favoured rhoticity. The effect of the presence of another /r/ in the same word was studied by Ellis, Groff & Mead (2006: 59–60), Myhill (1988: 207) and Miller (1998) all of whom found that it disfavoured rhoticity, and by Nagy & Irwin (2010: 268) who found no significant effect.

Moving on to morphological context, we find that the effect of a following word boundary is difficult to compare due to the very different ways in which studies have coded this variable and the other variables they have combined it with. Vivian (2000: 30–31), Sullivan (1992; reported in Dudman 2000: 18; and Vivian 2000: 17), Dudman (2000: 35) and Piercy (2006: 60) all simply compared word-final with word-medial contexts and found that word-final contexts disfavoured rhoticity; Baxter (2008), Labov (1972) did the same but found that word-final position favoured rhoticity. Irwin & Nagy (2007: 142) and Barras (2010: 115, 231) each contrasted word-final, word-internal but morpheme-final and morpheme-internal positions but found different results: Irwin & Nagy that word-final position favoured rhoticity but Barras that it disfavoured it. Nagy & Irwin (2010: 257) and Piercy (2012: 82) both combined this with following phonological context and found that word-final position (ignoring linking r and prepausal contexts) disfavoured rhoticity compared with all other morphological contexts except word-internal morpheme-final preceding a heterosyllabic consonant. Becker (2014: 158) followed a similar coding scheme and found that word-final position (again ignoring linking r and prepausal contexts) disfavoured rhoticity compared with all other morphological contexts except word-internal morpheme-final. Myhill (1988: 207) also combined following morphological context with following phonological context, contrasting a following word boundary with a syllable boundary or neither, but found no significant effect. Simpson (1996; reported in Dudman 2000: 41) found that the final *syllable* of the word disfavoured rhoticity compared with medial syllable.

We face the same difficulty in assessing the effect of a following morpheme boundary. In both Becker (2014: 155) and Nagy & Irwin (2010: 257)'s mixed morphological-phonological context coding schemes, morpheme-final positions disfavour rhoticity compared with morpheme-internal positions (although Irwin & Nagy (2007: 143)'s analysis found no effect). Barras (2010: 115) finds that word-internal morpheme-final position favours rhoticity compared with word-final position but disfavours it compared with morpheme-internal position. Piercy (2012: 82) splits morpheme-final positions on the presence of a following tautosyllabic consonant but does not do so for morpheme-internal positions, making a simple comparison impossible.

Function words were found to disfavour rhoticity compared to content words by Becker (2014: 156) and Irwin & Nagy (2007: 142–143) but to have no effect by Piercy (2012: 81–82). More frequent words were found to disfavour rhoticity by Nagy & Irwin (2010: 256–257), Piercy (2012: 81–82) and Sudbury & Hay (2002: 289–290) (for linking r). Short words were found to favour rhoticity compared with longer words by Irwin & Nagy (2007: 142–143).

All of the effects reported are summarised in Table 8. What seems striking about these effects, contra Nagy & Irwin (2010: 268), is the degree of agreement across studies. There are a

15 However, authors do not always make it clear exactly how tokens are coded with regard to this variable. In the case of Myhill, this seems to indicate that a pause followed *the segment*; accordingly, this incorporates the information that the /r/ was syllable-final and word-final, and does not code for tokens that are in prepausal words but word-internal. By contrast, in the present study, as well as some of the others reviewed, 'prepausal' refers to the position of the word, not the segment.

number of reasons why no single study could expect to find effects for all of the variables discussed here, even if all of them were in fact operative in the variety in question. Most studies are based on relatively small datasets of just a few thousand tokens. Once this large number of variables is cross-categorised, this implies very low cell values, which will create difficulties in finding significant effects. Accordingly, no single study has ever included all of these predictors. Furthermore, like so many phenomena in linguistics, most of these variables do interact with each other to some degree. This again encourages researchers to choose between those with problematic interactions, coding only for the most powerful explanatory variables and excluding others from consideration. Where researchers have not done this, the effects of correlated predictors may mask one another. Finally, different studies have used a variety of different statistical tools of varying sophistication, which can clearly result in different findings (note the discussion of preceding vowel effects, above). For all these reasons, only *positive* findings of an effect should be treated as evidence: findings of no effect, an explicit decision not to include a predictor in a model, or a failure to consider a possible predictor at all should not be treated as relevant. Differences in statistical tools used by different researchers (as well as the likely problems with small datasets) also mean we should not treat differences in the *relative importance* of predictors as evidence.

On this conservative measure, we find complete agreement across studies on:

- the presence of another /r/ in the word;
- prepausal position;
- morpheme-final position;
- stress;
- word class;
- and word frequency.

We find near-complete agreement that a following tautosyllabic consonant favours rhoticity, the only exception being Watt, Llamas & Johnson's finding for older speakers in Gretna. This level of agreement is striking, especially considering that this comparison includes communities for which the variable has totally different sociolinguistic status and the variants totally different rates.

We find substantial disagreement on just two predictors: the role of word-final position (with eight studies finding that this disfavours rhoticity and three that it favours it) and the role of preceding vowels (particularly NEAR, SQUARE and START). There is some slight indication that this disagreement is predicted by relatedness: all three varieties in which word-final position disfavours rhoticity are North American varieties in which rhoticity is increasing. Nevertheless, there are other North American varieties in which word-final position disfavours rhoticity, as it does in other parts of the world. There are no obvious regional patterns in the effect of preceding vowels.

Study	variety/ies	direction	preceding vowel	tautosyllabic C	other /r/	prepausal	morpheme-final	word-final	stress	emphasis	functionword	word length	word frequency
Trudgill & Gordon 2006	Australia	non-rhoticity	*										
Asprey 2007	Black Country	non-rhoticity	*	+									
Dudman 2000	Cornwall	non-rhoticity	*					-	+				
Hollitzer 2013	Berkshire, Wiltshire, Somerset	non-rhoticity	*	+									
Sullivan 1992	Devon	non-rhoticity						-					
Jones 1998	Devon; West Somerset	non-rhoticity	*										
Piercy 2006, 2007, 2012	Dorset	non-rhoticity	*	+		+	*	-	+		0		-
Schützler 2010	Edinburgh	non-rhoticity				+			+				
Williams 1991	Isle of Wight	non-rhoticity											
Barras 2010	Lancashire	non-rhoticity	back vowels > front vowels*			+	-	-	+				
Vivian 2000	Lancashire	non-rhoticity	*					-	+				
Sudbury & Hay 2002[16]	New Zealand	non-rhoticity	back vowels > front vowels						+				-
Myhill 1988	Philadelphia	non-rhoticity	*	0	-	-		0	+				
Watt, Llamas & Johnson 2014	Scottish-English Border	non-rhoticity		*									
Simpson 1996	Shropshire	non-rhoticity						-	+				
French 1988	Yorkshire	non-rhoticity				+							

16 Internal factors only investigated for linking r.

Study	variety/ies	direction	preceding vowel	tautosyllabic C	other /r/	prepausal	morpheme-final	word-final	stress	emphasis	functionword	word length	word frequency
Feagin 1990	Alabama	rhoticity	*	+									
Elliott 2000	American films	rhoticity											
Irwin & Nagy 2007	Boston	rhoticity	back vowels > front vowels*	+			0	+			-	-	0
Parslow 1967, 1971	Boston	rhoticity	NURSE > other vowels										
Nagy & Irwin 2010	Boston; New Hampshire	rhoticity		+	0	+	-	-					-
Sharbawi & Deterding 2010	Brunei; Singapore	rhoticity	0										
Hinton & Pollock 2000	Iowa	*	0						+				
Villard 2009	New Hampshire; Vermont	rhoticity	*										
Becker 2014	New York City	rhoticity	*	+		+	-	-	+		-		
Labov 1966 [1972]	New York City	rhoticity	*					+					
Ellis, Groff & Mead 2006	Philadelphia	rhoticity			-								
Miller 1998	Philadelphia	rhoticity	*		-								
Baxter 2008	Quebec	rhoticity	*					+					
Hartmann & Zerbian 2010	South Africa	rhoticity		0						+			
Pollock & Berni 1997	Tennessee	*	*										

Table 8: All internal effects in previous studies

4.2 Factors conditioning rhoticity in Bristol English

For every token in the dataset the following factors were recorded:

- the preceding vowel;
- whether the /r/ was syllable final or followed by tautosyllabic consonant(s);
- following morphological context (morpheme-internal vs. morpheme-final vs. word-final);
- syllable stress (primary vs. secondary stressed vs. unstressed);
- whether the word in question was a content or function word;
- whether the word immediately preceded a pause or the end of a turn;
- the time it was produced during the interview;
- word frequency (on the basis of the spoken BNC and the full BNC (Leech, Rayson & Wilson 2001)).

Mixed-effects regression was then used to investigate the influence of these factors on rhoticity in Bristol English. Since the dataset for some preceding vowels was relatively small, only the six most common were included: lettER, NORTH/FORCE, NEAR, NURSE, SQUARE and START. Data from near categorically non-rhotic speakers (9, 11, b1 and b2) were also excluded. Since there is a categorical relationship between stress and preceding vowel (preceding vowel lettER is always unstressed), only one of these predictors could be included in the model; since preceding was found to have greater explanatory power, stress was dropped. Contrary to the findings of previous studies, following morphological context, following tautosyllabic consonant and word frequency (by either measure) were not found to make any significant improvement to the model; nor, as might have been expected from some past research, was an interaction between the first two of these. Accordingly, they were dropped from the model. Speaker id was included as a random effect, as was lexical item; the latter helps to ensure that any internal effects identified do not simply reflect the idiosyncratic behaviour of particular words. The output of the final model is given Figure 3.

The findings are in line with previous studies of rhoticity. The largest effect identified is that of preceding vowel. Preceding vowels favour rhoticity in the order:

NURSE > NEAR > START > SQUARE > lettER > NORTH/FORCE

Among these, we see that there is a particularly large gap between NURSE (1.97515) and the next most favouring context (1.03831); the differences between START/SQUARE and lettER/NORTH/FORCE are quite small. This matches the findings of previous studies that NURSE favours and NORTH/FORCE and lettER disfavour rhoticity. Looking specifically at Piercy's findings for Dorset, which is the geographically nearest methodologically comparable study, we find an identical hierarchy except for the reversed positions of lettER and SQUARE (this difference is likely due to the fact that Piercy included stress as an independent variable alongside preceding vowel).

The other large effect is that of prepausal position, with strongly favours rhoticity; this too is in line with all but one of the previous studies. Word class has a smaller effect, with function words disfavouring rhoticity compared with content words. Taking this effect together with the disfavouring effect of the lettER vowel and favouring effect of prepausal, we get the impression that rhoticity is strongly controlled by stress in this variety, with syllables bearing less stress (because they are in phonologically unstressed positions in the word or chronically understressed words) more likely to lose rhoticity and those bearing more stress (including those in utterance-final position) more often retaining rhoticity.

Finally, the time in the interview has a small but significant effect, with more rhotic tokens produced later in interviews. This is consistent with a non-standard feature of speakers' vernaculars which is (very slightly) consciously suppressed in the more formal initial stages of the interview and increases as subjects relax and use a more informal style.

It is worth noting that the effects of external predictors appear different in the model in

Figure 3 than in the model quoted in Figure 2: here, male speakers slightly but significantly favour rhoticity and the effect of father's job type is altered so that it is the 'medium' category that most disfavours rhoticity. These changes are due to excluding the data from the categorical speakers 9, 11, b1 and b2; it is the first model, which includes data from all the speakers, that should be consulted regarding these external effects. However, this is a reminder of the high level of within-group variance in these data: with such data, the chance addition or exclusion of a small number of individual speakers has a large effect on findings. In this light, further studies of this variety with larger samples of data from more speakers are extremely desirable.

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation)
['glmerMod']
 Family: binomial  ( logit )
Formula: perceptually.rhotic ~ scale(year_of_birth) + gender + fathers_job_LM +
    vowel + function_word + prepausal + scale(modified_clip_start) +      (1 |
speaker) + (1 | word_simplified)
   Data: data_prepped_for_internal
Control: glmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 40000))

     AIC      BIC   logLik deviance df.resid
  4319.5   4426.2  -2143.7   4287.5     5801

Scaled residuals:
    Min      1Q  Median      3Q     Max
-7.4610 -0.2704  0.1807  0.3833  6.1342

Random effects:
 Groups          Name        Variance Std.Dev.
 word_simplified (Intercept) 0.6736   0.8207
 speaker         (Intercept) 2.0534   1.4330
Number of obs: 5817, groups:  word_simplified, 190; speaker, 26

Fixed effects:
                           Estimate Std. Error z value Pr(>|z|)
(Intercept)                 2.62610    1.47665   1.778 0.075335 .
scale(year_of_birth)       -0.77057    0.27796  -2.772 0.005568 **
genderM                     1.25966    0.61107   2.061 0.039265 *
fathers_job_LMhigh         -2.90762    1.71183  -1.699 0.089405 .
fathers_job_LMlow          -2.88509    1.53926  -1.874 0.060884 .
fathers_job_LMmedium       -5.04811    1.68591  -2.994 0.002751 **
vowelNEAR                   1.03831    0.30918   3.358 0.000784 ***
vowelNORTH~FORCE           -0.20870    0.17340  -1.204 0.228738
vowelNURSE                  1.97515    0.19545  10.106  < 2e-16 ***
vowelSQUARE                 0.56774    0.24803   2.289 0.022079 *
vowelSTART                  0.62510    0.19297   3.239 0.001198 **
function_wordTRUE          -0.61197    0.20270  -3.019 0.002536 **
prepausalTRUE               0.90592    0.11247   8.054 7.98e-16 ***
scale(modified_clip_start)  0.12568    0.05051   2.488 0.012845 *
```

Figure 3: Mixed-effects regression model investigating internal factors

5 CONCLUSIONS

Rhoticity was a traditional feature of several varieties of English English: Lancashire English, Northumberland English, the English of the south coast, and West Country Englishes. Recent studies have uniformly found it declining (in the West Country and Lancashire) or disappeared entirely (Northumberland, the central and eastern south coast) under influence from the non-rhotic standard. This study has investigated rhoticity in Bristol, the largest city in the West Country and an under-studied locality in sociolinguistics. It has found, as expected from this larger context, that rhoticity is waning. It can be seen falling in apparent time, and most of this change seems to have occurred during the lifetimes of some of the oldest speakers in the community. On the basis of the

high within-group variability in the population, it is suggested that adult speakers of Bristol English probably do take part in lifespan change for this variable. An investigation into the internal constraints on rhoticity reported in the literature identifies a long list of factors known to influence this variable, and several of these (preceding vowel, word class, prepausal position) are demonstrated to have a corresponding effect in Bristol English. Looking particularly at the effect of preceding vowel, we find a particularly close match with the findings of Piercy's (2012) study of Dorset: this is intuitively likely, since Dorset English is one of the geographically closest varieties we can compare.

The data are also used to test the model of individual and community change proposed by Baxter & Croft (2016). To fit the typology Baxter & Croft's model produces, we must assume that rhoticity in Bristol English is a variable with quite weakly weighted variants for which speakers accommodate to one another relatively little. It is argued that this is quite credible: it seems likely it is relatively difficult to acquire since it has significant structural implications and interacts with other phonetic processes; it never seems to be the focus of speakers' metalinguistic comments, suggesting it is not highly salient. Accordingly, these data are taken to confirm the predictions of Baxter & Croft's model.

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