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VARIABLE SCOTTISH ENGLISH CONSONANTS: THE CASES OF /ʍ/ AND NON-PREVOCALIC /r/

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Abstract
In a sample of 27 speakers of Scottish Standard English two notoriously variable consonantal features are investigated: the contrast of /ʍ/ and /w/ and non-prevocalic /r/, the latter both in terms of its presence or absence and the phonetic form it takes, if present. The pattern of realisation of non-prevocalic /r/ largely confirms previously reported findings. But there are a number of surprising results regarding the merger of /ʍ/ and /w/ and the loss of non-prevocalic /r/: While the former is more likely to happen in younger speakers and females, the latter seems more likely in older speakers and males. This is suggestive of change in progress leading to a loss of the /ʍ/ - /w/ contrast, while the variation found in non-prevocalic /r/ follows an almost inverse sociolinguistic pattern that does *not* suggest any such change and is additionally largely explicable in language-internal terms. One phenomenon requiring further investigation is the curious effect direct contact with Southern English accents seems to have on non-prevocalic /r/: innovation on the structural level (i.e. loss) and conservatism on the realisational level (i.e. increased incidence of [r] and [ɾ]) appear to be conditioned by the same sociolinguistic factors.

Key words: Scottish English, sociophonetics, language variation and change, rhoticity, consonants

1. The variables

In discussions of consonants in Scottish English three characteristic features are typically identified (e.g. Jones 2002: 26-28): The velar fricative /x/ which results in minimal pairs like *loch – lock*, the labio-velar fricative /ʍ/ in words spelt with initial <wh->, resulting in minimal pairs like *which – witch*, and the general articulation of non-prevocalic /r/, i.e. rhoticity. While the existence (or loss) of the contrast between /x/ and /ʍ/ affects the phoneme inventory of Scottish English, the articulation of non-prevocalic /r/ constitutes a structural (or combinatory) characteristic. Additionally, /r/ may generally occur in realisations that are rare in Southern English today, namely as a tap [ɾ] or trill [r].

Of the three, /x/ shall not be considered in the present study since it is very much restricted to low frequency Scots lexemes that have gained some currency in Scottish English, especially place names (e.g. *Loch Lomond, Auchtermuchty*).

Therefore, /ʍ/ and non-prevocalic /r/ are the objects of this investigation. However, the complexity of /r/ suggests that it be subdivided into two variables, one pertaining to *articulation* (i.e. presence or absence) and the other to *realisation* (i.e. phonetic form, if present). These are the three outcome variables and their labels:

- **R^a** articulation of non-prevocalic /r/
- **R^r** phonetic realisation of /r/, if articulated
- **WH** presence of /ʍ/ - /w/ contrast[1]

Thus, examples of three of the four main types of segmental accent variation identified by Abercrombie (1979: 68-71) are adressed: structural (R^a), realisational (R^r) and systemic (WH). In the analysis, R^r took one of the the three values ø, [r, ɾ] or [ɹ]. Intermediate types characterised by mere vowel colouring were not considered at this stage. In this simplified approach I follow Romaine (1978: 146) rather than Stuart-Smith (2003: 127). For R^a, the zero-realisation ø was given the value 0 and [r, ɾ] and [ɹ] were given the value 1. Thus, R^a was treated as strictly binary.

2. The data

The data used for this study were collected in Edinburgh in March 2008. Interviews were conducted with 27 speakers 17 - 62 years old at the time. They were pupils and teachers at a private-school as well as students and staff at the University of Edinburgh. Therefore the sample can with some justification be said to be broadly middle-class throughout.

Non-prevocalic /r/ was elicited in three speech styles: wordlist, reading-passage and careful speech. For /ʍ/, only reading-passage and careful speech were available. Table 1 shows the total number of tokens per variable and their average number per speaker.

Table 1: Token numbers for /ʍ/ and non-prevocalic /r/

	/ʍ/	**/r/**
tokens	400	2316
tokens per speaker	~ 15	~ 86

3. Research questions

Individual studies were conducted on the three variables, essentially asking the same questions: (a) Which factors have an effect on R^a, R^r and WH, and (b) what are the respective roles of internal and external factors in each case? Based on these findings, R^a and WH were compared, the general question being (c) are the patterns of variation observed in R^a and WH similar or different? With regard to WH, high-frequency function words were especially scrutinised: Do they show a behaviour different from that of other lexemes, and if so, are they more likely to merge the traditional contrast of /ʍ/ and /w/?

[1] For an analysis of the phonetic complexity of this variable cf. Lawson and Stuart Smith (1999).

4 Non-prevocalic /r/

4.1 Previous reports on non-prevocalic /r/

In her study of Edinburgh working-class school children, Romaine (1978) finds that boys are more inclined to vocalise non-prevocalic /r/ (i.e. to become partially non-rhotic) than girls. Where non-prevocalic /r/ is articulated, boys use the tapped realisation [ɾ] more frequently than girls do, while girls prefer the approximant realisation [ɹ]. Romaine argues that the partial loss of non-prevocalic /r/ she finds in her data is very unlikely to be induced by the emulation of Southern English models of pronunciation, since the linguistic situation lacks the necessary sociolinguistic contact. According to Romaine (1978: 18), [ɾ] is most likely in linking contexts and least likely before a pause, [ɹ] appears most frequently before a word bginning with a consonant and is least likely in linking contexts, and the loss of non-prevocalic /r/ is most likely prepausally and least likely in linking contexts. It must be noted that Romaine's results for phonetic environments are only partially comparable to the present study since she considered only word-final /r/, whereas the present study also includes non-prevocalic /r/ as part of clusters (as in *part, bird,* etc.).

Macafee (1983) investigates Glasgow working-class speech and finds that in this variety post-vocalic /r/ is generally retained, but may be occasionally lost among adults. According to her, the trilled realisation [r] is rather rare in urban speech where it may be used emphatically in special contexts. The realisations as an approximant [ɹ] or a tap [ɾ] are more common, the latter occurring especially in intervocalic position.

Macafee's statement about the decrease of trilled realisations of /r/ in Glasgow speech is generalised for the entire Central Belt by Johnston (1997) who says that [r] occurs only sporadically, even in vernacular speech, and that [ɾ] is by far the more common variant. According to Johnston, Urban Scottish Standard English generally (i.e. not only non-prevocalically) uses the approximant [ɹ] rather than the tap [ɾ], less so, however, in intervocalic position – this entirely confirms Macafee's statement to this effect. Johnston also finds that the vocalisation (a term used to denote "loss") of non-prevocalic /r/ is increasingly common, particularly in Mid-Scots urban speech which of course includes Edinburgh.

In Stuart-Smith's (2003) data, above 90% of non-prevocalic /r/ is articulated by Glasgow middle class speakers, while working class speakers vocalise more, among these especially female adolescents. The loss of non-prevocalic /r/ is most likely in prepausal position while it is least likely in linking contexts.

4.2 Predicting R^a

For the exploration of R^a and R^r a logistic regression model with a backward progression was used: Initially all predictors of interest are included and the algorithm calculates the relative contribution each of them makes to the prediction of the outcome variable R^a. Insignificant predictors are excluded after the first stage and the analysis is repeated in

the same fashion until only significant predictors remain.[2] These make up the model as given in the regression table.

The two most important values in the regression table are the effects coefficient *Exp(B)* for each predictor, and *Nagelkerke's* R^2 which is an evaluation for the overall goodness of the model. *Exp(B)* makes a statement about a change in the likelihood of a certain outcome effected by a change in the predictor variable. In table 3, for example, *Exp(B)* = 1.734 for the predictor MALE means that the likelihood of non-prevocalic /r/ to be articulated increases by the factor 1.734 (or by 73.4%) if the token in question is uttered by a male speaker. Thus, *Exp(B)* > 1 signifies a positive effect and *Exp(B)* < 1 signifies a negative effect. *Exp(B)* = 2 and *Exp(B)* = 0.5 an be said to describe effects of equal strength, albeit positive in the former and negative in the latter case. The order of effect-strengths is more easily ascertained using the coefficient *B*: Here, the absolute value (or unsigned portion) of a coefficient denotes its strength, so that *B* = 1.2 and *B* = -1.2 signify effects of equal strength (positive and negative, respectively). But this value is otherwise not as illustrative as *Exp(B)*, hence the latter is the basis of all discussions of the regression tables (tables 3, 4 & 7).

Eleven predictors were used in the investigation of R[a]. The power of prediction of each of them is always relative to an uncoded referent. For example, the positive effect of STRESSED, i.e. the increased likelihood of non-prevocalic /r/ to be articulated in stressed syllables, implies that the effect is the opposite in *un*stressed syllables. The independent variable UNSTRESSED was not used, however, and the use of both STRESSED *and* UNSTRESSED would in fact be a redundancy that the model would be unable to cope with. In table 2, the eleven predictors are given and their meanings are explained.

Table 2: Eleven predictors (7 external, 4 internal) used for the logistic regression, giving predictor label, explanation and uncoded referent (in square brackets)

	Predictor	**Explanation**	**Reference category**
external	AGE_OLDER	speakers aged 52-62	[speakers aged 17-22]
	AGE_MIDDLE	speakers aged 42-52	[speakers aged 17-22]
	CONTACT	Anglo-English contact	[no A-E contact]
	UNIVERSITY	university context	[private school context]
	MALE	male speakers	[female speakers]
	WORDLIST	wordlist tokens	[tokens in careful speech]
	TEXTPASSAGE	reading-passage tokens	[tokens in careful speech]
internal	STRESSED	stressed syllables	[unstressed syllables]
	PREVOCALIC[3]	linking context	[no linking context]
	PREPAUSAL	pause following /r/	[no pause following /r/]
	SYLL_FINAL	/r/ syllable-finally	[/r/ within cluster]

[2] The default threshold value for determining the significance or insignificance of logit-predictors in SPSS is p = 0.1, not the ususal p = 0.05. This is more relevant in the case of WH, where WHICH was included in the stage 5 model despite the fact that it has a value of p = 0.07 (cf. table 7).

[3] As a predictor of non-prevocalic /r/, PREVOCALIC seems paradoxical: "non-prevocalic" refers to position within the same syllable, while PREVOCALIC refers to vowels at the beginning of the following syllable that create the context necessary for linking-/r/.

It has to be borne in mind that the effects of individual speakers are disregarded in this type of analysis: The logistic regression operates on a single level and assumes that all tokens are independent observations when in fact utterances are nested within speakers and the data as a whole have a hierarchical structure with the individual data points at level 1 and the speakers at level 2. Therefore, the model of variation presented in this paper should be treated more as an exploration of the variation and less as the final word on it (cf. section 7).

Table 3 lists the predictors relevant to the prediction of R^a. Note that only one of the original eleven independent variables was excluded (SYLL_FINAL) as having no significant contribution to make. Predictors with a value of $Exp(B) \geq 2$ or $Exp(B) \leq 0.5$, i.e. those that at least double or halve the odds of the outcome $R^a = 1$, are given in bold print. They are regarded as strong factors, those with values of $Exp(B) \geq 1.5$ or $Exp(B) \leq 0.67$ are regarded as moderately strong factors, and all others with values relatively close to $Exp(B) = 1$ are regarded as weak factors.[4]

Table 3: Logistic regression modelling factors significant for the prediction of articulated /r/ in non-prevocalic position; arranged in descending order according to effects coefficient Exp(B); strong factors are in bold print

Predictors	B	SE	Exp(B)	p
constant	.509	.189	1.663	.007
PREPAUSAL	1.435	.168	**4.200**	.000
PREVOCALIC	1.261	.179	**3.528**	.000
STRESSED	1.234	.118	**3.434**	.000
WORDLIST	.904	.220	**2.469**	.000
CONTACT	-.590	.126	.554	.000
MALE	.550	.128	1.734	.000
UNIVERSITY	-.407	.146	.666	.005
TEXTPASSAGE	-.353	.115	.703	.002
AGE_OLDER	-.338	.141	.713	.016
AGE_MIDDLE	-.318	.138	.728	.022
N = 2316				
Nagelkerke's R^2 = .238				
excluded: SYLL_FINAL				

It is immediately obvious that the top three predictors are all language-internal: PREPAUSAL is by far the strongest and PREVOCALIC and STRESSED are also strong with values of *Exp(B)* around 3.5. In prominent prepausal position where the presence or absence of /r/ is particularly noticeable because the production of speech is briefly interrupted, the speakers of the sample tend to retain non-prevocalic /r/, perhaps simply because there is enough time for full articulation. The same is true for stressed syllables, again quite possibly because lexical stress tends to lengthen the syllable as a whole and the reduction of vowels and consonants is therefore less likely. Unsurprisingly, linking-

[4] This subdivision is of course arbitrary and only serves to impose some order on the great number of predictors used in the models of R^a and R^r.

/r/ will usually be articulated, which is indicated by the high value of *Exp(B)* for the predictor PREVOCALIC.

Of the external (sociolinguistic) predictors, only WORDLIST belongs to the group of strong factors in this model, but it is considerably weaker than any factor from the group of internal factors. It is puzzling that WORDLIST is a factor strongly favouring R^a while TEXTPASSAGE has a negative effect: Why the articulation of non-prevocalic /r/ should be less likely in the text passage is not immediately plausible, especially since WORDLIST has such a marked *positive* effect and both are relative to careful speech. Two explanations could be considered: First, speakers reading the wordlist were highly conscious of the targeted word and may have paid special attention to the articulation of non-prevocalic /r/. This would be evidence of the high prestige rhoticity enjoys among the Scottish middle classes. The negative effect of TEXTPASSAGE is not as easily explained, but I would argue here that speech rate may play a role: It is not necessarily the case that the increase in the level of consciousness from careful speech via the textpassage to the wordlist should be concomitant with decreasing speech rates from the most fluent and rapid in careful speech to the most precise and enunciative in the wordlist. In other words, it is easily possible that the most rapid speech is found in the textpassage much rather than in supposedly more spontaneous and more naturally produced speech. The great impact of the three internal predictors included in the model so far (cf. table 3) make it rather probable that another internal factor, rate of speech, outweighs any stylistic differences that may exist between the three text types. This is a possibility that needs to be explored in future research on the same data.

It can be argued that CONTACT and UNIVERSITY predict the effects of the same underlying cause, Anglo-English contact, albeit in two different manifestations: The former looks at the effect of contact in the home or during an extended stay in England, the latter at the effect of exposure to the anglicised surroundings of Edinburgh University. Both have negative effects on R^a, with UNIVERSITY only slightly weaker than CONTACT. In the sample, men are generally more inclined than women to retain non-prevocalic /r/, although it must be said that the positive effect of MALE is only moderate. If we uncritically assume that women more readily adopt the incoming prestigious form, and if we equally assume that Anglo-English non-rhoticity *is* the prestigious form, then the role of MALE would be corroborating evidence. However, in the light of the stylistic pattern, especially the higher proportion of non-prevocalic /r/ that is articulated by *all* speakers in the wordlist, it appears more than doubtful that non-rhotic speech is targeted by Scottish middle-class speakers, and that the gender difference detected here is of great sociolinguistic meaning.[5]

Speakers belonging to the middle-aged or the older group tend to articulate a smaller proportion of non-prevocalic /r/. The negative effects of AGE_OLDER and AGE_MIDDLE are the two weakest factors included in the model, however. This does not suggest change in progress in the sense of "loss", since it means that the younger speakers are retainers of non-prevocalic /r/. We may be looking at age-grading with those speakers engaged in professional careers intermittently becoming less Scottish with regard to this particular accent feature, but also with no tendency in the younger generation to become

[5] Cf. also the evidence from WH that suggests a reversal of the gender pattern found for R^a.

non-rhotic – interestingly this confirms results found by Macafee (1983) in Glasgow working-class speech.

The logit model shown in table 3 explains 23.8% of the variation found in the data (expressed by Nagelkerke's R^2). The fact that this value is relatively low despite the inclusion of a rather large number of predictors possibly indicates the shortcomings of this particular statistical approach in which the quite significant effect of the individual speaker is disregarded (for a brief discussion of this see above and cf. also section 7). While the relative strengths of external factors in the model are interesting, they are put into perspective by the much greater weight of internal factors. In order to shed more light on this circumstance, a second logistic regression was run, including only the three relevant internal factors (PREPAUSAL, PREVOCALIC and STRESSED). The result of this analysis is shown in table 4.

Table 4: Logistic regression modelling only internal factors significant for the prediction of articulated /r/ in non-prevocalic position; arranged in descending order according to effects coefficient Exp(B); strong factors are in bold print

Predictors	**B**	**SE**	**Exp(B)**	**p**
constant	.134	.063	1.143	.034
STRESSED	1.439	.111	**4.214**	.000
PREPAUSAL	1.307	.164	**3.697**	.000
PREVOCALIC	1.145	.176	**3.142**	.000
N = 2316				
Nagelkerke's R2 = .167				

Comparing the "full" logit in table 3 to the "internal" logit in table 4, it is first of all striking that now STRESSED is the strongest factor: The algorithm comes to a different conclusion regarding the relative weight of these three factors, because their coefficients are not calculated in isolation but in combination with all other predictors that are entered. Secondly, the value of R^2 is still relatively high: The small number of predictors in the second model still accounts for 16.7 % of the variation compared to 23.8% in the 10-predictor model, which is another way of illustrating the dominance of internal factors. In figure 1, all tokens are sorted into (internal) factor groups and the proportion of articulated non-prevocalic /r/ is plotted, comparing the group of tokens that fulfil the respective criterion (or criteria) with the group of those that do not.

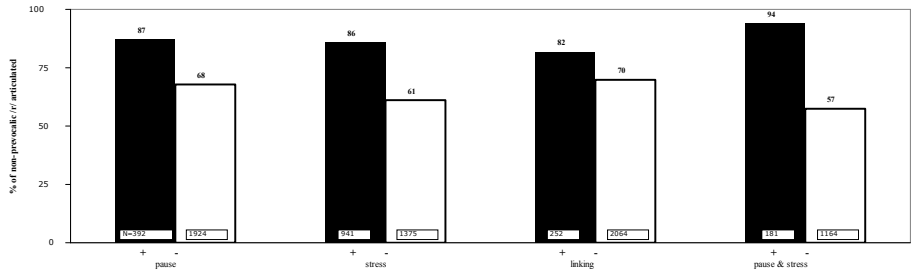

Figure 1: Proportion of articulated non-prevocalic /r/, sorted into internal factor groups

4.3 Predicting R^{r}

For the prediction of R^{r}, each possible outcome was analysed using a separate logistic regression. The same principles as for R^{a} were applied in classifying significant predictors as strong, moderate or weak. Results are summarised in table 5 as a list of relevant positive and negative factors for each phonetic realisation. Since the realisation ø is equivalent to non-articulation and has already been discussed under section 4.2, the focus in the following paragraphs will be on [ɹ] and [ɾ, r].

Table 5: Predictors increasing (↑) and decreasing (↓) the likelihood of different realisation types of non-prevocalic /r/ to occur; strong factors are in bold print

	[ɹ]	[ɾ, r]
↑	**PREPAUSAL** **STRESS** **WORDLIST** PREVOCALIC	**MEN** **OLDER** **UNIVERSITY** **PREVOCALIC** **CONTACT** **SYLLABLE_FINAL**
↓	**OLDER** **UNIVERSITY** CONTACT MEN	**TEXT**

The traditional realisations [ɾ, r] are more likely to be produced by men than by women, and by implication women can be said to be more likely to use [ɹ] than men – this is a confirmation of findings by Romaine (1978). Older speakers are also more likely to use the more conservative variants. The use of [ɾ, r] also appears to be reinforced by predictors related to dialect contact (CONTACT, UNIVERSITY), while the use of the approximant [ɹ] does not become more likely in these settings. The trill or tap [ɾ, r] is more likely to occur in linking contexts than in others (which confirms Romaine 1978, Macafee 1983 and Johnston 1997), but in prepausal position, [ɹ] is preferred, a result apparently contradicting Romaine 1978. Perhaps indicating this variant's prestige, WORDLIST emerged as a factor with a strong positive effect on the likelihood of [ɹ].

5 Phonemic distinctness of /ʍ/

5.1 Phonetic description and classification

The phoneme /ʍ/ is remarkably ambiguous and elusive when it comes to phonetic description or membership in natural classes. Descriptions range from *breathed* [i.e. voiceless] *lips-back fricative* (Grant 1914: 37), *voiceless bilabial fricative* (Giegerich

1992: 36) over *voiceless labial-velar fricative* (Wells 1982: 408; McMahon 2002: 31; Cruttenden 2008: 230) to *voiceless labio-velar fricative* (McCully 2009: 47)

Virtually all authors agree that /ʍ/ is a fricative. However, this is somewhat problematic if /ʍ/ is viewed as one half of a pair of consonant phonemes whose other half, /w/, is unanimously described as an approximant. Avoiding this pitfall and describing /ʍ/ as a voiceless bilabial approximant could be regarded as a contradiction *in se* by some, since by definition English approximants are generally voiced (McMahon 2002: 29). Suggestions have also been made to phonemicise /ʍ/ diphonemically as /hw/ or /xw/ (Wells 1982: 408-9; Cruttenden 2008: 230) – accepting this would resolve terminological and classificatory problems, but would of course also render the present investigation moot.

Phonetically, /ʍ/ can be described as a hybrid between an approximant and a fricative and can be interpreted as the combination of a voiced and a voiceless component, or at least as a partially devoiced approximant, thus: [xw][6] < [hw] < [w̥].

5.2 Previous reports on /ʍ/

In spelling, /ʍ/ is represented by <wh> "and is very seldom replaced by **w** [i.e. /w/][7] in Scottish speech" (Grant 1914: 38). In the early 20th century, the traditional realisation appears to have been stable and unassailed by incoming forms, although it must be remembered that Grant's view is rather prescriptive since he focuses on the promotion of middle-class Scottish Standard English (Grant 1914: v) rather than on the exploration of other Scottish varieties or variation in general.

In her spoken Glasgow data, Macafee (1983: 32) finds that the contrast between /ʍ/ and /w/ is partly eroded in younger speakers. Similarly, Johnston (1997: 507) reports a merger of the two for Edinburgh.

Discussing Scottish Standard English, Giegerich (1992: 36) sees the contrast as essentially still in operation for most Scottish speakers, and similarly Jones (2002: 27) says that there is "a clear and distinct difference in pronunciation" between the two in the relevant contexts (cf. also Stuart-Smith 2008: 63 for a similar assessment).

Stuart-Smith also notes that /ʍ/ as a distinct phonemic category is in decline in Glasgow working-class speakers, especially adolescents, and that middle-class adolescents also use [w] in the relevant contexts rather than their adult counterparts do (Stuart-Smith et al. 2007: 239).

In his study of adolescent speakers from Aberdeen, Brato (2007: 1492) finds that [w] is very frequent in all groups of his socially stratified sample. An especially interesting point he makes is that dialect contact with Anglo-English may account for the tendency of middle-class speakers to lose the contrast.

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[6] Grant (1914: 38) stigmatises this type beginning in a voiceless velar fricative which he considers to be too extreme for speakers of "the more conservative pronunciation of educated Scotland" he describes and promotes (Grant 1914: v). This is perhaps indicative of this particular variant's association with Scots.

[7] Grant tends to label phonemes without brackets.

5.3 Incidence in the corpus

The overall frequency of tokens in the data were of course largely determined by the design of the reading-passage. Here, no special effort was made to balance the proportion of lexical words to function words like *which, where, what* etc. As table 6 shows, the 5 function words *what, when, why, where* and *which* together make up 367 of 400 tokens which equals nearly 93%. The words *whatever, somewhere, anywhere, nowhere* and *somewhat* where treated as separate categories (while *what's* was treated as *what*) because of their compound nature.[8]

Table 6: Incidence of lexical tokens containing /ʍ/ in the corpus

incidence	**lexeme(s)**
120	*what / what's*
116	*when*
64	*why*
42	*where*
25	*which*
7	*whirlpool*
5	*whisky / whiskies, whatever, somewhere*
3	*white / whiter*
1	*anywhere, nowhere, somewhat, whale, whereas, whether, while, whilst*
***total:* 400**	

5.4 Predicting WH

With a few exceptions, the predictors used were the same as for R^a and R^r (cf. table 2): POSTPAUSAL was used instead of PREPAUSAL since /ʍ/ only occurs in syllable-initial position. For the same reason SYLL_FINAL did not apply. Since only tokens from careful speech and from the textpassage were available for /ʍ/, WORDLIST did not apply either, and PREVOCALIC is of course meaningless if applied to this variable and was therefore not used. Additionally, lexical predictors for the five high-frequency lexemes were included (WHAT, WHEN, WHY, WHERE and WHICH). Again a logistic regression with a backward progression was used. Table 7 lists the results at stage 5, i.e. after the exclusion of the 4 least significant predictors.

[8] The circumstance that there are many cases of syllable-initial rather than word-initial <wh-> in English remains largely undiscussed in the literature.

Table 7: Logistic regression modelling factors significant for the maintenance of the /ʍ/ - /w/ contrast; arranged in descending order according to effects coefficient Exp(B); strong factors in bold print

Predictors	**B**	**SE**	**Exp(B)**	**p**
constant	.137	.456	1.147	.764
AGE_OLDER	1.337	.313	**3.806**	.000
CONTACT	-1.318	.337	**.268**	.000
UNIVERSITY	-1.163	.388	**.313**	.003
AGE_MIDDLE	1.143	.313	**3.136**	.000
MALE	-1.092	.367	**.335**	.003
WHICH	-.918	.507	**.399**	.070
POSTPAUSAL	.893	.284	**2.443**	.002
STRESSED	.829	.239	**2.292**	.001
TEXTPASSAGE	-.781	.288	**.458**	.007
N = 400				
Nagelkerke's R^2 = .289				
excluded: WHAT, WHEN, WHY, WHERE				

In this model, two of the sociolinguistic variables, age and gender, rank very highly. Both AGE_OLDER and AGE_MIDDLE have very high values of *Exp(B)* which by implication means that younger speakers tend *not* to observe the contrast of /ʍ/ and /w/. Men also seem inclined to merge the two as indicated by the low coefficient of MALE. The variable WH seems to be highly responsive to dialect contact, as both CONTACT and UNIVERSITY are strongly disfavouring factors.

While the predictors named thus far are the strongest in the model, it must be stressed that the division into strong, moderate and weak predictors is not as straightforward for WH as it was for R[a]. The model given in table 7 is characterised by a set of nine fairly well balanced predictors all of which make large contributions to the model as a whole. The two internal factors relevant for WH are of almost equal strength, with POSTPAUSAL slightly stronger than STRESSED. Since [ʍ] can be phonetically described as pre-aspirated [w], it makes good sense that in stressed syllables this pre-aspiration effect should be more pronounced. In rapid speech the form [w] may appear for /ʍ/ because it is arguably easier to articulate and requires less of a pulmonic impulse. Accordingly a pause preceding /ʍ/ will give the speaker time to articulate the slightly more effortful [ʍ]. Thus the importance of both POSTPAUSAL and STRESSED is altogether plausible and unsurprising.

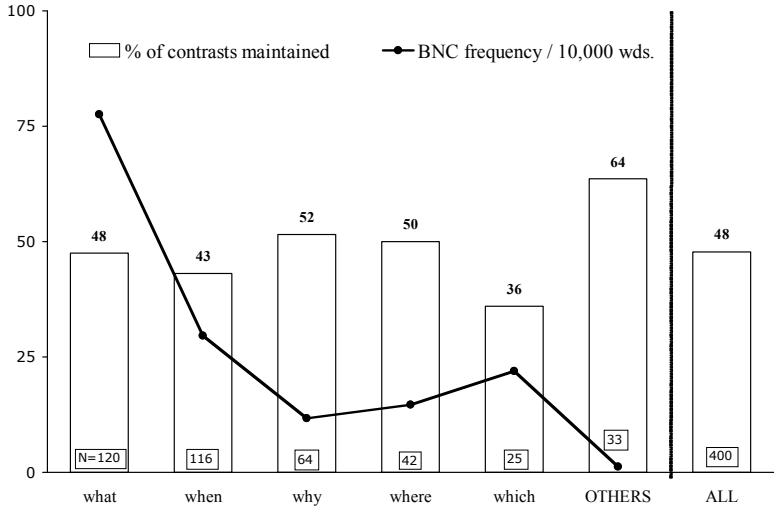

Figure 2: Comparison of normalised BNC-frequencies and proportions of maintained /ʍ/ - /w/ contrasts.

Here, as for R[a], the stylistic pattern is puzzling: TEXTPASSAGE decreases the likelihood of [ʍ], but it is not at all sure whether this points to actual stylistic differentiation with the respective sociolinguistic implications, or whether it is simply due to an increased rate of speech which in turn makes it more difficult for the speaker to produce a variant of /ʍ/ that will be perceived and classified as [ʍ].

Of the five lexical predictors, only WHICH makes a significant contribution to the model: compared with all other words, the word *which* is significantly less inclined to preserve the contrast. The selection of predictors is not ideal, however, because the frequencies of the five function words *what, when, why, where* and *which* in the data is so overwhelmingly high compared with that of the remaining words (cf. table 6). For example, testing the effect of WHY compares the 64 tokens of why against the 336 remaining words, 303 of which are *what, when, where* or *which*. The predictors as they are used here do not make a statement about the behaviour of the five function words compared to that of all other words, but rather about each function word compared to the other function words (plus a negligible number of other words). Figure 2 allows a better comparison of the five words of interest with the remaining words. In addition, the normalised frequencies of the words in the British National Corpus are plotted. Compared to all other tokens that contain <wh->, the words *what*, *why*, *where*, and especially *when* and *which* are liable to use [ʍ] rather than [w]. At the same time, these words are much more frequent than the other words that were part of the data.

6 Discussion

6.1 Non-prevocalic /r/

It seems to be characteristic of the variation observed in R[a] that a small number of language-internal predictors (PREPAUSAL, PREVOCALIC, STRESSED) account for most of it, while a much larger number of language-external (or sociolinguistic) factors account for the rest of it. This, in combination with the tendency of younger speakers to articulate a larger proportion of non-prevocalic /r/ suggests that we are *not* looking at change in progress, but that in fact rhoticity is maintained in Scottish middle-class speech (cf. Stuart-Smith 2003) showing, however, rather extreme internal variation.

Contact to speakers of Anglo-English accents in the family or at university certainly reduces the proportion of articulated non-prevocalic /r/, but in the light of the age-patterns that were found it seems more plausible to interpret this adaptation as age-grading rather than permanent change.

Female speakers are on the whole more likely to vocalise (i.e. lose) /r/ in non-prevocalic position – thus the effect of gender is inverse to that found in working-class speakers by Stuart-Smith (2003).

If we look at the factors underlying the different realisations that articulated non-prevocalic /r/ takes in the data (variable R[r]), some findings of previous studies are confirmed, but there is also evidence of patterns that so far went undetected. In accordance with the tendency of women to lose non-prevocalic /r/, they also tend to use the approximant realisation [ɹ] more often than men while the opposite is true for the more conservative realisations [ɾ, r]. This is especially plausible if [ɹ] is regarded as intermediate between [ɾ, r] and ø. Romaine (1978) rightly cautions against the use of a hierarchical scale of realisations (between extreme cases like, for example, [r] and ø) because intermediate values may have distinct and stable sociolinguistic meanings, but in purely phonetic terms [ɹ] certainly is a step towards ø that coincides with women's generally greater tendency not to articulate non-prevocalic /r/.

The wordlist material not only displays the highest proportion of articulated /r/, but also an increased likelihood for an approximant realisation. These two findings point towards the replacement of [ɾ, r] by [ɹ] as the new prestige form of /r/ in Scottish English previously postulated by Romaine (1978).

The most interesting and also most challenging patterns are those conditioned by dialect contact as expressed by the predictors UNIVERSITY and CONTACT. Both of these decrease the proportion of articulated non-prevocalic /r/, but at the same time those instances that *are* articulated under their influence are more likely to be realised as the more traditional variants [ɾ, r]. It would be fascinating if it was possible to confirm this synchrony of innovation (i.e. loss) on the structural level and conservatism on the realisational: This would suggest that the two are to some extent independent and in consequence dissimilar in their response to the same sociolinguistic influence.

6.2 / ʍ /

The contrast of /ʍ/ and /w/ is variably present in 23 out of 27 speakers, i.e. only 4 speakers seem to have completely merged the two into /w/. However, the contrast is far from stable: speakers do not use /ʍ/ categorically and variation is marked.

One important finding is that young speakers display the contrast much more rarely than the other age groups. The same is true for men as compared to women, but the difference is somewhat less marked. Other factors with strong negative effects on the maintenance of the contrast are direct dialect contact with Anglo-English and an association with the university setting. The latter can perhaps be interpreted as just another type of language contact, since Edinburgh University is particularly anglicised among Scottish Universities, at least when compared to the universities of Glasgow, Stirling and Dundee.

As with non-prevocalic /r/, internal factors (here: STRESSED and POSTPAUSAL) also play an important role in analysing the variation of the contrast: Both have a strong positive effect on the outcome variable WH, but they are only two of a balanced mix of strong factors. This is in marked contrast to non-prevocalic /r/ where the internal factors are clearly dominant and in fact still account for most of the explicable variation if all other factors are disregarded.

The reasons why members of the lexical category WHICH should be more likely to merge /ʍ/ and /w/ are yet unclear, but articulatory reasons may play a role considering that WHICH differs from the other four lexical predictors (WHAT, WHEN, WHY, WHERE) in containing a vowel that is close rather than open. Considering the output of the model and the solid token number for all five of these high-frequency words, a chance result can be ruled out with some confidence.[9] Frequency was not included as a predictor, but evidence for a fundamental difference between the five high-frequency function words and the rest of the data suggests that erosion of the contrast has progressed furthest in WHAT, WHEN, WHY, WHERE and WHICH. Re-running the logistic regression with a single predictor FUNCTIONWORD replacing the five separate lexical items would probably somewhat clarify the overall picture.

On the whole the relative weight of predictors appears much more balanced in the case of WH as compared to R^a, i.e. external factors play a much greater role in predicting the outcome and there seems to be a stronger sociolinguistic pull on this variable. Especially the fact that younger speakers and especially men tend to merge /ʍ/ and /w/ suggests that here we may indeed be looking at change in progress.

7 Conclusions and outlook

As shown in the individual discussions, WH and R^a respond rather differently to some of the predictors. For example, male speakers favour rhoticity but disfavour the /ʍ/ - /w/

[9] Effects potentially due to chance (especially because of low token numbers) would be detected and excluded by the model.

contrast. If the classic sociolinguistic gender assumption was accepted, this would be evidence suggesting that the two outcome variables enjoy rather different prestige. Similarly, older and middle-aged speakers retain the contrast of /ʍ/ and /w/ to a greater extent but are also less likely to articulate non-prevocalic /r/. It could even be argued that the response of one of the two outcome variables to the factors age and gender mirrors the response of the other. The predictors CONTACT and UNIVERSITY have a unifying effect, pulling both variables away from a traditionally Scottish towards a leveled British pronunciation, but this effect is much more marked for WH.

In figure 3, average values for both variables are plotted against each other. There is no significant correlation of the two, and it does not seem at all possible to predict a speaker's behaviour with regard to R[a] from his known behaviour with regard to WH.

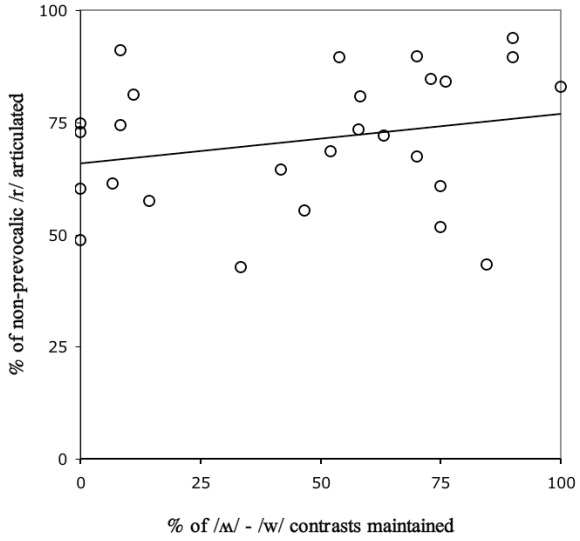

Figure 3: General correlation of speaker averages of WH and R[a]
N = 27; Pearson's r = .242; p = .223

Naturally a good many things remain to be done to improve the analysis. Firstly, /r/ will be investigated on a general level, i.e. in *all* environments and not only non-prevocalically. As predictors explaining the variation found in /r/, neighbouring vowels may play role: For non-prevocalic /r/ a certain quality of the preceding vowel may increase the likelihood of a certain variant of /r/ to appear, and the same needs to be explored for prevocalic /r/ as well as for linking-/r/ where the *following* vowel is a potentially significant factor.

Results found for the predictors CONTACT and UNIVERSITY suggest that the aggregation of these two into a single contact-related predictor may improve the model by simplifying it.

One rather puzzling finding in the analysis so far is the erratic stylistic pattern found for R[a] and WH. The lack of a regular progression from less formal careful speech via the

reading-passage to the wordlist in ʀ[a] is confirmed by a similar pattern between careful speech and reading passage for WH and is therefore not considered to be due to errors of judgment or chance. I speculated above that this effect may be not so much due to stylistic differenciation but to the speech rates of individual speakers. Therefore, the replacement of the stylistic predictors by yet another internal factor, SPEECHRATE, may shed some light on this phenomenon.

A rather important issue that will need to be addressed is the adequacy of logistic regression as a tool of analysis for the kind of data at hand: Since the individual data points (or tokens) are not independent observations but are nested in a higher-level category, the speaker, a model analysing hierarchical (or multi-level) data structures will probably have to be employed and may provide even better explanations.

Putting these suggested improvements into practice will hopefully provide answers to those questions that remain open and to those that have only just arisen through the research presented here.

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