A SPECTROGRAPHIC ANALYSIS OF VOWEL FRONTING IN BRADFORD ENGLISH

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Abstract

The /o/ vowel in the English of Bradford is produced by many speakers as a monophthong with a clearly fronted or central quality. Description of such a pronunciation is, however, all but absent from the literature, suggesting that such pronunciations are a relatively recent development in Bradford speech. The acoustic characteristics of 337 tokens of /o/ are investigated, with a view to matching acoustic cues to the auditory impression of fronting. The findings are assessed with respect to similar fronting patterns in the vowel systems of varieties of English elsewhere in the UK and worldwide, and to the principles of sound change elucidated by Labov (1991, 1994). We conclude that 'internal' factors alone are inadequate to explain the current tendency for varieties of English in northern England to feature /o/ fronting, and suggest that the appearance of this variant in Bradford English is the consequence of contact-induced spread.

1. Introduction

This paper outlines a preliminary study made of the /o/ vowel in the English of Bradford, a city of approximately 300,000 inhabitants in West Yorkshire.[1] Bradford English (henceforth BE) exhibits many of the general features of northern accents of British English, though to date the pronunciation of the variety has been investigated in detail only by Petyt (1985). In this paper we focus on one specific variable: the vowel found in words of the GOAT set, such as *go, load, boat, snow, coal, throat*, etc. (for an explanation of the choice of keyword used to denote lexical sets, see Wells 1982: xviii-xix). We will hereafter refer to vowel variables by keyword so as to prevent confusion between phonetic exponents and higher-order phonological categories.

A characteristic phonetic quality of the GOAT vowel in BE is a back monophthong in the region of [ɔː], such that *boat*, for example, may be homophonous (or at any rate very nearly homophonous) with *bought*. In this respect, BE resembles several other accents of northern England, such as that of Newcastle upon Tyne, in which productions of the GOAT vowel may be indistinguishable from those exemplifying the THOUGHT~NORTH~FORCE set (Watt 1998a: 150; 232ff.). It will be noticed from the formant plots presented in §4 that there is for some BE speakers a significant overlap in acoustic terms between GOAT and THOUGHT~NORTH~FORCE.

In addition, we observe a fronted or centralised variant of GOAT. We may symbolise this variant [ɵː], in parallel with the centralised GOAT variant reported in Newcastle and Durham (Wells 1982: 300; Lass 1989: 190; Watt & Milroy 1999). The actual phonetic quality of this vowel is judged by the second author - a native of

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Bradford - to lie in the region between [ʊ] and [ə]. The vowel is variably rounded, but in most cases seems less rounded than the [oː] found generally across Yorkshire and other regions of northern England. Thus, forms like *cut* and *coat* may (potentially) be distinguished solely by vowel duration, while *jerk* and *joke* may for some speakers be homophonous.

In order to investigate whether such perceptual equivalence has its basis in overlap of categories in the acoustic domain, the frequencies of the first two formants of 337 tokens of BE GOAT were measured and compared with those of tokens of neighbouring vowel categories. The results of this analysis are presented in §4, and are appraised with reference to so-called 'internal' factors (speaker-independent properties of an abstract vowel phonology) and 'external' factors (the various social characteristics of the BE speakers sampled) so as to contextualise the findings in a larger frame. The findings are also compared with similar GOAT pronunciations reported to be extant in the accents of other urban centres in the region.

First, however, we turn to previous published descriptions of the phonetic characteristics of BE: the development of the two GOAT variants mentioned is examined, and the antiquity of the centralised variant [ɵː] estimated.

2. Previous accounts of Bradford GOAT

Descriptions of Bradford English in the dialectological literature are rather scarce.[2] Four relevant studies are briefly summarised here: Wright's (1892) study of the dialect of Windhill; Orton & Dieth's (1963) description of the speech of Wibsey; Petyt's (1985) analysis of the English of the cities of Huddersfield, Halifax and Bradford; and Hughes & Trudgill's (1996) summary of non-standard features in BE.

2.1 Wright (1892)

At the time of Wright's study, Windhill was a village lying some three miles north of Bradford itself, though today it lies within the city boundaries. There may therefore have been small phonetic differences between Windhill and Bradford English proper during this period, since Bradford's expansion following the Industrial Revolution was due to large-scale influx of workers from other parts of the country, a situation which must have resulted in a good deal of dialect contact and possibly a resultant levelling of localised phonetic features (on levelling, see Kerswill 1996; Kerswill & Williams 1999). Windhill, then, may have preserved characteristics of West Yorkshire English for far longer than was the case in industrialised Bradford. In the absence of evidence either way, however, we will assume that Wright's description applies also to the English of Bradford itself.

Wright's treatment of the phonetic exponents of GOAT reveals an alternation between four contextually or lexically predictable diphthongs, and a short monophthong [ɒ] in items like *roast*. No long back monophthong corresponding to [ɔː] or [oː] is reported. The diphthongs (transcriptions as per Wright) pattern as follows:

[2] This, indeed, can be said of urban Yorkshire in general. There exists, for instance, no recent widely-available treatment of the English of the city of Leeds, despite the fact that Leeds is after London the UK's largest metropolitan district, and its fourth largest city by population (source: www.brixworth.demon.co.uk/leeds/).

[oi]	*coal, road*	[ɔə]	*snow*
[ɔu]	*coke*	[uə]	*nose*

It can be argued, of course, that to group these vowels together as allophonic variants of a single category is to superimpose a modern (or at any rate RP-like) division of the lexicon on the phonology of nineteenth-century Yorkshire English. *Coal* and *road* need not have been members of the same lexical set as *coke* and *snow* any more than *choice* or *force* need have been. However, given that in modern Bradford speech the items in the sets above may all be realised by the same vowel, and that Wright's traditional pronunciations are highly recessive or even extinct, we may with justification consider the changes which brought together [oi], [ɔu], [ɔə], [uə] and [ɒ] to represent a process of convergence on a pattern resembling that found in southern varieties of British English.

2.2 Orton & Dieth (1963)

The material collected by Orton & Dieth in Wibsey, an area of Bradford around two miles to the south of the city centre, shows that the system of four diphthongs reported by Wright was still extant until relatively recently. The diphthongs themselves differ somewhat in the fine details (or at any rate have been transcribed slightly differently), but their distribution *vis-à-vis* the lexicon seems to have been held fairly constant. However, it must be borne in mind that the Survey of English Dialects, of which the Wibsey material forms a part, was conducted with a view to collecting traditional, localised speech forms, and to this extent data collection in urban centres was by and large avoided (see for instance Stoddart, Upton & Widdowson 1999). Speech was elicited typically from older, less educated men, and those interviewed in Wibsey may well have been born at the end of the nineteenth century. Thus, we should be wary of assuming that the four-way split between the diphthongs [ɔɪ], [ɔʊ], [oə] and [ʊə] was a feature of BE that persisted across the board into the 1960s. It is possible, for example, that such distinctions were collapsed much earlier on in the speech of women, since females are said to avoid or abandon localised speech variants in favour of incoming supra-local ones much more readily than is the case for males (e.g. Chambers 1995).

Orton & Dieth do, however, make mention of a long monophthong [ɔː] in a limited number of GOAT items (*know*, *own* and *snow*), which in Wright's system took [ɔə]. It appears, then, that the schwa offglide was absorbed or 'smoothed' into the vowel nucleus while vowel length was retained. In any case, we see here a pronunciation which is still very common in BE, and which must have spread through much or all of the GOAT set by lexical diffusion within the last few generations.

2.3 Petyt (1985)

Petyt's monograph on the speech of Huddersfield, Halifax and Bradford is the most comprehensive work to date on West Yorkshire English, being based on doctoral work he carried out in the mid-1970s. His analysis of the situation regarding the GOAT vowel is complicated somewhat, however, by his postulation of two phonemes which he labels /ɔʊ/ and /oː/ (the latter being what he calls 'urban /oː/'). The rationale for two phonemes rather than one is the existence of minimal pairs such as *mown~moan*, *knows~nose*, and *rowed~road/rode*.[3] Petyt points out, however, that in his study individual speakers varied in the consistency with which they used this contrast, and suggests that the 'urban' /oː/ was gaining ground on the diphthongal form. It is possible, then, that the historically-motivated distribution of the phonetic exponents of these phonemes was becoming less and less clear-cut to BE speakers, and that merger of /ɔʊ/ and /oː/ was taking place. In such a situation, one might expect the maintenance of the distinction, and the adoption of monophthongal realisations in words of the *mown~knows~rowed* set, to become sociolinguistically marked. Petyt attributes the appearance of monophthongal [oː] in West Yorkshire varieties to the influence of RP, although it is difficult to see how [oː] could resemble an RP model ([əʊ], or something similar) more closely than did the traditional diphthongal pronunciation (see §5.3). On the other hand, the apparent preference for [oː] in GOAT items among Tyneside English speakers is argued to be motivated by a pressure to avoid the stigma perceived to be attached to the more traditional centring diphthong [ʊə] (Watt & Milroy 1999). So although [oː] is still recognisably northern, it may be that it is not viewed in the same negative light as strictly localised BE forms like those described by Wright and Orton & Dieth.

2.4 Hughes & Trudgill (1996)

Petyt's predictions about the attrition of the full phonemic status of /ɔʊ/ through its gradual merger with /oː/ are borne out by Hughes & Trudgill's brief treatment of BE (1996: 88-92).[4] While they describe /ou/ - corresponding to Wells' GOAT - as 'a narrow diphthong or a monophthong, [o̞ː]' as in *boat* or *nose*, like Petyt they accord /ɔu/ phonemic status, but only for a subset of the BE-speaking population. 'For some speakers', they argue, 'many words which have *ow* or *ou* in the spelling (e.g. *knows*...) have /ɔu/. [...] Thus for these speakers *nose* and *knows* are not homonyms' (p.89). The distinction, which persists in the English of Norwich (see Trudgill 1974 *et passim*), 'is being lost, younger speakers generally using /ou/ [i.e. [oː]] in both sets of words' (Hughes & Trudgill 1996: 89).

No indication is given anywhere of a centralised or fronted variant of either of these vowels as a feature of BE, or indeed of West Yorkshire English as a whole. Wells (1982: 358) does, however, cite a quality [ö̞ː] to be found in urban districts of the 'middle north', an area spanning the counties of Greater Manchester, West Yorkshire, and South Yorkshire, and thus encompassing the Leeds-Bradford conurbation, Sheffield, Huddersfield and Manchester proper (p.350). This might represent the first observation of BE GOAT fronting in the dialectological record.[5]

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[3] The word-list given to the subjects in this study contains the pairs *knows~nose* and *sole~soul*, but for our immediate purposes no attempt is made to ascertain whether this distinction still holds; see Appendix.

[4] The text of the 1996 edition (the third) does not differ substantially from that of the first edition (1979), and so we may consider Hughes & Trudgill's description to be contemporary with that of Petyt.

[5] Reynolds (1990: 125) considers the 'diphthong reduction' of /oʊ/ to [o̞ː] among a sample of West Yorkshire children to be symptomatic of phonological disorder.

2.5 Summary

The picture, then, seems to be one involving a levelling or reduction of localised phonemic or sub-phonemic contrast in the vowel(s) of lexical items now apparently collapsed into a class corresponding to Wells' RP-based GOAT set. If earlier analyses are to be relied upon, at least two contrastive phonemes have merged into one within the last twenty years or so. It would be interesting to investigate whether the contrast is still a feature of the phonological systems of older BE speakers, and whether these speakers observe it with the kind of consistency we could expect for a phonemic distinction. Since, however, we are looking for acoustic evidence of GOAT *fronting*, rather than for signs of the survival of Hughes & Trudgill's /ou/~/ɔu/ contrast, we turn next to an examination of GOAT fronting itself.

3. Method

3.1 The formant frequency model

The current practice in instrumental phonetics, at least as it is used in sociolinguistic research (beginning with Labov *et al*. 1972; see also Labov 1991, 1994), is to reduce individual vowel sounds to a pair of figures representing the frequencies in Hertz of the two lowest formants, which are conventionally labelled F_1 and F_2 (Fry 1979: 75-81). Formants can be defined as narrow bands within the acoustic spectrum in which energy is concentrated during the production of speech sounds; the frequency of each formant is determined by the volumes and resonances of various vocal tract cavities (pharyngeal, oral, nasal). Formants contain most energy during sonorant sounds such as vowels, and the frequencies of F_1 and F_2 relative to one another are thought to provide the human speech perception system with the cues necessary for the recognition of individual vowel qualities. F_1 and F_2 frequencies are, moreover, said to correlate closely with tongue position, such that an increase in F_1 frequency corresponds to tongue lowering and jaw opening, while an increase in F_2 frequency results from fronting of the tongue body (e.g. Ladefoged & Harshman 1979). The acoustic consequences of vowel fronting of the type under investigation in this paper, therefore, would be a relative increase in the frequency of F_2 in GOAT tokens as compared to some reference level – say, the F_2 frequencies of tokens of the back vowels /ɔ/ or /u/, or to the boundaries of a triangle defined by the F_1 and F_2 maxima and minima with apices at [i a u].

The formant frequency model, of course, is derived from the acoustic attributes of vocalic segments rather than perceptual 'vowel qualities' of the sort transcribed by phoneticians using impressionistic analysis techniques.[6] It therefore does not directly reflect the non-linear nature of the perception of frequency changes by the ear,[7] nor can it provide any information about the process by which speech sounds are

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[6] For a detailed account of the development of the formant frequency model see Rosner & Pickering (1994: 284-287).

[7] The use of psychoacoustic frequency transforms - the Bark, Koenig, or mel scales, for instance - is well established in experimental phonetic research (see e.g. Miller 1989) but is practically absent from current work on sociophonetics. While a number of researchers in the latter field recognise the importance of treating speech sounds more as perceptual objects than as purely acoustic events (e.g. Iivonen 1995, Aulanko & Nevalainen 1995), psychoacoustic scales are conspicuous by their absence in Labov's work and the paradigm it has generated. As Labov *et al*. (1972: 31) remark, 'we have considered alternative displays of [our] data at several points, including linear-logarithmic plots, but none of the problems considered in this volume have been further illuminated by other approaches.'

categorised or 'normalised' by the auditory system (Johnson 1990; Nusbaum & Magnuson 1997).

Thus, while we recognise the limitations of such a model, it is also true that formant plots can provide an approximate representation of the *relative* qualities of individual vowels for single speakers. In the following section, some example plots are presented as evidence of GOAT fronting, and some possible interpretations are offered of the distribution of vowels on each speaker's F_1/F_2 plane.

3.2 Recording

A total of eight speakers of BE were recorded by the second author as part of a second-year undergraduate project. Most of the speakers were known to her, or were relatives of these friends and acquaintances. The speakers were of both sexes (5 females, 3 males), ranging in age from 17 to 75 years. The speakers can all be said to come from mid- to upper-working class backgrounds. All are from the city of Bradford, and are speakers of BE. The eight speakers, with their ages and occupations, are listed below.

Marcelle, 17: low-grade clerical worker in building society
Debbie, 27: mature student studying towards psychology degree
Irene, 37: market stall trader; teaches English as a second language
Doreen, 55: housewife
Barbara, 75: retired, former office worker

Paul, 23: nursery nurse on council estate
Ray, 29: machine overseer in textile mill
Arthur, 72: retired, former manual worker

Each speaker was instructed to read a list of some 100 isolated words, plus 7 short phrases containing target phonological variables (see Appendix). They were asked to read aloud in as natural a way as possible, and to avoid affecting a 'telephone' or 'office' voice. After reading the list, some speakers were given the opportunity to read it a second time. In the repeat reading, the words were read in rows from top to bottom rather than down each column from left to right. The items included in the list were intended to be frequent enough to be familiar to all readers, and at the same time to provide a range of phonological contexts for each of the target vowels. Vowels other than GOAT (crucially FLEECE, GOOSE and START) were included so as to provide an indication of the boundaries of the vowel plane for each speaker, thereby indicating the degree of fronting or peripherality of each GOAT token.

The speakers were generally fairly accurate in their reading; where misreadings occurred, they tended to fall on the items *Wrose* (an area of Bradford), *shirk* and *coop*, which were misread by some speakers as *worse*, *shriek* and *Co-op* (the abbreviated form of *Co-operative Society*). *Though* was confused with *thought*, and *bear* occasionally with *beer*, while *bough* was clearly unfamiliar to several speakers. Nonetheless, it was possible to collect a sample of at least 23 usable GOAT tokens for all speakers, while the total number of vowels analysed for an individual speaker was in no case less than 51 (see Table 1).

3.3 Sampling and formant extraction

The speakers were recorded on standard compact audio cassette using a Sony WM-D6C Professional Walkman with a Sony directional stereo microphone, which was placed facing the speaker on a table or other suitable surface. In the main the recordings are of appropriately high quality, and in spite of occasional background or electrical noise on the tapes, digitisation of the recordings and extraction of formant values was carried out with ease (though see §3.4 below). The recordings were sampled at a rate of 11,025 Hz into Sensimetrics *SpeechStation 2*, a spectrographic analysis software package, running within the Windows NT environment on a Pentium II PC.

Once all eight recordings had been sampled, the words containing the target vowels were isolated and labelled. Accidental misreadings were rejected. Formant measurements were taken from spectra generated by locating the vowel midpoint on the spectrogram which is automatically displayed by *SpeechStation* whenever sound files are opened. The suitability of vowel midpoints for this type of measurement is debatable, but - at least in principle - it serves to minimise the effects of formant transitions at the vowel margins, and it may allow the vowel to reach or approach its prototypical 'target' during the vocalic articulation (for further discussion of the problems associated with this technique, see Bladon & Lindblom 1981; Bladon 1982; Harrington & Cassidy 1994; Watt 1998a: 30-39). Figures 1 & 2 are screen dumps showing how the formant measurements discussed in subsequent sections of this paper were arrived at.

The spectrum window, as in Figure 2, allows the user simultaneously to display Fast Fourier Transform (FFT) and Linear Prediction Coding (LPC) analyses of the spectrum. Generally, both authors used the LPC trace (the smoother four-peaked envelope in Figure 2) for locating formant peaks in favour of the FFT trace, since it is often more difficult to locate formants with certainty in the FFT envelope.

Figure 1. Broad-band spectrogram of *note*, Ray, 29 (frequency (kHz) on *y* axis, time (milliseconds) on *x* axis). Cross-hairs indicate location of spectrum shown in Figure 2.

Figure 2. Acoustic spectrum at midpoint of vowel of *note*, as per Figure 1 (intensity (dB) on *y* axis, frequency (kHz) on *x* axis). Clipping level 106 dB, dynamic range 40 dB. FFT and LPC envelopes are superimposed.

3.4 Problems in acoustic analysis

There was in fact a significant number of cases in which the spectrum generator failed to detect F_2 reliably, either because of the ambiguity caused by closely-packed harmonics with approximately equal intensities,[8] or because acoustic energy above the range typical of F_1 for a particular speaker was relatively weak or sparse. The latter phenomenon was especially common in the speech of female subjects. It is suggested that digitisation at a higher sample rate (say, at the next highest setting of 22,050 Hz) or adjustment of the LPC parameters might have overcome this problem.

Where a formant was clearly visible in the spectrogram but was ambiguous in or absent from the spectrum display, *SpeechStation*'s formant tracking facility was used. Thus, each vowel token's formant values could be estimated by using three semi-independent methods.[9] The potential sample for each speaker was large enough, however, that tokens for which F_1 and F_2 could not be measured with any confidence or accuracy were discarded.

3.5 Scatter plots

So as to represent the acoustic vowel space graphically without having to resort to the use of logarithmic scales, the F_1 value for each vowel token was subtracted from the F_2 value, with the resulting value then being plotted against F_1, as Ladefoged (1982: 180) suggests. The axes of the formant plot chart are then reversed, such that the plot more closely resembles the traditional vowel quadrilateral, with close front vowels to the upper left-hand corner, and open vowels toward the bottom centre of the chart. Note that the values for each axis at the origin will vary, depending on the

[8] In a few cases, a formant peak which was obscured in the LPC trace (because, for instance, of ambiguity caused by neighbouring harmonic peaks of near-equal intensity) the higher or highest local dB value was read from the FFT envelope. The choice of peak was dictated more often than not by the 'ball-park' values of the relevant formant in other tokens of the same vowel type. *SpeechStation* allows the user to change between a number of window size settings, which to some extent can correct this problem; time limitations precluded a full assessment of the options here.

[9] It is probable that this feature of the program uses the same FFT formant extraction algorithm as the transform used by the spectrum generator, in which case the results are equally reliable.

frequency range of each speaker's F_1 and F_2. It is not feasible at this stage to plot one speaker's F_1 and F_2 values against another's, since the figures must be run through a complex normalisation algorithm in order to allow, for instance, plots for male speakers to be superimposed on those for female speakers.[10] Rather, plots are presented in the following section speaker by speaker, accompanied by commentary on qualitative aspects of the distribution of vowel points on the $F_1 \times (F_2 - F_1)$ plane.

4. Results

4.1 Results of acoustic analysis

For the sake of clarity, lexical sets which are not distinguished phonetically in BE are collapsed together as follows:

FOOT, STRUT → FOOT
THOUGHT, NORTH, FORCE → NORTH[11]
LOT, CLOTH → LOT

START and BATH pattern differently with respect to /a/ and /ɑ/ in BE from the distribution obtaining in RP and other southern accents, and START will refer to the word list items *cart*, *calf*, *banana*, *bar*, *farm* and *cart*.

Only monophthongs bearing primary word stress were sampled for this study. It will be noticed from the word list in the Appendix that some items, such as *Metro*, contain relevant vowels in unstressed position; these were, however, disregarded.[12] The number of GOAT tokens and the size of the overall sample for each speaker are shown in Table 1.

The disparity in sample sizes between individual speakers is the consequence of several factors: whether the speaker was recorded reading the word list twice or not, the number of his or her misreadings, whether or not formant measurements were taken for the KIT vowel (carried out for five speakers), and the inclusion of multiple tokens of the 'point' vowels representing the extreme corners of the vowel space. Doreen's sample, for instance, includes just two tokens of FLEECE and three of START and GOOSE, though these are fairly tightly clustered (Figure 4) and give a good impression of the location of the vowel plane boundaries.

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[10] Normalisation is used here in its mathematical sense - i.e. adjusting formant frequency ranges and ratios until samples for separate speakers can be directly compared - and not as a synonym for perceptual equivalence, as in §3.1. Significantly, on the single occasion that Labov uses the term 'normalisation' in *Principles of Linguistic Change* (1994: 456), he intends the former sense.

[11] Hughes & Trudgill report that 'pairs of words like *pore* (which has *r* in the spelling) and *paw*... are distinguished. Words without *r* have /ɔː/ ([ɔ̣ː]); words with *r* have /ɔə/ ([ọə̣]). [...] This distinction is also made by some RP speakers' (1996: 89). Thus, the vowels of *bore* and *force* in the word list are potentially phonetically distinct from those of *pause* and *caught* in the BE recorded for this study. Of the eight speakers recorded, Arthur (one of the oldest informants) appears to observe this contrast quite consistently. Indeed, he inserts an alveolar tap [ɾ] in his first reading of *force*, serving to highlight the distinction further, though this is probably a stylistic device rather than a habitual feature of his speech.

[12] There are signs, all the same, that GOAT in unstressed syllables may be more prone to fronting than in other positions. This possibility awaits investigation.

Table 1. GOAT tokens analysed and overall sample size, by speaker

Speaker	GOAT (n)	total (N)
Marcelle	26	61
Debbie	57	146
Irene	27	61
Doreen	23	51
Barbara	37	82
Paul	59	151
Ray	57	144
Arthur	51	132
TOTAL	**337**	**828**

Arthur's sample unfortunately gave results we do not feel adequately confident about despite the comparative straightforwardness with which his vowel formants were measured; we disregard it for the purposes of this paper, as repetition of the analysis must be carried out. We therefore present results for just seven of the eight speakers in the following sections. Plots for these seven speakers are arranged in descending order of age.

Barbara's point vowels cluster, as might be anticipated, around points defining a roughly equilateral triangle. Her NURSE vowels lie near the centre of the triangle, and the systemically back vowels LOT, NORTH and GOAT occupy a relatively compact area somewhat 'lower' than GOOSE. NORTH, as suggested in §1, falls almost entirely within the GOAT area, and in many cases Barbara's NORTH and GOAT vowels are indistinguishable in auditory terms. The overlap between FOOT and GOAT is also notable in Barbara's case. There is some evidence of an overlap of GOAT and NURSE, suggesting that GOAT fronting is sporadic in Barbara's speech, although NURSE is in any case perhaps a little higher than might be expected, and the locus of GOAT appears to be at least as far back as NORTH and GOOSE. Bearing in mind that the GOOSE vowel of the word list items *coop*, *boom*, *booed* and *goose* is typically diphthongal in BE, with a first element starting near [ɪ] and retracting to the close back area, the GOOSE vowel is surprisingly close to CV8 position for Barbara (compare e.g. Debbie's plot in Figure 7).

The split between Barbara's 'front' and 'back' tokens of START is interesting. The vowel of *cart*, for instance, would be [aː] in Hughes & Trudgill's system (1996: 188), and as such would be distinguished from *cat* only by vowel length. While an auditory split in Barbara's START vowels is less conspicuous than the formant plot might suggest, we speculate that Barbara is attempting to avoid the (possibly stigmatised) front [aː] in favour of the more standard back vowel.

While the overall number of tokens plotted in Figure 4 is smaller than is the case for Barbara in Figure 3, we see an approximately similar pattern. GOAT is more consistently a 'back' vowel here, and again coincides with the formant values for FOOT. The main cluster of Doreen's GOAT tokens is equidistant from GOOSE and NORTH, though there is again something of an overlap with NORTH for some tokens. START is relatively back, while formant values for NURSE in Doreen's speech match those for Barbara rather closely. Like Barbara's, then, the vowel space represented by Figure 4 is comparatively crowded in the back mid area, and one might expect some vowel fronting as a means of dissimilating overlapping vowel categories should homophony become a problem (see §5.2).

Figure 3. Vowel plot for Barbara, 75

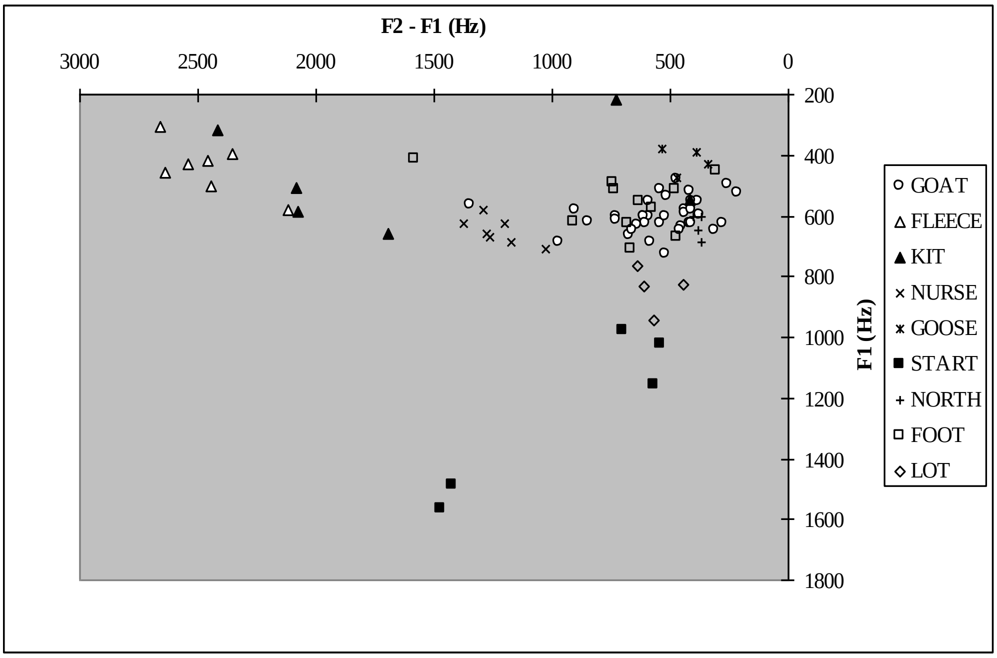
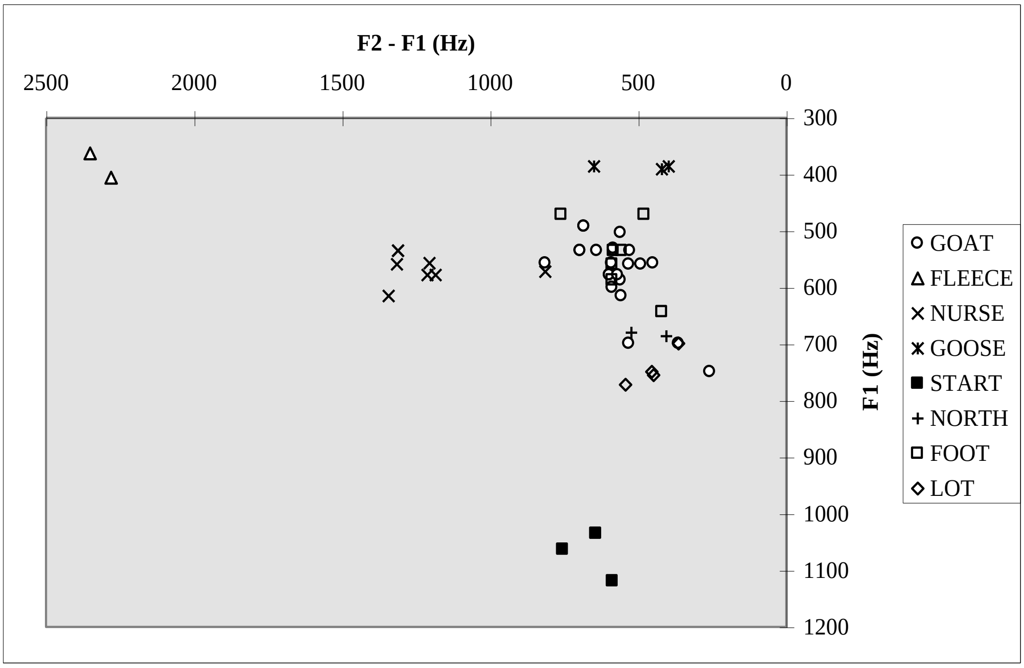
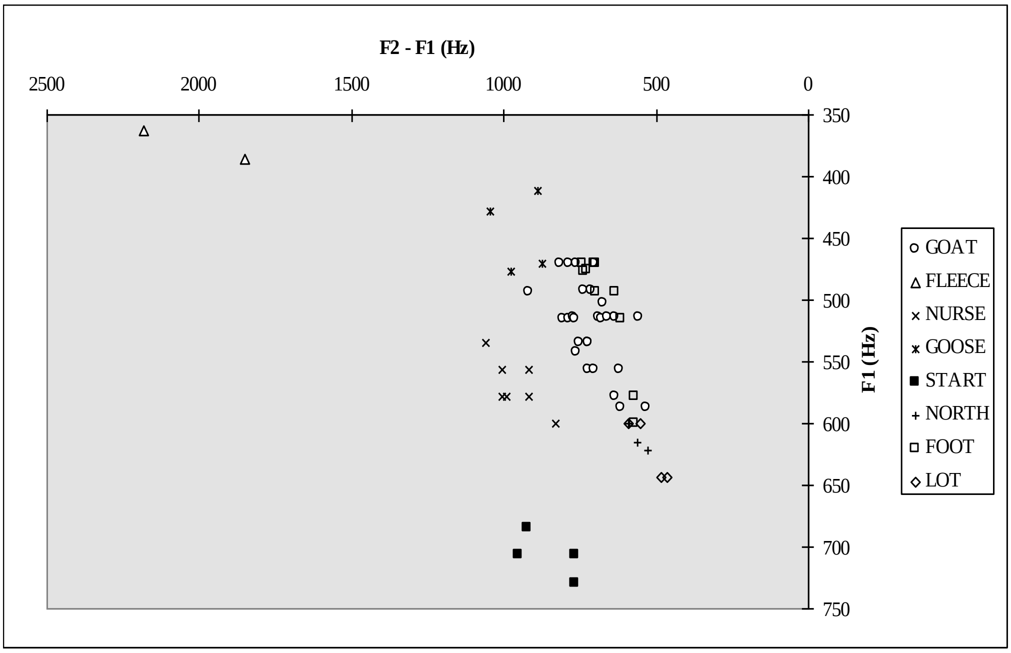


Figure 4. Vowel plot for Doreen, 55



Irene's vowel triangle, shown in Figure 5, is rather different in shape from those in the plots in Figures 3 and 4. GOOSE appears to have fronted along the upper boundary of the triangle and is now almost as central (along the F_2 - F_1 axis) as is the area occupied by NURSE. There is a suggestion that GOAT too seems to be encroaching on a more central area, at any rate relative to NORTH and LOT, though the scatter of points for GOAT and NURSE is still clearly distinct. GOAT and FOOT are again almost entirely superimposed on one another. Figure 5 may be compared with the plot for Debbie (Figure 7) which represents the vowel space for a female BE speaker with a demographic background similar to Irene's, but who is ten years younger; the GOAT and GOOSE fronting evident in Debbie's plot might be taken as a continuation of the first stages of the fronting process hinted at in Figure 5.

Figure 5. Vowel plot for Irene, 37



By contrast with Figure 5, and more especially with Figure 7 below, the vowel plot in Figure 6 suggests stability. FLEECE and KIT are almost entirely distinct, while the clusters of tokens for NURSE and START are compact and separated from other vowel categories by large clear areas (what the plot might look like were tokens of additional vowel categories such as FACE, DRESS and TRAP to be added is open to conjecture, of course). GOOSE is somewhat fronted, while GOAT is little further forward, relatively speaking, than are NORTH or LOT. These last two categories overlap considerably, as do GOAT and FOOT. However, there is little indication that GOAT is fronted into the central area occupied by NURSE, as we might wish to observe if GOAT fronting of the sort reported for Tyneside and Hull English (§1, §5.3) is to be confirmed. Ray, however, is not typical of the sort of speakers who have been found to front this vowel in the aforementioned varieties: in Tyneside a fronted vowel [ɵː] was favoured by men between 16 and 25 years of age in the middle-class group (Watt & Milroy 1999), while in Hull (Williams & Kerswill 1999) it seems most common amongst middle-class teenage girls. Debbie, who at 27 is of a comparable age to Ray, exhibits a quite different pattern, as seen in Figure 7.

Figure 6. Vowel plot for Ray, 29

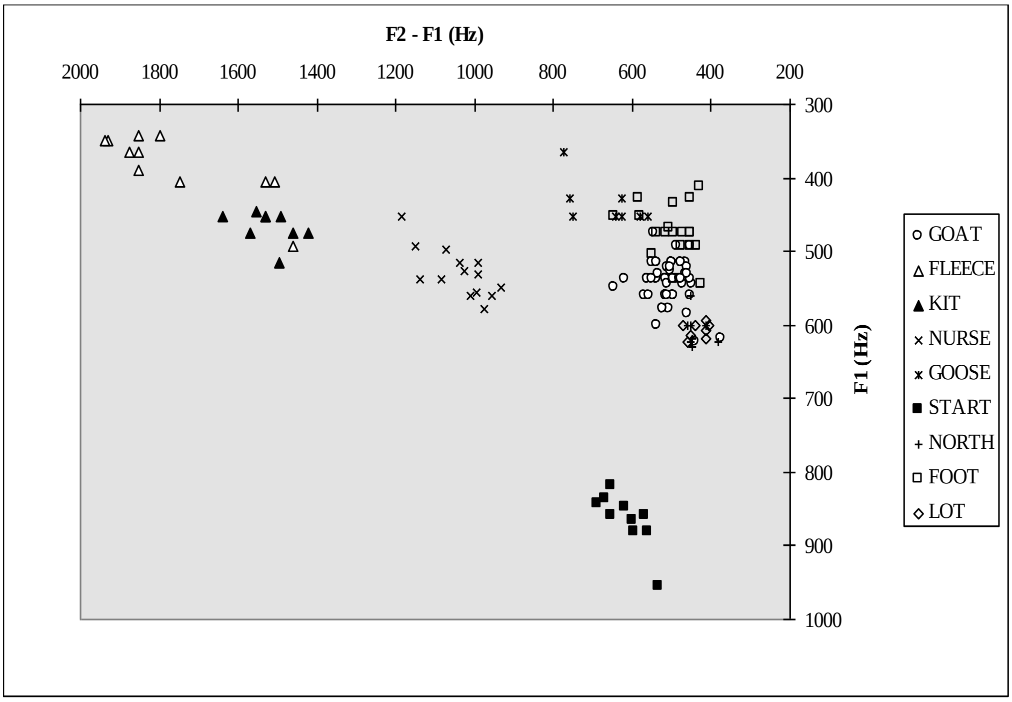
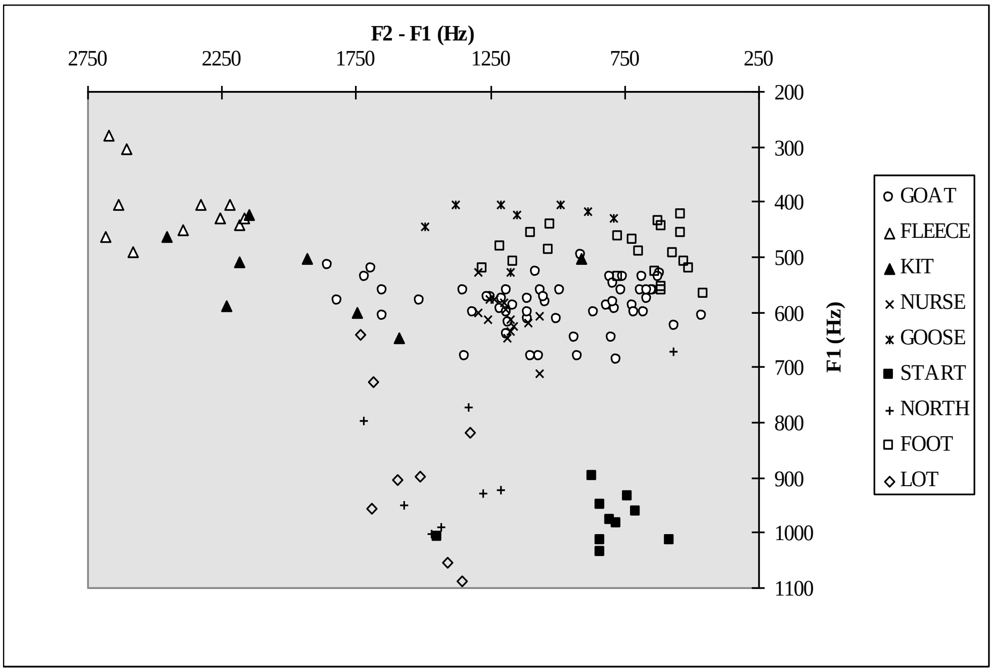


Figure 7. Vowel plot for Debbie, 27

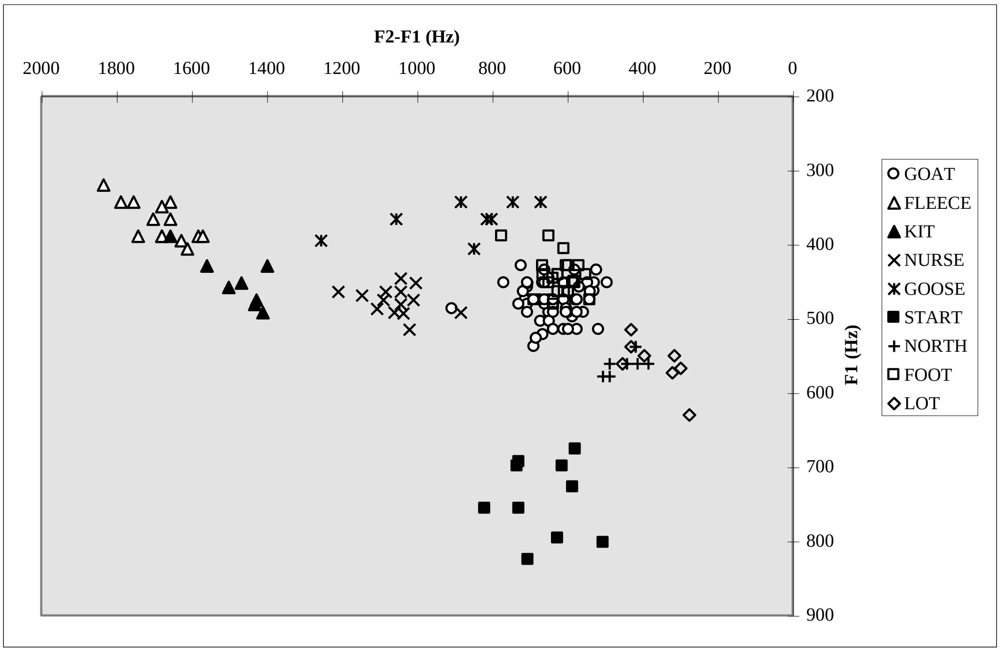


The forward scatter of all the back vowels in Debbie's sample is immediately noticeable in Figure 7. Tokens of LOT and NORTH are found in an area one might expect to find occupied by TRAP (or indeed START), while F_2 - F_1 values for GOOSE extend horizontally from around 800 to 1,500 Hz. FOOT tokens are similarly arrayed in an approximately straight line, starting near the back periphery of the vowel space and extending as far as the central NURSE region. The distribution of Debbie's GOAT tokens is most markedly different from the vowel's distribution in the plots presented so far, however: the central area is in fact 'overshot', with several GOAT tokens being located in an area bordering on the KIT region. This can be taken as evidence of the acoustic reality of GOAT fronting in BE, assuming that the formant measurements upon which Figure 7 is based are reliable, and that we are prepared to accept that formant plots realistically reflect the acoustic continua of speech production.

Figure 8, for 23-year-old Paul, is also suggestive of GOAT fronting, though the location of the cluster of GOAT tokens relative to neighbouring vowel categories resembles Irene's plot (Figure 5) more than it does Debbie's. FOOT overlaps GOAT to a considerable degree, and is similarly fronted, while the fronting of GOOSE is at least as marked as is the case for Debbie. Paul's GOAT region is less diffuse than Irene's or Debbie's, however, suggesting that if he is indeed fronting this vowel, he is doing it more slowly, more gradually, or more generally with respect to the lexicon, than are these other speakers.

We expected to find that of all the speakers in the sample, Marcelle (Figure 9) would exhibit the most GOAT fronting, since it is, at least in Hull, apparently a feature most typical of the speech of young women. By comparison with Debbie's plot, however, the evidence of fronting in Figure 9 is rather subtle. The fronting of GOOSE is if anything one of the more salient features to be noted in Marcelle's plot, though as Labov (1994: 208) suggests fronting of /o/ is always preceded by fronting of /u/ (see §5.1).

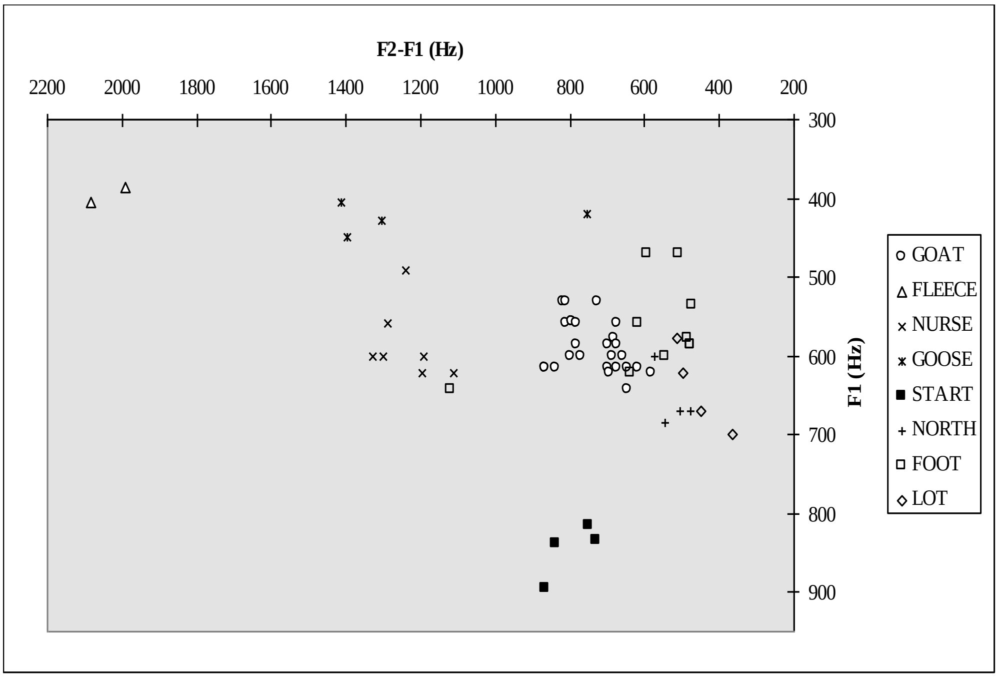
Figure 8. Vowel plot for Paul, 23



For Marcelle, GOAT does indeed seem to have fronted beyond the FOOT region, and assuming that NORTH and LOT remain peripheral, GOAT is already becoming fairly central. It is possible that Marcelle's NURSE is also fronting, which appears to be a relatively common process in the English of England (Lass 1989; Watt 1996, 1998b; Newbrook 1999; Williams & Kerswill 1999) and the Southern Hemisphere (e.g. Wells 1982; Lass 1990; Watson *et al.* 1998), but to ascertain this it is necessary to incorporate formant measurements for the front vowel series, a task which has yet to be carried out. While NURSE fronting (triggered perhaps by the incursion of GOAT's field of dispersion[13] into the central area) may indeed be taking place in Marcelle's system, the formant frequencies of the NURSE tokens cross-plotted in Figure 9 do not appear radically different from those for other female speakers, and more detailed analysis of this variable is required here in order to arrive at a clearer picture.

The figures shown in Table 2 provide a summary of a subset of the figures upon which the plots for the GOAT vowel in Figures 3 to 9 are based. Since we are interested in the fronting along the front-back axis (corresponding to an increase in the frequency of F_2, and hence an increase in the difference between F_2 and F_1), F_1 values are omitted from the table. Although the means for F_2 - F_1 are based on absolute frequency values and thus prevent individual speakers from being directly compared, the standard deviation given for each speaker allows an estimate of the degree of clustering or scatter along the front-back axis to be made, and so gives an idea of the stability - or otherwise - of the vowel target.

Figure 9. Vowel plot for Marcelle, 17



Looking first at the column containing the F_2 - F_1 means, we can see that there is little to distinguish between the male and female speakers on this parameter, in that the range for the older women Barbara and Doreen extends into that for Ray and Paul. As implied by the plots in Figures 3 to 9, the younger women Marcelle and Debbie have the highest average (F_2 - F_1) scores, and are followed by Irene. Debbie's mean (F_2 - F_1) is in fact nearly double those of Barbara and Doreen. It could be argued that for Debbie, the target of GOAT is now practically as far forward as that of her NURSE vowel ($\bar{X}$ (F_2 - F_1) = 1191.1 Hz; SD = 74.3).

[13] The area within an envelope circumscribing the scatter of tokens around a putative target or prototype. See Martinet (1952, 1955); King (1967).

Table 2. F_2 - F_1 means (Hz), standard deviations, and range, by speaker

Speaker	$\overline{X}$ (F_2 - F_1)	SD	range	N
Barbara	547.5	217.0	212 - 1347	37
Doreen	571.9	114.7	258 - 814	23
Irene	712.8	82.9	532 - 917	27
Debbie	1022.9	339.8	458 - 1857	57
Marcelle	815.5	348.1	582 - 868	26
Ray	505.5	44.5	373 - 647	57
Paul	623.0	71.9	528 - 716	59

Now compare the standard deviations and ranges for each speaker: it appears that the scatter of tokens around a putative GOAT target is greatest among the speakers for whom the fronting is most advanced: viz., Debbie and Marcelle. Irene's SD of 82.9 (11.6% of her $\overline{X}$ (F_2 - F_1) score) is surprisingly low, but inspection of Figure 5 reveals that the trend of the scatter of GOAT tokens perhaps follows the *y* axis more closely than it does the *x* axis: that is, in her productions of GOAT Irene varies more in F_1, corresponding to vowel height, than she does in F_2 ($\overline{X}$ F_1 = 520.9 Hz; SD = 34.0, or 6.5% of $\overline{X}$ F_1). For the male speakers Ray and Paul, the relatively compact clustering seen in Figures 6 and 8 is confirmed by their low standard deviations. Although their mean (F_2 - F_1) scores are on a par with those of Barbara and Doreen for this vowel, the spread around the mean for both speakers is considerably smaller for the men. This is true most particularly for Ray, whose GOAT distribution is perhaps the best evidence in the present sample of a well-defined vowel target of the sort we are looking for. Clustering of this sort might argue against spread of the fronting by lexical diffusion, in that for Ray there is little sign of certain words favouring a fronted vowel more than others; compare this with Debbie's *home*, *road*, *Wrose*, *sole*, *go*, and *moan*, all of which have $F_2 – F_1$ values that are well above average in both her readings of these words, possibly indicating that fronting is more frequent before nasals, voiced oral consonants and in open syllables, or in the environment of 'grave' consonants (labials and velars).[14] Such patterns, if they can be called that, may of course be purely coincidental: Debbie's first iteration of *phone* yielded an $F_2 – F_1$ 81.5% higher than her overall mean for GOAT, while the second was some 20.5% below it. An estimate of whether Debbie's preference for fronted vowels in the above words reflects a more general patterning is provided by an investigation of the possible correlation between lexical identity, phonological context, and degree of fronting, which is discussed briefly in the following section.

4.2 Effects of lexical identity and following context

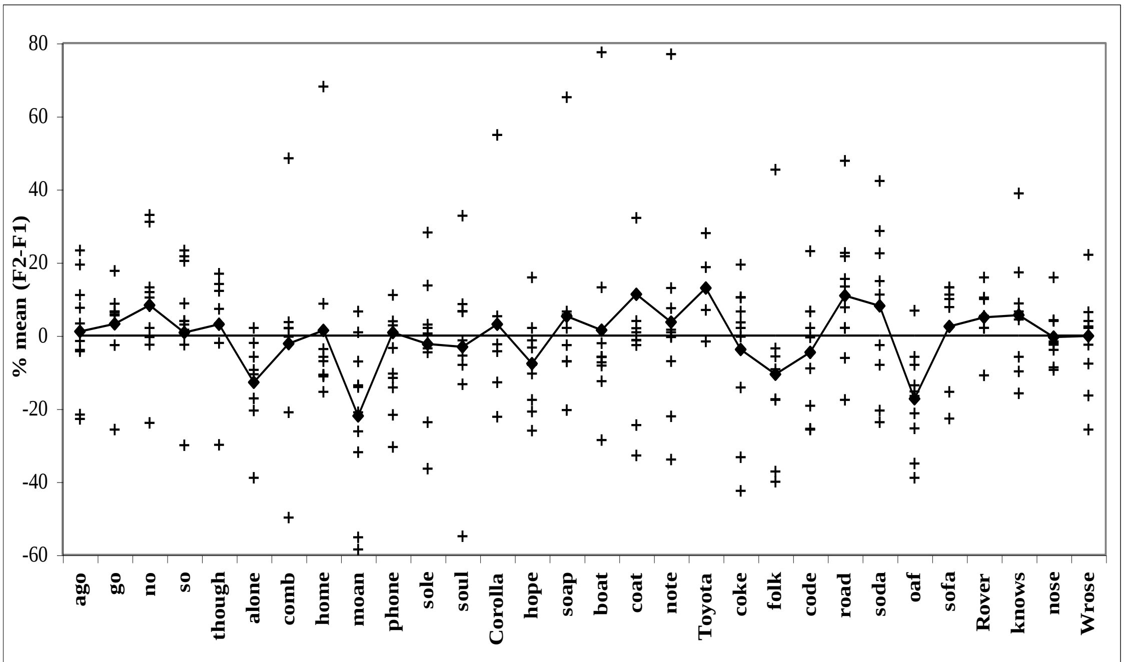
Space limitations preclude detailed exploration of this topic here, though the overall trends are summarised by Figure 10 and Table 3, below. All $F_2 – F_1$ scores collected from each speaker are plotted in Figure 10, expressed as percentages of that speaker's mean ($F_2 – F_1$) for his or her entire GOAT sample. In addition, aggregated

[14] Assuming that /r/ contains a labial component, which for BE seems reasonable.

means for each lexical item are derived by averaging these deviations across all seven speakers (thereby highlighting any tendency among the speakers as a whole to front the vowel of individual lexical items; this was designed to reveal speaker-independent lexical or phonological conditioning). Though somewhat crude, this method of normalising samples taken from male and female speech is adequate for our present purposes: points which fall below the zero line represent vowels which are acoustically 'backer' than average, while those above the line are located there by virtue of their relatively high F_2, or frontness.

Figure 10 reiterates the width of the range of $F_2 - F_1$ values across the speaker group, though trends within the scatter of points are not strikingly apparent. Contrary to Debbie's pattern of preference, there is some suggestion that fronting is *disfavoured* where GOAT precedes a nasal consonant (particularly before /n/ in *alone* and *moan*, and possibly also in *phone*, and before /m/ in *comb* and *home*); *oaf* seems to be produced with especially low F_2, while a good proportion of points for *coke* and *folk* fall below the mean. *Hope* and *boat* appear to pattern like *coke* and *folk* in this respect.

Figure 10. Deviations from aggregated mean (F_2 - F_1) for each of 30 GOAT items, all speakers (%). Aggregated means per lexical item indicated by filled diamonds joined by solid line; horizontal line indicates grand mean for entire GOAT sample.



Further tests for correlation (Spearman's rho) between fronting and lexical identity were carried out by comparisons of rankings (by their raw $F_2 - F_1$ values, rather than deviations from the mean) within the word list items for each speaker.[15] ρ values achieving significance at the $p \leq .05$ level were actually fairly infrequent, and ran somewhat counter to expectation. For instance, while Irene and Doreen tended to prefer fronter GOAT vowels in many of the same items (*soda*, *road*, *coke*, *Wrose*; ρ =

[15] Since certain word list items were absent from some speakers' samples, these tests were run on a subset of 19 GOAT words which were produced by all seven speakers (*ago, boat, coat, code, coke, go, knows, moan, no, nose, note, oaf, phone, road, so, soda, sole, soul, Wrose*).

0.586, $p \leq .05$), a stronger correlation was found between Irene's sample and Ray's first pass through the word list ($\rho = 0.63$, $p \leq .05$), and indeed, the latter was a good deal stronger than the match between Ray's first and second readings ($\rho = 0.442$, $p \leq .05$). Hence, we should be careful of overinterpreting these results, at least until a larger sample can be collected.

So as to investigate the possible contribution of phonological context, lexical items were grouped by (a) the manner and (b) the place of articulation of the following consonant, if any. Table 3 indicates the deviations from the grand mean ($F_2 – F_1$) for each of ten sound class types, pooled across the seven speakers (V# indicates GOAT in vowel-final syllables, e.g. *though*, *no*, *so*).

Table 3. Extent of fronting in various following phonological contexts (% deviation from grand mean (F_2 - F_1))

MANNER	% deviation	PLACE	% deviation
V#	3.3	V#	3.3
V+nasal	-7.0	V+labial/ labiodental	-1.9
V+lateral	-0.8	V+alveolar	0.8
V+voiceless stop	1.6	V+velar	-7.2
V+voiced stop	4.8		
V+voiceless fricative	-7.4		
V+voiced fricative	2.5		

The effect of a following nasal is, as expected, to suppress fronting (or at least to lower F_2; articulatory configuration is of course unknown). The hypothesised influence of 'grave' consonants is suggested by the low figure for following velars, though the deviation for the V+/l/ context (*sole*, *soul*, *Corolla*) is only very small, and that for following labials and labiodentals scarcely larger. Following voiceless fricatives appear to have the strongest inhibitory effect on fronting, though bear in mind that there are only two words in the list satisfying this condition (*oaf* and *sofa*), and that for nearly all speakers *oaf* has a considerably lower mean ($F_2 – F_1$) than does *sofa*; i.e., it is probably a lexical effect confined to the former word rather than a general contextual pattern. More sophisticated statistical analysis of the data may be of help here.

In summary, there are suggestions that fronting may affect some GOAT words before others, and that it is inhibited before certain types of consonant, particularly nasals. But there is nothing we could point to as 'allophony' in the conventional sense. We are thus dealing with a vowel whose exponents are fairly unconstrained with respect to lexical identity and following phonological context.

5. Discussion

This preliminary study has found, then, that there are some indications in the acoustic signal of the fronting of the target of GOAT in Bradford English. The fronting, which involves a shift away from the periphery of the vowel space toward a more central region, is most advanced among the three youngest speakers, Debbie, Marcelle and Paul. There is, moreover, some evidence of sporadic fronting among the older female speakers Irene, Doreen and Barbara, and in general the scatter of points representing GOAT tokens is rather diffuse for these speakers. Compare the figures for the female speakers with those for Ray and Paul: the clustering of GOAT tokens is significantly more compact in Figures 6 and 8 than in the other figures, suggesting the relative stability of the target of this vowel in Ray's and Paul's phonologies. In Paul's case, however, it may be speculated that if GOAT fronting is taking place, it is affecting his pronunciation of the relevant words in a more gradual and comprehensive manner than might be true for some of the female speakers. Fronting in Paul's sample is still apparently relatively subtle, and the tight clustering of his $F_2 - F_1$ values between about 500 and 750 Hz argues for a fronting 'en masse' rather than the more selective pattern we see, say, for Debbie.

The fronting of BE GOAT, which is both audibly salient and acoustically observable, is typical of changes which are presently taking place in varieties of English in the United Kingdom and indeed all over the world. The results reported above also fit fairly well with the observation that it is young women who tend to introduce innovations of this type. Such developments in the phonetics (and/or phonology) of spoken English naturally demand an explanation. As yet, however, we lack a detailed understanding of how sporadic variation is stratified into more stable patterns of linguistic behaviour, and, equally, how stratification is *preserved* (i.e., how innovations adopted by certain social groups are resisted by others). The extent to which variation and change can be ascribed to forces working independently of speakers within the phonology itself ('internal' factors) - as opposed to changes brought about by socially-motivated processes ('external' factors) - is an area in which it is notoriously difficult to arrive at firm conclusions (see Milroy 1992 for an outline of the major problems). Labov's recent work embodies the most widely-known current models of the dynamics of vowel systems as they intersect with socially-conditioned variation, and in the following section we assess the provision made for the fronting of back vowels as formulated by Labov (1991) and revisited in Labov (1994).

5.1 Labov's Third Principle

The fronting of back vowels in English - particularly GOOSE (e.g. Torgersen 1997) and GOAT (Eustace 1970; Luthin 1987; Eckert 1997), but also FOOT and STRUT (Bauer 1985; Henton 1983) - is commonly reported in the literature. Such a process is not confined to English, of course: Lass (1989), for instance, presents a wide range of evidence in support of an argument that West Germanic languages are typologically disposed toward front rounded vowels, and that varieties of English lacking front rounded vowels will tend to shift back vowels forward by way of compensating for this lack.[16] Thus, we ought to find that fronting of (at least) /u/, /o/, /ʊ/ and /ʌ/ is a widespread feature of varieties of English undergoing sound change; Watt (1998b) analyses NURSE fronting in Newcastle English in these terms, since NURSE is reported to have merged with the THOUGHT~NORTH~FORCE set at [ɔː] but has evidently subsequently split from it again.

Labov (1991: 35) accounts for fronting of back vowels by means of an ostensibly language-universal principle he states simply as 'back vowels move to the

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[16] We note that the fronting in 14th-century Northern Middle English of /oː/ to [øː] (>[iː], [ɪə] in *boot*, etc.; see Lass 1987: 226-227) is a generally accepted reconstruction of a sound change which fed into the Great Vowel Shift. In a sense the fronting described here is merely a recapitulation of an earlier development.

front' (Principle III; see also Labov 1994: 116). This principle might account straightforwardly, if tritely, for the fronting of GOAT in BE, were it not for the condition Labov places on its operation: that GOAT - Labov's /ow/ - be participating in a chain shift involving some or all of the monophthongs in the system at the time. We have no evidence that chain shift, a process which usually involves raising and breaking of vowels along the periphery of the vowel triangle, is taking place in BE, nor is it clear why GOAT should have to front in tandem with GOOSE, as Labov demands: 'When /ow/ is fronted, it is always in parallel with /uw/ [i.e. GOOSE] and considerably behind it' (1994: 208). There are certainly signs of GOOSE fronting among the younger BE speakers sampled here, as we saw in §4, but as Labov points out, 'The fronting of back vowels that is associated with chain shifting takes place either on the upper peripheral track, like /u/, or on the lower peripheral track, like /o/' (1994: 208).[17] In this schema, GOAT would have to raise or lower to a peripheral position before fronting, and would either have to follow along behind GOOSE on a path toward the close front area, or drop to front along the [a]~[ɑ] continuum.

Neither of these options is obviously applicable to BE GOAT fronting. Labov does, however, allow for a reasonable degree of flexibility in the interpretation of formant plots in terms of their relation to the two-track model (see for example the discussion of the vowel systems of two speakers of Texas and London English in Labov 1994: 169-177). It might be possible, then - if intuitively less than completely plausible - to view our BE findings as another example of the dependency of GOAT fronting upon GOOSE fronting. But we feel that more compelling evidence of such coordination would be required if an attempt to fit the Bradford data into the chain shift model were to be worthwhile. For the present, then, we are satisfied that if GOAT fronting is taking place in BE, it has so far had little, if any, effect upon the vowel system as a whole, and that it is probably too early to say whether the fronting is part of a shift of the sort Labov describes.

5.2 Alternative internal explanations

We may attempt to account for the fronting in functional terms, on the other hand. It might be that overcrowding in the back mid area of the vowel space (as suggested by Figures 3 through 9) is enough to precipitate a fronting of one or more vowels so as to 'free up space'. This option would act as a sort of escape valve forestalling the potential merger of neighbouring vowel categories. Argumentation in defence of such a view can be found in Samuels (1972), who follows Martinet (1952) in portraying the overcrowding as a consequence of the interaction of two antagonistic factors: (a) the intrinsic asymmetry of the articulatory space in the supraglottal tract, and (b) the phonological drive for symmetry (by which the system attempts wherever possible to match front vowels with back vowels at equivalent heights, and vice versa). A symmetrical monophthong system would indicate that at some stage (b) had won out and that equilibrium had been achieved, while a system in which symmetry was disrupted by the fronting of one or more back vowels could be accounted for by a

[17] Labov's /u/ is equivalent to the close nucleus of BE GOOSE and FOOT(~STRUT), while /o/ represents the mid nucleus of GOAT and THOUGHT~NORTH~FORCE. For Labov, the pairs /u/~/ʊ/ and /o/~/ɔ/(~/ɒ/) are distinguished by laxness and tenseness, rather than by quality, and often behave in coordination when participating in chain shifts. The 'tracks' Labov refers to are two lanes running parallel with one another around the periphery of the vowel triangle. A vowel whose target is shifting may sidestep another by switching tracks, thereby avoiding merger (Labov 1994: 177).

temporary strengthening in the effects of (a) on the system's self-organising capacities. According to this view, that part of the phonology responsible for the configuration of elements in the system is in constant conflict with the inadequacies of the human vocal apparatus for articulating the exponents of those elements. Thus, systemic equilibrium is constantly punctured because of the unsuitability of the mechanism by which the system is expressed. But how, or why, one pressure would begin to take precedence over the other at any particular point in time remains unexplained.

As a way of bridging the gap between the level of abstraction at which Martinet and Samuels are operating and a more concrete level of analysis, we might bring perceptual factors into the picture here. Consider, for example, the claims made by Lindblom (1986):

> ... for a vowel pair with a small spectral distance, the predicted perceptual dissimilarity must be made dependent on whether the vowels are front or back. For instance, although [yː] and [øː] may have a spectral distance similar to that for [uː] and [oː], the front pair is heard as more dissimilar. It is as if listeners make their space more spacious at the point where universal perceptual space seems most crowded (Lindblom 1986: 38).

Moreover, argues Lindblom, vocalic articulations made toward the front of the vowel space are better suited to the morphology of the oral tract and the neural structures controlling the movements of the articulators. He cites three sets of matching 'facts':

> (i) that articulators have greater mobility at the front of the mouth (e.g. lips, tongue tip), (ii) that there is a richer supply of structures for sensory control at anterior vocal tract locations, (iii) that acoustic-perceptual effects are greater at the front than at the back. [...] Does [the asymmetry of vocal tract sensori-motor representation] contribute to the primacy of height (sonority or F_1) over front-back (chromaticity or F_2) distinctions and the favouring of contrasts produced in anterior articulatory regions that have expanded sensory representations? (Lindblom 1986: 39).

Of course, it then becomes necessary to explain why, if anterior articulations for vowels (and presumably also consonants) are optimal, languages retain any back vowels at all, and why fronting of back vowels is something that appears to lie dormant but is periodically triggered in languages or language varieties in which contrasting back vowels have hitherto been preserved. These questions are clearly beyond the scope of the present paper, but relevant issues are explored more fully in, for example, Liljencrants & Lindblom (1972), Crothers (1978), Lindau (1978), Disner (1980), Lindblom *et al*. (1984), Schwartz *et al.* (1997a,b), or Vallée *et al*. (1999).

Another possible source of the fronting is the assimilation of back vowels to adjacent coronal consonants, which would be anticipated by models of speech production allowing for overlap of tongue articulations (or gestures) in CV/VC sequences (e.g. Öhman 1965; Browman & Goldstein 1990). The fronting of [o] in the environment of consonants involving an anterior tongue-body position as a consequence of purely mechanical factors might then become generalised to this vowel in all contexts, at which point the coarticulatory origin of the change would be obscured. However, the matter of how this reallocation of phonetic space might be negotiated between speakers is a question internal explanations are not equipped to answer. We must look instead at the role of ‘external’ factors in the transmission of innovations across the speech community.

5.3 External explanations

To label the adoption of a fronted variant of GOAT as the outcome of the operation of various external, social forces seems easier than attempting to posit physiological or perceptual motivations for it. Inevitably, though, the question of the origin of the change must come back to the ‘initiation problem’ implied by the discussion in the previous section (for an explanation of this term and its ramifications see Weinreich *et al*. 1968). That is, it is a simple matter to account for the spread of GOAT fronting in BE, and in the wider context, by saying that the BE speakers sampled here borrowed or acquired the feature from other BE speakers, or speakers of a neighbouring variety. But this obviously still does not explain where, how or why GOAT fronting arose in the first place.

On this topic we can offer only speculative remarks. That BE speakers should seek to modify their GOAT pronunciations in line with an RP-type [əʊ] closing diphthong at this stage strikes us as unlikely, given the continuing general antipathy toward southern English accents in northern English cities like Bradford,[18] and the absence of obvious signs of convergence among other phonological variables on an RP-like pattern (or, perhaps more plausibly, an ‘Estuary English’ pattern). In any case, is the phonetic similarity between [ɵː] and [əʊ] really any closer than that between [oː] and [əʊ]? Recall from §2.3 Petyt’s assertion that [oː] was becoming more frequent than the traditional BE [ɔʊ] as a consequence of the influence of RP; if we understand this correctly, Petyt is claiming that the monophthong [oː] more strongly resembles the RP closing diphthong [əʊ] than does the closing diphthong [ɔʊ]. All else being equal, one might expect the adoption of [oː] among urban West Yorkshire English speakers to be an indication of a shift *away* from RP, rather than one towards it. But until fairly recently it seems to have been universally assumed among European linguists that convergence on RP was more or less assured for all non-standard accents of British English (for discussion see Lass 1976; Milroy 1992), and thus we should not be surprised that Petyt sought to explain in these terms his observed prevalence of [oː] over [ɔʊ].

At this point we might ask why we feel *any* obligation to try to divine the origin of GOAT fronting. Spontaneous sound changes lacking any obvious direct cause are, after all, are the stock-in-trade of historical phonologists, and much of the time no effort is made by researchers in that field to provide externally-grounded explanations for the systemic reconfigurations they describe. Umlaut processes in Germanic languages, for instance, are generally accepted at face value as developments which ‘just happened’, and continue to happen, since umlaut is still productive in various

[18] Kerswill & Williams comment in a recent conference abstract (MethodsX, Memorial University of Newfoundland, St. Johns, August 2-6 1999), ‘In the north, southern influences on vowels are not detectable’, and further, ‘… adoption [of southern non-RP consonants] in the North can… be ascribed to their lack of regional associations. This is not true of the vowels, which have strong regional and social-class associations’.

Germanic languages and dialects (see e.g. Wetzels 1981; Lass 1984, 1989, 1997). In this connection, Trudgill (1999) invokes a notion of 'drift' (akin to that of Sapir) as an explanation for similarities between geographically separated varieties which are not due to any direct connection or contact, but to the fact that the varieties are derived from mixtures of similar dialects in similar proportions. 'Varieties may resemble one another,' he argues, 'because, having derived from a common source, they continue to evolve linguistically in similar directions as a result of linguistic change even after separation.' Nonetheless, the freedom to attribute changes to the vagaries of historical accident or to genetic type is a luxury sometimes more grudgingly afforded to those working on variation and change in contemporary language varieties, since, unlike historical phonologists describing completed sound changes, they do not have the benefit of hindsight.

Lacking a satisfactory internal account, however, we must for the present assume that BE speakers who are exposed to fronted GOAT pronunciations either accept or reject the adoption of such forms into their own linguistic repertoire on the basis of their perceived attractiveness, correctness or appropriateness. This is naturally presumed to take place at a subconscious level, though it is easy enough to elicit attitudinal responses from the speakers themselves. Informal literature such as dialect dictionaries and newspaper columns are often a useful source of information about the extent to which sound changes have reached the level of conscious awareness among the general public; the implication for sociophonologists in these cases is that these forms have been established in the variety in question for some time, and have become relatively deeply entrenched. Thus far, we have been unable to locate any references in the popular press, direct or indirect, to GOAT fronting in Bradford or West Yorkshire English, but there are numerous examples to be found in popular literature elsewhere in Yorkshire and the north of England. Pronunciations such as *Kirka Curler* ('Coca Cola'), *there's ner snur on the rurd* ('there's no snow on the road') and *serp on a rerp* ('soap on a rope') are reported to be extant in Hull (Hull Daily Mail, 16th March 1999),[19] while in the Teesside city of Middlesbrough, *bloke* is now said to be pronounced '*blerke* rather than *blowke*' (Middlesbrough Evening Gazette, 23rd April 1999).[20] GOAT fronting seems better established in Newcastle upon Tyne than is the case on Teesside, as spellings such as *a lurd of blurks* (Viz, issue 88) are extremely common in newspaper features and dialect dictionaries published on Tyneside (Beal 1998); Harry Enfield, the television comedian, exploits Tyneside GOAT~NURSE homophony in a sketch about Newcastle office workers going outside for a 'smirk' (*Harry Enfield and Chums*, BBC1, 2.9.99). Clearly, then, we are not dealing with a variant so subtly different from traditional pronunciations that it is unnoticeable to the speakers who use it or may potentially acquire it. If GOAT fronting on Humberside, Tyneside - and now perhaps also Teesside - has reached a level of general recognition to the extent that it can form the basis of newspaper articles and comedy sketches, we might also expect the stereotype to surface occasionally in connection with BE. To date, however, our enquiries to West Yorkshire English speakers about the use of such pronunciations in Bradford and Leeds have resulted in

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[19] We are grateful to Ann Williams for bringing this to our attention.

[20] Thanks to Carmen Llamas, who as a native of Middlesbrough states that she had never encountered this form in Teesside English until the article was published. See Llamas (1998) for discussion of Teesside GOAT.

responses stating quite categorically that [snɵː], [bɵːt] and [blɵːk] are East Yorkshire pronunciations that people in West Yorkshire would never use.

We can be fairly certain, then, that GOAT fronting is a genuinely innovative feature in BE, and that, being already well established in some urban centres, it is becoming typical of an area stretching from Yorkshire almost to the Scottish border.

6. Conclusion

Acoustic analysis of 337 tokens of the GOAT vowel in Bradford English indicates that the target of this vowel is fronting from a peripheral to a central area of the vowel space in the speech of some younger BE speakers. The fronting process seems most advanced among the young women recorded for this project, and is hence in all likelihood marked for age and gender in BE. This hypothesis awaits testing.

As yet the status and perception of the fronted GOAT variant [ɵː] in BE is rather unclear, and a more substantial body of data must be collected in order to assess its distribution within the BE-speaking population. It will be important to record a range of speech styles, since word list readings are arguably less naturally produced than spontaneous conversational speech, and a sample of subjects balanced for age, sex, and demographic background should ensure a more representative impression of BE as it is currently spoken. Comparisons with neighbouring varieties will also be of great value. A similar study using instrumental analysis is planned for the Hull corpus (Ann Williams, p.c.), while information on the acoustic characteristics of GOAT in Leeds English is presently being collected by Khattab (see Khattab (this volume), where [əː] is recorded as a sporadic variant of GOAT in the speech of two Arabic-English bilingual boys living in Leeds. We also await details of GOAT fronting in the cities of Doncaster and York.[21] Once these results are collated, we may start to piece together a picture of a sound change which appears to be spreading across northern England rather rapidly.

We hypothesise, in the meantime, that the use of GOAT fronting in BE symbolises the identity of BE speakers with speakers from other areas of northern England in which such pronunciations are established, and that this identity is facilitated by a high level of contact between inhabitants of urban areas in the region. The origin of the fronting process may indeed be the result of one (or more) of the internal factors discussed in §5.2, but in a sense this is unimportant, given that innovations arising from internal pressures cannot be thought of as changes *per se* unless they are adopted by a community of speakers. Of more significance are the factors conditioning the path taken by the change as it diffuses between communities, and the purposes for which speakers may use the new form in opposition to the old one(s). As yet we have only a sketchy idea of what these factors and purposes might be, but uncertainty is an inevitable feature where incipient sound change is first detected.

[21] Sali Tagliamonte (p.c.) confirms that GOAT fronting is a feature of York English which is used extensively by her children, but that it is strongly marked for gender (her 5-year-old son using it more than her older daughters) and that it is commonest in the items *know* and *no*. She suggests, further, that it has an interactive function, indicating that [ɵː] may be pragmatically as well as socially significant to young York speakers.

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Appendix: word list

Please say your first name and count from 1 to 10

be	*beam*	*keys*	*keep*	*bid*
kit	*nip*	*kiss*	*oaf*	*soul*
sole	*bay*	*name*	*daze*	*cake*
bed	*pet*	*cap*	*back*	*bomb*
pot	*cop*	*boss*	*go*	*so*
no	*though*	*bar*	*farm*	*cart*
calf	*banana*	*bore*	*soda*	*sofa*
road	*caught*	*pause*	*force*	*good*
put	*book*	*look*	*bud*	*code*
home	*comb*	*coat*	*cut*	*pup*
bus	*fur*	*bird*	*firm*	*turn*
note	*boat*	*nose*	*knows*	*shirk*
pearl	*skirt*	*buy*	*pies*	*pipe*
five	*alive*	*bough*	*lout*	*cows*
mouse	*about*	*boy*	*toyed*	*noise*
annoy	*Wrose*	*phone*	*moan*	*alone*
beer	*feared*	*feel*	*bear*	*cared*
fairs	*aware*	*booed*	*boom*	*coop*
goose	*soap*	*hope*	*folk*	*coke*
cure	*endured*	*poor*	*jury*	*ago*

Toyota Corolla	*Bradford City Football Club*
Rover Metro	*Bradford City Council*
Fiat Punto	*down at the Bradford Arms*
Fiat Uno	*from Bradford Interchange*