NOW AND THEN: THE EVOLUTION OF MALE-FEMALE DIFFERENCES IN THE VOICING OF CONSONANTS IN TWO VARIETIES OF FRENCH

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Abstract

The focus of this paper is on changing patterns of voicing in the phonologically voiced stops of Metropolitan French. Devoicing of voiced stops is a well-known feature of certain Oïl dialects and varieties of French, notably those where there is contact with Germanic languages, but there are many interacting factors which can cause devoicing. Following a review of some of these factors, data are presented in turn from the *Atlas linguistique de la France* and from a study of contemporary speakers from Lille and Bordeaux, which confirm the expectation drawn from previous research that there have been marked changes in patterns of voicing in (at least middle-class) Lille French, a variety where devoicing in final position was a prominent local feature. The findings are discussed in the light of the complex of factors which can cause devoicing, and in relation to the distinction made by Watt and Milroy (1999) and others between supra-local dialect levelling and supra-regional standardisation.

1.0 Introduction

Phonologically voiced stops in French are canonically produced with vocal-fold vibration (voicing) throughout the closure period, through the release and into the vowel; voiceless stops, by contrast, have no voicing during closure and short periods of aspiration following the release (Voice Onset Time, or VOT).[1] However, it is well known that patterns of voicing vary both within and across languages (see, for example Docherty, 1992, and other studies reviewed in Temple, 1998). The focus of this paper is on the variable devoicing of phonologically voiced stops in French; I use the term "devoicing" here in its broadest possible sense, that is the absence or cessation of vocal-fold vibration during the closure phase of the stop, which may be accompanied by a positive VOT after the release. After an examination of the potential causes of variable devoicing, some results are presented from a quantitative analysis of data from the *Atlas linguistique de la France* which are consistent with there being sociolinguistically motivated patterning in the variability. This is then compared with the patterning found in a more recent set of French data, and the findings are considered in the light of recent suggestions in the variationist literature about the different ways in which varieties of a language might influence each other.

2.0 Variability in voicing patterns

2.1 Causes of variable voicing

There are two possible types of explanation for this variability in the production of voicing. The first is that the cessation of voicing may be the result of aerodynamic constraints. In order for voicing to be sustained, there must be a flow of air through the glottis, which in turn means that the pressure below the glottis must be

[1] Space precludes an acknowledgement of all those who have helped me with the work from which this paper is derived. They are listed in Temple (1998). However, a special mention must be made of my gratitude to my colleagues Sali Tagliamonte, John Local and Anthony Warner, for their helpful advice and comments, to Mair Parry for generously allowing me access to her copy of the *Atlas linguistique de la France*, and to Martin Cottam who drew blueprints for the maps in Figure 1.

higher than the pressure above the glottis. However, the articulation of stop consonants necessitates a build-up of supra-glottal pressure behind the occlusion, with the result that, all other things being equal, the differential between sub- and supra-glottal pressure will rapidly equalise, leading to the cessation of voicing. It should be noted that aerodynamic conditions in stop production will be affected in complex ways by the linguistic context in which the consonant is produced. Some of these effects will enter into the discussion below, but for a detailed discussion of the interaction between linguistic and extra-linguistic effects, see Temple (1998).

The second possible explanation for devoicing relates to speaker choice, which can be either active or passive. Speakers have at their disposal mechanisms to delay the equalisation of sub- and supra-glottal pressure, for example by expansion of the vocal tract through lowering the larynx, or by lowering the velum to allow air to escape through the nose (e.g. Rothenburg, 1968; Westbury, 1983). They can therefore make a negative choice not to implement such devoicing-avoidance mechanisms, but they can also actively cause devoicing, for example by increasing airflow (and thus the rate at which the supra-glottal pressure builds up) or by increasing the tension of the walls of the vocal tract (e.g. Keating, 1984).

2.2 Variable voicing and speaker sex

There is cross-linguistic evidence to suggest that female speakers tend to devoice phonologically voiced stops more frequently than male speakers. For example Corneau (1999) reports some female speakers of Belgian French as producing seventy to eighty per cent of phonologically voiced stops with some devoicing, whereas devoicing only occurred in around thirty per cent of the stops produced by her male subjects. Arvaniti's impressionistic observations of data recorded from young Greek speakers was that, "my younger male speakers had more voicing on the whole than the female ones" (pers. comm.). Carminati (1984) found a similar effect for Italian word-medial stops. Her database was small, but her finding that twenty-seven of the thirty-one devoiced tokens she identified were produced by her two female speakers (56% of the female tokens), and only four of them by her three male speakers (c.5% of the male tokens) is nonetheless striking. Carminati's explanation for this difference is purely aerodynamic: since female speakers have smaller vocal tracts than males, then *ceteris paribus* supra-glottal pressure during stop closure will build up more rapidly in female speakers and cessation of voicing is thus more likely to occur. This explanation is consistent with the linguistic effects she found: rates of devoicing were greater the smaller the cavity behind the point of occlusion, thus there was more devoicing of /g/ than /d/, and of /d/ than /b/; and rates of devoicing were greater in geminates, where there is more time for pressure to build up to the critical point, than in non-geminates. If this hypothesis is valid, then where differences are found between male and female rates of devoicing, they should be greater, and more likely to be significant for /d/ and /g/ than for /b/.

There is evidence to suggest, however, that the aerodynamic explanation alone is not sufficient to explain male-female differences, and that therefore some element of speaker control is being exercised. The magnitude of the differences between groups of male and female speakers varies considerably: the findings of Corneau and Carminati are in stark contrast to those of Temple (1988), which found only marginal differences between young Parisian male and female speakers. Moreover, male-female differences have been found in French children, for example by Goudailler (1985) , who identified consistently higher rates of devoicing of word-initial stops by girls than by boys. Since Goudailler's subjects (who were aged between six and ten) had not yet

reached puberty, the differences in volume between their vocal tracts would have been minimal, and thus the only explanation for the girls' higher devoicing rates must be that the boys and girls were in some sense choosing to produce different voicing patterns, in other words that this represents learned behaviour.

2.3 Devoicing as a sociolinguistic phenomenon

If variable devoicing can be the result of learned behaviour, one might expect to find evidence of its variation correlating with sociolinguistic variables which are not explicable in terms of aerodynamics and speaker physiology. One source of such evidence again comes from Goudailler (e.g. 1985), who identified a regional effect whereby his child subjects from Lille consistently devoiced more frequently than those from Nice. He ascribes this to global differences between the phonetic realisation of the voicing contrast in northern and southern France. His claim is that whereas southern speakers rely on the presence versus absence of voicing during stop closure to cue the phonological distinction, the northern speakers have at their disposal "force articulatoire" as a cue. This would be manifested in differences in positive VOT between the "voiced" and "voiceless" stops, much as VOT is one of the major cues to the voicing contrast in English. However, even if there exists a global north-south difference in that northern French speakers have this extra cue at their disposal, the evidence from dialectological studies is that devoicing is not equally common across the different Oïl regions: it is most commonly recorded, both word-initially and word-finally, in east and northeastern France.

Variable devoicing has also been found to correlate with non-geographic sociolinguistic variables. Thus Pooley (1994, 1996) examined word-final devoicing in a corpus collected in Roubaix, not far from Lille, and found not only male-female differences, but also that rates of devoicing were higher in older speakers than in younger speakers, and higher in those not educated beyond the age of sixteen, than in speakers educated beyond that level. His conclusion from examining the interactions between these sociolinguistic variables was that word-final devoicing is a stigmatised feature of Roubaix speech which is particularly associated with older, less-educated, working-class female speakers.

3. Variability in stop consonant voicing at the beginning of the twentieth century

3.1 The *Atlas linguistique de la France*

The *Atlas linguistique de la France* (*ALF*; Gilliéron and Edmont 1902-10) provides a remarkably fruitful data source for examining variability in the patterning of the realisation of the voicing contrast at the turn of the twentieth century. The *ALF* contains data elicited by means of an orally administered questionnaire from informants at 639 locations across France and neighbouring Gallo-Romance speaking areas. At many locations more than one informant was questioned and fifteen per cent of informants were female (94/658). The transcription system devised by Gilliéron allowed for the recording of three degrees of voicing of consonants; for example, *b* represents a voiced bilabial stop, *p* a voiceless bilabial stop and the combined symbol *b̥* a sound which is "intermédiare[..] entre les deux sons marqués" (*ALF, Notice servant à l'intelligence des cartes: 19*), that is a partially voiced bilabial stop. While one might reasonably expect a degree of inconsistency in the transcriptions given the temporal and spatial distance between the interviews (which took from 1897 to 1901 to complete), every effort was made to avoid distortion of any kind and it is frequently

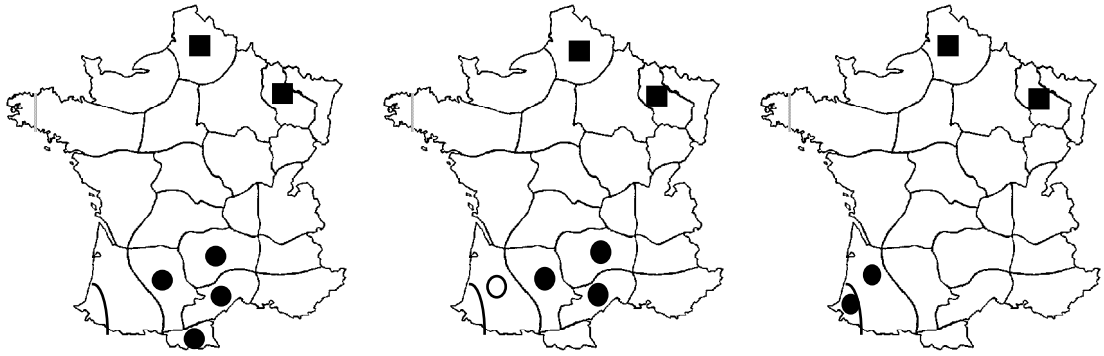
acknowledged that there is in fact a remarkable degree of consistency in the data. For a more detailed discussion of the methodology of the *ALF*, see Temple (2000).

3.2 Variable voicing in the *ALF*

The data reported here were extracted from all the *ALF* maps whose headwords contained phonologically voiced stops in "standard" French, and relate only to France itself. A data file was created where each token was coded as fully voiced, partially voiced or fully voiceless. In addition each token was coded with details of the informant's location, sex, age and occupation, and with details of the linguistic context, for example, the preceding and following segments, the position in the syllable and whether it appeared in an isolated word or in a short phrase. The locations of the informants were recorded in four ways: the precise location as identified by the location number on the maps, the *département*, the region (following the division into regions given in Straka 1973:11) and the area (*domaine d'Oïl* (northern France), *domaine d'Oc* (southern France) or *Franco-provençal* (central eastern France). The data were then imported into the Goldvarb multivariate analysis program (Rand and Sankoff 1990) for quantitative analysis. A detailed presentation of the results of that analysis can be found in Temple (2000); the present discussion will concentrate on a subset of the results relating to the informant-related variables, regional location and sex. Because the Goldvarb program allows only binomial analyses of the data, the partially voiced and fully voiceless tokens were treated together as being devoiced.[2]

Variability in the voicing of (b), (d) and (g) was only found when they occurred in the word-final coda of the headword, that is post-tonically, or where they were affected by assimilation to a following voiceless obstruent (in *absinthe*, *médecin*, *médecine*). Post-tonic stops occurred singly, as in *malade* or *langue*, and in word-final clusters, as in *chambre* or *coudre*. All words containing (b), (d) or (g) in these positions were found to have variable voicing of the stop in question, whereas all phonologically voiced stops in initial and other medial positions were consistently transcribed in the atlas as being fully voiced. Full lists of the words are given in the Appendix as Table A.1. Assimilatory cases are not considered in the discussion which follows. Again, details regarding the data not considered here can be found in Temple (2000). It should be noted that there were only two lexemes containing post-tonic (g), *langue* and *ongle*, and that their geographical distribution was sometimes uneven, so the findings relating to (g) have to be interpreted with caution.

[2] The terms "devoiced" and "devoicing" are used for convenience in this section (the alternatives all being somewhat clumsy), and are not intended to imply that a phonological process is necessarily taking place.



/b/ **/d/** **/g/**

Figure 1. Oïl (n) and Oc (l) regions with more than 30% of non-assimilatory tokens in variable lexemes fully or partially unvoiced.

As shown in Figure 1, there are clear regional patterns in the data, and there are regions both in the Oc and Oïl areas with significant proportions of devoiced tokens, which seems to run counter to Goudailler's claim of a north-south split in patterns of realisation of phonologically voiced stops. What is less clear from Figure 1 is that devoicing is much more geographically restricted in the Oc area than in northern France, where there is some devoicing in all regions, at least for (d), although rates are low (generally well below 10%) except in the northeastern Nord-Pas-de-Calais and Vosges/Lorraine-romane regions, which stand out, unsurprisingly, as having much more devoicing than any other region. In Oc, devoicing is concentrated in the central southwestern regions around the Languedoc, with some devoicing of (d) in Gascony, and fairly high rates there and in the Pays-Basque for (g), although since only one of the two lexemes was variable in the Oc area numbers of tokens are small in the latter case.

OÏL		**OC**	
CORRECTED MEAN	*.865*	CORRECTED MEAN	*.899*
Phoneme		**Phoneme**	
/b/	**.654**	/b/	**.743**
/d/	**.381**	/d/	**.296**
RANGE	.27	RANGE	.45
Sex		**Sex**	
female	**.425**	female	[.410]
male	**.516**	male	[.509]
RANGE	.09		
Region		**Region**	
Haute-Bretagne/Mayenne	**.560**	Limousin/Auvergne	
Normandie		Bordeaux/Gascogne/Béarn	
Ile-de-Fr/Orléans		Pays-Basque	
Nord-Pas-de-Calais	**.298**	Languedoc-ouest	[.535]
Champagne/Ardennes	**.852**	Nord/Centre-occitan	[.506]
Vosges/Lorraine	**.177**	Languedoc-est	[.392]

Charente/Vendée Centre Bourgogne Franche-Comté		Catalogne Provence-maritime Provence-alpine	
RANGE	.67		
TOTAL N	*2556*		*773*

Table 1. Separate variable rule runs comparing effects of phoneme, informant sex and region in Oïl and Oc areas respectively, on voicing in non-assimilatory /b/ and /d/. Square brackets indicate factor groups not selected as significant. Application = full voicing.

Table 1 shows the results of two separate multivariate analyses of a subset of the data using the Goldvarb package. The package enables the comparison of the relative effects of different independent variables which may be influencing patterns of variability in the dependent variable, which in this case is stop-consonant voicing. The variables tested in these analyses were place of articulation (bilabial versus dental), sex of informant (in cases where it was possible to be sure of this) and region. (g) was excluded from the analysis because of the relatively small number of tokens involved and their restricted distribution. In order to make the comparison across place of articulation it was only possible to include in this analysis data from regions with variable voicing of both (b) and (d); therefore the absence of a numerical score in the right hand column does not necessarily mean that there was no variable voicing at all in the region concerned. The full list of regions for each area is given here for reference. The total numbers of tokens analysed for (b) and (d) for Figure 1 were 1078 and 3664 respectively.

The figures to the right of each column in Table 1 are factor weightings for each variable group of factors. The application value is full voicing, which means that the closer a given factor weighting is to 1, the greater that factor favours full voicing. Thus, in both the Oïl and Oc areas, full voicing is favoured more in (b) than in (d), which is consistent with the aerodynamic explanation for devoicing put forward in Section 2 above. Square brackets round the factor weightings indicate that the independent variable does not play a statistically significant role in accounting for the patterns of variability in the dependent variable. Hence, although the cluster of Oc regions with variable voicing patterns are clearly significantly different from those where there is no devoicing, there is no significantly different effect between these regions in this subset of the data. By contrast, region is significant for the Oïl area: although devoicing in both (b) and (d) occurs in four of these regions, it is much more likely in Nord-Pas-de-Calais and Vosges-Lorraine, confirming the distributional data represented in Figure 1. With regard to the sex of the informants, the direction of the effect is the same in both cases, with females slightly favouring devoicing, but it is not a significant effect in Oc, and the fact that the range (the difference between the factor weightings) is very small indicates that its effect is not so great as the geographical location of the informant.[3] Nevertheless, the finding is consistent with those reviewed

[3] As noted above, only fifteen per cent of the informants for the *ALF* were female, so the results have to be interpreted with caution. Moreover, there is a much higher proportion of female informants in the Oïl regions than in the Oc ones. Nevertheless, Goldvarb is designed to take into account the uneven

above, which suggest that fully or partially devoiced realisations of voiced stops are a characteristic of northeastern varieties associated in some cases with female speech. Moreover, when (b) and (d) were tested separately across wider ranges of Oïl regions, informant sex had a significant effect for (d) but not for (b), which is again consistent with the physiologically based hypothesis. When data for Nord-Pas-de-Calais were tested separately, the variable did have a significant effect on (b) (the female factor weight was .395, the male factor weight, .535), which is consistent with Pooley's finding that final devoicing is a regional sociolinguistic variable associated with women.

4. Variability in stop consonant voicing at the end of the twentieth century

4.1 The Data

The data reported here were collected at two locations at opposite extremes of France, Lille in the far north-east, and Bordeaux in the south-west. Thirty middle-class speakers, ranging in age from 23 to 42 were interviewed and after some time had elapsed they were asked to read a short text and, at the end of the session, a series of sentences containing stop consonants in different phonetic contexts. They were recorded onto Digital Audio Tape and the read materials and extracts from the conversations were subsequently transcribed orthographically and analysed both by detailed impressionistic phonetic transcription and in an acoustic analysis using Signalyze 3.11 (Keller, 1994). The results presented here focus on the auditory analysis of the read data, since this is where the closest comparability exists with the data from the *ALF*, albeit the luxury of being able to listen repeatedly to high-quality recordings was not available to Gilliéron and Edmont. The database is thus small, but reveals some telling differences when compared with the *ALF* data.

4.2 Variable voicing in 1990's Lille and Bordeaux: results

The linguistic effects governing devoicing in the contemporary data are not so clear-cut as in the *ALF* data, as a comparison of Table A.1 and A.2 in the Appendix will reveal. As in the *ALF*, all potential assimilation sites show some devoicing, but whereas non-assimilatory devoicing only occurred in canonically word-final codas in the *ALF*, it occurs both word-initially, word-medially and word-finally in the contemporary data, although with differing distributions in the different phonemes. Words with non-variable voicing were only excluded from the analysis when there existed independent motivation for doing so. Thus, for example, there was no variability in word-medial (d), so all words with word-medial (d) were excluded,

Lille				**Bordeaux**			
	[b]	[b̥, p]	**Total**		[b]	[b̥, p]	**Total**
female	12	2	14	female	7	1	8
male	10	0	10	male	10	0	10
	[d]	[d̥, t]	**Total**		[d]	[d̥, t]	**Total**
female	107	7	114	female	76	3	79

distributions of variables which can occur with sociolinguistic datasets, and some credence can therefore be given to these findings.

male	77	2	79	male	59	1	60
	[g]	[g̊, k]	**Total**		[g]	[g̊, k]	**Total**
female	35	1	36	female	22	2	24
male	25	0	25	male	17	0	17
Total	voiced	devoiced		**Total**	voiced	devoiced	
	266	12	288		191	7	198

Table 2 Numbers of word-initial tokens of (b), (d) and (g) devoiced by female and male subjects in Lille and Bordeaux.

Lille				**Bordeaux**			
	[b]	[b̥, p]	**Total**		[b]	[b̥, p]	**Total**
female	22	0	22	female	11	1	12
male	19	0	19	male	12	2	14
	[d]	[d̥, t]	**Total**		[d]	[d̥, t]	**Total**
female	18	0	18	female	7	2	9
male	18	0	18	male	8	1	9
	[g]	[g̊, k]	**Total**		[g]	[g̊, k]	**Total**
female	13	0	13	female	8	1	9
male	13	0	13	male	7	0	7
Total	voiced	devoiced		**Total**	voiced	devoiced	
	103	0	288		53	7	60

Table 3 Numbers of word-final tokens of (b), (d) and (g) devoiced by female and male subjects in Lille and Bordeaux.

whereas with (b) the only word-medial devoicing occurred before high vowels, so words with non-high following vowels were excluded; in the case of (g), *Agathe* had some devoicing, whereas *agacer* was invariable, but were both included because (g) occurs in the same phonological context in the two words. Because the numbers of tokens are very low, the results are presented in qualitative rather than quantitative terms. It should be noted that the distribution of devoicing across individual speakers was checked to ascertain that the figures do not represent aberrant behaviour by one or two rogue speakers.

The most striking finding in Tables 2 and 3 is that the proportions of tokens devoiced are markedly lower than in the regions found to favour devoicing in the *ALF* data (recall that the regions marked on the maps in Figure 1 are those with over 30% devoicing). This impression is reinforced when the data for word-final position are examined (Table 3). The proportion of tokens devoiced overall in this position is the same as for word-initial position, and the most surprising finding is that none of the final devoiced tokens are produced by Lille speakers, male or female, whereas twelve per cent of Bordeaux word-final tokens are devoiced, a figure similar to the proportions Pooley (1994) found to be devoiced by his male, middle-aged, better-educated speakers in Roubaix. There does seem to be a sex-specific effect in these figures: in all cases but one (word-final (b) in Table 3), where devoiced tokens are produced, more are produced by females than males in the same region. However, the effect is absent in the context where it would traditionally be expected, that is word-finally in Lille.

5. Discussion and conclusions

Neither of the two datasets studied offers support for the claim that there is a global north-south divide in French patterns of voicing. The *ALF* data show no evidence of any perceptible variability in the production of initial and medial stops, nor do they indicate that devoicing in word-final syllables is restricted to northern France, although it is rather more widespread in the *domaine d'Oïl* in the case of (d). In both the north and the south word-final devoicing occurs predominantly in a limited number of regions. In the contemporary data, there is no evidence of a difference in rates of devoicing in any position between the speakers from Lille and those from Bordeaux.

Comparison between the data from the *ALF* study and those from the study of late-twentieth century speakers shows that a clear change has taken place in the far north-east of France: whereas the *ALF* informants produced high levels of word-final devoicing, the contemporary speakers produce none at all. Pooley's figures are intermediate between the two. The majority of Pooley's speakers "would be classed as *ouvrier* or *employé* according to INSE[4] categories" (Pooley, 1994: 220), as would the *ALF* informants, which is not the case for any of the speakers in the present study. The behaviour of the middle-class Lille speakers here is in fact exactly what would be expected, if the patterns observed by Pooley are taken to indicate change in progress, since they represent the completion of that process. However, this interpretation leaves open the question as to why the Bordeaux speakers, who share the same social characteristics, not also avoid final devoicing completely? A possible answer to that question is that the Bordeaux speakers are in a sense producing their stop consonants more 'naturally' than the Lille speakers, in that they are not compensating for the equalisation of sub- and supraglottal pressure when it occurs, and are simply allowing consonants to be devoiced when other factors conspire to make this happen. Since devoicing has no apparent negative prestige value in this region, there is no sociolinguistic significance attached to this behaviour. By contrast, for the Lille speakers, word-final devoicing is a traditionally stigmatised local variant and therefore one which these "middle-class" professionals will want to avoid producing. They, therefore, presumably are implementing devoicing-avoidance mechanisms for consonants in this position. This can only be a speculative explanation with such

[4] The French national statistical institute.

small numbers of tokens, but it is interesting to note that in initial position, where devoicing is not traditionally a regional variant, the Lille and Bordeaux speakers do produce proportionately very similar amounts of devoicing: 4.5% by the Lillois and 3.5% by the Bordelais.[5] The absence of the sex-specific difference which is present in the *ALF* data and in non-word-final contexts might be taken as further confirmation of the fact that Lille speakers are deliberately avoiding devoicing in word-final position: where they do not implement devoicing-avoidance strategies, the naturally expected male-female difference appears to emerge.

In some sense, then, there has been levelling between these geographically separate regions, with the Lille speakers abandoning their local variant and adopting a pattern closer to the supra-regional norm. Might it not be appropriate, then, to describe the change as a case of over-levelling, with the Lillois hypercorrecting in their avoidance of final devoicing? Watt and Milroy (1999) make a distinction between dialect levelling, which they characterise as the reduction of variability at the expense of locally marked variants, and the traditional sociolinguistic conception of variation and change in relation to a supra-regional prestige standard. In their Newcastle English data, the vowel variants favoured by the speakers leading change, typically the younger middle-class females, tend to be supra-local, but not the prestige variants of southern British English, aiming, as Watt (1998:7) puts it to, "sound like northerners, but *modern* northerners". Historically, the relative prestige of northern and southern varieties of French means that it would be unrealistic to portray these Lillois as accommodating or over-accommodating to the Bordeaux norm, and in any case the Bordeaux voiced stops are simply unmarked in terms of prestige, positive or negative. It is the case, however, that both groups of speakers produce other phonetic variants which do have regional associations, for example the back [ɑ] in Lille, and the [V(∇))N] pronunciation of standard nasalised vowels in Bordeaux.[6] Voicing has never been sociolinguistically marked in Bordeaux, and therefore no evaluation can be made of the nature of levelling on the basis of the data under discussion here. In the case of the Lille speakers, their proximity to Paris makes the distinction between levelling to supra-local and supra-regional norms academic to a certain extent, and yet the presence of the back [ɑ] shows that they retain some distinctiveness from regionally unmarked French. It could be, then, that categorical voicing of word-final "voiced" stops is the new regional norm, which has arisen as a purely intra-regional reaction to a stigmatised local form. On the other hand, it could be that the change in final-devoicing in Lille represents hypercorrective movement towards standard patterns. If this is the case, then future studies of pronunciation in Lille would be expected to show rates of final devoicing akin to those found here in Bordeaux. If, however, the focus is local (in which case it is misleading to talk of any kind of levelling), then the categorical voicing by certain groups of speakers might be expected to persist, at least until all vestiges of the traditional, stigmatised variant have vanished from Lille speech.

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[5] This also holds for word-medial tokens, which are not shown here.

[6] These variables have yet to be subjected to qualitative acoustic analysis and quantified.

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Appendix

Variable	No devoicing
/b/	
*a**b**sinthe, ar**b**re, bar**b**e, cham**b**re, dou**b**le, her**b**e, jam**b**e, meu**b**le, novem**b**re, octo**b**re*	***b**arbe, **b**o**b**ine, **b**oeuf, **b**ouc, **b**oucle, **b**oulanger, **b**retelle, **b**ride, **b**on, jam**b**on, la**b**ourer, sa**b**ot, ta**b**ac*
/d/	
*ai**d**e, bri**d**e, ci**d**re, Clau**d**e, cor**d**e, cou**d**re, descen**d**re, sala**d**e, mala**d**e, mé**d**ecin, mé**d**ecine, mou**d**re, pou**d**re, rai**d**e, tiè**d**e, vi**d**e*	***d**éjeuner, **d**escendre, **d**ire, **d**ix, **d**ouble, **d**ouze, **d**ur, jar**d**inier, lun**d**i, mercre**d**i, sou**d**er, tar**d**if*
/g/	
*lan**g**ue, on**g**le*	*é**g**lise, **g**agner, **g**arçon, **g**auche, **g**oût, **g**rain, **g**range, **g**reffer,*

Table A.1 Headwords of maps analysed for underlying (b), (d) and (g).

Variable	No devoicing
/b/	
*a**b**sent, a**b**sorber, **b**icentennaire, **B**oulogne[7], ha**b**itant, d'ha**b**itude, Jaco**b**, pu**b**[8], ro**b**e, sno**b**, su**b**stituer*	***b**alcon, **B**arbara, **b**eau, **b**eaucoup, **b**lanc, **B**onne[9], Elisa**b**eth, garde-ro**b**e, Isa**b**elle,*
/d/	
*ble**d**, **d**e, **d**éfilé, **d**epuis, **d**es, **d**ire, **d**ix-sept, **d**ommage, **d**u, Gou**d**e, habitu**d**e, mé**d**ecin,*	*a**d**apter, anec**d**ote, après-mi**d**i, **d**éjà, **d**énigrer, **d**eux, **d**evoir,*
/g/	
*A**g**athe, **g**arde-robe, **g**arer, **g**oudronné, zigza**g***	*a**g**acer, bla**g**ue, **g**arder, **G**augin*

Table A.2 Words from read data containing variable and non-variable (b), (d) and (g).

[7] In *Bois de Boulogne.*

[8] Abbreviation of *publicité*

[9] In *Cap de Bonne Espérance*