

## **Dat is What the PM Said: A Quantitative Analysis of Prime Minister Chrétien's Pronunciation of English Voiced Dental Fricatives**

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A sociolinguistic–variationist type analysis was applied to the pronunciation of the English voiced dental fricative /ð/ by one Francophone Canadian, Prime Minister Jean Chrétien. Fricative [ð]–realisations were favoured in an interview setting, and plosive [d]–realisations were favoured in formal speeches, attributable to difficulties associated with the task of reading aloud. [ð]–realisations were favoured following fricatives, and [d]–realisations were favoured following voiceless but not voiced plosives; the latter result is proposed to be due to differences in intra–oral pressure. [d]–realisations were favoured preceding mid–high vowels, but [ð]–realisations were favoured preceding /i/, explainable in terms of an articulatory effect that also produces affrication in Canadian–French /d/ preceding high–front vowels. Statistical analyses were conducted using GoldVarb and SPSS software. The latter allows for tests of the significance of individual factors and of factor group interactions.

La prononciation de la fricative dentale voisée anglaise /ð/ chez un locuteur canadien francophone, le Premier ministre Jean Chrétien, a été soumise à une analyse variationniste sociolinguistique. Les réalisations fricatives [ð] ont été favorisées en contexte d'entrevue et les réalisations plosives [d] dans les discours formels, ce qui peut être attribué aux difficultés associées à la lecture à voix haute. Les réalisations [ð] ont été favorisées après des fricatives et les réalisations [d] ont été favorisées après des occlusives sourdes, mais non voisées; nous proposons que ce dernier résultat est relié à la pression intra–buccale. Les réalisations [d] ont été favorisées devant les voyelles mi-hautes, alors que les réalisations [ð] ont été favorisées devant /i/, ce qui peut être expliqué par un effet articuloire qui produit également l'affrication en français canadien de /d/ devant les voyelles antérieures hautes. Des analyses statistiques ont été réalisées avec les logiciels GoldVarb et SPSS, ce dernier permettant de tester la significativité des facteurs individuels et des interactions entre groupes de facteurs.

### **1. Introduction**

Francophone Canadians have difficulty discriminating perceptually between English /ð/ and /d/ (Polka, Colantonio, and Sundara 2001). When speaking English, Francophone Canadians often substitute dental plosives for English dental fricatives (Rvachew and Jamieson 1995, Teasdale 1997, Brannen 2002), and this is one of the most noticeable features of a Franco–Canadian accent (Gatbonton 1978). The substitution is not unexpected given that French lacks dental fricatives but has coronal plosives that are generally realised as apicolaminal and dental (Charbonneau and Jacques 1972, Dart 1991).<sup>2</sup> Canadian–French

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<sup>2</sup> Dart (1991) found that, for /t/ and /d/, French speakers from northern France and Belgium produced more dento-laminal and dento-apicolaminal realisations than did English speakers from the west coast of the United States, who primarily produced apical realisations that were further back. However, there was considerable variation and

speakers, who substitute French /t/ and /d/ for English /θ/ and /ð/ respectively, differ from European–French speakers, who substitute /s/ and /z/. The difference has been attributed to the fact that whilst European–French /s/ tends to be dental (Dart 1991), Canadian–French /s/ is alveolar (Teasdale 1997, Brannen 2002). For Canadians the dental plosive is the closest L1 sound to the English dental fricative, but for Europeans the strident dental fricative is the closest.

Gatbonton (1978) found that, in a read-aloud task, the percentage of English /ð/ produced by native Canadian French speakers that were correctly perceived by native Canadian English listeners (i.e., not perceived as English /d/) was dependent on phonological context: The correct identification rates were 43% following vowels, 38% following liquids, 27% following voiced plosives and nasals, 35% following voiceless fricatives 35%, and 14% following voiceless plosives.

This paper reports on a case study of the production of L2–English voiced dental fricatives, /ð/, by one prominent L1–Canadian–French speaker, The Right Honourable Jean Chrétien, Prime Minister of Canada from 1993 to 2003. A comparison is made of Mr. Chrétien’s /ð/–productions in two different social settings: a television interview and speeches in the House of Commons. The linguistic variables considered are the preceding and following phonetic segments. The study is quantitative, using a variationist style of analysis common in sociolinguistic research. The paper is also intended to introduce students of variationist sociolinguistics to some of the advantages of software packages providing options beyond those available in VARBRUL and GoldVarb.

Mr. Chrétien’s use of both French and English has been a matter of public comment in Canada for many years. Mr. Chrétien’s French has been observed to vary from highly informal *française populaire* to a much more formal style, although this style would not be classed as international standard French (P. Balcom, personal communication, August 29,

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overlap between the two groups, and it was not true that French speakers always produced dental plosives or that English speakers always produced alveolar plosives.

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2003). Whilst Mr. Chrétien trained as a lawyer and practised law, a profession in which speaking eloquently and clearly is essential, as a politician he has portrayed himself as “the little guy from Shawinigan,” a down to earth man of the people, and some commentators have suggested that his folksy speaking style is a deliberate attempt to project this image. Mr. Chrétien is renowned in the Canadian Anglophone population for his peculiar use of the English language. Despite this, Mr. Chrétien is also capable of producing quite eloquent English which, although accented, deviates little from the syntactic norms of educated Anglophone Canadian usage. Again, there has been speculation that Mr. Chrétien use of “poor” English is at least in part deliberate.<sup>3</sup> The public interest in this particular individual and his speech warrants case studies on Mr. Chrétien’s use of language. The goal of the present study is therefore to describe stylistic variation of a phonetic variable in Mr. Chrétien’s English in particular. The study is limited in scope and only considers articulatory and processing constraints, rather than political motivation, as possible causes for variation found. The degree to which findings of the present study are generalisable to a larger population may be limited due to the fact that Mr. Chrétien is a rather unique individual. It should be noted that Mr. Chrétien learnt English relatively late in life: he was born in 1934 and claims to have spoken hardly any English as late as the early 1980s. Mr. Chrétien has also suffered from a partial facial paralysis since childhood, and this may act as a speech impediment.

The paper proceeds first with a description of the interview and speeches used as a source of data. This is followed by a description of the method and criteria used to extract and code the dependent variable /ð/ and independent linguistic variables preceding and following segments. Results of statistical analyses are followed by a discussion of possible causes for the variation observed in Mr. Chrétien’s /ð/.

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<sup>3</sup> Rampton (1987) suggests that non-native speakers may deliberately emphasise their status as non-native speakers for social effect, although the motivation of the participants in Rampton’s study may have differed from potential motivations in the case of Mr. Chrétien.

## 2. Method

All instances of Mr. Chrétien's /ð/ variants were extracted from the recordings of the interview and speeches. The /ð/-tokens and their social setting and phonetic contexts were coded and subjected to binary logistic regression analyses (Sankoff 1988, Young and Bayley 1996, Hosmer and Lemeshow 2000, Pampel 2000, Menard 2002; Paolillo 2002). The data sources and each of the steps in the analysis are discussed in detail below.

### 2.1 Sources

Samples of Mr. Chrétien speaking were taken from two social settings: One setting was an interview broadcast on the CBC television news programme *The National* on December 18, 2002. Topics discussed were Iraq, health care, and the leadership of the Liberal party. The other setting consisted of two speeches given in the House of Commons on September 17 and October 15, 2001, on the subjects of the terrorist attacks in the United States and the international campaign against terror. The interview and speeches were obtained from the internet where they were available as streaming audio–video files with more–or–less accurate transcripts. Sources of sufficient length but closer in time were not available. It was unfortunately not possible to obtain sources of sufficient length which would have represented Mr. Chrétien's truly extemporaneous speech, such as when asked unexpected questions during a media scrum. Whereas the Prime Minister appeared to be speaking extemporaneously during the interview, it is more than likely that he received the questions beforehand and had an opportunity to compose his answers prior to the actual recording of the interview. There was, however, no sign that he was reading from a Teleprompter or other notes. In contrast, the House of Commons speeches were clearly read from papers which were visible in the video images.

To facilitate identification of potential /ð/-tokens, all occurrences of “th” in the transcripts were highlighted. The streaming audio–video files were rerecorded as audio files and saved on the local hard–drive (only the English portions of the speeches were included in the new audio files). Locally stored files in audio format were more amenable to finding and

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listening multiple times to relevant parts of the recording. The length of the interview was 22 minutes (including the interviewer's questions and comments), and the combined length of the speeches (excluding the French portions) was 29½ minutes.

### 2.2 Coders

Coders were two native English speakers. The first coder (the author) was raised in the UK, but had lived in Anglophone regions of Canada (Ontario, Nova Scotia, and British Columbia) for a total of eight years, and had not lived in any other English-speaking country for over twelve years. The second coder was raised in British Columbia and had moved to Ontario three years prior to his participation in the study. Both participants were in their early thirties and reported no hearing difficulties.

### 2.3 /ð/-token extraction and coding

The two coders listened to the recordings over headphones, and independently coded every occurrence of /ð/ as either [ð] or [d].<sup>4</sup> Coding was based on the coders' perception of whether the /ð/ phoneme was realised as a fricative or a plosive. Native-speaker perception was deemed the relevant factor for determining whether an apparent English /ð/ – /d/ substitution had been made. Square brackets are used in this paper to indicate particular realisations of the phoneme; however, the symbols in square brackets represent perceived phonemes rather than articulatory or acoustic phonetic detail. Brannen (2002) found that Canadian Anglophones performed poorly on an AXB discrimination test for dental [t̪] versus alveolar [t], so it was considered safe to assume that the coders in the present study would identify dental [d̪] as English alveolar /d/. Cases of disagreement between the two coders were recoded and the outstanding cases of disagreement (6.7% of total) were deemed to be ambiguous and were not included in the statistical analysis. There were a number of false starts where the same word was repeated, sometimes with the same and sometimes with a different variant of /ð/; since repetitions are clearly not independent observations, none of the repetitions

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<sup>4</sup> The first coder also corrected the transcripts where they deviated from the audio files.

were included in the coding.

The potential linguistic cause of variation in /ð/-production that was of interest in the present study was coarticulation with the immediately adjacent segments. Therefore, the first coder also phonetically transcribed the segments preceding and following each /ð/-token and they were then coded for inclusion in the statistical analyses.

#### **2.4 Preceding–segment coding**

The dependent variable, the /ð/-variant, was crosstabulated with the independent variables *preceding–segment* and *social–setting* to help determine a coding system for the preceding segment. Certain segments resulted in a small or zero count in some cells, and so for statistical analysis it was desirable to combine these into larger groupings. Groupings considered were those that combined segments with similar trends in their distribution, e.g., /s/ could potentially be combined with /f/ because both corresponded with a greater number of [ð]-realisations than [d]-realisations, but /s/ could not be combined with /r/ since the latter corresponded with a greater number of [d]-realisations. Groupings considered were also required to have some phonetic basis, e.g., /s/ and /f/ could potentially be combined into a fricative class, or /s/ and /r/ could potentially be combined into an alveolar class.

The coding scheme for the preceding segment <sup>5</sup> was based on aerodynamic considerations: *Ceteris paribus*, higher intraoral pressure during a closure would result in a faster more plosive-like release. Since intraoral pressure is greater during voiceless than voiced plosives (Malécot 1966, Stevens 1998: 469), a greater number of plosive [d]-realisations of /ð/ are predicted following a voiceless plosive. It was hypothesised that intraoral pressure or degree of opening may also be a relevant factor in other manners of

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<sup>5</sup> It was decided to group consonant clusters preceding the /ð/-variant according to the last member of the cluster. For example, /nd/ (“and the” was a common sequence) was grouped with /d/, on the assumption that the last member of the cluster would have the principle coarticulatory influence on the /ð/, i.e., relative to the onset of the /ð/, velar closure was assumed to occur earlier for /nd/ than for /n/ and therefore the transition into /ð/ following /nd/ was expected to be more similar to the transition following /d/ than that following /n/. This decision also had a practical motivation, namely the difficulty of deciding whether /d/ was present or not in an /ndð/ sequence especially when the /ð/ could be realised as [d].

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articulation. The preceding segment was therefore coded into manner classes in order of decreasing intraoral pressure: *voiceless plosive, fricative*<sup>6</sup> (and affricate), *voiced plosive, nasal, liquid*, and *vowel*, plus *pause*. This coding scheme is hereafter referred to as the *preceding–segment* factor group. The resulting groupings are almost identical to those identified by Gatbonton (1978) and the group ordering (apart from being listed in reverse) is the same (see §1 above).

Other coding schemes such as presence of preceding coronal closure were considered and tested by not found to produce statistically significant results and for sake of brevity will not be reported here.

### **2.5 Following–vowel coding**

Segments following the /ð/ were all vowels and were coded as *high /i/*, *mid–high /ɪ e o/*, *mid–low /ɛ æ/*, or *schwa /ə/*. This coding scheme is hereafter referred to as the *following–vowel* factor group. Schwa was included as a distinct category since it accounted for a large proportion (approximately 45%) of the following vowels in the data. Since /i/ requires a high fronted tongue position, relatively close to the tongue position for /d/, the tongue may move relatively slowly towards the /i/ target compared to other vowel targets and may remain close to the roof of the mouth resulting in affricated release (Ohala 1983). In Canadian French, /t/ and /d/ are realised as affricates before /y/ and /i/ (Charbonneau and Jaques 1972, Marchal 1980).<sup>7</sup> Gatbonton (1978) found that Francophone Canadians’ affricated realisations of English

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<sup>6</sup> Voiceless fricatives have a higher intraoral pressure than voiced fricatives (Malécot 1968, Stevens 1998: 380–383, 477–480); however, since there were only nine instances of voiced fricatives in the data, they were coded together with voiceless fricatives as the *fricative* factor, to which were also added the four affricates in the data.

<sup>7</sup> Although the laxer [ɪ] allophone of Canadian French /i/ also triggers affrication of /t/ and /d/ (Charbonneau and Jaques 1972), in crosstablulations with *preceding–segment* and *social–setting* Mr. Chrétien’s English /ɪ/ clearly patterned with /e/ and not with /i/. The fact that French [ɪ] and English /ɪ/ are represented using the same phonetic symbol does not imply that they are articulated in the same way, and in fact Escudero and Polka (2003) found that Canadian French [i] and [ɪ] are more similar acoustically than are Canadian English /i/ and /ɪ/. Their data suggests that English /ɪ/ is lower than French [ɪ] and therefore English /ɪ/ would be less likely to cause affrication than French [ɪ]. Mr. Chrétien’s French has not been analysed to determine whether he affricates /d/ before [ɪ], nor whether he produces his English /ɪ/ in the same way as his French [ɪ].

/ð/ were perceived as /ð/ by native English speakers. It was therefore predicted that following-/i/ would favour realisations of English /ð/ that would be perceived as /ð/ by the Anglophone coders in the present study. This hypothesis is discussed at greater length in section 4.3 below.

### 3. Results

A total of 552 tokens were extracted from the raw data, 272 from the speeches and 280 from the interview. The vast majority of occurrences of /ð/ were word initial in words such as “the,” “these,” “that,” “their,” “there,” and “they,” with only 11 occurrences of word medial /ð/ in words such as “other.” The coders failed to agree on 37 tokens (6.7% of the total extracted), 17 from the speeches and 20 from the interview. This left a total of 515 tokens for statistical analysis, 255 from the speeches and 260 from the interview. Figure 1 presents the raw distributions of /ð/-variants across *social-setting* and *preceding-segment*, and *social-setting* and *following-vowel*.

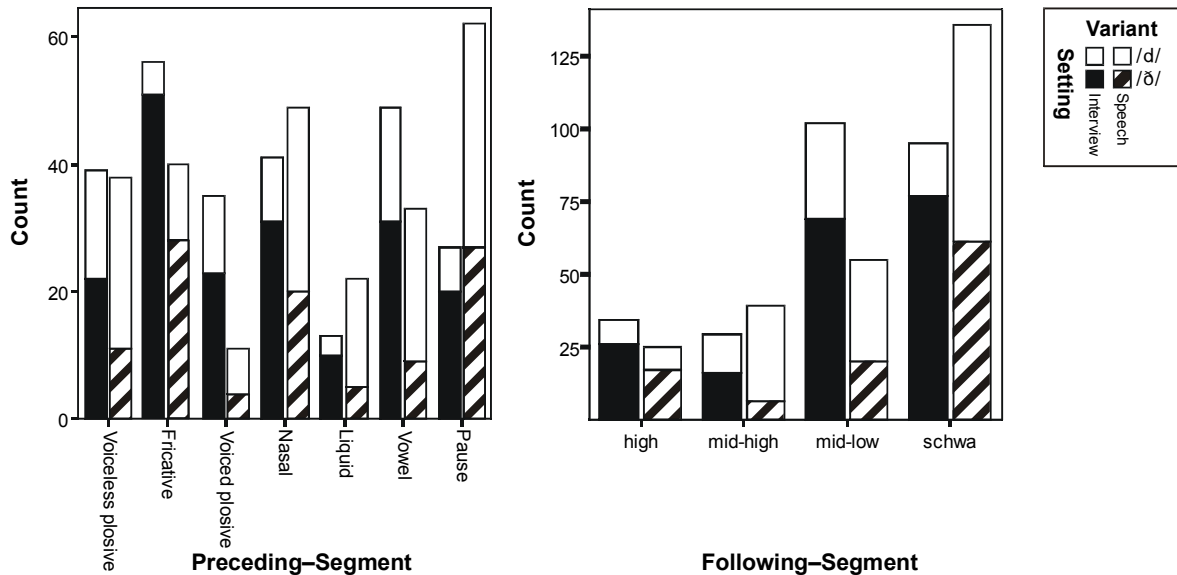


Figure 1 Raw distributions of /ð/-variants



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Binary logistic regression analyses were conducted using both GoldVarb 2001 (Robinson, Lawrence and Tagliamonte 2001) and SPSS 11.5 (SPSS 2002) software packages. GoldVarb was used since it is a common tool in variationist–sociolinguistic research and directly produces an output in terms of probability–like factor weights, an easily interpretable format familiar to many sociolinguists. For the same reason I will, where possible, employ the statistical terminology generally used in the sociolinguistic literature that makes use of to VARBRUL and GoldVarb analyses. SPSS was used since its output includes results not available in GoldVarb: the Wald test for the significance of factor groups, factor–group interactions, and individual factors. Other commercial software packages provide the same options,<sup>8</sup> and SPSS was chosen because of its availability to the author. Apart from possible rounding errors, SPSS and GoldVarb can produce identical factor weights and log likelihoods. The Appendix describes how to obtain GoldVarb–like output using SPSS.

Step–up and step–down factor–group entry in GoldVarb (more accurate method, averaging by centering factors, step–up/down threshold .05001) and SPSS (stepwise entry and removal of .05 for probability of likelihood–ratio statistic based on maximum partial likelihood estimates) converged on a model including all of the factor groups *social–setting*, *preceding–segment*, and *following–vowel*. All factor groups also reached significance on the Wald statistic in a simple effects model in SPSS, see Table 1. A model including all two–way interactions, and a model including all two–way interactions and the three–way interaction failed to find any interactions that reached significance on the Wald statistic.

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<sup>8</sup> SAS is comparable to SPSS with a few extra options for logistic regression, STATA will perform certain types of logistic regression analysis that are not available in SPSS or SAS.

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**Table 1** Coefficients *B* for factor groups and individual factors and their statistical significance according to the Wald statistic (S.E. = standard error for *B*). Probabilities of [ð] realisations for factor groups and individual factors.

Factors	<i>B</i>	S.E.	Wald	df	Sig.	p( [ð] )
<b>Social Setting</b>						
interview	.794	.112	50.123	1	.000*	.723
speech	-.794	.112	50.123	1	.000*	.349
<b>Preceding Segment</b>			35.768	6	.000*	
voiceless plosive	-.571	.240	5.653	1	.017*	.401
fricative	1.373	.266	26.569	1	.000*	.823
voiced plosive	-.132	.303	.190	1	.663	.509
nasal	-.037	.226	.027	1	.870	.533
liquid	-.409	.342	1.433	1	.231	.440
vowel	-.591	.233	6.409	1	.011*	.397
pause	.367	.233	2.473	1	.116	.630
<b>Following Vowel</b>			25.580	3	.000*	
high	.796	.252	9.956	1	.002*	.724
mid-high	-1.050	.241	19.028	1	.000*	.294
mid-low	-.175	.178	.972	1	.324	.499
schwa	.428	.172	6.207	1	.013*	.643
Constant	.167	.127	1.727	1	.189	.542

\* significant at  $\alpha = .05$

The model containing *social-setting*, *preceding-segment*, and *following-vowel* was a good fit for the data: The  $-2$  log likelihood ratio between this model and the model containing no factors (aka  $G_M$  or *the model*  $\chi^2$ , see Menard 2002: §2.2) was  $\chi^2(10) = 120.974$ ,  $p < .0005$ . The strength of the association between the independent and dependent variables was, however, not especially high, the McFadden likelihood ratio (see Menard 2002: §2.2.1) was  $R_L^2 = .172$ . The log-likelihood for the model was  $-291.848$  and the maximum possible log-likelihood for a saturated model was  $-264.949$  (value from GoldVarb), leading to a  $-2$

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log-likelihood-ratio of  $\chi^2(45) = 53.798$ ,  $p = .0052$ , i.e., a statistically significant amount of variance was left unaccounted for by the model. However, this traditional measure of goodness-of-fit is problematic for reasons outlined in Menard (2002: 22–23). The alternative Hosmer and Lemeshow goodness-of-fit index,  $\chi^2(8) = 6.20$ ,  $p = .624$  (values from SPSS), indicated that the model was a good fit (the  $p$  value was high). In GoldVarb only 5 of the 55 cell-error values exceeded the 2.0 criterion suggested by Young and Bayley (1996) and none exceeded the 3.84 criterion suggested by Paolillo (2002: 82), and the cell total chi-squared was  $\chi^2(10) = 43.679$ ,  $p < .001$ .

Factor weights<sup>9</sup> are presented in Figure 2. A factor weight above the .5 line indicates that, compared to all contexts, fricative [ð]-realisations of /ð/ are favoured in the context associated with that factor weight, and a factor weight below the line indicates that plosive [d]-realisations are favoured. Asterisks indicate factor weights that are significantly different from .5, i.e., those that correspond to statistically significant coefficient values in Table 1. The input value, an indicator of the overall probability of [ð]-realisations, was .542 and not significantly different from .5 (the logit of the input value is the  $B$  constant in Table 1). Because the input value was slightly higher than .5, the probabilities for fricative [ð]-realisations in each context were slightly higher than the associated factor weights. Probabilities of [ð]-realisations in each context are given in the far right column of Table 1.<sup>10</sup>

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<sup>9</sup> The  $B$  coefficients in Table 1 are the logits of the factor weights in Figure 2, and one can be converted into the other as follows:

$$\text{Factor Weight} = \exp(B) / (1 + \exp(B)) \quad B = \ln(\text{Factor Weight} / (1 - \text{Factor Weight}))$$

<sup>10</sup> Probabilities are calculated by adding the constant and coefficients (the logits of the input value and the factor weights), and transforming the result into a probability using the same formulas given above for converting from coefficients to factor weights (see Paolillo 2002: 166–170). For example:

$$\begin{aligned} p([\text{ð}] | \text{interview}) &= \exp(B(\text{constant}) + B(\text{interview})) / (1 + \exp(B(\text{constant}) + B(\text{interview}))) \\ &= \exp(.167 + .794) / (1 + \exp(.167 + .794)) = .724 \end{aligned}$$

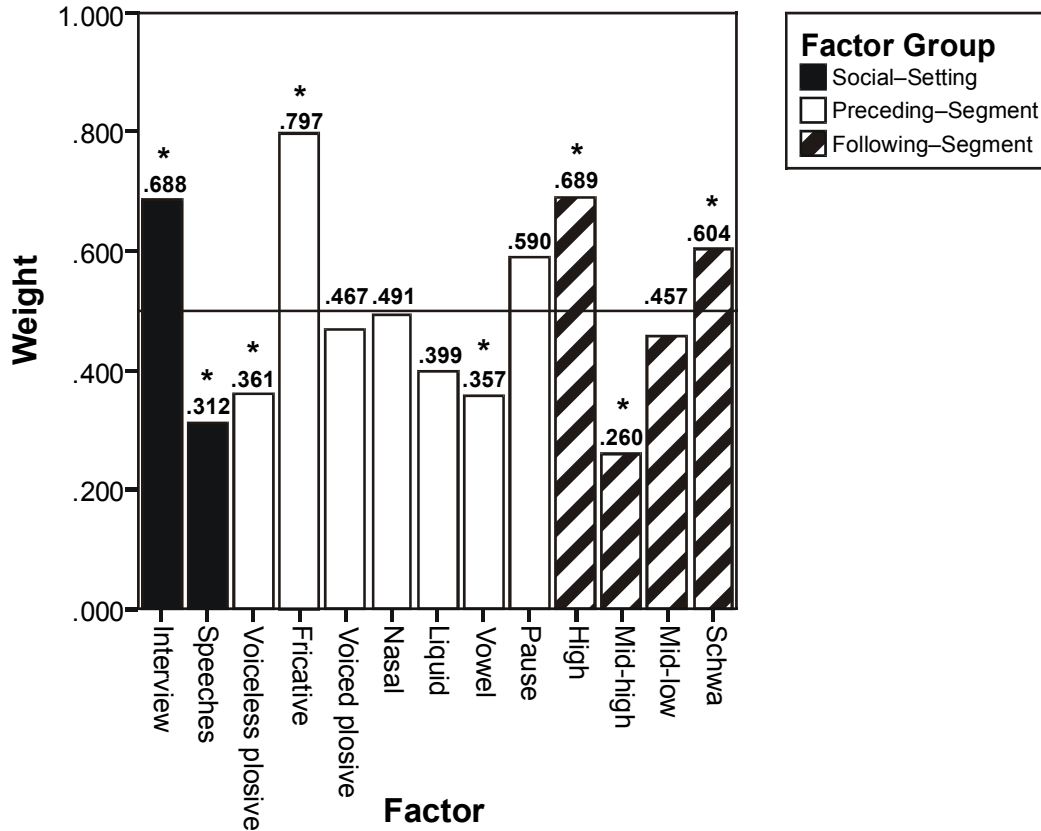


Figure 2 Factor weights for fricative [ð]-realisations of /ð/

#### 4. Discussion

Possible explanations for the pattern or results obtained are provided in this section of the paper. These explanations are speculative but could suggest directions for future research should studies based on a large number of participants replicate the results of this case study.

##### 4.1 Social setting

Mr. Chrétien had a greater probability of producing [ð]-variants in the *interview setting* than in the *speech setting* (factor weights .688 versus .312). On this variable, Mr. Chrétien had a heavier accent when reading a speech than when being interviewed.

Bell (1984) proposed that stylistic shifts are due to audience design, e.g., speakers may

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shift their style to reduce the perceived social distance between themselves and their audience, or shift towards a style expected by audiences in particular social settings. The difference in pronunciation between the interview and speech settings may be attributable to audience differences. Whilst in both settings the true audience may arguably have been the Canadian public, the ostensive audience for the speeches were the members of the House of Commons, and the ostensive audience for the interview was the interviewer, Peter Mansbridge. However, given the topic and ostensive audience, a more formal style might have been expected in the speeches given in the House of Commons, which might be expected to require better, more careful, or more prestigious pronunciation. Style shifting due to audience does not therefore appear to be a likely explanation for the variation in Mr. Chrétien's pronunciation.

An alternative and more consistent explanation for why Mr. Chrétien's English accent was more native-English-like in the interview is that it may have been a less stressful situation than reading the speeches (see Piper and Casin 1988). Oyama (1976) found that non-native speakers' pronunciation was worse when reading aloud than when describing a traumatic personal experience. Factors such as the inability to choose one's own vocabulary and the need to focus attention on decoding the written text, may be detrimental to one's pronunciation when reading aloud in a second language.

### **4.2 Preceding segment**

Consistent with the hypothesis that greater intra-oral pressure would favour plosive realisations of /ð/, preceding *voiceless plosives* favoured plosive [d]-realisations to a greater extent than did preceding *voiced plosives* (only the factor weight for the former was significantly lower than .5). The results for the remainder of the manners of articulation were, however, inconsistent with the hypothesis that greater intra-oral pressure would correlate with a greater probability of plosive [d]-realisations of /ð/: The factor weight for preceding *nasals* (relatively less intra-oral pressure) was very similar to that of preceding *voiced plosives* (relatively more intra-oral pressure) (neither of these had factor weights significantly different to .5). Preceding *liquids* and *vowels* (with progressively lower intra-oral pressure) appeared

to favour [d]–realisations to a greater extent than did preceding *nasals* and *voiced plosives* (with progressively greater intra–oral pressure) (only the factor weight for *vowel* was significantly lower than .5). The transition from a vowel to /ð/–target requires the tongue to move a greater distance and possibly at higher speed compared to the transition from a consonant. This may make it harder to produce a closure with the amount of precision needed for a fricative, making an easier ballistic closure more likely following a vowel (see Kirchner 1998: 51–53, and Boersma 1998: 155–156).

*Fricatives* were the only preceding segments which favoured fricative [ð]–realisations of /ð/, and they strongly favoured [ð] (factor weight .797, significantly higher than .5). It would seem therefore that the aerodynamic or articulatory effect of a preceding *fricative* favours [ð]–realisations (it is easier to produce a fricative following another fricative), whilst the effects from all other preceding segments are either neutral (i.e., for *voiced plosives*, *nasals*, and *liquids*) or moderately favour [d]–realisations (i.e., for *voiced plosives* and *vowels*).

Preceding pauses also appeared to favour fricative [ð]–realisations; however, the factor weight was not significantly higher than .5. Raw distributions (Figure 1) suggest that, if the effect had been significant, it would be neutral in the speech setting but positive in the interview setting. Such an interaction could be theoretically possible since the effect of a pause may be different in nature from the coarticulatory effect of an actual preceding segment, and the nature of the pauses in the speeches and the interview were somewhat different: the speeches had more and longer pauses than the interview, a difference attributable to the differences in rhetorical style appropriate for each situation.

#### **4.3 Following vowel**

As predicted, following–/i/ vowels quite strongly favoured fricative [ð]–realisations of /ð/ (factor weight significantly higher than .5). As hypothesised in section 2.5, this may be attributed to there being a long narrow stricture of width appropriate for frication during the transition of the tongue from the apicolaminal closure of a French–like /d/ and the high–front position of the /i/. Such a transient stricture also results in affrication in Canadian French /t/

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and /d/ (Charbonneau and Jaques 1972, Marchal 1980). It is not claimed here that the affrication in Canadian French and in Canadian French accented English are exactly the same: Canadian French affricated /d/ is general transcribed as [dz] whereas Gatbonton (1978) transcribed the affricates she observed in French accented English as [dð]. Rather, what is claimed is that the stricture during transition of the tongue from an apicolaminal /d/ to an /i/ is the cause of both [dz] when Canadian French speakers produce French voiced dental plosives, and the cause of a greater likelihood of [dð] or [ð]–realisations when Mr. Chrétien attempts to produce English voiced dental fricatives. Further, as per the results of Gatbonton (1978), it is claimed that [dð] is perceived as /ð/ by native Anglophone listeners (the coders reported that they did not hear any of the /ð/–tokens as [dz]).

Following–/ɪ e o/ <sup>11</sup> strongly favoured plosive [d]–realisations of /ð/ (factor weight significantly lower than .5). The effect may be due to the tongue position for mid–high vowels where the tip of the tongue is lower relative to the body of the tongue than is the case for high and low vowels. Because of this, the blade of the tongue is more parallel to the front of the hard palate in high and low vowels than in mid vowels (compare Figures 6.2, 6.7 and 6.6 for English /i/, /e/ and /æ/ in Stevens 1988: 261, 271 and 269). Following a coronal plosive this would result in the tip of the tongue in mid–vowels having a faster trajectory away from the teeth or alveolar ridge than the body of the tongue, favouring a clean plosive release. In high and low vowels, the blade and tip of the tongue would move away together resulting in a period of time in which there is a long narrow stricture favouring affricated release, especially in the context of high vowels where the tongue stays near the roof of the mouth and can move slowly towards the vowel target. As argued above, affricated release would lead to the perception of English /ð/.

Following–/ə/ moderately favoured fricative [ð]–realisations of /ð/ (factor weight significantly higher than .5). It could be that the more native-English-like pronunciation in this

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<sup>11</sup> This group consisted primarily of the front vowels, 27 instances of /ɪ/ and 38 of /e/ compared to 5 instances of /o/

context is due to a frequency effect: due to the high frequency of the word “the,” /ə/ is the most frequent vowel following /ð/, and hence /ðə/ is the most practised combination. Following–/ε æ/ had a neutral effect (factor weight not significantly lower than .5).

#### **4.4 Tests for interactions**

No interactions between factor groups were found. Whilst interactions between linguistic factor groups would not have been theoretically problematic, interactions between the social–setting factor group and the linguistic factor groups would have been: Interaction between linguistic and stylistic variables would have indicated that the probability of fricative realisations of /ð/ in different social settings was subject to different coarticulatory effects rather than an across the board scaling of the same coarticulatory effects, a highly unlikely intra–speaker effect. (As noted above a preceding pause may be exempted from this logic since it is not an actual segment which could coarticulate with the /d/.) Theory and results therefore support the conclusion that only simple contextual effects were relevant in the probability of fricative realisations of /ð/ in Mr. Chrétien’s pronunciation.

#### **5. Summary**

A variationist style quantitative analysis was conducted on the English /ð/ pronunciation of a notable Francophone Canadian, Prime Minister Jean Chrétien. Tokens were coded into fricative [ð] and plosive [d]–realisations according to native Anglophones’ perception. Productions of /ð/ perceived as fricatives by native Anglophone listeners may be considered to be “correctly” pronounced. Social settings was found to have a large effect, with a greater probability of fricative realisations during a television interview than during speeches in the House of Commons. This may be due to that fact that the speeches were read out loud, a task which has been found to be deleterious for the pronunciation of non–native speakers. Fricative realisations of /ð/ were favoured if the preceding segment was a fricative, likely attributable to the ease of transition from an aerodynamically or articulatorily similar segment. Preceding voiceless plosives favoured plosive realisations of /ð/ to a greater extent than did preceding



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voiced plosives. This is consistent with the hypothesis that greater intraoral pressure (as found in voiceless compared to voiced plosives) would cause the tongue to lower faster, resulting in less likelihood of transitional frication. Following /i/ also favoured fricative realisations of /ð/, which is likely attributable to a similar coarticulatory effect to that which results in affricated release of /t/ and /d/ in Canadian French.

### **Appendix: Obtaining GoldVarb-like output from SPSS**

Commercial and some freeware statistics packages may have certain advantages over the freeware packages such as GoldVarb and VARBRUL commonly used in sociolinguistic research. Paolillo (2002, §1.3.3) discusses the advantages and disadvantages of the two types of software. The current paper made use of SPSS to test for the statistical significance for factor-group interactions and for individual factors. Whilst such tests are technically possible in GoldVarb, e.g., via manually dummy coding interactions (Paolillo 2002: §3.3.5 and 4.3.2), and comparing models with and without individual factors (Guy 1988), conducting these tests manually is labourious and time consuming.

One of the strengths of a commercial package such as SPSS is the flexibility it provides in allowing the researcher to conduct different analyses using different options. This flexibility has a disadvantage in that it requires the researcher to be familiar enough with the various options in order to know which he or she should choose on a given occasion. I would encourage readers unfamiliar with the workings of logistic regression and the effect of options available to read further in this area. Good introductions for applied researchers include Pampel (2000) and Menard (2002), a somewhat more advanced but accessible text is Hosmer and Lemeshow (2000).

My purpose here is to set out the options needed to produce GoldVarb-like output using SPSS. I will assume that the reader has some familiarity with SPSS, if not, they are advised to work through the relevant paper and online material packaged with the software. The following instructions are valid for version 11.5 of SPSS with base, regression, and

advanced modules.

1. Create or open an appropriately formatted data file.
2. From the menu bar, select *Analyze > Regression > Binary Logistic...*
3. Place the dependent variable into the box labelled *Dependant*, and the independent variable into the box labelled *Covariates*.
4. Press the *Categorical...* button.
  - a. Place all the independent variables into the box labelled *Categorical Covariates*.
  - b. In the *Contrast* drop-down list, select *Deviation*.
  - c. By default, the *Last* radio button is checked for *Reference Category*.
  - d. Select all of the independent variables and press *Change*.
  - e. Press *Continue*.
5. Press *OK*. An output window will open containing the logistic regression output.
6. Repeat steps 2 through 5, but at step 4c change the checked radio button to *First* for *Reference Category*.
7. Two logistic regression outputs will now be visible in the output window. Compare the *Variables in the Equation* tables under *Block 1: Method = Enter* of the top and the bottom output. The two will be identical except for:
  - a. Data for the last factor in each factor group will be missing in the top output and data for the first factor in each factor group will be missing in the bottom output. Data from both outputs must be combined in order to obtain data for all individual factors.
  - b. Labels for each individual factor, in the form VARIABLE(1), VARIABLE(2), etc., will not agree between the top and bottom outputs, VARIABLE(2) in the top output will correspond to VARIABLE(1) in the bottom output. For the references of these labels, see the *Categorical Variables Coding* tables in the respective outputs.
8. Model coefficients are given as logits in the column labelled *B*, and their odds ratios are given in the column labelled *Exp(B)*. Factor weights are obtained via the following formula:
$$\text{Factor Weight} = \text{Exp}(B) / (1 + \text{Exp}(B))$$

To conduct a step-up and step-down analyses, before step 5:

- a. Press the *Options...* button.
  - i. Change the *Probability for Stepwise Removal* to .05.
  - ii. Press *Continue*.
- b. Change the *Method* drop-down option to *Forward:LR* (for step-up).
- c. Press *OK*. An output window will open containing the logistic regression output.
- d. Repeat, but change the *Method* drop-down option to *Backward:LR* (for step-down).

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(Links may no longer be current.)

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