HIGH-VOWEL LENITION IN THE FRENCH OF QUEBEC AND PARIS

by

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ABSTRACT

High-vowel lenition is attested in various forms in a number of languages, including Shoshoni, Lezgian, East Cree, Andean Spanish, and Japanese, along with many others. It is also attested in the development of the various Romance languages from Proto-Romance.

High-vowel deletion and devoicing are both attested in Quebec French, with some authors reporting devoicing but no deletion, and others reporting frequent deletion and devoicing. Research indicates that both surrounding consonantal context and sociolinguistic factors contribute to (non)lenition of Quebec French high vowels, with some authors treating deletion and devoicing as separate phenomena and others treating them as different manifestations of the same phenomenon. Few studies have investigated high-vowel lenition in other varieties of French.

This study investigates deletion and devoicing of the high-vowel phonemes /i/, /y/, and /u/ in the French spoken in Quebec and Paris, and identifies which phonetic and social factors, including left and right context, vowel phoneme, provenance, gender, and style, best predict these phenomena. It also addressed whether high-vowel deletion and devoicing are different manifestations of a single phenomenon or two separate phenomena in these varieties of French.

Data are from recordings of native French speakers from the Phonologie du Français Contemporain (PFC) corpus project. Each speaker participated in two different interviews representing two levels of style. For each speaker, each interview type, and each high-vowel phoneme, twenty interconsonantal tokens were transcribed and coded as deleted or present, and as voiced or devoiced, along with the surrounding consonantal context. Tokens were subjected to statistical analysis.

Despite most expectations, there are no statistical differences between the rates of deletion and devoicing in Quebec and Paris, and neither phenomenon is unique to Quebec French. The best predictors of deletion were place and manner of articulation of surrounding consonants, while the best predictor of devoicing was voiceless surrounding consonants. These results indicate that deletion and devoicing are separate processes. Although not significant at the aggregate level, sociolinguistic factors were significant predictors in more specific models. Deletion and devoicing of French high-vowels are both more complex and more widespread than previous studies have suggested.

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CHAPTER 1

INTRODUCTION

It has long been known that Quebec French high vowels /i/, /y/, and /u/ undergo variable devoicing, shortening, and deletion under certain phonetic and sociolinguistic conditions (Charbonneau 1955; Locke 1949).

(1) *Quebec French High-Vowel Lenition*

a.	*j'imagine*	/ʒ**i**maʒin/	[ʒmaʒɪn]
	'I imagine'		
b.	*je suppose*	/ʒə s**y**poːz/	[ʒə spoʊz]
	'I suppose'		
c.	*Qu'est-ce que vous pensez?*	/kɛs kə v**u** pɑ̃se/	[kɛs kə f̩ pɑ̃se]
	'What do you think?'		
d.	*à nous autres*	/a n**u**-z-otʁ/	[a nzoʊt]
	'to us'		
e.	*un petit peu*	/œ̃ pət**i** pøː/	[œ̃˞pt͡si̥pøː]
	'a little bit'		
f.	*les sujets*	/le s**y**ʒe/	[le sy̥ʒe]
	'the subjects'		

g. *beaucoup de choses* /bok**u** də ʃoːz/ [bokʊ̥̆d̥ ʃoʊz]

'many things'

The exact circumstances that condition and result from high-vowel lenition are complex. As evidenced in (1*c*), vowel deletion in some cases is total enough to induce other phonological processes, such as leftward (de)voicing assimilation. (1*d*) demonstrates that this type of syncope may occur between voiced as well as voiceless consonants. Although high-vowel devoicing is most likely to occur between voiceless consonants, it is also possible with adjacent voiced consonants, as in (1*f*). Finally, (1*g*) demonstrates both shortening and devoicing, as well as the laxing of a high vowel with a tautosyllabic coda, which is also characteristic of Quebec French, but is not treated further here. Examples (1*c*), (1*e*), and (1*g*) also provide evidence that these phenomena may occur across word boundaries as well as word-internally.

High-vowel syncope can combine with other phonological processes, such as schwa syncope and consonant voicing assimilation, to result in further variation from underlying phonological forms:

(2) *je suppose* /ʒə sypoːz/ → [ʃpoʊz]

The different types of high-vowel lenition have been argued by some (e.g. Gendron 1966) to be varying degrees of the same process, and by others (Cedergren & Simoneau 1985, among others) to be separate processes resulting independently within the same causative phonological environments. They have been analyzed in depth from phonetic and phonological viewpoints, as well as from a viewpoint incorporating sociodemographic factors (Cedergren, 1985), but to date little research has examined these phenomena with regard to their application as products of varying levels of sociolinguistic style.

The present study approaches Quebec French high-vowel lenition from a combined perspective, considering both social and phonetic variables, with data taken from a corpus of speakers of Quebec French and Parisian French. The paper is organized as follows: Chapter 2 provides a literature review of high-vowel lenition and related phenomena cross-linguistically and in French. Chapter 3 delineates the variables included in this study and the specific research questions relevant to the study. Chapter 4 gives a detailed methodology of the procedures for data collection and analysis. The results of this study, including responses to the research questions, are presented in Chapter 5. Finally, Chapter 6 provides discussion and conclusions from the study.

CHAPTER 2

LITERATURE REVIEW

High-vowel lenition has been attested in various forms in a number of languages, including Shoshoni (McLaughlin 1993; Miller 1972), Lezgian (Chitoran & Babaliyeva 2007), East Cree (Dyck et al. 2014), Andean Spanish (Delforge 2008), and perhaps most famously Japanese (Tsuchida 2001; Varden 1998; etc.), along with many others (Gordon 2012).

2.1 Introduction to the literature

The current literature specific to high-vowel lenition in French is not extensive, and mostly focuses on Quebec French only. Early studies that mention high-vowel devoicing in Quebec French, but that do not provide further detail, include Locke (1949) and Charbonneau (1955). These were followed by the first phonetic analysis of Quebec French high-vowel devoicing by Gendron (1966). This and other experimental studies are detailed further below. In addition to these, Smith (2001) and Torreira and Ernestus (2010) report devoicing of high vowels to be common in European French as well.

2.2 Experimental studies

Gendron (1966) investigated factors affecting high-vowel devoicing in Quebec French only, based on the claim that it never occurs in the French of France, or even in careful speech, (such as radio broadcasts) in Quebec. His subjects—nine from Montreal, eight from Quebec City, and two from Paris for comparison, all born between 1912 and 1936, and all living in Paris at the time of data collection—read a prepared wordlist into a microphone. For /i/ and /y/, the word list contained words with /i/ and /y/ in unstressed internal and initial syllables, with both open and closed syllables for each syllable position. (No data were collected for stressed syllables.) The word list also contained other words as distractors. For /u/, a separate word list was used, which did not have information for all of the syllable types. Gendron notes the presence of both fully and partially devoiced vowels (with some voicing at either the beginning or end of the vowel) among the vowel tokens collected, but classifies all such vowels as devoiced in his final analysis.

Gendron found that nearly half of all high-vowel tokens in internal syllables were devoiced, whereas in initial syllables less than a fifth of these tokens were devoiced. According to his measurements, /i/ is the high-vowel phoneme most likely to devoice, followed closely by /y/ and then by /u/. He found (surprisingly) some examples of high vowels becoming devoiced even when preceded by a voiced consonant, as in *éd**i**fier*, *éd**i**fication*, *hab**i**tation*, *us**i**té*, and *mus**i**calité*. Even more surprising was that in at least some of these cases (Gendron does not specify how many), the leftward consonant had become devoiced as well:

(3) *édification* /edifikasjɔ̃/ → [et͡si̥fi̥kasjɔ̃]

Gendron ultimately concluded that for high vowels in both initial and internal syllables, word length and lexical frequency do not seem to be factors in devoicing, but that rate of speech, syllable position, and consonantal environment (specifically, various sequences of surrounding obstruents) are determining factors. Specifically, the combination of two surrounding voiceless stops (one before and one after the vowel token) is the environment most favoring devoicing, followed by an adjacent voiceless stop and a voiceless fricative (regardless of which comes before the vowel), with the lowest rates of devoicing occurring in environments including one or more voiced obstruents. In addition to these factors, Gendron notes differences in rates of devoicing for different speakers, with one speaker who devoiced regularly in all positions, six who devoiced half of the potential tokens, three who devoiced a fourth of the potential tokens, and others who devoiced only two or three tokens total. Even so, Gendron did not include individual speaker variation in his numerical analysis, and did not address it in his conclusions as a significant factor for predicting devoicing. In addition, Gendron provided only a raw numerical analysis of his results, without any further statistical analysis. Had his data been submitted to statistical verification, at least some of his final results may have been different.

Dumas (1972) recorded seventeen speakers identifying a prepared set of stimuli (275 numbered words elicited from photographs and at least 100 others elicited during conversation) to examine a number of vowel-related phenomena in the French spoken in Montreal, Quebec, including high-vowel lenition. Each of the speakers chosen for Dumas' study was a middle-class native of Montreal between the ages of twenty-five and thirty-five at the time of the study, with no more than a high school education. After the recordings were complete, Dumas transcribed each occurrence of each high vowel in IPA before performing his numerical analysis and forming his conclusions.

Dumas (1972) was the first to remark that deletion is not necessarily linked to devoicing, since deletion occurs between voiced as well as voiceless consonants, but devoicing generally only occurs between voiceless consonants. He makes a clear distinction between realizations of high vowels in stressed and unstressed syllables, finding both devoicing and deletion to be unattested in stressed syllables, but common in unstressed syllables. Based on the same data as well as further research, Dumas (1987) later acknowledged the complex relationship between deletion and devoicing, noting that in many cases, especially after fricatives, high-vowel devoicing may make it appear that the vowel in question has been deleted, even when audible and visible traces and vowel duration indicate that it has not. Even so, Dumas asserts that in some cases, syncopated forms may have become so common as to suggest a relexicalization of the word with the deleted vowel missing, as with the word *frigidaire*, which he suggests has, for the grand majority of his speakers, been relexicalized as /fʀiʒdaᵋʁ/ (Dumas' transcription; cf. European French /fʁiʒidɛʁ/).

Cedergren and Simoneau (1985) provide the most comprehensive study of high-vowel lenition in Quebec French. Theirs is also the first study to distinguish fully between devoicing, shortening, and deletion as three possibly separate phenomena. Cedergren and Simoneau's data come from recordings of 60 Quebec French speakers from the Sankoff-Cedergren corpus (Sankoff & Cedergren 1972). The large number of speakers allowed them to perform extensive statistical analyses, and also made theirs the first study on French high-vowel lenition to incorporate sociolinguistic factors to any significant degree.

For each speaker, researchers transcribed every occurrence within a fifteen-minute block of each of the high-vowel tokens /i/, /y/, and /u/, along with the vowel token's phonological and syntactic contexts. Each vowel token was coded as either "present", "absent", or "not perceived" (used for unclear cases, which were later reclassified) based on the transcriber's perception of the vowel or lack thereof. After auditory coding was complete, each vowel token coded as "absent" was also submitted to spectrographic analysis. In some cases, vowel tokens which had been coded as "absent" during auditory coding still retained visible traces in the spectrographic analysis, leading Cedergren and Simoneau to class these as examples of "false syncope". Of these vowel tokens, those which had a duration of less than 30 ms were reclassified as "shortened", and those with no visible trace of voicing were classified as "devoiced". Tokens in which the vowel (always /i/) appeared superimposed on a consonant (usually a fricative) were eliminated from the analysis. Vowel tokens in words containing multiple high vowels—such as *civilisation*—were uniformly classified as "present" due to the difficulty of determining which vowel was being deleted.

The social factors Cedergren and Simoneau investigated were age, gender, and linguistic market integration. Other factors included original vowel phoneme, left context, right context, word type, and position of the token in relation to the stressed syllable (either pretonic or not). Ultimately they found that not all factors were significant for all groups. Segmental context was a strong predictor in all cases.

The most significant linguistic indicators for full syncope were segmental context—for both men and women—and word type (function or content, with function words affected more than content words) and position in relation to word stress—for women only; the most significant social indicators were linguistic market integration for women and age for men, with younger age groups producing more syncope (i.e. deleting more high vowels) than older groups. With regard to consonant environment, they note that overall, greater constriction (i.e. presence of fricative or leftward affricate consonants) and voicelessness of surrounding consonants favor deletion. They remark that voiced stops and sonorants discourage syncope, as well as syllables with complex onsets. Based on similarities between the determining factors for deletion and length reduction, Cedergren and Simoneau posit that the two phenomena are in fact two modalities of a single mechanism, whereas devoicing is an entirely separate process.

With regard to high-vowel shortening, Cedergren and Simoneau remark that more than half of the vowels analyzed acoustically (i.e. half of all vowels coded in the auditory coding as not perceived) were of short duration. They also remark that at the time of their writing there was no literature specifically addressing length reduction of high vowels. They report that neighboring fricatives especially encourage reduction, and also that among men, even nasals encourage reduction. They note a general decline in reduction for women (meaning that fewer younger women reduce vowels compared to older women), but an increase for men, with a particular proclivity for length reduction exhibited by the least educated of the young men.

For devoicing, Cedergren and Simoneau identify preceding context as the most significant factor for men, followed by following context, age, and linguistic market integration. For women the two contexts are reversed: the following context is the most significant factor, followed by preceding context, age, and position in relation to word accent. In general then, consonant environment is the greatest determining factor. Where Dumas (1972) had reported voiceless stops as an important factor in devoicing, Cedergren and Simoneau found that fricatives were again better predictors; they also remark that voicing of the preceding consonant does not appear to block the process, but voicing of the following context does. They conclude that the combination which best favors devoicing is fricative_$\text{OBSTRUENT}_{[-\text{voi}]}$, and also note that the high front vowels /i/ and /y/ devoice more than the back vowel /u/.

Although Cedergren and Simoneau ultimately concluded, based on the factors influencing each phenomenon, that the specific phonological contexts favoring deletion and shortening were different from those favoring devoicing, for all three phenomena, the phonological environment was the most significant factor, with surrounding voiceless consonants, and specifically fricative surrounding consonants, as the best predictors in all cases. They also claim that schwa deletion in French relies on the same underlying principle as high-vowel deletion, and they strongly suggest that these processes are continuations of similar types of lenition that occurred in Latin.

Dumas (1987) briefly discusses both shortening/deletion (which he, like Cedergren and Simoneau, classifies as different forms of the same phenomenon) and devoicing, and gives a few examples of each. Based on data from his previous (i.e. Dumas 1972) and continuing research, he concludes that devoicing is primarily motivated by surrounding voiceless consonants, and that shortening/deletion is primarily motivated by a surrounding continuant and a stop (in either order), or by a series of two surrounding continuants, as in *village* [vlaʒ]. He argues that in some cases, deletion may be complete enough that a word may be argued to have undergone relexicalization, as with the

Montreal street name *De Lorimier*, which is so consistently pronounced without the medial /i/ that even when directly challenged, many locals will spell it as *De Lormier*. Dumas goes on to compare the French of Quebec and "standard" French, arguing that in both varieties, the underlying weakness of these vowels is also due to rhythmic variations inherent to the language.

Ouellet and colleagues (1999) analyze weakening effects on high vowels in Canadian French by comparing realizations of these vowels for a speaker of an unspecified variety of Canadian French and a speaker of European French. Their speakers—both "professional speakers" (Ouellet et al. 1999:1)—were recorded reading from a corpus of 102 sentences from the French newspaper *Le Monde*. From these recordings, a total of 396 high-vowel tokens (per speaker) were then measured for duration and their F1 and F2 values taken from the middle of each vowel. Ouellet et al. remark that "[h]igh vowels are characterized in Canadian French, by the extreme variability of their phonetic realizations" and further observe that "[d]evoicing, shortening and deletion make up […] three stages in the weakening process". Their data support findings by Dumas (1972) and Cedergren and Simoneau (1987) (but contra Gendron 1966) that these phenomena occur in closed as well as open syllables. Although their own study did not encounter any examples of complete deletion, they also remark that length reduction may occur in voiced environments, but devoicing may not, suggesting once again that these may be separate phenomena.

Ouellet and colleagues remark—but do not provide evidence to support the claim—that these phenomena "are generally less frequent in reading than in spontaneous discourse" (Ouellet et al. 1999:4). Taking into account the professions of both of their speakers and the nature of their data, this may at least partially explain the lack of full deletion in their data. In particular, the Canadian French speaker was not only a professional speaker, but was reading prepared sentences from a newspaper written in European French. The complete lack of deletion in the data of Ouellet et al. (1999) is in line with Gendron's (1966) earlier assertion that these phenomena did not occur at all in European French, or in the careful speech of radio and news announcers.

2.3 Related studies

Apart from these more in-depth experimental studies, other studies which at least refer to or provide examples of high-vowel lenition in French are Phinney (1981), Picard (1991), and Beckman (1996).

Phinney (1981) discusses patterns of rhythm and stress in French, and suggests that Iambic Reversal (Liberman & Prince 1977) may account for some instances of weakened high vowels in Quebec French, as in 'des couleurs claires' [de k(u)lœːr klέir] (Phinney's transcription), although she gives no indication as to which type of weakening (e.g. shortening, deletion, devoicing, or some other phenomenon) this refers to.

Picard (1991), similar to Cedergren and Simoneau (1985), argues that many of the phonological changes apparent in Quebec French are simply the same processes that were at work in the historical transition from Latin to French. He cites a number of examples of high-vowel deletion, including one which appears to exhibit metonymy, a process that to my knowledge remains heretofore unmentioned in the literature on Quebec French high-vowel deletion.

Beckman (1996) compares high-vowel lenition in Montreal French to similar processes in other languages, and concludes that the different processes of high-vowel lenition are graded (i.e. gradient) phenomena, rather than the categorical phenomena advocated in “earlier phonological descriptions”. She also introduces a distinction between two different types of high-vowel lenition cross-linguistically: one (represented by English and German) which though still graded leads to full deletion; and the other, which she describes as a graded process of devoicing ultimately leading to deletion (contra Cedergren and Simoneau’s assertion that these are two separate processes), and which she claims is the type apparent in Montreal French (as well as Japanese and Korean). Beckman also notes the possibility that for Montreal French, these phenomena may or may not be considered prestigious. This is in contrast to Japanese, for which the prestige variety explicitly incorporates high-vowel devoicing as part of the standard used in broadcast media.

2.4 Summary of literature review

Each of the abovementioned studies was conducted with different questions in mind and differing methodologies, making exact comparison between the results of the studies impossible. For example, Gendron (1966) found no examples of actual deletion, and therefore analyzed only devoicing, but suggested that this devoicing could possibly lead to full deletion in future generations. While it is possible that the process of high-vowel deletion had not yet begun in Quebec French at the time of Gendron’s writing, it is equally possible that Gendron’s speakers did not exhibit deletion due to the nature of his study, or due to the fact that they were all living in Paris at the time of the study. Shortly after Gendron’s (1966) study, Dumas (1972) provided clear examples and analysis of both devoicing and deletion. Phinney (1981) mentioned an unspecified type of high-vowel weakening only as it applied to her concept of Iambic Reversal. Similarly, Picard (1991) and Beckman (1996) were primarily interested in changes in the pronunciation of Quebec French in general and cross-linguistic comparisons of these phenomena in various languages, respectively, and not specifically in high-vowel devoicing or other forms of high-vowel lenition. Even so, the conclusions of these various studies allow some predictions to be made. Dumas (1972; 1987), Cedergren and Simoneau (1985), and Ouellet et al. (1999) all provide evidence that high-vowel shortening and deletion are two manifestations of the same process, but that high-vowel devoicing is a separate process. Similarly, these experimental studies, as well as Gendron (1966), cite consonantal environment as the strongest predictor of both devoicing and deletion/shortening, with high vowels most likely to devoice between voiceless obstruents and most likely to be shortened or deleted between stops (regardless of their voicing). While each of these studies included social variables, such as age, gender, and provenance (in the case of Gendron 1966, and Ouellet et al. 1999), no study found these to be significant to the same level as other more purely linguistic factors, and the only study to include analysis for multiple provenances (Ouellet et al. 1999) included only one speaker for each, both of whom were professional radio announcers. It may be that further investigation into these social factors will reveal more significant results.

CHAPTER 3

CORPUS, VARIABLES, AND RESEARCH QUESTIONS

Data for the study were taken from a corpus managed by Jacques Durand, Marie-Hélène Côté, Bernard Laks, and Chantal Lyche as part of the *Phonologie du Français Contemporain* (PFC) project (Durand et al. 2002; 2009). Access to this corpus is available at http://www.projet-pfc.net. This study made use of the full corpus, which is available to researchers who agree to a number of requirements, including the requirement that a link to the project website be included in the material of any research conducted using the corpus.

3.1 The PFC corpus

The PFC corpus provides access to recordings and orthographic transcriptions of interviews performed between 1999 and 2008, with speakers of various ages, socioeconomic backgrounds, occupations, and education levels, from a number of French-speaking locales throughout the world. In general, speakers who contribute to the corpus participate in four different interview segments: (1) Reading a prepared wordlist out loud; (2) reading a prepared prose text out loud; (3) responding to a number of prepared questions in a guided conversation with the interviewer; and (4) participating in free conversation with another local resident, whom they generally know personally. For most speakers, the PFC corpus provides detailed demographic information, indicating the speaker's age, occupation, level of education, other languages spoken, and so on, generally also including this same information for the speaker's parents. In addition to this, the PFC corpus provides coding data for a number of linguistic phenomena specific to the French language, such as schwa deletion and *liaison*.

The data for this study consist of tokens of the high vowels /i/, /y/, and /u/ taken from a total of 15 speakers from Paris and Quebec, with three men and three women from Paris, and three men and six women from Quebec. The corpus metadata available for each speaker vary, with year of birth and gender available for all Paris speakers, but only gender available for Quebec speakers. Although it was not included in the corpus metadata, the majority of Quebec speakers volunteered their date of birth during the course of the interviews contained in the corpus. All of the subjects of this study for whom the year of birth was available were born between 1970 and 1981. Based on information volunteered during the course of interviews, all of the Paris speakers were from the city of Paris. At the time the corpus interviews were conducted, all of the Quebec speakers were university students from the province of Quebec, living in Quebec City, and completing undergraduate- or graduate-level work at the (French-language) Université de Laval, with the exception of two speakers, who, based on information volunteered during interviews, were instructors at the university. These nine speakers were the only speakers available in the corpus from the province of Quebec. The majority of the subjects interviewed in Quebec were students in linguistics, who had been invited to participate in the PFC project after hearing a talk by the interviewer, who is also a linguist and a native of France. As such, some of the interviews directly address differences between Quebec French and European French, suggesting that the subjects may have been more linguistically aware during the interviews than would normally be desirable.

Due to concerns by Dumas (1972) and Cedergren and Simoneau (1985) regarding the artificiality of reading prepared texts, as well as comments by Ouellet et al. to the effect that reading activities seem to inhibit actual occurrences of high-vowel deletion, only the guided- and free-conversation portions of the interview were used in the present study. While the recordings of the guided and free conversations were generally around 10 minutes long, some were shorter than five minutes. In addition, the two speakers who identified themselves as instructors at the university participated in extended guided conversations, but no free conversation. For the present study, the guided- and free-conversation interviews were used to approximate two different speech styles, assuming a somewhat more formal style for the guided-conversation interview and a less formal style for the free-conversation interview.

3.2 Dependent and independent variables

3.2.1 Dependent variables

The dependent variables included in this study are DELETION and DEVOICING. I adopt Cedergren and Simoneau's (1985) and Ouellet's (1999) conclusion that length reduction and deletion are two manifestations of the same process, and that devoicing is a separate but related process. The criteria used to classify a high-vowel token as either deleted or present, and as either devoiced or voiced, are given in detail below.

3.2.2 Independent variables

3.2.2.1 Phonetic variables. The independent phonetic variables included in this study are LEFT-CONTEXT VOICING, RIGHT-CONTEXT VOICING, LEFT-CONTEXT PLACE, RIGHT-CONTEXT PLACE, LEFT-CONTEXT MANNER, and RIGHT-CONTEXT MANNER, following results by Gendron (1966), Dumas (1972), and Cedergren and Simoneau (1985), which suggest that consonantal context is one of the primary predictors of DELETION and DEVOICING. In addition, VOWEL PHONEME is also included as an independent phonetic variable, in order to allow comparison of results for each of the high-vowel phonemes /i/, /y/, and /u/.

3.2.2.2 Social variables. Due to the fact that all of the subjects included in this study are of similar age and education, insofar as the data from the PFC corpus are accurate, the sociolinguistic variables included are limited to those which vary between speakers. Specifically, the sociolinguistics variables addressed in this study are PROVENANCE, GENDER, and STYLE.

The variable PROVENANCE refers to whether a given speaker is from Quebec or from Paris, and is thus limited to two possible values: “Quebec” or “Paris”, as reported by interviewees and included in the corpus metadata. Because each of the subjects reported his or her own gender unambiguously as either male or female, the variable GENDER also has only two possible values for the purposes of this study. The variable STYLE likewise has two possible values—“Guided” and “Free”—based on the guided and free conversation styles.

3.3 Research questions

This study seeks to confirm and expand upon the results of previous studies by addressing each of the following research questions:

1. Can statistical analysis confirm, as suggested in previous studies, that DELETION and DEVOICING are best predicted by different factors, or are they predicted by the same factors?
2. How do instances of DELETION and DEVOICING compare between speakers from Quebec and speakers from Paris, between women and men, and between the Guided and Free STYLES?
3. Is there a difference in statistical significance between the primarily social variables PROVENANCE, GENDER, and STYLE and the primarily phonetic variables LEFT CONTEXT and RIGHT CONTEXT and VOWEL PHONEME?
4. Are the three high-vowel phonemes /i/, /y/, and /u/ affected by the same factors, and thus better analyzed as a group, or by different factors, suggesting that they should be treated separately?

CHAPTER 4

METHODOLOGY

4.1 Obtaining tokens

The corpus provides a separate set of files for each speaker, including, among others, an audio file of each interview in uncompressed WAV format and a time-aligned Praat (Boersma & Weenink 1996) textgrid file for each interview, containing a full time-aligned orthographic transcription of the interview.

High-vowel tokens were identified orthographically, that is, by using the "Find" function in Praat to find all instances of their orthographic equivalents (given in the table below) within the time-aligned transcript.

(4) *Orthographic equivalents of high-vowel phonemes*

Phoneme	Orthographic equivalent(s) used for identification
/i/	‹i›, ‹y›
/y/	‹u›, ‹û›
/u/	‹ou›

In French, the glide phones [j], [ɥ], and [w] are allophonic variants of their vowel counterparts /i/, /y/, and /u/ and are identical to them in the orthographic system. These glide variants were excluded as tokens, following Cedergren and Simoneau's (1985) logic that because these only appear neighboring other vowels, their voicing cannot be productively compared to that of their allophones, which appear only between consonants. In some cases, this choice led to the exclusion of further tokens, such as the /i/ token in the word *il* when occurring before or after another vowel, since in Quebec French it is frequently pronounced as [j] in these contexts. Similarly, the /i/ token in the phrase *c'est à dire* was excluded due to the phrase's frequent pronunciation by Paris speakers as a single syllable (usually realized as [sejʁ]).

In general, each interview was approximately ten minutes (600 seconds) long, although some were shorter. For both the guided and the free conversations for each speaker, tokens were collected beginning half-way through the interview at 300 seconds in order to allow speakers to settle into the conversation and begin speaking more naturally. For each speaker and interview type, the first twenty tokens after the 300-second mark were collected for each vowel phoneme. Six of the thirty interviews were less than ten minutes long, with two interviews just over 7-and-a-half minutes, three around 6-and-a-half minutes, and the shortest at only 2 minutes and 18 seconds long. Many of these interviews still provided twenty tokens for each vowel after the 300-second mark; for those that did not, additional tokens were collected by moving backwards from the 300-second mark, in order to remain near the middle of the interview. In a few cases, there were still fewer than twenty tokens available for some vowels for some speakers. Even counting these discrepancies, the average number of tokens per vowel phoneme, per interview, per speaker was approximately 18. The total numbers of vowel tokens for each speaker for each interview are given in Table 1.

After identifying potential tokens orthographically, each token was marked in a separate interval in the relevant time-aligned Praat textgrid. Tokens for each vowel

Table 1

Tokens per interview per speaker

Speaker code	Free	Guided	Total tokens
75C-CB2	60	59	119
75C-CM1	51	55	106
75C-CR1	60	57	117
75C-LC1	47	59	106
75C-SB1	101	65	166
75C-VL1	60	57	117
CQA-AB1	60	59	119
CQA-CP1*	N/A	59	59
CQA-CP2*	N/A	58	58
CQA-GS1	57	60	117
CQA-JR1	39	60	99
CQA-JS1	49	60	109
CQA-MG1	58	60	118
CQA-MS1	60	60	120
CQA-MT1	39	16	55

* The speakers indicated did not participate in the free conversation.

phoneme were stored in separate, newly created tiers within the textgrid. While the textgrids provided with the corpus were time-aligned, this alignment was phrase-based rather than word- or phone-based. Because of this, a number of automatic- and forced-alignment tools (e.g. Goldman 2011; Lacheret et al. 2014; Milne 2014; Rosenfelder et al. 2011) were initially considered to allow for automatic identification of individual phones, followed by automatic calculation of duration measurements of each vowel token. This possibility was ultimately rejected for a number of reasons: First, although automated interval alignment and subsequent duration measurements would be consistent across all vowel tokens, the complexity of the tokens in question may have rendered these alignments and measurements less accurate, especially in cases such as those mentioned above, in which multiple cues (auditory as well as visual) were necessary to identify the beginning and end of each vowel. Second, this study deals with dialectal French variation in interviews with multiple speakers, with frequent instances of speech interruption and overlap, whereas the auditory alignment tools that are readily available are specifically designed for use with data from individual speakers, usually in laboratory settings. Furthermore, these alignment tools are generally designed and trained for English-language input. Although a few tools exist for automatic alignment of French data, they must be trained to a specific dialect of French, rather than multiple dialects, sometimes overlapping, in order to work effectively. This training must also be done with individual speakers in laboratory settings. Due to these reasons, the use of automatic alignment software was rendered impractical and the individual intervals for each high-vowel token were created by hand as described below.

Following the initial marking of the approximate location of each vowel token within its respective phoneme tier, the duration of each token was marked according to the following criteria: (1) The beginning and end of each vowel token were marked in the appropriate time-aligned textgrid to correspond with the beginning and end of the visual presence of at least the first two formants of the vowel (following Cedergren and Simoneau 1985) in the corresponding spectrogram. (2) In cases where a vowel was clearly audible but formants were not clearly visible, the beginning and end of the vowel were marked to correspond with the beginning and end of change in the visible pitch contour made possible through Praat's automated pitch display. (3) If neither the presence of vowel formants nor the combination of auditory cues (such as the audible beginning or end of voicing, etc.) and visual pitch contour made clear that a vowel was distinct from its surrounding consonants (i.e. if the vowel was completely deleted), the location of the vowel was marked at the boundary between the surrounding consonants as a zero-millisecond vowel interval. Even in cases in which the vowel was audibly more consonantal than vocalic, the presence of vowel formants in the spectrogram—and often auditory cues as well—frequently confirmed that the underlying vowel remained distinct from the surrounding consonants, as demonstrated in Figure 1. Due to their clear differentiation from the surrounding consonant phones, cases such as that in Figure 1 that were over 30 ms were considered undeleted vowels for the purpose of statistical analysis, based on the presence of the first two vowel formants, even when their audible realization may have seemed to be more consonant-like. This type of vowel is one of the types of vowels which both Dumas (1972) and Cedergren and Simoneau referred to as examples of apparent deletion or false syncope. In order to avoid inconsistencies in interval marking, each vowel token interval was placed while viewing the spectrogram at

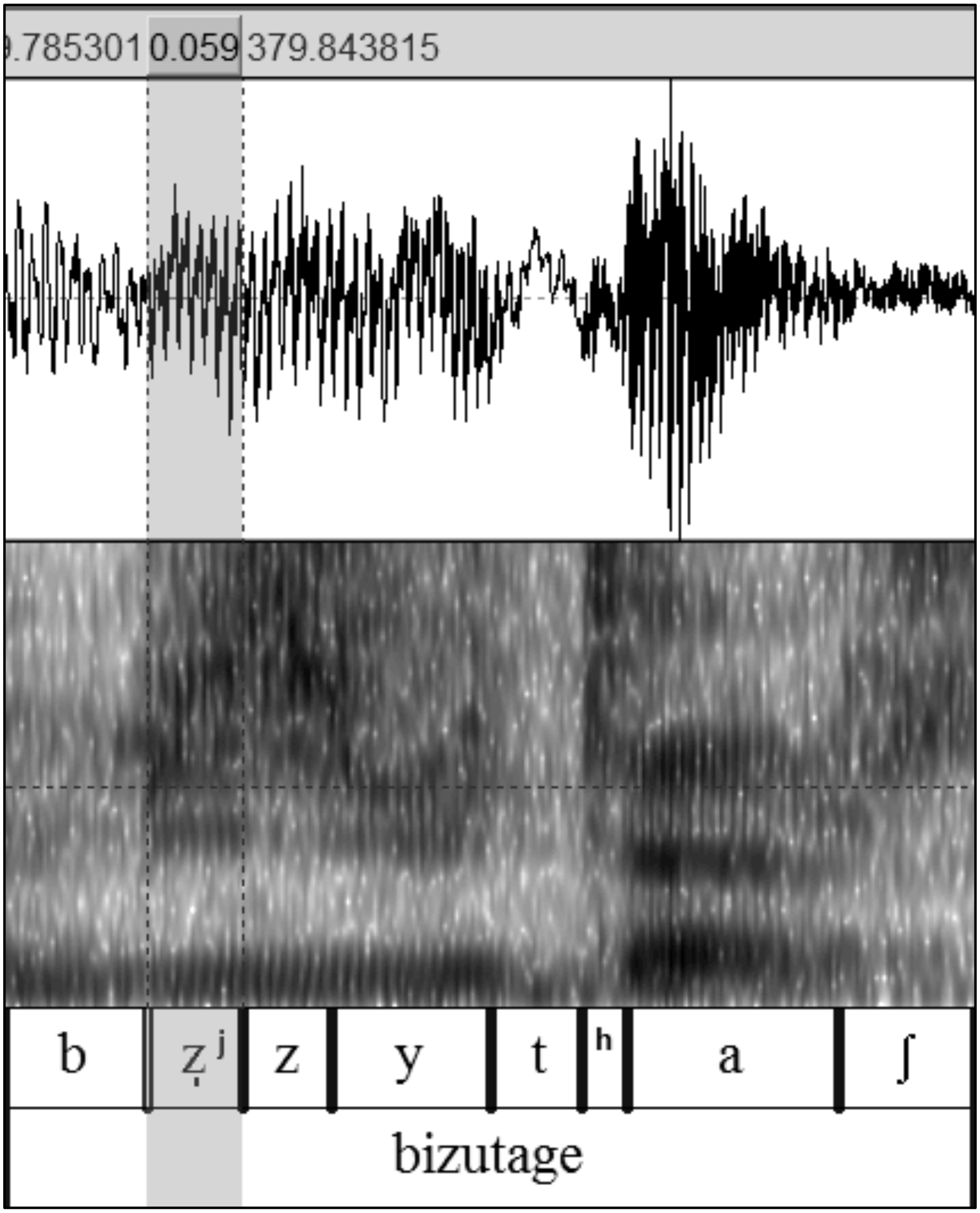

Figure 1. A fricativized vowel retaining full vowel formants

approximately the same zoom level in Praat, with approximately 200 milliseconds visible.

4.1.1 Auditory coding and token extraction

After the identification and marking of vowel tokens as time-aligned textgrid intervals were completed, each vowel token was coded within its textgrid interval in narrow phonetic transcription using the International Phonetic Alphabet (IPA). This auditory transcription was performed by the researcher—a near-native speaker of French with training in IPA transcription. Coding each token using IPA characters and diacritics allowed for both broad distinctions, such as those between tense and lax vowels, and narrower distinctions, such as indicating the voicing, fronting, backing, raising, lowering, palatalization, rounding, rhoticity, or syllabicity of a segment. Each vowel token was listened to multiple times to assure accurate transcription, according to the following guidelines: First, the vowel token was sampled within its syllable environment; it was then sampled independent of its syllable environment; and finally it was sampled within the context of the entire containing word or phrase. The immediate consonant context—i.e. the preceding and following consonants—were also transcribed in IPA based on auditory rather than orthographic cues. All auditory coding was performed using in-ear headphones in order to eliminate the interference of outside noise to the extent possible.

Once every token for each speaker, each interview, and each vowel phoneme had been coded auditorily, the corresponding Praat textgrids were extracted into separate files. Values for additional data points, such as the duration of each vowel token and the voicing, place, and manner of articulation of the surrounding consonants, were derived from the start and end times of each vowel interval and from the relevant IPA transcriptions. In addition to these data, binary classifications of each vowel token as either “voiced” or “voiceless” and as either “present” or “deleted” were established, based on the following criteria: A vowel token was classified as voiceless if its IPA transcription contained the voiceless diacritic (as in [u̥]) or if it was transcribed as a voiceless syllabic consonant (such as [ç̩]). Whether an individual vowel token is classified as deleted is based on auditory coding and confirmed by the vowel’s duration measured in milliseconds, with the threshold for deletion set at 30 ms (following Cedergren and Simoneau 1985, and Ouellet et al. 1999). Devoicing is determined by the presence or lack of auditory voicing, along with the presence or lack of a voicing bar in the relevant spectrogram . Although Cedergren and Simoneau (1985) note that in some cases devoicing is not complete, with either the beginning or end of a vowel still retaining some voicing, for the purposes of this study, tokens classified as voiceless are those for which there is no noticeable voicing (either auditory or in the spectrogram) for the duration of the vowel.

4.2 Data analysis

Following the completion of all data coding, initial summary statistics of the data were calculated, with the following raw numerical results:

The total number of high-vowel tokens collected was 1585, with 854 tokens from Quebec speakers and 731 tokens from Paris speakers. The numbers of tokens from female versus male speakers were also unequal, with female speakers providing 970 tokens and male speakers providing 615. Similarly, there were a total of 844 tokens from the guided conversations, and only 741 from the free conversations.

The uneven numbers of tokens for each of the variables PROVENANCE, GENDER, and STYLE made it necessary to analyze the data using a nonparametric statistical model in order to allow comparisons to be made across speakers and other variables, even though the frequency distribution for different variables was other than normal.

Similarly, the number and complexity of independent variables in the present study, including both social (PROVENANCE, GENDER, and STYLE) and phonetic variables (LEFT-CONTEXT VOICING, RIGHT-CONTEXT VOICING, LEFT-CONTEXT PLACE, RIGHT-CONTEXT PLACE, LEFT-CONTEXT MANNER, and RIGHT-CONTEXT MANNER), called for a statistical logistic regression model to compare the effects of all of these variables on the dependent variables—DELETION and DEVOICING. Logistic regression allows for comparison of multiple types of independent variables made up of binary categorical data. In the case of the present study, comparing only those tokens produced by Quebec speakers to those produced by Paris speakers gives initial results that are not borne out statistically; for example, raw numerical analysis of the rates of deletion for Quebec speakers versus Paris speakers seems to indicate that speakers from Quebec have higher overall rates of deletion than speakers from Paris. These initial results appear to be convincing, but statistical analysis using a logistic regression model reveals that the variable PROVENANCE is not statistically significant at the aggregate level when compared with other variables. (For full discussion, see Chapter 5.)

Finally, my data provide clear examples of individual variation as a possibly confounding variable: Although in general, Quebec speakers deleted 25% of high-vowel tokens and devoiced 11% of the remaining undeleted tokens, one speaker from Quebec deleted only 8% and devoiced only 2% of relevant tokens. Similarly, although Paris speakers in general deleted 19% of high-vowel tokens and devoiced 11% of remaining undeleted tokens, one speaker deleted as many as 31% and devoiced as many as 33% of relevant tokens. Due to the otherwise confounding effects of individual speaker variation on related variables, such as that speaker's PROVENANCE, GENDER, or STYLE, SPEAKER was included as a random effect in each of the statistical models detailed below (see Hay, 2011, for a similar example and further explanation).

For this study, all tokens were statistically analyzed using R (R Development Core Team 2008), a free statistical package based on the S programming language that allows for complex statistical modeling, including mixed effects logistic regression. Tokens and other data contained in the main data spreadsheet were imported into R in the form of a CSV file. In order to address the issue of whether it can be confirmed that DELETION and DEVOICING are separate processes, separate individual statistical models were created for DELETION and DEVOICING, including all of the independent social and phonetic variables in each model. In the case of DELETION, the model returned usable results. In the case of DEVOICING, due to small numbers of relevant tokens for certain variables, the model failed to produce statistically significant results. In cases such as this, more refined models in many cases provided results that were not available at the aggregate level. These specific models were created for comparison of DELETION and DEVOICING with specific groups of variables, one for comparing the various sociolinguistic variables, and another for comparing the various phonetic variables to each other, as well as individual models comparing the results of the different values of each social variable (for example, comparing results from Quebec speakers to results from Paris speakers).

The output of the R statistical package is given in five columns: The first column is a list of the different independent variables included in the model as fixed effects, along with the combined "Intercept" effect, which serves as a baseline and may represent the effects of other variables not included in the statistical model as either fixed or random effects. All independent variables are treated as binary, with the effect of one of each of the binary options set to zero (i.e. no effect) and the other's effect calculated in relation to the first. For example the variable PROVENANCE may be given in terms of the effect of PROVENANCE=Quebec, with the effect of PROVENANCE=Paris set to zero. The second column gives an estimate, in the form of a logarithmic odds coefficient, of the strength and direction of the effect of a particular variable. In the present study, negative values indicate that the corresponding effect disfavors deletion, while positive values indicate that the corresponding effect favors deletion. The further the estimate is from zero, the greater the effect. Logarithmic odds are calculated as a function of probability values, with values stretching from negative infinity to zero, and from zero to positive infinity. The third and fourth columns contain the standard error and the *z* value for each effect. If a variable's standard error is large, this means that estimates regarding its effect cannot be taken as reliable. In most cases, a large standard error is due to a very large estimate coefficient (whether positive or negative), or a very small sample size of relevant tokens for that particular variable. The *z* value is used to calculate the last column, which is a probability measurement, indicating the statistical significance of the corresponding variable. For convenience, R also provides different significance codes next to this column, which can be interpreted as follows: Three stars (***) indicate values between 0 and 0.001 (alternatively written as $p < 0.001$); two stars (**) indicate values between 0.001 and 0.01 ($p < 0.01$); a single star (*) indicates values between 0.01 and 0.05 ($p < 0.05$); a dot (·) indicates values between 0.05 and 0.1 ($p < 0.1$); and a blank space ( ) indicates any value between 0.1 and 1 ($p \leq 1$). For this study, only those effects with a probability measurement of $p < 0.05$ (indicated by a single, double, or triple star) are considered statistically significant.

As noted above, a number of different models were created in order to compare the effects of the various independent variables. Not all of these models produced statistically significant results. For both DELETION and DEVOICING, aggregate models were created containing all tokens indiscriminately. Separate models were then created to compare the effects of the social variables PROVENANCE, GENDER, and STYLE and the phonetic variables LEFT-CONTEXT VOICING, RIGHT-CONTEXT VOICING, LEFT-CONTEXT PLACE, RIGHT-CONTEXT PLACE, LEFT-CONTEXT MANNER, and RIGHT-CONTEXT MANNER. In addition, separate models were created for each of the individual social variables (PROVENANCE, GENDER, and STYLE), in order to allow for more clear comparisons between their individual values (Quebec versus Paris, female versus male, and guided versus free style, respectively). The results of each of these models are presented in detail in Chapter 5.

CHAPTER 5

RESULTS

5.1 Initial numerical results

There were a total of 1585 tokens combined for all high-vowel phonemes for both Quebec and Paris speakers, giving an average of approximately 106 tokens per speaker. Of the 1585 total tokens, 358 (22.6%) were deleted and 134 (8.5%) were devoiced. Separating the results for Quebec speakers and Paris speakers provides some interesting insights: A total of 854 tokens were collected from Quebec speakers, 217 of which (25.4%) were deleted and 67 of which (7.9%) were devoiced; from Paris speakers, a total of 731 tokens were collected, with 141 tokens deleted (19.3%) and 67 devoiced (9.2%). (The identical number of devoiced tokens from both Quebec speakers and Paris speakers was an unusual coincidence.) These results are summarized below in Table 2.

A raw numerical summary of the aggregate results for speakers from Quebec versus Paris, women versus men, guided versus free styles, and each of the vowel phonemes /i/, /y/, and /u/ is provided in Table 2 only for comparison with other studies (such as Gendron 1966) which provide no statistical analysis. Because the effects investigated in these raw results are not all statistically significant, these numbers cannot be used to draw general conclusions about the relevant phenomena.

Table 2

Tokens DELETED and DEVOICED,
separated by social variables and VOWEL PHONEME

Variables	Total	Deleted (%)	Devoiced (%)
Aggregate	1585	358 (22.6%)	134 (8.5%)
Quebec	854	217 (25.4%)	67 (7.8%)
Paris	731	141 (19.3%)	67 (9.2%)
Women	970	225 (23.2%)	93 (9.6%)
Men	615	133 (21.6%)	41 (6.7%)
Guided	844	203 (24.2%)	61 (7.2%)
Free	741	155 (20.9%)	73 (9.9%)
/i/	552	123 (22.3%)	37 (6.7%)
/u/	487	75 (15.4%)	53 (10.9%)
/y/	546	160 (29.3%)	44 (8.1%)

5.2 Statistical results

Separate mixed methods logistic regression models were created for devoicing and deletion, first at the aggregate level (i.e. with all tokens included), and later with separate models for each of the values of the social factors PROVENANCE, GENDER, and STYLE. Finally, separate models were created for each VOWEL PHONEME /i/, /y/, and /u/. In general, each model was created using "fine" phonological classification for LEFT- and RIGHT-CONTEXT PLACE, using the individual places of articulation BILABIAL, LABIODENTAL, ALVEOLAR, POSTALVEOLAR, PALATAL, VELAR, UVULAR, and GLOTTAL; some statistical models failed to produce significant results with the fine classification, but were able to produce results with a more "coarse" phonological classification, making us of the broader phonological place categories LABIAL, CORONAL, DORSAL, and POST-VELAR. In some cases, the coarse model was able to identify statistically significant effects when the finer model was unable to, or was able to obtain results with more acceptable levels of standard error in cases where the fine model produced unacceptably high standard errors for a large number of factors. In these cases, the use of the coarse model is indicated.

The results of each statistical model are presented here according to the research question they address. For models whose output is greater than a full page, only statistically significant and nearly significant ($p < 0.1$) effects are presented here.

5.2.1 Comparison of Deletion and Devoicing

In agreement with previous studies, the factors that favor and disfavor high-vowel lenition are, for the most part, different for DELETION and DEVOICING. As demonstrated in

Table 3, the best predictors in favor of deletion are rightward nasal consonants and the underlying vowel phoneme /y/. Left- or rightward liquids, leftward stops, and rightward palatal consonants all disfavor deletion. The voicing or voicelessness of surrounding consonants are not significant predictors of deletion at the aggregate level, and neither are any of the social factors PROVENANCE, GENDER, and STYLE, although STYLE is near the significance threshold at $p < 0.054$. In addition to these known variables, other unknown (i.e. Intercept) effects are also significant predictors of deletion.

For devoicing, the aggregate statistical model failed to converge (i.e. to produce statistically valid results), likely due to the low number of tokens devoiced overall—134 tokens out of 1585 total (8.5%), compared to 358 out of 1585 (22.6%) for deletion. However, using broader phonological categories for LEFT- and RIGHT-CONTEXT PLACE allowed the model to converge. As can be seen in Table 4, in contrast with deletion, the best overall predictors in favor of devoicing are (unsurprisingly) voiceless surrounding consonants, along with leftward fricatives, rightward dorsals, and the underlying vowel phoneme /u/. Rightward labials favor devoicing significantly, but leftward labials disfavor devoicing. As with deletion, the aggregate model for devoicing was not significantly affected by the social factors PROVENANCE, GENDER, and STYLE, but there are significant Intercept effects disfavoring deletion.

Ultimately, the different results for high-vowel deletion and devoicing suggest that these two phenomena are best understood as separate processes which occur in the same environments, but which are nevertheless affected by different variables. While both are affected to a greater degree by their consonantal environments than by other factors, the specific consonantal conditions associated with each phenomenon differ.

Table 3

Aggregate model for DELETION

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−1.24880	0.34739	−3.595	0.000325	***
L=liquid	−0.94775	0.31357	−3.022	0.002507	**
VOWEL=/y/	0.40212	0.15463	2.601	0.009308	**
R=liquid	−0.82052	0.31893	−2.573	0.01009	*
R=nasal	0.63366	0.27594	2.296	0.021653	*
R=palatal	−2.63516	1.30374	−2.021	0.043255	*
L=stop	−0.38984	0.19672	−1.982	0.047512	*
STYLE=Guided	0.26109	0.13572	1.924	0.054395	·
L=voiceless	0.33906	0.17886	1.896	0.058003	·
R=voiceless	0.31694	0.17338	1.828	0.067553	·

Table 4

Aggregate model for DEVOICING

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−5.191000	0.678800	−7.648	0.000000	***
L=voiceless	2.800000	0.533200	5.251	0.000000	***
R=voiceless	0.770500	0.275800	2.794	0.005210	**
L=fricative	1.590000	0.639700	2.486	0.012920	*
VOWEL=/u/	0.660100	0.266300	2.479	0.013180	*
R=Dorsal	0.773100	0.341700	2.262	0.023690	*
R=Labial	0.610000	0.275100	2.217	0.026620	*
L=Labial	−1.003000	0.493800	−2.031	0.042280	*
L=liquid	1.375000	0.763300	1.801	0.071630	·
GENDER=M	−0.371800	0.212600	−1.749	0.080320	·
R=Postvelar	−0.983100	0.573000	−1.716	0.086220	·

5.2.2 Comparisons based on individual social models

While the social variables PROVENANCE, GENDER, and STYLE were not statistically significant predictors of either deletion or devoicing at the aggregate level when compared with the phonetic variables, separate models created to allow comparison between the different values of each of the social variables do provide interesting insights.

5.2.2.1 Comparison by PROVENANCE. As indicated in Table 5a, for Quebec, significant factors favoring deletion are mostly based on the rightward consonantal context: rightward voiceless consonants, nasals, and labiodentals were all statistically significant factors favoring deletion; significant factors disfavoring deletion were /u/ as the underlying phoneme, leftward liquids, and rightward uvulars ([ʁ]) and palatals. By contrast, Table 5b indicates that for Paris, significant factors favoring deletion were underlying /y/, voiceless leftward consonants, and the Guided style; factors disfavoring deletion were rightward liquids and velars, with statistically significant Intercept factors also disfavoring deletion. The lack of statistically significant Intercept factors for deletion in Quebec suggests that all of the statistically significant factors affecting deletion are accounted for, whereas for Paris, at least some significant factors remain unknown.

Separating devoiced tokens by PROVENANCE once again yields more specific statistically significant factors for Quebec speakers (Table 6). For Quebec, left- and rightward voiceless consonants and the underlying vowel phoneme /u/ all had statistically significant effects in favor of DEVOICING, while only Intercept effects significantly disfavored DEVOICING in Quebec.

For Paris, the model for DEVOICING failed to produce statistically significant

Table 5

Comparison of DELETION in Quebec and Paris

a. DELETION in Quebec

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
R=uvular	−1.68414	0.45914	−3.668	0.000244	***
VOWEL=/u/	−0.95574	0.27406	−3.487	0.000488	***
R=voiceless	0.80673	0.24094	3.348	0.000813	***
L=liquid	−1.29383	0.38665	−3.346	0.000819	***
R=nasal	0.96535	0.37660	2.563	0.010367	*
R=palatal	−3.84248	1.70211	−2.257	0.023978	*
R=labiodental	0.69997	0.34391	2.035	0.041821	*
R=postalveolar	−1.01489	0.53144	−1.910	0.056174	·
L=stop	−0.53787	0.28402	−1.894	0.058254	·
R=liquid	−0.96531	0.51822	−1.863	0.062496	·
R=glide	2.49420	1.35640	1.839	0.065940	·

Table 5: Continued

b. DELETION in Paris

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−2.70429	0.5604	−4.826	0.0000014	***
VOWEL=/y/	1.17514	0.2736	4.295	0.0000175	***
L=voiceless	0.75061	0.2839	2.644	0.0082	**
STYLE=Guided	0.49080	0.2110	2.326	0.0200	*
R=liquid	−0.99247	0.4362	−2.275	0.0229	*
R=velar	−1.23815	0.6117	−2.024	0.0429	*
L=labiodental	0.90876	0.5224	1.740	0.0819	·
VOWEL=/u/	0.53004	0.3087	1.717	0.0860	·

Table 6

DEVOICING in Quebec

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−4.48700	0.85860	−5.225	0.000000174	***
VOWEL=/u/	1.07400	0.41170	2.609	0.00908	**
L=voiceless	1.59200	0.65190	2.441	0.01463	*
R=voiceless	0.87440	0.42260	2.069	0.03855	*

results. This was the case using fine and coarse phonological place distinctions. This lack of statistically significant results is likely due to the fact that a number of different possible values of LEFT and RIGHT CONTEXT had too few tokens to allow reliable statistical comparison with other values, even when those other values had a large number of tokens. For example, in all of the data from Paris, there was only a single token bounded by a leftward palatal consonant, rendering a devoicing estimate for L=palatal within the Paris tokens impossible. The Paris-specific models for devoicing, which included L=palatal and other similar values with a paucity of tokens, produced unacceptably large standard errors for a number of factors, rendering their results unreliable. As such, no statistically based comparison can be made between Quebec and Paris with regard to devoicing.

5.2.2.2 Comparison by GENDER. Statistical models for DELETION separated by

GENDER also demonstrate differences in significant effects. As shown in Table 7a, for women, the only significant factor favoring deletion was PROVENANCE; specifically, women from Quebec were more likely to delete high vowels than women from Paris. Factors disfavoring deletion were leftward stops and liquids, and rightward liquids, uvulars, and postalveolars. Interestingly, there are no statistically significant Intercept effects for women, suggesting that the factors present may be the only significant factors in predicting deletion for women. The results for men were different. For men (Table 7b), factors favoring deletion were leftward labiodental and stop consonants, the Guided STYLE, and the underlying vowel /y/. The only statistically significant factors disfavoring deletion for men were Intercept factors.

Separating results for DEVOICING by GENDER presents similar difficulties to those seen when separating by PROVENANCE. Table 8a demonstrates that the model containing only tokens from female speakers provides a number of statistically significant factors using the coarse phonetic model, but the model for male speakers was unable to identify any statistically significant results using either fine or coarse distinctions for place. For women, left- and rightward voiceless consonants were again statistically significant predictors in favor of devoicing, as were leftward liquids, rightward bilabials, and the underlying vowel phoneme /u/. The only statistically significant effects disfavoring DEVOICING among women were Intercept effects. The complete lack of usable results for men with regard to DEVOICING makes further comparison based on gender impossible.

5.2.2.3 Comparison by STYLE. Separating occurrences of DELETION by STYLE also provides different significant effects: For the Guided STYLE (Table 9a), significant factors favoring deletion were rightward nasals and the underlying vowel /y/; factors disfavoring

Table 7

Comparison of DELETION by GENDER

a. DELETION by women

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
R=uvular	−1.46095	0.3835	−3.81	0.000139	***
L=liquid	−1.34577	0.40432	−3.329	0.000873	***
L=stop	−0.81848	0.259	−3.16	0.001577	**
R=postalveolar	−2.03133	0.66847	−3.039	0.002376	**
PROVENANCE=Quebec	0.60144	0.29175	2.062	0.039254	*
R=nasal	0.68473	0.35148	1.948	0.051396	·
L=voiceless	0.43267	0.23284	1.858	0.063131	·
R=bilabial	−0.55121	0.30847	−1.787	0.073946	·
R=liquid	−0.70721	0.39672	−1.783	0.074644	·

Table 7: Continued

b. DELETION by men

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−3.29438	0.61399	−5.365	8.07e-08	***
STYLE=Guided	1.11451	0.24612	4.528	5.95e-06	***
VOWEL=/y/	0.78212	0.26969	2.9	0.00373	**
L=labiodental	1.40718	0.61086	2.304	0.02124	*
L=stop	0.956	0.42093	2.271	0.02314	*
R=voiceless	0.55747	0.30323	1.838	0.066	·
R=liquid	−1.01203	0.60381	−1.676	0.09372	·

Table 8

DEVOICING by women

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−6.11300	1.00400	−6.088	0.000000001	***
L=voiceless	2.79300	0.80110	3.487	0.000489	***
VOWEL=/u/	0.98300	0.35440	2.774	0.005542	**
R=labial	0.97190	0.40730	2.386	0.017036	*
R=voiceless	0.86990	0.36480	2.385	0.017085	*
L=liquid	2.08500	1.03300	2.018	0.043574	*
R=velar	0.76600	0.42820	1.789	0.073596	.

Table 9

Comparison of DELETION by STYLE

a. Deletion in Guided STYLE

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−1.62063	0.43168	−3.754	0.000174	***
VOWEL=/u/	−0.64789	0.26069	−2.485	0.012944	*
R=nasal	0.88290	0.37728	2.340	0.019276	*
L=uvular	−1.24962	0.53921	−2.317	0.020478	*
VOWEL=/y/	0.47664	0.21721	2.194	0.028207	*
L=nasal	−0.94097	0.48511	−1.940	0.052416	·
R=voiceless	0.44012	0.24004	1.834	0.066725	·

Table 9: Continued

b. Deletion in Free STYLE

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
R=uvular	−1.31900	0.43560	−3.028	0.00246	**
R=velar	−1.62300	0.55680	−2.914	0.00357	**
L=stop	−0.83300	0.31640	−2.632	0.00848	**
L=liquid	−1.18900	0.51550	−2.307	0.02106	*
R=palatal	−2.90100	1.50400	−1.929	0.05373	·
R=bilabial	−0.65090	0.35570	−1.830	0.06726	·
GENDER=M	−0.75120	0.41350	−1.817	0.06926	·
VOWEL=/y/	0.44790	0.24730	1.811	0.07014	·
R=liquid	−0.91830	0.52820	−1.738	0.08213	·

deletion were leftward uvulars and the underlying vowel /u/, with Intercept effects disfavoring deletion also significant. For the Free STYLE (Table 9b), there were no statistically significant factors favoring deletion. Significant factors disfavoring deletion were leftward stops and liquids, and rightward velars and uvulars.

Using separate models for each STYLE with regard to DEVOICING also provides further insights. As is demonstrated in Table 10a, for the Guided STYLE, left- and rightward voicelessness both favor devoicing, as do the underlying vowel /u/ and leftward liquids. The only significant factors disfavoring devoicing are Intercept factors, which strongly disfavor devoicing. Table 10b shows that for the Free STYLE, using fine distinctions for LEFT- and RIGHT-CONTEXT PLACE did not yield statistically significant results, but using coarse distinctions did. Using these results, leftward voiceless and fricative consonants were both strong significant predictors of devoicing, which was disfavored by rightward nasals and other (Intercept) factors.

5.2.3 Comparison based on VOWEL PHONEME

The fact that there are statistically significant differences in rates of DELETION and DEVOICING based on the underlying VOWEL PHONEME of a given token suggests that the factors with significant effects on these rates for each of the three high-vowel phonemes /i/, /y/, and /u/ may not necessarily be the same. This is in fact borne out by the data, with each of the high-vowel phonemes behaving differently and being affected by different variables. Ultimately, at least with regard to DELETION, each of the high-vowel phonemes is best treated individually rather than as simply part of a larger category.

As seen in Table 11a, for the underlying VOWEL PHONEME /i/, significant factors

Table 10

Comparison of DEVOICING by STYLE

a. Devoicing in Guided STYLE

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−5.8655	1.2308	−4.766	0.00000188	***
L=voiceless	2.9847	1.0454	2.855	0.00430	**
R=voiceless	1.1606	0.4493	2.583	0.00979	**
VOWEL=/u/	0.9466	0.4004	2.364	0.01807	*
L=liquid	2.5533	1.2077	2.114	0.03451	*
L=uvular	2.2898	1.2206	1.876	0.06066	·
R=velar	0.9041	0.4985	1.814	0.06970	·
GENDER=M	−0.6146	0.3441	−1.786	0.07403	·

Table 10: Continued

b. Devoicing in Free STYLE

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−5.19900	0.92010	−5.651	0.000000016	***
L=voiceless	2.91000	0.73090	3.982	0.0000683	***
L=fricative	2.04900	0.85390	2.400	0.0164	*
R=nasal	−1.52800	0.91620	−1.668	0.0954	.

favoring DELETION were PROVENANCE=Quebec (i.e. with speakers from Quebec more likely to delete /i/ than speakers from Paris), rightward nasals, and rightward voiceless consonants. Factors with significant effects disfavoring deletion of /i/ were left- and rightward bilabials, and rightward velars, with Intercept effects disfavoring deletion of /i/ also significant. Table 11b makes clear that for the underlying VOWEL PHONEME /y/, the only significant factor favoring deletion was the Guided STYLE. Significant factors disfavoring deletion were leftward stops, liquids, and uvulars ([ʁ]). For /u/, Table 11c shows that significant factors favoring deletion were rightward labiodentals and leftward voiceless and bilabial consonants. Factors disfavoring deletion were PROVENANCE=Quebec (i.e. with speakers from Quebec *less* likely to delete /u/ than speakers from Paris), and rightward stops, liquids, postalveolars, and uvulars, with Intercept effects disfavoring deletion also significant.

5.3 Significant predictors of high-vowel lenition

Only the phonetic variables LEFT CONTEXT, RIGHT CONTEXT (both including VOICING, PLACE, and MANNER) and underlying VOWEL PHONEME, were statistically significant predictors of any type of lenition at the aggregate level. The social variables PROVENANCE, GENDER, and STYLE were not statistically significant predictors of either DELETION or DEVOICING at the aggregate level. This is in keeping with the findings of other researchers (e.g. Cedergren and Simoneau 1985; Dumas 1972), who found consonantal context, but not social factors to be important predictors of these same phenomena.

However, this should not be interpreted as meaning that social variables have no

Table 11

Comparison of DELETION by VOWEL PHONEME

a. Deletion of /i/

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
(Intercept)	−2.74400	0.5576	−4.920	0.000000864	***
PROVENANCE=Quebec	1.83500	0.4285	4.283	0.0000184	***
L=bilabial	−2.80900	0.7400	−3.796	0.000147	***
R=velar	−2.01900	0.5707	−3.538	0.000404	***
R=nasal	1.60900	0.5417	2.969	0.002984	**
R=bilabial	−1.13800	0.4362	−2.610	0.009049	**
R=voiceless	0.73020	0.3235	2.257	0.023994	*

b. Deletion of /y/

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
L=liquid	−1.325148	0.449870	−2.946	0.00322	**
L=stop	−0.817351	0.319523	−2.558	0.01053	*
STYLE=Guided	0.532730	0.227441	2.342	0.01917	*
L=uvular	−1.524160	0.684161	−2.228	0.02590	*

Table 11: Continued

c. Deletion of /u/

Factor	Estimate	Std. Error	*z* value	Pr(>|*z*|)	
R=uvular	−2.75700	0.7275	−3.790	0.000151	***
R=liquid	−2.59500	0.7724	−3.360	0.000780	***
R=stop	−1.23300	0.4744	−2.600	0.009330	**
R=post-alveolar	−2.90300	1.1220	−2.587	0.009691	**
L=bilabial	1.34500	0.5636	2.386	0.017041	*
L=voiceless	1.50200	0.6416	2.340	0.019273	*
(Intercept)	−2.15200	0.9504	−2.265	0.023538	*
L=labio-dental	1.92300	0.9226	2.085	0.037098	*
PROVENANCE=Quebec	−0.61830	0.2991	−2.067	0.038720	*

effect on either high-vowel DELETION or DEVOICING. Meyerhoff (2000:9–11), for example, discusses the fact that while certain aspects of language may be constrained by linguistic rather than social factors, when those linguistic constraints are taken into account, social factors are often able to shed light on further variation that is not completely accounted for by purely linguistic factors.

Evidence for this argument can be found in the individual models created for each VOWEL PHONEME. For example, each of the vowel phoneme models exhibits at least one social factor that is a statistically significant predictor of deletion. (See below for full discussion.) This suggests once again that when more purely linguistic (i.e. "phonetic") factors are already taken into account, it is often only nonlinguistic (i.e. "social") factors which can account for the remaining variation.

CHAPTER 6

CONCLUSIONS

High-vowel-lenition phenomena are often assumed to be specific to Quebec French, with some authors (e.g. Gendron 1966) explicitly stating that they do not occur at all in Parisian French, or even in careful speech in Quebec, although other authors (e.g. Torreira 2011; Torreira & Ernestus 2010) have specifically investigated similar phenomena in European French. The data I have analyzed make it clear that they are in fact not only present, but pervasive in Parisian French. While it is true that from a raw numerical perspective, speakers from Quebec deleted more than those from Paris, statistical analysis including multiple other factors revealed that ultimately these differences are not significant.

6.1 Final conclusions

As in previous studies, the best predictors of both high-vowel DELETION and DEVOICING are variables directly related to the consonantal environment, but the apparently separate status of DELETION and DEVOICING means that there are no specific known factors that can be used as reliable predictors of both phenomena in the same context. Because of this, any patterns that are present in the data apply only to either DELETION or DEVOICING and not to both.

Given previous assertions regarding the Quebec-specific nature of these phenomena, it is somewhat surprising that the variable PROVENANCE was not statistically significant at the aggregate level. Even so, as seen from the individual VOWEL PHONEME models, with specific types of phonetic variation taken into account, social variables can still become powerful predictors for high-vowel lenition. For example, the fact that for Parisian speakers, DELETION was more likely during the Guided STYLE may imply that DELETION has some positive social significance, assuming speakers were somewhat more conscious in their speech during the Guided STYLE than in Free STYLE. Similarly, the fact that men (but not women) from both Paris and Quebec were more likely to delete high-vowel tokens during the Guided STYLE seems to suggest that high-vowel deletion carries some more positive social significance for men than for women.

Ultimately, my findings support those of previous authors with regard to the factors most closely associated with both high-vowel deletion and devoicing. In the decades since Gendron's (1966) study, these factors have not changed significantly; what has apparently changed is the social interpretation of these phenomena. Where Gendron (1966), Dumas (1972), and Ouellet et al. (1999) all commented on the unlikelihood of high-vowel deletion in more careful speech styles, my data indicate that at least for DELETION, the more formal Guided STYLE increases the likelihood of lenition.

6.2 Limitations of the current study

This study was limited in a number of ways. The first limitation was in the number of speakers. While there were large numbers of speakers interviewed in the Paris region, the Quebec region had only nine speakers total, limiting the possibility of analysis and comparison to these nine speakers and the demographics they represented. Apart from this, incomplete demographic information for most of the Quebec speakers made more detailed analysis impossible in many cases, possibly leading to the statistically significant intercept effects present in some statistical models. As has already been stated, a number of the statistical models for devoicing were unable to produce meaningful statistical results, likely due to low numbers of tokens in certain contexts and for certain speakers. A larger number of speakers, with more consistent interview lengths, would likely have resulted in more successful statistical analysis for these models.

6.3 Future work

There are a number of ways in which future research regarding French high-vowel devoicing can be expanded to build upon this and other related studies. The PFC corpus contains data for a number of other French-speaking populations in addition to Quebec and Paris. Future analysis involving other regions could reveal further insights into the pervasiveness of these phenomena throughout the French-speaking world. In addition, incorporating other regional data with greater demographic diversity among speakers would make possible further analysis of different social variables such as age, profession, and education. Studies incorporating subjects of varying ages would, for example, allow better predictions to be make about whether these phenomena are expanding or contracting in different areas.

Future research could also make more specific comparisons between high-vowel deletion and devoicing in French and other languages, as well as more in-depth comparisons with related phenomena such as schwa variability and lenition of other types of vowels. Comparing the realizations of these phenomena in French to other languages could provide insights into larger phonetic trends, possibly allowing for more general theoretical assertions to be made.

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