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ORIGINAL RESEARCH

Identification of regional French accents in (northern) France, Belgium, and Switzerland

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This paper investigates whether European Francophone subjects are able to distinguish between regional French accents from (northern) France, Belgium, and Switzerland, and at what level of granularity. In total, samples from 120 speakers (from five different areas in each country under study) were presented to hundreds of native French listeners from these three countries. In a first set of experiments, listeners were asked to identify the speakers' country of origin: they achieved 60% correct identification on average, with significant effects of listeners' region of origin, speakers' age, socioeconomic status, and region of origin. In a second set of experiments, listeners from Belgium, France, and Switzerland were asked to identify the speakers' region of origin within each country (5-alternative forced choice). Results, albeit above chance, proved to be poorer than they were in the first set of experiments (31% correct identification on average). Complementary analyses were conducted to evaluate the role of listeners' region of origin, speakers' age, speakers' region of origin, and their interaction. They showed asymmetrical response patterns across the three countries under investigation: France (or, within France, Paris, which represents the norm) seems to act as a magnet and a catalyst of unification. Younger generations, especially, are more often associated with its way of speaking when their accent is not clearly identifiable. Switzerland, though, resists this homogenizing process better than Belgium does.

1. Introduction

Variation in speech, which conveys both linguistic and indexical information (Silverstein, 2003), raises many issues for language sciences. Regional accents are key aspects of this variation: they may even perturb understanding in our own mother tongue (Floccia et al., 2006). They trigger accommodation, convergence, and divergence mechanisms which may give rise to language changes (Babel, 2010; Delvaux & Soquet, 2007; Giles, Coupland & Coupland, 1991; Kim, Horton & Bradlow, 2011). As Labov (2001:5) wrote, "language, as an instrument of communication, would work best if it did not change at all." However, a fully homogeneous linguistic community is impossible; we do not all have the same pronunciation, we all have our own physiology and personality, along with a mimetic desire that drives us to imitate our models. Amongst other factors, the discrepancy between production and perception may result in language changes. By a distance effect between speakers, differences may then increase: various languages, dialects, and accents may arise.

Traditionally, an *accent* is defined as "the cumulative auditory effect of those features of pronunciation which identify where a person is from regionally and socially" (Crystal, 2003). According to Lippi-Green (2012:44), "the term has no technical or specific meaning. It is widely used by the public; however [...] accent is a loose reference to a specific 'way of speaking'." Contrarily to the terms *dialect* and *language variety*, which may refer to specific pronunciation traits, grammar, lexical items, and idioms, accent refers to pronunciation alone. The difference between an accent and a variety, though, is not clear-cut in everyday conversation. In this paper, which focuses on pronunciation, taking the example of French spoken in Europe, we will not always make the distinction between accent and a variety. As for the term *dialect*, at least in France, it denotes a traditional heritage, most often a rural way of speaking resulting from a fragmentation of Vulgar Latin spoken in Gaul (Tuaillon, 1991), and we will avoid using this term when dealing with regional French varieties.

Since accents may be markers of identity, the question of their identification is particularly important. Also, since considerable variability comes into play, in both production and perception, studying accents requires large numbers of speakers and listeners. The resources available and crowdsourcing-like approaches now make new research possible.

Perception is a central issue in cognitive sciences, discussed in perceptual dialectology from three perspectives: representations and mental mapping in the absence of linguistic input, in the wake of Preston (1989); evaluative and affective attitudes in response to linguistic stimuli; and the ability to identify various accents from a phonetic input. From the latter perspective, Clopper & Pisoni (2004) demonstrated that,

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without prior training or feedback, American listeners, when asked to listen to fellow Americans with various accents and locate their geographical origin on a map, are able to distinguish three broad regions: New England, South, North/West. Another experiment using a free classification paradigm yielded similar results (Clopper & Pisoni, 2007). A dissertation on Norwegian and Dutch dialects also developed a mapping of lexical-level phonological and acoustic distances within and across dialectal areas (Heeringa, 2004). Other studies were devoted to the identification of four Dutch and five British English varieties by listeners from the countries concerned (van Bezooijen & Gooskens, 1999), another to six Welsh varieties (Williams, Garrett & Coupland, 1999). Another perception experiment, for German-speaking regions, showed that Swiss, Austrian, and Saxon dialects were identified best (Burger & Draxler, 1998). More recently, German Swiss dialects have been investigated in detail by Leemann & Siebenhaar (2008).

There are various accents in French, even though this language is one of the most codified in the world. We all have stories to tell about different accents. Strictly speaking, everyone has an accent if by this term we mean a particular way of speaking a language (Lippi-Green, 2012). But most often, at least for non-linguists, this word suggests that one can recognize the speaker's background, in his/her pronunciation: what place, what social environment. Accent recognition involves two processes: an evaluation of a more or less pronounced deviation vis-a-vis a standard and an identification proper (Fries & Deprez, 2003). The first process is maybe a French exception, as compared to more pluricentric languages such as English or Spanish, even if there is great evidence in sociolinguistics that, even in English- or Spanish-speaking communities, the standard language ideology is not erased, and the idea that certain features are more correct (i.e. standard) than others is omnipresent. The second process (categorization) consists of confronting what we hear to what we already know: it can well be explained by exemplar theories (Pierrehumbert, 2003). How could we recognize a particular accent if we had never heard it? A symptomatic question is "you have an accent: where do you come from?"

The perceptual identification of regional French accents has only recently received attention (Armstrong & Boughton, 1997; Bauvois, 1996; Hauchecorne & Ball, 1997; Moreau et al., 2008). In their pioneering listening test, Armstrong & Boughton (1997), in particular, showed how subjects from Rennes (in the West of France) found it difficult to geographically identify accents from Rennes and from Nancy, two cities situated 400 miles apart, symmetrical with respect to Paris.

Many linguistic studies exist on the regional pronunciation particularities of the French language. Some of them provide a description of a number of accents—possibly including neighboring countries of France such as Belgium and Switzerland, where French is also spoken (Carton et al., 1983; Martinet, 1945; Walter, 1982). Others concentrate on a specific French area: for example French as spoken in the south of France (Aubanel & Nguyen, 2010; Binisti & Gasquet-Cyrus, 2003; Coquillon, 2005; Eychenne, 2014; Durand, Slater & Wise, 1987; Sichel-Bazin, Buthke & Meisenburg, 2012; Sobotta, 2006), in Alsace—where a Germanic dialect, Alsatian, is also spoken (Philipp, 1968; Vajta, 2002)—in Belgium (Bardiaux, 2014; Delvaux & Soquet, 2007; Hambye & Simon, 2004, 2009; Pohl, 1983) or in Switzerland (Métral, 1977; Grosjean et al., 2007; Schoch, 1980; Sertling-Miller, 2007; Singy, 1995). However, most studies are descriptive and their findings do not enable us to reliably predict which French accents are most localizable.

To precisely delimit these accents (which may be more or less homogeneous, of a more or less continuous nature) and to quantify to what extent listeners are able to determine the origin of a speaker, a major difficulty is that some parameters may be distinctive to certain listeners but not to others and that people's perception may depend on their exposure to various accents. A number of factors may affect the judgments and the awareness of identifiable differences. Based solely on pronunciation, locals are expected to perform with a finer-grained perception than non-locals. In sociolinguistics, many studies focus on the representations of specific varieties, stored in long-term memory, more or less stereotyped, and possibly different from behavioral reactions to actual speech samples (Preston, 1989).

For a decade, the Phonology of Contemporary French (henceforth PFC)[1] program (Durand, Laks & Lyche, 2002, 2005, 2009) has boosted investigation on regional variation in French. This project endeavored to collect recordings covering a wide French-speaking territory, with a dozen speakers per survey point. At each investigation point, the material is made up of as many males as females of balanced age categories, from varying educational and professional backgrounds, who were born and have spent most of their lives in the same place. For each speaker, three minutes of read speech (the reading of a 396-word text) as well as a dozen minutes of spontaneous speech (directed interviews and free conversations) are recorded.[2] Within this framework, perceptual experiments involving an accent identification/evaluation task have subsequently been conducted (Boula de Mareüil & Bardiaux, 2011; Pustka, 2007; Woehrling & Boula de Mareüil, 2006). Some studies focus on French spoken in Belgium (Bardiaux, 2014; Bardiaux & Boula de Mareüil, 2013), Switzerland (Goldman, Avanzi & Schwab, 2014; Racine, Schwab & Detey, 2013), or Africa (Boula de Mareüil & Boutin, 2011; Boula de Mareüil, Brahimi & Gendrot, 2004; Lyche & Skattum, 2012).

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Many questions arise: How many accents and which ones can a French speaker identify on the basis of speech samples? Do linguistic cues described in the literature (e.g. prosodic patterns that are characteristic of Belgian or Swiss varieties) allow French varieties to be distinguished? To what extent are graphical layouts resulting from classification techniques related to the politically-defined countries (France, Belgium, and Switzerland) or well-established linguistic areas? The studies listed above bring interesting responses, with a clear-cut boundary between northern and southern French. According to numerous studies, Metropolitan French is divided into two main areas: the North (including the vast cities of Paris, Lille, and Lyon) and the South (Carton et al., 1983; Léon, 1993; Hauchecorne & Ball, 1997; Armstrong & Boughton, 1997; Armstrong & Pooley, 2010; Boughton; 2006; Coquillon, 2005; Detey & Le Gac, 2008; Lyche, 2010; Sertling-Miller, 2007; Woehrling, 2009).[3] The southern French area roughly corresponds to the *oc* dialectal area (Coquillon, 2005; Sichel-Bazin et al., 2012; Woerhling, 2009). The French accents of Belgium (Bardiaux, 2014; Boula de Mareüil & Bardiaux, 2011; Hambye & Simon, 2009; Woerhling, 2009), and Switzerland form two other groups (Andreassen, Maître & Racine, 2010; Avanzi et al., 2012; Goldman et al., 2014; Racine et al., 2013; Woerhling, 2009).[4]

Many of the aforementioned authors pointed out that northern French, southern French, and Belgian French listeners encountered difficulties in precisely locating speakers' cities of origin when taking part in perception experiments (see Bardiaux, 2014 or Boughton, 2006, among others). Correct identification scores are often at chance level: speakers from northern France, especially, tend to converge towards Reference French. The latter, described in pronunciation textbooks and spoken in the media, close to the Paris variety (Detey & Le Gac, 2008; Laks, 2002; Lodge, 1993; Lyche, 2010; Morin, 2000), exerts pressure on all regional accents. Even in Belgium, speakers from cities such as Tournai (in the Hainaut province, near the French border) are often associated with speakers from France (Bardiaux, 2014). In Switzerland, speakers from Geneva are perceived as having a pronunciation that is close to Reference French, whereas speakers from other cantons tend to be identified as having a strongly marked regional accent (Goldman et al., 2014; Racine et al., 2013).

Despite their importance, these studies present several limitations, especially in terms of numbers of regions (typically three, such as South-West, South, and South-East of France; West, Center and East of Belgium) and numbers of listeners (typically 20–25 subjects from northern France, southern France or Belgium, with little attempt to test interactions between speakers' and listeners' origins). To our knowledge, comparable results are not available for Switzerland. In addition, the listener effects of age, gender, and socioeconomic status have never been taken into account in a systematic way. The present study attempts to fill this gap.

This paper addresses regional accents in European French from the angle of human perception. Based on large numbers of speakers and listeners around various survey points, its goal is twofold. Its first purpose is to investigate to what extent accents from the northern half of France, Belgium, and Switzerland can be identified by native French listeners from the corresponding areas. Southern French, which is different, will be discarded. Since accents may be more marked in older speakers (Léon & Léon, 1997), age is examined as a possible influential factor, indicating that apparent-time change and homogenization processes are in progress (Labov, 1972). Speakers' socioeconomic status will also be investigated, since accents are generally more marked in working-class speakers than they are in middle-class speakers (Armstrong & Boughton, 1997; Moreau et al., 2008). Second, we investigate whether or not a higher degree of granularity within (northern) France, Belgium, and Switzerland can be achieved by listeners from the corresponding countries. Classification techniques will be used so as to visualize the results obtained. The impact of listeners' region of origin and speakers' age will be discussed, as well as the role of the norm and the advantages and disadvantages of using different speaking styles.

The corpus used, involving both reading and spontaneous speech, is presented in the next section, together with the method applied. The following sections report on the listening tests we conducted, analyze the results, and conclude.

2. Corpus and method

2.1 Corpus

For the present study, data were taken into account from 15 PFC survey points: five in the north of France, five in French-speaking Belgium, and five in French-speaking Switzerland (see Maps 1–3).[5] These audio data come from different French regions, Belgian provinces, and Swiss cantons: they were chosen because they were used in previous studies dealing with European French accents (in production and perception, as mentioned in the introduction) and/or because they represent different dialectal areas in France, Belgium, and Switzerland.

Four of the Belgian survey points had been considered in previous perception studies (Bardiaux, 2014; Bardiaux & Boula de Mareüil, 2013). The city of Gembloux, in the province of Namur, is a central locality in the Walloon area, the pronunciation features

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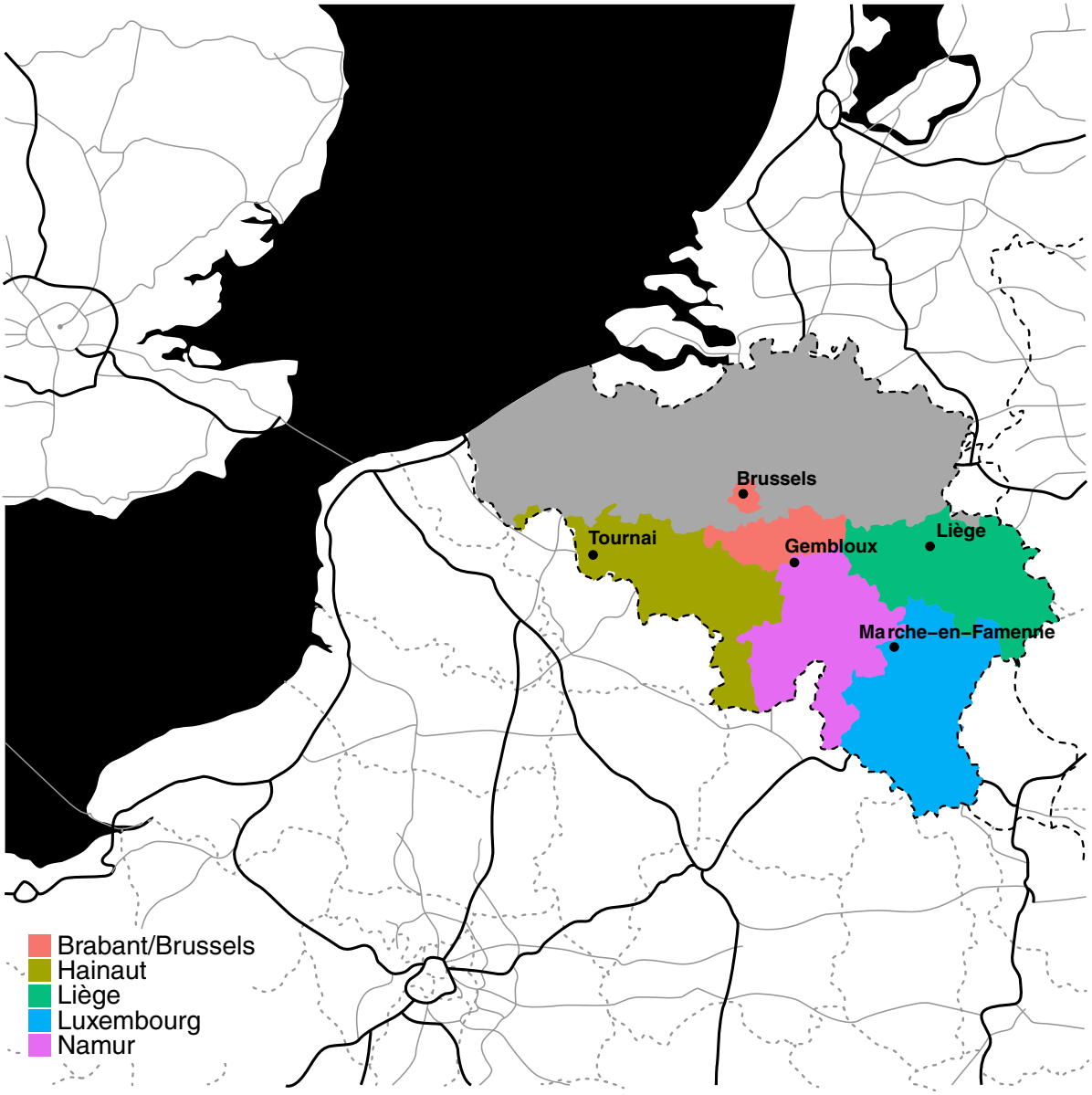

Map 1. Map of Belgium with the five investigation points and their regions.

of which are said to be common to the whole country (Hambye & Simon, 2009). The accent of Liège, on the contrary, is the most characteristic accent in French-speaking Belgium (Bardiaux, 2014; Hambye & Simon, 2004). As for Tournai, due to its proximity to France, it is attracted by the French metropole of Lille (Hambye & Simon, 2009). Brussels is the capital of Belgium; it is located in the Flemish part of Belgium, but is officially bilingual and geographically close to the Wallon Brabant province (Baetens-Beardsmore, 1971). Finally, Marche-en-Famenne, which has never been investigated until now, belongs to the province of Luxembourg: it was introduced to cover another French-speaking province of Belgium. In northern France, Brécey represents a western French variety: this city is located 61 miles from Rennes, which was investigated by Armstrong and Boughton (1997). Paris, the capital of France, is considered as the reference French variety (Detey & Le Gac, 2008; Fouché, 1956; Laks, 2002; Malécot, 1977; Morin, 2000). Ogéviller represents an eastern French variety: it is a small village located 34 miles from Nancy, the French variety of which was also investigated by Armstrong & Boughton (1997). Near the northern border of France, we selected Béthune, a city located 24 miles from Lille. Finally, we chose Lyon, in the Rhône-Alpes region: this town was an important place in the Francoprovençal area when Gallo-Romance dialects were still spoken (Martin et al., 2000), and for

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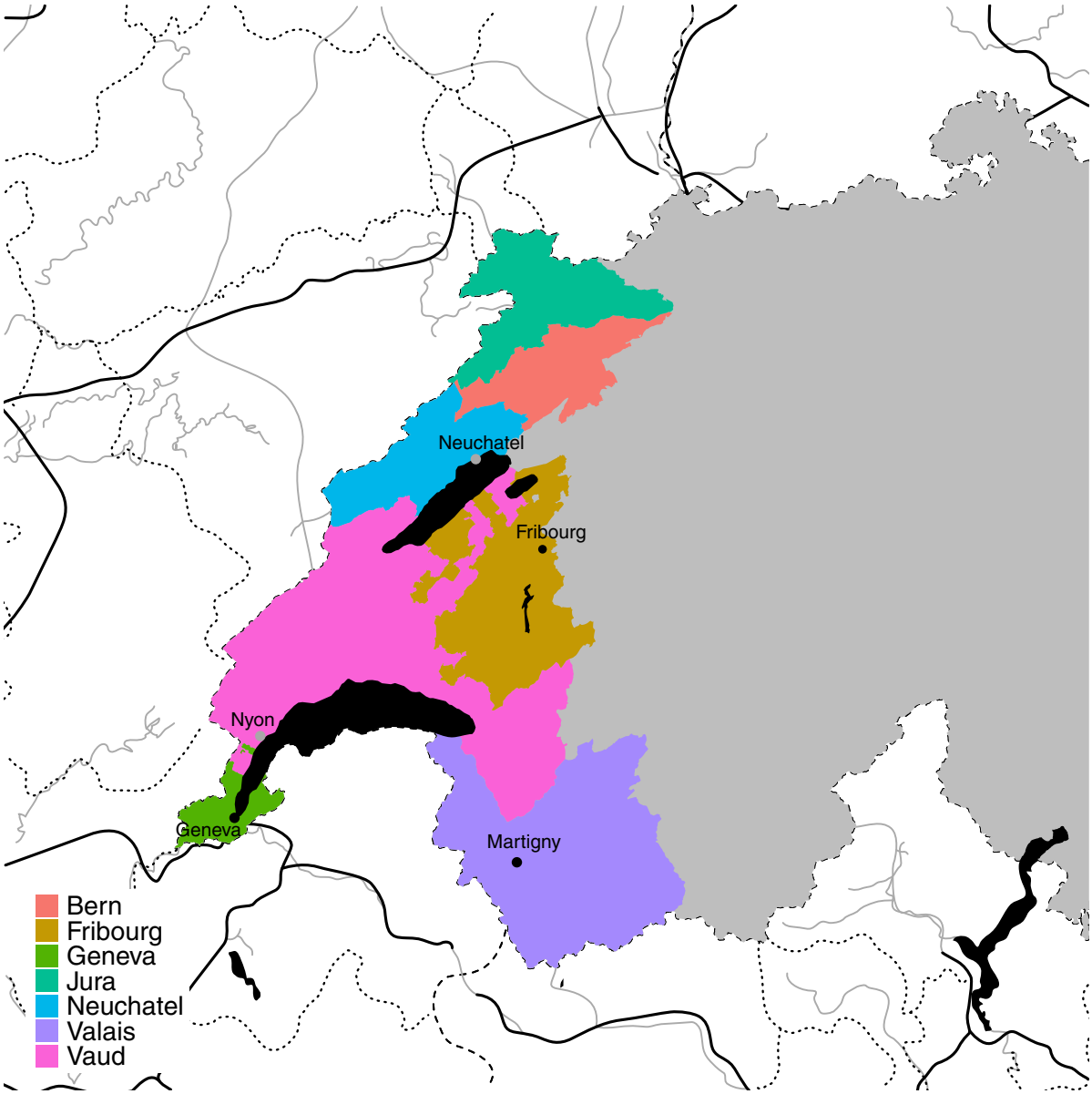

Map 2. Map of Switzerland with the five investigation points and their regions.

this reason (among others), the pronunciation of its speakers may share some features with Swiss French (Scherrer, Boula de Mareüil & Goldman, 2015).

In Switzerland, we selected Geneva, which may be considered as embodying a local standard French, due to its cultural and socioeconomic status in the Swiss-French area (Racine et al., 2013). Nyon, in the Vaud canton—the first PFC survey that was released—has been claimed to display the most typical Swiss accent (Andreassen et al., 2010). Neuchâtel is a hinterland city where French is said to be the "purest" in Switzerland (Terrier, 1997), but strong regional accents have been observed (Goldman et al., 2014).[6] The last two investigation points are Martigny, a city located in the eastern part of the Valais canton, and Fribourg, a bilingual city located in the eponymous canton, the pronunciation features of which have not been documented in the publications we consulted.

Each survey point was represented by eight informants (4 males, 4 females). Speaker age ranged from 19 to 93. In addition, participants were categorized as belonging to the working class (WC) or the middle class (MC), according to their level of education and whether or not their occupation was manual.[7] Table 1 summarizes some information about the speakers in the database.[8]

The 120 selected speakers were born and raised in the cities in which they were recorded, which somewhat guarantees that their pronunciation is representative of

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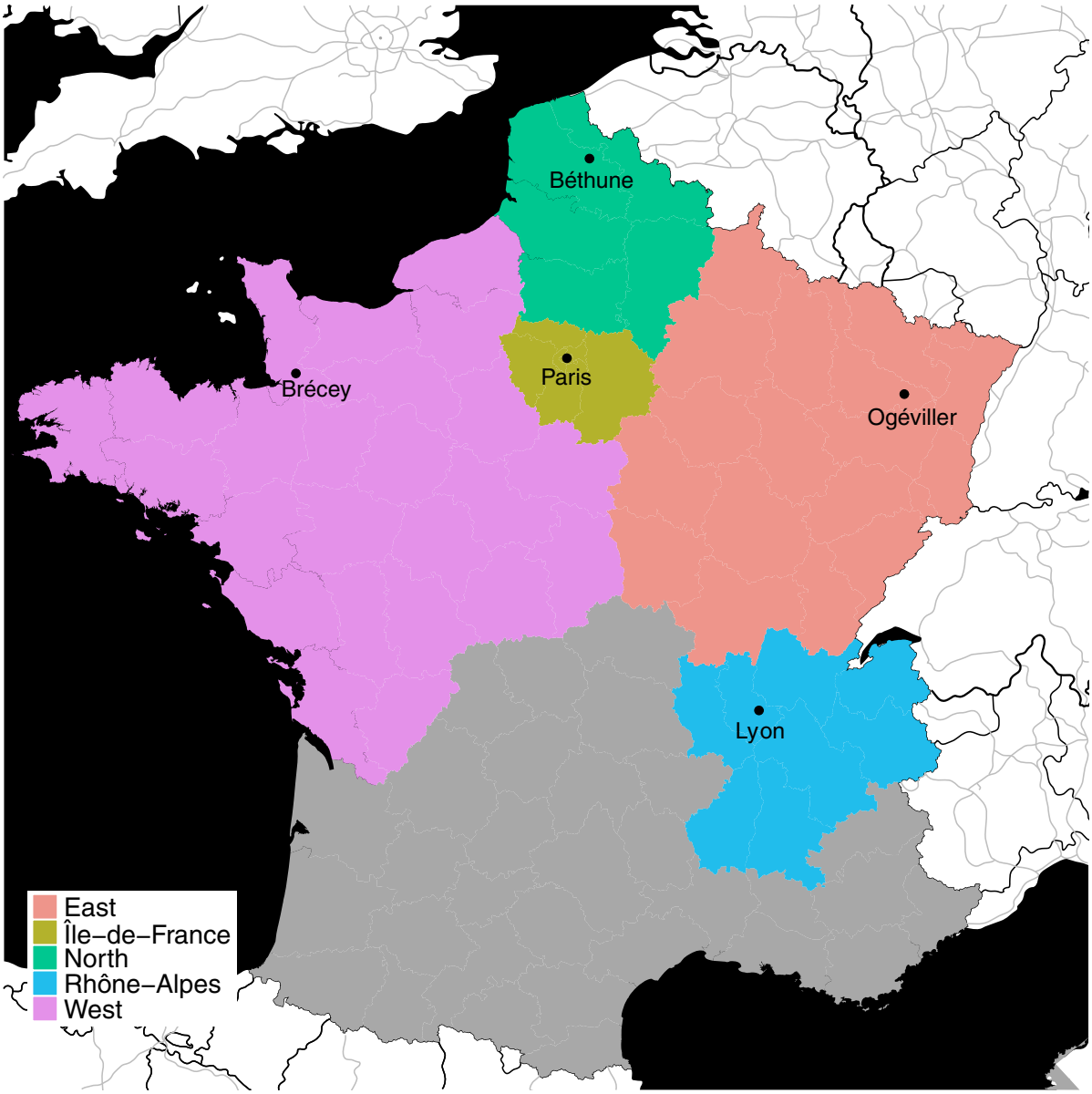

Map 3. Map of France with the five investigation points and their regions.

the area they are living in. For each speaker, two speech samples were selected. The first one is a long read sentence (25 words), taken from the middle of the PFC text, which is identical for all speakers: "*La côte escarpée du mont Saint-Pierre qui mène au village connaît des barrages chaque fois que les opposants de tous les bords manifestent leur colère.*" ('The steep hill of Mont Saint-Pierre that goes up to the village is blocked whenever opponents from all sides express their anger") (see Durand et al., 2002, 2005, 2009). The second one is an excerpt of spontaneous speech, extracted from guided interviews. It was chosen according to the following criteria: assertive utterance whose length is equivalent to that of the read excerpt (about 10 seconds on average), absence of reference to a location which would bias the identification, absence of intervention from the interlocutor, absence of lexical or grammatical shibboleths, and few hesitations from the speaker.

2.2 *Method*

As mentioned above, we were interested in the following questions: Are native listeners capable of discerning French vs. Belgian vs. Swiss accents? How fine-grained is the distinction within these accents? Assessing over a hundred French vs. Belgian vs. Swiss speakers would have been too long and tedious for listeners. The first experiment we conducted was therefore split in two

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Table 1. *Geographic background, age and socioeconomic status of the speakers (WC = Working Class, MC = Middle Class).*

				Age (years)		Number and socioeconomic status	
	Survey point	Area	Short name	Min.-Max.	Mean (sd)	WC	MC
Belgium	Brussels	Brabant/Brussels	B-BR	27-65	43.8 (15)	0	8
	Gembloux	Namur	B-NA	22-76	42.1 (21)	4	4
	Liège	Liège	B-LI	21-76	47.7 (24)	3	5
	Marche-en-Famenne	Luxembourg	B-LU	18-66	39.8 (20)	2	6
	Tournai	Hainault	B-HA	19-82	43.6 (25)	3	5
France	Béthune	North	F-NO	21-89	46.3 (25)	4	4
	Brécey	West	F-WE	19-80	47.1 (22)	4	4
	Lyon	Rhône-Alpes	F-RA	21-74	42.2 (21)	4	4
	Ogéviller	East	F-EA	23-93	58.2 (24)	8	0
	Paris	Île-de-France	F-IF	24-86	50.3 (22)	0	8
Switzerland	Fribourg	Fribourg	S-FR	20-82	43.3 (24)	4	4
	Geneva	Geneva	S-GE	21-61	41.3 (18)	2	6
	Martigny	Valais	S-VS	22-80	48.8 (28)	4	4
	Neuchâtel	Neuchâtel	S-NE	25-78	52.5 (24)	4	4
	Nyon	Vaud	S-VD	30-70	46.2 (17)	8	0
				18-93	46.2 (21)	54	66

parts: with young speakers (mean age: 27; standard deviation: 7.5) and older speakers (mean age: 65; standard deviation: 12.2), in Experiment1Y and Experiment 1O, respectively (see Table 2). On the other hand, asking French subjects to identify accents from five Belgian provinces or five Swiss cantons, for instance, would have been too difficult. The fine-grained experiment was therefore split in three parts: for Belgium, France, and Switzerland in Experiment 2B, Experiment 2F, and Experiment 2S, respectively.

Since several speaking styles (read speech and interview, especially) are represented in the PFC corpus, their influence on the listeners' performance also calls for quantification. Previous studies often rely on read speech alone, despite the problems it causes (Clopper & Pisoni, 2004). In our opinion, the use of both read and spontaneous speech offers several advantages. First, the display of an identical read sentence allows comparisons all other things being equal (and lends itself better to acoustic measurements). In particular, the sentence quoted in § 2.1 allows comparisons with previous studies, since it was used by Boula de Mareüil & Bardiaux (2011), Racine et al. (2013), and Woehrling & Boula de Mareüil (2006). Reading discards lexical and syntactic clues and makes sure that the differences between speakers are only due to pronunciation. Spontaneous speech represents a register of speech which better reflects the true vernacular of the speakers (their natural way of speaking in everyday use): in the PFC protocol, casual speech was elicited by fieldworkers' attempt to visit friends of friends. By using both types of speech, results in terms of accent identification rates did not differ significantly according to Boula de Mareüil & Boutin (2011) and the studies previously cited. Here, since we had to make choices (not to extend the test duration too much), the read sentence was kept in Experiment 1 and spontaneous speech was kept in Experiment 2. In our data, we often found it hard in spontaneous speech to avoid country-specific references, but insofar as the latter did not provide regional hints, they were included in Experiment 2.

For both sets of experiments, a user-friendly interface was used (Ménétrey & Schwab, 2014), among other things allowing participants to enter information about their region of origin, age, gender, and self-evaluated ability to discriminate between Belgian, French, and Swiss accents, by clicking on buttons, and enabling us to capture their responses. Participants took part in the experiment at home or in their office and were asked to use headphones or earphones. They received no feedback concerning their answers and they were not paid for their participation.

Each experiment was preceded by a familiarization phase (3 stimuli not included in the test dataset). After listening to each excerpt, listeners had to indicate where the speaker was from (in Experiment 1: Belgium, France, or Switzerland; in Experiment 2: between 5 alternatives). Their choice was forced: subjects had to tick one of the boxes proposed; they could not respond "I don't know" or advance to the next stimuli without answering. They could not listen to each sample more than once, nor did they have access to the transcript of the utterance. Each experiment lasted approximately 15 minutes.

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2.3 Statistics

Statistical analyses were conducted with the R software, version 3.1.2. (R Development Core Team, 2014). To assess whether the distribution observed was above chance level, binomial t-tests were performed. To examine the effects on the outcome variable (TRUE/FALSE) of different predictors (age, gender, socio-economic status, speakers' and listeners' origins), we fitted several Generalized Linear Mixed Models (GLMMs) with a logit link function (R package lme4, Bates et al., 2015). A Generalized Linear Mixed Model (GLMM) consists in an extension of a Generalized Linear Model (GLM). In a GLMM, the linear predictor contains random effects in addition to the fixed effects. Speakers and Items (i.e. stimuli) were systematically entered as random effects. Residual plots were inspected visually to ensure that no obvious deviations from homoscedasticity or normality were incriminated. P-values, set at a level of 0.05, were finally obtained by likelihood ratio tests of the model against the model without the fixed effects in question.

To visualize the distance/proximity between the French varieties at stake, confusion matrices were used in order to plot different graphs. Due to the large number of varieties used in Experiment 1, several layouts provided by Kruskal's Non-metric Multidimensional Scaling were generated (R package MASS, Venables & Ripley, 2002).

3. Results of Experiment 1 (across Belgium, France, and Switzerland)

For Experiment1Y, involving young speakers, and Experiment1O, involving older speakers, Table 2 provides basic information about the speakers:

In total, 99 listeners (35 males and 64 females, aged 35 on average) took part in Experiment 1O: 25 from Belgium, 51 from France, 23 from Switzerland. Another 114 listeners took part in Experiment 1Y (37 males and 77 females, aged 37 on average): 23 from Belgium, 63 from France, 28 from Switzerland. In both experiments, 75% of participants declared they had at least a Master's university degree, 9% declared they had quit studying after their high school diploma, 16% declared they had a bachelor's university degree. Most participants are highly educated, thus potentially more mobile and in contact with other French accents in their personal curriculum. These favorable conditions enable us to hypothesize overall better results than the ones we would obtain with subjects exposed to fewer accents.

Table 2. *Age and socioeconomic status (SES) of the speakers involved in Experiments 1O and 1Y.*

		SES		Age	
	Country	WC	MC	Min.-Max.	Mean (sd)
1O	Belgium	9	11	42-82	61.7 (12)
	France	12	8	54-93	67.1 (14)
	Switzerland	13	7	66-82	66.3 (10)
1Y	Belgium	3	17	18-37	25.2 (5)
	France	9	11	19-45	30.6 (10)
	Switzerland	9	11	20-39	26.6 (5)

3.1 Participants' self-evaluated ability to distinguish Belgian/French/Swiss accents

Prior to the test, participants were asked to indicate their presumed ability in distinguishing the three accents involved, as in previous work (Boula de Mareüil & Boutin, 2011; Vieru et al., 2011; Woehrling, 2009). On average, they claimed they were able to distinguish between these three accents in 85.2% of cases. Two GLMMs (one for each experiment) were run with the participants' origin as the outcome and the pairs of varieties to distinguish. They revealed that the interaction between these two predictors was significant in both experiments (Experiment 1O: $\chi^2(8) = 57.427$, $p < 0.001$; Experiment 1Y: $\chi^2(8) = 57.103$, $p < 0.001$).

As can be seen in Table 3, the percentages vary according to the participants' origin and the pairs of accents to distinguish. In both experiments 1O and 1Y, no significant difference was found between the three pairs of accents to discriminate (Belgian vs. Swiss, French vs. Belgian, French vs. Swiss) for Belgian and Swiss subjects. The only significant differences which were found concern French participants, who declared themselves less confident in discriminating Belgian vs. Swiss accents than in discriminating French vs. Belgian

Table 3. *Participants' self-estimated ability (%) to distinguish between the three accents under investigation in Experiments 1O and 1Y.*

Pair of accents	Listeners' origin	Experiment 1O Self-evaluated ability	Experiment 1Y Self-evaluated ability
Belgium vs. Switzerland	Belgium	95.8	86.9
	France	64.7	61.9
	Switzerland	91.3	82.1
France vs. Belgium	Belgium	100.0	91.3
	France	94.1	100.0
	Switzerland	82.6	67.8
France vs. Switzerland	Belgium	75.0	78.3
	France	90.1	96.8
	Switzerland	86.9	89.3

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accents or French vs. Swiss accents ($p < 0.001$ in both experiments 1O and 1Y).

This first asymmetry between the French group and the other groups is interesting to note. It is probably due to the fact that the Swiss and Belgians are familiar with the French of France, in addition to knowing their own variety, whereas the French are not necessarily in this situation. In all cases, the percentages are rather high (sometimes at ceiling values) and encouraged us to continue the analysis. Their link with listeners' actual performance will be discussed in § 3.4.

3.2 Effects of Speakers' Origin (Country), Gender, Socioeconomic Status, and Listeners' Origin

3.2.1 Experiment 1O

First, statistical analyses revealed that the percentage of correct identification for each of the three countries is clearly above the chance level (33.3%): correct identification scores reach 75.7% for France, 54.3% for Belgium, and 56.6% for Switzerland ($p < 0.001$ according to binomial t-tests). The results of a GLMM run with the speakers' origin, listeners' origin, speakers' gender, and speakers' socioeconomic status, as well as all the interactions involving speakers' origin, entered as predictors, reveal that these scores are affected by an interaction between speakers' origin and listeners' origin ($\chi^2(4) = 86.210$; $p < 0.001$). As can be seen in Figure 1, when hearing Belgian stimuli, Belgian listeners, with a correct identification score of 66.4%, perform better than do Swiss listeners (53.2%, $p < 0.0001$), who perform better than do French listeners (43.3%, $p < 0.001$). Correlatively, when hearing Swiss stimuli, Swiss listeners, with a score of 70.4%, perform slightly better than do Belgian listeners (55%, $p < 0.001$), who perform better than do French listeners (44.4%, $p < 0.001$). By contrast, there is no significant difference between participants regarding their correct identification scores for French speakers (75.6% on average).

In addition, an interaction between speakers' origin and speakers' socioeconomic status is found ($\chi^2(2) = 11.207$; $p < 0.001$). As can be seen in Figure 2, socioeconomic differences are strongly discriminant in Belgium and Switzerland: correct identification scores are 64.6% for working class (WC) speakers vs. 40.6% for middle class (MC) speakers in Belgium ($p < 0.001$), 57.5% for WC speakers vs. 44.8% for MC speakers ($p < 0.05$) in Switzerland. In France, on the contrary, MC speakers are slightly more often perceived as French than are WC speakers, but the difference is not significant: correct identification scores are 72.6% for

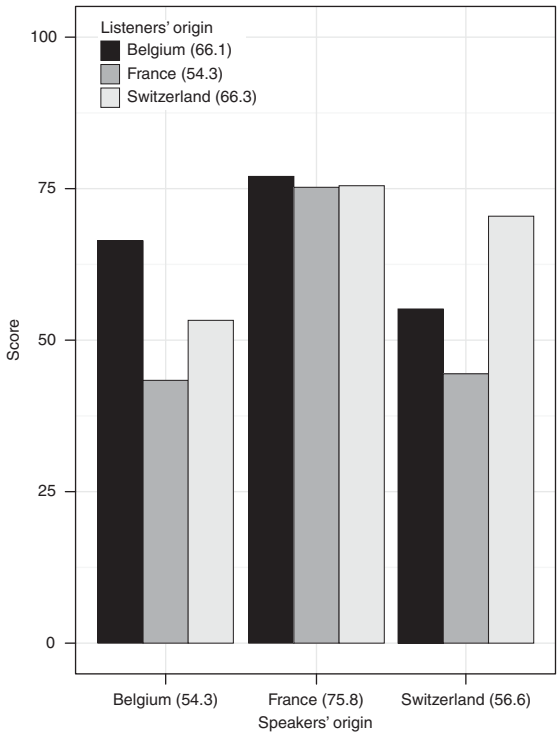

Figure 1. Correct identification scores (%) as a function of speakers' and listeners' origins (Experiment 1O). Average correct identification scores by listener group and speaker group are reported between parentheses.

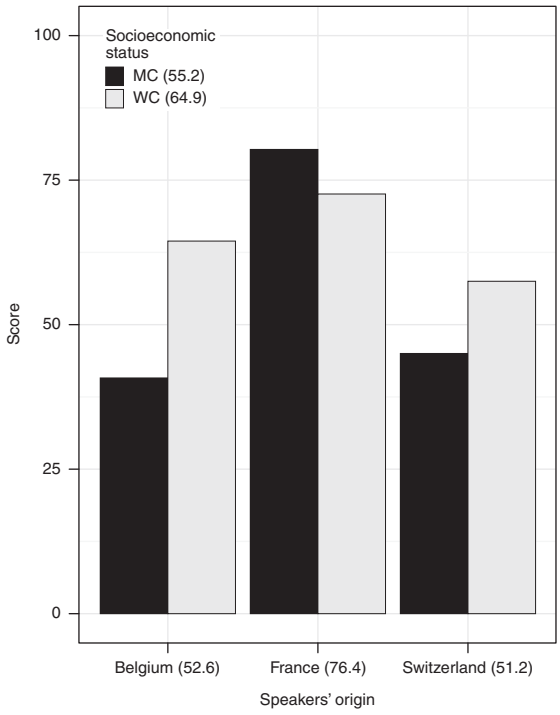

Figure 2. Correct identification scores (%) as a function of speakers' origin and SES (Experiment 1O). Average correct identification scores by speaker group and socioeconomic status are reported between parentheses.

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WC speakers vs. 80.3% for MC speakers (n.s.). We will return to this asymmetry between France (the center), Belgium and Switzerland (the periphery).

3.2.2 *Experiment 1Y*

For young speakers, too, the correct identification of each of the three countries is clearly above the chance level (33%): correct identification scores reach 72.6% for France, 54.7% for Belgium and 52.5% for Switzerland ($p < 0.001$ for each country). These scores vary significantly according to the interaction between speakers' and listeners' origins ($\chi^2(4) = 67.774$; $p < 0.001$), as can be seen in Figure 3. When hearing Belgian stimuli, listeners from Belgium obtain better scores (66.3%) than do listeners from France and Switzerland ($p < 0.0001$ for both groups). In that case, listeners from France and Switzerland do not differ significantly: their correct identification scores are 49.6% and 48.3%, respectively. Correlatively, when hearing Swiss stimuli, listeners from Switzerland obtain better scores (59.8%) than do Belgian listeners (50%, $p < 0.0001$), who obtain better score than do French listeners (46.3%, $p < 0.05$). The three groups of listeners do not differ significantly when hearing French stimuli: the correct identification score is 72.6% on average.

Moreover, the speakers' origin interacts with the speakers' socioeconomic status ($\chi^2(2) = 14.191$; $p < 0.001$). As can be seen in Figure 4, the speakers' socioeconomic status does not have the same impact as the speakers' origin. In Belgium, WC speakers are not significantly better recognized than MC speakers: the correct identification score is 53.6% on average.[9] In France, MC speakers are better recognized than WC speakers: correct identification scores are 83.1% vs. 63.5% ($p < 0.01$). In Switzerland, on the contrary, WC speakers are better recognized than MC speakers: their correct identification scores are 62.8% vs. 40.1% ($p < 0.01$). Again, the center (France) and the periphery (Belgium and Switzerland) exhibit different patterns.

3.3 *Effects of Speakers' Origin (Locality)*

We were interested in testing the effect of the speakers' locality on accent identification. Are speakers from cities that represent centers in their country (Geneva, Paris, and Brussels) better identified than speakers from hinterland localities? All listeners taken together, the speakers from some localities appear to be better identified than others, as can be seen in Table 4.

Due to the large number of survey points and the smaller number of listeners from each region around these survey points, it was not possible to conduct the

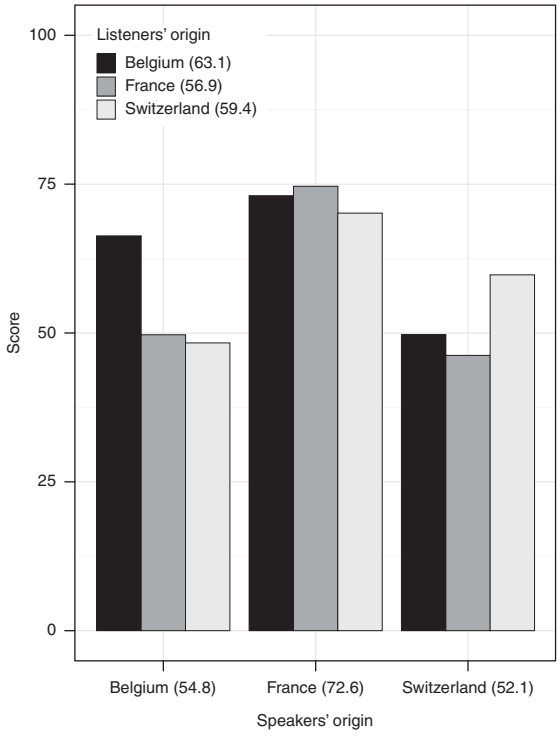

Figure 3. Correct identification scores (%) as a function of speakers' and listeners' origins (Experiment 1Y). Average correct identification scores by listener group and speaker group are reported between parentheses.

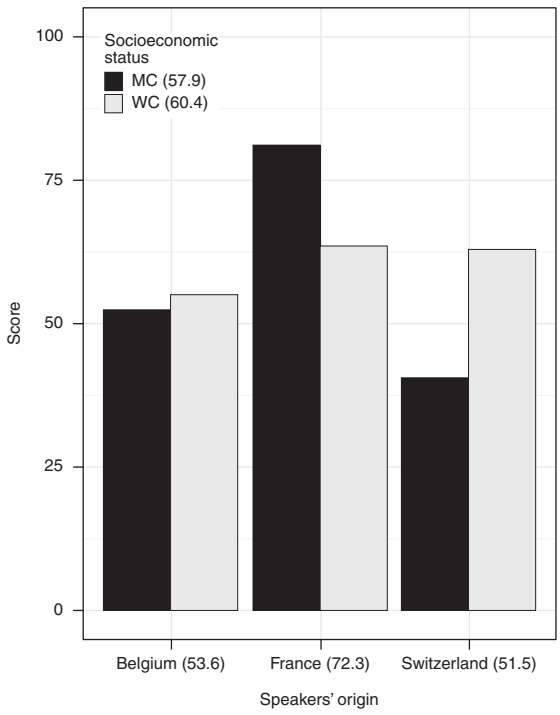

Figure 4. Correct identification scores (%) as a function of speakers' origin and SES (Experiment 1Y). Average correct identification scores by speakers group and socioeconomic status are reported between parentheses.

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same analysis as in § 3.1, to check whether correct identification rates varied as a function of listeners' origin, and/or speakers' gender, socioeconomic status, or origin. This is the reason why we plotted the results of non-metric Kruskal Multidimensional Scaling (henceforth MDS), in order to investigate the possible effects of age and region.[10] The graphical layouts for the two experiments (1O and 1Y) and the three groups of listeners (Belgian, French, Swiss) are displayed in Figures 5–7. They show interesting differences in country classification as a function of listeners' origin and speakers' age.

Table 4. *Correct identification scores (%) as a function of speakers' regions.*

Pred.	Experiment 1O			Experiment 1Y		
Real	Belgium	France	Switz.	Belgium	France	Switz.
B-BR	26.5	54.5	18.9	28.9	48.6	22.3
B-HA	34.6	54.0	11.3	53.0	26.3	20.6
B-LI	73.9	8.5	17.4	67.1	12.1	20.8
B-LU	62.3	15.9	21.7	57.2	12.9	29.8
B-NA	59.8	17.4	22.7	57.2	13.8	28.9
F-IF	6.8	78.7	14.4	12.2	70.1	17.5
F-NO	7.0	81.5	11.3	7.8	82.8	9.2
F-OG	22.2	61.1	16.6	26.1	48.4	25.4
F-RA	9.6	77.2	13.1	5.0	87.2	7.6
F-WE	9.6	79.8	10.6	11.4	77.4	11.1
S-FR	28.5	27.5	43.9	26.1	16.01	57.8
S-GE	15.4	37.6	46.9	21.2	54.82	23.9
S-NE	25.7	14.9	59.3	36.8	13.82	49.3
S-VD	18.9	10.1	70.9	26.5	10.75	62.7
S-VS	19.7	35.8	44.4	24.5	17.32	58.1

Focusing on the MDS for Belgium in Experiment 1O (Figure 5a), we observe a continuum between speakers representing the Belgian provinces of Luxembourg (B-LU), Liège (B-LI), and Namur (B-NA) and northern French speakers. In the middle of this continuum, we find speakers representing the provinces of Hainaut (B-HA) and Brussels/Walloon Brabant (B-BR). Interestingly, the speakers from the five Swiss cantons form a separate group, which is located in an orthogonal dimension of the graph. With listeners from France and Switzerland (Figures 6a and 7a), the MDS representations show rather consistent and expected classifications with regard to speakers' actual origins, except for B-BR speakers, who cluster with northern French speakers.

Turning to the MDS for Belgium in Experiment 1Y (Figure 5b), one can see that all Belgian speakers form a homogeneous cluster, to which Geneva (S-GE) speakers are attached. French and other Swiss speakers form consistent clusters. In the perception of French listeners (Figure 6b), Swiss and Belgian speakers are merged in a cluster on the left side of the figure, whereas French speakers are on the other side of this figure. Eastern French (F-EA), Brussels, and Geneva speakers are located between these two clusters. As for Swiss listeners (Figure 7b), their responses result in consistent clusters, except when it comes to identifying Geneva and Brussels, two major cities whose accents appear to be perceived as closer to that of northern France.

3.4 Summary and Discussion

Overall, our results can be summarized as follows. In Experiment 1O as in Experiment 1Y, French speakers were better identified than were Belgian and Swiss speakers. This is first due to the fact that French listeners

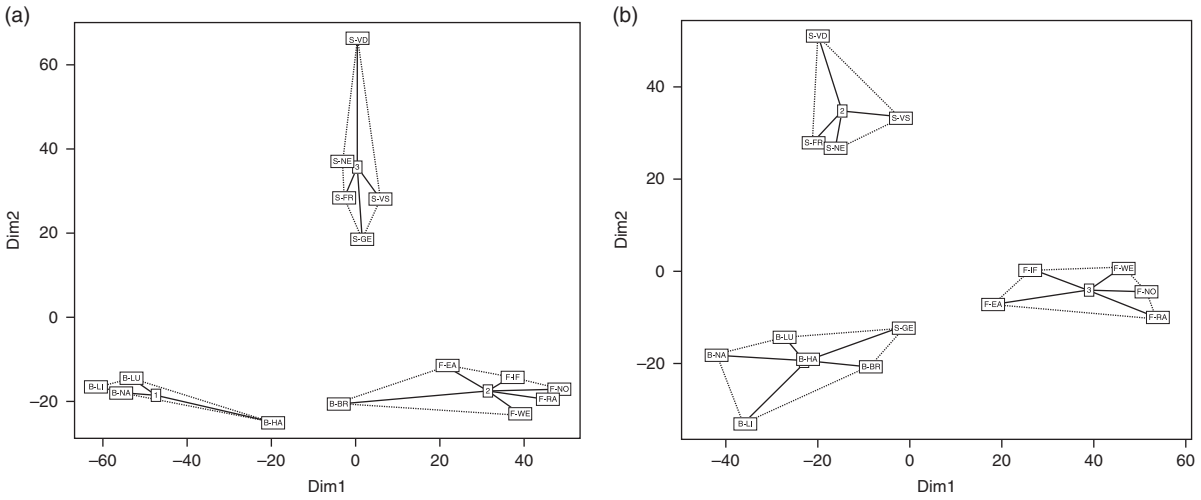

Figure 5. Multidimensional scaling for the 15 survey points resulting from Belgian listeners' responses in Experiment 1O (on the left) and in Experiment 1Y (on the right).

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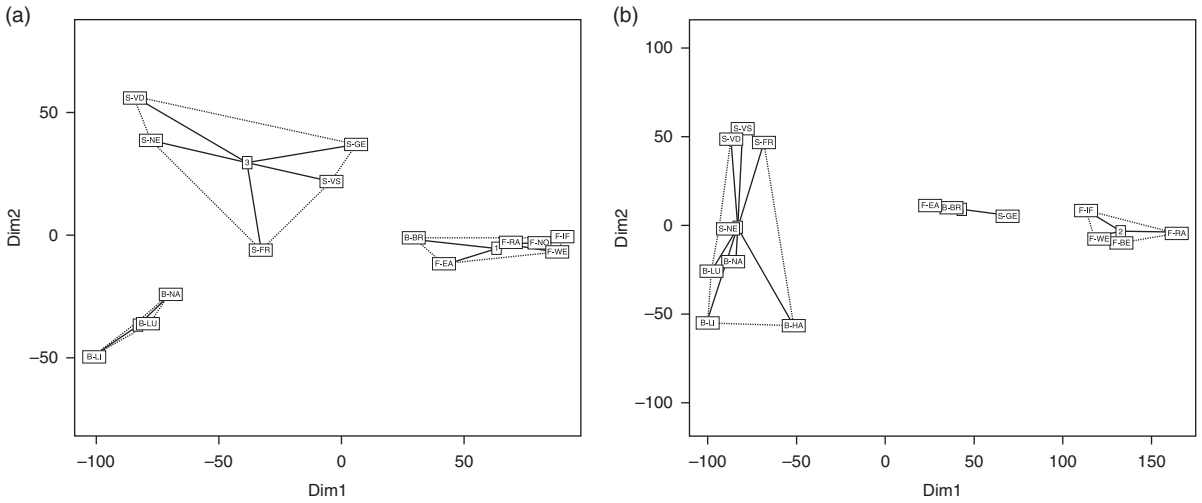

Figure 6. Multidimensional scaling for the 15 survey points resulting from French listeners' responses in Experiment 1O (on the left) and in Experiment 1Y (on the right).

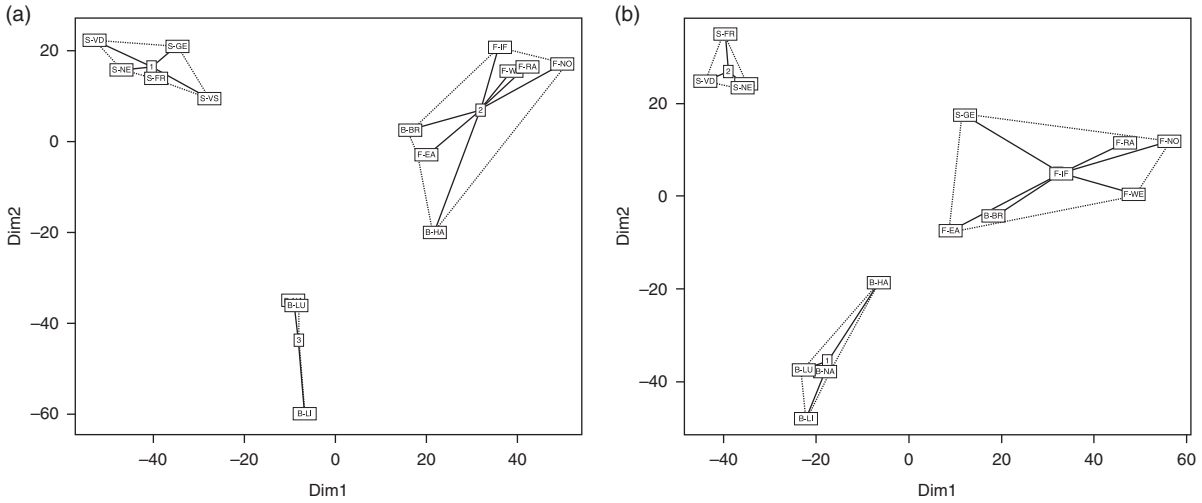

Figure 7. Multidimensional scaling for the 15 survey points resulting from Swiss listeners' responses in Experiment 1O (on the left) and in Experiment 1Y (on the right).

distinguish poorly between Swiss and Belgian accents, as if, in their representations, there were only two broad varieties, theirs and that of the periphery: this result is in accordance with the participants' self-reports (see § 3.1). Instead, Belgium and Switzerland were well identified by Belgian and Swiss listeners, respectively. Our analyses did not reflect any effect of speakers' gender. As far as the effect of speakers' socioeconomic status is concerned, however, interesting response patterns were found. In Experiment 1O, Belgian and Swiss WC speakers were better identified than were MC speakers, whereas this difference was not significant for French speakers. In Experiment 1Y, the effect of speakers' socioeconomic status was not significant for Belgium, but it was significant for Switzerland (WC speakers being better identified than MC speakers) and France (MC speakers being better identified than WC speakers). By and large, the difference between French speakers on the one hand, and Swiss (and Belgian) speakers on the other hand can be explained as follows: in northern France, WC speakers tend to have a regionally-marked accent which may be associated with Belgium or Switzerland, whereas in Switzerland (and Belgium, at least significantly for older speakers), it is the opposite: MC tend to speak in a more uniform way than do WC speakers, they converge toward standard French and for this reason are more often categorized as originating from (northern) France.

As for multidimensional scaling, it aimed at highlighting where, across the different localities, speakers

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were identified best (as Belgian, French, or Swiss) or confounded with speakers from other countries. Results show that speakers from some survey points are correctly identified across the two experiments, regardless of the listeners' background (B-LI, B-NA and B-LU in Belgium; F-NO, F-WE, F-RA and F-IF in France; S-FR, S-VS, S-NE and S-VD in Switzerland), while other survey points are floating: they are grouped either with Belgium or Switzerland or with northern France. Brussels speakers are almost systematically attached to the northern France group. Counter-intuitively, older speakers from B-HA (near the French border) are often misclassified as belonging to the northern France group, whereas younger speakers from B-HA are better identified as Belgian. Eastern French speakers are often clustered in a group located between northern France and a group comprising speakers from Belgium or Switzerland. Older speakers from Geneva are correctly identified as Swiss, but younger speakers tend to be classified in an intermediate group.

Thus, a kind of leveling or koineization seems to affect the Belgian French variety of Tournai, in the Hainaut province (B-HA): if younger speakers sound more Belgian than do older speakers, this may indicate that phonetic changes are in progress, perhaps because of the disappearance of the traditional Picard dialect (Francard, 2005). At the same time, our results show a twofold center-periphery relation: France is the center from which the norm radiates and, in the periphery, Brussels and Geneva act as local centers. Brussels is the capital of Belgium—it is a cosmopolitan enclave in the Flemish-speaking region (where a Dutch dialect is spoken). Geneva is not the capital of Switzerland, but it is the cultural capital of the French-speaking part of Switzerland. In Experiment 2, we will examine the more precise role of these two big cities, as well as that of Paris, which has long been (and still is) the political, cultural, and economic capital of France. The gentrification of these cities may result in a more leveled way of speaking.

4. Results of Experiment 2 (within Belgium, France and Switzerland)

Experiment 2 comprises three parts, in which native French speakers from Belgium (Experiment 2B), France (Experiment 2F), and Switzerland (Experiment 2S) were asked to listen to 40 spontaneous speech stimuli extracted from the PFC corpus (see § 2.2) and to indicate where the speakers they listened to came from, with a 5-alternative forced choice (5 survey points) within each country. Prior to the test, they were asked if they felt able to distinguish between the five accents, between just a few of them, or if they thought they could not perform the task at all.

Since the speaker groups were not balanced regarding socioeconomic status across survey points, this predictor was set aside in the statistical analyses. Also, for computational reasons, speakers' gender was not taken into account, because there were only 4 speakers of either gender for each locality. We noted that the gender effect was not significant in Experiment 1. Finally, each model included the following variables: speakers' origin, listeners' origin, speakers' age, and the interaction between these three variables.

4.1 Experiment 2B

In total, 107 native Belgian French listeners took part in Experiment 2B (45 males and 62 females, aged 33 on average), coming from areas around the 5 Belgian survey points under investigation (as can be seen in Map 1 and Table 1): 28 originated from the B-BR area, where they had spent most of their lives, 20 from B-HA, 20 from B-LI, 22 from B-NA and 17 from B-LU. Most of them (67.9%) had at least a Master's university degree. Out of the 107 participants, 51% felt able to distinguish among all the accents at stake prior to hearing the

Table 5. *Confusion matrix resulting from Experiment 2B (% identification scores).*

		Speaker's origin				
Listeners' origin	Predicted Real	B-BR	B-HA	B-LI	B-LU	B-NA
B-BR	B-BR	45.5	17.4	4.9	12.5	19.6
	B-HA	28.6	24.6	4.0	13.4	29.5
	B-LI	15.6	13.4	32.6	21.4	17.0
	B-LU	9.4	6.3	41.5	24.1	18.8
	B-NA	12.5	16.5	12.5	26.3	32.1
B-HA	B-BR	41.9	18.1	5.6	9.4	25.0
	B-HA	30.6	32.5	4.4	13.1	19.4
	B-LI	15.6	11.9	38.8	21.9	11.9
	B-LU	8.1	7.5	41.9	23.8	18.8
	B-NA	16.9	20.6	10.6	27.5	24.4
B-LI	B-BR	48.8	18.1	4.4	7.5	21.3
	B-HA	41.3	31.3	2.5	8.1	16.9
	B-LI	9.4	6.3	51.3	21.3	11.9
	B-LU	4.4	5.0	49.4	23.1	18.1
	B-NA	10.0	13.1	15.6	30.0	31.3
B-LU	B-BR	30.1	11.8	7.4	20.6	30.1
	B-HA	23.5	22.1	7.4	21.3	25.7
	B-LI	15.4	14.7	42.6	21.3	5.9
	B-LU	3.7	5.9	51.5	20.6	18.4
	B-NA	11.8	17.6	16.2	27.9	26.5
B-NA	B-BR	30.7	13.6	6.3	13.6	35.8
	B-HA	25.6	23.9	6.3	19.3	25.0
	B-LI	10.8	11.4	42.0	23.3	12.5
	B-LU	8.5	6.8	42.0	26.7	15.9
	B-NA	14.2	11.4	14.8	33.5	26.1

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stimuli, 46.8% responded "not all", and only 5.2% thought they would not be able to do so at all.

The confusion matrices resulting from their responses are reported in Table 5. Average correct identification scores by listener group can more readily be read in Figure 8.

On average (see Figure 8), correct identification scores for the 5 Belgian French varieties ranged from 24.5% (B-LU) to 40.8% (B-BR)—with a mean of 32.1%. As for listeners' correct identification according to the area of origin of the listeners, they ranged from 29.6% (B-LU) to 37.1% (B-LI). Several t-tests led us to conclude that all the varieties were correctly identified above the chance level ($p < 0.01$ for B-LU; $p < 0.001$ for the others), and that all the groups of listeners performed above the chance level ($p < 0.001$ for all of them).

These results suggest that listeners did not answer randomly, which is reassuring as for the representativeness of our informants. However, the results of GLMMs do not show significant differences. In other words, speakers from B-LI and B-BR were not significantly better identified than were speakers from B-NA, B-LU, or B-HA; in the same line, listeners from B-LI did not perform significantly better than did the other participants. No age effect was found either. More interestingly, the GLMM reveals a significant interaction between speakers' and listeners' origins ($\chi^2(16) = 4998.9$; $p < 0.05$), as can be seen in Figure 8.

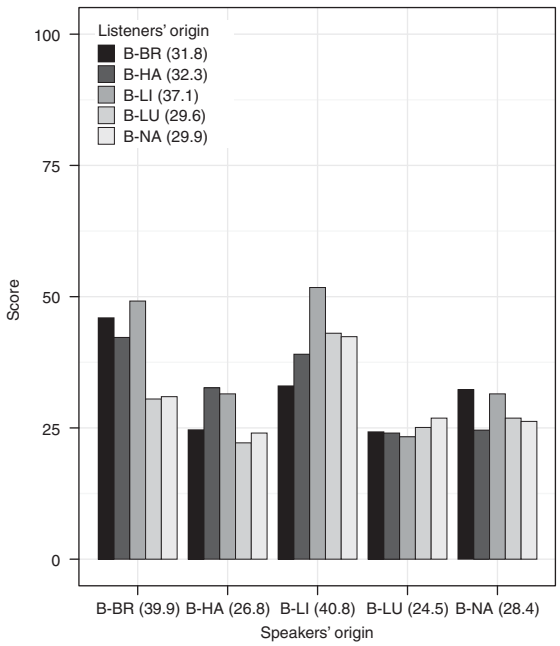

Figure 8. Correct identification scores (%) as a function of speakers' and listeners' origins (Experiment 2B). Average correct identification scores by listener group and speaker group are reported between parentheses.

Post-hoc tests reveal that the scores obtained by listeners from B-BR, B-HA, and B-LI are significantly higher than are those of participants from B-LU and B-NA for speakers from B-BR ($p < 0.001$ in each case). In addition, listeners from B-BR identified speakers from B-BR in 45.5% of cases, which is almost twice the score obtained for speakers from B-LU (24.1%, $p < 0.05$) and B-HA (24.6%, $p < 0.01$). The tests also reveal that listeners from B-LI performed significantly better than did participants from B-BR for speakers from B-LI (51.3% vs. 32.6%, $p < 0.05$). Listeners from B-LI also obtained significantly better scores for speakers from B-BR and B-LI (48.8% and 51.3%, respectively) compared with speakers from B-LU (23.1%, $p < 0.05$). To summarize, listeners' tendency to better identify speakers of their own variety was only observed in Liège (B-LI).

4.2 Experiment 2F

In total, 161 native French listeners (54 males and 107 females, aged 37 on average) took part in Experiment 2F, coming from areas around the 5 French survey points under investigation (as can be seen in Map 3 and Table 1): 20 originated from the F-EA area (where they had spent a big part of their lives as well), 20 from the F-WE area, 22 from the F-NO area, 65 from the F-IF area and 34 from the F-RA area. Most of them (77.2%) had at least a Master's university degree. Out of the 161 participants prior to hearing the stimuli, 27.6% felt able to distinguish among all the accents involved, 62.5% responded "not all", and 9.8% thought they would not be able to do so: they were therefore less confident than were Belgian participants. The confusion matrices resulting from their responses are reported in Table 6. Average correct identification scores by listener group can more readily be read in Figure 9.

On average (see Figure 9) the correct identification scores of the 5 French speaker groups ranged from 19.9% (F-WE) to 46.2% (F-IF)—with a mean of 28.8%. As for listeners' correct identification according to the area of origin of the listeners, the correct identification scores obtained ranged from 27.8% (F-IF and F-NO) to 30.6% (F-RA). Several t-tests were conducted, showing that all the varieties except F-WE were correctly identified above the chance level ($p < 0.001$ for the other ones) and that all the listeners performed above the chance level, irrespective of their origin ($p < 0.001$ for all of them).

The GLMM do not reveal any effect of listeners' origin but a significant effect of speakers' origin ($\chi^2(14) = 7127.2$; $p < 0.001$), meaning that some varieties were better identified than others were. Nevertheless, this predictor was involved in interactions: as can be seen in Figure 9, speakers' correct identification scores for the different varieties depended on the listeners' origin ($\chi^2(16) = 7143.6$; $p < 0.001$).

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Table 6. *Confusion matrix resulting from Experiment 2F (% identification scores).*

		Speaker's origin				
Listeners' origin	Predicted Real	F-EA	F-IF	F-NO	F-RA	F-WE
F-EA	F-EA	34.4	8.8	22.5	14.4	20.0
	F-IF	7.5	48.4	6.3	20.1	17.6
	F-NO	16.9	22.5	16.3	17.5	26.9
	F-RA	10.3	32.1	13.5	28.2	16.0
	F-WE	16.4	33.3	7.5	20.1	22.6
F-IF	F-EA	27.8	11.5	23.9	12.8	23.9
	F-IF	11.4	45.5	6.0	21.1	15.9
	F-NO	14.9	24.1	22.2	16.4	22.4
	F-RA	10.6	36.8	11.4	23.2	17.9
	F-WE	15.0	33.2	12.9	18.8	20.1
F-NO	F-EA	29.0	9.7	23.3	17.0	21.0
	F-IF	11.8	41.8	7.1	21.2	18.2
	F-NO	10.8	15.9	36.9	18.2	18.2
	F-RA	12.4	30.6	19.4	14.1	23.5
	F-WE	14.5	31.2	22.0	15.6	16.8
F-RA	F-EA	28.0	11.6	20.5	14.9	25.0
	F-IF	11.9	50.7	3.7	23.5	10.1
	F-NO	11.5	20.1	22.7	23.0	22.7
	F-RA	11.6	27.4	13.1	32.0	15.8
	F-WE	19.4	24.6	11.6	25.0	19.4
F-WE	F-EA	27.0	6.9	24.5	16.4	25.2
	F-IF	15.0	43.8	8.1	21.9	11.3
	F-NO	14.4	19.4	23.1	23.1	20.0
	F-RA	12.7	31.6	13.9	27.2	14.6
	F-WE	14.8	32.3	9.0	22.6	21.3

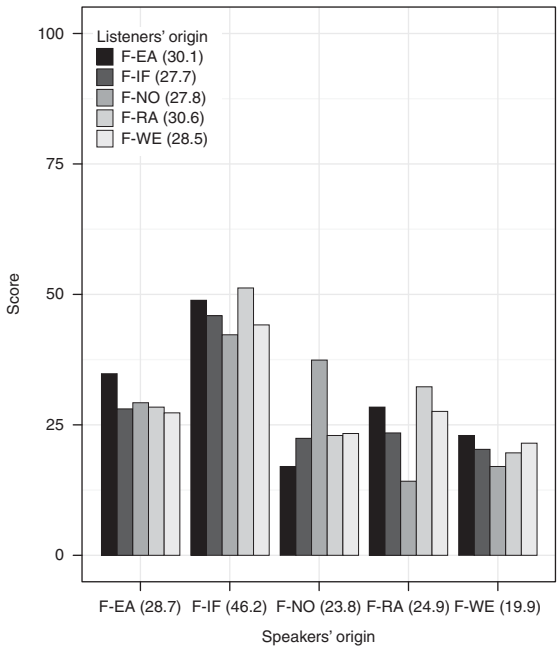

Figure 9. Correct identification scores (%) as a function of speakers' and listeners' origins (Experiment 2F).

Post-hoc tests indicate the following main differences: for F-NO speakers, listeners from F-NO obtained correct identification scores which were significantly higher than those of all other participants (36.9%, $p < 0.001$ compared with F-EA; $p < 0.01$ compared with F-IF and F-RA; $p < 0.05$ compared with F-WE). For F-RA speakers, it appears that F-NO listeners obtained scores which were significantly below those of all other participants (14.1%, $p < 0.001$ compared with F-RA; $p < 0.01$ compared with F-EA and F-WE; $p < 0.05$ compared with F-IF). Additionally, it turns out that all listeners except F-NO listeners obtained significantly better scores for the F-IF variety than for all the other varieties (at different p-values): correct identification scores ranged from 43.8% to 50.7%.

Also, the GLMM reveals a significant interaction between speakers' origin and speakers' age ($\chi^2(5) = 7142.5$; $p < 0.001$). As can be seen in Figure 10, in F-EA and F-WE, the older the speakers, the better the identification score. In F-IF (the Parisian region), the opposite was found: the younger the speaker, the better the identification scores. Finally, there was no age effect for F-NO and F-RA speakers.

Thus, a certain asymmetry exists between Paris and the rest of France. The high correct identification scores for Parisian speakers can be explained by the fact that the French capital somehow attracted participants' answers, as a default choice, when the speaker's accent is not clearly localizable: the answer "Paris", whether it was right or wrong, was given almost twice as often as the other ones (for younger speakers, especially). This unbalanced response pattern, which was not observed for Belgium, shows up in the confusion matrices of Table 6, when the numbers in each column are added. In addition, younger Parisian speakers are better identified than older ones, contrarily to what happens in the East and the West of France. Older speakers might exhibit some archaic pronunciation features which were associated with accents of other regions, linguistically more conservative. This asymmetry is in keeping with the status assigned to Paris, that of a representative of standard French.

4.3 Experiment 2S

In total, 218 native Swiss French listeners from Switzerland (96 males and 122 females, aged 34 on average) took part in Experiment 2S, coming from areas around the 5 Swiss survey points under investigation (as can be seen in Map 2 and Table 1): 24 originated from S-FR, 24 from-S-GE, 84 from S-NE, 64 from S-VD, and 22 from S-VS. Most of them (61.3%) had at least a Master's university degree. Out of the 218 participants, prior to hearing the stimuli, 83.1% felt able to distinguish among all the accents, 9.1% responded "not all", and 8.8% thought they would not be able to do so. The

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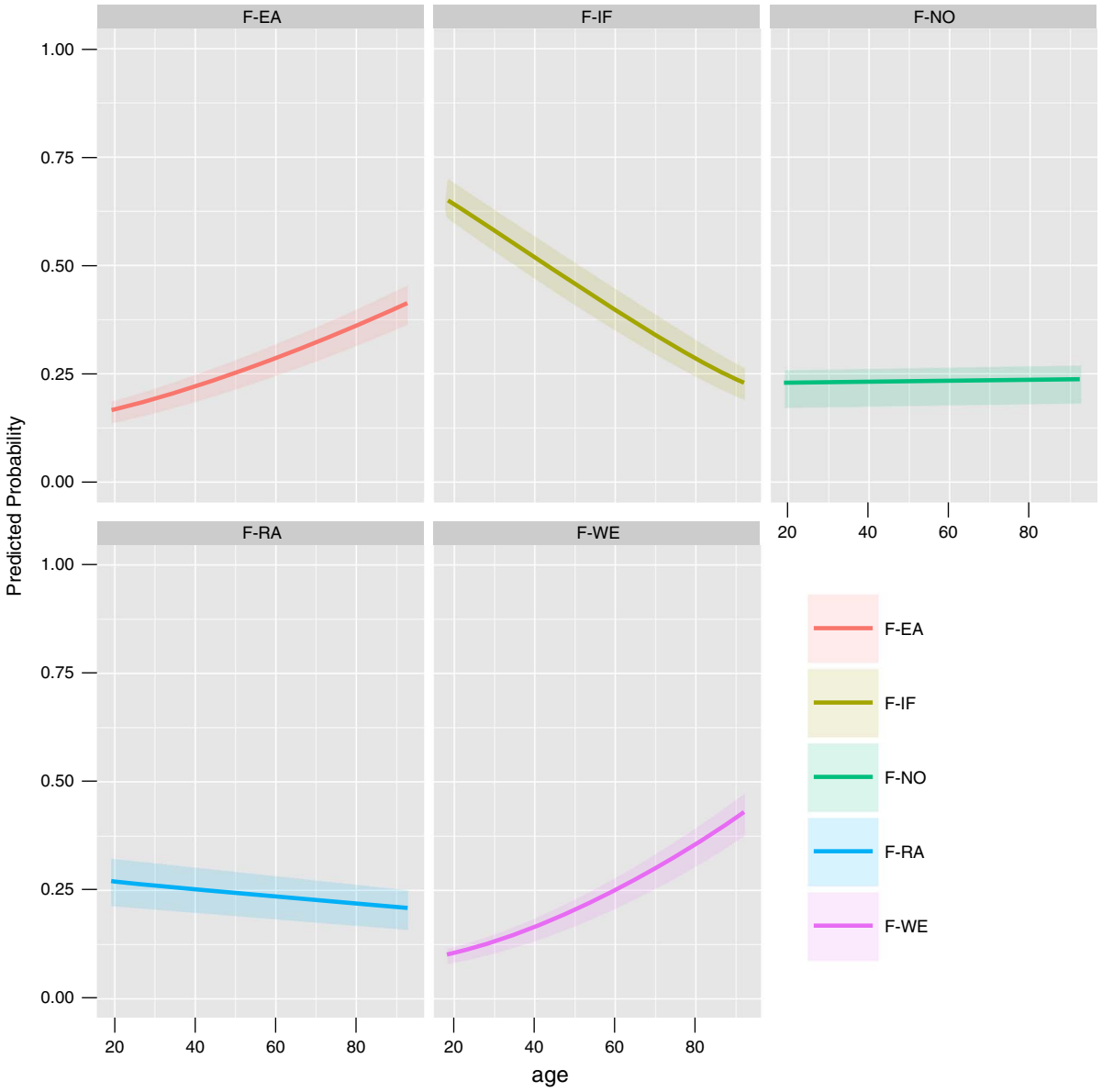

Figure 10. Correct identification score (%) as a function of speakers' origin and age (Experiment 2F).

confusion matrices resulting from their responses are reported in Table 7. Average correct identification scores by listener group can more readily be read in Figure 11.

On average (see Figure 11), correct identification scores for the 5 Swiss cantons under study ranged from 21.5% (S-FR) to 39.9% (S-NE)—with a mean of 32.6%. As for listeners' correct identification according to the area of origin of the listeners, they ranged from 31.1% (S-NE) to 36.5% (S-FR). Several t-tests were run, showing that all the varieties except S-FR were significantly well identified above the chance level ($p < 0.001$ for the other ones) and that all the participants performed above the chance level, wherever they came from ($p < 0.001$ for all of them).

The GLMM does not reveal any effect of speakers' age, listeners' origin, or speakers' origin, but a significant interaction between speakers' and listeners' origins was found ($\chi^2(16) = 10289$; $p < 0.001$), as can be seen in Figure 11.

Post-hoc tests indicate the following main differences: for S-FR speakers, listeners from S-FR, with a 45.8% correct identification score, significantly outperformed all the other participants ($p < 0.001$ for all the scores obtained). For S-GE speakers, too, S-GE listeners obtained a 50.5% score, which is significantly higher than all other participants ($p < 0.05$ compared with S-VD listeners; $p < 0.01$ in other cases). Similarly, for S-VS speakers, S-VS listeners obtained a 45.5% score

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Table 7. *Confusion matrix resulting from Experiment 2S (% identification scores).*

		Speaker's origin				
Listeners' origin	Predicted Real	S-FR	S-GE	S-NE	S-VD	S-VS
S-FR	S-FR	45.8	6.8	10.4	22.4	14.6
	S-GE	15.6	36.5	10.9	19.8	17.2
	S-NE	14.1	15.6	40.1	21.4	8.9
	S-VD	23.4	20.3	18.2	29.2	8.9
	S-VS	26.0	13.5	15.1	14.6	30.7
S-GE	S-FR	14.1	12.5	25.5	22.9	25.0
	S-GE	15.6	50.5	7.8	20.3	5.7
	S-NE	28.1	10.4	35.4	15.6	10.4
	S-VD	15.1	18.8	16.1	34.4	15.6
	S-VS	20.3	15.1	15.6	17.2	31.8
S-NE	S-FR	19.9	12.4	26.2	19.6	21.9
	S-GE	15.0	37.8	14.3	22.9	10.0
	S-NE	17.3	17.0	41.5	17.1	7.1
	S-VD	21.1	19.6	19.5	25.6	14.1
	S-VS	26.5	13.8	12.1	17.4	30.2
S-VD	S-FR	16.0	15.2	19.5	29.7	19.5
	S-GE	16.4	39.8	8.6	24.6	10.5
	S-NE	21.1	16.4	40.6	14.5	7.4
	S-VD	23.0	17.4	17.0	32.2	10.4
	S-VS	22.7	11.1	12.1	19.3	34.8
S-VS	S-FR	21.6	13.1	16.5	20.5	28.4
	S-GE	17.0	34.1	10.8	22.2	15.9
	S-NE	21.6	15.3	39.8	17.6	5.7
	S-VD	21.6	21.0	16.5	30.7	10.2
	S-VS	26.1	6.8	5.1	16.5	45.5

which is significantly higher than those of all other participants ($p < 0.01$ compared with S-NE listeners; $p < 0.05$ in other cases). In addition, all listeners except S-FR and partly S-VS participants obtained lower scores for S-FR speakers (below 20%), compared with speakers from the other Swiss cantons. Thus, listeners' tendency to better identify their own variety was observed in 3 out of the 5 Swiss cantons under investigation: Fribourg, Geneva, and Valais.

4.4 Summary and Discussion

The results of Experiment 2 can be summarized as follows:

In Belgium, all varieties were well identified above the chance level (with a mean of 32.1%). Brussels and Liège represent the best identified varieties, but statistical analyses did not show that they were significantly better identified than others. An interaction between listeners' and speakers' origins was found, but the results were not contrasted enough to validate the hypothesis according to which subjects from a given area recognize the accent of that place better. Finally, no age effect was found.

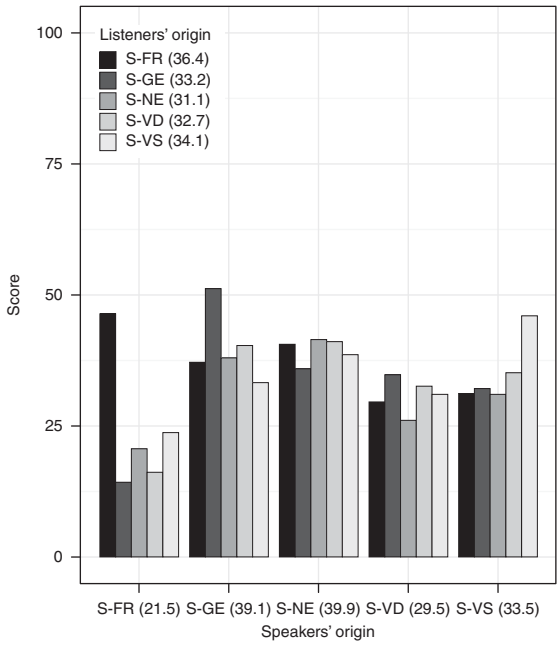

Figure 11. Correct identification scores (%) as a function of speakers' and listeners' origins (Experiment 2S). Average correct identification scores by listener group and speaker group are reported between parentheses.

In France, all varieties except that of the West were well identified above the chance level (with a mean of 28.5%). Paris, in Île-de-France (F-IF) represents the best identified variety, whereas F-NO is the worst identified variety. The high identification score of Parisian speakers is chiefly due to the fact that "Paris" was a kind of default answer: it operates as a magnet, which is not unconnected with its role, namely representing standard French. Interestingly, an interaction between speakers' and listeners' origins was found: listeners from the northernmost region of France (F-NO), sampled are far better than all the others at identifying their own variety. Speakers' age also appears to have a significant impact on the identification of speakers: even if no age effect was found in the regions which obtained the lowest scores, the older the speakers from the East and the West, the better the identification. For Paris speakers, an opposite effect was found: the older the speaker, the worse the identification.

In Switzerland, all varieties except that of S-FR were well identified above the chance level (with a mean of 33.0%). S-NE and S-GE represent the best identified varieties, and S-FR the worst identified variety. A significant interaction between speakers' and listeners' origins was found, due to the fact that S-FR, S-GE, and S-VS listeners identified their own varieties better than subjects from other cantons did. This does not hold for

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Neuchâtel (S-NE) and Vaud (S-VD) cantons, which remains unexplained and deserves further examination. Nevertheless, Swiss listeners are better at identifying the accent of the area they live in than are Belgian or French subjects.

All in all, Belgian, French and Swiss listeners achieved rather modest results (albeit above chance) when asked to identify accents of areas within their own countries with a relatively high level of granularity. This outcome is at variance with Belgian and Swiss participants' self-confidence in distinguishing 5 regional accents from their own countries (in 51–81% of cases, see §§ 4.1 and 5.3, while French subjects were more cautious). The Swiss, as compared with the others, perform slightly better, and the absence of age effect (unlike in France) may indicate that regional accents are more resistant in Switzerland. Yet, we are witnessing a homogenization process which began long ago, from Paris to France and from France to its francophone neighbors. The prominent role of Paris is to serve all at once as a melting pot center and a soundboard of standardization: it is a two-way street.

5. General discussion

The work done helped us to draw in broad outlines the contours of some European French accents, in perception. It was based on recordings of a number of speakers from different regions of France, Belgium, and Switzerland.

Our first experiment yielded asymmetrical response patterns between France on the one hand, Belgium and Switzerland on the other hand, in the sense that older and working-class speakers from the latter two countries tend to be better identified than young and middle-class speakers. To understand this asymmetry (also noticeable in the participants' self-estimated capacity to distinguish between Belgian/French/Swiss accents) and the social mechanisms that are at play, a discussion of the notions of norm and center/periphery is needed.

We are aware that what follows may be a francophone singularity: it is not necessarily universal. In layman's terms, a person is said to have an accent—even if this accent is difficult to qualify—when, in his/her pronunciation, a deviation from a norm is perceived. The norm, albeit ill-defined scientifically, represents a target model; it may change from below (from the lowest layers of the social hierarchy and/or below the threshold of consciousness), under the pressure of use of a large number of people, or from above, following the aesthetic sensibilities of a small dominant group (Labov, 1994, 2001). For the French language, at least in Europe, it is generally considered that the pronunciation norm corresponds to the pronunciation of the Paris educated bourgeoisie (Fouché, 1956; Malécot, 1977; Morin, 2000).[11] The Paris melting pot, towards which all communication channels converge, is the place which hosts most administrations, the place of national political decision-making, which concentrates much of economic activity and where cultural life is most intense (Carton et al., 1983; Lodge, 1993; Armstrong & Pooley, 2010). Today, the Parisian elite's pronunciation has spread and is broadcast through radio and television, where few journalists with a localizable accent can be heard. The mainstream media now play an essential role, even more so than school, in the development of a standard (Castellotti & Robillard, 2003). In a country like France, where the government and broadcast media are highly centralized, it is not surprising that these professionals of public speech now embody the norm. The same does not apply to Italian and German, for example, where it is common to hear different regional accents on television (Detey et al., 2016). Even in Switzerland, the results of some studies suggest that the Paris pronunciation functions as an international standard for the French language, while the Geneva pronunciation represents a kind of local standard (Racine et al., 2013). The canton of Geneva shares a long border with France, hosts a lot of French cross-border workers, and is the seat of major Swiss media, which can convey a way of speaking that gets close to the Parisian standard. In France, and to varying degrees throughout the French-speaking world, news announcers' accents are very light (Léon & Léon, 1997; Detey et al., 2016).

An accent may be more or less marked, more or less masked. Like slang or jargons, an accent may be claimed, to state one's identity and loyalty to one's city or region, to stand out, to show one's difference with respect to others—this is Saussure's (1916) parochialism or *esprit de corps*. On the other hand, having an accent may sound "vulgar", leading some people to suppress, abandon, or blur their accents, for the sake of social success. In some situations, this stigmatization may have a counter-effect and result in ambivalent reactions, consisting of saying that one's way of speaking is ugly but that it is one's own pronunciation: this appropriation is a typical case of legitimization of a devalued language variety, reminiscent of the Labovian concept of "covert prestige". Two forces act on language: a unifying one and a dividing one (Saussure, 1916). These opposite forces can dominate alternatively, and the effects of this domination are not necessarily the same on all pronunciation features. As in fashion trends, we are dealing with a mix between a statement of identity and a willingness to be integrated into society (Eckert, 2003; Milroy, 2001).

Everyone has their way of speaking; behaviors may also vary according to life circumstances. Yet, we are often prone to generalize, to speak about Belgian, Swiss accents, etc. We can hear differences between speakers

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of the same origin and similarities—defining what is called an "accent". Where should we stop to say that it is the same accent or a different accent? Many French people will assign a label such as "Belgian accent" to some pronunciation particularities even though accents do not necessarily stop at political borders between states. This generalization from France may seem quite rude to Belgians (Francard, 2001): in Tournai, near the French border, for instance, the inhabitants have the reputation of speaking like French people (Hambye & Simon, 2009). The results of Experiment 1 confirm it for older speakers but no longer for younger speakers, who are perceived as closer to other Belgian speakers. This intra-Belgian leveling or koineization goes against the idea that the alignment on Paris would be unconditional; it is not impossible that there are light multicentricity phenomena in French-speaking Europe, although to a much lower extent than what is encountered elsewhere.

By and large, it is easier to finely recognize accents to which we are geographically close. This is not surprising; but statistically validated in a minority of cases, in Experiment 2 (5 out of 15). Another trend is also prevalent, consisting of saying that from one village to another, people do not speak the same way and that, for anyone who is familiar enough, it is very easy to distinguish (Métral, 1977; Matthey, 2003). People focus on differences rather than on similarities, which are more numerous. This may be explained, in terms of information theory, by the fact that we pay more attention to rare events than to frequent events: we are more interested in a dog bitten by a man than by a man bitten by a dog.

What is true for traditional dialects (which may exhibit a great deal of grammatical and lexical variation within a few miles) is less true for accents in standardized languages: the results of our second experiment show that, even for Belgians, it is hard to correctly recognize different Belgian accents. In Switzerland, accents seem to resist better, but in France, confusions between regional accents are even more frequent for younger speakers. This lack of precision in the identification of regional French accents corroborates other studies carried out in France (Armstrong & Boughton, 1997; Boughton, 2006; Hauchecome & Ball, 1997) or in other countries such as the United States (Clopper & Pisoni, 2004, 2007).

The frequent overestimation of our ability to correctly identify accents can have different causes: our ego may first be at stake—one can boast of having a good ear, being able to immediately recognize accents and voices on the phone (while most of the time only a small number of familiar voices are implied, in quite specific situations). Second, the caricatures we are accustomed to, from actors and humorists, largely dictate our perception categories and may bias our representations. In everyday life, finally, where lexical, grammatical and situational clues can be intertwined, we often know the origin of our interlocutor. In a given place and at a given time, we expect to hear some accents or dialects more than others, which allows us to infer hypotheses. Under blind experimental conditions, the task is much more difficult.

On the other hand, an accent may be characterized by a whole bundle of features, and our perception is not omniscient: it does not remember everything but may be particularly sensitive to certain salient events, which are not necessarily frequent. This fact may also explain the difficulty in correctly identifying various accents from a few seconds or even a minute of speech. When we think we can immediately distinguish an accent from the Vaud canton and another Swiss accent, for example, the illusion can lie in the adverb "immediately": it is likely that, in reality, we have to wait a long time for cues that are not related to pronunciation alone. Our experiments support this argument, which has already been discussed in sociolinguistics (e.g. Preston, 1989).

6. Conclusions

In summary, an accent can be defined as a set of pronunciation features enabling the identification of the speaker's regional and sociological background. An accent is thus defined primarily by perception (as well as linguistic representations) and, at least in French-speaking Europe, quickly involves the concept of norm, because identifying is also comparing. To identify, say, a Swiss accent from the Vaud canton, it is indeed more important to know people from that area than referring to a norm. Exemplar-based theories, e.g. Pierrehumbert (2003), brought to light that accents are stored in memory at the same time as speakers who are associated to them. Yet, they do not account for the fact that speakers from the Vaud Canton are often mistaken as coming from Geneva and that speakers from Geneva are often mistaken as French.

The perception experiments we conducted suggest that the degree of granularity with which various European French accents can be distinguished is often overrated. The results were obtained with highly educated, likely mobile listeners: with a more balanced set of individuals, one might expect even lower scores. Accents from (northern) France, Belgium, and Switzerland are correctly discriminated more than half the time, in our experimental setup, but within these countries, with a 5-alternative forced-choice identification task, listeners' performance drops to a third of correct answers. These results contrast with those of the questionnaires submitted to participants prior to the tests, on the self-reported ability to distinguish various

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accents: in most cases, subjects imagined they could finely discriminate between accents—in up to 83% of cases, for our Swiss participants. There is thus a gap between what people think they can do and what they really do. Besides the scarcity of some pronunciation cues, a cause of this gap between representations and the actual performance of subjects who are asked to identify the origin of speech samples lies in the persistence of linguistic myths (Armstrong & Boughton, 1997; Boughton, 2006; Hauchecorne & Ball, 1997). Some clichés, some legends die hard, and our representations inherited from the past show great inertia, which cannot be ignored when working on accents.

It is not uncommon that peripheral areas are more conservative in terms of language—rural areas related to agriculture, especially, which better preserve local characteristics. Metropolises, where the traditional differences merge, are more innovation-prone, which is not proper to French-speaking Europe (Milroy, 2001). Today, with urbanization, school, television, many differences between accents fade. This was confirmed by our two experiments, younger speakers being on the whole more difficult to localize than older speakers. Differences between accents decline among middle-class speakers especially, which was measured in our first experiment (consisting of discriminating amongst Belgian, French, and Swiss accents). Unfortunately, speakers' socioeconomic status could not be taken into account in our second experiment (in which listeners were asked finer-grained distinctions), because of unbalanced distributions between working-class and middle-class speakers in the big cities, in particular. This is a limitation of the present study, but also a reflection of reality: the elites reside mostly in big cities. There is a trend towards gentrification in European capitals, creating a dissymmetry between centers and peripheries. Paris, in this context, plays a specific role, and tends to be imitated by Brussels and Geneva (in their pronunciations, too).

Further studies should include other accents, from Alsace and the south of France, for instance, possibly with a free-classification task. Comparisons with other countries, German-speaking Switzerland and Dutch-speaking Belgium would also be interesting. However, such comparisons would be difficult to make due to the dialectal fragmentation of these regions. In French, more often than not, people have to rely on pronunciation features alone (no lexical or grammatical cues) to identify their interlocutors' background. On the other hand, the French language differs from the situations of other European languages of colonization, because France remains the largest francophone country, with 66 million inhabitants — the second native French-speaking community in the world is Quebec, with only 8 million speakers. This is undoubtedly an element that makes French a mono-centered language, unlike English, Spanish and Portuguese, for example (Gadet, 1996).

A certain unification is observed across French accents. At the same time, the development of mobility may promote new changes. If we here focused on non-mobile speakers, following a traditional conception in dialectology, this does not mean we deny this reality. Accents change, like language in general. If they tend to homogenization, today, under the pressure of the pronunciation norm (especially in a centralized country like France), one can hypothesize that they will be redistributed, if not within contiguous territories, at least in networks, for instance in the way of suburban accents around major cities (Fagyal, 2010). Some geographic borders have been abolished, but other borders, sociocultural boundaries, are maintained. Today, it is possible that the language practices of France, French-speaking Belgium and French-speaking Switzerland are more strongly organized around social differences than around regions (Armstrong, 2001; Armstrong & Jamin, 2002). A better understanding of the social dimension of language change is therefore necessary in order to describe with accuracy the asymmetry of the relations of domination within a given language community, especially the French-speaking one, and their numerous consequences on language evolution as well as speakers' attitudes.

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Notes

[1] For more information, see the website of the project (http://www.projet-pfc.net/).

[2] The original aims of the PFC project were to investigate (formal) phonology: its protocol was not designed with use in perceptual dialectology in mind. Yet, the survey method included several contextual styles with the specific goal of eliciting more or less casual speech samples, in compliance with the Labovian enterprise and the variationist point of view. Rather non-mobile, the speakers are assumed to "represent" different areas and localized pronunciation features.

[3] For dialectologists, the northern French area does not include Alsace nor western Brittany, where non-Gallo-Romance

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languages used to be (or are still being) spoken. For example, the regional French pronunciation in Alsace keeps track of a Germanic substrate (Carton et al., 1983; Steiblé, 2014; Woerhling, 2009). It will not be considered here.

[4] Let us note that the limits of the Belgian and Swiss accents do not coincide exactly with political frontiers. Some pronunciation features of Belgian French are also found in the Nord-Pas-de-Calais and in the Ardennes neighboring regions (Hambye, 2005); some pronunciation features of Swiss French are also found in the Rhône-Alpes or Franche-Comté neighboring regions, for example (Métral, 1977; Pustka & Vordermayer, 2006).

[5] Maps were generated with the ggmap R package (Kahle & Hadkey, 2013). Map tiles are designed by Stamen Design (under CC BY 3.0, Data by OpenStreetMap, under ODbL).

[6] We did not take into account speakers from the two remaining Swiss cantons Bern and Jura (see Figure 2). This choice was made for two reasons: first, we wanted the numbers of points across the three countries to be equivalent; second, the accents of these cantons, even though they have not been studied thoroughly, are considered by native speakers as very close to the Neuchâtel accent.

[7] The PFC database provides information concerning speakers' level of education and occupation. We are conscious that the factors potentially determining the speakers' socioeconomic status are numerous, but we followed Chambers & Trudgill (1998) as well as Chambers (2009), considering that occupation is a good indicator of social class.

[8] Unfortunately, it was not possible to balance the accents regarding socioeconomic status. Even though it is of course possible to find 4 working-class and 4 middle-class speakers in each locality, the differences that are displayed in Table 1 reflect a certain reality, namely the gentrification (that is, the trend which results in the displacing of lower-income families to the suburbs) of capital cities such as Brussels or Paris.

[9] This could be explained by the fact that there were only three WC young speakers in Belgium.

[10] MDS is a data mining technique that makes it possible to reduce variation dimensions to a small number of uncorrelated variables. It is traditionally used to visualize the information contained in a matrix in a 2-dmension graph.

[11] For another point of view, see Moreau et al. (2008)

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