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Transmission and Diffusion: Linguistic Change in the Regional French of Béarn

1. INTRODUCTION

Labov (2007) demonstrates that, in situations of linguistic change, the TRANSMISSION of linguistic features from parent to child will have a systematically different outcome to the adoption of new linguistic features by adult learners via DIFFUSION:

> The transmission of linguistic change within a speech community is characterized by incrementation within a faithfully reproduced pattern characteristic of the family tree model, while diffusion across communities shows weakening of the original pattern and loss of structural features.
>
> (Labov, 2007: 344)

Labov draws evidence for this dichotomy from two studies of geographical diffusion: (i) the spread of the New York City pattern of /æ/-tensing to four other communities of varying distance; (ii) the adoption of the Northern Cities (vowel) Shift (NCS; see Labov et al., 2006) by residents of St. Louis as it diffuses from Chicago. Labov finds that structural contraints on the

tensing of /æ/ are lost as the pattern diffuses outward from New York City and that individual sound changes from the Northern Cities Shift are being adopted from Chicago, rather than the diffusion of the structural pattern as a whole (2007: 344). These findings lead Labov to conclude that 'the contrast between transmission and diffusion is absolute: one copies everything; the other is limited to the most superficial aspects of language: words and sounds' (2007: 349).

The TRANMISSION versus DIFFUSION dichotomy has been studied by Stanford and Kenny (2013), who used a computer-simulated agent-based model to examine the diffusion of the Northern Cities Shift from Chicago to St. Louis, and by Tagliamonte and Denis (2014) who examined the diffusion of grammatical innovations from Toronto to surrounding Ontarian communities characterised by varying degrees of rurality. Evidence for the dichotomy has never, however, been explicitly identified in varieties of French, despite the growing number of studies that have considered diffusing linguistic features within the context of supralocalisation (see, for example, Boughton, 2006, 2013; Pooley 2006, 2007; Hornsby, 2006; Armstrong and Pooley, 2010).

Traditionally, diatopic variation in contemporary varieties of French has received relatively little attention when compared with the large body of sociolinguistic literature on geographically-based variation and change in English.[1] This article aims to address this disparity by considering evidence for the seemingly dichotomous linguistic mechanisms of TRANSMISSION and

[1] There are, however, some studies which have examined localised variation in French within a Labovian sociolinguistic framework, such as Lennig (1979) in Paris, Arnaud (2006) in Haut-Jura, and Hall (2008) in Normandy.

DIFFUSION in the regional variety of French spoken in Béarn, southwestern France: the advancement of linguistic changes from below taking place between successive generations as well as changes from above taking place in the variety as a result of exposure to non-local varieties of French will be considered.

The analysis presented here considers linguistic variation and change taking place in regional French within the context of a theoretical construct hitherto examined primarily with reference to English in North America (but see Toulmin, 2009, for a historical analysis of these phenomena in India). As such, this article assesses evidence for the existence of universal language change processes which apply cross-linguistically and challenges the presumption that the mechanisms of linguistic change active in Europe are different to those attested in North America.

2. THEORETICAL BACKGROUND

2.1 Transmission

TRANSMISSION is defined by Labov (2007) in terms of the 'family tree model'. The continuity of dialects and languages is said to be the result of children's ability to learn the language of older generations (including structural and social constraints) and to reproduce faithfully this language (2007: 346):

> A language (or dialect) Y at a given time is said to be descended from language (or dialect) X of an earlier time if and only if X developed into Y by an unbroken sequence of instances of native-language acquisition by children.
>
> (Ringe et al., 2002: 63)

It is this 'unbroken sequence' of native-language acquisition by children that Labov terms TRANSMISSION. The faithful replication of older generations' language, however, need not be total. In Labov's view, children are capable of preserving 'linguistic descent' even when replication is imperfect – when language changes (2007: 346). Changes which take place internally over time are said to be generated by the process of INCREMENTATION whereby 'successive cohorts and generations of children advance the change beyond the level of their caretakers and role models, and in the same direction over many generations' (Labov, 2007: 346). INCREMENTATION takes place when children associate variability in the language of previous generations with the vector of age, advancing changes further along the same trajectory.

Labov illustrates the mechanism of TRANSMISSION with evidence from the distribution of tense and lax short /æ/ in New York City which is governed by a complex array of phonological, grammatical, stylistic and lexical constraints. Younger generations are shown to faithfully replicate this system in New York and to preserve the integrity of the system as a whole, although more recent analyses have shown that the system of the youngest informants is also suggestive of change from below, via

INCREMENTATION with respect to the traditional following phonological environment constraint (Becker, 2010). Labov also analyses evidence for the NCS in Chicago, a clockwise chain shift of six vowels originally initiated by the tensing and raising of short /æ/. This chain shift is free of lexical and grammatical constraints, applying to all instances of the vowels across the linguistic system, but the pattern is structurally complex in that it involves the interrelated and dependent movement of all vowels within the vowel space. Within the cities, such as Chicago, where the NCS was initiated, younger generations are shown not only to faithfully replicate the new vowel system in its entirety via TRANSMISSION but also to advance the NCS changes via INCREMENTATION. Successive generations have also been shown to replicate and preserve structural and social constraints on variation during the TRANSMISSION of grammatical features in Canadian English (Tagliamonte and Denis, 2014), providing additional evidence for the ability of children to reproduce adult patterns with a high degree of structural accuracy.

2.2 Diffusion

Within the family tree model, as presented above, subsequent branches of the family tree are normally seen to become more distant from each other (cf. the development of the Romance languages from Latin). Similarities between parallel branches of the family tree are usually the result of contact between the speech communities involved and of the transfer of features from one to the other (Labov, 2007: 347).

DIFFUSION is defined by Labov as the transfer of linguistic features *across* the branches of the family tree (2007: 347). The process which permits such transfer, and which underpins the mechanism of linguistic DIFFUSION, is speech accommodation (Giles et al., 1973), whereby, in face-to-face interactions between adults, speakers converge to, or diverge from, the variety of language spoken by their interlocuter in order to gain social favour or to distinguish themselves socially (Trudgill, 1986: 2).

The process of speech accommodation and the resultant DIFFUSION of linguistic features from one variety to another is presented by Labov as secondary to TRANSMISSION in that diffusing features are seen to replace traditional dialectal features which have been passed down from parent to child: 'They are the result of a secondary process in which speakers of one particular dialect gain an ascendancy – commercial, political, or cultural – and the ensuing expansion of this dialect wipes out the intermediate forms of the original continuum' (2007: 347). This phenomenon, whereby linguistic features spread out from culturally and economically dominant centres such as New York City or Paris, is part of the process of 'regional dialect levelling' (Kerswill, 2003) which is claimed to be 'leading to the loss of localised features in urban and rural varieties of English in Britain, to be replaced with features found over a wider region' (2003: 223).

The spread of linguistic features, via DIFFUSION, across branches of the family tree is traditionally thought to follow a wave-like and/or urban hierarchical pattern within the field of dialect geography. Wave-like DIFFUSION is characterised by the adoption of linguistic features radiating outward from a central focus by nearby locations before those at greater

distances. This wave-like model is often modified by the likelihood that nearby towns and cities will adopt diffusing features before more rural areas in between – urban hierarchical diffusion (Kerswill, 2003: 223). The hierarchical DIFFUSION of linguistic features is modelled in Trudgill's (1986) 'gravity' model: linguistic innovations are said to be leaping or 'parachuting' according to a defined hierarchical pattern, beginning in the largest urban centre and spreading to rural areas via smaller and smaller 'satellite' towns (1986: 39). Evidence from dialectology provides records of both DIFFUSION and TRANSMISSION acting simultaneously. In the urban centre where the linguistic feature originates, language change may take place via the mechanism of TRANSMISSION (and INCREMENTATION) as younger speakers advance the change over time. As the linguistic feature diffuses outwards across geographical (and social) space, the linguistic forms adopted are not necessarily identical to the original form. This means that linguistic features spreading to outlying areas may be adopted 'off the shelf' (Milroy, 2007) without faithful replication of associated structural and social constraints on variability:

> 'We can expect a certain degree of weakening of the process in outlying areas, since the expanding forms are copied from adults who are at a relatively conservative level to begin with and are acquired by adults who change their own speech in a sporadic and inaccurate manner.'
>
> (Labov, 2007: 350-1)

Labov demonstrates the inferior language-learning abilities of adults with results from two studies of geographical DIFFUSION. Firstly, the New York City short /æ/ pattern is shown to have diffused geographically from New York to four other areas (Northern New Jersey, Albany, Cincinatti, and New Orleans) but, in each case, the adoption of this change from above has involved a loss of structural detail, 'a transportaion of the general phonetic basis for the NYC split, but not a faithful copy' (Labov, 2007: 360). Secondly, Labov examines evidence for the diffusion of the NCS from Chicago to St. Louis and demonstrates that St. Louis speakers approximate the NCS pattern rather than consistently replicating it, 'indicating that the sound changes are diffusing individually, rather than as a system' (2007: 383). Labov infers from the adoption of these individual features, in an 'off the shelf' fashion, that the presence of new vowels in St. Louis is not the structural consequence of the NCS (initiated by the tensing and raising of /æ/), but instead constitutes evidence for the borrowing of individual elements of the shift from Chicago. Likewise, Tagliamonte and Denis (2014) find that the diffusion of quotative *be like* from Toronto to surrounding Ontarian towns and villages has involved the loss of structural and social constraints on variation leading to 'an attempt at, but imperfect replication of, the prevailing quotative system in Toronto, the diffusing model' (2014: 129).

Following the adoption of diffusing features, subsequent TRANSMISSION and INCREMENTATION may take place in the adopting varieties, leading to an array of incrementing regions 'where each surrounding area exhibits incrementation at its own level, and the only

difference between the big city and the small town is the time at which the process was initiated' (Labov, 2007: 350). Indeed, the structural and social constraints on variation and change will normally be absent or different in the new incrementing regions. Trudgill's (1974) study of the diffusion of (æ) in the Norwegian dialects of the Brunlanes peninsula, for example, showed features adopted via diffusion to undergo subsequent linguistic change in the new towns because of INCREMENTATION on the part of children, though no analysis of structural constraints was included in this study.

Finally, we must make a distinction between linguistic features diffusing across geographical space and linguistic features diffusing across social groups within a defined geographical space. Both types of DIFFUSION are underpinned by the process of speech accommodation and result in the weakening of the original diffusing pattern as well as the loss of structural complexity and sociolinguistic constraints on variation and change. For example, Labov (2014) shows that African American speakers in Philadelphia do not fully integrate the local dialect's structural constraints on the distribution of tense and lax /æ/, present in the speech of White informants, into their phonologies. Labov presents these findings as additional evidence of the distinction between 'the nearly error-free transmission from parent to child, and the less accurate diffusion across the population' (2014: 1), leading to the conclusion that, in cases of diffusion across both social and geographical space, 'words and sounds may diffuse from one community to another, but systems do not' (2014: 18).

2.3 The Transmission-Diffusion Dichotomy

In Labov's terms, change occurring during TRANSMISSION can be viewed as a change occuring within the linguistic system, or 'change from below', whereas DIFFUSION involves the importation of elements from other systems, or 'change from above' (2007: 347). Labov frames this dichotomy in terms of the differential language learning abilities of children and adults, respectively. Children are capable of replicating the adult system with a high degree of accuracy, acquiring linguistic features with all of their structural complexity and motivating change from below via the mechanism of INCREMENTATION when the features acquired are aligned with the vector of age. Adults, on the other hand, are less accurate in their language learning which places limitations on the mechanism of DIFFUSION because most instances of dialect contact in face-to-face interactions are between adults, leading to a loss of structural detail during the acquisition process.

A clear dichotomy between these two mechanisms of language change is said to be dependent on the concept of a well-defined speech community with a common structural base and a unified set of sociolinguistic norms (Labov, 2007: 347). Identifying and defining such a speech community is problematic in many respects (see Patrick, 2002 for a full discussion of these issues). Labov states, however, that any general view of language descent must be prepared to integrate the mechanisms of both TRANSMISSION and DIFFUSION, particularly when a well-defined speech community cannot be identified. For example, in western European dialectological studies (Auer and Hinskens 1996, Trudgill 1996, Kerswill

2003), the contrast between TRANSMISSION and DIFFUSION is said to be less prominent because these studies have generally identified the transfer of well-known features of older established dialects as the main linguistic phenomenon taking place: 'We rarely find reports of changes from below that depend on transmission through incrementation, as in the many new sound changes of North America' (Labov, 2007: 348). Additionally, Labov states that, hitherto, discussions of language change in European dialectology have largely examined linguistic variation and change in relatively simplified terms, focusing on isolated individual dependent variables without a full analysis of the transfer (via both TRANSMISSION and DIFFUSION) of structural and sociolinguistic constraints during dialect contact. Analysing lexical isoglosses or unconnected phonetic variables is said to inhibit a comparative examination of the outcomes of TRANSMISSION and DIFFUSION because, without a higher degree of abstraction, the preservation or loss of constaints on variation and change cannot be accurately identified (Labov, 2007: 348).

3. CONTEXTUAL BACKGROUND

The analysis presented in this article examines evidence for the mechanisms of TRANSMISSION and DIFFUSION, as well as evidence that these mechanisms can be considered to be dichotomous, in the regional variety of French spoken in the region of Béarn, southwestern France.

3.1 Dialect Levelling in Metropolitan French

Regional varieties of French are often considered to have resulted from contact between the local languages of France and the more recently imposed French language: 'In the first half of the twentieth century, as French began to make significant inroads into areas of provincial France where it had not previously been spoken, new varieties emerged from contact between local and national norms' (Hornsby, 2006: 3). Perhaps the most famous example of this is Tuaillon's assertion that regional French is 'ce qui reste du dialecte quand le dialecte a disparu'[2] (1974: 576). Traditionally, dialectological studies of regional French have focused on the identification in French of substrate features from France's moribund languages and, subsequently, on the loss of these features in favour of non-local forms.

The loss of local features from regional varieties of French has been shown to result from the process of 'regional dialect levelling', of which geographical DIFFUSION is a principal component (Pooley, 1996; Hornsby, 2006; Boughton; 2006, 2013; Hall, 2008; Armstrong and Pooley, 2010; Mooney, 2014a, 2016; and others). Hornsby (2006) notes that increasing urbanisation in France over the past century has gone hand in hand with geolinguistic homogenisation, particularly in the north of France, while Armstrong and Pooley (2010: 12) view the 'hypercephalic' demography of France as promoting the adoption of Parisian speech forms. Social changes, particularly those related to the centralising forces of Paris, are taken to be

[2] 'What remains of the dialect when the dialect has disappeared'.

the reason for a 'tendance à l'uniformisation de la prononciation[3] en France métropolitaine'[4] (Borrell and Billières, 1989: 55).

The prevalent diffusing norm in metropolitan France is commonly referred to as 'supralocal' French, as opposed to 'standard' French. Where standard French is the reference variety of French codified in grammars and dictionaries and propagated through the education system as the national language of France, supralocal French, on the other hand, is a levelled northern urban variety of French which is, in phonological terms, closely equivalent to what Carton et al. (1983) termed *français standardisé* (in opposition to *français standard*, in the normative sense) (see Figure 1). Supralocal French constitutes a statistical norm, in that it is the everyday speech form of the majority of the population in the northern two thirds of France which differs from standard French primarily in relation to its phonology (Pooley, 2006: 360).

<Figure 1 approximately here>

Figure 1. Supralocal French (Pooley, 2006: 385).

While 'supralocalisation' involves the spread of the northern statistical norm via geographical DIFFUSION (supralocal French or *norme*, cf.

[3] Some definitions of regional French consider it to comprise phonological, grammatical and lexical variation: 'les régionalismes du français affectent toutes les parties de la langue: la prononciation, la grammaire, les mots' ('French regionalisms can be found at all levels of linguistic structure: pronunciation, grammar, and words') (Tuaillon, 1988: 292). Many contemporary descriptions of regional French have tended, however, to focus on phonological and phonetic variation (see, for example, Martinet, 1945; Walter, 1982; Carton et al., 1983).

[4] 'Tendency towards pronunciation uniformity in metropolitan France'.

Garmadi, 1981), 'standardisation', on the other hand, involves convergence towards the 'ideologised' prescriptive norm (standard French or *sur-norme*). It is, however, primarily the supralocal French norm that is involved in widespread dialect levelling in metropolitan French. This norm diffuses outward from Paris, both hierarchically and in a wave-like fashion, tending to affect urban areas, particularly in the northern two thirds of France, before spreading to the contiguous rural areas in between cities and towns.

There is evidence to suggest that the regionally neutral supralocal variety of French has also spread southward into the northern *langue d'oc* regions. Indeed, Pooley notes that it is 'in particular the *départements* which contain the Mediterranean coastline and Pyrenean borderlands and the immediately contiguous regions, where accents readily identifiable as southern may be commonly heard' (2007: 40). Armstrong and Pooley (2010) adduce high levels of migration to the south of France as a motivational factor in the adoption by young *Méridionaux* (literally, 'Southerners') of a northern accent. Based on the findings of small number of studies, such as Wanner (1993) and Kuiper (2005), it is commonly assumed that younger speakers in southern regions of France are systematically adopting a non-local accent, what Hornsby and Pooley refer to as 'le manque de méridionalité dans la prononciation des jeunes méridionaux'[5] (2001: 510).

[5] 'The lack of "southerness" in young Southerners' pronunciation'.

3.2 The Region of Béarn

Béarn is the historically Romance-speaking part of the modern-day Pyrénées-Atlantiques *département* in southwestern France (see Figure 2). The region is primarily rural and the local *langue d'oc* variety historically spoken in Béarn, a sub-dialect of Gascon, is commonly referred to as Béarnais (see Mooney, 2014b). Over the course of the twentieth century, Béarnais was gradually ousted from all domains by the dominant French language. The subsequent rise of industrialisation, social mobility and in-migration to the region has led to a situation of dialect contact: the regional variety of French that had emerged from language contact has been in contact with incoming varieties of French for some time, with the most notable of these being the supralocal northern norm.

<Figure 2 approximately here>

Figure 2. The region of Béarn (from Wikimedia Commons user Thomas Gun).

Béarn also contains the city of Pau, the second largest urban centre, after Bordeaux, in the region of Aquitaine. The central *commune* of the city had a population of 84,763 in 2009 (INSEE, 2012), but its greater urban area has a population of approximately 198,000 inhabitants. The demographic evolution of Pau was rapid in the latter half of the twentieth century: it had a population of only 48,320 in 1954 (INSEE, 2012). This rapid growth is due to large-scale in-migration following the discovery of natural gas at nearby Lacq in the 1950's. Pau is served by an international airport and the *TGV (Train à Grande Vitesse) Atlantique* high-speed rail network with links to

Bordeaux in two hours. The national *TGV* network links Pau to Paris in five hours and intercity trains and motorways link it to other large urban centres such as Toulouse and the Bayonne-Anglet-Biarritz conurbation.

Pau is some 800km from Paris and, as such, it is unlikely that supralocal linguistic features diffusing from Paris in a wave-like fashion will be adopted by speakers in Béarn. A more likely scenario, given the geographical distance from the cultural and economic centre, is that Béarn residents may adopt features diffusing via a defined hierarchical pattern: it is possible that supralocal features may be diffusing to Pau via intermediate urban centres such as Bordeaux or Toulouse. Given the indirect nature of this diffusion, Labov's model predicts that supralocal features would be adopted into the regional French of Béarn with a loss of structural detail and of sociolinguistic constraints, since these have been shown to weaken with each successive instance of diffusion via (perhaps numerous) satellite towns.

4. METHODOLOGY

The data presented in this article were extracted from an original corpus of over 30 hours of natural, spontaneous speech. Thirty informants, native to the region of Béarn[6], participated in sociolinguistic interviews with the author, and the sample was stratified by biological sex (male; female) and by age (old; middle; young). Older speakers were over the age of 65 years, middle speakers were between 30 and 50 years, and young speakers were

[6] Speakers in the old generation were native Béarnais speakers; speakers in the middle generation were born to parents who were native Béarnais speakers; speakers in the young generation had parents and grandparents which fit the categories outlined above.

secondary school students between 16 and 18 years of age. These age groups were chosen to reflect different life stages as recommended by Milroy and Gordon (2003): retirement, the working world, and secondary school, respectively. Within each group, there were equal numbers of male and female participants. Informants were interviewed at three semi-urban fieldwork sites in the central Pau region (see Figure 3).

<Figure 3 approximately here>

Figure 3. Map of Pau and Fieldwork Sites.

Using the speech of the older generation as the regional baseline norm, this sample structure enables the present study to examine evidence for TRANSMISSION, or the faithful replication of speech forms, by comparing the speech of the younger generations to the baseline and, as such, by considering changes taking place in the variety in apparent time:

> 'The basic assumption underlying the [apparent time] construct is that, unless there is evidence to the contrary, difference among generations of similar adults mirror actual diachronic developments in a language: the speech of each generation is assumed to reflect the language more or less as it existed at the time when that generation learned the language.'
>
> (Bailey, 1991: 241)

This methodology also permits the examination of diffusing supralocal features in the speech of three generations of speakers from Béarn, as a result of exposure to non-local varieties of French.

4.1 Variables

The analysis of TRANSMISSION and DIFFUSION will focus on the nasal vowel system of the regional French of Béarn. Standard French has four nasal vowels (/ɛ̃/, /œ̃/, /ɑ̃/ and /ɔ̃/) and traditional descriptions of regional French in the south of France attest a phonologically similar system of four nasal vowels (Walter, 1982; Carton et al., 1983). The phonetic realisation of the southern French system, however, differs greatly from standard French: nasalisation is variable; vowel quality is traditionally modified such that /ɛ̃/ is higher [ẽ], /ɑ̃/ is central [ã̟] and /ɔ̃/ is more open [õ̞]; homorganic nasal consonant codas frequently accompany nasal vowels, i.e. [ẽN], [œ̃N], [ã̟N] and [õ̞N].

4.2 Analysis

The analysis began by labelling 4042 tokens of the nasal vowels for vowel onset and offset in Praat (Boersma, 2001; Boersma and Weenink, 2012) text grids, across the thirty speakers selected for analysis. The sociolinguistic distribution of the vowel tokens are presented in Table 1.

<Table 1 approximately here>

Table 1. Token counts for French nasal vowels by 'age' and 'sex' (F = female; M = male).

In each case, the token was coded auditorily for presence versus absence of a nasal consonant coda (e.g. /ʃɑ̃bʁ/ as [ʃãmbɾ] or [ʃãbɾ]): in cases where presence/absence could not easily be determined impressionistically, the spectrogram was examined for the presence of a periodic wave, with a notable drop in amplitude above F0, between the vowel offset and the beginning of the following segment. The distribution of nasal consonant codas is presented in Figure 4: while the percentage usage of a nasal consonant coda decreases as generations become younger, it is striking that nasal consonant presence is the majority form for all generations in this sample.

<Figure 4 approximately here>

Figure 4. Percentage of nasal vowels with nasal consonant codas by 'age'.

An automatic extraction script was then used to measure the value of F1, F2 and F3 at the vowel midpoint, as well as the vowel's duration. These formants were estimated in Praat using the LPC (Linear Predictive Coding) algorithm, with a maximum of 4,000 Hz for male speakers and 4,500 Hz for female speakers. This instrumental adjustment based on biological sex was included as formant trackers may accurately track three formants below 4,500 Hz for female speakers, but may be less accurate for male speakers who might have four formants in the 4,500 Hz range (Clopper, 2011: 195; Llamas et al., 2009: 392). A subset of the resultant data set (15%) was analysed manually by inspecting the spectrogram and verifying that automatically extracted values were correct. The results presented below focus on extracted values for F1 and F2: F1 and F2 measurements are traditionally interpreted in terms of lingual configuration, with F1 being an

indicator of tongue height and F2 of tongue backness. While the analyses of F3 and duration revealed some interesting findings (see Mooney 2014a, 2016), these are not reported here in order not to deviate from the main issues of concern in this study: the transmission and diffusion of linguistic change. Additionally, formant measurements above F2 may not be wholly reliable when extracted from spontaneous speech samples because F3 is severely affected by nasalisation (De Mareüil et al., 2007): 'due to nasal zeroes, F3 can be divided into two peaks of lesser intensity and/or shift towards higher frequencies' (Delvaux et al., 2002: 2).

Acoustic analyses of nasal vowels pose many methodological issues for the investigator, the most pertinent of which are addressed here. Firstly, measuring formant values at the vowel midpoint may be problematic due to the potentially diphthongal quality of the French nasal vowels: velo-pharyngeal coupling can lead to dynamic formant transitions during the vowel's production. Nonetheless, the presence of a nasal consonant coda in addition to the majority of vowels in the data set meant that many vowels were variably denasalised and visual inspection of the data subset suggested that measurements at the vowel midpoint were reflective of the vowel's steady state formant values. Other researchers have also successfully exploited midpoint measurements for the French nasal vowels such as, for example, Delvaux et al. (2002: 2). We must also note, when interpreting formant values for nasal vowels in articulatory terms, that velopharyngeal coupling can depress F2 and such changes cannot be attributed, without question, to a change in tongue position within the oral cavity (Carignan et al., 2013). Indeed, this F2 depression can result from a variety of

articulatory gestures (lip rounding, velar aperture; tongue backing; pharyngeal constriction) acting in tandem (Delvaux et al., 2002: 3). In sum, while we may be able to say that F2 is lower for a given vowel (i.e. that it's quality is different), we cannot be sure that this is directly correlated to tongue backing.

The acoustically measured data were normalised across speakers using the Lobanov (1971) normalisation technique before being analysed statistically in Rbrul (Johnson, 2009), which makes use of existing functions in the R environment. The primary analysis used was mixed-effects linear regression for continuous variables, an analysis that has become best practice in sociophonetic studies (Baayen et al., 2008; Drager and Hay, 2012). Mixed-effects models control for variation introduced into the data set by individual speakers and tokens occurring in individual lexical items. Each model included 'speaker' and 'word' as random effects as well as 'nasal consonant coda' and 'syllable type' as fixed effects. 'Nasal consonant coda' was coded as a binary variable [yes; no] while the 'syllable type' factor group had three factors: final-open (/Cṽ#/); final-closed (/CṽC#/); medial-open (/ṽCV(C)#/).

5. VARIATION AND CHANGE IN THE SOUTHERN FRENCH NASAL VOWELS

The results of the acoustic analyses for the nasal vowels aim to shed light on the TRANSMISSION versus DIFFUSION dichotomy using data from the regional French of Béarn by examining, firstly, evidence for the successful replication of the older speakers' nasal vowel system by subsequent (middle and young) generations and, secondly, evidence for the adoption of supralocal linguistic features (and structural constraints) diffusing from elsewhere. This study also aims to address the presumption (from previous research) that TRANSMISSION and INCREMENTATION may not have an equally important role to play in driving linguistic change in Europe and North America.

5.1 Supralocal and Parisian Nasal Vowels

Previous studies of regional French have demonstrated that some convergence towards Parisian or supralocal linguistic norms is inevitable. The nasal vowel systems presented here will be essential to the discussion of geographical DIFFUSION in the regional French of Béarn.

Where the standard French system distinguishes four nasal vowel phonemes (/ɛ̃/, /œ̃/, /ɑ̃/ and /ɔ̃/), the supralocal French system (also characteristic of Parisian French) contrasts only three nasal vowels (/ɛ̃/, /ɑ̃/ and /ɔ̃/) (see Figure 5) due to the merger of /ɛ̃/ and /œ̃/ to /ɛ̃/ (Pooley, 2006: 368). This means that the words 'brun' ('brown') /bʁœ̃/ and 'brin'

(‘sprig’) /bʁɛ̃/ are both pronounced [bʁɛ̃] by the majority of speakers in northern France.

<Figure 5 approximately here>

Figure 5. Supralocal French nasal vowels.

Additionally, in contemporary Parisian French, the nasal vowels appear to be undergoing a counterclockwise chain shift (see Figure 6; Mettas, 1973; Walter, 1994; Hansen, 1998, 2001) in which /ɛ̃/ approaches /ɑ̃/, /ɑ̃/ approaches /ɔ̃/, and /ɔ̃/ becomes very rounded and close, e.g., ‘bain’ (‘bath’) /bɛ̃/ →[bɑ̃], ‘banc’ (‘bench’) /bɑ̃/ →[bɔ̃], ‘bon’ (‘good’) /bɔ̃/ →[bõ]). Hansen notes that the counterclockwise movement of this shift contrasts with the ‘rotation […] observée pour les voyelles du français canadien qui vont vers l’avant’[7] (2001: 45), e.g., ‘bain’ /bɛ̃/ →[bẽ], ‘banc’ /bɑ̃/ →[bɛ̃], ‘bon’ /bɔ̃/ →[bɑ̃]) (cf. Carignan, 2011; Nicholas et al., forthcoming).

<Figure 6 approximately here>

Figure 6. Chain shift in Parisian French

The chain shift taking place in Parisian French constitutes a change from below in progress. Hansen (2001) notes that the shift is being led by intermediate variants in certain contexts and that it was nowhere near complete in the early noughties. Hansen identified two structural factors accelerating the chain shift (2001: 45): variants occurring in stressed position (final syllable of the rhythmic group) were more advanced than

[7] ‘rotation observed for the Canadian French nasal vowels which are moving forward’.

variants occurring in unstressed environments (see Mettas, 1973; Fónagy, 1989); within rhythmic groups, variants occuring in final syllables of polysyllabic words also exhibited more evidence for change in progress (see Léon, 1983; Malderez, 1991).

In addition to the primarily sociolinguistic studies cited above, there have been a large number of studies focussing on the phonological status and phonetic quality of the (European) French nasal vowels. These studies are largely based on laboratory, rather than spontaneous, speech and provide a wealth of descriptive detail on the nasal vowels, examining them from a variety of perspectives: speech perception (Delvaux et al., 2004; Woehrling and Boula de Mareüil, 2006; Delvaux, 2009); articulatory phonetics (Maeda, 1990; Teston and Demolin, 1997; Montagu, 2004; Delvaux et al., 2002; Delvaux et al., 2008; Carignan, 2013); acoustic phonetics (Longchamp, 1979; Maeda, 1982, 1993; Montagu, 2007); phonology (Durand, 1988, 2009; Delais-Roussarie and Durand, 2003; Durand and Eychenne, 2011). In the fields of articulatory and acoustic phonetics, there is much emphasis placed on the mapping of articulatory gestures onto acoustic cues for nasalisation and thus many of the studies cited above fall into both categories.

5.2 Evidence for Transmission in Béarn

This section presents evidence for faithful linguistic TRANSMISSION from parent to child as well as for gradual INCREMENTATION, characteristic of innovative 'change from below'. The summative results for regional French

nasal vowel quality presented here are based on mixed-effects regression models with two accepted levels of statistical significance: significant ($p < .05$); highly significant ($p < .01$).

Firstly, all generations in the study were shown to use a four-term nasal vowel system, characteristic of the traditional southern French pattern: regression analyses revealed all generations to distinguish four nasal vowels phonetically. The distribution of /ɛ̃/ in the speech of the older generation is governed by syllable type on the F1 dimension ($p < .01$): final syllables favour lower variants of /ɛ̃/ than medial syllables. This may be a result of the tendency for final syllables to be longer than medial syllables: speakers may therefore have more time to reach a lower target for this vowel. Nonetheless, this vowel height conditioning is replicated by the middle ($p < .01$) and young generations ($p < .01$) and the constraint ranking is the same in each case. This is evidence for the faithful replication of the /ɛ̃/ distribution (along with structural constraints) in successive generations within the speech community. On the F2 dimension, the older speakers' /ɛ̃/ distribution is not governed by internal constraints. For the middle generation, on the other hand, vowel frontness/backness is constrained by the presence or absence of a nasal consonant ($p < .05$): vowels occurring without a nasal consonant coda are significantly centralised. The youngest generation shows a parallel development ($p < .05$), transmitted faithfully from the middle generation, with centralisation of /ɛ̃/ when no nasal consonant is present. It is possible that no such constraint is evident in the

older generation's system because there is less variability in nasal consonant presence, with the large majority of nasal vowels accompanied by a nasal consonant coda.

All three generations make a significant phonetic distinction between /ɛ̃/ and /œ̃/, showing these phonemes not to be merged in the regional French of Béarn. This distinction is faithfully replicated by successive generations and no significant constraints on the distribution of /œ̃/ were present in any of the generations.

The distribution of /ɑ̃/ in the older generation is governed by syllable type on the F1 dimension ($p < .01$): final syllables favour lower variants than medial syllables. This syllabic constraint is successfully transmitted to subsequent generations (middle ($p < .01$) and young ($p < .05$)) who display the same constraint ranking on variation in /ɑ̃/.

Finally, the older speakers' distribution of /ɔ̃/ is constrained on the F1 dimension by syllable type ($p < .01$), with final syllables favouring lower variants than medial syllables. This constraint is faithfully replicated by the middle generation ($p < .01$) but not by the young generation. Additionally, the oldest generation's /ɔ̃/ distribution is constrained by the presence or absence of a nasal consonant coda, with nasal consonant codas favouring variants further back in the vowel space ($p < .05$). This constraint is replicated in the system of the young generation ($p < .05$) but not that of the middle generation. This loss of structural detail in the chain of transmission

to subsequent generations may, as we will see, be due to the fact that this vowel is involved in a 'change from below'.

Despite the phonological stability in the nasal vowel system of the regional French of Béarn, the apparent-time study revealed various incremental phonetic changes to be taking place in the nasal vowels: /œ̃/-fronting; /ɑ̃/-backing; /ɔ̃/-centralisation. In each case, successive generations of speakers were shown to advance changes in vowel quality along the F2 dimension, aligning inter-generational variation with the vector of age.

The linear regression analysis presented in Table 2 shows the F2 values for /œ̃/ to be undergoing change in apparent time. The baseline regression coefficient of -0.203 for the older speakers shows that their /œ̃/ vowels have the lowest F2 values when compared with the other generations: /œ̃/ vowels are significantly fronter in acoustic space in each successive generation with the youngest generation leading the change. This pattern of change is characteristic of INCREMENTATION as defined by Labov (2007).

<Table 2 approximately here>

Table 2. Regression model for F2 (/œ̃/) (with 'speaker' and 'word' as random effects).

The /ɑ̃/ vowel is also undergoing change in apparent time in the regional French of Béarn, becoming significantly more back in the acoustic vowel space in each successive generation. Evidence for INCREMENTATION is

presented in Table 3, where the linear regression coefficients indicate gradual F2-lowering: older speakers produce the frontest variants of /ɑ̃/ with a positive baseline coefficient of 0.242, indicating that they produce the highest F2 values for this vowel. The negative regression coefficient returned by the analysis for the middle generation indicates F2-lowering, and the youngest speakers lead the change, as they have the lowest F2 values for /ɑ̃/.

<Table 3 approximately here>

Table 3. Regression model for F2 (/ɑ̃/) (with 'speaker' and 'word' as random effects).

The final apparent-time change taking place in Béarn is /ɔ̃/-centralisation. The regression analysis in Table 4 returned 'age' as a highly significant predictor of the value of F2: younger generations realise /ɔ̃/ as progressively more centralised than old speakers.

<Table 4 approximately here>

Table 4. Regression model for F2 (/ɔ̃/) (with 'speaker' and 'word' as random effects).

Within the nasal vowel system of the regional French of Béarn, there is evidence for both TRANSMISSION and for the INCREMENTATION of changes in apparent time. Structural constraints present in the system of the oldest generation, such as the syllabic conditioning of vowel quality, were shown to be successfully transmitted from parent to child in an unbroken chain of intergenerational TRANSMISSION. Three clear cases of INCREMENTATION in

apparent time were also identified, illustrating the gradual advancement of vowel quality changes by successive generations.

5.3 Evidence for Diffusion in Béarn

The changes taking place via INCREMENTATION in the nasal vowels of the regional French of Béarn cannot exclusively be said to constitute 'change from below' akin to the incremental changes presented by Labov et al. (2006) for the NCS. There is varying evidence to suggest that at least some of these changes were initiated by the process of DIFFUSION.

It seems logical to interpret the significant fronting of /œ̃/ in apparent time as an instance of DIFFUSION because the acoustic fronting of /œ̃/ reduces the phonetic difference between this vowel and (stable) /ɛ̃/. This change may therefore be indicative of the prolific surpalocal merger of /ɛ̃/ and /œ̃/ diffusing to Béarn. If this is the case, it is clear that this change has not yet come to completion and that any apparent DIFFUSION of the supralocal norm constitutes a 'change from above' in progress, since even the youngest generation was shown to make a significant phonetic distinction between the front nasal vowels.

The quality difference between fronted and backed /ɑ̃/ traditionally distinguishes southern varieties of French from northern or supralocal ones. As such, the /ɑ̃/-backing change may be interpreted as an instance of supralocalisation whereby the traditional centralised variant of the older generation has been replaced, in apparent time, by a low back variant

(approximately [ɑ̃]) by the mechanism of geographical DIFFUSION. There is no evidence to suggest that the Parisian change shift, where /ɑ̃/ raises to [ɔ̃], is diffusing to Béarn: the height of /ɑ̃/ is stable across the generations, occupying a low position in the acoustic vowel space. Given the reduced levels of contact between children born into native Béarnais families and adult speakers from elsewhere during their formative years of early childhood development (0–5 years), it seems more likely that the supralocal backed [ɑ̃] variant was adopted into the regional French of Béarn by the middle generation of speakers. The difference between the older speakers' conservative variant, approximately [ã], and the new supralocal variant adopted by the middle generation may then have been aligned by the youngest generation with the vector of age, causing them to interpret the situation as follows: the younger the speaker, the more advanced the F2 change. Labov has shown that an array of incrementing regions may exist post-diffusion, where one generation adopts the diffusing variant and successive generations advance the change at their own level (2007: 350). If this is the sequence of events, the backing of /ɑ̃/ as a 'change from above' via DIFFUSION by the middle generation may constitute a 'change from below' in Labov's terms for the youngest generation, as they advance the change via INCREMENTATION rather than adopting this feature via DIFFUSION. Arguably, the 16-18 year olds in the youngest generation will now be aware of the overt prestige of this backed variant but, in their formative years, there is no reason to believe that speakers would interpret

linear /ɑ̃/-backing as a supralocal change, as a result of reduced exposure to the supralocal norm. Armstrong and Pooley's (2010) assertion that young *Méridionaux* have adopted supralocal features as a result of large-scale in-migration to the south must, in this scenario, be interpreted differently: while diffusion may be the reason younger speakers are adopting non-local features, it is possible that these features are adopted 'indirectly' from the previous local generation, who adopted these features 'directly' via diffusion from northern populations at an earlier stage.

/ɔ̃/-centralisation was revealed in the apparent time study to be a significant change in progress. There is no evidence to suggest that this change is a direct result of geographical DIFFUSION in that it has not hitherto been attested in supralocal French. Martinet (1945; 1958) proposed a functional explanation for oral /ɔ/-fronting: the presence of /ɑ/ in the speech of northern informants was said to have caused crowding in the back of the vowel space leading to fronter realisations of /ɔ/. It is also possible, therefore, that /ɑ̃/-backing in the regional French of Béarn has caused /ɔ̃/-centralisation to maximise the phonetic distinction between the phonemes and to maintain a four-term nasal vowel system.

When we consider these three changes together, it appears that the nasal vowel system of the regional French of Béarn is experiencing a counterclockwise chain shift in apparent time, initiated by the backing of /ɑ̃/, as illustrated in Figure 7. Where the Parisian chain shift identified by Hansen (1998, 2001) appeared to be initiated by the lowering and backing

of /ɛ̃/ (following a merger with /œ̃/), the chain shift in Figure 7 appears to have been initiated by the adoption of backed /ɑ̃/ via DIFFUSION by the middle generation of speakers, followed by subsequent INCREMENTATION by the youngest generation. From a functional perspective, this /ɑ̃/-backing in apparent time has caused parallel centralisation of /ɔ̃/ and, therefore, the significant /œ̃/-fronting change discussed above may alternatively be interpreted as part of a wider systemic change, or chain shift (rather than a case of gradual supralocalisation via DIFFUSION).

<Figure 7 approximately here>

Figure 7. Chain shift in the regional French of Béarn

The adoption of an individual feature from supralocal French, rather than the system as a whole, into the regional French nasal vowel system has therefore triggered a series of changes from below, internal to the system in Béarn. Some of these changes resemble supralocal norms but it is equally possible that these changes are internally-motivated or that, as younger speakers grow older and come into more intimate contact with the supralocal norm, multiple causation is more appropriate an explanation. This chain shift in the regional French of Béarn illustrates the transmission-diffusion interface, showing the two processes to interact and to overlap, leading to innovations in the sense that they are 'spontaneous' local developments that are not directly attributable to the process of DIFFUSION.

These developments are also consistent with Labov's findings for DIFFUSION. Much like the DIFFUSION of the NCS from Chicago to St. Louis,

individual features from the diffusing system, rather then the complexity of the entire system, are adopted into receiving varieties: the supralocal three-term nasal vowel system is not adopted and there is no evidence for the Parisian chain shift in Béarn. While the Parisian and Béarn chain shifts may be considered different responses to somewhat similar problems, from a functional perspective, the triggers are certainly different. We have seen this in Labov's study where the NCS was triggered by the raising of short /æ/ in Chicago but not in St. Louis; any INCREMENTATION of the chain shift involved the advancement of change for individual sounds (2007: 378).

6. CONCLUSION

This article has presented substantial evidence, in the regional French of Béarn, for TRANSMISSION, INCREMENTATION, and DIFFUSION. The nasal vowel system of the oldest generation of regional French speakers was successfully replicated, along with structural constraints on variation, by subsequent generations in the region. Younger generations were also shown to advance three ongoing changes in the nasal vowel system: /œ̃/-fronting; /ɑ̃/-backing; and /ɔ̃/-centralisation. It seemed logical to interpret the first two of these apparent-time changes as instances of supralocalisation (via DIFFUSION) because the resultant vowel qualities approximate supralocal norms. I have argued, however, that the individual adoption of one supralocal feature, /ɑ̃/-backing, has initiated a large-scale systemic change in the nasal vowel system of this variety of French. This change is driven by

younger speakers via the process of INCREMENTATION and is subject to functional constraints which aim to preserve a four-term nasal vowel system, accommodating changes in vowel quality within a counterclockwise push chain shift.

These results highlight the difficulty involved in proposing TRANSMISSION and DIFFUSION as wholly separate processes. Indeed, we have seen evidence to suggest that isolated instances of DIFFUSION can lead to internal systemic change which is incremented gradually during the TRANSMISSION process, and which is not characteristic, from a global perspective, of the original diffusing system. The evidence presented here for a chain shift in regional French shows that changes depending on TRANSMISSION via INCREMENTATION do occur in Europe, even if they have not been studied until recently, which led to Labov's assertion that it was rare to find this type of change in European dialectological studies (2007: 348). Additionally, this examination of regional French has attempted to address Labov's critique that European studies tend to ignore the TRANSMISSION of structural constraints from generation to generation, choosing instead to focus on isolated dependent variables transferred from substrate varieties or adopted from dominant centres. It seems that the processes governing linguistic descent and linguistic change in southwestern France are not all that different from those identified in North America and that TRANSMISSION and INCREMENTATION do have an equally important role to play in driving linguistic change in Europe, even though, as we have seen, the initiator of the systemic change in Béarn was, in the first instance, DIFFUSION.

In exploring complex theoretical issues, such as the TRANSMISSION versus DIFFUSION dichotomy, with reference to varieties of French, not only can the researcher support or challenge existing constructs that are based almost exclusively on varieties of English, but he/she can also inform current debates on the very nature of regional French. In the latter half of the twentieth century, large-scale in-migration to Béarn, primarily from the north of France, has led to increased contact between regional French speakers and migrants who make use of the northern supralocal norm. As it moves through time, the adoption of supralocal features into regional French is not surprising, given the increasing levels of contact between northern and southern populations in the latter half of the twentieth century. The regional French of Béarn's approximation of northern norms cannot, however, be considered as complete convergence, and, indeed, the evidence presented here for innovative internal change indicates that while regional French is adopting supralocal forms, it does so with quantifiable regard to its own pre-existing internal structure. This supports the view that regional Frenches are stable non-standard contemporary varieties of French (cf. Hornsby, 2006), rather than a collection of transitional ephemera which will ultimately fall out of use in favour of dominant supralocal norms.

Word Count: 7,965 words.

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