Not as you R: Adapting the French rhotic into Arabic and Berber

Mohamed Lahrouchi
CNRS & Université Paris 8

Abstract

This article examines the adaptation of the French rhotic in Arabic and Berber. In loanwords borrowed from French, the uvular fricative is systematically interpreted as a coronal tap, despite the fact that Arabic and Berber have phonemic /ʁ/ and /χ/. We argue that this phenomenon is determined by phonological rather than phonetic factors. We show that Tashlhiyt Berber and Moroccan Arabic speakers, including monolinguals, are able to identify the French *r* as a sonorant, based on their native phonology, where many co-occurrence restrictions are analyzed in terms of sonority-sensitive dependency relations between the most sonorous segment and its neighbouring segments.

Keywords: Loanword phonology; rhotics; Tashlhiyt Berber; Moroccan Arabic.

1. Introduction

Many studies have attempted to establish unity in the phonological behaviour of rhotic consonants, despite their high phonetic variability. In many languages, these consonants behave as a distinct class whose phonological properties often involve the same set of features (see Hall 1997, Walsh Dickey 1997, Wiese 2001, 2011, among others). This paper examines the adaptation of the French rhotic in Arabic and Berber. In loanwords borrowed from French, the uvular fricative (whether voiced [ʁ] or unvoiced [χ]) is systematically interpreted as a coronal tap, despite the fact that both Arabic and Berber have phonemic /ʁ/ and /χ/. Examples are given in (1).

(1)   *French*   *Tashlhiyt Berber / Moroccan Arabic*

a.   byʁo   biru   'office'

       ʁazwaʁ   razwar   'shaver'

       sɛʁʒɑ̃   ʃarˤʒˤɑn   'sergeant'

       pɛʁmisjɔ̃   b(ə)rmsjun   'permission'

b.   tχɛ̃   træn   'train'

       fχɑ̃s   fransa   'France'

       sɛχtifika   s(ə)rtafika   'certificate'

       kaχtɔ̃   karˤtˤon   'cardboard'

This phenomenon proves interesting to study, not only for the light it sheds on the structure of rhotic consonants in the languages under scrutiny, but also because it contributes to the highly debated issue on whether loanword adaptations are phonologically or phonetically driven. Two hypotheses have been raised in the literature to account for such

adaptation phenomena: in one, the adaptation of loanwords is done by bilinguals who have access to the underlying form of the French rhotic (Paradis & LaCharité 2001, LaCharité & Paradis 2005), and in the other, loanword adaptation is governed by phonetic (perceptual) cues (Peperkamp et al. 2008, Bakst & Katz 2014, Peperkamp 2015). Under the phonetic hypothesis, Berber and Moroccan Arabic speakers should have kept the French rhotic unchanged, since they have phonemic /ʁ/ and /χ/ in their native languages. As to the analysis advocated by Paradis & LaCharité, one wonders why uneducated monolinguals, who arrived in France in the early 1970s, interpret the French uvular systematically as a coronal although they do not have access to the phonology of the source language (e.g. [ʁ]ouen > [ruwa] 'city name', met[χ]o > [metˤro] 'subway', a[ʁ]genteuil > [arʒantæj] 'city name', place voltai[ʁ]e > [blɑsˤbuntir]).

In this paper we propose an alternative analysis, taking Paradis & LaCharité as a starting point. According to our hypothesis, speakers of Berber and Moroccan Arabic select the coronal tap rather than the uvular fricative due to its phonotactics. Based on their native phonology, they identify the French *r* as a sonorant, which patterns with *l* in complex onsets (see also Chabot, and Noelliste, this volume).

The paper is organized as follows: Section 2 outlines the debate on the role of phonology and phonetics in loanword adaptation processes. Section 3 deals with the rhotic consonants in French, Moroccan Arabic, and Berber. The relevant data will be presented and analyzed therein. Section 4 concludes the paper.

2. Phonology vs. phonetics in loanword adaptation: An overview

As noted by Kang (2011: 2258), loanword adaptation processes allow probing into the grammatical knowledge of speakers in ways that native data alone do not. It is a crucial task for linguistic theory to determine whether the patterns arising from these processes reflect phonetic or phonological representations, and in either case, what kind of information is employed in the foreign and native languages.

Proponents of the phonetic approximation stance argue that phonetic details play a central role in loanword adaptation. Speakers map foreign sounds onto the phonetically closest sounds in their native language. In his seminal work, Silverman (1992) distinguished two levels of adaptation, one of which involves phonological computation. In the first level, the input consists of an acoustic signal, which speakers parse into segmental-sized chunks without any access to their phonological representation in the source language. In the second

level, the phonotactics of the borrowing language apply in order to repair any illicit syllabic or prosodic structure. Along the same lines, Steriade (2001) and Kenstowicz (2003, 2005) argue for perceptual similarity, combined with other grammatical constraints that address the phonotactics of the borrowing language.

In a recent study on the adaptation of French vowels into Moroccan Arabic, Kenstowicz & Louriz (2009) argue that the process whereby French back, mid, and low vowels introduce pharyngealization to adjacent consonants is better analyzed in terms of auditory silence and similarity rather than as contrastive phonological features of the borrowing language (see Zellou 2011 for an alternative view on this topic).

The strongest version of the phonetic approximation stance is promoted by Peperkamp & Dupoux (2003) and Peperkamp (2005: 347) who claim that "all loanword adaptations are phonetically minimal transformations that apply in perception". That is, all non-native sound properties are mapped onto the phonetically closest sounds in the native language through a phonetic (perceptual) decoder. One piece of evidence for this hypothesis comes from the adaptation of word-final /n/ in Japanese (Peperkamp *et al.* 2008): While English words like *pen* and *walkman* are adapted with a moraic nasal consonant, French words like *parisienne* 'parisian-FM' and *terrine* 'pâté, terrine' resort to u-epenthesis in the final position, leading to [parijennu] and [terīnu], respectively. This asymmetry, the authors argue, is due to "fine phonetic differences between English and French word-final [n]", to which Japanese listeners are sensitive.

Most approaches to loanword adaptations are phonetically-based, relying on the nature of the input from the source languages, which is claimed to consist exclusively of surface forms. In contrast to these approaches, it has been proposed that many adaptation processes reflect the speakers' phonological competence, combined where appropriate with their knowledge of the source language. For instance, it has been argued that vowel epenthesis in loanwords obeys the phonological rules of the borrowing language. Rose & Demuth (2006) have shown that the quality of the epenthetic vowel used in Sesotho for English and Afrikaans loanwords is generally predictable on the basis of the feature specifications of the input vowel to its left. In most cases, such epenthesis consists of copying the input vowel (e.g. [fʊtbɔl] > [futubɔlɔ] 'football'; [knɪp] > [kinipi] 'pocket knife'), except when the source vowel is /a/, which triggers the epenthesis of /ɪ/, since it is phonologically underspecified for place (e.g. [pɑtʁuwn] > [pɑtɪrunɪ] 'pattern/cartridge'; [kɑʁtʃi] > [kɑriti] 'cart').[1]

---

[1] The reader is referred to the original work for further details and analysis, especially with regard to the

Further evidence for the phonological approach to loanword adaptation processes comes from French, which adapts English words like *hold up* and *hard rock* as [oldɔp] and [aʁdʁɔk], respectively. According to Paradis & LaCharité (2001), the failure to adapt the laryngeal consonant /h/ is due to the non-availability of the pharyngeal node in the phonology of French. The nature of the French uvular rhotic does not challenge this alleged *Non-Availability Hypothesis*. Although the French rhotic can be realized as a uvular fricative [ʁ], phonologically, it behaves as a coronal sonorant, which patterns with /l/ in complex onsets.

Bilingualism has also been used to argue for a phonological analysis. It has been claimed that bilingual speakers play a central role in the adaptation of loanwords, as they have access to the phonological representations of both source and borrowing languages. In this regard, Paradis & LaCharité (2001: 272) contend that "bilingual Arabic speakers who adapt French loanwords classify the French rhotic as coronal, despite the fact that Arabic has a phonemic uvular /ʁ/ in its inventory of gutturals."[2]

Following the same reasoning, I will argue in the next section that it is the phonological rather than the phonetic representation that matters in how the French *r* in loanwords is interpreted in Moroccan Arabic and Berber. Furthermore, I will explain how monolingual speakers of Berber who barely speak French adapt the French rhotic directly from source forms (i.e. on-line adaptation) as a coronal tap. Relying on previous work on the structure of roots in Berber (Lahrouchi 2010), I will show that Berber phonology provides speakers with enough evidence to analyze the French rhotic as a sonorant.

3. The adaptation of the French rhotic into Berber and Moroccan Arabic

Before addressing the core issue of the paper, it is necessary to present the phonemic system of the borrowing languages, and some basic phonological features, to allow for a better understanding of the analysis. Comparison with French is provided where appropriate, especially with regard to the nature and distribution of the rhotic consonants.

3.1 Background on Berber and Moroccan Arabic phonology

Berber is an Afroasiatic language, spoken in large parts of North Africa, mainly in Morocco and Algeria, and to a lesser extent in Niger, Mali, Libya, Egypt, Tunisia and Burkina

---

contribution of consonants to the feature copied onto the epenthetic site. Similar patterns are found in Fula (Paradis 1996) and Shona (Uffmann 2001, 2007), among others.

[2] Authors disagree as to the place of articulation of the fricative rhotic in Moroccan Arabic, some authors arguing that it is velar (Caubet 2007, Ennaji *et al.* 2004, Harris 1942, and Marçais 1977), while others classify it as uvular (Boudlal 2001, Heath 1997, and Paradis & LaCharité 2001).

Faso. Three main varieties are found in Morocco: Tashlhiyt is spoken in Southern Morocco; Tamazight is spoken in the Middle Atlas, and Tarifit is spoken in Northern Morocco. Unless otherwise specified, all Berber data used in this paper refer to the Tashlhiyt variety, of which I am a native speaker. The adaptation of loanwords in Tamazight and Tarifit proceeds along similar paths as in Tashlhiyt, except for a few phonetic and phonological differences, irrelevant for the purpose of the present work.

Tashlhiyt is a relatively well-documented variety. Its phonemic system, extensively studied in previous works, contains three vowels /i, a, u/, 33 consonants, and two semi-consonants /j, w/ (cf. Dell & Elmedlaoui 2002; Ridouane 2008, 2016; Lahrouchi & Kern 2018, among others). The consonants are listed in Table 1.

Table1. *Tashlhiyt Berber consonant inventory*

	Labial	Dental	Alveolar	Palatal	Velar	Uvular	Pharyngeal	Laryngeal
Stop	b	t d tˤ dˤ			k g kʷ gʷ	q qʷ		
Fricative	f		s z sˤ zˤ	ʃ ʒ ʃˤ ʒˤ		χ ʁ χʷ ʁʷ	ħ ʕ	h
Tap			r rˤ					
Lateral			l lˤ					
Nasal	m		n					
Approximant	w			j				

Most consonants have geminate counterpart, except for /ʕ/ and /h/, which are realized only as singleton, at least in native words. Of interest is the behavior of the rothic consonants. Gemination of the coronal tap results in a trill, similar to the Spanish *perro* 'dog' vs. *pero* 'but', whereas the gemination of the voiced uvular /ʁ/ may lead to a voiceless stop (e.g. *ʁr* 'read-aorist' / *aqqra* 'read-imperfective', *nʁ* 'kill-aorist' / *nqqa* 'kill-imperfective'). The distribution of geminates in Berber is commonly described as highly marked, since they occur in intervocalic as well as in initial and final positions (Ridouane 2007, Lahrouchi 2017, among others). Table 1 also displays pharyngealized coronals and labialized dorsals, contrasted with their plain counterparts.

The consonantal inventory of Moroccan Arabic is identical to that of Berber, except for labiovelarized dorsals, which some authors do no explicitly analyze as phonemic (see Heath 1997, and Caubet 2011), while others argue that they are contrastive, relying on minimal pairs like *skət* 'he stopped talking' / *sk^{w}ət* 'be quiet!', *xraʒ* 'he went out' / *x^{w}raʒ* 'get out!', and *kħəl* 'black' / *k^{w}ħəl* 'kohl' (Boudlal 2001: 16). Moroccan Arabic also contrasts singleton and geminate consonants. These occur in any position within the word, as in Berber.

Centuries of coexistence with Berber have deeply impacted the phonological and morphological structures of Moroccan Arabic. One of the main features developed in this language as a result of contact with the Berber dialects is the loss of vowel length contrast. Moroccan Arabic has retained three short vowels from Classical Arabic, /i, a, u/, and has developed a short epenthetic vowel [ə], used to break up complex consonant clusters (Heath 1997, Caubet 2011, and Lahrouchi 2018).

As evident in Table 1, Moroccan Arabic and Berber contrast the coronal tap /r/ with the uvular fricative /ʁ/ (e.g. Berber: *rar* 'to give back' / *ʁar* 'to be dry', *rz* 'to break' / *ʁz* 'to dig'; Moroccan Arabic: *rab* 'to be destroyed' / *ʁab* 'to be absent', *brˤa* 'he's healed' / *bʁa* 'he wants'). In contrast, French has only one phonemic rhotic /ʁ/ which stands in free variation with the uvular trill [R] and with the coronal tap [r]. The French rhotic also occurs in complementary distribution with the voiceless uvular [χ] such as in *travail* [tχavaj] 'work' and *frein* [fχɛ̃] 'brake'. This phonemic difference impacts the adaptation of the French rhotic into Berber and Moroccan Arabic, as we will see in the next section.

3.2 A phonological account of the adaptation of the French rhotic

The phonetic approximation approach predicts that Berber and Moroccan Arabic speakers should adapt French words like *bureau* [byʁo] 'office' and *rideau* [ʁido] 'curtain' without changing the uvular fricative, since it is part of the phonemic inventory of their native phonology. The allophonic variant [χ], found in words like *frein* [fχɛ̃] 'brake' and *carte* [kaχt] 'card', should likewise remain unchanged, as Berber and Moroccan Arabic have a phonemic /χ/. Loanwords of the type shown in (2) clearly contradict this prediction.

(2) *French*   *Berber / Moroccan Arabic*

a.   bʁigadje   b$^{(ə)}$rgadi   'brigadier'

     ɛ̃fiʁmje   a-f$^{(ə)}$rmli   'nurse'

     sɛʁvis   s-s$^{(ə)}$rbis   'service, row'

     byʁo   l-biru   'office'

     pɛʁmisjɔ̃   b$^{(ə)}$rmsjun   'permission'

6

	fɛʁm	l-firma	'farm'
	komisaʁja	l-kumisarija	'police station'
	tɛ̃bʁ	t-tanb⁽ə⁾r	'stamp'

b.	elektʃisite	t-trisinti	'electricity'
	putʃ	l-budra	'beam'
	tʃɛ̃	t-tran	'train'
	fʃɑ̃s	fransa	'France'
	sɛʃtifika	s-s⁽ə⁾rtafika	'certificate'
	fʃigo	l-frigu	'fridge'
	fʃomaʒ	l-f⁽ə⁾rmaʒ	'cheese'
	filtʃ	l-fil⁽ə⁾r	'filter'

c.	fuʃʃɛt	l-f⁽ə⁾rˤʃetˤɑ	'fork'
	bʁuwɛt	l-b⁽ə⁾rˤwetˤɑ	'wheelbarrow'
	ʃofœʁ	ʃ-ʃˤeforˤ	'driver'
	kʃwasɔ̃	k⁽ə⁾rˤwassˤɑ	'croissant'
	tʃase	tˤrˤasˤe	'draw'
	kaʃtɔ̃	karˤtˤon	'cardboard'
	sɛʁʒɑ̃	ʃˤarˤʒˤɑn	'sergeant'
	kapoʁal	kɑbrˤɑn	'corporal'

These data were gathered partly from spontaneous speech and interviews of native speakers, including myself, as well as from written sources (Heath 1989, Paradis & LaCharité 2001, Kentowicz & Louriz 2009). They are grouped into three classes depending on the phonetic nature of the French rhotic and the introduction of pharyngealization by the input vowels in loanwords.

The data in (2) involve many adaptation strategies (including denasalization of French nasal vowels, manner change in consonants, and sibilant harmony), which are irrelevant to the topic of the present paper. The discussion below focuses only on those observations that are relevant to the discussion. First, the French rhotic is systematically adapted as a coronal tap in Berber and Moroccan Arabic, regardless of whether it is phonetically voiced [ʁ] (2a) or voiceless [χ] (2b) uvular. This factor alone is sufficient to refute the phonetic approximation hypothesis, as it shows that phonetic details and perceptual similarity are not the only constraints governing the adaptation of loanwords in Berber and Moroccan Arabic.

Second, the French mid and low vowels introduce pharyngealization on adjacent segments, including the coronal tap (2c). This feature, which is contrastive in Berber and Moroccan Arabic (see Table 1), spreads to the whole word and results in the lowering of the high vowels, as in [tˤrˤasˤe] 'draw' and [kɑrˤtˤon] 'cardboard'. These words should have been adapted as *[trasi] and *[kɑrtun], had they followed the general rule which turns French mid vowels into the corresponding high vowels in Berber and Moroccan Arabic (e.g. [l-fi̱rma] ← /fɛʁm/ 'the farm'; [la-gri̱s] ← /gʁɛs/ 'the fat'; [l-bu̱n] ← /bɔ̃/ 'the order form').

Third, some input vowels are deleted in the adapted forms, resulting in consonant clusters, which can be simplified by means of vowel epenthesis. The schwa put in brackets is to be understood as epenthetic in Moroccan Arabic, unlike in Tashlhiyt Berber, where it is systematically omitted (for instance, the form meaning 'brigadier' is realized as [bərgadi] in Moroccan Arabic, and as [brgadi] in Tashlhiyt Berber).

Fourth, the initial consonant in the adapted forms stands for the Arabic definite article /l-/. It surfaces as a geminate by assimilation with the following coronal consonant. In Berber, the definite article is systematically embedded in the adapted noun, but does not necessarily denote definiteness, as opposed to Moroccan Arabic where each noun has a definite vs. indefinite form (see Guerssel 1987, 1992, Ouhalla 2005, and Lahrouchi 2013 on definiteness in Berber).

Kenstowiz & Louriz (2009) analyze the adaptation of French mid and low vowels in terms of phonetic (auditory) similarity rather than phonological constrastiveness. They argue that the adapters map the French vowels onto the closest vowels in the auditory (acoustic) space of Moroccan Arabic. The French mid and back vowels are generally adapted by the introduction of pharyngealization on adjacent coronal consonants. Counter-examples include forms like *pompe* [pɔ̃p] 'pump' and *bon* [bɔ̃] 'vouhcer', which are unexpectedly adapted to high vowels, yielding [lbumba] and [lbun], respectively. Kenstowicz & Louriz's phonetic-based analysis can hardly be implemented in the case at hand, since there is no faithfulness to the French rhotic in the adapted forms. The reason behind the adaptation of the French uvular as a coronal tap in Moroccan Arabic and Berber is entirely phonological, as discussed below.

It is a well-established fact that the French rhotic behaves like a sonorant: it patterns with the lateral consonant /l/ in complex onsets. It also occurs in the immediate vicinity of vowels (pre- and post-vocalic positions). In light of such arguments, Paradis & LaCharité

8

(2001) claim that bilinguals play a key role in the adaptation of the French rhotic to a coronal tap, since they have access to the phonology of both source and target languages. Accordingly, bilingual speakers identify this consonant as a sonorant, despite its phonetic nature. Further evidence for this hypothesis is provided by Arabic loanwords in French. The authors discuss several examples where the Arabic uvulars /ʁ/ and /χ/ are adapted in French as velar stops (see 3a), suggesting the non-availability of the pharyngeal node in the phonology of French. Meanwhile, the Arabic coronal tap /r/ is systematically interpreted as a uvular in Standard French (see 3b).

(3)   *Arabic*   *French*

a.   maʁrib   magʁɛb   'Maghreb'

      ʁazal   gazɛl   'gazelle'

      χalifa   kalif   'calif'

      ʃajχ   ʃɛk   'Sheikh'

      ʁarrafa   kaʁaf   'water pitcher'

b.   hrisa   aʁisa   'harissa'

      ribatˤ   ʁaba   'Rabat'

      ʕarab   aʁab   'Arab'

      sˤaħra   sa_aʁa   'Sahara'

      barˤudˤ   baʁud   'saltpetre, last stand'

Needless to say, the phonetic approximation approach explains neither the data in (3) nor the data in (2). In both cases, it wrongly predicts that the uvular fricative will remain unchanged, regardless of the direction of borrowing.[3]

Consequently, Paradis & LaCharité (2001) are correct in saying that phonotactics affect the adaptation process. Taking their analysis a few steps further, I argue that speakers of Berber and Moroccan Arabic can select the coronal tap rather than the uvular fricative due to the phonotactics of their own language. Let us consider the following data.

(4)   *French*   *Berber*

      ʁwã   ruwa   'Rouen'

      plasvɔltɛʁ   blˤasˤbunter   'Voltaire square'

---

[3] One may argue that the adaptation of the French rhotic into North African languages involves historical considerations. Martinet (1969) suggested that the apical rhotic [r] was introduced at the time of the French occupation by speakers who predominantly used this variant; a fact which would explain its selection in loanwords instead of the uvular variant [ʁ]. However, according to Morsly (1983), the latter variant, taught at school as the standard realization of the French rhotic, has since then replaced the apical realization.

ebɛʁʒəmã	eberʒma	'housing'
gaʁdynɔʁ	gardinorˤ	'North station'
tuʁɛfɛl	tturifil	'Eiffel Tower'
kyʁkyma	lkorˤkoma	'turmeric'
kuʁbəvwa	kərbubba	'Courbevoie'
nãtɛʁ	nɑntˤɛrˤ	'Nanterre'
bʁokoli	lbrokoli	'broccoli'
aʁʒã	larʒa	'money'

These data were collected from uneducated native speakers of Berber, with little to no French.[4] They arrived in France in the early 1970's and settled in the Parisian region, mainly in the northern suburbs. One may well ask how these people interpret the French uvular systematically as a coronal although they do not have access to the phonology of the source language. One possible explanation lies in their native Berber phonology, which may allow them to identify the French rhotic as the analogue of the coronal tap in their native language.

3.3 Sonority-driven phonotactics in Tashlhiyt Berber roots

In a relatively recent study (Lahrouchi 2010), it has been shown that the segmental composition of consonantal roots in Tashlhiyt Berber obeys structural and distributional constraints, the foremost being:

(5)   Each root contains at least one sonorant, immediately preceded by an obstruent.

The examples in (6) illustrate this constraint. They are grouped into four sets, where O stands for an obstruent and S for a sonorant.

(6)

√OOS

gzm	'cut'
bsr	'spread out'
bdr	'mention'
kʃm	'enter'
kbu	'pierce'

√SOS

mgr	'reap'

√OSO

|	
frd	'nibble'
krz	'plow'
xrb	'scratch'
smd	'add'
ħlb	'eat (liquid food)'

√OSS

knu	'lean'

---

[4] Needless to say that this type of data challenge the idea that orthography influences the adaptation of the French rhotic in Berber (see Vendelin & Peperkamp 2006 on the role of orthography in loanword adaptations).

lkm	'arrive'	bri	'scratch'
nkr	'stand up'	xmr	'ferment'
rgl	'knock'	ʁml	'mold'
ntl	'hide'	ʒlu	'lose'

Of the roots listed in the aforementioned study, 73% belong to these classes. 82% of them contain at least one sonorant preceded by an obstruent. Counterexamples include roots that are entirely made of obstruents (e.g. *bdg* 'be wet', *bzg* 'swell', *zdʁ* 'inhabit'), and roots where the only sonorant occurs in the initial position (e.g. *rkz* 'dance', *lqʒ* 'crush', *rqs* 'jump').

Based on this type of constraints, Lahrouchi (2010) has proposed that Tashlhiyt Berber triconsonantal roots display a binary-branching head-complement structure, where the obstruent is the *head* and the following sonorant its *complement*. This structure is hierarchical, rendered by means of a tree diagram analogous to those that represent syllabic and syntactic constituencies. The roots represented in (7) illustrate the proposal (the head position is indicated by the dot at the end of the branch).

(7)
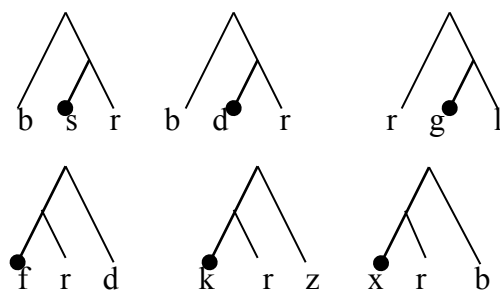
The head and the complement share the same node in the tree. The remaining segment, linked to a higher node, is a *satellite* that occurs indifferently to the left or the right of the head-complement pair.

Biconsonantal roots are no exception to this trend. Half of them are of the form obstruent-sonorant (e.g. *fl* 'leave', *gn* 'sleep', *gl* 'bust'). Those displaying the reverse order (sonorant-obstruent) do not exceed 25%, and behave as underlying triconsonantals (see Iazzi 1991, and Lahrouchi 2008, 2010, among others).

One piece of evidence in favor of this structure is provided in the imperfective stem: only roots containing an obstruent-sonorant cluster, that is, a head-complement structure, undergo gemination in the imperfective. Moreover, the segment which is geminated is the one which occurs in the head position; for instance, *gzm* and *mgr* geminate the medial consonant, while *frd* geminates the initial one (see Dell & Elmedlaoui 1985, 1988, 2002 for an alternative

analysis). Roots lacking the head-complement structure resort to tt-prefixation in the imperfective.

The careful reader will have noticed that branching onsets in French exhibit the same pattern.[5] They are composed precisely of an obstruent followed by a sonorant. It is therefore not surprising that Berber native speakers, monolinguals included, can employ this phonological pattern and adapt the French rhotic as a sonorant, that is, as a coronal tap. That is not to say, however, that the obstruent-sonorant cluster behave as complex onsets in Berber. Word-initial complex clusters are much less restricted in this language than they are languages with genuine complex onsets. While French requires that word-initial clusters have always a rising sonority profile, Berber imposes no sonority restriction on their distribution. As shown in the examples below, Berber exhibits not only #CC sequences of rising sonority (8a) but also their mirror image (8b), as well as those which have a sonority plateau (8c).

(8)	a. OS		b. SO		c. OO	
	kru	'rent'	rku	'be dirty'	kti	'remember'
	bri	'scratch'	rbu	'carry on the back'	bdu	'begin'
	gnu	'sew'	ngi	'overflow'	bgu	'drill'
	dlu	'cover'	ldi	'pull'	fsi	'untie, melt'
	sli	'touch'	lsan	'they wore'	sti	'pick out''

Any CC combination is possible in Berber, regardless of the relative sonority of the consonants. According to Dell & Elmedlaoui's syllabic model (1985, 1988, 2002), prevocalic clusters of the type in (8) are systematically parsed as heterosyllabic: The first consonant stand as a syllable on its own while the second one is syllabified in the onset position (see Ridouane, Hermes & Halle 2014, and Lahrouchi 2001: 103, 2018).

The obstruent-sonorant pattern is undoubtedly active at the phonological level of Tashlhiyt Berber and French as well. While in the latter language it is used at the syllabic level in order to defines the sonority profile of complex onsets, in Tashlhiyt Berber it underlies the organization of consonantal roots in the lexicon, assigning them a binary-branching head-complement structure, which does not necessarily correspond to their syllabic structure.

If this analysis is correct, then the hypothesis according to which bilinguals must

---

[5] The obstruent-sonorant pattern has also been reported in Bella Coola. Bagemihl (1991: 559) noted that in this Salishan language, the continuative is formed by reduplicating the obstruent-sonorant cluster (e.g. $tl'k^w \rightarrow tltl'k$ 'swallow', $kwn \rightarrow k^wuk^wn$ 'take').

phonologically adapt loanwords before monolinguals can appropriate them becomes unnecessary redundant (Paradis & LaCharité 2001: 258). It is sufficient to say that Berber speakers select the coronal tap in French loanwords instead of the uvular fricative based on their native phonology, where many co-occurrence restrictions can be analyzed in terms of sonority-sensitive dependency relations between the most sonorous segment in a specific domain and its neighbouring segments.

4. Conclusion

In this paper, it has been argued that the adaptation of the French rhotic into Berber and Moroccan Arabic is determined by phonological rather than phonetic factors. Following Paradis & LaCharité's phonological analysis, it has been shown that even monolingual speakers who do not have access to the phonology of the source language are able to adapt the French rhotic as a coronal tap. Relying on their native phonology, in which sonorants play a central role in the organization of segmental content, speakers identify the French uvular as a sonorant, which patterns with /l/ in complex onsets.

The literature on loanwords abounds with studies which discuss phonetic and phonological approaches to adaptation strategies. As shown above, phonetic similarity wrongly predicts that the French uvular, be it voiced [ʁ] or unvoiced [χ], will remain unchanged in Berber and Moroccan Arabic, since they have phonemic /ʁ/ and /χ/. The analysis proposed here clearly advocates for phonological similarity between phonemic categories in L1 and L2.

References

Bagemihl, Bruce. 1991. Syllable structure in Bella Coola. *Linguistic Inquiry* 22: 589-646.

Bakst, Sarah & Jonah Katz. 2014. A phonetic basis for the sonority of [χ]. *UC Berkeley Phonology Lab Annual Report*: 11-19.

Boudlal, Abdelaziz. 2001. *Constraint interaction in the phonology and morphology of Casablanca Moroccan Arabic*. Thèse d'Etat dissertation, Mohammed V University, Rabat.

Dell, François & Mohamed Elmedlaoui. 1985. Syllabic Consonants and Syllabification in Imdlawn Tashlhiyt Berber. *Journal of African Languages and Linguistics* 7: 105-130.

Dell, François & Mohamed Elmedlaoui. 1988. Syllabic Consonants in Berber: Some New Evidence. *Journal of African Languages and Linguistics* 10: 1-17.
DOI: https://doi.org/10.1515/jall.1988.10.1.1

Dell, François & Mohamed Elmedlaoui. 2002. *Syllables in Tashlhiyt Berber and in Moroccan Arabic*. Dordrecht: Kluwer. DOI: https://doi.org/10.1007/978-94-010-0279-0

Ennaji, Moha, Makhoukh, Ahmed, Essaiydi, Hassan, Moubtassime, Mohamed & Slaoui, Souad. 2004. *A grammar of Moroccan Arabic*. Sidi Mohamed Ben Abdellah University, FLHS, Fes.

Guerssel, Mohamed. 1987. The status of lexical category preposition in Berber: implication for the nature of construct state. In *Studies in Berber Syntax,* Guerssel, M. & Hale, K. (Eds.), 159-190. MIT, Lexicon Project Working Papers, Cambridge, MA.

Guerssel, Mohamed. 1992. On the Case System of Berber. *Canadian Journal of Linguistics* 37/2: 175-195.

Hall, Tracy Alan. 1997. *The phonology of coronals*. Amsterdam: John Benjamins.

Harris, Zellig. 1942. The phonemes of Moroccan Arabic. *Journal of the American Oriental Society* 62/4: 309-318.

Heath, Jeffrey. 1989. F*rom Code-Switching to Borrowing: Foreign and Diglossic Mixing in Moroccan Arabic*. London: Keegan Paul International.

Iazzi, Elmehdi. 1991. *Morphologie du verbe en tamazight (parler des Aït Attab Haut-Atlas Central) : approche prosodique*. D.E.S thesis, Mohammed V University, Rabat.

Kang, Yoonjung. 2011. Loanword phonology. In *The Blackwell Companion to Phonoloy*, Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (Eds.), 2258-2282. Malden, MA / Oxford, UK: Wiley-Blackwell.

Kenstowicz, Michael. 2003. The role of perception in loanword phonology: A review of *Les emprunts linguistiques d'origine européenne en Fon*. *Studies in African Linguistics* 32: 95 −112.

Kenstowicz, Michael 2005. The phonetics and phonology of loanword adaptation. In *Proceedings of ECKL 1: Proceedings of 1st European Conference on Korean Linguistics*, S.-J. Rhee (ed.), 17–32. Seoul: Hankook Publishing Co.

Kenstowicz, Michael & Nabila Louriz. 2009. Reverse engineering: Emphatic consonants and the adaptation of vowels in French loanwords into Moroccan Arabic. *Brill's Annual of Afroasiatic Languages and Linguistics* 1: 41–74.
DOI: https://doi.org/10.1163/187666309X12491131130701

LaCharité, Darlene & Carole Paradis. 2005. Category preservation and proximity versus phonetic approximation in loanword adaptation. *Linguistic Inquiry* 36/2: 223-258. DOI: 10.1162/0024389053710666

Lahrouchi, Mohamed. 2001. *Aspects morpho-phonologiques de la dérivation verbale en berbère tachelhit*. PhD dissertation, University of Paris 7.

Lahrouchi, Mohamed. 2008. A templatic approach to gemination in the imperfective stem of

14

Tashlhiyt Berber. *Studies in African Linguistics* 37/1: 21-60.

Lahrouchi, Mohamed. 2010. On the internal structure of Tashlhiyt Berber triconsonantal roots. *Linguistic Inquiry* 41/2: 255-285. DOI: https://doi.org/10.1162/ling.2010.41.2.255

Lahrouchi, Mohamed. 2013. Templates, markers and syntactic structure in Tashlhiyt Berber. *Lingua* 133: 53-72. DOI: https://doi.org/10.1016/j.lingua.2013.03.007

Lahrouchi, Mohamed. 2017. The first steps in the acquisition of syllables and geminates in Tashlhiyt Berber. In *Language Acquisition at the Interfaces: Proceedings of GALA 2015*, Jiyoung Choi, Hamida Demirdache, Oana Lungu & Laurence Voeltzel (eds.), 108-129. Newcastle upon Tyne: Cambridge University Press.

Lahrouchi, Mohamed. 2018. Syllable structure and vowel-zero alternations in Moroccan Arabic and Berber. In *The Routledge Handbook of African Linguistics*, Augustine Agwuele & Adams Bodomo (eds.), 168-180. Oxon, UK: Routledge. DOI: 10.4324/9781315392981

Lahrouchi, Mohamed & Sophie Kern. 2018. From babbling to first words in Tashlhiyt language acquisition: a longitudinal two-case study. *Canadian Journal of Linguistics* 63/4: 493-526. DOI: 10.1017/cnj.2018.6

Marçais, Philippe. 1977. *Esquisse grammaticale de l'arabe maghrébin*. Paris: Librairie d'Amérique et d'Orient.

Martinet, André. 1969. "R", du latin au français d'aujourd'hui - *le français sans fard*. Paris: Presses Universitaires de France.

Morsly, Dalila. 1983. Diversité phonologique du français parlé en Algérie: réalisation du /r/. *Langue Française* 60: 65-72.

Ouhalla, Jamal. 2005. Agreement features, agreement and antiagreement. *Natural Language and Linguistic Theor*y 23: 655-686. DOI: 10.1007/s11049-004-5927-z

Paradis, Carole. 1996. The inadequacy of filters and faithfulness in loanword adaptation. In Jacques Durand and Bernard Laks (eds.), *Current trends in phonology: Models and methods*. Salford: ESRI.

Paradis, Carole & Darlene LaCharité. 2001. Guttural deletion in loanwords. *Phonology* 18/2: 255-300. DOI: 10.1017/S0952675701004079

Peperkamp, Sharon. 2005. A psycholinguistic theory of loanword adaptation. *Proceedings of the Annual Meeting, Berkeley Linguistics Society* 30: 341–352.

Peperkamp, Sharon. 2015. Phonology versus phonetics in loanword adaptations. In *The Phonetics-Phonology Interface. Representations and Methodologies*, J. Romero & M.

Riera (eds), 71-90. Amsterdam: John Benjamins.

Peperkamp, Sharon & Emmanuel Dupoux. 2003. Reinterpreting loanword adaptations: The role of perception. In *Proceedings of the 15th International Congress of Phonetic Sciences*, M. J. Solé, D. Recasens & J. Romero (eds), 367–370. Barcelona: Causal Productions.

Peperkamp, Sharon, Inga Vendelin & Kimihiro Nakamura. 2008. On the perceptual origin of loanword adaptations: experimental evidence from Japanese. *Phonology* 25: 129-164. DOI: 10.1017/S0952675708001425

Ridouane, Rachid. 2007. Gemination in Tashlhiyt Berber: An acoustic and articulatory study. *Journal of the International Phonetic Association* 37/2: 119-142. DOI: 10.1017/S0025100307002903

Ridouane, Rachid. 2016. Leading issues in Tashlhiyt Berber phonology. *Language and Linguistics Compass* 10/11: 644-660. DOI: 10.1111/lnc3.12211

Ridouane, Rachid, Anne Hermes & Pierre André Hallé. 2014. Tashlhiyt's ban of complex syllable onsets: phonetic and perceptual evidence. *Language Typology and Universals* 67/1: 7-20. DOI: 10.1515/stuf-2014-0002

Rose, Yvan & Katherine Demuth. 2006. Vowel epenthesis in loanword adaptation: Representational and phonetic considerations. *Lingua* 116: 1112–1139. DOI:10.1016/j.lingua.2005.06.011

Uffmann, Christian. 2001. Patterns of vowel epenthesis (not only) in Shona loanwords. In *Proceedings of HILP* 5, Caroline Féry, Anthony Dubach Green & Ruben van de Vijver (eds.), 193-211. Universität Potsdam.

Uffmann, Christian. 2007. *Vowel Epenthesis in Loanword Adaptation*. Tübingen: Niemeyer.

Vendelin, Inga & Sharon Peperkamp. 2006. The influence of orthography on loanword adaptations. *Lingua* 116: 996-1007. DOI: 10.1016/j.lingua.2005.07.005

Walsh-Dickey, Laura. 1997. The Phonology of Liquids. PhD dissertation, University of Massachusetts, Amherst.

Wiese, Richard. 2001. The phonology of /r/. In *Distinctive Feature Theory*, T.A. Hall (ed.), 335-350. Berlin/New York: Mouton de Gruyter.

Zellou, Georgia. 2011. Pharyngealization of French loanwords in dialectal Moroccan Arabic: An acoustic analysis of bilingual speakers. *Dialectologia* 6: 95-108.