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

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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/. It is argued that this phenomenon is determined by phonological rather than phonetic factors. It is shown 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)	<i>French</i>	<i>Tashlhiyt Berber / Moroccan Arabic</i>	
a.	byʁo	lbiru	‘office’
	ʁezim	rrizim	‘diet’
	sɛʁzã	ʃar ^s z ^s an	‘sergeant’
	pɛʁmisjõ	b ^(a) rmsjun	‘permission’
b.	tχẽ	ttran	‘train’
	fχãs	fransa	‘France’
	sɛχtifika	ss ^(a) rtafika	‘certificate’
	kaχtõ	kar ^s t ^s on	‘cardboard’

This phenomenon will repay investigation, 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 tap although they do not have access to the phonology of the source language (e.g. [ʁ]ouen > [ruwa] ‘city name’, met[χ]o > [metʰrʰo] ‘subway’, a[ʁ]genteuil > [arʒantæj] ‘city name’, place voltai[ʁ]e > [blʰasʰbuntir]).

In this paper an alternative analysis is proposed, taking Paradis & LaCharité as a starting point. According to my 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 2019, and Noelliste 2019), as opposed to the uvular fricatives /ʁ/ and /χ/, which never occur after an obstruent.

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 salience 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 *terriner* ‘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. [fotbɔl] > [futubɔlɔ] ‘football’; [knɪp] > [kinipi] ‘pocket knife’), except when the source vowel is /a/,

which triggers the epenthesis of /v/, since it is phonologically underspecified for place (e.g. [patruwn] > [patiruni] ‘pattern/cartridge’; [kartʃi] > [kariti] ‘cart’).¹

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 provide an overview of the phonetic and phonological properties of the French rhotic, as well as the phonemic system of the borrowing languages, along with some basic phonological features in order to allow for a better understanding of the analysis.

¹ The reader is referred to the original work for further details and analysis, especially with regard to the 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 (see also Boersma & Hamann 2009 on vowel epenthesis in English loanwords into Korean).

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).

3.1 Outline of the phonetics and phonology of French *r*

The rhotic consonant is one of the most variable segments in Modern varieties of French, with many free and contextual variants, most of which have been largely studied (see Tranel 1987, Fougeron & Smith 1993, Walker 2001, Russell Webb 2002, 2009, among others). Traditionally, three free variants have been reported in the literature, namely the uvular fricative [ʁ], the uvular trill [ʀ] and the apical trill [r], all of which broadly reflect dialectal variation on the French territory.

Nowadays, most speakers produce a uvular fricative, typically voiced in onset position (see 2a) and devoiced when adjacent to voiceless obstruent (2b). In coda position, *r* is often realized as a uvular approximant with a relatively "wider aperture at the point of oral constriction", according to Russell Webb (2009: 88), while it varies from approximant to fricative in intervocalic position.

(2) Voiced vs voiceless variants of *r*

	<i>Orthography</i>	<i>phonetic form</i>	
a.	rideau	ʁido	‘curtain’
	râteau	ʁato	‘rake’
	drapeau	dʁapo	‘flag’
	bras	bʁa	‘hand’
b.	train	tʁɛ̃	‘train’
	fromage	fʁomaʒ	‘cheese’
	arc	aʁk	‘arch’
	archive	aʁʃiv	‘archive’

Although being phonetically realized as a fricative, the French rhotic exhibits the same distribution as the lateral /l/. Both consonants occur in the immediate vicinity of a vowel, either as the second member of a complex onset (3a) or as the first member of a complex coda (3b).

(3) *r* / *l* distribution

	<i>Orthography</i>	<i>phonetic form</i>	
a.	gras	gʁa	‘fat, fatty’
	glas	gla	‘toll’
	prix	pʁi	‘price’
	pli	pli	‘fold’
b.	courte	kuʁt	‘short (FM)’
	moult	mult	‘many’

orgue	ɔʁg	‘organ’
algue	alg	‘seaweed’

These distributional properties are of paramount importance in the adaptation of the French rhotic in Moroccan Arabic and Berber, as we will see subsequently.

3.2 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 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.

Table 1. *Tashlhiyt Berber consonant inventory*

	Labial	Dental	Alveolar	Palatal	Velar	Uvular	Pharyngeal	Laryngeal
Stop	b	t tʰ d dʰ			k g kʷ gʷ	q qʷ		
Fricative	f		s sʰ z zʰ	ʃ ʃʰ ʒ ʒʰ		χ χʷ ʁ ʁʷ	ħ ʕ	h
Tap			r rʰ					
Lateral			l lʰ					
Nasal	m		n					
Approximant	w			j				

Most consonants have geminate counterparts, except for /ʕ/ and /ħ/, which are realized only as singleton, at least in native words. Of interest is the behaviour of the rhotic

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, and 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 not explicitly analyze as phonemic (see Heath 1997, and Caubet 2007), while others argue that they are contrastive, relying on minimal pairs like *skət* ‘he stopped talking’ / *skʷət* ‘be quiet!’, *xrəʒ* ‘he went out’ / *xʷrəʒ* ‘get out!’, and *kħəl* ‘black’ / *kʷħəl* ‘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 2007, and Lahrouchi 2018).

As evident in Table 1, Moroccan Arabic and Berber contrast the coronal tap /ɾ/ 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’ / *rab* ‘to be absent’, *brʰa* ‘he’s healed’ / *bʁa* ‘he wants’). In contrast, French has only one phonemic rhotic, with three free variants (see section 3.1). The French rhotic also occurs in complementary distribution with the voiceless uvular [χ] such as in *travail* [tʁavaj] ‘work’ and *frein* [fʁɛ̃] ‘brake’ while in Moroccan Arabic and Berber it is phonemic (e.g. MA: *χir* ‘good, prosperity’ / *ʁir* ‘only’; Berber: *χlu* ‘destroy’ / *ʁlu* ‘be expensive’). These phonemic differences impact the adaptation of the French rhotic into Berber and Moroccan Arabic, as shown below.

3.3 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 (4), common to Berber and Moroccan Arabic, clearly contradict this prediction.

(4)	<i>French</i>	<i>Berber / Moroccan Arabic</i>	
a.	bʁigadje	b ^(ə) rgadi	‘brigadier’
	ẽfiɛmjɛ	(a)-f ^(ə) ɾmli	‘nurse’
	sɛʁvis	s-s ^(ə) rbis	‘service, row’
	byɔ	l-biru	‘office’
	pɛʁmisjɔ̃	b ^(ə) ɾmsjun	‘permission’
	fɛɾm	l-firma	‘farm’
	komisarija	l-kumisarija	‘police station’
	tɛ̃bɛ	t-tanb ^(ə) ɾ	‘stamp’
b.	elɛktɾisite	t-trisinti	‘electricity’
	putɾ	l-budra	‘beam’
	tɾɛ̃	t-tran	‘train’
	fɾã̃s	fɾ ^ɛ ans ^ɛ a	‘France’
	sɛɾtifikɑ	s-s ^(ə) ɾtafika	‘certificate’
	fɾigo	l-frigu	‘fridge’
	fɾomɑʒ	l-f ^(ə) ɾmɑʒ ^ɛ	‘cheese’
	filtɾ	l-ffilt ^(ə) ɾ	‘filter’
c.	fɾɾɛt	l-f ^(ə) ɾɾɛt ^ɛ a	‘fork’
	bɾuwɛt	l-b ^(ə) ɾwɛt ^ɛ a	‘wheelbarrow’
	ʃofɔɛ	ʃ-ʃɛfor ^ɛ	‘driver’
	kɾwasɔ̃	k ^(ə) ɾwass ^ɛ a	‘croissant’
	tɾase	t ^ɛ ɾas ^ɛ e	‘draw’
	kaɾtɔ̃	kaɾ ^ɛ t ^ɛ on	‘cardboard’
	sɛɾʒã	ʃar ^ɛ ʒ ^ɛ an	‘sergeant’
	kaɾɔal	kaɾ ^ɛ an	‘corporal’

The data were gathered partly from spontaneous speech and interviews of five native speakers, including myself, as well as from written sources (cf. Heath 1989, Paradis & LaCharité 2001, Kentowicz & Louriz 2009, Bensoukas *et al.* 2017, and the *World Loanword Database* edited by Haspelmath & Tadmor, available at <https://wold.clld.org/language/6>).

Three subjects are natives of Tashlhiyt Berber. The two others are natives of Moroccan Arabic. They live in the northern suburbs of Paris, specifically in Asnières and Gennevilliers, which host a large community of Berber and MA speakers.

The examples in (4) 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. They 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 which 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 realized as voiced [ʁ] (4a) or voiceless uvular [χ] (4b). This factor alone is sufficient to refute the phonetic approximation hypothesis, as it shows that phonetic details and perceptual similarity are not the key 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 (4c). 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 [tʰrʰasʰe] ‘draw’ and [karʰtʰon] ‘cardboard’. These words should have been adapted as *[trasi] and *[kartun], had they followed the general rule which turns French mid vowels into the corresponding high vowels in Berber and Moroccan Arabic (e.g. [l-fīrma] ← /fɛʁm/ ‘the farm’; [la-gris] ← /gʁɛs/ ‘the fat’; [l-bun] ← /bũ/ ‘the voucher’).

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 [bɛrgadi] 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 contrastiveness. 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. Words such as *pompe* [pɔ̃p] ‘pump’ and *bon* [bɔ̃] ‘voucher’, which do not contain any coronal consonant, are 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 (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 /ħ/ are adapted in French as velar stops (see 5a), suggesting the non-availability of the pharyngeal node in the phonology of French. Meanwhile, the Arabic coronal tap /ɾ/ is systematically interpreted as a uvular in French (see 5b).

(5)	<i>Arabic</i>	<i>French</i>	
a.	maʁrib	magʁeb	‘Maghreb’
	ʁazal	gazel	‘gazelle’
	ħalifa	kalif	‘calif’
	ʃajħ	ʃɛk	‘Sheikh’
	ʁarrafa	kaʁaf	‘water pitcher’
b.	ħrisa	aʁisa	‘harissa’
	ribat ^ʕ	ʁaba	‘Rabat’
	ħarab	aʁab	‘Arab’
	s ^ʕ aħra	sa_ʁa	‘Sahara’
	baʁ ^ʕ ud ^ʕ	baʁud	‘saltpetre, last stand’

Needless to say, the phonetic approximation approach explains neither the data in (5) nor those in (4). 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.

(6)	<i>French</i>	<i>Berber</i>	
i. #__	ɾuwã	ɾuwa	‘Rouen’
	ɾazwaɾ	ɾɾezʷan	‘razor’
	ɾyjej	ɾwaj	‘Rueil’
	ɾadjo	ɾradju	‘radio’
	ɾuz	ɾruʒ	‘red, red wine’
	ɾezim	ɾrizim	‘diet’
ii. __#	nãtɛɾ	nantʷɛɾʷ	‘Nanterre’
	aɲjɛɾ	aɲjɛɾʷ	‘Asnières’
	plãsvøltɛɾ	blʷãsvøltɛɾ	‘Voltaire square’
	gãɾdynøɾ	gãrdinøɾʷ	‘North station’
	desɛɾ	ddisɛɾ	‘dessert, fruits’
	kãɲtðɛsɛʒɾ	kãɾʷtʷsɛʒɾ	‘residence permit’
iii. V__V	lãɾɛvifivik	lɾivifirik	‘the ringroad’
	tuvɛfɛl	tturifil	‘the Eiffel Tower’
	nɯmɛvø	nnimiru	‘number’
	ɛkɯvi	lkuri	‘riding stable’
	sɛkɯvite	ssikuriti	‘security, safety officers’
	ãsyɾã	lãsvøɾʷãsvø	‘insurance’
iv. #C__	bɾøkøli	lbɾøkøli	‘broccoli’
	bɾãvø	brãvu	‘cheer’
	tɲãkil	trãkil	‘calm’
	tɲãmwaj	tʷɾãmwaj	‘traway’

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 [ʀ]. 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.

	tɣravopyblik	tʳ ^ʰ aboblik	‘public works’
	fχãs	fransa	‘France’
v. ...C__	lãbreaz	lambɾjaz	‘cutch’
	tẽbr	ttanbr	‘stamp’
	ladɾes	ladris	‘the address’
	metɣo	metʳ ^ʰ o	‘subway’
	etχãze	etʳ ^ʰ anzi	‘foreigner’
	matɣikyl	matrikul	‘registration number’
vi. ...__C	lawzã	law ^ʰ za	‘the money’
	kuɛbɛnwa	k ^(a) rbubba	‘Courbevoie’
	eberzɛmã	eberzma	‘housing’
	gãrdynɔɛ	gardinor ^ʰ	‘North station’
	ɾɛmɛɛjsjɔ̃	b ^(a) rmsjun	‘permission’
	kyɣkyma	lkor ^ʰ koma	‘turmeric’

These data were collected from two 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. They were 65 and 72 years old when they were interviewed in 2017. In addition to data gathered from their spontaneous speech, they were given a list of items, mainly place names and proper names, which they often use when speaking Berber inside their community in France. They were told each item in French and they were asked to pronounce it in Berber.

The data are sorted into six classes, depending on whether the rhotic appears in word-initial (6i), in word-medial (6v) or in word-final position (6ii), as well as in intervocalic position (6iii), in complex onsets (6iv) and in heterosyllabic clusters (6vi). They clearly show that the French rhotic is systematically adapted in Berber as a coronal tap (or as a trill when geminated), regardless not only of its phonetic nature but also of its position within the word and the syllable.

The data also challenge the idea according to which orthography may influence the adaptation process, as the source and the borrowing languages do not use the same alphabet (see Vendelin & Peperkamp 2006, and Hamann & Colombo 2017 on the role of orthography in loanword adaptation). The situation is even more complex in Berber, whose vitality owes

much to millennia of oral tradition, with little to no influence of written sources. The Tifinagh alphabet, officially introduced at school in the last two decades in Morocco, is barely used by Berber speakers, let alone illiterates whose data are central to the analysis advocated here.

One may well ask how Berber and MA speakers 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 phonology, which may allow them to identify the French rhotic as the analogue of the coronal tap in their native language. The next section addresses the phonotactics of Tashlhiyt Berber, which come into play in the adaptation of the French rhotic.

3.4 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:

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

The examples in (8) illustrate this constraint. They are grouped into four sets, where O stands for an obstruent and S for a sonorant.

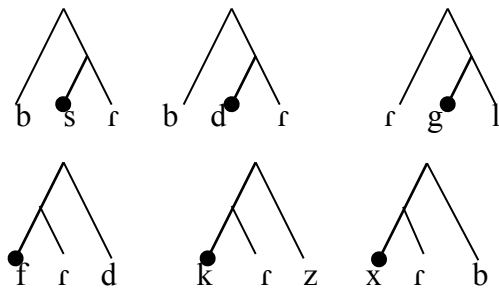
(8)			
	\sqrt{OOS}		\sqrt{OSO}
	gzm ‘cut’		frd ‘nibble’
	bsr ‘spread out’		krz ‘plow’
	bdr ‘mention’		xrb ‘scratch’
	kjm ‘enter’		smd ‘add’
	kbu ‘pierce’		ħlb ‘eat (liquid food)’
	\sqrt{SOS}		\sqrt{OSS}
	mgr ‘reap’		knu ‘lean’
	lkm ‘arrive’		bri ‘scratch’
	nkr ‘stand up’		xmr ‘ferment’
	rgl ‘knock’		κml ‘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’, *zdk* ‘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 (9) illustrate the proposal (the head position is indicated by the dot at the end of the branch).

(9)



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 favour 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

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* → *tltl'k* ‘swallow’, *kwn* → *k^wuk^wn* ‘take’).

not surprising that Berber 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 clusters behave as complex onsets in Berber. Word-initial complex clusters are much less restricted in this language than they are in 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 (10a) but also their mirror image (10b), as well as those which have a sonority plateau (10c).

(10)	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’

Apart from a few restrictions, of which we will see a significant example beneath, any CC combination is possible in word initial position 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 (10) 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 define 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 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. More specifically, they identify any French rhotic preceded by an obstruent as a sonorant, just like they do in their own language when selecting

among trisegmental verbs those which resort to gemination, and those which geminate either the medial or the initial consonant. Then, they consistently generalize the adaptation to the remaining contexts where the French rhotic appears, including word-initial, medial and final position (e.g. *ʔido* ‘curtain’, *byʔo* ‘office’, *baʔ* ‘bar’), as well as in heterosyllabic clusters (e.g. *aʔk* ‘arch’, *aʔdwaz* ‘slate-gray’).

Another piece of evidence in favour of the adaptation of the French rhotic as a sonorant lies in the distribution of the uvular fricatives /ʁ/ and /χ/ in Berber. Unlike /ʁ/, /ʁ/ and /χ/ do not occur after an obstruent, hence no *bʁ, *fʁ, *bχ, *kχ, *tχ or any other similar cluster in any position within the word (see El Mountassir 2003, and Lahrouchi 2010 for relevant data), except for a few forms, most of which often contain a morphological boundary between the obstruent and the uvular fricative. This is shown in the examples in (11), where prefixed *t-* stands for feminine and second person marker, while suffixed *-ʁ* marks first singular person.

(11) Contexts where /χ/ and /ʁ/ can be preceded by an obstruent

i. Across morpheme boundaries

<i>t-ʁza</i>	‘she dug a hole’
<i>t-χsi</i>	‘it (FM) was switched off’
<i>t-ʁus</i>	‘it/she is clean’
<i>t-ʁama-t</i>	‘you remained’
<i>xʁb-ʁ</i>	‘I scratched’
<i>hʁg-ʁ</i>	‘I burnt’

ii. Stem-internal position

<i>adʁar</i>	‘piece of skin’
<i>asʁar</i>	‘wood’
<i>sʁ</i>	‘buy!’
<i>zɔʁ</i>	‘live!’

Based on the phonotactics underlying the distribution of rhotic consonants in Berber, native speakers interpret any French rhotic preceded by an obstruent as a sonorant. They know from their own phonology that amongst rhotic consonants, only /ʁ/ can appear after an obstruent.

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. In addition to this, they know that among the three rhotics available in their language, only the coronal tap can precede an obstruent in same root.

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.

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