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Author(s): Yvan Rose

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Perception, representation and correspondence relations in loanword phonology

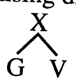
YVAN ROSE
McGill University

1. Introduction*

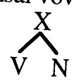
Systematic patterns of segmental deletion are found in French loanwords in Fula and Kinyarwanda (e.g. Rose 1995, Paradis and LaCharité 1997). These deletion patterns are restricted to two specific contexts: rising diphthongs and nasal vowels. In this paper, I will show that both rising diphthongs and nasal vowels are represented in the loan input as two Root nodes licensed by a unique timing position, following the representations in (1). I will also discuss important issues relative to input interpretation and representation in loanword phonology. An analysis will follow, couched within Correspondence Theory (McCarthy and Prince 1995).

(1) Rising diphthongs and nasal vowels: two Root nodes under one timing unit

a) Rising diphthong



b) Nasal vowel



Timing tier

Segmental tier

1.1 Description of the languages studied

As we can see by comparing the brief description of French, Fula and Kinyarwanda in (2), (3) and (4), these languages differ in many respects.

(2) French phonological system (Casagrande 1984)

a) Phoneme inventory

p/b	t/d		k/g					
f/v	s/z	ʃ/ʒ						
m	n	ɲ			i	y		u
	l				e	ø		o
w		ɥ/j		ʁ	ɛ/ɛ̃	œ/œ̃	(ə)	ɔ/ɔ̃
							a/ɑ̃	

b) Syllable structure

- Branching onsets are allowed (e.g. *bras* [bʁa] 'arm')
- Codas are allowed (e.g. *patte* [pat] 'paw')
- Onsets followed by empty nuclei are allowed (e.g. *arbre* [aʁbʁ] 'tree')

(3) Fula phonological system (Paradis 1986)

a) Phoneme inventory

p/b	t/d		k/g				
f	s			h			
		tʃ/dʒ					
ɓ	ɗ	ƈ					
m	n	ɲ	ŋ		i		u
	r/l				ɛ		ɔ
w		j				a	

b) Syllable structure
- Branching onsets are disallowed (*σ[CCV)
- Codas are allowed (CVC]σ)
- Onsets followed by empty nuclei are disallowed (*CVCC#)

(4) Kinyarwanda phonological system

a) Phoneme inventory (Jouannet 1983)

p	t/d		k/g	
β/f/v	s/z	ʃ/ʒ/ç		h
pf	ts	tʃ		
m	n	ɲ		
	r			
w		j		

i/iː		u/uː
e/eː		o/oː
	a/aː	

b) Syllable structure

Maximal syllable: CV(ː) (no branching onsets, no codas)

Nasal contours (^{n}C) are allowed

As already mentioned, the languages presented above differ in many respects. For example, even though the features Labial, Coronal and [nasal] are contrastive in Fula and Kinyarwanda (see inventories in (3) and (4) respectively), neither of the two languages combine these features in their native inventory. The French Labial-Coronal and nasal vocoids will have to be adapted in Fula and Kinyarwanda.

2. Data

2.1 Preservation contexts: an example

I will now turn to the data to be discussed. First, we can find contexts of full preservation in word-initial consonant-liquid-vowel (CLV) clusters. In (5), we can see that French loanwords containing a word-initial CLV sequence are adapted in both Fula and Kinyarwanda with preservation of all of the input segments.

(5) a) French CLV sequence adapted in Fula (Lebel 1994)

classe	[klas]	→	[kalaːs]	'class'
drap	[dʁa]	→	[dara]	'bed sheet'
frais	[fʁɛ]	→	[fɛrɛ]	'fresh'

b) French CLV sequence adapted in Kinyarwanda (Rose 1995)

plume	[plym]	→	[purimi]	'feather'
drapeau	[dʁapo]	→	[darapo]	'flag'
frommage	[fʁɔmaʒ]	→	[foromaaʒi]	'cheese'

2.2 Deletion contexts

2.2.1 CGV sequences containing an ill-formed glide in Fula[1]

The CLV context contrasts with the consonant-glide-vowel (CGV) context. Fula disallows Labial-Coronal vocoids (see (3a)). In (6a), we see that when the Labial-Coronal segment appears in a CV sequence, it is preserved. The *[y] is adapted into [i]. However, we observe in (6b) that when the Labial-Coronal vocoid *[ɥ] appears in a CGV sequence deletion is observed in the adapted form.

(6) *Labial-Coronal segments adapted in Fula (Paradis and LaCharité 1997)

a) *Lab-Cor in a CV sequence: preservation

autobus	[ɔtɔbys]	→	[ɔtɔbis]	'bus'
budget	[bydʒɛ]	→	[bidzɛː]	'budget'
bureau	[byʁo]	→	[birɔ]	'desk / office'

b) *Lab-Cor in a CGV sequence: deletion

biscuit	[biskɥi]	→	[biski]	'biscuit'
tuyau	[tɥijo]	→	[tijɔ]	'pipe'
circuit	[siʁkɥi]	→	[sirki]	'circuit'

2.2.2 Nasal vowels in a CVC language: Fula

Turning now to nasal vowels, we see in (7a) that in French loanwords in Fula, when nasal vowels appear in an open syllable, they are adapted into a VN sequence, i.e. with preservation of the nasal part of the vowel. However, when nasal vowels appear in a closed syllable, nasality is lost, as we can see in (7b).

(7) French nasal vowels adapted in Fula (Paradis and LaCharité 1997)

a) Nasal vowel in open syllable: full preservation

canton	[kɑ̃.tɔ̃]	→	[kantɔn]	'township'
ciment	[si.mɑ̃]	→	[siman]	'cement'
consulat	[kɔ̃.sy.la]	→	[kɔnsula]	'consulate'

b) Nasal vowel in closed syllable: loss of nasality

balance	[ba.lɑ̃s]	→	[balas]	'scale'
dimanche	[di.mɑ̃ʃ]	→	[dimaːs]	'Sunday'
essence	[ɛ.sɑ̃s]	→	[ɛsaːs]	'gasoline'

2.2.3 Nasal vowels in a CV language: Kinyarwanda

Regarding the nasal vowels found in French loanwords in Kinyarwanda, we can see in (8a) that the nasal portion of a word-internal nasal vowel is preserved and creates a nasal contour onto the following consonant. However, when the nasal vowel is word-final, as in the examples in (8b), nasality is lost.

(8) French nasal vowels adapted in Kinyarwanda (Rose 1995)

a) Word-internal nasal vowel: full preservation

bandit	[bɑ̃di]	→	[βaː^{n}di]	'bandit'
fanfare	[fɑ̃faʁ]	→	[faː^{m}faːri]	'fanfare'
vidange	[vidɑ̃ʒ]	→	[vidaː^{n}ʒi]	'garbage'

b) Word-final nasal vowel: loss of nasality

camp	[kɑ̃]	→	[ka]	'camp'
avion	[avjɔ̃]	→	[avijo]	'plane'
maçon	[masɔ̃]	→	[maso]	'mason'

Keeping these data in mind, I will now discuss how the French inputs should be perceived, interpreted and finally adapted in the borrowing languages.

3. On the nature of the input

Concerning the phonological status of the loanwords studied in this paper, I follow Paradis and LaCharité (1997), who argue that these loanwords are phonological inputs to the borrowing language. In order to discuss the representation of these loanwords, three important questions will be addressed regarding 1) the prosodic shape of the loan input, 2) how this input is perceived by the borrower, and 3) how it is represented in the borrower's phonology.

3.1 Loan and native inputs have identical prosodic shapes

Regarding the prosodic shape of the loan inputs, Silverman (1992) adopts a strong phonetic position, claiming that the input is merely acoustic and is devoid of any phonological representation. Paradis and LaCharité (1997) provide arguments against a strictly phonetic treatment of the loan input. They claim that the phonological output of the source language phonology is directly incorporated into the host lexicon. Their position, however, poses problems. If the input to the borrowing language were the output of the source language's phonology, this would logically entail that the input is incorporated into the borrowing language with its segmental *and* prosodic representations. Consequently, we should expect syllable and stress patterns from the source language to show up with some consistency in the studied forms. However, there is no empirical evidence in the loanwords studied here that borrowers access prosodic levels of representation such as the syllabic tier. I argue that prosodic elements such as syllable constituents are not represented in the loan input for three reasons. First, as I just mentioned, syllable constituency found in the foreign (non-adapted) form does not affect the way that loanwords are adapted. Second, access to higher levels of representation (e.g. syllabic or metrical) cannot characterize the loanwords studied in this paper. (Other loanword situations such as the ones studied in Paradis and Lebel (1994, 1997) and Itô and Mester (1995) do require access to these levels of representation.) Third, if the input to phonological adaptation contained its full foreign prosodic structure, its formal representation would not look like that of native inputs, as prosodic structure is standardly assumed not to be present in input representations. Therefore, I claim that the loan inputs studied in this paper have the same prosodic shape as any native input in the language, as illustrated in (9).

(9) Current proposal: native and loan inputs have the same prosodic shape[2]

```
a) Native input          b) Loan input
   X    X    X              X    X    X
   |    |    |              |    |    |
   R    R    R              R    R    R          (R = Root node)
```

These representations relate directly to the next point to be discussed, namely, perception of the loan input.

3.2 Loan input is perceived through L1 contrastive features

When a loan segment is not present in the L1 inventory, the way the borrowing language can cope with this segment has consequences on how it will be adapted. On this, Silverman (1992) and Yip (1993), in their respective studies of English loanwords in Cantonese, hypothesize that the segmental deletion cases observed in these loanwords are caused by a lack of salience at the perceptual level. According to their hypothesis, the deletions observed are not phonological. However, Jacobs and Gussenhoven (1998) object, in line with Paradis and LaCharité (1997), that the deletions found in loanwords must be the result of the borrowing language's grammar constraints. They propose that the borrower has full access to the loan's phonological representations, through the UG. I agree with Jacobs and Gussenhoven (1998) that the UG plays a determining role in the perception and interpretation of loan inputs. However, I adopt a more restrictive view concerning what the borrower can access. The position I defend follows from Brown (1997), who demonstrates, with a series of experiments on perception of non-native contrasts in L2 learners, that new segments can be represented only when the contrastive features are present in the native (L1) phonology. With regards to this, Brown predicts that 1) L1 features can be combined in new ways (to yield new segments), but that 2) new feature s cannot be added to the system. This entails, for example, that the Fula or Kinyarwanda speaker, who has no front rounded vocoids but has both coronal and labial vocoids in his L1, should be able to combine these two features to build a new representation for the vowel [y], as illustrated in (10).

(10) Current proposal: L2 representations can combine L1 contrastive features

L1 contrasts	Contrastive features	Possible new representations
a) /i/ ~ /u/	Lab, Cor	Lab-Cor vocoids (e.g. [y])
b) /t/ ~ /n/	[nasal]	Nasal vowels ([nasal] added to vowels)
c) * /e/ ~ /ɛ/	(No [ATR])	ATR contrast cannot be represented

3.3 Non-native representations are interpreted through the UG

In addition to building new contrasts, the borrower needs to interpret the way segments are anchored to the timing tier. When foreign strings of segments are not present in the borrowing language, I propose that interpretation should be driven by the UG. In the case of a CLV sequence, the default interpretation is arguably that three distinct segments are licensed by their own timing position, as we see in (11).

(11) Default interpretation of CLV sequences (cf. Vata, Kaye 1985)

```
X   X   X       Timing tier
|   |   |
C   L   V       Segmental tier
```

The situation, however, is more complex in the case of a CGV sequence. In theory, the speaker can interpret it in three different ways, as presented in (12).

(12) Possible interpretations of CGV sequences

```
a) X   X   X     b) X    X      c)   X     X     Timing tier
   |   |   |        |   / \         / \    |
   C   G   V        C  G   V       C   G   V     Segmental tier
```

As more than one option for the interpretation of a CGV sequence is available across languages, in order to determine what the default option offered by the UG is, it is necessary to investigate the typological tendencies found cross-linguistically.

To tease apart (12a) and (12b), I examined the syllabification of CGV clusters across languages. On one hand, (12a) must lead to a CG.V syllabification, since, according to Schane (1987), only falling diphthongs count as two positions in languages that treat long vowels and diphthongs as quantitatively equal. On the other hand, (12b) can only be syllabified as C.GV, since the only two positions available in this configuration must be syllabified as an onset-nucleus sequence. We can see from the survey in (13) that, in languages that have CGV clusters, the C.GV syllabification appears to be favored. The monopositional rising diphthong option in (12b) is thus less marked than (12a).

(13) Syllabification of CGV clusters across languages

Language	Family	C.GV	CG.V
Frisian	West Germanic		√
Dutch	West Germanic		√
American English[3]	West Germanic	√	√
Old English	West Germanic	√	
Slovak	Slavic	√	
French	Romance	√	
Spanish	Romance	√	
Italian	Romance	√	
Imyan Tehit	Indo-Pacific	√	

A more complex task resides in teasing apart (12b) and (12c). However, this last option, which represents secondarily-articulated consonants, is subject to several distributional restrictions (e.g. Maddieson (1984) and Ladefoged and Maddieson (1996)). For example, of the four existing secondary articulations, Labial is the most attested, but C^w is largely confined to velars and uvulars, and it is only attested in a minority of languages. Also, the possible set of secondarily-articulated consonants is very restricted. Given all of these restrictions, it seems unlikely that (12c) constitutes an unmarked option. I therefore conclude that (12b) is the UG default interpretation available to the borrower.

3.4 Representation of input rising diphthongs and nasal vowels

Following this conclusion, I assume the representation for rising diphthongs given in (14).

(14) Representation of a rising diphthong

```
    X          Timing tier
   / \
  G   V        Segmental tier
```

There is thus, in loan input representations, a crucial difference between CLV and CGV sequences. The sharing of one timing position by two Root nodes in rising diphthongs illustrated in (14) is in fact parallel to that for nasal vowels, whose representation is given in (15). Nasal vowels contain a combination of two Root nodes, an oral and a nasal one, anchored to a single timing position. This representation, which is in line with Dell (1970) and Prunet (1986), is argued for by Paradis and Prunet (1997) and supported by Piggott (1997).

(15) Representation of a nasal vowel (e.g. Paradis and Prunet 1997)

```
    X          Timing tier
   / \
  V   N        Segmental tier
```

We will see in the next section that the sharing of a timing position in rising diphthongs and nasal vowels constitutes the structural cause for the Root node deletions observed earlier in the data. This complexity will also have consequences on how segments are adapted in loanwords. As we will see, in all of the deletion contexts, at least one of the input Root nodes, as well as the timing position that dominates it, will be preserved in the output.

4. Analysis

The analysis is couched within Correspondence Theory. The first two constraints in (16a) are Max constraints that refer to two distinct units: the segment and the Root node. Max(Seg) is violated when an input combination of both a Root node and the timing unit it is attached to is completely deleted in the output. If either the timing position or the Root node is preserved in the output, no violation of Max(Seg) occurs. Thus, a violation of Max(Seg) necessarily implies a violation of Max(Root), while a violation of Max(Root) does not entail a violation of Max(Seg). The third constraint in (16a) prevents insertion of segments in output forms. I will also refer to the syllabic constraints in (16b). The first constraint, the OCP, will prevent candidates containing tautosyllabic identical segments. The second constraint in (16b) ensures that the syllabic constraints of the borrowing language are satisfied in the output. In the same way, the OK(Seg) constraint in (16c) requires loanwords to satisfy the borrowing language's segmental constraints. I propose the constraint ranking in (16d). Following this ranking, priority is given to the OCP, seen here as an undominated constraint, then to the syllabic and segmental constraints of the borrowing language.

(16) The constraints and their ranking
- a) Faithfulness constraints (e.g., McCarthy and Prince 1995):
  - i) Max(Seg): Every input segment has an output correspondent.
  - ii) Max(Root): Every input Root node has an output correspondent.
  - iii) Dep(Seg): Every output segment has a correspondent in the input.
- b) Syllabic constraints:
  - i) OCP: Adjacent tautosyllabic segments cannot be identical (inspired by, e.g., Leben 1973).
  - ii) OK(σ) (porte-manteau syllabic constraint; Yip 1993).
- c) Segmental constraint: OK(Seg) (porte-manteau segmental constraint).
- d) Constraint ranking:
  OCP >> OK(σ), OK(Seg) >> Max(Seg) >> Dep(Seg) >> Max(Root)

4.1 Segmental sequences

We can observe in the tableau in (17) that the constraint ranking proposed correctly predicts vowel epenthesis in inputs where each segment hosts its own timing position.

(17) CLV → CVLV[4]

```
                    X X X
                    | | |
Input: drap [dʁa]   d ʁ a
```

Input: drap [dʁa]

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[dra]		*!				
[da]				*!		*
☞ [da.ra]					*	

The situation is different in inputs where two Root nodes share a unique timing position, as we can see with the tableau in (18). In this case, preservation of all of the input Root nodes (e.g. in the last two candidates) would violate the OCP. The candidate showing Root node deletion is thus optimal, as it only violates the low-ranked constraint Max(Root).

(18) CɥV → CV

Input: *biscuit* [biskɥi]

```
X X X X  X
| | | |  /\
b i s k  ɥ i
```

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[bis.kɥi]			*!			
☞ [bis.ki]						*
[bis.kij]	*!					*
[bis.ki.ji]	*!				**	

I will now turn to the adaptation of nasal vowels. I will show that the constraint ranking proposed in (16d) predicts the right adaptation patterns in both Fula and Kinyarwanda.

4.2 Nasal vowels

4.2.1 Nasal vowels adapted in a CVC language: Fula

Starting with the adaptation of nasal vowels in Fula, we can see in (19a) that the possibility of syllabifying the input nasal Root node in the coda when there is no other segment in this position is optimal. However, as we can see in (19b), when another input segment must be syllabified in coda position, deletion of the nasal Root node is preferred over insertion of an epenthetic vowel (Dep(Seg) >> Max(Root)).

(19) Adaptation of nasal vowels in Fula

a) In open syllables

Input: *ciment* [simã]

```
X X X  X
| | |  /\
s i m  a N
```

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[si.mã]			*!			
[si.ma]						*
☞ [si.man]						
[si.ma.ni]					*!	

b) In closed syllables

Input: *balance* [balãs]

```
X X X  X  X
| | |  /\ |
b a l  a N s
```

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[ba.lãs]			*!			
☞ [ba.las]						*
[ba.lans]		*!				
[ba.lan.sa]					*!	

4.2.2 Nasal vowels adapted in a CV language: Kinyarwanda

The analysis proceeds in the same fashion in Kinyarwanda, a CV language allowing for nasal contours. We can see in (20a) that a word-internal input nasal

Root node can be licensed by the following consonant in the optimal candidate. As this option is not available to word-final input nasal Root nodes, and since codas are not possible in Kinyarwanda, there is no potential licenser available to the nasal Root node, which is deleted in the optimal form, as we can see in (20b). As it was the case for Fula above, Root node deletion is preferred over segmental epenthesis.

(20) Adaptation of nasal vowels in Kinyarwanda

a) Word-internally

X X XX

Input: *bandit* [bɑ̃di] b a N d i

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[βɑ̃.di]			*!			
[βa.ni.di]					*!	
☞ [βa.ⁿdi]						
[βa.di]						*!

b) Word-finally

X X X X

Input: *coussin* [kusɛ̃] k u s ɛ N

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[kʷusɛ̃]			*!			
[kʷu.sen]		*!				
☞ [kʷu.se]						*
[kʷu.se.ni]					*!	

4.3 Additional evidence

4.3.1 Adaptation of rising diphthongs

I will now briefly discuss examples of French loanwords in Japanese, which provide additional evidence supporting the current proposal. First, we must observe, in the examples in (21), that French [y] is adapted into [ju] in Japanese.

(21) French [y] → [ju] in Japanese (Shinohara 1997)

crudité	[krydite]	→	[kurjudite]	'raw vegetables'
allumer	[alyme]	→	[arjume]	'to light'
calcul	[kalkyl]	→	[karukjuru]	'calculation'

In (22), we can see that the front rounded glide [ɥ] is also adapted into [ju], and that the vowel following the input glide is preserved in the adapted form; it is adapted as a CGVV sequence which does not violate the Japanese syllable structure.

(22) French C[ɥ]V → C[ju]V in Japanese (Shinohara 1997)

cuisiner	[kɥizine]	→	[kjuizine]	'to cook'
nuage	[nɥaʒ]	→	[njuazju]	'cloud'
suivi	[sɥivi]	→	[sjuivi]	'follow-up'

I attribute this preservation pattern to the fact that the segmental adaptations in (21) and (22) never create contexts violating either the syllabification constraints of

Japanese or the OCP. Thus, full preservation of all of the input Root nodes can be observed, as analyzed in (23). The optimal form does not require segmental insertion *per se*, as the output diphthong [ju] and the vowel [i] have an input correspondent: the [ɥ] and the [i] of the input diphthong [ɥi], respectively. Thus, only insertion of a timing position is required in the selected candidate.

(23) C*ɥ*V → C*ju*V in Japanese

```
                               X  X   X X X X
                               |  /\  | | | |
Input: cuisiner [kɥizine]      k  ɥ i z i n e
```

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[kɥi.zi.ne]			*!			
☞ [kjui.zi.ne]						
[ki.zi.ne]						*!
[ku.zi.ne]						*!

4.3.2 Against a perceptual approach to nasal vowel adaptation

One could object that the adaptations of nasal vowels observed earlier could be analyzed on perceptual grounds only. The hypothesis, under this view, would be that nasal vowels are unpacked at the perceptual level, and that these vowels are interpreted in the loan input as true VN sequences. The examples in (24) enable us to falsify such a hypothesis. We see that word-final French true VN sequences are adapted with full preservation of both Root nodes in Kinyarwanda.

(24) French word-final VN sequences adapted in Kinyarwanda (Rose 1995)

bottine	[bɔtin]	→	[βotiːni]	'ankle boot'
douane	[dwan]	→	[duwaːni]	'customs'
carbone	[kaʁbɔn]	→	[karuβoːne]	'carbon'

The word-final VN context contrasts with the one of word-final nasal vowels, which always shows nasal deletion. This contrast is easily accounted for in the analysis proposed here, from the structural difference that exists between a nasal vowel and a VN sequence. In the former, both Root nodes share a unique timing unit while, in the latter, each segment hosts its own timing position. The analysis is presented in tableau (25).

(25) VN# → VNV# in Kinyarwanda

```
                           X X X X X
                           | | | | |
Input: bottine [bɔtin]     b ɔ t i n
```

	OCP	OK(σ)	OK(Seg)	Max(Seg)	Dep(Seg)	Max(Root)
[bo.tin]		*!				
☞ [bo.ti.ni]					*	
[bo.ti]				*!		

Thus, an approach based on perception or salience for explaining segmental deletion in loanwords (e.g. Silverman 1992, Yip 1993) cannot account for the adaptation contrast in nasal vowels. This contrast strongly supports the view defended here that the loanwords studied in this paper are best accounted for on structural grounds. It also provides additional empirical evidence in favor of the analysis proposed in this paper that Root node deletion can only occur in contexts where two Root nodes share a unique timing position in the input.

5. Discussion

In this paper, I have discussed central questions in loanword phonology: first, how the loan input is perceived and represented by the borrower's phonology; and second, which constraints govern the adaptation of the loan input. Finally, I have argued against a perceptual approach to segmental deletion in loanword phonology.

Recall that rising diphthongs and nasal vowels are the only contexts where deletion of a Root node is consistently found in the data. I have established a correlation between this observation and the parallelism between the representation of a rising diphthong and that of a nasal vowel. In both of these structures, two Root nodes are anchored to a unique timing position. This two-tier representation is necessary in order to account for the alternations observed in the data. In all contexts where one of the Root nodes cannot be licensed in the borrowing language, it gets deleted.

Finally, the constraint ranking proposed in (16d) holds for all of the languages discussed here. The question as to whether this ranking should be considered to be a fixed (universal) hierarchy is left open for further research.

Notes

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1 To explain the absence of such a pattern in Kinyarwanda, we need to mention that French loanwords in Kinyarwanda were borrowed from Belgian French (BF), a dialect of French which does not have the front rounded glide [ɥ] in its inventory. BF only has the glides [w] and [j]. Words that are pronounced with [ɥ] in Standard French are pronounced with [w] in BF (e.g. Standard French *biscuit* [biskɥi] is pronounced [biskwi] 'cookie' in BF).

2 The timing tier is represented here with skeletal positions. Note that equivalent predictions can be made in other frameworks (e.g. Moraic Theory).

3 Davis and Hammond (1995) demonstrate that in English CGV sequences, the glide [w] is part of the onset (Cw.V) whereas the glide [j] is the first member of a rising diphthong (C.jV).

4 Because of space constraints, only the candidates directly relevant to the alternations observed in the data will be given in the tableaux.

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