

On the Role of Prosodic Structure in French Loanword Incorporation into Bambara

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1. Introduction and background

Longstanding contact and the official status of French in Mali have resulted in a sizeable number of French loanwords incorporated into the Bambara (Bamana) lexicon. Because the phonotactics of French syllables are more complex than those permitted in the maximal CV template of native Bambara words, borrowed words are almost always adapted structurally in some way upon incorporation. In addition to the approximation of incompatible sounds between the phonological inventories of the two languages, illicit structures (e.g. complex syllable margins (both onsets and codas), consonant-consonant sequences over syllable boundaries, and word-final closed syllables) must be repaired and brought into line with the phonology of the borrowing language. These incompatible structures are systematically resolved via vowel epenthesis. The goal of this paper is to explore the bearing that prosodic structure appears to have on the position of epenthetic vowel(s) in borrowings and the specific type of vowel epenthesized. The data are extracted from a small corpus of approximately 200 borrowed words in Margetts (2010), found in the Appendix. Where indicated, Bailleul (2007) and Dumestre (2011) have been consulted to supplement these data. The analysis presented draws on research on prosodic structure above the level of the syllable in Manding languages and elsewhere in the Mande language family (e.g. Bamba 1991; Green 2010, in press; Green et al. 2012; Leben 2002, 2003; Kuznetsova 2007; Vydrine 2004, 2010).

The findings in this paper suggest that patterns of syllable repair and vowel epenthesis observed in French loanword incorporation into Bambara are best described with reference to the prosodic structures of both languages. That is, the location of input French stress and characteristics of Bambara prosodic feet play important roles in loanword incorporation. Furthermore, it is shown that the types of consonants found in syllable onsets of a foot and the lexically-specified vowels located within a foot are key components in predicting observed outcomes of repair by epenthesis. That prosodic foot structure may play a role in loanword incorporation is interesting for several reasons. First, research on the higher prosodic structure of Mande languages is nascent. For Bambara, in particular, recent work presents varied evidence for metrical/foot structure but does not agree on all the characteristics of these feet. One possible reason for discrepancies between these works relates to the fact that there is no overt evidence for stress and/or accent in Bambara or Manding languages in general. These two characteristics are often invoked in discussions of foot structure. Scholars therefore rely on other segmental and tonal processes to motivate their observations and analyses.

Another interesting point is that some epenthetic vowels appear to be a total harmonic copy of another vowel within a foot. That is, epenthetic vowels may be underspecified such that they receive their specification for height, backness, and tenseness (ATR) from a lexically-supplied vowel within the foot, if one is present. In instances where an epenthetic vowel cannot receive these features by spreading, a default high vowel results (most often [i], but [u] is often found in labial environments). Vowel harmony is not typically characteristic of Bambara and its Manding relatives (e.g. Dyula and Maninka). Thus, it may be that the ‘total vowel harmony’ (TVH) considered here for French loanword

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incorporation into Bambara is an unmarked state of affairs that results when lexically-assigned vowels are not supplied in the input.¹

2. Some characteristics of Bambara phonology

This section introduces components of Bambara phonology that influence the discussion below. Important among these are: i) the sound inventory of the language ii) the types of vowels found in native Bambara words iii) the distribution of vowels in words of different shapes iv) syllable structure and phonotactics of the language, and v) phonological processes affected by prosodic structure.

Mismatches between the phonological inventories of French and Bambara necessitate repair via approximation when French words are borrowed into Bambara. This is unproblematic and has little bearing on the epenthesis process described below. Being aware of the types of changes taking place, however, helps to make the data more transparent. For example, [ʃ] and [ʒ] are common French and are most often approximated to [s] and [z] in Bambara, respectively. Note, however, that [z] is not a native phoneme in Bambara. Similarly, [v] and [ʀ] in French often become [w] and [r]/[r̥] in Bambara, respectively. Bambara has a seven vowel system [i,e,ɛ,a,o,ɔ,u] alongside a corresponding series of phonemic nasal vowels [ĩ,ẽ,ɛ̃,ã,õ,ũ].² Contrastive long vowels (which have been lost by some speakers) occur only in morpheme initial position. French front rounded vowels are approximated in a variety of ways in Bambara. These approximations are not discussed further in this paper.

The representative native Bambara monomorphemic words in (1) illustrate that the language does not consistently exhibit TVH. Dumestre (2003:21) points out, however, that approximately half of disyllabic words in the language contain identical vowels in both syllables, as in (2). Furthermore, there is no evidence for processes reminiscent of vowel harmony in words formed by the productive processes of compounding and/or derivation, as in (3).

- (1) a. [fila] ‘two’ vs. [fali] ‘donkey’
 b. [teli] ‘fast’ vs. [tilẽ] ‘day’
 c. [kuna] ‘plate’ vs. [kanu] ‘love’
 d. [kawule] ‘month following the rainy season’
 e. [farita] ‘orphan’
- (2) a. [bili] ‘roof’ b. [dege] ‘to learn’
 c. [kenɛ] ‘healthy’ d. [basa] ‘lizard’
 e. [dusu] ‘courage’ f. [cogo] ‘manner’
 g. [kɔnɔ] ‘stomach’
- (3) a. [ba.muso.kɔrɔ] ‘old she-goat’ b. [da.kuru.ɲa] ‘mouthful’
 goat.female.old mouth.fold.fois

Standard Bambara is syllabically conservative, generally permitting only maximal CV syllables, with few notable exceptions. This strict syllable template is seen in French loanword incorporation, where the language must repair French CCV, CVC, and CVCC syllables, among others. Repair typically involves vowel epenthesis to break consonant-consonant sequences, whether within a syllable or across a syllable boundary. I assume in this paper that consonant-consonant sequences are broken prior to prosodic foot formation, yielding a number of different outcomes. For example, a word-initial C_1C_2V syllable is parsed into a $(C_1v.C_2V)$ foot (where ‘v’ represents an epenthetic vowel and ‘.’ indicates a syllable boundary). Likewise, a word-initial C_1VC_2 syllable is parsed into a $(C_1V.C_2v)$ foot.

¹ For a general overview of the types of vowel harmony systems found in the languages of the world, see van der Hulst & van de Weijer (1995).

² In Bambara orthography, **Vn** indicates a nasal vowel. For example, *tilen* ‘day’ is phonetically [tilẽ]. A phonetic nasal consonant often emerges in a syllable coda when a nasal vowel is followed by an obstruent. Furthermore, although Bambara is a tonal language, the Margetts (2010) corpus does not mark tone. Thus, tone has been omitted from the data points in this paper but is assumed not to play a role in the processes described herein.

Because Bambara feet are assumed to be parsed exhaustively, a $C_1VC_2.C_3VC_4$ French word like *fourchette* [fʊr.ʃɛt] ‘fork’ is parsed into two disyllabic feet, i.e. *furuseti*, $(C_1V.C_2v)(C_3V.C_4v)$, where C_2 and C_3 are in adjacent syllables in the input. Footing occurs analogously in longer words, always conforming to a maximal CV template. A proposed role for foot structure and more detail on how foot function in loanword incorporation are considered below.

Bambara foot structure has been argued to play a role in the outcome of both the segmental and tonal phonology of the language. Important to this paper are conditions defining the process of *affaissement*, or leveling, as reported in Leben (2002, 2003) and Green (2010). These authors describe *affaissement*, which acts on trisyllabic LHH melody words, introducing an alternation to LLH via L-tone spreading when two conditions are met. First, a foot boundary must intervene between the second and third syllable, i.e. (LH)(H) \rightarrow (LL)(H). Second, L tone spread only occurs via *affaissement* when the onset of the second syllable of the foot is *weak*, i.e. a liquid or a velar stop. Thus, the nature of foot-internal segments has been shown to affect the outcome of certain phonological processes in Bambara. Note that *affaissement* also occurs in relevant disyllabic LH words comprised of one foot when followed by another H word. Similarly, a featural foot, the *syllabeme*, has been described for some Mande languages (e.g. Kuznetsova 2007; Le Saout 1979; Vydrine 2002, 2004) in which the nature of the first consonant of the syllabeme licenses the features of other components within the structure. While this structure is not found in Bambara, such domain-dependent relationships are reported in genetically-related languages.

3. Basic characteristics of French loanword incorporation

The data from Margetts (2010) represent a number of repair strategies employed in French loanword incorporation into Bambara. The remainder of this paper aims to summarize and capture key generalizations about this process as they relate to prosodic structure. This paper draws on two earlier propositions: i) French words are comprised of disyllabic iambs (weak+strong sequences) constructed from the right edge of the stress domain (e.g. Scullen 1997), and ii) Bambara words are comprised of maximally disyllabic trochees constructed from left-to-right (e.g. Green et al. 2012). Of interest is how these seemingly incompatible prosodic systems interact with one another in loanword incorporation.

We begin by schematizing French loanword incorporation in five steps and later discuss necessary adaptations to this schema. Bambara foot structure is taken as basic, and its interaction with French foot structure is later introduced. The five steps are: i) French input is received; ii) a maximal CV syllable grid is formed; iii) syllables are parsed into disyllabic feet from left-to-right (syllables that cannot be parsed into disyllabic feet are parsed into degenerate monosyllabic feet at the right edge of a word); iv) vowel epenthesis occurs; and v) the form observed in Bambara results.

Each instance of repair discussed provides additional information about the role that prosodic structure appears to play in loanword incorporation. Those instances in which a reported form in Margetts (2010) does not follow from the proposed analysis are marked in the Appendix by ‘*’ and are summarized briefly in the concluding remarks. Additional research, collecting a larger corpus of French loans, may provide further insight into the validity and/or behavior of these exceptions. Where relevant, borrowings contained in Bailleul (2007) and Dumestre (2011) supplement the discussion.

The simplest instances of borrowing are those in which vowels are supplied in the input and are mapped faithfully to the Bambara output with minimal alteration, as in (4). The only repair in such words is the addition of a default (nearly always high) vowel, which effectively avoids an illicit word-final CVC syllable.

	<u>French Orthography</u>	<u>IPA</u>	<u>Bambara</u>	<u>English Gloss</u>
(4) a.	<i>cassette</i>	[ka.set]	kaseti	‘cassette tape’
b.	<i>carotte</i>	[ka.rɔt]	karɔti	‘carrot’
c.	<i>conférence</i>	[kɔ̃.fe.rãs]	kɔ̃feransi	‘conference’
c.	<i>allumette</i>	[a.ly.mɛt]	alimeti	‘candle’

The borrowings in (4) differ from many other instances where Bambara must repair disallowed consonant-consonant sequences, such as French CCV syllables or instances where consonants are in

contact across a syllable boundary. The representative example in (5) illustrates onset consonants of a word-initial CCV syllable repaired by vowel epenthesis.

- (5)
- | | |
|--------------------|-----------------------|
| | <i>drapeau</i> ‘flag’ |
| i. French input | [dra.po] |
| ii. Grid formation | d_ .ra.po |
| iii. Footing | (d_ .ra)(po) |
| iv. Epenthesis | (da.ra)(po) |
| v. Bambara output | [darapo], *[dirapo] |

The consonants of the complex onset are divided into a maximal CV grid and subsequently parsed into maximally disyllabic feet. The empty grid slot created is filled by an epenthetic vowel that appears to be a harmonic copy of the other lexically-supplied vowel in the foot. An unattested form in which the epenthetic vowel is a default high vowel is given for comparison and marked by “*”. Note that word-final default vowel epenthesis is not necessary here, as it was in (4), because a word-final vowel is supplied in the input. Bear in mind (as discussed below) that this apparent TVH is only found in feet that meet certain structural conditions. Other borrowings necessitate both types of epenthesis illustrated in (4) and (5). This is shown in (6), where TVH is seen in the first foot, while word-final epenthesis is observed in the second.

- (6)
- | | |
|--------------------|-------------------------|
| | <i>fromage</i> ‘cheese’ |
| i. French input | [frɔ.maʒ] |
| ii. Grid formation | f_ ro.ma.z_ |
| iii. Footing | (f_ .ro)(ma.z_) |
| iv. Epenthesis | (fo.ro)(ma.zi) |
| v. Bambara output | [foromazi], *[firomazi] |

Longer native Bambara words can be seen to support iterative left-to-right footing (Green 2010). Such words, as in (7), illustrate TVH in word-internal feet when the appropriate conditions are met. Examples like (11), below, show that some structural conditions do not permit TVH in certain words.

- (7)
- | | |
|--------------------|-------------------------------|
| | <i>démocratie</i> ‘democracy’ |
| i. French input | [de.mo.kra.si] |
| ii. Grid formation | dɛ.mo.k_ .ra.si |
| iii. Footing | (dɛ.mo)(k_ .ra)(si) |
| iv. Epenthesis | (dɛ.mo)(ka.ra)(si) |
| v. Bambara output | [dɛmokarasi], *[dɛmokirasi] |

While the examples in (5)-(7) pertain to input CCV syllable repair, the process can occur in words where a consonant-consonant sequence split by a syllable boundary must be repaired (e.g. CVC.CVC). An illustrative example is in (8). Here, harmonization occurs rightward within a foot in the repair of an input CVC syllable, while in the examples above, the process occurred leftward in the repair of input CCV syllables.

- (8)
- | | |
|--------------------|--------------------------|
| | <i>fourchette</i> ‘fork’ |
| i. French input | [fuʀ.ʃɛt] |
| ii. Grid formation | fu.r_ .sɛ.t_ |
| iii. Footing | (fu.r_)(sɛ.t_) |
| iv. Epenthesis | (fu.ru)(sɛ.ti) |
| v. Bambara output | [furuseti] |

The types of incorporation in (4)-(8) are straightforward cases. Other intricacies come to light when considering input French words of a larger variety of shapes and lexically-supplied segments. Thus far, the foot-internal TVH shown above (and indeed in the vast majority of all cases) suggests that this phenomenon occurs only under certain conditions. That is, the ability of TVH to occur relates closely to the type of consonants that comprise a foot. For harmonization via TVH to occur, the C_1 of a ($C_1V_1C_2V_2$) foot must be an obstruent consonant, while the C_2 is a liquid consonant (most often [r], but sometimes [l]).³

The examples in (9) illustrate words in which TVH does not occur when these two conditions are not met. Example (9a) shows an input where both C_1 and C_2 are obstruents. Examples (9b) and (9c) illustrate cases where C_1 is a nasal consonant, while C_2 is an [r]. In each, TVH fails to occur where it otherwise occurs with a C_1 obstruent and another C_2 liquid. The alternative is default vowel epenthesis.

(9)

	<i>basket</i> ‘basketball’
i. French input	[ba.skɛt]
ii. Grid formation	ba.s_ .kɛ.t_
iii. Footing	(ba.s_)(kɛ.t_)
iv. Epenthesis	(ba.si)(kɛ.ti)
v. Bambara output	[basiketɪ], *[basaketi]

	<i>Norvège</i> ‘Norway’
i. French input	[nɔrvɛʒ]
ii. Grid formation	nɔ.r_ .wɛ.z_
iii. Footing	(nɔ.r_)(wɛ.z_)
iv. Epenthesis	(nɔ.ri)(wɛ.zi)
v. Bambara output	[nɔriwɛzi], *[nɔrɔwɛzi]

	<i>mars</i> ‘March’
i. French input	[mars]
ii. Grid formation	ma.r_ .s_
iii. Footing	(ma.r_)(s_)
iv. Epenthesis	(ma.ri)(si)
v. Bambara output	[marisi], *[marasi]

While the outcome of TVH for C_2 [r] is rather clear throughout the data, an anonymous reviewer suggests that the behavior of TVH across a C_2 [l] is ambiguous in some instances. Indeed, some of this ambiguity arises due to the nature of the borrowings themselves. For example, the outcome in words where the potential for TVH with a C_2 [l] is obscured because both foot vowels are supplied in the input, e.g. *polisi*, [pɔlisi], ‘police’. One also finds ambiguous outcomes where identical vowels in a foot cannot be attributed to TVH, but rather are supplied in the input, e.g. *salati*, [salad], ‘lettuce’ or *telefoni*, [telefɔni], ‘telephone’. There are other words that might provide more information on TVH across [l]; however the seemingly harmonized epenthetic vowel is high, like the default, e.g. *filimu*, [film], ‘film’, *filitere*, [filitɛr], ‘filter’. I argue, nonetheless, that words like *galasi*, [glas], ‘glass’ (and perhaps even *bɔlɔti*, [pɔlɔt] ‘ball’ (Dumestre 2011:142) or *sɔrɔdasi*, [sɔlda], ‘soldier’ (Dumestre 2011:935)) suggest that TVH can and does occur across C_2 [l] under the appropriate conditions. The behavior of C_2 [l] is discussed further below. In this small corpus of borrowings, finding the exact *shape* and segmental content of words to demonstrate a sizable number of tokens is an acknowledged limitation of this study. While these data perhaps do not yet offer a complete picture of TVH over liquids, the observations reported call for additional, systematic elicitation of borrowings. For the purposes of this analysis, I shall assume the broader interpretation of TVH over liquids; however it may be necessary to redefine the conditions for TVH to include only C_2 [r] if future research cannot flesh out the ambiguity of C_2 [l].

³ An analogous type of TVH over other *weak* consonants, i.e. velar stops, is introduced below.

Concerning the ability for foot-internal segments to bear on the outcome of morphophonological processes, recall that liquids (both [l] and [r]) are described elsewhere as ‘weak’ in what would be C₂ foot positions (e.g. Dumestre 1987; Green 2010). In this position, they permit tone spreading via *affaissement*, or leveling. That is, specific foot-internal segments can and do affect the outcome of phonological processes in Bambara. Note that ‘weakness’ of consonants cannot necessarily be attributed to sonority, as glides (i.e. [w] and [j]) do not permit *affaissement* nor do they appear to allow TVH when they occupy a C₂ foot position (e.g. *buwasɔn*, **bawasɔn*, [bwasɔ̃], ‘beverage’) It may also be the case, however, that velar stops act as ‘weak’ consonants in French loanword incorporation, much as they have been observed to do regarding *affaissement*. While words of the shape necessary to show this are few in the corpus, one such example is in (10).

(10)

	<i>docteur</i> ‘doctor’
i. French input	[dɔk.tœʀ]
ii. Grid formation	dɔ.k_ .tɔ.r_
iii. Footing	(dɔ.k_)(tɔ.r_)
iv. Epenthesis	(dɔ.kɔ)(tɔ.rɔ)
v. Bambara output	[dɔkɔtɔɔ], *[dɔkitɔɔ]

Instances where harmonization occurs across liquids (and perhaps velar stops) within a foot have been discussed, as have those words where harmonization cannot occur when relevant structural conditions are not met. It is also possible to observe the constraints that foot boundaries place on TVH. Patterns of vowel epenthesis show that TVH does not simply occur across any C₁-obstruent/C₂-liquid sequence. Rather, TVH is constrained to applying within a foot, as in (11). In (11), the complex syllables of the input [ɛ̃.fɔʀ.ma.tik] are broken in grid formation, i.e. *ɛn.fo.r_ma.ti.k_*, creating adjacent syllables that, prior to footing, appear to have the requisite segmental content for TVH application. Once footing occurs, however, these syllables are parsed into adjacent feet, which precludes harmonization. The **bold** type highlights the fact that the incorporated word contains an epenthetic default vowel, as opposed to TVH, which is shown in the starred, unattested form. Similar examples are found in *enterineti*, [ɛ̃tɛrɛnet], ‘internet’ (*ɛntɛrɛneti) and *oberizini*, [ɔbɛʀʒini], ‘eggplant’ (*ɔbɛʀzini).

(11)

	<i>informatique</i> ‘computing’
i. French input	[ɛ̃.fɔʀ.ma.tik]
ii. Grid formation	ɛn.fo.r_ .ma.ti.k_
iii. Footing	(ɛn.fo)(r_ .ma)(ti.k_)
iv. Epenthesis	(ɛn.fo)(ri.ma)(ti.ki)
v. Bambara output	[ɛn for imatiki], *[ɛn for omatiki]

The absence of harmonization in such words is difficult to capture without reference to the foot domain. TVH readily occurs elsewhere under analogous conditions, but nonetheless fails to be seen here. While these facts alone would not suffice to motivate the presence of the foot in Bambara, the distribution of vowels seen thus far are arguably correlated with known properties of Bambara foot structure. Next, we turn to the role that French prosodic structure plays in loanword incorporation.

4. Sensitivity to French prosodic structure

The data above describe several types of French loanword incorporation into Bambara. By and large, they refer to Bambara syllable margin phonotactics and foot structure but do not consider the role played by French prosodic structure in the incorporation process. This section considers how prosodic structures of the two languages appear to interact with another.

It is commonly accepted that French is a stress language and that French prosodic feet are disyllabic iambs (light + heavy sequences of syllables) constructed from the right edge of the stress

domain (e.g. Scullen 1997). This would appear to be at odds structurally with the view presented here and elsewhere (e.g. Green 2010) that Bambara feet are constructed from the left edge of a word. Given what has been presented above, however, a French-based footing schema would fail to capture certain generalizations about the harmonization patterns in Bambara. Hypothetical illustrations of this alternative in (12) support this view. The **bold** syllable in each example marks the location of input stress which defines the right edge of the stress domain and from which footing would be determined. This schema makes incorrect predictions concerning the location of epenthetic default vowels versus instances of TVH within a foot. See the proposed Bambara footing schema in (6) and (12) for comparison.

(12)

- | | |
|--------------------|---------------------------------|
| a. | <i>fromage</i> ‘cheese’ |
| i. French input | [frɔ.maʒ] |
| ii. Grid formation | f_ro.ma.z_ |
| iii. Footing | (f_)(ro. ma)(z_) |
| iv. Epenthesis | (fi)(ro.ma)(zi) |
| v. Bambara output | *[firomazi], [foromazi] |
| | |
| b. | <i>informatique</i> ‘computing’ |
| i. French input | [ɛ.fɔ̃.ma.tik] |
| ii. Grid formation | ɛn.fo.r_.ma.ti.k_ |
| iii. Footing | (ɛn)(fo.r_)(ma. ti)(k_) |
| iv. Epenthesis | (ɛn)(fo.ro)(ma.ti)(ki) |
| v. Bambara output | *[enforomatiki], [enforimatiki] |

Although Bambara does not use the same footing schema as French, it appears that loanword incorporation is sensitive to French stress and syllable structure in interesting ways. One way is in the incorporation of words with a final stressed CVC syllable. It is not uncommon for borrowings ending in a CVC syllable whose final consonant is an obstruent to exhibit default vowel epenthesis (as in (4)); however this may seem unusual for words like those in (13) containing consonants in a word-final ($C_1V_1.C_2V_2$) foot (namely a C_1 obstruent and C_2 [r]) that might be expected to permit TVH. In each instance in (13), a default vowel is epenthesized word-finally, as opposed to the final foot exhibiting TVH. As discussed in Section 5, the failure of TVH to apply in such words is attributed to restrictions on the process occurring in feet in certain positions in the prosodic word domain.

(13)

- | | |
|--------------------|---------------------------------|
| | <i>hélicoptère</i> ‘helicopter’ |
| i. French input | [e.li.kɔ̃p.tɛʀ] |
| ii. Grid formation | e.li.kɔ̃.p_.tɛ.r_ |
| iii. Footing | (e.li)(kɔ̃.p_)(tɛ.r_) |
| iv. Epenthesis | (e.li)(kɔ̃.pi)(tɛ.ri) |
| v. Bambara output | [elikɔ̃pitɛri], *[elikɔ̃pitɛʀ] |
| | |
| | <i>passport</i> ‘passport’ |
| i. French input | [pas.pɔ̃ʀ] |
| ii. Grid formation | pa.s_.pɔ̃.r_ |
| iii. Footing | (pa.s_)(pɔ̃.r_) |
| iv. Epenthesis | (pa.si)(pɔ̃.ri) |
| v. Bambara output | [pasipɔ̃ri], *[pasipɔ̃ʀ] |

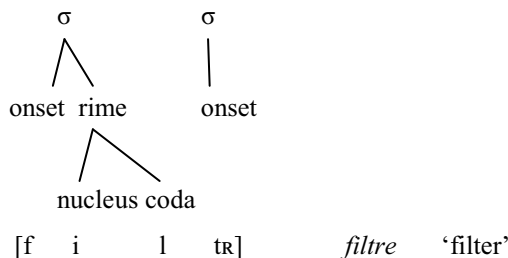
	<i>pasteur</i> ‘pastor’
i. French input	[pas.tœr]
ii. Grid formation	pa.s_.t̩.e.r_
iii. Footing	(pa.s_)(t̩.e.r_)
iv. Epenthesis	(pa.si)(t̩.e.ri)
v. Bambara output	[pasit̩eri], *[pasit̩er̩]

Compared to word-final CVC syllables, when the final stressed syllable is **CCV**, the output is somewhat different. Here, harmonization within the epenthetic slot that split the input onset consonants is sometimes observed, as in (14). Motivation for this outcome is taken up below.

(14)	<u>French Orthography</u>	<u>IPA</u>	<u>Bambara</u>	<u>English Gloss</u>
a.	<i>frein</i>	[fr̩ɛ̃]	f̩er̩n	‘brake’
b.	<i>goudron</i>	[gudr̩ɔ̃]	gud̩r̩ɔ̃n	‘tarmac’
c.	<i>patron</i>	[patr̩ɔ̃]	pat̩r̩ɔ̃n	‘patron’
d.	<i>train</i>	[tr̩ɛ̃]	t̩er̩n	‘train’

Also interesting are adaptations for French words containing word-final ‘semisyllables’ (e.g. Féry 2003). The notion of the semisyllable (as opposed to a ‘core’ syllable) avoids violations of the Sonority Sequencing Principle (Clements 1990), such that it places what would be a rising sonority coda into the onset of a following rimeless syllable. A schematic of a core syllable vs. a semisyllable adapted from Féry (2003) is shown in (15). This is followed by a list, in (16), of French borrowings into Bambara that exhibit this type of syllabification. Their incorporation suggests that the consonants of the semisyllable are split by the CV grid, as expected, and are then populated by identical vowels. Most often these are identical high vowels, either [i] or [u] as conditioned by the surrounding environment. In some instances, however, the mid vowel [e] is epenthésized. The schema for incorporation proceeds as expected in other syllables, e.g. (16c). In words like (16a,f,i), however, the observed outcomes may indicate that the input stressed syllable is (at least perceived as) bimoraic and footed as a moraic trochee. Such proposals of bimoraicity are proposed in other instances in French for tense vowels, nasal vowels, and some mid vowels (e.g. Féry 2003). If we assume bimoraicity of these stressed syllables to be the state of affairs here, it would suggest that Bambara feet are perhaps moraic trochees, rather than syllabic trochees. No evidence has yet been offered in the literature to tease apart this distinction; however these details must await further inquiry.

(15) Core syllable + Semisyllable



(16)

	<u>Bambara</u>	<u>French Gloss</u>	<u>Input IPA</u>	<u>English Gloss</u>
a.	bibulu	bible	[bibl]	bible
b.	desanburu	décembre	[desãbr̩]	December
c.	filitere	filtre	[fil̩tr̩]	filter
d.	finetiri	fenêtre	[f̩ɛ̃nɛ̃tr̩]	window
e.	letere	lettre	[l̩ɛ̃tr̩]	letter

f.	liburu	livre	[livR]	book
g.	litiri	litre	[litR]	liter
h.	metere	mètre	[mɛtR]	meter
i.	metiri	maître	[mɛtR]	teacher
j.	mōnturu	montre	[mōtR]	watch
k.	sɛntimɛtɛrɛ	centimètre	[sãtimɛtR]	centimeter
l.	sɛrɛkili	cercle	[sɛrk]	circle
m.	tenburu	timbre	[tɛ̃br]	stamp
n.	winegiri	vinaigre	[vinegR]	vinegar
o.	witiri	vitre	[vitR]	windowpane

Another point for consideration concerns input CCVC words, as in (17), that do not exhibit TVH across a C₂ [1]. In words of this shape, only a single vowel is supplied in the French input, yet Bambara phonotactics require both the complex onset and word-final coda of the input to be repaired. Thus, such monosyllabic inputs yields trisyllabic Bambara outputs, necessitating two epenthetic vowels.

(17)	<u>French Orthography</u>	<u>IPA</u>	<u>Bambara</u>	<u>English Gloss</u>
a.	<i>classe</i>	[klas]	kilasi	‘class’
b.	<i>plaque</i>	[plak]	pilaki	‘plaque’
c.	<i>fleur</i>	[flœR]	filɛri	‘flower’

Compare the outcome in (17a) to the word *galasi* ‘ice’, from the analogous CCVC input [glas]. These nearly identical inputs differ only in the [voice] specification of their initial consonant but have different outputs. That voicing is responsible for inciting this alternative would be surprising, as voicing has not affected the outcome of TVH elsewhere. It may be, however, that the unique shape of these inputs yields variation in how the input vowel is parsed upon footing. In words like *galasi*, the result of grid formation and footing would be (g_.la)(s_), yielding TVH within the first foot and default epenthesis word-finally. The outcome for *kilasi*, however, may be due to the fact that grid formation and footing places the input vowel into the strong position of a foot, thereby removing the environment for TVH, yielding (k_)(la.s_). This might result because an input stressed vowel attracts the head of a foot, where possible. Because feet are preferably trochaic in Bambara, and a stressed vowel is attracted to the stronger foot position, the foot is parsed to contain the stressed vowel at the left edge of the foot. The syllable before it is therefore parsed into a degenerate foot. Further insight into the robustness of this variation must await future research.

5. Prosodic structure in French loanword incorporation

The data in Section 3 illustrated the distribution of default vowels resulting from epenthesis, a correlation between epenthesis patterns and known characteristics of Bambara prosodic feet, and the role of the foot as a domain for TVH. Section 4 offered a number of diverse contexts whose outcomes inform a refined characterization of the French loanword incorporation schema. These data, taken together, suggest several ways in which the two prosodic systems drive the patterns of loanword incorporation and thereby affect the proposed incorporation schema.

First, an input stressed syllable is prominent. Importantly, the input syllable must be marked as prominent before modifications are made to satisfy the phonotactic requirements of Bambara. Bambara syllable margin phonotactics necessitate the formation of a maximal CV grid, breaking consonant clusters and other consonant-consonant sequences syllable-by-syllable. Once this grid is created, the input stressed syllable is footed, and the prominent vowel projects the prosodic word head. Footing of the input stressed syllable has several manifestations, as shown in the examples below.

Generally speaking, for a CVC → CVCv repair or a CCV → CvCV repair (where ‘v’ represents the epenthetic vowel), the non-epenthetic vowel is prominent and projects the prosodic word head. Feet are then parsed maximally, left-to-right, as characteristic of Bambara. Next, TVH occurs in accordance with the structural requirements for harmonization discussed in Section 3.

It was broached in (13) that harmonization occurs, where possible, but is generally restricted from occurring in certain feet. (18) shows that TVH appears to fail in feet not immediately dominated by the prosodic word projection.⁴ A notable exception in (21) is when the vowel projecting the prosodic word head is in a metrically weak position, i.e. at the right edge of a trochaic foot. In such instances, harmony often occurs within the foot, perhaps to counteract (or balance) an unfavorable right-edge prominence.

This revised incorporation schema and its outcomes are illustrated below. In each example, the input stressed syllable is marked ‘*’. This syllable is the head of the foot and projects the prosodic word head.

(18) and (19) juxtapose word structures in foot-internal non-harmonizing vs. harmonizing contexts, respectively. In (18), TVH does not occur in the non-head foot when the necessary structural conditions are not met. This example also shows that although the head foot meets the necessary structural conditions for TVH, the process cannot occur. An analogous case is in (19) where a non-head foot meets the requirements for TVH to occur. (20) captures the outcome in words where harmonization cannot occur due to the presence of an intervening foot boundary.

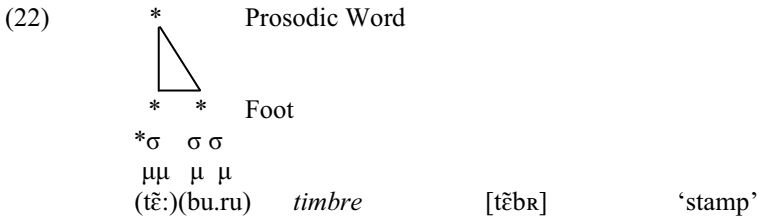
- (18)
- | | | | | | |
|---|-----------------------|-----------------|-----------|------------|-----------|
| $\begin{array}{c} \diagup \\ * \text{---} * \\ \sigma \quad \sigma \quad * \sigma \quad \sigma \end{array}$ | Prosodic Word
Foot | | | | |
| $\begin{array}{c} * \\ \text{(pa.si)} \end{array}$ | (pɔ.ri) | <i>passport</i> | [pas.pɔʀ] | ‘passport’ | *pasapɔri |
-
- (19)
- | | | | | | |
|---|-----------------------|-------------------|-----------|--------|-----------|
| $\begin{array}{c} \diagup \\ * \text{---} * \\ \sigma \quad \sigma \quad * \sigma \quad \sigma \end{array}$ | Prosodic Word
Foot | | | | |
| $\begin{array}{c} * \\ \text{(fu.ru)} \end{array}$ | (sɛ.ti) | <i>fourchette</i> | [fʊʀ.ʃɛt] | ‘fork’ | *furisɛti |
-
- (20)
- | | | | | | | |
|--|------------------------------|------------------|---------------------|-----------------|-------------|---------------|
| $\begin{array}{c} \diagup \\ * \text{---} * \text{---} * \\ \sigma \quad \sigma \quad \sigma \quad \sigma \quad * \sigma \quad \sigma \end{array}$ | Prosodic Word
Foot | | | | | |
| $\begin{array}{c} * \\ \text{(ɛn.fo)} \end{array}$ | $\text{(ri.ma)} \end{array}$ | (ti.ki) | <i>informatique</i> | [ɛ̃.fɔʀ.ma.tik] | ‘computing’ | *ɛnforomatiki |

A more complex situation concerns words, as in (14), wherein the input stressed final syllable is CCV. In these words, it appears that the repair of CCV → CvCV places an input stressed syllable in a metrically-weak position, i.e. a position that would create an iambic (weak + strong) sequence if default vowel epenthesis occurred as usual. Iambic sequences are typically disallowed in Bambara (Green 2010). To avoid this, the language appears to permit TVH within this foot to create a sonority plateau, effectively balancing and/or counteracting the skewed prosodic structure while still remaining true to the input prominence of French final stress. An example of this is in (21).

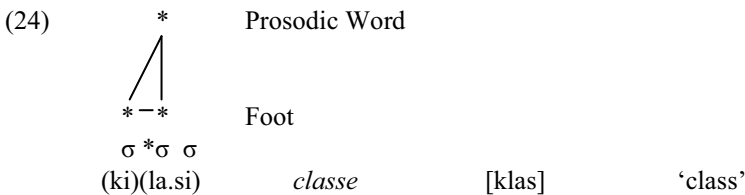
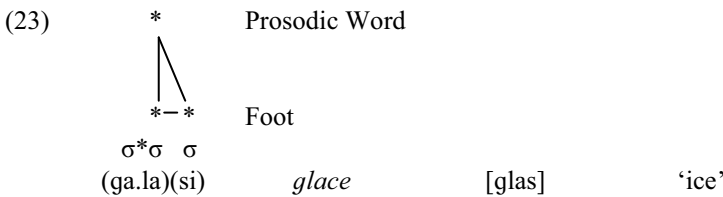
- (21)
- | | | | | | |
|--|-----------------------|----------------|----------|----------|-----------|
| $\begin{array}{c} \diagup \\ * \text{---} * \\ \sigma \quad \sigma \quad * \sigma \end{array}$ | Prosodic Word
Foot | | | | |
| $\begin{array}{c} * \\ \text{(gu)} \end{array}$ | (dɔ.rɔ̃) | <i>goudron</i> | [gudrɔ̃] | ‘tarmac’ | *gudirɔ̃n |

⁴ Exceptions to this generalization are few but can be found marked by ‘*’ in the Appendix.

Next, if one assumes that the vowel of a core syllable preceding a semisyllable is bimoraic and heavy, this syllable would constitute a heavy unary foot of its own. The consonants of the semisyllable would then be parsed into a disyllabic foot containing two epenthetic vowels filled by identical default vowels. This is illustrated in (22).



Finally, there is variation in the outcome for similarly shaped words like *galasi* and *kilasi*, from [glas] and [klas], respectively. The explanation offered above concerns the foot position into which the input (and only) vowel is parsed, as represented in (23) and (24).



The generalizations laid out here and their accompanying representations capture the outcome of the vast majority of French loanwords incorporated into Bambara reported in Margetts (2010); however future research is necessary to firm up a few points and to explore further certain exceptional outcomes. For example, from identical (Standard) French inputs, the words *maître* [mɛtr̥] ‘teacher’ and *mètre* [mɛtr̥] ‘meter’ are borrowed as *metiri* and *metere*, respectively, in Bambara. Also, *tabali* ‘table’, presumably from the French *table* [tabl] does not yield an expected **tabili*, as in other final semi-syllable words. This may suggest an influence of the English pronunciation with a syllabic liquid, i.e. [tʰeɪbl̩]. Other reported forms appear exceptional, e.g. *karitɔn* ‘carton’, where one might expect **karatɔn* and *motere* ‘motor’, where one might predict **moteri*, following from other similarly shaped words. Metathesis seems to be at play in *burɛti* ‘wheelbarrow’, from [brɛt], *brouette*.

6. Concluding thoughts

The data discussed above, drawn from this small corpus of French borrowings, point toward several generalizations about the role of prosodic structure in French loanword incorporation into Bambara. In each instance, the mechanism for loanword incorporation makes reference to the prosodic structure of both the borrowing and lending languages. The data considered in this paper permit the proposal of several factors at play in the incorporation mechanism. First, the stressed syllable supplied in the French input forms the basis around which the rest of the loanword incorporation process proceeds. As a result, Bambara remains faithful to the prominence inherent in the input word by parsing an input stressed syllable into a foot, wherein its vowel projects the prosodic word head. Supplied with this input prominence, the remainder of the loanword incorporation mechanism draws

on components of Bambara prosodic phonology. Important among these parameters is Bambara foot structure, which supplies the parameters of boundedness, exhaustivity, and directionality. Although no consistent correlates of stress and/or accent have been identified for native Bambara words, it has been argued elsewhere that feet are structural components of Bambara and play an important role in various morphophonological processes. In loanword incorporation, Bambara feet appear to play a role as a domain of application within which TVH occurs. The types of consonants and vowels comprising these feet, and more specifically the segments occupying different positions in the foot, are important factors in whether or not harmonization can occur within the foot. Thus, the patterns of vowel epenthesis witnessed in loanword incorporation correlate in important ways with foot structure and relate to phonological characteristics of both French and Bambara.

Because these data are drawn only from a small corpus of French loanwords, the generalizations discussed here offer a preliminary but promising glimpse into the role that prosodic structure plays in loanword incorporation Bambara. Expanded data collection focused on loanwords is called for, as well as experimental work aimed at investigating the ways in which vowel quality is manifested or varies both inside and outside of the foot domain. Inquiries into the robustness of variation in CCVC inputs and the status of harmonization across C₂ [l] and velar stops must also be expanded. This work has the potential to shed more light on the harmonization phenomena and its relationship to other foot-based processes proposed to be underway in the language.

Appendix - French loanwords included in Margetts (2010)

<u>Bambara</u>	<u>French Gloss</u>	<u>Input IPA</u>	<u>English Gloss</u>
alimeti	allumette	alymet	candle
ampulu	ampoule	āpul	bulb
angileteri	Angleterre	āglōter	England
arōndisiman	arrondissement	arōdismā	neighborhood
asiyeti	assiette	ašjet	plate
awiyōn	avion	avjō	airplane
balōn	ballon	balō	ball
bandi	bandit	bādi	bandit
banki	banque	bāk	bank
basiketi	basket	basket	basketball
batiri	batterie	batri	battery
bato	bateau	bato	boat
bibilioteki	bibliothèque	biblijōtek	library
bibulu	bible	bibl	bible
biki	bic	bik	pen
birike	briquet	brike	lighter
biro	bureau	byro	office
bisiki	biscuit	biskūi	cookie
biye	billet	bijε	ticket
bōnbōn	bonbon	bōbō	candy
bōrōsi	brosse	brōs	brush
bureti*	brouette	bruet	wheelbarrow
burusi	brousse	brus	countryside
buteli	bouteille	butej	bottle
butigi	boutique	butik	shop
buwason	boisson	bwasō	drink
buwati	boite	bwat	box
cēni	chaîne	ʃen	chain
dara	drap	dra	sheet
darapo	drapeau	drapo	flag
demokarasi	démocratie	demōkrasi	democracy
depite	député	depyte	deputy

desanburu	décembre	desābr	December
desen	dessin	desē	drawing
dimasi	dimanche	dimāŋ	Sunday
dipilomu	diplôme	diplom	diploma
disitiriki	district	distrik	district
dɔgɔtɔɔ	docteur	dɔktɔɛr	doctor
dɔrɔgu	drogue	dɔɔg	drug
egilisi	église	egliz	church
elikɔpiteri	hélicoptère	elikɔptɛr	helicopter
esansi	essence	esās	gasoline
enfɔrimatiki	informatique	ēfɔrmatik	computing
enterineti	internet	ēternet	Internet
faari	phare	far	headlight
faransi	France	frās	France
fewuruye	février	fɛvrɪje	February
feren	frein	frē	brake
fileri	fleur	flɔɛr	flower
filimu	film	film	film
filitere	filtre	filtr	filter
fīnetiri	fenêtre	fɔnɛtr	window
firiti	frites	frit	fries
foromazi	fromage	frɔmɑʒ	cheese
foron	fourreau	furo	sheath
foto	photo	fɔto	photograph
furuno	fourneau	furno	furnace
furuseti	fourchette	furfɛt	fork
galasi	glace	glas	ice
gari	gare	gar	station
garamu	gramme	gram	gram
garasi	garage	garaʒ	garage
geresi	Grèce	grɛs	Greece
gitari	guitare	gitar	guitar
goferenaman*	gouvernement	guvɛrnəmā	government
goli	goal	gol	goal
gudɔrɔn	goudron	gudrɔ	tarmac
izini	usine	yzin	factory
kafe	café	kafe	coffee
kamiyɔn	camion	kamjɔ	truck
kanpapi	campagne	kāpap	countryside
kapitalisimu	capitalisme	kapitalism	capitalism
kapiteni	capitaine	kapiten	captain
karitɔn*	carton	kartɔ	cardboard box
karɔti	carotte	karɔt	carrot
kaseti	cassette	kaset	cassette tape
kasiki	casque	kask	helmet
katoliki	catholique	katɔlik	Catholic
keremu	crème	kɛrɛm	skin cream
kese	caisse	kɛs	trunk
kilasi	classe	klas	class
kile*	clé	kle	key
kinini	quinine	kinin	quinine
kiriyɔn	crayon	krɛjɔ	pencil
komini	commune	kɔmyn	district

komite	comité	kõmite	committee
kõnferansi	conférence	kõferãns	conference
kurane	Coran	kõrã	Coran
kuyeri	cuillère	kujjɛr	spoon
labure	labourer	labure	to plow
lakere	(la) craie	(la) kre	chalk
lakõli	l'école	(l)ekõl	school
lankiri	l'encre	(l)ãkr	ink
leterɛ	lettre	letr	letter
liburu	livre	livr	book
litiri	litre	litr	liter
loteli	(le) hôtel	(l)otɛl	hotel
marisi	mars	mãrs	March
marito	marteau	marto	hammer
masiki	masque	mask	mask
mayõnezi	mayonnaise	majõnez	mayonnaise
mazisitara	magistrate	mazistra	magistrate
metisi	métis	metis	person of mixed race
mere	maire	mɛr	mayor
merekiri	mercure	mɛrkyr	mercury
mɛterɛ	mètre	mɛtr	meter
mɛtiri	maître	mɛtr	teacher
miliyari	milliard	miljar	billion
miliyõn	million	miljõ	million
minisitiri	ministre	ministr	minister
miniti	minute	minyt	minute
moterɛ*	moteur	mõtɛr	engine
mõturu	montre	mõtɛr	watch
nɛzi	neige	nɛz	snow
nimõrõ	numéro	nymero	number
nizeri	Niger	nizɛr	Niger
nowanburu	novembre	nõvãbr	November
nõriwɛzi	Norvège	nõrvɛz	Norway
obɛrizini	aubergine	obɛrʒin	eggplant
papiye	papier	papje	paper
pasipõri	passport	paspõr	passport
pasiteri	pasteur	pastɛr	pastor
patõrõn	patron	patrõ	boss
pedali	pédale	pedal	pedal
penaliti	penalty	penalti	penalty
peresidan	président	prezidã	president
peterõli	pétrole	petrõl	gasoline
pɛtiri	peinture	pɛtyr	painter
pikiri	piqûre	pikyɛr	injection
pilaki	plaque	plak	plaque
pili	pile	pil	battery
pisini	piscine	pisin	swimming pool
polisi	police	põlis	police
politiki	politique	põlitik	politics
porogaramu	programme	prõgram	program
porotesitan	protestant	prõtɛstã	Protestant
poroze	projet	prõʒɛ	project
põli	poêle	pwal	frying pan

pomu	pomme	pɔm	apple
pɔn	pont	pɔ̃	bridge
pɔri	port	pɔR	port
rezɛn	raisin	REZɛ̃	grape
salati	salade	salad	lettuce
sandiwisi	sandwich	sãdwiʃ	sandwich
santimetere	centimètre	sãntimetr	centimeter
semisi	chemise	ʃɛmiz	shirt
sentiri	ceinture	sɛ̃tyR	belt
serisi	cerise	sɛRIZ	cherry
sɛki	chèque	ʃɛk	check
sɛrekili	cercle	sɛRkl	circle
sɛtanburu	septembre	sɛptãbr	September
sigareti	cigarette	sigaret	cigarette
siman	ciment	simã	cement
sipageti	spagetti	spageti	spaghetti
sitane	Satan	satã	Satan
sizo	ciseaux	sizo	scissors
sokola	chocolat	ʃɔkɔla	chocolate
sude	souder	sude	to weld
sukaro	sucré	sykr	sugar
suseti	chaussette	ʃosɛt	sock
tabali*	table	tabl	table
takisi	taxi	taksi	taxi
tamati	tomate	tɔmat	tomato
telefoni	téléphone	telefɔn	telephone
terorisi	terroriste	tɛRɔrist	terrorist
tenburu	timbre	tɛ̃br	stamp
teren	train	trɛ̃	train
tɔni	tonne	tɔn	ton
turisimu	tourisme	turism	tourism
walisi	valise	valiz	suitcase
wɛere	verre	vɛR	glass
wɛrese	verset	vɛRse	verse
wɛsiti	veste	vɛst	jacket
winegiri	vinaigre	vinegr	vinegar
wisiki	whisky	wiski	whiskey
witamini	vitamine	vitamin	vitamin
witiri	vitre	vitR	pane of glass
woyasi	voyage	vwajaʒ	journey
zandarama	gendarme	ʒãdarm	policeman
zenerali	général	ʒeneral	general
zurunali	journal	ʒurnal	newspaper

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