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ADAPTATION OF [ATR] IN ENGLISH LOANWORDS IN ÈWÙLÙ: THE CASE OF ANAPTYCTIC HIGH-VOWELS

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Abstract
Like English loanwords of some studied Nigerian languages (NigLs), the anaptyctic vowels /i/ and /u/ are employed in those of Èwùlù to simplify consonant clusters and open closed syllables. Previous studies have shown that the choice of /i/ and /u/ is determined by Labial Harmony (LH) and Back/Rounding Harmony (B/RH) rules. Interestingly, Èwùlù adopts additional anaptyctic high vowels /ɪ/ and /ʊ/, which are unmotivated in other NigLs, specifically, Yoruba, Emai and Urhobo (YEU). We account for the four high vowels in the Èwùlù English loans and show that, in addition to LH and B/RH effects, Advanced Tongue Root (ATR) Harmony governs the choice of the inserted vowel. Accordingly, Èwùlù speakers/listeners insert [+ATR] /i/ and /u/ in the loans, if the source vowels are [i:, ɪ, eɪ] and [əʊ, u:, ʊ], respectively. They insert [-ATR] /ɪ/ and /ʊ/, if the source vowels are [e, ɜ:, æ, ɑ:, aɪ, ɔɪ] and [aʊ, ʌ, ɔ:, ɒ], respectively. Given that the Èwùlù adapters pronounce the English [i:, ɪ, eɪ, əʊ, u:, ʊ] and [e, ɜ:, ɑ:, æ, aɪ, ɔɪ, aʊ, ʌ, ɔ:, ɒ], in terms of their native [+ATR] and [-ATR] systems, respectively, we suggest that the implementation of these native vowels in the adaptation process takes place both in production and perception. Importantly, this study exposes the typology of vowel insertion in loanword adaptations across (West) African languages described as type /1IU/ languages, which have [ATR] contrast only in non-high vowels, and type /2IU/ languages, which have [ATR] contrast in two sets of high vowels /i, u/ versus /ɪ, ʊ/.

Key words: ATR, Èwùlù, loanword, perception, production, anaptyctic vowels

Nwátàókwū
Dị́kà ókwúọ́nụ́ ńdị́ óyìbō dị nà ókwúṇ́nyépùtẹ̄ nà ásụ̀sụ̄ óyìbō ńdị́ Nigeria, ńdị́ Èwùlù nà éwèlī fáwẹ̄ẹ̀lị ńtíyé, ǹkè bù /i/ nà /u/, nà émé kụ́má ókwú ásụ̀sụ́ ńdí óyìbō kà ókwé ńdị́ Èwùlù sụ́ ókwúṇ́nyépùtẹ̄. Rịsáàchị ńdí gàị́ní kụ̀nī sị́ nà ókwú ásụ̀sụ́ ńdị́ óyìbō gọ̀sị nī sị́ nà fáwẹ̄ẹ̀lị /ɪ/ nà /ʊ/ dị nà Èwùlù á dịnà nà ókwú ásụ̀sụ́ ńdị́ Yọ̀ròbā, Émàì and Ìshòbò. Ní mé rìsáàchì ǹkéwẹ̀, ànyị́ àbá sị́ nà òfú ífé ẹ́fụ̀ nà èmé ńdị́ ásùsū Nigeria, yá mèǹì ńdí Éwùlù jì éwèlī fáwẹ̄ẹ̀lì /i/ nà /u/ nà étí yé nà ókwú ásụ̀sụ̄ ńdị́ óyìbō. Ànyị́ ábá sị́ nà íléńwépùté nà íléńwébẹ̀tẹ́, ṇ́dị́ óyìbō nà àkpó Advanced Tongue Root (ATR) Harmony, nà yá nà èmé ńdị́ Èwùlù nà éwèlí fáwẹ̄ẹ̀lì /i/ kọ̀bụ̀ /ɪ/, /u/ kọ̀bụ̀ /ʊ/ nà ètíyé nà ókwú ásụ̀sụ́ ńdị́ óyìbō. Ṇ́chọ́pụ̀tá rịsáàchị ǹkèẹ bá gọ́sị́ nà ńdị́ Èwùlù nà éyúùzùú fáwẹ̄ẹ̀lị [+ATR] /i/ and /u/ ọ́bụ́lụ́ nà fáwẹ̄ẹ̀lị ńdị́ óyìbō bụ [i:, ɪ, eɪ] and [əʊ, u:, ʊ]. Màṇà ọ́bụ́lụ́ nà fáwẹ̄ẹ̀li ńdí óyìbō bụ̀ [e, ɜ:, ɑ:, æ, aɪ, ɔɪ, aʊ, ʌ, ɔ:, ɒ] ńdị́ Èwùlù nà éyúùzùụ́ [-ATR] /ɪ/ and /ʊ/. Ṇ́chọ́pụ̀tá rịsáàchị ànyị́ ábá sị́ nà òkwúkwúọ́nụ̄ nà ókwúọ́nụ́nụ́, nà nwánẹ́bị̀ nà èmé ńdị́ Èwùlù nà éyúùzùú fáwẹ̄ẹ̀lị ńdị́ óyìbō dika si na nwa bu fáwẹ̄ẹ̀lị ńdị́ Èwùlù. Màkà élúé ńdị́ Èwùlù nà éyúùzùú fáwẹ̄ẹ̀lị ńdị́ óyìbō fụ̀, rịsáàchị ànyị́ ábá sị́ nà ásụ̀sụ́ ńdí ojii (West) Africa)) dị íshú nẹ́bị̀: ńdị́ wèní fáwẹ̄ẹ̀lị ẹ̀bụ̀á sị́sọ̀, yá bụ̀ /i/ nà /u/, nà ṇ́dị́ wèní fáwẹ̄ẹ̀lị ẹ̀nọ́, yá bụ̀ /i, u/ nà /ɪ, ʊ/.

Ísiókwū: ATR, Èwùlù, ókwúṇ́nyépùtẹ̄, ókwúọ́nụ́nụ́, fáwẹ̄ẹ̀lị ńtíyé

1. Introduction

Previous studies on English loanwords of African languages, referring particularly to studies on adaptations in Nigerian West Benue-Congo (WB-C) languages have shown that the /i/ and /u/ vowels are the two anaptyctic/epenthetic vowels adopted to break up consonant clusters and open closed syllables of English vocabularies (Pulleyblank 1988, Egbokhare 1990, 1998, Akinlabi, 1993, Yip 1993, Ufomata 2004, Oyebade 2006, Aziza and Utulu 2006). We draw a few examples from the English loanwords in WB-C languages: Yoruba, Emai, and Urhobo (YEU, hereafter) to substantiate the fact in (1), as follows:

(1)	Source	Loanwords	Gloss
a. Yoruba			
i.	**bred**	**búrɛ́dì**	‘bread’
ii.	**ʤi:p**	**ʤîìpù**	‘Jeep’
b. Emai			
i.	**keɪk**	**ìkêkì**	‘cake’
ii.	**mæp**	**ìmâpù**	‘map’

c.
Urhobo

i.	**sleɪt**	**ìsi̱nétì**	‘slate’
ii.	**zəʊn**	**ìzónù**	‘zone’
iii.	**əlɑ:m**	**ànámù**	‘alarm’

As can be noticed, the adoption of /i/ and /u/ is validated in (1). The researchers mentioned in the foregoing have suggested that the two inserted vowels are governed by the principles of Labial Harmony (LH) and Back/Round Harmony (B/RH). Accordingly, in Yoruba (1a, i & ii) and Emai (1b, i & ii), the choice of /u/ is determined by the feature [labial], which is inherent in the source coda. However, in the non-labial environment, /i/, which has been suggested to be the basic form is chosen (Pulleyblank 1988 and Akinlabi 1993, Egbokhare 1998). Moreover, in Urhobo, the choice between the two high vowels is governed by the feature [±round] or [labial]. The former feature applies, if the source nucleus is a round vowel, as in (1c, ii). Whereas, like in Yoruba and Emai, the latter feature applies, if the source consonant is labial, as (1c, iii) shows. In contexts other than these two, the anaptyctic /i/ vowel is inserted, validated by the form in (1c, i) (Aziza and Utulu 2006), compared the forms in (1a, i & 1b, i).

Interestingly, the same articulatory principles operative in YEU apply in Èwùlù-Igbo (WB-C: Nigeria), as we will show and discuss in detail in the analyses Sections. However, we consider the loan examples in (2 a, i & ii) and (2b, i & ii) as pilot data to illustrate the effect of the constraints mentioned above:

(2) Vowel anaptyxis in English loanwords in Èwùlù

	English	Èwùlù Adaptation	Inserted vowel	Gloss
ai.	**bleɪd**	**bú̱léèdì̱**	***u ~ i***	‘blade’
ii.	**kəʊm**	**kómùbù̱**	***u***	‘comb’
bi.	**bed**	**bɛ́ɛ̀dì̱**	***ɪ***	‘bed’
ii.	**fɔ:m**	**fɔ́ɔ̀mɔ̱̀**	***ʊ***	‘form’

Adopted from (Utulu 2019: 35)

It will be observed that in (2a, i & ii), the anaptyctic **/u/** is inserted after **/b/**, motivated by the LH principle. In (2b, ii), its back counterpart, the anaptyctic **/ʊ/** is inserted in the context of *round* vowels **/ɔɔ/**, triggered by the B/RH principle. Elsewhere, however, the respective front counterparts of the round back vowels, that is, the **/i/** and **/ɪ/** are inserted.

The appearance of the **/ɪ/** and **/ʊ/** vowels in Èwùlù English loan adaptation, as in (2b, i & ii) draws our curious attention, which raises two vital questions in this study. First, why do Èwùlù speakers, in addition to adopting **/i/** and **/u/** for insertion to modify source deviant syllables in loans, employ **/ɪ/** and **/ʊ/** for the same purpose? Second, why do they employ **/i/** or **/ɪ/** and **/u/** or **/ʊ/** in certain definable contexts in the loans? Providing answers to these two questions is the objective of this study, appealing to the CV phonology framework, an offshoot of Goldsmith’s (1976) Autosegmental Theory proposed by Clements and Keyser (1983). The reason for our choice of this framework over others is based on the fact that tongue root harmony, also known as ATR harmony is a long-distance, assimilatory phonological phenomenon (Rose and Walker 2004, Rose 2018), which can be fruitfully explained using the Association Conventions of the Autosegmental Theory.

2. Èwùlù vowel inventory and advanced tongue root

The Èwùlù vowel inventory comprises nine vowels **/i, ɪ, e, ɛ, a, ɔ, o, ʊ, u/** (Utulu 2020). Of the nine vowels, there are four high vowels **/i/, /ɪ/, /u/ and /ʊ/**. The quantity of the high

vowels, therefore, validates our grouping of Èwùlù as a type /2IU/ dialect, following Casali's (2017) sub-grouping of African languages, in terms of tongue root contrast in high vowels and non-high vowels. Based on the notion of tongue-root harmony, the Èwùlù nine vowels are divided into two sets: Set A vowels /i, e, o, u/ and Set B vowels /ɪ, ɛ, a, ɔ, ʊ/. The two divisions are based on the degree of expansion of the pharynx in the articulation of the Set A vowels as opposed to those of Set B in (3). The vowel patterns are similar to those found in languages such as Central Igbo, Izon, Akan, and Dagbani (Lindau 1975, Emenanjo 1978, Hudu 2013, 2014). The first set of vowels is labeled [+ATR], given its higher degree of expansion of the pharynx, while the second set is tagged [-ATR], due to its relatively lower degree of expansion of the pharynx. The two sets of vowels are presented in (3), as follows:

(3) The Èwùlù 9-vowel inventory

Set A		Set B	
[+ATR]		[-ATR]	
i	**u**	**ɪ**	**ʊ**
e	o	ɛ	ɔ
		a	

NB - Vowels in bold print are the inserted vowels in the Èwùlù English loans

As the current working loan data show, the high vowels **/i/, /ɪ/, /u/,** and **/ʊ/** in (3) are typically used as anaptyctic vowels to simplify the source consonant clusters and to open its closed syllables. As we mentioned earlier, the inclusion of the latter two high vowels reflects the difference between the Èwùlù vowel system and the YEU systems, manifesting the observed disparity in the number of high vowels employed in the epenthesisation of the loanwords exemplified in (1) across some Nigerian languages versus Èwùlù in (2).

3. English vowels

Owing to the contact between English, the source of the current loanword data, and the indigenous/native languages of Nigeria, monolinguals most often borrow English items while in dire need to converse or interact with people they consider to use English more often for formal or informal conversations. But for reasons that might be hinged on some combination of factors, such as the first-language-second-language system gap, and consideration of English as a language of prestige, among others, the monolinguals invariably subject English items used during communication process to some structural adjustments otherwise known as "adaptation". One such evidence is validated by the qualities of vowels employed in the adaptation processing mirrored in the current data, and determined quite obviously by the force of the first-language system. As we will show in this study, the Èwùlù speakers' choice of an inserted vowel, be it /i/ or /u/, /ɪ/ or /ʊ/, has direct mapping on the quality of the source (English) vowel inventory. We, therefore, expect that accounting for such mapping would advance our understanding of the role production and perception potentially play in loanword adaptation.

Featuring prominently in the current loanword data are the English source vowels of varying qualities. The first set of vowels comprises twelve pure vowels **[iː, ɪ, e, æ, ɑː, ɒ, ɔː, ʌ, ɜː, ə, ʊ, uː]**, eight diphthongs, divided into two: closing diphthongs **[eɪ, aɪ, ɔɪ, əʊ, aʊ]**, and centring diphthongs **[ɪə, eə, uə]**. Remarkably, however, there is no indication that ATR, which features conspicuously in the current loanword data, is an overt feature of English which serves as the donor language. Thus, the appearance of ATR in loanword phonology, as this study attempts to reveal, becomes somewhat of a puzzle. However, when the notion of "adaptation" in lexical borrowing is put in its proper perspective, the reason for the appearance of ATR in nativisation becomes very obvious.

As this study will show, see particularly the chart in (14), the English source vocalic inventory seems to determine the context where **/i/** or **/ɪ/**, and **/u/** or **/ʊ/**, is inserted in the borrowed items. For ease of reference and analysis of the Èwùlù loanwords, we present the approximate vowel space of each of the source (English) pure vowels in (4), following Roach (2000):

(4) The English vowel inventory – pure vowels (Roach 2000)

i: **u:**

ɪ **ʊ**

ɔ:

e **ə**

ɜ:

ʌ

ɒ

æ

ɑ:

In the adaptation processing, as we will show in Section 6, the source vowels in (4) appear to find their individual correspondences from those of the borrowing language schematised in (3).

4. Method

The data for this study were extracted from the English loanword corpora collected between 2017, 2018, and 2020 from five Èwùlù native speakers, two adult male and three adult female speakers, all monolinguals, who lack formal education. The source of the data came from the speakers' performance on code-mixing discourses that expressed nativised English pronunciation technically known as *loanwords*. Owing to its scope, this study limited itself to the investigation of English monosyllabic words with the CVC (e.g., bill), CCVC (e.g., break), and CVNC (e.g., tank) syllables structures, domains where loanword vowel epenthesis typically operates. In order to analyse the loan data in a very principled way, the framework of the CV-Phonology, an offshoot the Autosegmental Phonology was used. The non-linear model was chosen over other models because of it handles quite insightfully, and transparently, too phonological phenomena like tongue-root harmony that exemplifies long-distance assimilation/*spread* of the ATR feature within a local context like the root morpheme.

5. Vowel anaptyxis

Vowel anaptyxis is a process whereby a vowel is inserted in positions other than the initial position within the word (Crystal 2008). The vowel, also known as *anaptyctic or parasite vowel*, is typically unmotivated for insertion processing in native phonology of borrowing languages (Kenstowicz 2003, Peperkamp and Dupoux 2003), a fact that lends credence to Èwùlù investigated in this study. For instance, in Èwùlù, the core syllable shape is the consonant-vowel (CV) structure. Therefore, morphemes in the dialect are largely those with syllables that maximally consist of a single C followed by a single V (Utulu 2020). Thus, phonologically, no prosodic reasons should compel vowel anaptyxis to apply in the native Èwùlù sound system in order to resolve complex syllable structures, even if marked structures were generated due to morphological or syntactic considerations, which yield successive V elements such as a /CV.V/ shape.

When vowels occur in succession, however, the dialect has two options to adjust the marked sequence. The first option is the deletion of one of the vowel clusters, in which, usually, the first of the two sequences is the target. It is the operation of this rule that triggers the elision of the juncture /á/ in **/àdá + ùgò/** 'a name', thus yielding the phonetic form **[àdûgò]**. The second option is the de-syllabification of a final V element, usually the high vowel /i/, /ɪ/, /u/ or /ʊ/ (sometimes /o/ or /ɔ/), if preceded by a non-high vowel. The execution of this rule glides the front high vowels to [j], and the back/round vowels to [w], in a process called Glide Formation.

For instance, the Èwùlù word **/bìá/** 'come, affirmative', becomes **[bjă]** phonetically in order to avoid the occurrence of consecutive V elements that violate the core CV syllable structure of the dialect**.** Syllable-based generalisations such as these make it inconceivable to expect the native Èwùlù phonological rules to trigger the insertion of element(s) in order to simplify lexically-/grammatically-motivated heterosyllabic vowel sequences.

6. Descriptive Analysis

Below, we present the Èwùlù English loan data. They are divided into different categories based on, first, the source syllable shapes, **CVC**, **CCVC**, **CVNC**; and second, the quality of the inserted vowel.

6.1 Final /i/-insertion in CVC vocabulary

Our loanword data show that those with CVC shape are adapted as CVVCV by the Èwùlù speakers. Apart from the noticeable *vowel doubling* phenomenon that takes place in the Èwùlù adaptation processing, as in (5), motivated by the source neutral f0 contour (Utulu 2019), an anaptyctic final vowel /i/ is inserted to re-syllabify the source syllable shape. As a rule, the epenthetic process in (5) is activated to open the source closed syllables:

(5) CVC vocabulary and insertion of final anaptyctic /i/

	English	Èwùlù adaptation	Gloss
a.	**bɪl**	**bíìlì**	'bill'
b.	**geɪt**	**géètì**	'gate'
c.	**keɪk**	**kéèkì**	'cake'
d.	**pɪn**	**píìnì**	'pin'
e.	**feɪθ**	**féètì**	'faith'
f.	**fi:d**	**fíìdì**	'feed'

As (5) indicates, the anaptyctic [+ATR] vowel /i/, and not its [-ATR] /ɪ/ counterpart, (not [+ATR] /u/ or [-ATR] /ʊ/ either), is inserted. Given the adaptation pattern, see also that in (6) through (13), we suggest that two interacting phonetic principles determine the choice of the inserted vowel /i/, which also motivates the choice of the anaptyctic /ɪ/, /u/ and /ʊ/. The principles are:

(i) perception, a processing system we advanced in this study also has a strong influence on the Èwùlù speakers' interpretation of the source nuclei as native ATR-induced vocalic elements, following Silverman (1992), Peperkamp & Dupoux (2003); and,

(ii) production, a gestural system that explains the influence the articulation of a segment (consonant or vowel) in conjunction with the system in (i) has on the articulation of a neighbouring segment (which is well-documented in the literature on YEU English loanword adaptations).

6.1.1 Perception

Auditory perception as a psycholinguistic processing system plays an important role in the choice of the four high vowels listed alternately in point (c), Section 6.1.2, for insertion in loanwords. As we will show in the following Sections, see the chart in (14), the (c) factor explains the Èwùlù speakers' pronunciation of the English vowels, in terms of their native ATR system. With the interaction of the two principles in (i) and (ii) above in place, we can then understand why the /i/-insertion process in (5) together with those described in (6) through (13) takes place. Referring to the loan adaptation in (5), it will be noticed that the source coda consonants and syllable nuclei are *non-labial* and *non-round* segments. Thus, both the coda consonants and the nuclei vowels lack *labiality* and *rounding.* These two phenomena explain why the non-round anaptyctic /i/ rather than the round anaptyctic /u/ is selected in the loan phonology.

Moreover, the source vowels in (5), namely **[ɪ]**, **[eɪ],** and **[i:],** which are found in the periphery of the vowel space no. 1 of the cardinal vowel, are perceptibly similar to the Èwùlù [+ATR] **/i/** found in the similar vowel space. Consequently, we assume the Èwùlù speakers' perception of the source vowels [i:, ɪ] and [eɪ] as equivalents of the native [+ATR] /i/ and /e/, respectively compels them to insert the [+ATR] anaptyctic /i/ at the expense of its [-ATR] counterpart /ɪ/, and the anaptyctic /u/ or /ʊ/ as well. Such interactions that take place between perception and production, we will argue in this work, account for the quality of the inserted vowel in Èwùlù loanword adaptation.

6.1.2 Production/articulation

With perception playing an important role in loan adaptation, we show that three phonological rules (already alluded to in Section 6.1.1) interact with perception in (current) loan adaptation. The rules are:

(a) **Labial Harmony** (LH), which selects /u/ or /ʊ/ over /i/ or /ɪ/, if a neighbouring consonant is specified for the feature [labial], as opposed to [coronal] or [dorsal];
(b) **Back/Round Harmony** (B/RH), which determines the choice of the anaptyctic /u/ or /ʊ/, if the source onset/coda consonants are specified with the feature [labial], or if the source syllable nuclei are specified with the feature [+round], otherwise /i/ or /ɪ/ are inserted; and
(c) **ATR Harmony**, which influences the choice of /i/ or /ɪ/, /u/ or /ʊ/, subject to the quality of the source vowels vis-à-vis the native vowels.

6.2 Vowel insertion

6.2.1 Final /ɪ/-insertion in CVC vocabulary

Like in (5), source closed syllables in (6) are re-syllabified and opened in the loans, where the selected anaptyctic vowel /ɪ/, rather than its counterpart /i/, is inserted word finally, as follows:

(6) CVC vocabulary and the insertion of the final anaptyctic /ɪ/

	English	Èwùlù adaptation	Gloss
a.	**taɪt**	**táìtì**	'tight'
b.	**gæs**	**gáàsì**	'gas'
c.	**bʌkɪt**	**bɔ́kɛ́ɛ̀tì**	'bucket'
d.	**peg**	**pɛ́ɛ̀gì**	'peg'
e	**tɔ:tʃ**	**tɔ́ɔ̀tʃì**	'torch'
f.	**ɔɪl**	**ɔ́jìlì**	'oil'

Like in (5), the Èwùlù insertion /ɪ/ in (6) is influenced by production and perception considerations. On the influence of articulation, all the (6) source coda elements **t, s, g, ʧ, l** are *non-labial* consonants. For this reason, the insertion of /u/ or /ʊ/ in this context is ruled out. However, the example (6e) **tɔ́ɔ̀tʃì** 'torch' runs contrary to our claim here, where /ʊ/ ought to be inserted on the influence of the source round vowels /ɔ:/, which is produced as native /ɔ/, but the non-round /ɪ/ is rather inserted in place of /ʊ/, which agrees in ATR with native /ɔ/. There is a compelling phonetic reason for the choice of /ɪ/ over /ʊ/ in (6e). The feature [coronal] specified for the affricate, [ʧ] seems to have an overridden influence over the feature [round]. Consequently, the /ɪ/ rather than /ʊ/ is inserted.

6.2.2 Final /u/-insertion in CVC vocabulary

Unlike in (5) and (6), the native round vowel /u/ is inserted in (7), as follows:

(7) CVC vocabulary and the insertion of the final anaptyctic /u/

	English	Èwùlù adaptation	Gloss
a.	**ru:f**	**rúùfù**	'roof'
b.	**fəʊn**	**fóònù**	'phone'
c.	**ʧi:p**	**ʧíìpù**	‘cheap’
d.	**bʊk**	**búùkù**	'book'
e.	**pu:l**	**púùlù**	'pool'
f.	**ju:θ**	**júùtù**	‘youth’
g.	**ʧi:f**	**ʧíìfù**	'chief '
h.	**kəʊk**	**kóòkù**	'Coke'

First, the Èwùlù English listeners’ or speakers’ selection of /u/ in (7) appears to be driven by their perception of the source vowels **[i:], [u:], [əʊ]** and [**ʊ]** as the native **/i/, /u/, /o/** and **/u/**, respectively. However, we suggest that production obviously plays its own part too. For instance, the selection of /u/ is traceable to the principle of LH (i.e., labiality) effect, enforcing the source coda consonant [p] and [f], as in (7c) **ʧíìpù** and (7g) **ʧíìfù** to attract the anaptyctic /u/, ruling out the insertion of /i/ and /ɪ/. Moreover, its choice is also linked to the RH (i.e., rounding), valid in the articulatory gestures of the source vowels **[u:], [əʊ], and [ʊ]**. Recall in (3), these native vowels (7) **/i/, /u/, /o/,** and **/u/** belong to the [+ATR] set of vowels. This explains why the speakers insert anaptyctic vowel [+ATR] /u/, a context where [-ATR] counterpart /ʊ/ is not at all expected to surface, as we will show in the next Section.

6.2.3 Final /ʊ/-insertion in CVC vocabulary

Taking cognisance of the phonetic principles that determine the context of insertion of the Èwùlù high vowels, the environment that attracts the anaptyctic **/ʊ/** can be fully understood, given the patterning of the examples in (8):

(8) CVC vocabulary and the insertion of the final anaptyctic /ʊ/

	English	Èwùlù adaptation	Gloss
a.	**kʌp**	**kɔ́ɔ̀pʊ̀**	‘cup’
b.	**bʌs**	**bɔ́ɔ̀sʊ̀**	‘bus’
c.	**ʃɒp**	**ʃɔ́ɔ̀pʊ̀**	'shop'
d.	**paɪp**	**páìpʊ̀**	‘pipe’
e.	**ʃaʊt**	**ʃáʊ̀tʊ̀**	‘shout’
f.	**kɔ:t**	**kɔ́ɔ̀tʊ̀**	‘court’

In (8), /ʊ/ takes precedence over /u/ in the insertion process. Its preference over /u/, treated in (7), is clearly governed by the principle of ATR harmony. Apart from the ATR effect, the [+round] feature of the adjoining source nuclei **[ʌ], [ɒ], [ɔ:]** and **[ʊ]** in **/aʊ/**, and the [labial] feature of the coda consonant **[p]** influence the choice of /ʊ/. Accordingly, we argue that the speakers’ interpretation of the English vowels in (8), as perceptual correlates of native /ɔ/ and /ʊ/, which are members of [-ATR] vowels, motivates the choice of anaptyctic [-ATR] /ʊ/ in place of [+ATR] /u/.

However, the adaptation in (8d) **páìpʊ̀** fails to sanction the anaptyctic /ɪ/ after /p/, as is the case in (6a), in which the source nucleus is also [aɪ], but rather permits the anaptyctic /ʊ/. The selection of anaptyctic /ɪ/ is unmotivated in (8d) because the feature [labial] inherent in the source coda **[p]**, functioning as an onset in the loan, appears to be more salient to the speakers than the feature [-round] specified for the source complex vowel **[aɪ]**.

6.2.4 Final and interconsonantal /i/-insertion in CCVC vocabulary

Influenced by the principles of perception and articulation, anaptyctic /i/ is inserted between C-clusters and in final position, as in (9):

(9) CCVC vocabulary: The interconsonantal and final anaptyctic /i/

	English	Èwùlù adaptation	Gloss
a.	**gri:s**	**gìrîzì**	'grease'
b.	**breɪk**	**bùréèkì**	'brake'
c.	**frɪdʒ**	**fìrîɗʒì**	‘fridge’
d.	**sleɪt**	**sìléètì**	‘slate’
e.	**kreɪt**	**kìréètì**	‘crate’
f.	**kredɪt**	**kírɛ́dîìtì**	‘credit’

In (9), it will be observed that /i/ (and not /ɪ/) is the preferred inserted vowel. Again, as we showed in the previous Sections, the choice of /i/ is navigated by the quality of the source vowels [i:, ɪ] and [eɪ], which perceptually approximates to Set A vowels (3) /i/ and /e/, respectively. Nonetheless, the form (9f) **kírɛ́dîìtì** deserves our special attention here: the anaptyctic vowel inserted between the clusters **/k/** and **/r/** is the [-ATR] /ɪ/, while the final anaptyctic vowel is the [+ATR] /i/. The quality of the former extra vowel is governed by the source [e], approximating closely to the cardinal vowel no. 3, which the Èwùlù adapters articulate as the native [-ATR] /ɛ/. Consequently, the /ɪ/ specified for [-ATR] feature is inserted between the two consonants. Whereas the quality of the latter extra vowel is governed by the source [ɪ], pronounced by the speakers as the native [+ATR] /i/, which is why the [+ATR] /i/ is inserted. The point of interest here is that the (9f) example vis-à-vis those in (9a-e), advances the understanding of the role the principles of perception and production (ATR harmony) play in loan adaptation, especially in type /2IU/ languages/dialects like Èwùlù.

6.2.5 Final /ɪ/-insertion in CCVC vocabulary

Like (6), the [-ATR] /ɪ/ is the preferred anaptyctic vowel in loans (10):

(10) CCVC vocabulary and the anaptyctic /ɪ/

	English	Èwùlù adaptation	Gloss
a.	**klæs**	**kìláàsì**	‘class’
b.	**glæs**	**gìlààsì**	‘glass’
c.	**brʌʃ**	**bòrɔ́ɔ̀ʃɪ̀**	'brush'
d.	**flʌʃ**	**fòlɔ́ɔ̀ʃɪ**	‘flush’
e.	**klʌʧ**	**kòlɔ́ɔ̀ʧɪ**	‘clutch’
f.	**braɪt**	**bòráìtɪ**	'bright'

The rules that motivate the anaptyctic process in the forms in (5) through (9) are the same rules that motivate that in the examples in (10). For instance, in (10a & b), both the interconsonantal and final /ɪ/-insertion rules apply. In these two contexts, the /ʊ/-insertion rule is barred, thus, permitting strictly only the application of the /ɪ/-insertion rule. The prevention of the application of /ʊ/-insertion rule in the two cases is due to the fact that **/k/** and **/s/** are unspecified for the feature [labial] which naturally triggers rounding, and, therefore, necessitates /ʊ/- or /u/-insertion. As expected, in (10c, d, f), /ʊ/ is inserted interconsonantally, owing to the assimilatory effect of the source labial consonants **/b/** and **/f/**. The form in (10e) **kòlɔ́ɔ̀ʧɪ** exhibits interconsonantal /ʊ/-insertion as well, even though the source preceding (onset) consonant /k/ is unspecified for the feature [labial]. Quite differently, the insertion of /ʊ/

between the **/k/** and **/l/** in (10e) is motivated by the presence of the source /ʌ/, typically pronounced as /ɔ/ in Nigeria English, our assumed proximate source of the loans. Presumably, the presence of the native [-ATR] round vowel /ɔ/ is the reason the [-ATR] anaptyctic /ʊ/ is adapted in (10e). More importantly, the fact that the native [-ATR] /ʊ/ is preferred to its round [+ATR] /u/ counterpart in (9c-f), is motivated, first, by the Èwùlù speakers' awareness of the tongue-root contrast attested in their native phonology; and second, by perception, in which the speakers perceive the acoustic image of the source /æ, aɪ/ and /ʌ/ and produce them as native /a/ and /ɔ/ vowels, respectively. It will be recalled that the two native vowels belong to the [-ATR] set of vowels in (3).

In the final description of the loans, we draw source vocabulary with the phonotactic arrangement, Nasal-plus-Consonant (NC) cluster in order to widen the scope of data and, therefore, shed further light on the impact perception and production have on high-vowel insertion in Èwùlù loanword adaptation. We consider the pattern in (11), as follows:

(11) CVNC vocabulary and the anaptyctic /i/

	English	Èwùlù adaptation	Gloss
a.	**ʤi:nz**	**ʤíǹsì**	'jeans'
b.	**sɪŋk**	**síŋ̀kì**	'sink'
c.	**bi:nz**	**bíǹsì**	'beans'
d.	**tʃeɪnʤ**	**tʃénʤì**	'change'
e.	**pɪŋk**	**píŋ̀kì**	'pink'

Featurally, the source vowels **[i:], [ɪ]** and **[eɪ]** are *non-round* vowels. This gesture, thus, rules out /u/- or /ʊ/-insertion, as we have encountered so far. It will be recalled we attributed the choice of /i/ instead of /ɪ/ to the speakers' pronunciation of (11) [i:], [ɪ] and [eɪ] as perceptual correlates of native [+ATR] /i/, and /e/. We argue that this constrains the speakers to select the native anaptyctic /i/ in place of /ɪ/, its [-ATR] counterpart. As it were, these two adaptation processing corroborate Silverman's *perceptual* and *operative* levels. The pattern in (12) throws more light on these principles, as follows:

(12) CVNC vocabulary and the anaptyctic /ɪ/

	English	Èwùlù adaptation	Gloss
a.	**fens**	**fɛ́ǹsì**	'fence'
b.	**dæns**	**dáǹsì**	'dance'
c.	**sent**	**sɛ́ǹtì**	'scent'
d.	**tæŋk**	**táŋ̀kì**	'tank'
e.	**pænt**	**páǹtì**	'pant'

At the perceptual level, the acoustic image/input the Èwùlù speakers have of the source vowels **[e]** and **[æ]** in (12), both of which approximate the cardinal vowels nos. 3 and 4, respectively, are interpreted by them as the native [-ATR] /ɛ/ and [-ATR] /a/, respectively. This explains why, unlike in (11), the [-ATR] anaptyctic /ɪ/ is inserted in place of /i/, its [+ATR] counterpart.

On the final description of vowel anaptyxis in the Èwùlù loanword adaptation, we consider a set of data exhibiting the insertion of /ʊ/ in (13), while leaving out /u/, since our current working data, accidentally, do not include final /u/-insertion in CVNC vocabulary, apart from the source vocabulary **kəʊm** 'comb', in which the English 'silent' <b> is sounded in Èwùlù, most probably due to the speakers' innovation stemming from imitation of educated pronunciation by close acquaintances, and is, therefore, realised as **kómǹbù**. The /ʊ/-insertion process is as follows:

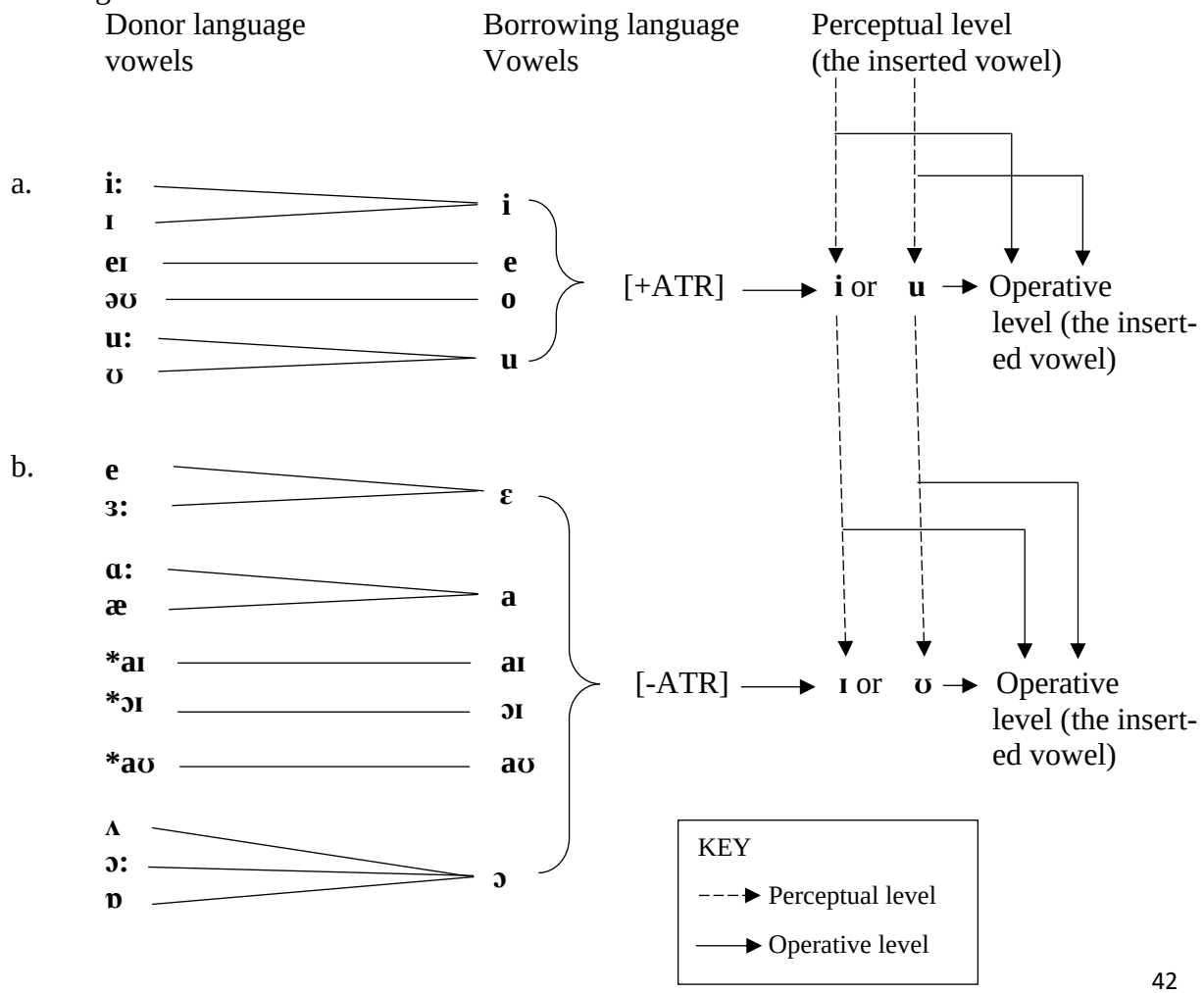
(13) CVNC vocabulary and the anaptyctic /ʊ/

	English	Èwùlù adaptation	Gloss
a.	**pɒnd**	**pɔ́ǹdɔ̀**	'pond'
b.	**saʊnd**	**sáʊ́ǹdɔ̀**	'sound'
c.	**pʌmp**	**pɔ́m̀pɔ̀**	'pump'
d.	**kæmp**	**kám̀pɔ̀**	'camp'
e.	**bɒm**	**bɔ́m̀bɔ̀**	'bomb'

As can be seen, the same processes governing the different shades of vowel anaptyxis that we have encountered so far are operative in (13). Here, the quality of the source vowels /ɒ/, /(a)ʊ/, /ʌ/ and /æ/, typically pronounced as Èwùlù [-ATR] vowels /ɔ/, /ʊ/, /ɔ/ and /a/, respectively, coupled with the labial specification for the coda consonants /p/ and /b/, induces /ʊ/-insertion. It will be noticed that, in (13a) and (13b), the coda consonant is unspecified for the feature [labial], yet /ʊ/ is inserted. The choice of the inserted round vowel is motivated by the assimilatory effect of the source [ɒ] realised as the native /ɔ/ and the source /ʊ/ in /aʊ/ realised as the native /ʊ/. Thus, in (13a) and (13b), the nuclei motivates the quality of vowel inserted and not the source coda consonant. In (13d), however, it is the source coda /p/ that triggers /ʊ/-insertion, in a context where the source /æ/, pronounced as native /a/, is naturally unmotivated to trigger *rounding* which characteristically drives the /ʊ/-insertion rule.

In (14), we present a chart shedding some light on the vowels of English, the Donor Language (DL) and those of Èwùlù, the Borrowing Language (BL). The chart simply relates vowels of the DL, as the *input* that the Èwùlù speakers pronounce as their native ATR-bound vowels. The vowel quality correspondences are exemplified, as follows:

(14) A Chart Showing Èwùlù Listeners' Active Perception/Acoustic Image Mapping of English Vowels to their Native ATR-induced Vowels



* The source [ɪ] in the diphthongs [aɪ] and [ɔɪ] is pronounced as the native [-ATR] /ɪ/, while the source [ʊ] in [aʊ] is pronounced as the native [-ATR] /ʊ/. However, the source [ɪ] and [ʊ], functioning as pure vowels, are characteristically pronounced as the native [+ATR] /i/ and [+ATR] /u/, respectively (see the first two vowels and the last two in (14a). We assume the speakers' common pronunciation of the source [a] and [ɔ] as the perceptual approximates of native [-ATR] /a/ and /ɔ/ compels them to adopt [-ATR] anaptyctic vowels in the specific loans, see, for example, (6a, f), (8d), (10f) and (13b). Lastly, the choice of the anaptyctic /u/ or /ʊ/ may be driven by the LABIAL feature specification for a surrounding source consonant or the ROUND feature specification for a source round vowel.

Relating to the vowel inventories in (3) and (4), the schema in (14) espouses the interaction between the perception and articulation effects governing the insertion of **/i, ɪ, u, ʊ/** in the English loanwords in Èwùlù in (5) through (13). The chart paints a picture of the correlation between the quality of the DL vowels and those of the BL divided into two, as in (14a) and (14b), based on the speakers' (or listeners') pronunciation of the foreign elements. The broken and solid lines at the extreme right of the schema indicate the appropriate levels (perceptual and operative levels) that underlie the quality of high vowels inserted in the nativisation process. The solid lines indicate that the insertion of /i/ or /u/, and vice versa; /ɪ/ or /ʊ/, and vice versa, is coordinated by three harmony principles: LH, B/RH, and ATR harmony. However, the broken lines reflect the speakers' interpretation of the English vowels in terms of their native specified [±ATR] feature, in which /i/ or /ɪ/, and vice versa; /u/ or /ʊ/, and vice versa, may be selected in the insertion process.

7. Exceptions to the patterns

If the representation in (14a) is considered closely, it will be noticed that Èwùlù inserts /i/ in the incorporated items b**iil**i '*bill'*, p**iin**i *'pin'*, (5a, d); f**i**riid**ʒi** '*fridge'* (9c); and s**iŋ**k**i** '*sink'*, p**iŋ**k**i** *'pink'* (11b, e). In these forms, we expect that the native /ɪ/ would be adopted in the loans, since, on perceptual grounds, the source [ɪ] and the native /ɪ/ occupy the periphery of the vowel no. 1. If this is necessarily true, the compelling question is: why do the Èwùlù speakers select /i/ instead of /ɪ/ in the insertion process in (5a) **bíìlì** 'bill', (5d) **píìnì** 'pin', (9c) **firiidʒi** 'fridge', (11b) **síŋkì** 'sink', and (11e) **píŋkì** 'pink'? We provide two possible explanations. First, we assume that Nigeria English (a language that developed through contact between Nigerians and the British colonial masters) is the proximate source for the loans (see Kenstowicz 2006 for a similar view on tone loans). Accordingly, Nigerian English speakers (including its sub-varieties, e.g. Urhobo English) usually "under-differentiate" the native English tense vowel /i:/ and its lax counterpart, /ɪ/. A consequence of the *under-differentiation* is the neutralization of the two phonemes as [i], or [i:] (Adejare 1995, Utulu 2014, Utulu & Akinjobi 2015). Second, the speakers/listeners appear to be affected by "phonological deafness", using Peperkamp's and Dupoux's (2003) terminology, whereby, during the "imitation process", they, being monolinguals, seem to be limited in their ability to perceive tense-lax contrast that exists between /i:/ and /ɪ/, as the forms in (5a), **bíìlì** 'bill', (5d) **píìni** 'pin' versus (5f), **fíìdì** 'feed'; (9a) **gìrîìzì** 'grease' versus (9c) **fìrîìdʒì** 'fridge'; and (11a) **dʒínsì** 'Jeans', (11c) **bíìnsì** 'beans' as opposed to (11e) **píŋkì** 'pink'.

Besides, we need to explain the motivation for the final insertion of the /u/ vowel in 'book' **bʊk**, pronounced **búùkù** (7d), where we expect the Èwùlù speakers to insert /ʊ/, the correspondent of the source /ʊ/. We might attribute the 'mismatch' to the influence of "analogical pronunciation", in which the digraph **<oo>** is often thought by educated and semi-educated Nigerian bilinguals to correspond with /u/-pronunciation, applicable to the forms, *pool, cool, fool, loop.* We assume this innovation might have found its way into the adaptation processing, as the Èwùlù monolinguals attempt to model the English accent of the educated bilinguals.

Also, we need to account for the motivation behind the modification of source [eɪ] and [əʊ] as native /e/ and /o/, respectively, particularly in the respective loans we exemplified in (5b) **géètì** 'gate', (5c) **kéèkì** 'cake', (5e) **féètì** 'faith', (9b) **búréèkì** 'brake', (9d) **sìléètì** 'slate', (9e) **kìréètì** 'crate', (11d) **tʃénʤì** 'change', and (7b) **fóònù** 'phone', (7h) **kóòkù** 'Coke'.

Relating to the obvious vowel reduction (monophthongisation) rule operative in these forms, Utulu (2014a, 2014b) suggests that the English closing diphthongs appear to be simplified in NigE (which implicates the current Èwùlù English loan data) because the *sonority distance* between the first vowel [e] and the second vowel [ɪ], the first vowel [ə] and second vowel [ʊ] is minimal. As it were, the minimal sonority distance between the units, he argues, violates the principle of Maximum Perceptual Differentiation (Katamba 1989).

Aside from the fact that the first and the second units of the closing diphthongs are perceptually indistinct for Nigerian speakers of English, we assume the substitution of English [eɪ] and [əʊ] for /e/ and /o/, respectively is influenced by orthography, in which letter <a>/<ai> in (5b) *g<u>a</u>te,* (5c) *c<u>a</u>ke,* (5e) *f<u>ai</u>th,* (9b) *br<u>a</u>ke,* (9d) *sl<u>a</u>te,* (9e) *cr<u>a</u>te,* (11d) *ch<u>a</u>nge* and letter <o> (7b) *ph<u>o</u>ne* and (7h) *C<u>o</u>ke* tend to be employed in the respective closing dipththongs (Utulu 2014b). Spelling-induced pronunciation of these sorts in second language acquisition has been suggested to play a part in loan adaptation (Peperkamp & Dupoux 2003). Given that the Èwùlù informants are monolingual, we assume their "basilect" English accent might have been influenced by what Hawkins (1984) refers to as "ear borrowings", in which they consciously or unconsciously incorporate English-sourced items by imitation from their educated Nigerian interlocutors with whom they socialised.

Against this backdrop, we may establish two key facts here. First, the Èwùlù speakers appear to retrieve the input of the loanwords from their mental dictionary for the English items heard from educated English pronunciation in their local environment and then derive the output of the borrowed English items in the course of conversing in Èwùlù. Our assumption here is corroborated by the speakers' conversion of the source vowel quality to that which agrees with their native vowel quality, in terms of the Èwùlù *complete* ATR harmony system, which contrasts markedly with the *partial* ATR harmony system noted for YEU. Second, the borrowed items express a "foreign accent", resulting from the fact that the Èwùlù speakers know the English language poorly, or not at all. The borrowed items are, therefore, adapted by adjustments on the basis of *phonetic minimality*, in which both the native vowels in (14), and consonants in (5) through (13) approximate the acoustic image of those of the source (see also 15 -20). Crucially, following Boersma and Hamann (2009), we might assume that Èwùlù nativisation process supports the view that, through production mechanisms, loanword adaption is phonological as well as perceptual in nature; the two merely interact with each other to implement loanword processing.

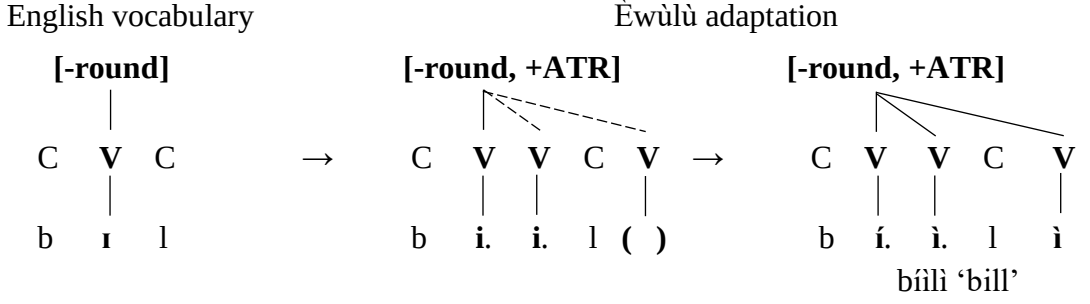
8. Theoretical analysis: CV phonology

In this section, we proceed to capture the perceptual-cum-production effects on the inserted vowels **/i/, /ɪ/, /u/,** and **/ʊ/** in the Èwùlù English loan data we posited in (5) through (13). Since we assume the vowel anaptyxis explored in the foregoing as purely assimilation or spread of features from neighbouring consonants and vowels, we appeal to the CV-Phonology proposed by Clements and Keyser (1983). We adopt the association conventions of the Autosegmental Phonology developed by Goldsmith (1976) in order to link the various harmonic features to the CV and segmental tiers.

8.1 Final /i/-insertion

To begin with, we adopt the exemplar form in (5a), **bîìlì** 'bill' for a CV-Phonology analysis. We analyse the (5a) form in (15a), which exhibits a left-to-right featural spread effect, as follows:

(15a) *A*daptation of ***bill*** (15b)



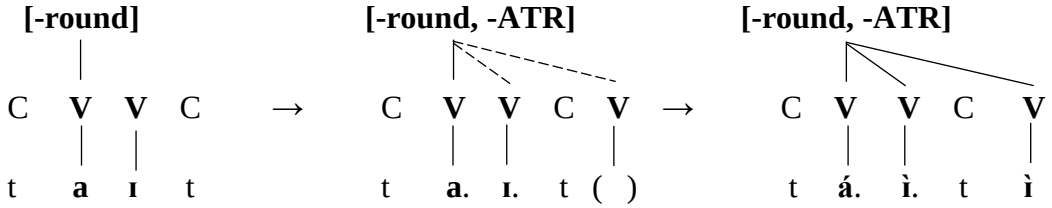
As (15a) demonstrates, the Èwùlù speakers introduce the anaptyctic [+ATR] /i/ pronounced as the source /ɪ/ to re-syllabify the source closed syllable, indicated by the parenthesis symbol '( )' to accommodate the anaptyctic /i/, the acoustic input/image of the English /ɪ/. In (15b), the intended insertion of /i/ unspecified for the feature [+round] is fully executed in the third column (15b), as the solid association lines indicate. However, it should be noted that in source vocabularies like 'bill', the *labial* input from the onset /b/ is unmotivated. This is why the possibility that the [+ATR]-bound anaptyctic /u/ would be inserted in this context is implausible. Rather, in the *bill* example, it is the vowel feature [-round] that is more salient to the speakers than the labial feature which induces /u/-insertion. The source vocabulary 'bright', as in (10f) **bòráìtɪ**, (see also 18a, b), in which the labial input from the onset /b/ is active, triggering the insertion of a round anaptyctic vowel corroborates our claim here.

8.2 Final /ɪ/-insertion

The approach in (15a & b) will explain (16a & b), also exhibiting a left-to-right featural spread. We take the first example in (6) **táìtì** 'tight' for analysis. In (16b) insertion is intended, re-syllabifying the source vocabulary. The empty V slot shows this process, which will accommodate the native low-high vowel /ɪ/, the perceptual/acoustic correlate of source /ɪ/ in [aɪ], as follows:

(16a) *A*daptation of ***tight*** (16b)

English vocabulary Èwùlù adaptation



táìtì 'tight'

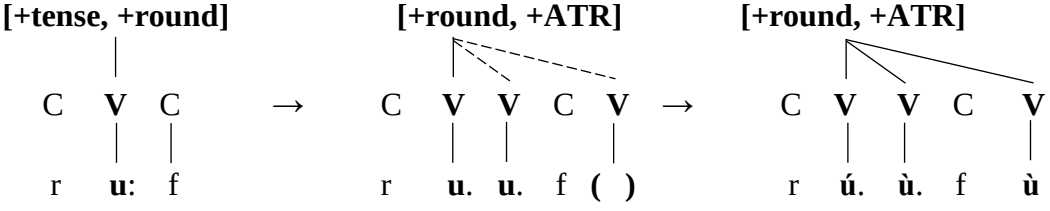
As (16b) shows, the Èwùlù pronunciation of the English [aɪ] as the native /a/ and /ɪ/, both patterning as [-ATR] vowels, calls up the non-round anaptyctic [-ATR] /ɪ/ in the loan phonology in the third column. It will be noticed that the source adjacent consonants and the source complex vowels are unspecified for the features [labial] and [+round], respectively. The absence of *labiality* explains why the anaptyctic /ʊ/ would not be inserted here but rather its non-round counterpart /ɪ/. In fact, the issue of significance here is that the example (16), like that in (15) paints a picture of the interaction of the two parses principles of perception, RH and ATR Harmony.

8.3 Final /u/-insertion

Taken the first example in (7) **rúùfù** 'roof', we also show the context under which the anaptyctic /u/ is employed in the loans, autosegmentally, as in (17a, b):

(17a) *A*daptation of ***roof*** (17b)

English vocabulary Èwùlù adaptation

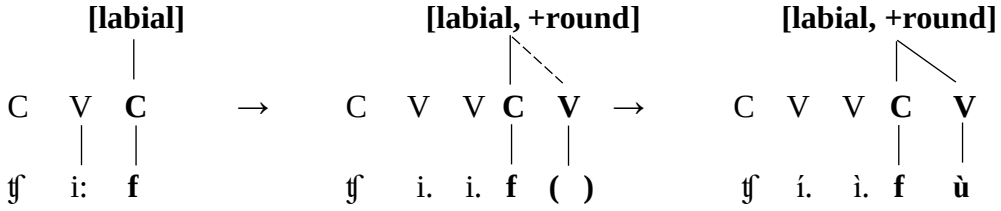


rúùfù 'roof'

Again, in a left-to-right fashion, the source [+tense, +round] vowel [u:], interpreted by the Èwùlù informants as their native [+ATR] vowel /u/, takes a /u/-quality anaptyctic vowel. At the operative/articulatory level, ATR harmony, specifically the [+ATR] feature, induces the choice of an anaptyctic vowel, which selects /u/, leaving out its [-ATR] counterpart /ʊ/ in this context. Moreover, it will be noticed that the principle of RH (and not LH) is that which triggers the insertion of /u/ rather than /i/. The overridden effect of RH over LH can be accounted for, if we consider the forms such as **ju:θ** 'youth' and **bu:θ** 'booth' forms, becoming the Èwùlù **júùtù** and **búùtù**, respectively. In these examples, the source /u:/ triggers the choice of anaptyctic /u/, unlike in the loanword **ʧĩifù** 'chief' taken from (7c), where the source labial consonant /f/ is the trigger of /u/-insertion. We proceed to explore the structure of **ʧĩifù** in (18a, b) to show why /i/ is not inserted finally, unlike the examples **júùtù** and **búùtù**:

(18a) *A*daptation of ***chief*** (18b)

English vocabulary Èwùlù adaptation



ʧĩifù 'chief'

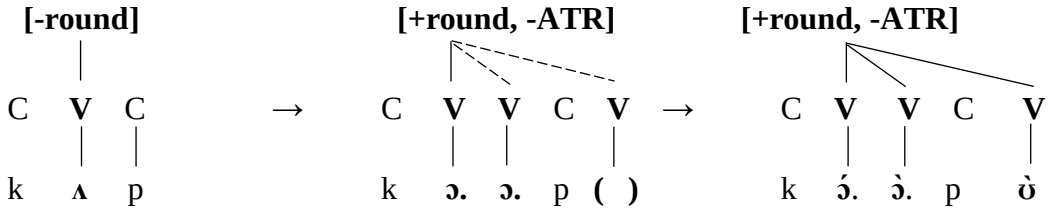
In the usual left-to-right direction spread, (18) shows autosegmentally the spread of *labial, (round)*, giving rise to /u/-insertion rather than /i/-insertion. The (18) example vis-à-vis the **júùtù** and **búùtù** examples, suggests that the trigger of the quality of the inserted vowel could be the input gesture of the source coda or that of the source vowel nucleus. Similarly, the form in (7g) **ʧĩipù** 'cheap', where the source [p] is the trigger of the /u/-insertion, and not the coronal consonant [θ], pronounced as the native /t/ in **júùtù** and **búùtù** sheds light on our observation here.

8.3 Final /ʊ/-insertion

The insertion of final /ʊ/, like its higher counterpart /u/, is also determined by (i) the quality of the source vowel; (ii) the place articulation of the coda-turned onset; and (iii) the perceptual input that the speakers have of the English vowels, based on the native ATR phenomenon, as the chart in (14) exemplifies. We further take the theoretical machinery of CV-phonology to demonstrate the speakers' selection of /ʊ/ at the expense of /u/ in (19). The interaction of these rules is demonstrated, as follows, as we consider the form, *'cup'* in (8a), the source **/kʌp/** becoming the Èwùlù English **/kɔ́ɔ̀pʊ̀/:**

(19a) *A*daptation of ***cup*** (19b)

English vocabulary Èwùlù adaptation



kɔ́ɔ̀pʊ̀ 'cup'

In the light of the patterning of **páìpʊ̀** 'pipe', also listed in (8), precisely in (8d), we argue that the choice of the inserted vowel /ʊ/ in **kɔ́ɔ̀pʊ̀** is motivated by the source [ʌ], typically pronounced as the Èwùlù /ɔ/, but doubled to accommodate the source falling f0 (L%), as pointed out in the literature (see Utulu, 2019, Utulu et al 2020). While the motivation of /ʊ/-insertion in **kɔ́ɔ̀pʊ̀** is the vowel quality of the source, the trigger of it in **páìpʊ̀** is the source coda, the labial consonant [p], similar to the effect in (18). Besides, the speakers' ATR

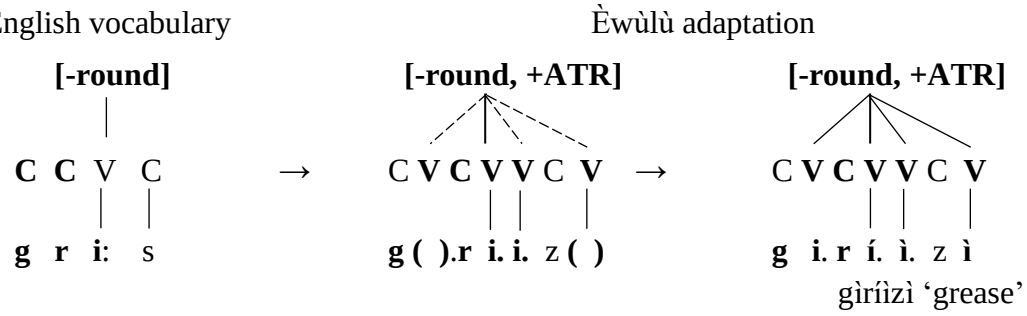
interpretation of the source [ʌ] as the native /ɔ/ necessitates the specification of [-ATR]. This fact is validated by (3), where we show /ɔ/ as a member of the Set B vowels specified with the [-ATR] feature. Thus, it is no coincidence the [-ATR] anaptyctic vowel /ʊ/ is inserted in (19) at the expense of its [+ATR] counterpart, /u/.

To shed further light on the role *perception* and *production* play in the Èwùlù loanword adaptation from the non-linear approach we are working with here, we explore the inserted high vowels occurring between consonant-consonant (CC) clusters in the next Sections.

9. Vowel insertion between onset clusters

Insertion of the /i/ vowel (together with the /ɪ/, /u/, and /ʊ/ vowels) is not limited to the final position in the loans, as the forms in (9) and (10) exemplify. In (9), for example, the anaptyctic /i/ does occur between CC clusters in the source CCVC vocabulary. We consider the source (9a) vocabulary **gri:s** 'grease' becoming the Èwùlù **gìrîìzì** in (20), appealing to the association conventions of the Autosegmental Phonology, as follows:

(20a) *A*daptation of ***grease*** (20b)



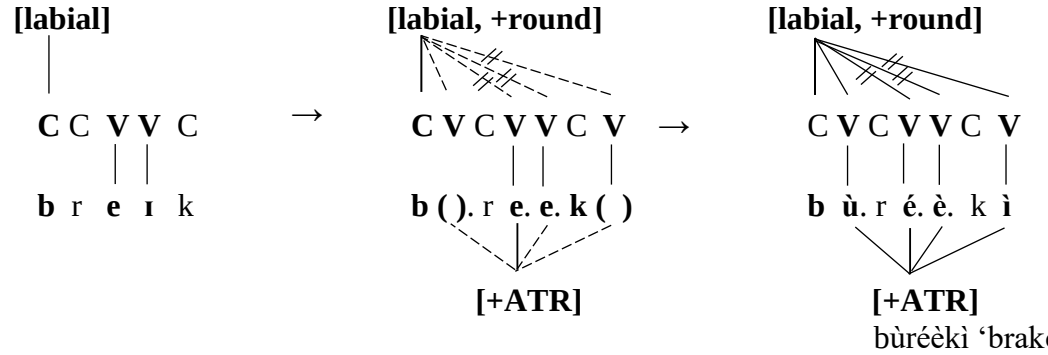
gìríìzì 'grease'

At the operative level (third column), the /i/ is inserted in two empty slots to simplify the source complex syllables, indicated by two parentheses. First, the front high vowel is inserted between /g/ and /r/. Second, it is inserted finally after /z/ (in the second column). Its insertion at the expense of the /u/ (and not the /ʊ/, or even the /ɪ/) is informed by the quality of the source [-round] [i:] vowel, which is pronounced as the Èwùlù [+ATR] /i/ by the Èwùlù informants, as we have demonstrated so far. Basically, the choice of the inserted /i/ is due to the fact that the source [i:] is neither a round vowel that may drive /u/-insertion nor is it a vowel quality that closely approximates the native [-ATR] vowels illustrated in (3), which may trigger /ɪ/-insertion. In other words, the interaction of both the principles of RH and ATR harmony, selecting the relevant vowel quality and tongue root feature [+ATR], evolving from the perceptual and production levels, triggers the choice of the anaptyctic /i/ in this context. Autosegmentally, the structure of the association lines clearly explains the pattern. The solid and broken association lines (second column, (20b)) demonstrate the fact that the featural assimilation, the spread of [-round] and [+ATR] features, began from the adapted /i/, the perceptual (or acoustic) image of the source [i:], spreading "bi-directionally" to the interconsonantal anaptyctic /i/, at its left, and subsequently to its duplicate at the right, and lastly to the final anaptyctic /i/.

Furthermore, the source vocabulary in (9b) **breık** 'break', adapted as **bùréèkì**, poses three interesting patterns that can further advance the understanding of the influence the perceptual and operative/production level has on foreign vocabulary in the second language context. We present the patterns in (21) as follows:

(21a) *A*daptation of ***brake*** (21b)

English vocabulary Èwùlù adaptation



bùréèkì 'brake'

In (21), the feature labial, specified for the /b/, that is, the initial C of the CC cluster, triggers /u/-insertion process between it and its counterpart /r/ (see the first and last columns). We assume here that the rule of LH is operative here. The LH inserts /u/ in place of /i/, contrary to what is applied in (20), where the trigger of the anaptyctic /i/ is not the /g/ but rather the native /i/ doubled as /ii/. Also, it will be observed that the feature [+round], specified for the inserted interconsonantal /u/ vowel after /b/, does not spread beyond the re-syllabified /bu./-syllable. The truncation of the round feature within the locality that /bu./ occurs, as it were, is captured by the "delink" notation '=', suggesting the unspecified features [labial] and [+round] for the /éè/ and the anaptyctic /i/. That the labial-round spread does not go beyond *bu.*, implies that only the anaptyctic vowel /i/ and not the /u/ can be inserted in this environment, and this is exactly the case in (21b).

However, it will be observed that, in spite of the confinement of the labial-round-spread-rule to *bu.*, the [+ATR] feature spreads bidirectionally, from the simplified native /e/, the perceptual image of the source complex vowel [eɪ] to the entire inserted vowel elements that flank it on the left and the right. As in (20) and (21), a close observation of the patterning of the inserted vowels /ɪ/ and /ʊ/ both interconsonantally and finally in (10), would reveal similar operating principles, which motivate the choice of the inserted vowel. Interestingly, the choice of the inserted vowel in (11) through (13) is determined by the same constraints interacting with one another.

10. Conclusion

The insertion of anaptyctic /i/ and /u/ in English loanword adaptation has been previously accounted for in the literature, specifically from the perspective of Nigerian linguistics. However, this study has suggested that, within the Nigerian context, some languages/dialects show that, in addition to /i/ and /u/, /ɪ/ and /ʊ/, the lower counterparts of the former high vowels, feature prominently in loan adaptation. This differentiates Èwùlù, the dialect investigated in this study, from languages like Yoruba, Emai, Urhobo (YEU), thus, validating Casali's (2017) classification of languages like YEU as **/1IU/** systems and Èwùlù, among others as a **/2IU/** system. Accordingly, YEU has only two phonological high vowels **/i/** and **/u/** in their native vowel systems, while Èwùlù has four contrastive high vowels **/i/**, **/ɪ/**, **/u/** and **/ʊ/** in its native vowel system, thus necessitating the number of high vowels these languages potentially insert in loanword adaptation. Importantly, however, this study has shown that vowel insertion in Èwùlù loanword phonology, as in YEU, is governed by the principles of Labial Harmony (LH) and Back/Round (B/RH) Harmony. Crucially, the novelty of the presented study is two-fold. First, it shows that, in addition to the principles of LH and B/RH, ATR Harmony, which is unmotivated in YEU, drives the choice of the inserted vowel in the loans, where /i/ or /ɪ/ may be inserted and vice versa; /u/ or /ʊ/ inserted and vice versa. Second, it suggests that both production and perceptual considerations influence the choice of the inserted vowel. This is because the Èwùlù speakers pronounce the English vowels [**iː, ɪ, eɪ, əʊ, u, ʊ]** and [**e, ɜː, ɑː, æ, aɪ, ɔɪ, aʊ, ʌ, ɔː, ɒ]** in terms of their native [+ATR] and [-ATR] systems, respectively. Whereas, as shown in the loanword adaptation literature, the YEU English speakers display no such four-way adaptation of the source vowels in terms of tongue-

root harmony. In sum, this study, following Boersma and Hamman (2009), has attempted to advance the understanding that adaptation of source vowels in native pronunciation is computed by the phonological system of the BL and that it also takes place in perception. A second implication is that the study exemplifies the typology of vowel insertion in loanword adaptations across (West) African languages, which have been described as types /1IU/ and /2IU/ languages (Casali 2017), the two groupings respectively having [ATR] contrast only in non-high vowels and in two sets of high vowels /i, u/ versus /ɪ, ʊ/.

Abbreviations

ATR advanced tongue root
LH labial harmony
B/RH back/round harmony
NigLs Nigerian languages
1IU a notation used for representing languages with only two phonemic high vowels /i/ and /u/
2IU a notation used for representing languages with extra phonemic high vowels /i/, /ɪ/ and /u/, /ʊ/
WB-C West Benue-Congo
YEU Yoruba, Emai and Urhobo
DL donor language
BL borrowing language

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