



Monophthong substitution demystified: a constraint-based analysis

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Keywords

optimality theory;
constraint-based;
Iraqi Arabic;
loanword
substitution; vowel
substitution;
monophthong

تاريخ القبول: ٢٠٢٦/٦/١

Abstract

The present study seeks to provide an explanatory account of the monophthong substitution patterns within English loanwords in Iraqi Arabic (IA). The study utilizes the optimality theory framework to identify all the phonological constraints imposed on these loanwords, examine how these constraints interact and rank against each other, and explain how this ranking governs their substitution. The findings indicate that a total of 13 phonological constraints, comprising 11 markedness constraints and 2 faithfulness constraints, play a role in adapting English monophthongs within English loanwords in IA. The findings further reveal that the total domination of the markedness constraints *ɜ:, *e, *a:, *ə, *ʌ, and *ɒ is responsible for forbidding these particular monophthongs from emerging within the IA output form. Additionally, the findings indicate that the undominated ranking of the markedness constraint *HIGH and the faithfulness constraints IDENT(round) and IDENT(μ) is accountable for the IA speakers' tendency to adapt English monophthongs into predominantly low or mid vowels while preserving the rounding and length of the input monophthongs.

Introduction

Thousands of English loanwords have found their way into Iraqi Arabic (IA) over the years (Albazarkan, 2000, p.1). However, only a small number of studies have been undertaken to investigate the prevalence of these words in IA and the changes they underwent after they were incorporated. Moreover, most of these studies were marked by restricted data and a predominant focus on the morphological or sociolinguistic aspects of the adaptations. Only three of these studies sought to identify patterns of adaptation while focusing on the phonological aspect.

Both As-Sammer (2015) and Salman (2018) investigated the phonological adaptations of English loanwords in IA by proposing a number of adaptation patterns and providing examples for each pattern, with As-Sammer (2015) providing a descriptive account of these patterns using Chomsky & Halle's (1968) rule-based SPE framework. As-Sammer (2015) based his adaptation patterns on vowel *quantity*, i.e., length, vs. vowel *quality*, i.e., "tongue height, tongue part, tongue glide, and lip position (As-Sammer, 2015, p. 13), whereas Salman (2018) classified her adaptation patterns in terms of adaptation processes. Regrettably, neither of these two descriptive investigations was able to provide sufficient quantitative data to corroborate the presence of these patterns nor did they make any effort to provide an explanation for them.

A more recent study by Abdulrazzaq & Al-Ubaidy (2023a) investigated the phonological adaptations in 346 English loanwords in IA. They used quantitative content analysis to identify and describe the monophthong adaptation patterns in these loanwords. The findings of this study revealed that the monophthongs in the output forms typically preserved as many features of the GB input monophthong as feasible, utilizing two major adaptation monophthong behavior patterns: mapping GB input monophthongs to their direct IA counterparts or replacing them with the closest IA match. Despite furnishing enough quantitative data to substantiate the identification and characterization of these two major adaptation patterns, the study, as with the previous two studies, failed to provide an explanatory account of why these adaptations took place.

Investigations into the phonological adaptations of English loanwords in other Arabic dialects, i.e., other than IA, predominantly focused on examining changes in consonants or the structure of syllables, rather than monophthongs. Only two of these studies aimed to explore what monophthong changes take place when English loanwords are borrowed into other varieties of Arabic. Abu Guba (2016) employed quantitative analysis to scrutinize the adaptation of monophthongs in 407 English words as they were incorporated into Ammani Arabic (AA). Similar to Abdulrazzaq & Al-Ubaidy (2023a), while the study effectively identified and delineated monophthong adaptation patterns in AA, it refrained from elucidating these patterns. Alhoody (2019), on the other hand, employed not only quantitative analysis to identify the monophthong adaptation patterns in 400 English loanwords in Qassimi Arabic (QA) but also utilized the optimality theory (OT) framework to elucidate these patterns.

When it comes to the study of languages other than Arabic, scholars have consistently used OT analysis (e.g., Hussain et al, 2011; Kambuziyya and Hosseinzadeh, 2014; and Phetkla, 2020) in order to get an understanding of the behavior of monophthongs in loanword phonology. By studying the transformation of lax to tense vowels (Kambuziyya and Hosseinzadeh, 2014), and monophthong substitution in general (Hussain et al, 2011 and Phetkla, 2020), these researchers have shown a consistent pattern where English monophthongs borrowed into Persian, Urdu, Panjabi, and Thai are often adapted by replacing them with their closest equivalents in the target language using the phonological constraints identified through the OT analysis.

This brief review of relevant literature makes it clear that the primary advantage of OT, that forms the theoretical framework of the present study, over conventional content analysis or analysis predicated on rule-based theories, lies in its explanatory adequacy. One limitation of rule-based theories, according to Carr & Montreuil (2013, p. 258), is the absence of a mechanism to explain how phonological rule outputs relate to one another (for further clarification illustrating the inadequacies of SPE theory in addressing "conspiracies," see McCarthy, 2008, p. 3).

Conversely, OT, which is a constraint-based model that was first introduced by Prince & Smolensky (1993/2004) in the early 1990s, uses universal constraints, constraint violability, and constraint ranking to explain these outputs (Archangeli, 1999, p. 540). Therefore, a full explanation of why English monophthongs change when incorporated into IA, for example, should extend beyond merely listing the phonological rules that distinguish the various output forms generated in various contexts (see As-Sammer 2015). It should also explain the reasons behind these adaptations by identifying the relationships between these forms.

OT is built on the notion of universal constraints that are nonetheless violable. It is assumed in OT that constraints are universal, that all languages have the same set of constraints, and that there are no language-specific constraints. Because the constraints are universal, they provide an explicit way of describing cross-linguistic commonalities. However, even though all constraints exist in all languages, the ranking in which they appear varies from one language to the next. According to OT, the development of distinct linguistic patterns is attributable to the different rankings of the same set of constraints. Thus, constraint violation provides a mechanism for conveying linguistic variation since the degrees of violation permissible for each constraint are unique to each language (Archangeli, 1999, p. 540; Gussenhoven, & Jacobs, 2017, p. 56).

In addition to its explanatory adequacy, the OT framework has proven to be the preferred method for studying loanword phonology in recent years because it effectively tackles the "duplication problem" that has presented difficulties for rule-based analyses of loanword adaptations (Kenstowicz & Kisseberth, 1977, p. 136; Jacobs & Gussenhoven, 2000, p. 193). According to the rule-based model of analysis (Silverman 1992), loanword phonology consists of rules that are absent in the borrowing language. Therefore, the grammar must incorporate additional rules specific to loanword phonology to duplicate morpheme structure constraints.

On the other hand, constraint-based theories, such as (OT), argue that they can explain phonological changes in loanwords without

the need for additional phonological rules (Yip 1993). According to these theories, loanword phonology is not considered a separate component of grammar. The phonological variations between foreign words and their native equivalents stem from the application of the same constraint hierarchy that regulates native phonology to non-native words and phrases (Archangeli 1997; Jacobs and Gussenhoven 2000; Kenstowicz 2007). In OT, it is believed that a language operates under a unified constraint hierarchy, where the interaction between markedness constraints and faithfulness constraints determines the ultimate structure of the language. Thus, when borrowing words from one language to another, it is important to maintain the input form of the source language while also ensuring that the output form in the borrowed language follows the relevant markedness constraints (Yip 1993).

To the best of my knowledge, no one has examined monophthong adaptation patterns within English loanwords in IA using an OT framework. The significant and ongoing incorporation of English loanwords into IA, coupled with the insufficient research available on the causes of these loanwords' monophthong adaptations as they are borrowed into IA, suggests that an OT analysis could fill this knowledge gap by providing a more comprehensive and precise understanding of these loanwords and explaining their adaptation.

The purpose of the current research is to explain why monophthong adaptations in English loanwords in IA occur through analyzing these adaptations using the OT framework. To be more specific, the study aims to:

- a. Determine the phonological constraints that play a role in the adaptation of English monophthongs borrowed into IA.
- b. Analyze the interaction and ranking of those phonological constraints to explain why these monophthong adaptations occur.

Monophthong inventories

Performing an OT analysis necessitates examining the native variety of the language,

which reveals the constraints that universal grammar may place on its speakers. Accordingly, the current study sample utilized the following two varieties:

1. General British (GB), often termed British English, represents the standard dialect of the English language utilized in both spoken and written forms throughout the United Kingdom (Cruttenden, 2014, p. 80).
2. Iraqi Arabic (IA), sometimes referred to as Baghdadi Arabic, Mesopotamian Arabic, or the gilit dialect, is the predominant Arabic dialect spoken in Iraq, both “numerically and in prestige,” (Blanc, 1959, p. 449).

GB boasts a total of 44 phonemes, comprising 24 consonants and 20 vowels. Vowels are categorized into 12 monophthongs and 8 diphthongs (Roach, 2009, p. x). The 12 GB monophthongs, seen in Figure 1, include seven short monophthongs: /ɪ/, /e/, /æ/, /ə/, /ʌ/, /ʊ/, and /ɒ/, along with five long monophthongs: /i:/, /ɜ:/, /u:/, /ɔ:/, and /ɑ:/.

	Front	Central	Back
High	i:		u:
near High	ɪ		ʊ
Mid	e	ə/ɜ:	ɔ:
near Low		ʌ	
Low	æ		ɑ:/ɒ

Figure 1. Chart of GB monophthongs

The IA phonemic inventory, on the other hand, has 39 phonemes in total—eight vowels and thirty-one consonants. All vowels in IA are monophthongs (Abdulrazzaq & Al-Ubaidi, 2023a, p. 201). Following Hassan (1981), Ghalib (1984), and Abdulrazzaq & Al-Ubaidi (2023a), the eight IA monophthongs, as illustrated in Figure 2, may be categorized as follows:

1. /i:/ a high, front, unrounded, long vowel, e.g., /ʃi:/ thing, /ʔi:d/ repeat, etc.

2. /ɪ/ a near-high, near-front, unrounded, short vowel, e.g., /ʃɪd/ shut, /ɪbn/ son, etc.
3. /ʊ/ a near-high, near-back, rounded, short vowel, e.g., /mʊr/ bitter, /nʊs/ half, etc.
4. /u:/ a high back rounded long vowel, e.g., /θu:m/ garlic, /ʃu:f/ look, etc.
5. /e:/ a mid, front, unrounded, long vowel, e.g., /me:z/ table, /ze:t/ oil, etc.
6. /ɔ:/ a mid, back, rounded, long vowel, e.g., /nɔ:m/ sleep, /sʔɔ:t/ sound, etc.
7. /a/ a near-low, front, unrounded, short vowel, e.g., /had/ he let go, /bas/ enough, etc.
8. /ɑ:/ a low, central, unrounded, long vowel, e.g., /ga:l/ he said, /na:s/ people, etc.

	Front	Central	Back
High	i:		u:
near High	ɪ		ʊ
Mid	e:		ɔ:
near Low	a		
Low		a:	

Figure 2. Chart of IA vowels

Since vowels in IA, like in GB, are all typically voiced, the terms *lax* and *short*, as well as *tense* and *long*, are used interchangeably throughout this paper in accordance with Skandera & Burleigh's (2005, p. 38) assertion regarding English vowels, which states that "all lax vowels are short vowels, and all tense vowels are long."

Method

Data collection

Abdulrazzaq & Al-Ubaidi (2023a) identified two major monophthong behavior patterns within English loanwords in IA, where GB input monophthongs would map to their direct IA counterparts or be replaced with their closest IA match. More specifically, when

occurring in English loanwords in IA, the four monophthongs with direct IA equivalents (i.e., /i:/, /ɪ/, /ɔ:/, and /ʊ/) typically do not require any adaptations and are all directly mapped faithfully to their IA counterparts. On the other hand, when they appear in English loanwords in IA, the remaining seven GB monophthongs lacking direct IA equivalents (i.e., /e/, /ə/, /ɜ:/, /æ/, /ʌ/, /ɑ:/, and /ɒ/) as well as the GB monophthong /u:/ (which, despite having a direct IA counterpart, can also be systematically adapted to IA /ɔ:/) are typically replaced with their closest IA match. The phonological adaptation patterns of this latter group of monophthongs (listed in Appendix A) when occurring in English loanwords in IA constituted the data for the current study. Consonantal, phonotactic, suprasegmental, and even diphthong adaptations were excluded from the analysis as they fall outside the scope of the present study.

Data analysis

OT analysis of the data was carried out by selecting a representative (typically monosyllabic) loanword of each pattern of adaptation. Within the analysis, the loanwords' GB pronunciation is utilized as both the input form and the output candidate with a direct IA match, while its actual IA pronunciation served as the optimal candidate. The output candidate containing the GB monophthong, as well as the closest possible other candidates (containing all other IA monophthongs), were then set against one another in a violation tableau to determine the markedness and faithfulness constraints involved in choosing the optimal candidate.

Next, and in order to rank these constraints, sets of elementary ranking conditions (ERCs) were set. All ERCs that were already entailed by other ERCs through W-extension or L-retraction, as well as all harmonically bounded candidates, were then detected and eliminated from further evaluation as they did not impact the ranking of constraints (McCarthy, 2008, p. 126; Prince, 2002, p. 5). The remaining ERCs were subjected to further analysis via the use of winner-rival comparisons in order to establish the final ranking of constraints. Following that, these comparative tableaux were re-evaluated through the application of constraint demotion in order to confirm the findings and detect any potential inconsistencies that may have existed.

Results

As mentioned earlier, Abdulrazzaq and Al-Ubaidy (2023a) found that when English loanwords were used in IA, the IA forms had a strong tendency to keep as many of the features of the GB input monophthongs as possible. This revealed two main monophthong behavior patterns where GB input monophthongs are either mapped directly to their IA match (requiring no adaptation) or are substituted with the closest possible equivalent within the IA phonemic inventory. Accordingly, none of the five GB monophthongs that have direct counterparts in IA (except for the /u:/ to /ɔ:/ adaptation) required any systematic adaptations, and they were all typically mapped faithfully to their IA counterparts. On the other hand, the GB monophthongs lacking IA equivalents followed a regular pattern of adaptation, which is being superseded by their closest IA match.

In the following subsection, one example of this regular adaptation pattern is analyzed using the OT framework with the goal of identifying the constraints involved within this pattern and determining how those constraints interact and rank against each other. Additional OT violation tableaux for all the other typical monophthong adaptation patterns (within the remaining GB monophthongs that do not have direct counterparts in IA as well as the exceptional GB /u:/ to IA /ɔ:/ pattern) can be found in Appendix B.

Replacing GB monophthongs with their closest IA match

This pattern of adaptation is utilized to handle GB monophthongs which are prohibited in IA. To demonstrate how substituting a GB monophthong with its closest IA counterpart fulfills the markedness criteria that prevent these vowels from appearing in IA syllables, consider the English loanword *block*, which is realized as /blɔ:k/ in IA. A faithful mapping of *block* would violate the markedness constraint *ɒ, which forbids IA syllables from having the vowel /ɒ/ (see Table 1 below for constraint definitions which all follow the strategy put forward by McCarthy, 2008, p. 39). To repair this, replacing the GB monophthong /ɒ/ with the mid vowel /ɔ:/, the high vowels /u/ or /ʊ/, or the low vowels /a/ or /ɑ:/, among other more marked options, can be resorted to. Vowel

substitution with the mid vowel /ɔ:/ would violate the constraint *MID, while substitution with the high vowels /u/ or /u:/ violates *HIGH, and substitution with the unrounded low vowels /a/ or /a:/ violates IDENT(round).

Table 1. Constraints used in adapting GB /ɒ/ in IA Constraints

*ɒ	Assign one violation mark for every syllable that has /ɒ/.
*MID	Assign one violation mark for every syllable that has a mid vowel.
*HIGH	Assign one violation mark for every syllable that has a high vowel.
IDENT(round)	Assign one violation mark for every output segment that differs from its input correspondent in the feature [round].

Since IA typically replaces GB /ɒ/ with /ɔ:/, it can be concluded that *ɒ dominates *MID. Tableau 1 illustrates the interaction of these constraints.

Tableau 1. *ɒ, *HIGH, IDENT(round) >> *MID

/ɒ/	*ɒ	*HIGH	IDENT(round)	*MID
a. ɒk	*!			
b. ɔ:k				*
c. ɒk		*!		
d. ɒ:k		*!		
e. ɔ:k			*!	
f. ɒk			*!	

Tableau 1 shows that the output candidate in (a), which has a direct equivalent in IA, is in fatal violation of the undominated markedness constraint *ɒ and is therefore eliminated from further evaluation. The winning candidate in (b) violates the markedness constraint *MID but satisfies the undominated constraint *ɒ, confirming that *ɒ dominates *MID. The same thing goes for the output

candidates in c & d and in e & f which are excluded despite satisfying *MID because of their fatal violation of the constraints *HIGH and IDENT(round), respectively, confirming that *HIGH and IDENT(round) outrank *MID.

GB /æ/ adaptation patterns in IA

According to Abdulrazzaq & Al-Ubaidy (2023a, p. 15), the lax GB monophthong /æ/ surfaces equally in IA as either the lax IA monophthong /a/ or the tense IA monophthong /a:/ (see Table 5). The challenge in conducting an OT analysis of these two adaptation patterns arises from the fact that both the GB monophthong /æ/ and the IA monophthong /a/ practically share the same features, since they are both [+front], [+low], and [+lax].

Accordingly, any analysis of the adaptation of the GB monophthong /æ/ to the lax IA monophthong /a/ would fail to produce any valid constraint ranking since both the output candidate that matches the input form as well as the winning output candidate respond equally to all constraints (except for *æ), as demonstrated in Tableau 2.

Tableau 2. Adaptation of GB /æ/ into IA /a/

/ɔæk/	*æ	*LAX	*FRONT	*LOW
a. ɔæk	*	*	*	*
b. ɔag		*	*	*

This results in overlooking the first of the three essential elements necessary for any valid ranking argument, as outlined by McCarthy (2008, p. 41). This element involves having a "conflict" where constraints must differ in their evaluation of two competing output candidates generated from the same input.

Similarly, any analysis of the other adaptation pattern of the GB monophthong /æ/ to the tense IA monophthong /a:/ also fails to produce any constraint ranking since the only three constraints that the losing candidate containing the lax IA /a:/ violates (i.e., *LAX, *FRONT, and *LOW) are also violated by the output candidate that matches the input form, as shown in Tableau 3.

Tableau 3. Adaptation of the GB /æ/ into IA /a:/

/flæf/	*æ	*LAX	*FRONT	*LOW
a. flæf	*	*	*	*
■ b. fla:f				*
c. flaf		*	*	*

As mentioned earlier, two other studies attempted to provide an explanatory account of monophthong adaptation patterns in English loanwords in other Arabic dialects (i.e., Abu Guba 2016 and Alhoody 2019). Though neither used the OT framework for identifying constraints and investigating their ranking and interaction, a look at the way these two studies analyzed GB /æ/ adaptation in Arabic loanwords may provide some valuable insight on this issue.

While agreeing with the present study's claim that the GB vowel /æ/ has two common realizations in Arabic, Abu Guba (2016, pp. 105-9) states that the short low front AA vowel /a/ is more prevalent. Abu Guba (2016) then utilizes phonotactic constraints to contend that the GB vowel /æ/, despite being mostly adapted to the short AA vowel /a/, intrinsically corresponds to the long AA vowel /a:/ and that it is shortened to /a/ due to a number of reasons, including foot binarity.

Alhoody's (2019, p. 114) analysis aligns with Abu Guba's (2016) findings, indicating that the GB vowel /æ/ is mostly adapted to the short QA vowel /a/, rather than the longer vowel /a:/. Unlike Abu Guba (2016), however, Alhoody's (2019, p. 115) concludes that adapting GB /æ/ to QA /a/ is "the conventional adaptation" and that adapting it to the longer QA /a:/ is necessitated by other factors such as stress assignment or other prosodic restrictions. Interestingly, unlike Abu Guba (2016) and Abdulrazzaq & Al-Ubaidy (2023a), Alhoody (2019, p. 49) characterizes QA /a/ as a central (and not a front) vowel, and unlike most descriptions of the GB monophthong /ʌ/, which describe it as a central vowel (e.g., Roach, 2009, p. 14; Davenport & Hannahs, 2020, p. 51), he characterizes it as a "back" vowel.

Thus, both Abu Guba (2016) and Alhoody (2019) avoided tackling the problem of two distinct cross-linguistic phonemes (GB /æ/ and IA /a/) sharing identical distinctive features. This is because, according to the standard

distinctive feature models, the low GB vowel /æ/ and the near-low IA vowel /a/ are both represented as [+low]. Instead, they resorted to utilizing less conventional characterizations of the input phonemes, such as describing the short input GB monophthong /æ/ as a long vowel and the central GB monophthong /ʌ/ as a back vowel. Cruttenden's (2014, p. 120) characterization of the GB monophthong /æ/ as being longer than a short vowel but shorter than a long vowel provides further evidence of the difficulty involved in conducting an accurate OT analysis of its adaptation in IA. Consequently, the adaptation patterns of this vowel into IA were excluded from the OT analysis of the current study, pending better understanding of the nature of this monophthong.

Discussion

This research analyzed the patterns of monophthong adaptation within English loanwords in IA to explain why GB monophthongs adapt when absorbed into IA. This was accomplished by utilizing the OT framework of analysis in order to detect the phonological constraints placed on these loanwords and analyze their interaction and ranking.

Identification of IA constraints

OT analysis results revealed that a total of 13 (11 markedness and 2 faithfulness) constraints were needed to account for all the typical monophthong adaptation patterns in English loanwords in IA, and these are listed in tables 2 and 3 below.

Table 2. *Markedness constraints used in the monophthong adaptation of English loanwords in IA*

Markedness Constraints		
1	*HIGH	Assign one violation mark for every syllable that has a high vowel.
2	*MID	Assign one violation mark for every syllable that has a mid vowel.
3	*LOW	Assign one violation mark for every syllable that has a low vowel.
4	*FRONT	Assign one violation mark for every syllable

		that has a front vowel.
5	*CENTRAL	Assign one violation mark for every syllable that has a central vowel.
6	*b	Assign one violation mark for every syllable that has /b/.
7	*ʌ	Assign one violation mark for every syllable that has /ʌ/.
8	*ə	Assign one violation mark for every syllable that has /ə/.
9	*ɑ:	Assign one violation mark for every syllable that has /ɑ:/.
10	*e	Assign one violation mark for every syllable that has /e/.
11	*ɜ:	Assign one violation mark for every syllable that has /ɜ:/.

Table 3. Faithfulness constraints used in the monophthong adaptation of English loanwords in IA

Faithfulness Constraints	
1	IDENT(round) Assign one violation mark for every output segment that differs from its input correspondent in the feature [round].
2	IDENT(μ) Assign one violation mark for every output segment that differs from its input correspondent in the feature [μ], i.e., mora.

Constraint interaction

Having identified the phonological constraints governing the monophthong adaptation of English loanwords in IA, the subsequent step was to analyze their interaction and ranking. As far as the constraint interaction that is involved in the adaptation of GB monophthongs is concerned, and keeping in mind the OT claims to psychological reality

(Den Ouden, 2014, p. 147), the results indicate that when IA speakers come across a GB monophthong, they first use the markedness constraints *i:, *ɪ, *u:, *ʊ, *ɔ:, *ɒ, *ʌ, *ə, *æ, *ɑ:, *e, and *ɜ:. to determine whether IA has a direct counterpart of the input monophthong or not. If a direct IA counterpart is available (i.e., when encountering GB monophthongs /i:/, /ɪ/, /u:/, /ʊ/, and /ɔ:/), no adaptation is needed. Instead, the EVAL component of IA grammar would regularly map the input monophthong faithfully to its direct IA counterpart, rejecting all other candidates. The only systematic exception to this is the irregular adaptation of GB /u:/ into IA /ɔ:/ (e.g., IA /ga:.zɔ:/ cashew, /ka.r.tɔ:n/ cartoon, etc.), which is mostly attributed to some phonotactic constraints (e.g., it typically occurs in multisyllabic words where the GB /ɔ:/ occurs in syllable-final position or is followed by nasal /n/. In addition, some limited instances of irregular adaptations also occur, and these are mostly attributed to the spelling of the source word (e.g., GB /ɔ:/ into IA /a:w/ in IA /sa:wna/ sauna, or GB /ɪ/ to IA /a/ in IA /s^ɪɔ:s^ɪadʒ/ sausage).

If no direct IA counterpart is detected, on the other hand, the EVAL component of IA grammar would use those same markedness constraints to reject any output candidates that have a direct counterpart in IA. It would also employ the markedness constraints, *HIGH, *MID, *LOW, *CENTRAL, and *FRONT, and the faithfulness constraints: IDENT(round) and IDENT(μ) to typically reject output candidates that differ from their input correspondents in rounding and length or those that do not lean towards the mid or front sections of the vocal tract. It would then select the candidates that remain as the optimal candidates.

Constraint ranking

The results of the OT analysis of the data indicate that the markedness and faithfulness constraints that play a role in adapting GB monophthongs into IA are ranked as shown in Table 4.

Table 4. Final rankings of constraints involved in the adaptation of GB monophthongs within English loanwords in IA

Rankings

1.	*ɒ, IDENT(round) >> *MID	*HIGH,
2.	*e, IDENT((μ)) *LOW	*ə, >> *HIGH,
3.	*ɜ:, *ʌ, *HIGH, *LOW, IDENT(round), IDENT(μ) >> *FRONT	
4.	*ɑ:, *FRONT *CENTRAL	IDENT(round), >>

The rankings of the constraints in Table 4 demonstrate a total domination of the markedness constraints *ɒ, *ʌ, *ə, *ɑ:, *e, and *ɜ: which forbid these particular monophthongs from emerging within the output form. This explains why native IA speakers tend to modify any English word with a GB monophthong that doesn't have an exact equivalent in IA. Furthermore, the undominated ranking of the markedness constraints *HIGH and the faithfulness constraints IDENT(round) and IDENT(μ) can account for IA speakers' preference to adapt English monophthongs into predominantly low or mid vowels while preserving the rounding and length of the input GB monophthong. This adaptation is so crucial that these speakers are willing to compromise faithfulness to the height and backness of input monophthong in order to achieve it.

As far as other Arabic dialects are concerned, Alhoody (2019, p. 145) managed to identify 18 phonological constraints by using Dresher's Contrastive Hierarchy Theory (2009) to detect the contrastive elements of the QA phonemic inventory and then utilizing them in identifying OT constraints. These constraints consisted of the 12 markedness constraints *[αLABIAL, -LOW], *[αLABIAL, +LOW], *[αLABIAL, -BACK], *[αLOW, +BACK], *[αHIGH, -LOW], *[αHIGH, +LABIAL], *[αHIGH, -LONG], *[αVOCALIC, +LOW], *[αVOCALIC, -LABIAL], *[αVOCALIC, +LONG], *[αVOCALIC, -HIGH], and *[αVOCALIC, +HIGH], as well as the six faithfulness constraints MAX[HIGH], MAX[LOW], MAX[BACK], MAX[LONG], MAX[LABIAL], and MAX[VOCALIC]. However, these specific QA constraints could not be compared with the IA constraints identified within the current study owing to the

disparate analysis frameworks used in both studies.

Another interesting analysis is provided by Abu Guba (2020), who, similar to this study, attempted to identify the phonological constraints involved in adapting English loanwords as they were borrowed into AA. However, Abu Guba (2020, p. 5) based part of his analysis on a requirement in AA and some other Arab dialects for a prosodic word to be minimally bimoraic since "monomoraic feet are absolutely forbidden" in them. To avoid monomoraic words like *dish* /dɪʃ/, Abu Guba (2020, p. 11) suggests that there is an undominated phonological constraint against subminimal prosodic words that would render this word, among others, into the adapted bimoraic word /dɪʃ-ʃ/ by geminating the final consonant. While conceding that further consonantal, phonotactic, and suprasegmental analysis of my IA data is needed, I could not detect any gemination when listening to native IA speakers pronounce monomoraic English loanwords in IA, such as *dish*, *full*, *gym*, *disc*, *bank*, etc. I therefore agree with the non-geminated phonemic transcription of this type of words in Rahim (1980), As-Sammer (2015), among others, and believe that this bimoraic minimality requirement does not apply to IA, and that the IA pronunciation of the English loanwords *block* and *dish* can be attributed to regular patterns resulting from the presence (or lack) of a direct counterpart of the GB monophthong in IA.

Similar to the present study, Cohen (2009), Hussain et al. (2011), Kambuziyya and Hosseinzadeh (2014), Alhoody (2019), and Phetkla (2020), among others, have all identified the phonological constraints involved in adapting monophthongs in English loanwords as they were borrowed into Hebrew, Urdu, Panjabi, Persian, QA, and Thai.

The present study, which focuses only on monophthong adaptations, may entail possible limitations due to its narrow scope. While the identification, interaction, and ranking of constraints described in this study provided interesting insights that helped explain the phonological adaptation patterns of monophthongs within English loanwords in IA, these remain preliminary, awaiting the results of further consonantal, phonotactic, and suprasegmental examination of the dataset.

This should hopefully provide a final ranking for all the phonological constraints involved, thus accounting for all the adaptations in the data.

Conclusion

The purpose of this research is to explain the patterns in which English monophthongs change when borrowed into IA by determining all the phonological constraints placed on these loanwords, analyzing how these constraints interact and rank against one another, and elucidating how this ranking governs their adaptation. The findings identified 13 phonological constraints that play a role in the adaptation of GB monophthongs within English loanwords in IA. These constraints are categorized into 11 markedness constraints that impose conditions on the structural well-formedness of the IA output form, thereby forbidding the occurrence of certain monophthongs or particular vowel features within the IA output form. Additionally, there are 2 faithfulness constraints that focus on maintaining the characteristics of the GB input monophthong, preventing output segments from exhibiting features that diverge from their input counterparts.

As for the interaction of these constraints, the findings indicate that when IA speakers hear a GB monophthong, they first use a number of markedness constraints to check whether the monophthong has a direct counterpart in IA. In cases where a direct IA counterpart exists, no adaptation is required. Instead, the EVAL component of IA grammar would faithfully map the input monophthong to its direct equivalent, eliminating all other candidates. If no direct IA counterpart is found, all output candidates that have a direct counterpart in IA will be rejected by the EVAL section of the IA grammar using the relevant markedness constraints. Next, a number of markedness and faithfulness constraints interact to transform the input GB monophthong into the output IA vowel.

As for the ranking of the markedness and faithfulness constraints that are utilized in adapting GB monophthongs in English loanwords in IA, the findings suggest that the ranking of the markedness constraints indicates that IA speakers tend to avoid high

vowel sounds to the point where they are willing to compromise faithfulness to the input monophthong's height and backness. IA speakers are similarly eager to adhere to the input monophthong's rounding and length to the extent that they are ready to forgo faithfulness to the input monophthong's height and backness. Thus, the ranking of both markedness and faithfulness constraints confirms the mid-oriented and front-oriented nature of the adaptation of GB vowels in English loanwords in IA (see Abdulrazzaq & Al-Ubaidy, 2023b, p. 207, and Abdulrazzaq, 2024, p. 456, for adaptation patterns and constraint rankings of IA diphthongs), and their tendency to maintain the rounding and length of the GB monophthongs.

By identifying the language-universal phonological constraints that determine the adaptation of English monophthongs as they are borrowed into IA and determining the language-particular interaction and ranking of those constraints, thus linking patterns of linguistic adaptations to the structure of the human language faculty, the current study has not only contributed towards achieving the ultimate goal of OT analysis "to support claims about the universal properties of Con" (McCarthy 2008, p. 3) but has also filled a gap in our understanding of IA loanword phonology, potentially leading to a better understanding of linguistic variation.

Appendix A

Table 5. Regular monophthong adaptation patterns within English words in IA reported in Abdulrazzaq & Al-Ubaidy (2023a)

	GB input	IA output	Frequency
1	u:	ɔ:	48%
2	e	a	53%
3	ə	a	57%
4	ɜ:	e:	66%
5	æ	a	48%
6	æ	a:	48%
7	ʌ	a	72%

8	a:	a:	90%
9	ɒ	ɔ:	78%

Appendix B

1. Adaptation of GB /u:/ to IA /ɔ:/

Tableau 4. { *HIGH, IDENT(round) } >> *MID

/kɑ:tu:n/	*HIGH	IDENT(round)	*MID
a. kɑ:tu:n	*!		
▣ b. kartɔ:n			*
c. kartun	*!		
d. kartan		*!	
e. karta:n		*!	

2. Adaptation of GB /e/ to IA /a/

Tableau 5. { *e, *HIGH, IDENT(μ) } >> *LOW

/tenis/	*e	*HIGH	IDENT(μ)	*LOW
a. tenis	*!			
▣ b. tanis				*
c. te:nis			*!	
d. tnis		*!		
e. tɔ:nis			*!	
f. tunis		*!		

3. Adaptation of GB /ə/ into IA /a/

Tableau 6. { *ə, *HIGH, IDENT(μ) } >> *LOW

/filtə:r/	*ə	*HIGH	IDENT(μ)	*LOW
a. filtə:r	*!			
▣ b. faltar				*
c. filter			*!	

d. filtə:r			*!	
e. faltar		*!		
f. filter		*!		

4. Adaptation of GB /ɜ:/ into IA /e:/

Tableau 7. { *ɜ:, *LOW, IDENT(round) } >> *FRONT

/ti:ʒ:t/	*ɜ:	*LOW	IDENT(round)	*FRONT
a. ti:ʒ:rt	*!			
▣ b. ti:ʒ:rt				*
c. ti:ʒ:rt			*!	
d. ti:ʒ:art		*!		

5. Adaptation of GB /ʌ/ IA /a/

Tableau 8. { *ʌ, *HIGH, IDENT(μ) } >> *FRONT

/bʌg/	*ʌ	*HIGH	IDENT(μ)	*FRONT
a. bʌg	*!			
▣ b. bag				*
c. ba:g			*!	
e. bɔ:g			*!	
h. bug		*!		

6. Adaptation of GB /ɑ:/ into IA /a:/

Tableau 9. { *ɑ:, *FRONT, IDENT(round) } >> *CENTRAL

/mɑ:sk /	*ɑ:	*FRONT	IDENT(round)	*CENTRAL
a. mɑ:sk	*!			
▣ b. ma:sk				*
c. mask		*!		

d.		*!		
me:sk				
e.			*!	
mo:sk				

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