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Phonological Adaptation of Arabic Loanwords in Tagalog: An Optimality Theory Analysis

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ABSTRACT

The adaptation of Arabic words in Tagalog was a dormant issue in Tagalog lexicography until Jean-Paul G. Potet documented these borrowings twelve years ago. In this paper, we give an account of the relation between the Arabic and Tagalog sound systems. There are major differences and minor similarities between the two languages. Of Arabic's 29 consonants, 15 lack direct counterparts in Tagalog's 16-consonant inventory which requires categorical phonemic substitutions instead of gradient phonetic adaptations. Crucially, the absence of forms relying on acoustic and perceptual adjustment in the data confirms these changes occur strictly at the phonemic level. We perform some phonological analysis in order to account for the constraints Tagalog has applied to some of the Arabic loanwords within the framework of Optimality Theory (OT). Ten constraints are ranked selectively as indicators of phonological influence on the process of adaptation. These constraints focus mainly on superheavy syllables by examining both medial and final positions of vowels and consonants in the data. While Tagalog has preserved some consonant clusters of Arabic, other than geminates, the data show that no complex vowels are allowed in ultima syllables. The findings reveal Tagalog's strict adherence to its native phonotactics, particularly in maintaining CV(C) syllable structure and prohibiting marked Arabic features. This study contributes to our understanding of loanword phonology in Austronesian languages by demonstrating how categorical substitution patterns can emerge even between phonologically divergent languages.

Keywords: Arabic; Tagalog; Phonology; Loanwords; Adaptation; Sound Change; Optimality Theory

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ARTICLE INFO

Received: 18 March 2025 | Revised: 11 April 2025 | Accepted: 14 April 2025 | Published Online: 17 April 2025
DOI: https://doi.org/10.30564/fls.v7i4.9135

CITATION

Alsamaani, M.A., Alhoody, M.M., 2025. Phonological Adaptation of Arabic Loanwords in Tagalog: An Optimality Theory Analysis. Forum for Linguistic Studies. 7(4): 949–962. DOI: https://doi.org/10.30564/fls.v7i4.9135

1. Introduction

The phonological adaptation of loanwords has attracted several researchers, who then investigated the interaction between the phonotactic constraints of the source and borrowing languages[1–9]. Philippine languages are among those that received attention in the literature to explore various aspects of phonological adaptation patterns[10–13]. Recent research has shown that phonological processes such as vowel epenthesis, consonant substitution, and syllable modification play crucial roles in the adaptation of loanwords.

For instance, Potet investigated how Arabic and Persian loanwords are adapted to conform to Tagalog phonotactics, whether by adding epenthetic vowels to break up consonant clusters that are illicit in Tagalog or by replacing consonants that are not available in the Tagalog inventory[10]. In another context, Sulit et al. conducted a comprehensive investigation of English loanwords in the Filipino language, focusing on morphophonological adaptation[11]. The study investigated the phonological changes that occur when English words are borrowed into the Filipino language, in order to adapt them to native Filipino phonotactic constraints. These changes might include phoneme substitution and vowel epenthesis to resolve consonant clusters.

In another study, more in-depth and related to this study than the others, Menson-Makalingkang and Echavez analyzed the phonological changes that are applied to Arabic loanwords in the Maguindanaon language (spoken in the province of Maguindanao in the south of the Philippines)[12]. They relied on Optimality Theory (OT) as a theoretical framework for analyzing the results. The research demonstrated that Arabic segments that are illicit in Maguindanaon are adapted to the phonologically closest Maguindanaon phonemes; e.g., the Arabic phonemes /q/ and /ħ/ are mapped to their native counterparts /k/ and /h/. The study also revealed some other phonological changes, such as simplification of consonants and stress adjustment to make Arabic loanwords fit into the grammar system of the Maguindanaon language. In the opposite vein, Baklanova shows how foreign elements are maintained faithfully in the grammar of Tagalog after adaptation[13]. For instance, some new sounds (such as /f/, /v/, and /z/, from Spanish and English loanwords) are introduced and integrated into the Tagalog inventory. Furthermore, the stress patterns of foreign loanwords are often maintained intact.

These studies serve as a solid foundation for research on mechanisms of phonological adaptation that can be used while investigating Arabic loanwords in Tagalog. Although many studies have addressed the phonological changes that occur in Tagalog words borrowed from other languages, such as English and Spanish, there is limited research on Arabic loanwords adapted in Tagalog. The fact that most previous studies focus on loanwords borrowed from languages other than Arabic indicates the lack of research which investigates the phonological adaptation patterns applied to Arabic loanwords in Tagalog.

Thus, the current research aims to contribute to our knowledge of loanword phonology by investigating the phonological processes that result from the adaptation of Arabic loanwords in Tagalog. In particular, the study concentrates on examining constraint interaction and phonotactic adjustments, based on the framework of Optimality Theory.

2. The Tagalog Language

Since the Philippines comprise a group of scattered islands, many different languages are spoken along the Filipino archipelago. Marquez writes: “There were seventy languages in 1939 and Harold Conklin lists twenty-five main linguistic groups and has sub-groupings of the main languages, coming up to a total of 156”[14]. The linguistic diversity of the archipelago raises the question: how and why is Tagalog preferred over the other languages spoken in the Philippines?

According to Tagalog, the language is Austronesian and originated from Taiwan[15]. Tagalog is also believed to have been the language of the rebels against the Spanish occupation of the archipelago, which ended with the arrival of the Americans in 1898. The name “Tagalog” has been gradually replaced by “Pilipino”; however, the word-initial /p/ has been replaced by /f/ to become “Filipino”. Although the phoneme /f/ is absent from the native Tagalog phonemic inventory, we see how Tagalog is flexible in changing phonemes, since the same reference states that the name Philip came to usage in the Philippines during the Spanish rule of the islands. Yet, Arabic loanwords in Tagalog have kept the /p/ for /f/ initially, medially, and finally: a point that we will return to later.

Tangco and Nolasco, in their paper, say that “Tagalog is the term used by majority of Filipinos to refer to the national

language. Filipino which used to be the Pilipino is the term presently in official use for the same referent"[16].

2.1. The Tagalog Sound System

Linguists who have studied Tagalog have incorporated different views into the construction of the language's consonantal phonemic inventory. On the one hand, French[17] counts 25 consonants as candidates, commenting that if we exclude a number of sounds (e.g., /f/, /v/, /θ/, /d/, /z/, /ʃ/, /ʒ/) along with the two sounds for Spanish borrowings [/č/ and /ǰ/], the inventory would comprise only 16 consonantal phonemes. This is supported by Zuraw, who argues for 16 consonants in Tagalog (**Table 1**)[18]. The inventory would comprise only 16 consonants[18]. On the other hand, both French and Zuraw agree on a five-vowel inventory for Tagalog (**Figure 1**)[17, 18].

Table 1. Tagalog Consonants.

Stops	Fricatives	Nasals	Flap	Glides	Lateral
p, t, k, b, d, g, ʔ	s, h	m, n, ŋ	ɾ	j, w	l

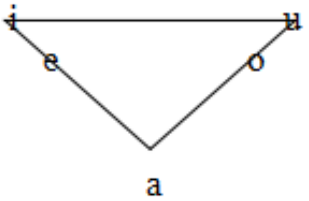

Figure 1. Tagalog Vowels.

For Zuraw, /d/ and /ɾ/ are "within native roots, they are in complementary distribution, with [ɾ] intervocalically and [d] elsewhere"[18]. Yet, this is not the case since none of the borrowed words in the study here have the flap [ɾ]. Tagalog has to map 15 consonants of Arabic because they are not found in the sound system of Tagalog.

After presenting this brief introduction to the consonants and vowels of Tagalog, we proceed to examine the language's syllabic structure.

2.2. Tagalog Syllable Structure

French discusses the syllable structure of Tagalog and refers to the controversy among scholars regarding the clear-cut accounts of these syllables[17]. While she contends that some syllables (V, VC, CV(:), CVC) are tied by some early studies to words of Tagalog origin, she argues in favor of an extended syllable pattern to include borrowed words. This is necessary since, according to French, a great number of loanwords, especially from Spanish and English, are used in everyday discourse more than native words of Tagalog[18]. As a result, *Taglish*, "a mixture of Tagalog and English", is commonly used in the Philippines.

The Tagalog syllable types, after including loanwords into consideration, would be as follows (**Table 2**)[17]:

Table 2. Tagalog Syllable Structure.

Label	Syllable Pattern
(a)	CV
(b)	CVC(C)(C)
(c)	CCV(C)(C)(C)

After examining the data, and because Arabic loanwords in Tagalog have no initial consonant clusters, we argue that the types of syllables with which Arabic loanwords are better associated would be CV and CVV below (to be discussed in Section 3, The SA Sound System), with the exception that the CV type in has the option for vowels in the data to be either short or long. In other words, Tagalog pronunciation in the data matches the syllable structure that is posited for native Tagalog words. This also goes hand-in-hand with Standard Arabic (SA) syllable structure, except that SA allows for consonant clusters. In this case, Tagalog would apply CV(V)(C), while SA would adopt the same structure, but with an optional extra consonant, e.g., CV(V)(C)(C). Section 5 will offer a commentary on the consonant-level phonemic changes.

With this background on Tagalog phonology in place, Section 3 provides a brief review of SA phonology.

3. The SA Sound System

The sound system of Arabic, a Semitic language of the Afro-Asiatic family and the official language of many countries in the Middle East and North Africa, exhibits many

of the most common phonemes found in other languages[19]. While it lacks ejectives and clicks, the Arabic sound inventory is always identified by the uniqueness of its emphatics (/tˤ/, /ðˤ/, /sˤ/, /dˤ/, and /lˤ/).

Most linguists agree that the consonantal phonemic inventory of SA comprises 29, as in **Table 3**. It is accompanied by three vowels, as in **Figure 2**, that behave as either short or long[19–22].

Table 3. SA Consonants.

Stops	Emphatic Stops	Fricatives	Emphatic Fricatives	Affricates	Nasals	Trill	Glides	Lateral	Emphatic Lateral
b, d, t, k, q, ʔ	tˤ, dˤ	f, θ, ð, s, z, ʃ, x, ɣ, ħ, ʕ, h	ðˤ, sˤ	dʒ	m, n	r	j, w	l	lˤ

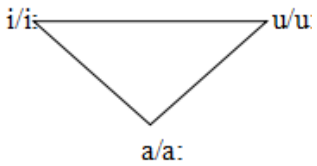

Figure 2. SA Vowels.

3.1. SA Syllable Structure

Arabic has both open and closed syllables. It also allows for complex nuclei and codas. The five syllable structures mentioned by Batais are listed in **Table 4**[22].

Table 4. Syllable Patterns in Arabic.

Label	Syllable Pattern	Gloss
(a)	CV [*li*]	'for me'
(b)	CVV [*la:*]	'not (negative particle)'
(c)	CVVC [*tˤi:n*]	'mud'
(d)	CVC [*qul*]	'say'
(e)	CVCC [*sˤarf*]	'money exchange'

Having briefly described the Arabic sound inventory and its word and syllable structures, we will discuss variable segmental adaptation patterns in the following sections. However, Sections 4 and 5 introduce the nature of the data and the theoretical framework used in this study.

4. Data

The loanwords analyzed in this study are sourced from Potet[10], who compiled a dictionary titled *Arabic and Persian Loanwords in Tagalog*. In this work, Potet states that half of the sixty words he believes have strong ties to Arabic are direct borrowings from Arabic; the majority of the others are an extension of Arabic borrowed via Malay. After applying semantic and phonological parameters, we conclude that around two-thirds of Potet's sixty words are of Arabic origin (see **Appendix A**). The other one-third, which we have not included here, are either archaic or borrowed from Persian. We believe that a handful of the vocabulary words he excluded from the final account, if examined carefully, would be closely affiliated with Arabic. Though they show strong ties to Arabic, they are not among the data we collected for the analysis in this paper.

5. Theoretical Framework

Building on the phonemic inventories of the donor language (Arabic) and the borrower language (Tagalog) stated above, we first examine the final phonological outcomes when Arabic sounds are incorporated into the Tagalog lexicon. This analysis aims to determine whether the resulting adaptations follow regular or irregular patterns of sound change. The consonantal adaptation is primarily governed by the availability of corresponding phonemes in Tagalog. When a direct match is absent, substitution occurs, typically preserving either the place or manner of articulation. In some instances, however, these features may be altered or interrupted, and in certain cases, tongue positioning is reversed, producing an adaptation in the opposite articulatory direction. To further refine this analysis, we employ the framework of OT, evaluating these adaptations in terms of competing constraints. By weighing these constraints, we determine the least violated candidate output, shedding light on the systematic nature of phonological borrowing in Tagalog.

Prince and Smolensky propose OT to describe the interaction between the surface (output) and underlying (input) forms[23]. The theory argues that the surface form (the actual pronunciation) is a result of an interaction of ranked constraints. OT contributes to the field of loanword phonology

by providing a robust tool to explain how foreign words are adapted to align with the phonotactic constraints of the borrowing language. This process is accounted for in OT by proposing that an input, which works as the underlying form of the source word, would surface as different possible realizations (called "candidates"). Then, each candidate passes through different markedness and faithfulness constraints.

In the context of loanword adaptation, the markedness constraints (e.g., open syllables) disfavor any candidate that contradicts the constraints of the borrowing language, whereas the faithfulness constraints attempt to make the possible output faithful to the input (the source form). These constraints are ranked hierarchically according to the phonotactic constraints of the borrowing language. Finally, the possible candidates are evaluated by an Eval element, which is responsible for choosing the optimal candidate that requires the fewest violations of the constraints. In the context of loanword phonology, markedness constraints are often ranked over faithfulness constraints. This explains potential modifications to loanwords after adaptation, e.g., vowel insertion, phoneme substitution, or consonant deletion to satisfy the constraints of the recipient language.

6. Consonantal Sound Change

In this section, because there are no Tagalog mid-vowels in the data (/e/ and /o/), we restrict our analysis to consonants, for Tagalog has fewer consonants than Arabic. As noted above, SA has a total of 29 consonantal sounds, yet Tagalog has only 16. If we subtract 16 from 29, the result would be 13. However, this value would not reflect the actual sound difference between the two languages, since both SA and Tagalog have some language-specific sounds that are not a part of the other language's inventory.

There are four sounds in Tagalog that are not found in SA. The language of Arabic does not contain the bilabial voiceless stop /p/. Furthermore, it has no velar voiced stop /g/, and it includes neither the velar voiced nasal /ŋ/ nor the alveolar voiced flap /ɾ/. On the other hand, Tagalog lacks 15 sounds from the phonemic inventory of Arabic consonants. First and foremost, the five emphatics (the stops /tˤ/ and /dˤ/; the fricatives /ðˤ/ and /sˤ/; and the lateral /lˤ/) are entirely absent in Tagalog. Second, 9 of the SA fricatives (/f/, /θ/, /ð/, /z/, /ʃ/, /x/, /ɣ/, /ħ/, and /ʕ/) are not found in the data. Third, the only affricate that Arabic has is /dʒ/; Tagalog does not have this sound, either. Below, we sketch out the differences with some examples. For more words with the same behavior, refer to **Appendix A**.

As shown in **Table 5**, the Arabic trill /r/ is replaced by the lateral /l/. Since the flap /ɾ/ is in the phonemic inventory of Tagalog, we would predict that it will compensate for the absence of the trill /r/. On the contrary, this is not the case; Tagalog has shown more preference for /l/ over /ɾ/. This may suggest that the phoneme /ɾ/ was adopted in a later stage of the language. That is to say, just like /f/, which was not used to represent Arabic words containing that phoneme, it has been active in recent modifications of phonemes.

Table 5. The Mapping from /r/ to /l/.

/r/ ® /l/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	*sˤa**r**f*	'money exchange'	*ˈsa:**l**ap*	'judge's fees'
(b)	*taqsˤi:**r***	'incapacity, negligence'	*takˈsi**l***	'idiot'

Unlike Kang's account of Hindi adaptations of English words, which preferred [-distributed] over [+anterior], Tagalog here has preserved [+anterior] and also made it an active phoneme[24]. The feature [-anterior] could be analyzed as a late implementation that occurred in the language to compensate for the sacrifice of the [-anterior] feature in some loanwords.

The pharyngeal /ʕ/ in **Table 6** is replaced by its neighbor in the vocal tract, the glottal stop /ʔ/. The glottal stop does not match the manner of articulation of /ʕ/, which is a fricative. The strange thing about these adapted words in Tagalog is that when the Arabic word has /ʕ/ word-medially, the sound disappears. We cannot argue that there is no glottal stop in word-medial positions in Tagalog because one word in the data proves the sound's availability in a place that is neither initial nor final: namely, *daˈʔulat* ('luck, fortune, fate') from the Arabic *dawlah* ('rotation, turn of fortune').

In order to account for this mismatch, in that /ʔ/ exists

Table 6. Replacement of the Arabic Pharyngeal /ʕ/ with the Glottal Stop /ʔ/.

/ʕ/ ® /ʔ/	Arabic	Gloss	Tagalog	Gloss
(a)	***ʕ****araq*	'liquor'	*'**ʔ**a:lak*	'liquor'
(b)	***ʕ****aqala*	'reason, intelligence'	***ʔ****a'ka:la****ʔ***	'thinking, opinion'

initially but not medially when a word is adapted from an Arabic word containing the pharyngeal /ʕ/, we would assume that vowel lengthening is employed by Tagalog phonology to compensate for the difficulty of implementing a glottal stop /ʔ/ in medial position. This is seen in *ʔal**ʕ**azi:f* ('the sound of sands/genies') → *ʔa'l**a:**sip* ('a ghoul') and *mu**ʕ**allim* ('teacher') → *'m**a:**lim* ('pilot'). Nevertheless, the phonemic inventory of Tagalog lacks /ʕ/, and as is seen in many languages including English, the voiced pharyngeal phoneme is replaced by the glottal stop. The previous operation may have been fulfilled due to the fact that the voiceless glottal fricative /h/ has been preserved to present the voiceless pharyngeal fricative /ħ/, as in **Table 7**, due to the fact that both /ħ/ and /h/ share the same manner of articulation. This has promoted /h/, as the adjacent phoneme to /ħ/ with some shared features, to be the best Tagalog candidate for taking the place of /ħ/.

Table 7. Replacement of the Arabic Voiceless Pharyngeal Fricative /ħ/ with the Voiceless Glottal Fricative /h/.

/ħ/ ® /h/	Arabic	Gloss	Tagalog	Gloss
(a)	***ħ****aja:*	'shyness'	***h****i'ja****ʔ***	'shame'
(b)	***ħ****ukm*	'judgment'	***h****u'kom*	'judge'

The mapping from /h/ to /t/, as shown in **Table 8**, has been the subject of a debate among linguists who have discussed the Arabic loanwords that are present in Malay and Indonesian. In his discussion of *ah* and *at* in Malay, Campbell suggests that different paths may have led to the inconsistency of the two endings[25]. First, the appearance of *ah* in some words but not all could be the result of late borrowings, since recent contact with Arabs may have made it easier to distinguish the correct articulation in utterances by the native speakers of the language. Second, in scrutinizing dependency on orthography, Campbell hypothesizes that there might be a tendency for some people to treat some registers within the grammar differently (e.g., *at* is for feminine). Third, the failure to impose the correct Arabic rule, for *ah* as being in a "word" or *at* as being part of a "phrase", has led to some confusion. Fourth, the source of *ah/at* words may have entered the language via different routes (e.g., Arabs, Persians, Indians), and for one reason or another, the linguistic system of the vector may have a role in the final representation of these words. Finally, he claims that many borrowed words (with *ah* and *at*) can be statistically substantiated as being intermediated by Persian before they finally get into the two languages: Malay and Indonesian.

Table 8. Substitution of Final /h/ with /t/ in Tagalog Loanwords from Arabic.

/h/ ® /t/	Arabic	Gloss	Tagalog	Gloss
(a)	*sunna****h***	'permissible'	*su'na****t***	'excise, circumciser'
(b)	*ʕala:ma****h***	'characteristic'	*ʔa'la:ma****t***	'old folks, tradition'

In opposition to Campbell's conclusion, Van Dam writes that statistical analysis of his own work supports the theory that Indonesian features direct borrowings from Arabic[26]. He adds that "hypercorrection" is one reason for the different distributions of *at* and *ah*. This kind of error has led Indonesian to map *ah* to an Arabic word such as *zina* ('adultery'), which has no "tied *t*", to be *zinah* with a final /h/. This controversy in the account of the distribution of /h/ and /t/ goes in line with "too-many-solutions… adaptation often converges on a specific strategy even when speakers have no apparent evidence for that process in their native language"[24]. Besides, Kang adds that the influence of the source language's orthography can have some impact on the borrowed words adapted in the host language.

Batais mentions the term "guttural consonants" to account for Indonesian sound changes[22], which, incidentally, occur in Tagalog in the same way (**Tables 9–11**). "Guttural" refers to the sounds articulated in the velum, uvula, pharynx, and glottis. Though we have noted some transcription differences in our work and that of Batais, who adopted (/χ/ and /ʁ/ instead of /x/ and /ɣ/), the final result may serve the same purpose.

Table 9. Substitution of the Arabic Voiceless Uvular Stop /q/ with the Voiceless Velar Stop /k/.

/q/ ® /k/	Arabic	Gloss	Tagalog	Gloss
(a)	*ʕara**q***	'liquor'	*ˈʔa:la**k***	'liquor'
(b)	*ta**q**sˤi:r*	'incapacity, negligence'	*ta**k**ˈsil*	'idiot'
(c)	***q**atal*	'killed'	***k**iˈtil*	'to kill'

Table 10. Substitution of the Arabic Voiceless Uvular Fricative /x/ with the Voiceless Velar Stop /k/.

/x/ ® /k/	Arabic	Gloss	Tagalog	Gloss
(a)	***x**ita:n*	'circumcision'	*ˈ**k**a:tan*	'circumcised'
(b)	*ʃaj**x***	'sheikh, elder, master'	*siˈja**k***	'Muslim cleric'

Table 11. Substitution of the Arabic Voiced velar Fricative /ɣ/ with the voiced Velar Stop /g/.

/ɣ/ ® /g/	Arabic	Gloss	Tagalog	Gloss
(a)	***ɣ**a:bah*	'forest'	*ˈ**g**u:bat*	'forest'

On many occasions, adjacent sounds from the Tagalog inventory have replaced the Arabic consonantal phonemes. Upon consideration of the three consonants (/q/, /x/, and /ɣ/), which happen to be absent in Tagalog, we notice that the ones that have taken their place are /k/ and /g/. This happens because /k/ and /g/ reside in a place of articulation that is part of the guttural territory. With that said, they have been promoted by their positions to be the best candidates, yet their manner of articulation as stops differs from /x/ and /ɣ/, but not /q/. In addition to that, the mapping from /q/ to /k/ has been motivated by an enhancement process, in which the sound has been produced in accordance with a backward directional strategy. This comes as no surprise; the mapping from /q/ to /k/ is found in some varieties of Arabic dialects in Syria, Palestine, and northern Algeria, so /qalb/ 'heart' changes to /kalb/. It also has been documented in a variety spoken by the old generation of the *banu tami:m* tribe in the Arabian Peninsula.

Despite the alternation between /f/ and /p/ in words with an Arabic /f/ adapted into Indonesian, as Batais confirms, the data we have from Tagalog in **Table 12** have replaced all instances of /f/ with /p/[22]. In the case of Malay, it is not clear whether they alternate or not; nevertheless, Ramasamy has stated that /f/ is part of the Malay phonemic system[27]. Due to Ramasamy's misrepresentation in his transcriptions of Arabic words, along with the inclusion of the segment /v/ as an Arabic consonant, we are reluctant to conclude that the /p/ in Tagalog is purely Filipino, as in (b) *kup**ˈja?*** "helmet, headgear' (**Table 12**). This is not a strong piece of evidence to conclude that the /p/ in Tagalog is an extension of the /p/ in Indonesian.

Table 12. Replacement of the Arabic Voiceless Labiodental Fricative /f/ with the Voiceless Bilabial Stop /p/.

/f/ ® /p/	Arabic	Gloss	Tagalog	Gloss
(a)	***f**ahm*	'understanding'	***p**aˈham*	'learned person, scholar'
(b)	*ku**f**ijah*	'hat'	*ku**p**ˈja?*	'helmet, headgear'
(c)	*sˤar**f***	'money exchange'	*ˈsa:la**p***	'judge's fees'

The change of /f/ to /p/ may go hand-in-hand with Kang's "native phonology" of emergent patterns[24], yet this strategy has been relaxed in recent times to include /f/ as a phoneme. This would account for changes that go in the other direction, from /p/ to /f/. The change from /dʒ/ to /g/ does not come as a surprise, since Egyptian Arabic has the same mapping for most of the Arabic words that carry the segment /dʒ/. The example in **Table 13** surfaces in Egyptian Arabic as *masgid*. An interesting point about the Tagalog adaptation of this word is its addition of the phoneme /n/, which cannot be located in the source. Nonetheless, unlike the phonemic inventory of Malay as cited by Ramasamy[27],

which does not have the segment /dʒ/, the Indonesian sound system retains it[21]. However, Ramasamy gives examples for /dʒ/ in Malay as being represented by /j/[27]. This suggests that the sound change (/dʒ/→/g/) has happened by virtue of a direct borrowing from Arabic, or through Indonesian.

Table 13. Substitution of the Arabic Voiced Postalveolar Affricate /dʒ/ with the Voiced Velar Stop /g/.

/dʒ/ ® /g/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	*mas**dʒ**id*	'mosque'	*man'si:**g**it*	'church'

One contrary example is a borrowing from English, which has been repaired in a coherent manner by satisfying an enhancement process. The word "individual" /ɪndəvɪ**dʒ**uəl/ has been adapted as /ɪndɪbɪ**d**wal/ by mapping /dʒ/→/d/. This, as well, could be due to a late borrowing. Furthermore, the addition of the segment /n/ in *man'si:**g**it* has gone in an opposite line to the common trend, in which borrowers tend to epenthesize vowels instead of consonants. Kang refers to this kind of phenomenon with no urgent affixation as "unnecessary repair"[24].

Whereas the Arabic coronals /θ/, /z/, and /sʕ/ (see **Tables 14**–**16**) are mapped to the alveolar voiceless fricative /s/, the /tʕ/ in **Table 17** is replaced by the alveolar voiceless stop /t/. Batais quotes Paradis & LaCharité[28], who argue that "the occurrence of the phonological adaptation /θ/→/s/ (rather than /θ/→/t/) in Indonesian can be ascribed to its consistency within the Indonesian speech community"[22]. We would assume the same thing has happened in Tagalog. Are these words represented in the same manner in Malay or Indonesian? More data are required to address this question. Furthermore, in Tagalog, the place and manner of articulation have been preserved for /z/, /sʕ/, and /tʕ/, but what is kept for /θ/ is manner only.

Table 14. Substitution of the Voiceless Dental Fricative /θ/ with the Voiceless Alveolar Fricative /s/.

/θ/ ® /s/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	*ʕu**θ**ma:ni:*	'Ottoman'	*ʔu**s**'ma:ni*	'a kind of a blanket'

Table 15. Substitution of the Voiced Alveolar Fricative /z/ with the Voiceless Alveolar Fricative /s/.

/z/ ® /s/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	*z**a**llah*	'error, slip, fault'	*'**s**a:la*	'person's fault, sin'
(b)	*ʔalʕaz**i**:f*	'the sound of sands/genies'	*ʔa'la:**s**ip*	'a ghoul'

Table 16. Substitution of the Emphatic Voiceless Alveolar Fricative /sˤ/ with the Voiceless Alveolar Fricative /s/.

/sʕ/ ® /s/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	***s**ˤarf*	'money exchange'	*'**s**a:lap*	'judge's fees'
(b)	*taq**s**ˤi:r*	'incapacity, negligence'	*tak'**s**il*	'idiot'

Table 17. Substitution of the Emphatic Voiceless Alveolar Stop /tˤ/ with the Voiceless Alveolar Stop /t/.

/tʕ/ ® /t/	Arabic	Gloss	Tagalog	Gloss
(a)	*qas**t**ˤilijah*	'Spain'	*kas'**t**i:laʔ*	'Spanish, Spaniards'
(b)	*ʃaj**t**ˤa:n*	'Satan '	*'si:**t**an*	'devil'

The change of /z/ to /g/ in **Table 18** could be a case of opposing enhancement of segments. In a variety of Arabic (Buraydawi, of Najdi Arabic), the SA word *qali:b* 'a water well' is pronounced *geli:b or dzeli:b*. In any case, what we observe in the Tagalog correlative is that the coronal /z/ became a dorsal /g/. The mapping from /z/ to /g/ has "differential faithfulness" or, according to Kang [24], "the too-many-solutions problem." The sound changes in Tagalog have chosen /s/ for many borrowed phonemes from Arabic, and it may be for this reason that /g/ has been promoted instead of /s/ to replace /z/. This kind of repair has led to an extreme shift in both place and manner of articulation.

Table 18. Substitution of the Voiced Alveolar Fricative /z/ with the Voiced Velar Stop /g/.

/z/ ® /g/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	*ʕazi:mah*	'a piece of paper with a magic formula written on it'	*ʔaˈgi:mat*	'amulet, talisman'

The change of /ʃ/→/s/ in **Table 19** also operates by the same mechanism that was reported by Ramasamy for Malay [27], and by Batais for Indonesian [22]. The process of departing from [-anterior] to [+anterior] suggests that this sound shift is a result of taking a detour through Malay before appearing in Tagalog. The shift in adaptation has taken place from sibilant to sibilant.

This section provided some insight into the Arabic borrowings that are extant in Tagalog. There has already been discussion amongst linguists about the ways in which Tagalog must compensate for the absence of 15 Arabic consonantal phonemes. Most importantly, we have observed two unexpected mappings of Arabic phonemes (namely, /z/ → /g/ and /dʒ/ → /g/), cases in which the delinked phonological feature is [coronal], with no match to either place or manner of articulation in this adaptation.

Table 19. Substitution of the Voiceless Postalveolar Fricative /ʃ/ with the Voiceless Alveolar Fricative /s/.

/ʃ/ ® /s/	**Arabic**	**Gloss**	**Tagalog**	**Gloss**
(a)	*ʃara:b*	'non-alcoholic drink'	***s***ala'bat	'mead from sugar cane juice mixed with ginger'
(b)	*ʃajtʕa:n*	'Satan'	'si:tan	'devil'

Following the presentation of the adaptation patterns of Arabic consonants in Tagalog, the next section provides a phonological analysis of these patterns within the framework of Optimality Theory (OT).

7. Optimality Theory Analysis

In this section, we adopt some OT constraints that best account for some of the phonological change observed in the Arabic-borrowed words in Tagalog. Since the data under investigation are comprised of words without added affixes, we are inclined to side with the classic OT rather than the Stratal OT, which is claimed to provide a better account of phrasal construction [23, 29]. Using the basic principles of OT as a model, we will set repair strategies for some of the sequences that are not tolerated in Tagalog output of Arabic-origin input.

To reiterate the background on the formation of both Arabic and Tagalog syllables, we should note that neither of the two languages allows onsetless (or naked) syllables, nor consonant clusters in the onset. Moreover, unlike Arabic, Tagalog forbids the existence of consonant clusters in codas. Yet, it is permissible in both languages that a word ends with an open syllable and, in this case, no obligatory coda. Thus, the Arabic clusters in the codas must be resyllabified to comply with the native construction of Tagalog words. In this regard, the SA word *'lams* 'touching' becomes *la'mas* 'kneading, touching' in Tagalog. According to the data, all monosyllabic words have been resyllabified to surface as disyllabic words; however, if the source has a word with two syllables, it occasionally turns into a trisyllabic word. Essentially, monosyllabic words are always changed to disyllabic words, yet most of the two-syllable words have maintained

their structure.

The stresses in Arabic-borrowed words in Tagalog fall into two categories. In the first, the stress is applied on the penultimate heavy, open syllable in the pattern CVV, as in *ʔa.ˈlaː.mat* 'old folks, tradition'; *ˈguː.bat* 'forest'; and *ˈsaː.la* 'person's fault, sin.' In the other category, where there is no CVV syllable in the target word, the stress falls on the ultimate CVC syllable. This can be found in words such as *sa.la.ˈwal* 'underpants,' *kup.ˈjaʔ* 'helmet, headgear,' and *hi.ˈjaʔ* 'shame.'

Furthermore, if we consider the classification of SA stresses as suggested by Watson [30], we would assume that there are three accounts for Arabic stress patterns in the data. The first account involves words that obtain the super-heavy syllable CVVC (e.g., *ʔal.ʕa.ˈziːf* 'the sound of sands/genies' and *taʕ.ˈliːm* 'teaching'), which attracts the stress. In the second account, a case in which no super-heavy syllable exists, the non-final heavy one with the structure CVV would be stressed, as in *ʕa.ˈlaː.mah* 'characteristic' and *ˈɣaː.bah* 'forest.' Lastly, in the absence of the above two syllable types, the stress targets the CVC pattern in the non-final position, as illustrated in *mu.ˈʕal.lim* 'teacher' and *ˈzal.lah* 'error, slip, fault.' Elsewhere, the stress would fall on the leftmost syllable with the CV pattern (e.g., *ˈʕa.qa.la* 'reason, intelligence').

Now, we will examine OT examples from the data. We do not intend to discuss all the possibilities of OT constraints; our aim here is to provide an idea of how some of the Arabic loanwords may look in relation to the basic notion of constraints. Tagalog has adopted many strategies in order to include Arabic words in the Filipino lexicon. Some of the constraints, as first proposed by Prince & Smolensky and later adapted and implemented by many studies [8, 21, 23, 31–34]; to name a few), are applied to the selected words.

The input word *ˈħukm* 'judgment' has one syllable and a consonant cluster, but in Tagalog it has a two-syllable structure. In both syllables in Tagalog, the onsets are preserved, so we must posit a constraint that disqualifies candidates with no onset, such as (a) below (**Table 20**). The second constraint should work on eliminating the consonant cluster from being well-formed, and for this reason, *COMPLEX would work better to sort out candidates (b) and (d) for the next word ***ˈxa.na:***. At this point, we are left with two constraints with less fatal violations: DEP-IO and IDENT-IO $^{\text{PLACE}}$. Though (c) violates them, it is still promoted as the good candidate (**Table 20**).

Table 20. Adaptation of a Coda Cluster.

Input: /ˈ*ħukm*/		**ONSET**	***COMPLEX**	**DEP-IO**	**IDENT-IO $^{\text{PLACE}}$**
(a)	*ħuk.om*	*!		*	
(b)	*hu.kmo*		*!		*
(c)	☞ *hu.kom*			*	*
(d)	*ħokm*		*!		

On the other hand, the Arabic word *ˈxa.na:* 'fornication' has two open syllables and one complex vowel. The Tagalog version surfaces with two syllables, but was modified to replace the second syllable's structure of CVV with the sequence CVC. At this stage, and since there is no long vowel in the output's best candidate, we included a constraint that eliminates choices with a complex vowel, as in (a) and (c) (**Table 21**). The consonant length */nn/* in (b) has fatally violated the second constraint in the list, *NOLONGC, which penalizes any occurrence of a geminate (or long) consonant in surface forms (**Table 21**). (d) is the winner, since it outranked the other nominees. The word *ka.ˈnaʔ* 'coitus' violates NOCODA and DEP-C, but this is considered minor in comparison with the violation of the first two constraints, so it does not prevent that form from being the winner (**Table 21**).

The Arabic word *ˈhim.mah* 'care, worry' in **Table 22** was adapted in Tagalog as *ˈhiː.mat* 'accuracy.' To account for the shift in this borrowing, we should eliminate the long consonant */mm/* in (b) from the list to better account for the proposed output (**Table 22**). In addition, because both output syllables have maintained the onset, the second constraint exemplifies the disfavoring of syllables without onsets, as in (c) and (d) (**Table 22**). The best candidate, (a) (**Table 22**), violates both *COMPLEX$^{\text{VOW}}$ and MAX-IO, but it is ranked lower in the table. Thus, ultimate violation does not occur,

Table 21. Adaptation of a Final Long Vowel.

Input: /ˈ*xa.na:*/		***COMPLEX ^{VOW}**	***NOLONGC**	**NOCODA**	**DEP-C**
(a)	*ka.ˈna:*	*!			
(b)	*xan.nˈaʔ*		*!	**	**
(c)	*xa:.ˈna*	*!			
(d)	☞ *ka.ˈnaʔ*			*	*

Table 22. Adaptation of Medial Long Consonants.

Input: /ˈ*him.mah*/		***NOLONGC**	**ONSET**	***COMPLEX^{VOW}**	**MAX-IO**
(a)	☞ *ˈhi:.mat*			*	*
(b)	*him.mat*	*!			
(c)	*him.ah*		*!		
(d)	*i:m.mat*		*!	*	

and it emerges as the winner.

Table 23 shows a case of preserving the original syllable structure, except for the fact that the complex vowel has been turned into a short one. The constraint *COMPLEX ^{VOW} rules out any word that does not comply with its restriction, such as (d) **(Table 23)**, although, as proposed in **Table 22**), the power of *COMPLEX ^{VOW} in **Table 23** is stronger due to its rank as the second constraint. Upon revisiting the first constraint, FREE-V, which Broselow defines as "[a] word [that] should not end in a vowel"[8], we conclude that any word that ends in a vowel is regarded as a bad candidate, and for this reason (a) and (c) will be eliminated (**Table 23**). Thus, the best candidate would be (b), *tak.ˈsil* 'idiot' (**Table 23**).

Table 23. Adaptation of a Medial Long Vowel.

Input: /*taq.ˈsˤi:r*/	**FREE-V**	***COMPLEX ^{VOW}**	**MAX-IO**	**NOCODA**	
(a)	*tak.ˈsi*	*!		*	
(b)	☞ *tak.ˈsil*				*
(c)	*tak.ˈsili*	*!			
(d)	*taks.ˈi:l*		*!		*

This section provided an OT analysis of how the syllable structures of Arabic loanwords are modified to conform to the phonotactic constraints of Tagalog. Twelve OT constraints were adopted to account for the strategies that are applied when Arabic words are borrowed into Tagalog. Depending on the words considered and the hierarchical order implemented in the process, the five constraints that fatally penalize the selection of certain word structures borrowed from Arabic into Tagalog are: ONSET, *COMPLEX, *COMPLEX ^{VOW}, *NOLONGC, FREE-V.

8. Conclusions

In this paper, we presented 41 Tagalog words of Arabic origin. We discussed the sound systems of SA and Tagalog. It is now evident that Tagalog lacks many consonants found in Arabic, leading to many borrowed words that map more than one Arabic phoneme to one Tagalog sound. On the level of vowels, and as represented in this paper, Tagalog has two more vowels than Arabic, and unlike Arabic, it also lacks long (tense) vowels in its phonemic system. Yet, this has not played any significant role in the outcome of many representations. However, the data reveal the presence of long vowels in Arabic loanwords, challenging the assumption that Tagalog exclusively uses short vowels. This finding contradicts the claims of French and Zuraw[17, 18] who argue that Tagalog lacks long vowels.

Our research has also commented on the consonantal changes from Arabic to Tagalog, with many observations such as the substitution of /f/ with /p/, although the current

behavior of the language has done the opposite, resulting in the word ***P**ilipino* becoming ***F**ilipino* (/p/ to /f/) [35]. This shift in behavior suggests that changes to the Arabic borrowed words are mainly old adaptations.

Finally, the last section discussed some aspects of the phonological changes, with some suggested constraints adopted from those proposed under the OT framework. To a large extent, these restrictions would rule out violations to the phonotactics of Tagalog, which largely disfavor zero onsets, clusters, and long segments (consonants and vowels). Codas are less restricted than onsets, with no closed syllables ever allowed in any penultimate syllable.

With that being said, future analysis of Tagalog loanwords may consider an intralingual, contrastive analysis within dialects of Filipino to see if loanwords have other phonological features and repair strategies not shown in this paper. Furthermore, this study has not discussed the phonetic adaptation of Tagalog loanwords from Arabic, as this needs more data gathered from native speakers of the language. This empirical evidence will shed light and feed into the debate on whether the process of adaptation has any perceptual effect in Filipino.

Author Contributions

Conceptualization, M.A.A., M.M.A.; methodology, M.A.A.; validation, M.A.A., M.M.A.; formal analysis, M.A.A., M.M.A.; investigation, M.A.A., M.M.A.; resources, M.A.A., M.M.A; writing—original draft, preparation, M.A.A.; writing—review and editing, M.A.A., M.M.A.; visualization, M.A.A., M.M.A.; supervision, M.A.A. All authors have read and agreed to the published version of the manuscript.

Funding

The Researchers would like to thank the Deanship of Graduate Studies and Scientific Research at Qassim University for financial support (QU-APC-2025).

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Data can be given upon request.

Conflicts of Interest

The authors declare no conflict of interest.

Appendix A. Tagalog Words of Arabic Origin

Arabic		Gloss	Tagalog	Gloss
ˈʕa.raq	عرق	‘liquor’	*ˈʔa:.lak*	‘liquor’
ˈʕa:.lim	عالم	‘knowledgeable’	*ˈʔa:.lam*	‘knowledge’
ˈdaw.lah	دولة	‘rotation, turn of fortune’	*da.ˈʔu.lat*	‘luck, fortune, fate’
ˈhim.mah	همة	‘care, worry’	*ˈhi:.mat*	‘meticulosity, accuracy’
ˈħa.ja:	حاجة	‘shyness’	*hi.ˈjaʔ*	‘shame’
ˈħukm	حكم	‘judgment’	*hu.ˈkom*	‘judge’
ʔis.ˈla:m	إسلام	‘Islam’	*ʔis.ˈlam*	‘Islam’
ˈqa.ba.lah	قبالة	‘talisman hung on necks’	*ka.ˈbal*	‘talisman, stone, gem’
ˈxa.na:	خان	‘fornication’	*ka.ˈnaʔ*	‘coitus’
ˈqasˁ.tˁi.li.jah	قسطيلية	‘Spain’	*kas.ˈti:.laʔ*	‘Spanish, Spaniards’
xi.ˈta:n	ختان	‘circumcision’	*ˈka:.tan*	‘circumcised’
ˈku.fi.jah	كوفية	‘hat’	*kup.ˈjaʔ*	‘helmet, headgear’
mu.ˈʕal.lim	معلم	‘teacher’	*ˈma:.lim*	‘pilot’
ˈmas.dʒid	مسجد	‘mosque’	*man.ˈsi:.git*	‘church’
ˈmaw.sim	موسم	‘season, monsoon’	*ˈmu:.sim*	‘season, wind’
ˈfahm	فهم	‘understanding’	*pa.ˈham*	‘learned person, scholar’
ˈzal.lah	زلة	‘error, slip, fault’	*ˈsa:.la*	‘person’s fault, sin’

Table 23. *Cont.*

Arabic		Gloss	Tagalog	Gloss
ʃa.ˈra:b	شراب	‘non-alcoholic drink’	*sa.la.ˈbat*	‘mead from sugar cane juice mixed with ginger’
ˈsˤarf	صرف	‘money exchange’	*ˈsa:.lap*	‘judge’s fees’
sir.ˈwa:l	سروال	‘trousers’	*sa.la.ˈwal*	‘underpants’
ʃaj.ˈtˤa:n	شيطان	‘Satan’	*ˈsi:.tan*	‘devil’
ˈʃajx	شيخ	‘sheikh, elder, master’	*si.ˈjak*	‘Muslim cleric’
sam.bil.ˈla:h	سم بالله	‘say: in the name of Allah’	*sum.ˈba:.li*	‘serving the head’
si.ˈja:.sah	سياسة	‘politics’	*si.ˈja:.sat*	‘search, inquiry’
ˈsun.nah	سُنة	‘permissible’	*su.ˈnat*	‘excise, circumciser’
taq.ˈsˤi:r	تقصير	‘incapacity, negligence’	*tak.ˈsil*	‘idiot’
taʕ.ˈli:m	تعليم	‘teaching’	*ta.ˈli:.ma*	‘memorizing’
ʕuθ.ˈma:.ni:	عثماني	‘Ottoman’	*ʔus.ˈma:.ni*	‘a kind of a blanket’
ʕa.ˈzi:.mah	عزيمة	‘a piece of paper with a magic formula written on it’	*ʔa.ˈgi:.mat*	‘amulet, talisman’
ˈʕa.qa.la	عقلَ	‘reason, intelligence’	*ʔa.ˈka:.laʔ*	‘thinking, opinion’
ˈka:.la	كالَ	‘to measure’	*ʔa.ˈka:.laʔ*	‘calculation’
ʕa.ˈla:.mah	علامة	‘characteristic’	*ʔa.ˈla:.mat*	‘old folks, tradition’
ʔal.ʕa.ˈzi:f	العَزيف	‘the sound of sands/genies’	*ʔa.ˈla:.sip*	‘a ghoul’
ʔa.ˈmi:n	أمين	‘trustworthy’	*ʔa.ˈmin*	‘to trust, take into account’
ʔa.ˈma:n	أمان	‘protection’	*ʔa.ˈmin*	‘to respect’
ˈɣa:.bah	غابة	‘forest’	*ˈgu:.bat*	‘forest’
ħi.ˈka:.jah	حكاية	‘story’	*hi.ˈka:.jat*	‘enticement, persuasion with nice words’
ˈqib.lah	قبلة	‘in front of, the west’	*ka.bi.ˈlaʔ*	‘the opposite side’
ˈqa.tal	قتل	‘killed’	*ki.ˈtil*	‘to kill’
ˈlams	لمس	‘touching’	*la.ˈmas*	‘kneading, touching, masturbation’
ʔa.ˈma:.nah	أمانة	‘deposit, trust’	*ˈma:.na*	‘inheritance’

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