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The Coda in Khmer Loanwords in Thai: An Optimality Theory Perspective[1]

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Abstract

The purpose of this research is to investigate how coda consonants were adapted in Khmer loanwords in Thai. The loanword data were collected from previous studies related to Khmer loanwords in four Thai works. The selected loanwords are limited to those that are still in use in current Thai. The analysis was based on the Optimality Theorative framework. In coda position, Khmer allows 13 consonants, p c t k h ʔ m l n ɲ ŋ j w, and Thai allows 9, p t k ʔ m n ɲ ŋ j w. The results of the study revealed that the absence of four consonants, c h l ɲ, in coda position in Thai phonotactics is one type of adaptation. But the adaptation occurred not only with those consonants, it also took place with some other codas that are allowed in both languages. From the Optimality Theory perspective, the adaptation was the result of the conflict of the two main constraints, faithfulness and markedness. For the codas which were not allowed in Thai phonotactics, Thai grammar ranks the markedness constraints, *c] *h] *l] *ɲ], higher than faithfulness constraints, IDENT-IO(F) and IDENT-IO(place). This finding is different from previous ones. More alternative forms of some codas were also found. Some codas were mapped to more than one form. The Optimality Theory could work well with such adaptation within Thai phonotactics.

Keywords: loanword, Optimality Theory, adaptation, coda, constraint

บทคัดย่อ

งานวิจัยนี้มีความมุ่งหมายเพื่อศึกษาการปรับเปลี่ยนของพยัญชนะท้ายในคำยืมภาษาเขมรในภาษาไทย ผู้วิจัยได้เลือกข้อมูลคำศัพท์ที่นำมาใช้ในการศึกษาจาก

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งานวิจัยที่ได้เก็บรวบรวมคำยืมภาษาเขมรในภาษาไทยที่ผ่านมาจำนวน 4 เล่ม โดยมีขอบเขตเฉพาะคำยืมภาษาเขมรในภาษาไทยที่มีใช้ในยุคปัจจุบันเท่านั้น โดยใช้แนวทฤษฎีภาษาศาสตร์อุตมผล (Optimality Theory) ในการวิเคราะห์ ในภาษาเขมร มีพยัญชนะท้ายพยางค์จำนวน 13 เสียง คือ p c t k h ʔ m l n ɲ ŋ j w และภาษาไทยมีจำนวน 9 เสียง คือ p t k ʔ m n ŋ j w ผลการศึกษาพบว่า 1) พยัญชนะท้ายในระบบเสียงภาษาเขมรมีมากกว่าภาษาไทย 4 เสียง คือเสียง c h l ɲ เสียงพยัญชนะท้ายทั้ง 4 เสียงนี้เป็นปัจจัยหนึ่งที่ทำให้เกิดการปรับเปลี่ยนเป็นไปตามระบบพยางค์ในไวยากรณ์ภาษาไทย อย่างไรก็ตามการปรับเปลี่ยนเสียงดังกล่าวไม่พบว่ามีเฉพาะพยัญชนะท้ายทั้ง 4 เสียงนั้นเท่านั้น แต่ยังพบว่าเกิดขึ้นกับพยัญชนะท้ายที่เหมือนกันระหว่างภาษาเขมรกับภาษาไทยอื่นด้วย ตามแนวทฤษฎีอุตมผล การปรับเปลี่ยนจะเกิดขึ้นด้วยเงื่อนไขบังคับทั้ง 2 คือ เงื่อนไขบังคับตรงและเงื่อนไขบังคับแปลกเด่น เสียงพยัญชนะที่ไทยไม่มีในตำแหน่งท้ายพยางค์ ในระบบไวยากรณ์ไทยถือว่าเงื่อนไขบังคับแปลกเด่น (*c] *h] *l] *ɲ]) อยู่เหนือกว่าเงื่อนไขบังคับตรงซึ่งได้แก่ Ident-IO(f) และ Ident-IO(place) การวิจัยครั้งนี้มีผลแตกต่างจากผลงานที่เคยมีการศึกษามาก่อนกล่าวคือ พบรูปแบบการเปลี่ยนแปลงเสียงพยัญชนะท้ายบางเสียงมีมากกว่า 1 หน่วยเสียง แสดงให้เห็นว่าทฤษฎีอุตมผล (Optimality Theory) สามารถใช้ศึกษาการปรับเปลี่ยนเสียงในภาษาไทยได้ดีอีกทฤษฎีหนึ่ง

คำสำคัญ: คำยืม ทฤษฎีอุตมผล การปรับเปลี่ยน พยัญชนะท้าย เงื่อนไขบังคับ

Introduction

Cambodia and Thailand are neighboring countries in Mainland Southeast Asia in the middle of the Indo-Chinese Peninsula. The two countries have a shared border of approximately 800 kilometers. The relationship between the Khmer and the Thai people dates from before the founding of the Thai Sukhothai kingdom or the middle of the Khmer Angkor Period around the twelfth century (Figure. 1).

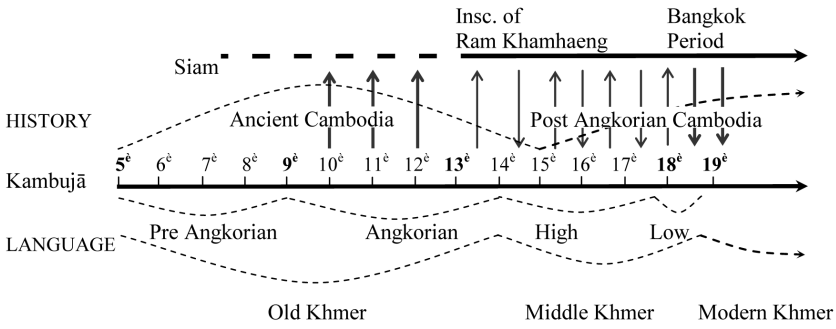


Figure 1: Comparative chart of Kambojā and Siam (Adapted from Pou, 2003: 259)

Long-time contact and adjacent geography resulted in cultural exchanges between the two countries. Cultural influences moved from the Khmer to the Thai in the 10th century, then from the Thai to the Khmer around the 16th century (Kœus, 1967: 268; Pou, 2003: 259; Khanittanan, 2004).

Linguistic borrowing resulted from these influences. The large number of loanwords and other linguistic elements found in the two languages indicate good neighborly relations between the Khmer and Thai people. Thousands of Khmer words were borrowed into Thai and hundreds of Thai words were also borrowed into Khmer. Thus, loanwords, especially Khmer loanwords in Thai, have become a topic of study and increased prominence in research for more than five decades by Thai and foreign researchers (Nacaskul, 1959; Thorngseub, 1979; Banchob, 1980; Huffman, 1986; Varasarin, 1984; Chuchun, 2000; Phakdeekham, 2006; Salee, 2010; Sonnang, 2010, and others).

By and large, the investigations from those studies concern the way in which words came into the Thai language as well as the origins of the words. The overall themes of previous studies were primarily the following: 1) description of the influx of Khmer words into the Thai language, 2) categorizing the loanwords according to language usage, and 3) the historical background of Khmer-Thai relations that led to linguistic contact. Next, the scope of studies moved to the linguistic area in which phonetic issues become crucial (Varasarin, 1984; Sonnang, 2010).

Varasarin's work can be considered the first study of Khmer loanwords in Thai that provided a broad picture of loanwords, especially phonetic adaptation. Her method of explaining the phenomenon of change is similar to that of generative phonology, which usually states that each phenomenon always occurred systematically. Varasarin (1984: 71) discussed changes that take place within the final consonants by focusing on four consonants, c h ɲ l, which are not allowed in coda position. Within the Thai language, she found that they were changed, t ʔ n, respectively.

Sonnang (2010) compared loanwords from Khmer to Thai and vice-versa. There are 1380 Khmer loanwords in Thai and 344 Thai loanwords in Khmer. In terms of coda, his study found that the change within final consonants of the loanwords is to four consonants, c l h ɲ, and other consonants which are allowed in the final syllable of Khmer and Thai. However, his study focused on the overall description of adaptation that takes place within the syllable margins.

To summarize, in previous studies, the coda adaptation was limited to the four coda consonants which are absent in Thai phonotactics; adaptations that take place in other codas were not strictly investigated. In other words, there is a gap in the research into how those codas were adapted by Thai grammar. This paper will discuss the coda adaptation in loanwords. The present study is an extension of a phonetic study from previous works that sheds light on the coda adaptations in the loanwords.

Methodology

The purpose of the present study is to investigate how the coda consonants in Khmer loanwords in Thai were adapted, based on the Optimality Theorative framework. The loanword data were collected from previous studies related to Khmer loanwords in four Thai works[2], especially the work by Varasarin (1984). The tokens were limited to the words with coda consonants that are still in use in standard Thai.

[2] Nacaskul, 1959; Bandhumedha, 1980; Varasarin, 1984; and Katanyu, 2000.

After the selection, the tokens were grouped according to type of coda consonants, obstruent and sonorant.

Each selected word bears a transcription form, orthographic form and meaning in English. The transcription for Khmer words follows IPA used by Prum Moal (2006) and for Thai it follows Karnchana Nacaskul (1998). As for orthography, Khmer words follow the Khmer dictionary of the Institute of Buddhism (Institute of Buddhism, 1967) based in Phnom Penh, and the Thai orthography follows the Thai dictionary of the Royal Institute of Thailand (Royal Institute of Thailand, 1999).

Khmer and Thai phonological inventories

Before we proceed to discuss the adaptations in the coda consonants, we shall set the groundwork by examining some elements involved in Thai and Khmer phonological inventories. In the phonological inventory, Khmer has 17 consonant phonemes and Thai has 21 consonant phonemes, Tables 1 and 2, respectively [in this article, the word Table is used to list some items as shown in below, whereas the term *Tableau* is for displaying the analysis within the OT only].

Table 1. Khmer Consonant Phonemes (Adapted from Moal, 2006: 29)

	Bilabial		Alveolar		Palatal	Velar	Glottal
Plosive	p	b	t	d	c	k	ʔ
Nasal	m		n		ɲ	ŋ	
Fricative				s			h
Trill			r				
Lateral Approximant			l				
Approximant		w			j		

Table 2. Thai Consonant Phonemes (Adapted from Kanchana, 1998: 147)

Consonant	Labial	Labial dental	Alveolar	Palatal	Velar	Glottal
Voiceless	p		t	c	k	ʔ
Plosive Voiceless	ph		th	ch	kh	
Voiced	b		d			
Nasal	m		n		ŋ	
Liquid			l			
Lateral			r			
Fricative		f	s			h
Approximant	w			j	(w)	

In initial syllable, Khmer and Thai both allow all consonants in simplex onset, but they limit the number of complex onsets or consonant clusters and syllable coda or syllable final consonants. While Khmer has approximately 80-88 complex onsets (Huffman, 1967; Nacaskul, 1959), Thai has 13 complex onsets (Nacaskul, 1998). In coda position, Thai allows 9 consonants, p t k ʔ m n ŋ j w, whereas Khmer allows 13, p c t k h ʔ m l n ɲ ŋ j w.

This article is most concerned with coda consonants. From the set of coda, Khmer and Thai both have 9 consonants, p t k h ʔ m n ŋ j w, which can be phonetically very similar. The rest are four consonants, c h l ɲ, which are absent in the coda position in Thai as compared to Khmer.

Theoretical background: Optimality Theory

Optimality Theory (OT) is a development of Generative Grammar, a theory sharing its focus on formal description and quest for universal principles on the basis of empirical research of linguistic typology and (1st) language acquisition (Kager, 1999: XI).

The basic assumption of the OT is that the grammar of language consists of a set of rank violable well-formedness constraints. While the constraints are universal, the ranking of constraints is language specific.

Each linguistic output form is *optimal*, in the sense that it incurs the least serious violations of a set of conflicting constraints. For a given input, the grammar generates and then evaluates an infinite set of output candidates, from which it selects the optimal candidate, which is the actual output. Evaluation takes place by a set of hierarchically-ranked constraints (C_1 >> C_2 >> … C_n), each of which may eliminate some output candidate outputs, until a point is reached at which only one output candidate survives. This elimination process is represented schematically:

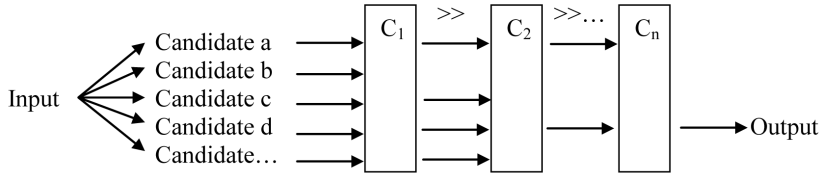


Figure 2: Mapping of input to output in OT grammar

In figure 2, the optimal output candidate is the one that is 'most harmonic' with respect to the set of ranked constraints. 'Harmony' is a kind of relative well-formedness, taking into account the severity of the violations of individual constraints, as determined by their hierarchical ranking. That is, violation of a higher-ranked constraint incurs a greater cost to harmony than violation of a lower-ranked constraint. Some violations must occur in every output candidate, as constraints impose conflicting requirements. Accordingly, a lower-ranked constraint can be violated to avoid the violation of a higher-ranked one, but the violation is always kept to a minimum, given the requirement of maximal harmony (Kager, 1999: 8-9).

Within Optimality-theoretic analyses, the working of and ranking between a set of *constraints* is often set graphically in the form of a display or *Tableau*. The more high-ranked constraints in the set are displayed on the left of this *Tableau*, while lower-ranked constraints are displayed on the right edge. Solid vertical lines separating the relevant constraints indicate that a constraint ranking has been established, while

a dotted vertical line between constraints indicates that no ranking has (yet) been established. Optimal candidates are indicated within a *Tableau* by particular symbol, often a pointing hand. *Tableau 1* exemplifies the above clue.

Tableau 1

	/viizə/	*[+voice, +cont	MAX-IO	IDENT-IO(voice)
(1)	[viizə]	*!		
☞ (2)	[wiisâa]			*
(3)	[iisâa]		*!	
(4)	[ziisâa]	*!		

(Adapted from Rungruang, 2007: 56)

Tableau 1 illustrates the adaptation of /z/ from an English word 'visa.' (1) - (4) are candidates generated from /viizə/. Three constraints, (*[+voice, +cont; MAX-IO and IDENT-IO(voice), are used to evaluate this adaptation. *Tableaux* like this are found throughout this work.

The coda adaptation in Khmer loanwords

Many languages restrict the type of consonants that may occur in the syllable coda (Prince, 1984; Itô, 1986; Clement, 1990; Goldsmith, 1990 cf. Kager, 1999: 130). From the selected words, all Khmer coda consonants are found attested with Khmer loanwords in Thai. Let us consider the coda consonants in items from (1).

		Khmer		Thai		Gloss
(1)	a.	cap	ចាប់	càp	จับ	to catch, to arrest
	b.	dɑoc	ដោច	dò:t	โดด	separated, isolated
	c.	ʔout	អួត	ʔùat	อวด	to brag, boast
	d.	lə:k	លើក	lə̂:k	เลิก	to cancel
	e.	prɑh	ប្រស់	plòt	ปลด	to set free
	f.	peaʔ	ពាក់	phàk	พัก	to wear; to relax

g.	prɔ:m	ព្រម	phrɔ́:m	พร้อม	to agree; together with
h.	cɔl	ជល់	chon	ชน	to collide
i.	ca:n	ចាន	ca:n	จาน	bowl, dish
j.	ʔaɲ cə:ɲ	អញ្ជើញ	ʔan chə:n	อัญเชิญ	to invite
k.	baɲ	បាំង	baɲ	บัง	to hide
l.	khmaw	ខ្មៅ	kha máw	เขม่า	black; soot
m.	ca:j	ចាយ	cá:j	จ่าย	to pay

All Khmer words from (1) are finalized in obstruents: p c t k h ʔ, and sonorants: m l n ɲ ŋ j w. From the source language to the recipient language, Khmer to Thai, respectively, they are identical, except c h l ɲ. In that, c and h are mapped to t, while l and ɲ are to n.

From the database, however, the adaptation was found not with only the four consonants, but also in other coda consonants, except p t w and j. They are identical in some words and adaptive in others. Thus, in the following sections, the adaptation will be discussed within those adapted consonants, by starting from the obstruent consonants, c k h, to the sonorant consonants, m l n ɲ ŋ.

The adaption of c

Let consider the alternation of c in the following words in (2).

		Khmer		Thai		Gloss
(2)	a.	coc	ចុច	cùt	จุด	to press on, spot
	b.	do:c	ដូច	dùt	ดุจ	like, similar
	c.	dac	ដាច់	dèt	เด็ด	cut, cut out
	d.	sa:c	សាច	sà:t	สาด	splash, spray
	e.	sɑm dec	សម្តេច	sŏm dèt	สมเด็จ	prince, royal

From the specific language the c is not allowed in a final syllable in Thai, but is allowed in Khmer. Thus, it is marked in coda position in Thai. A markedness constraint, *c], to ban the c from the coda position is proposed.

*c]

No c in final syllable.

Banning any segment from occurring undergoes some repair strategies. To this claim, when the c is not allowed in the coda position by *c], the segment had to be adapted. As shown in (2), the coda c in Khmer loanwords in final syllable was mapped to t. The two segments, c and t, have different places of articulation, [dor] and [cor], respectively. Thus, the c → t mapping violates a faithfulness constraint of Place, IDENT-IO(Place).

IDENT-IO(Place)

Correspondents in the input and output have identical place features.

(Kager, 1999: 132)

So far, two conflicting constraints to evaluate the c alternation are proposed. Then, they are ranked, as follows:

*c] >>IDENT-IO(F)

Tableau 2

		sa:c 'splash'	*c]	IDENT-IO(place)
(a)		sa:c	*!	
(b)	☞	sa:t		*

Tableau 2 shows how c → t mapping. Two candidates are generated from input sa:c, into candidate (a) and (b). The (a) is rejected, since it severely violates the higher-ranked constraint, *c]. So it is fatal. Only (b) is optimal, since it satisfies a higher-ranked constraint, although it violates a lower-ranked constraint Ident-IO(place).

From this reason, Thai grammar solves a marked segment of c in coda position by the strategy of featural change.

The adaptation of k

Thai phonotactics allow k in coda position. From this possibility the coda k in most Khmer loanwords in Thai is not adapted,

as shown in (1d). However, in some Khmer loanwords, it is also found to be adapted, as (3) shows.

		Khmer		Thai		Gloss
(3)	a.	kɑm raək	កម្រើក	kam rɔ̂:p	กำเริบ	to shake, move / increase
	b.	tak ta:eŋ	តាក់តែង	tòp tɛ̀ŋ	ตบแต่ง	to decorate
	c.	tɔm nuk	ទំនុក	thá núʔ	ทะนุ	preserve / support

From (3), two forms of k are presented, p in (3a-b) and ʔ in (3c). All together, three correspondent forms, k p ʔ, of k are found in Khmer loanwords in Thai. The following discussion will include the identical and alternative forms, starting from k → k (*Tableau 3*), k → p (*Tableau 4*), and k → ʔ (*Tableau 5*).

From OT assumption, each optimal output form arises from the conflict between markedness and faithfulness constraints. That is, an output is optimal when it incurs the least serious violation of a set of constraints, taking into account their hierarchy (Kager, 1999: 13). Thus, although k surfaces identically or adaptively, each surfaced form must arise from the conflicting constraint.

The correspondent outputs of k are presented in the following schemata:

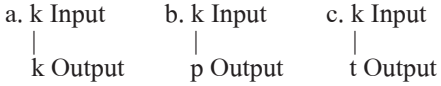


Figure 3: The correspondence diagram of k

Let consider the distinctive feature of each segment. The three obstruent consonants, k p and ʔ, have different places of articulation: [dor], [lab], and [lar]. Thus, the mapping from [dor] to [lab] or [lar] violates a faithfulness constraint IDENT-IO(place).

Itô (1989, cf. Jill, 2003: 106) proposed that Coda Condition prohibits a particular feature specification in the syllable coda:

*C]σ
|
[Place]

Figure 4: Coda Condition (Itô, 1989: 224, cf. Jill, 2003: 106)

Itô's familiar Coda Condition exemplifies the positional m arkedness approach that the marked features are prohibited in a specific position. From this assumption, some markedness constraints may be formalized as follows:

CodaCond
*[lab], *[dor], *[cor]..

The constraint governing the relative markedness of labials and coronals is intrinsically ranked as below:

Universal ranking for markedness constraints governing place of articulation
*[lab] >> *[cor]

(Kager, 1999: 42)

The segment ʔ is a stop that lacks supralaryngeal specification (Kager, 1999: 125). Following McCarthy's assumption, Lombardi (2001: 18) claims that it may seem odd for Phar to be the least-marked place given the cross-linguistic rarity of the true Pharyngeals and suggests that the markedness of the gutturals must be due not to their primary Place but to other features or combination of features that they bear; in the simplest case perhaps that glottal is highly marked. An additional hierarchy of markedness constraints of place featured by Kager, the Dorsal and Pharyngeal, are additionally proposed by Lombardi, as follows:

Place Hierarchy (PLHier):
*Dor, *Lab >> *Cor >> *Phar

The *Phar is adopted in this discussion by adapting as *[phar] to conform to the form of constraints proposed by Kager (1999: 42).

In the database, the coda k is not found deleted. Thus, it could be a hypothesis that a faithfulness constraint, Max-IO, is crucial.

MAX-IO
Input segments must have output correspondents (No deletion)

(Kager, 1999: 67)

This constraint militates against any segment deletion from the input-output form. Thus, so far, to analyze the adaptation of k in coda position, those involving constraints are *[lab], *[cor], *[pha], MAX-IO and IDENT-IO(place).

Those constraints could be ranked accordingly to the case of alternations that are discussed in the following sections.

The identical form of coda k, as shown in (1d), is illustrated in *Tableau 3* with the following constraint ranking:

IDENT-IO(place), MAX-IO >> *[dor]

Tableau 3

		lə:k 'cancel'	IDENT-IO(place)	MAX-IO	*[dor]
(a)		lə̂:		*!	
(b)	☞	lə̂:k			*
(c)		lə̂:ʔ	*!		

From the *Tableau*, three candidates, (a), (b) and (c), are generated. Of those, (a) and (c) are rejected, since they severely violate higher-ranked constraints, IDENT-IO(place) and MAX-IO, respectively. Candidate (b) wins in this competition. Although it violates *[dor], which is a lower-ranked constraint, it satisfies higher-ranked constraints. Thus, the identical form of coda k arises from the preference of IDENT-IO(place) and MAX-IO, which are higher-ranked over *[dor].

*[dor], i.e., Faith >> Markedness.

In (3a-b), coda k was adapted to p. The constraints coming to interact in this alternation are *[lab], *[dor], and IDENT-IO(place). They could be ranked as follows:

*[dor] >> *[dor], IDENT-IO(place)

Tableau 4

		kɑm raək 'shake'	*[dor]	*[lab]	IDENT-IO(place)
(a)		kam rə̂:k	*!		
(b)	☞	kam rə̂:p		*	*

Tableau 4 illustrates that candidate (a) violates *[dor], a higher-ranked constraint. Thus, it is rejected. Candidate (b) is an optimal output, although it violates *[lab] and IDENT-IO(place). They are lower-ranked constraints.

Another alternative form of coda k is the glottal stop ʔ. The ʔ bears [phar]. The constraints that come to evaluate this adaptation are *[dor], *[pha], and IDENT-IO and are ranked as follows:

*[dor] >> *[phar], IDENT-IO(place)

Tableau 5

		tɔm nuk 'support'	*dors	*[pha]	IDENT-IO(place)
(a)		tham nuk	*!		
(b)	☞	tham nuʔ		*	*

To summarize, the surface forms of k are identical and adaptive. Although k surfaces identically, it violates a markedness constraint *[dor] that militates against the occurrence of k in coda position. For the other adaptive forms, Thai grammar prefers the markedness constraints in a higher ranking. Thus, the outputs violate IDENT-IO(place), a faithfulness constraint.

The adaptation of h

In the Khmer language, the output h is phonetically from final syllable s. In traditional rule-based analysis, this transformation of s in coda position could be formulated as a rule: s → h/_ #. But discussing such a process is beyond the scope of the present study. In other words, from an orthographic perspective, the coda h is represented by ស or ៖ in Khmer language. Next, there comes a hypothesis that the final ស or ៖ in Khmer loanwords surfaces as t or ʔ within the Thai grammatical environment

(Varasarin, 1984). The following examples in (4) may fully support this prediction.

		Khmer		Thai		Gloss
(4)	a.	keh	កេះ	kɛ́ʔ	แกะ	to scratch, to curve
	b.	kuoh	គោះ	khɔ́ʔ	เคาะ	to hit, to strike
	c.	cah	ចាស់	cát	จัด	old, ancient / much
	d.	ləh	លើស	lə̂:t	เลิศ	over, more
	e.	rɔh	រស់	rɔ̂:t	รอด	to live, be alive

Although the coda h in a vast number of Khmer loanwords was mapped to one of two forms, h and ʔ, the process could not be assumed to happen to the coda h in all Khmer loanwords in Thai. From the database, while the segment h, as shown in (4), in many loanwords is surfaced to t and ʔ, its other forms k and h in a few words are also found. Items in (5) illustrate the findings.

		Khmer		Thai		Gloss
(5)	a.	crα: moh	ច្រមុះ	cà mù:k	จมูก	nose
	b.	treh	ត្រិះ	trìʔ	ตริ	to think, consider
	c.			trʉ̀k	ตรึก	nose
	d.	ca:h	ចាស	câ:h	จ๊ะ	woman's reply

Thus, a coda h has four correspondents: t ʔ k and h[3], as figure 5 illustrates:

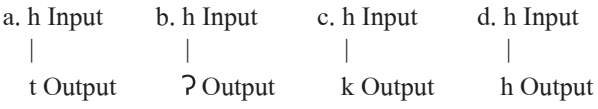


Figure 5: The correspondence diagram of k

[3] In the present work, we do not delve deeply into a new member of coda h in Thai. An experimental approach to finding the presence or absence of h in coda position in Thai should be conducted in future studies.

These correspondences are all obstruent. But to some extent, they are different in the value of features, h [+cont, phar], t [-cont, cor], ʔ [-cont, phar] and k [-cont, dor]. Thus, any adaptation that changes any feature of segment violates the IDENT-IO(F), militating against the featural change.

> IDENT-IO(F)
> Corresponding input-output segments are identical in specification for [F].
> Let α be a segment in the input and β be any correspondent of α in the output, if α is [γF] then β is [γF].
>
> (Walker, 2011: 53)

From Coda Condition mentioned in previous section of this article , such occurrence violates one or some of Markedness constraints of Place: *[dor], *[lab], *[cor], *[phar].

The following discussion is to analyze the alterations of h → t, h → ʔ, and h → k. The h → h mapping may be kept for future study. From our observation, a coda h is audible in some Thai words in less careful speech. A word câ:, a respond particle and a Khmer origin (Varasarin. 1984 : 75; Khanittanan. 2004 : 386), is likely pronounced câ:h rather than câ:. since there are a number of Thai words in less careful speech, including loanwords, end in final h, such as: ค่ะ, จ้ะ, วะ in เขามาแล้วค่ะ khăw ma: lɛɛw khâ! ดีแล้วจ้ะ di: lɛɛw câ↓, อะไรวะ ʔa raj wá "*well, what is it?*" Hass (1964: 85, 112, 500).

The alternation of h → t may be accounted by the following constraints: *[phar], *[cor], and IDENT-IO(F).

*[phar] >> *[cor], IDENT-IO(F)

Tableau 6

		lə:h 'over'	*[phar]	*[cor]	IDENT-IO(F)
(a)		lə:h	*!		
(b)	☞	lə̂:t		*	*

The alternation of h → ʔ may be accounted for by the following constraints: *[pha], *[cor], and IDENT-IO(F). h and ʔ bear the same feature of [phar]. Thus, *[pha] militates any segment bearing [phar] from occurring in coda position. The *h] and *ʔ] are from *[pha] family. Where the h is [+cont], the ʔ is [-cont]. The faithfulness constraint IDENT-IO(F) could be subdivided as IDENT-IO(F)(cont). They are ranked as follows:

*h] >> *ʔ], IDENT-IO(F)-IO(cont)

Tableau 7

	keh 'scratch'	*h]	*ʔ]	IDENT-IO(cont)
(a)	kɛ́h	*!		
(b) ☞	kɛ́ʔ		*	*

Another h → k mapping could be analyzed by: *[phar], *[cor], and IDENT-IO(F). These constraints could be specified as *h], *k], and IDENT-IO(F)(cont), respectively. The ranking of them is as follows:

*h], *ʔ] >> *k] , IDENT-IO(F)(cont)

Tableau 8

	crɑ: moh 'nose'	*h]	*ʔ]	*k]	IDENT-IO(cont)
(a)	ca moh	*!			
(b)	cà mùʔ		*!		*
(c) ☞	cà mù:k			*	*

To summarize, the coda h in Khmer loanwords in Thai surfaced as (h) t ʔ and k. The absence of h in coda position in Thai phonotactics is subject to adapting this segment. The strategy to solve the grammar prefers the featural change to the segment deletion. If the deletion appears, a faithfulness constraint Max-IO may arise to ban this repairing strategy. Thus it is a dominant constraint. Thai grammar ranks *[phar] or *h and Max-IO, as well, higher than other constraints. Hence, all output forms of h must satisfy these constraints.

The adaptation of m

A coda m is common in Thai final syllables. This possibility may be a merit for m to be attested with many Khmer loanwords in Thai identically surfaced. However, the database revealed that such a coda in some words was not surfaced in identical form. Items in (6) illustrate this adaptation.

		Khmer		Thai		Gloss
(6)	a.	lɔm tɔn	លំទោន	lan tho:n	ลันโทม	to bend, bow down
	b.	rɔm cuol	រំជួល	ran cuan	รัญจวน	to shake, quake
	c.	kɑm plɯŋ	កំភ្លឹង	phláp phlɯŋ	พลับพลึง	kind of lily

Example (6) illustrates that the m was adapted as n (6a-b) and p (6c). Another observation is that the alternative forms are found only in two-syllable words. This does not mean that such adapting did not occur within all mono-syllable words. It may, incidentally, exist in some words of our database. This does not mean that the m was generally adapted in the context of two-syllable words more than it was in mono-syllable ones.

Additionally, a lexical of (6a) may originate from rɔɲ cuoj more than from rɔm cuoj. If so, the ɲ - n mapping is possible, since ɲ is banned in coda position in Thai. It is altered to n or j in some words (see further adaption of ɲ in 5.7). The lexical ran cuan and ram cuan are the same in meaning (Royal Institute of Thailand, 1999: 556).

In terms of segment sequence, two adjacent segments in a two-syllable word, of which one is a coda of the first syllable and another is the onset of the following one, could form a consonant cluster. This cross-syllable combination is found in (6) as mt, mc, mp in Khmer and has its correspondence in Thai as nth, nc, and pph, respectively.

Nasal harmony is often blocked by featural co-occurrence restrictions that, in general, discountenance nasality in lower-sonority segments (Cohn, 1993; Piggott, 1992 and others, cf. McCarthy, 2011: 3). Walker formalizes these restrictions in OT with the following universal fixed constraint hierarchy:

Nasalizability constraint hierarchy
*NasPlo >> *NasFric >> *NasLiq >> *NasGli >> *NasVow
(Walker, 2011: 36, cf. McCarty, 2011: 3)

The sequences from (6) may violate the *NasPlo family, which its members as *mt, *mc, *mp, *nth, and *nc.

Tableau 9

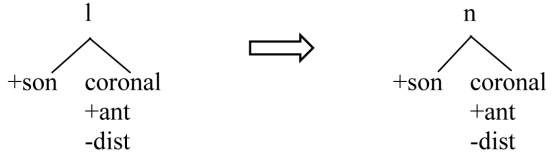
		lɔm ṭọn 'bend'	*mt	*nth	Ident-IO(f)
(a)		lam to:n	*!		
(b)	☞	lan tho:n		*	**

The adaptation of l

A coda l is banned to appear in coda position in Thai phonotactics. Consequently, it had to be adapted. Items in (7) illustrate this alternation.

		Khmer		Thai		Gloss
(7)	a.	jọl	យោល	jo:n	โยน	to swing
	b.	rɔm duol	រំដួល	lam duan	ลำดวน	Annonaceae
	c.	wil	វិល	wian	เวียน	to turn around
	d.	sɑm kɔɑl	សម្គាល់	săm khan	สำคัญ	to mark, note / important
	e.	prɑ: maəl	ប្រមើល	prà mə:n	ประเมิน	to estimate, survey

The distinctive features of the two segments are as follows:



(Rungruang. 2007: 144)

The two consonants have many identical features, [son], [cor], etc., that may be in place (Rungruang, 2007: 87, 108, 144). But the two

consonants differ in [nasal]. Thus, the alternation violated Ident-IO(f). To discuss this adaptation, two constraint interactions could be proposed, and are ranked as follows:

*l] >> IDENT-IO(F)

Tableau 10

		jo:l 'swing'	*l]	MAX-IO	IDENT-IO(F)
(a)		jo:l	*!		
(b)	☞	jo:n			*

From *Tableau 10*, *l] which bans segment l from coda position is higher ranked. (a) severely violates *l, thus it is fatal. Although (b) violates IDENT-IO(F), it is an optimal output, since it satisfies a higher-ranked constraint, *l]. Thai grammar favors featural change over deletion for the marked l in a coda position.

The adaptation of n

By and large, in coda position, the input and output of coda n is identical in both Khmer and Thai words. However, items in (8) show an alternative form of n.

		Khmer		Thai		Gloss
(8)	a.	kan kap	កាន់កាប់	kam kàp	กำกับ	to occupy
	b.	sɑn thɔɑp	សន្ធាប់	săm tháp	สำทับ	stormy / to reiterate
	c.	bɑn tə:ŋ	បន្ទើង	bam thə:ŋ	บำเทิง	entertainment

At first glance, this adaptation might appear to result from the influence of its context consonants, known as autosegment (McCarthy, 2011). As a hypothesis, the coda n in (8a) may conform to a p of the second syllable, n in (8b) conforms to p in the second syllable, and the m in (8c) may conform to b of the initial consonants of the syllable.

According to the OT perspective, these surface forms of n should arise from the conflicting constraints. The constraints appeared in the previous section. In this discussion, the member of *NASPLO should be the best to discuss.

Tableau 11

		kan kap 'occupy'	*nk, *nth, *nt	*mk, *mth	IDENT-IO(F)
(a)		kan kàp	*!		
(b)	☞	kam kàp		*	*

Two sets of constraints from one family interact. The first militates against the arising of sequence of alveolar nasal_plosive, and the second militates against the rising of sequence of labial nasal_ plosive. The first is higher-ranked. Candidate (a) violates one of this set, then is fatal. Candidate (b) satisfies the higher-ranked constraint, *nk, but violates lower-ranked constraints, *mk and IDENT-IO(F). Thus, it wins.

The adaptation of ɲ

As shown in *Table 2*, a palatal ɲ is absent in standard Thai. Consequently, it is marked in Thai phonotactics. In both syllable margins, when it is attested with Khmer loanwords in Thai, it adapts. In this section only coda position is discussed. The palatal ɲ in coda position adapted as presented in (9).

		Khmer		Thai		Gloss
(9)	a.	ʔaɲ cəːɲ	អញ្ជើញ	ʔan chəːn	อัญเชิญ	to invite
	b.	krɑː waːɲ	ក្រវាញ	krà waːn	กระวาน	cardamom
	c.	baɲ ciː	បញ្ជី	ban chiː	บัญชี	List
	d.	cɔm n̥eaːɲ	ជំនាញ	cham naːn	ชำนาญ	skillful
	e.	bɑm pɛ̤ɲ	បំពេញ	bam phen	บำเพ็ญ	to fill, complete

From (9), the segment ɲ cannot carry an independent value for dorsal. This feature is changed to coronal. The changing is subject to the violation of the faithfulness constraint, IDENT-IO(F). In other words, the nasal palatal ɲ is marked in Thai phonotactics, it undergoes some repairing strategies. Thai grammar favors featural change over deletion. It could be said that MAX-IO is higher ranked. Another markedness

constraint to prevent ɲ from occurring is *ɲ. It is a member of markedness constraint *[dor].

So far, three interacted constraints come to account: *ɲ, MAX-IO, and IDENT-IO(F). They could be ranked as follows:

*ɲ >> MAX-IO >> IDENT-IO(F)

Tableau 12

		ʔaɲ cəːɲ 'invite'	*ɲ	MAX-IO	IDENT-IO(F)
(a)		ʔaɲ cəːɲ	*!		
(b)		ʔa cəː		*!*	
(c)	☞	ʔan chəːn			*

But in other extents, ɲ in (10) has another alternation form: ɲ → j.

		Khmer		Thai		Gloss
(10)	a.	tẹaːk tẹaːɲ	ទាក់ទាញ	thák thaːj	ทักทาย	to attract
	b.	tuoɲ	ទួញ	thuaj[4]	ทวย	to moan

Tableau 13

		tẹaːk tẹaːɲ	*ɲ	MAX-IO	IDENT-IO(F)
(a)		thaːk thaːɲ	*!		*
(b)		tha thaː		*!*	
(c)	☞	thak thaːj			*

From *tableau 12* and *13*, the occurring of ɲ in Thai language violates *ɲ, a higher-ranked constraint. However, the grammar does not delete this segment, since it also violates another higher-ranked constraint, Max-IO. The best strategy is to choose a featural change, although it violates IDENT-IO(F), which is a lower-ranked constraint. Thus, ɲ is altered to n and j.

[4] The word is not generally used in present-day Thai.

The adaptation of ŋ

Final syllable ŋ is broadly used in the two languages. But in some Khmer loanwords, it was also adapted.

		Khmer		Thai		Gloss
(11)	a.	ʔɑŋ wɑ:r	អង្វរ	ʔɔ̂:n wɔ:n	อ้อนวอน	to beg, implore
	b.	dɑŋ hʊt	ដង្កឹត	chum hèt	ชุมเห็ด	kind of plant
	c.	caŋ ca:eŋ	ចាំងចែង	cà cɛ̂:ŋ	จะแจ้ง	clear, distinct

In (11), ŋ was adapted as n, m, or deletion. From the database, the alternations of ŋ are found only in di-syllable words. To account for this adaptation, the nasal harmony constraints could be the best. They are *NasPlo or *ŋc, *NasFri or *ŋh, *NasGli or *nw, *mh. The ŋ m or ŋ → n mapping violates the faithfulness constraint, Ident-IO(F).

*ŋh , *ŋc >> *mh , *nw , Ident-IO(F)

Tableau 14

		ʔɑŋ wɑ:(r) 'implore'	*ŋh , *ŋc	*mh , *nw	IDENT-IO(F)
(a)		ʔɑŋ wɑ:	*!		
(b)	☞	ʔɔ̂:n wɔ:n		*	*

The adaptation of r

In standard Khmer, a coda r was not auditorily pronounced (Phal Sok, 2004). From the database, many Khmer words end with this consonant. The adaptation of this segment is as follows:

		Khmer		Thai		Gloss
(12)	a.	ca:r	ចារ	ca:n	จาร	to inscribe

From (12), coda r in Khmer loanwords is adapted to n. This mapping violates the IDENT-IO(F). In other words, r is not allowed in coda position, it is marked. A markedness constraint *r is proposed. Thus, the interaction constraints are ranked as follows:

*r, Max-IO >> IDENT-IO(F)

Tableau 15

	ca:r 'inscribe'	*r	MAX-IO	IDENT-IO(F)
(a)	ca:r	*!		
(b)	ca:		*!	
(c) ☞	ca:n			*

Summary and conclusion

The present study investigated the adaptation of coda consonants in Khmer loanwords in Thai. The linguistic distinction between the two languages could be found from the point of coda consonants. Khmer allows 13 consonants in coda position, Thai allows 9. But from the result of this study, only 5 coda consonants, p t ʔ w j, were identical in the loanword context. The rest were adapted and can be illustrated briefly in the following table.

Table 3. Coda Simplifications in Loanwords

Coda in Khmer Loanwords in Thai			
Obstruent		Sonorant	
Input	Output	Input	Output
p	p	m	m, p
c	t	l	n
t	t	n	n, m
k	k, ʔ	ɲ	n j
h	ʔ, k, t	ŋ	ŋ, n, m, del.
ʔ	ʔ	w	w
-	-	j	j
-	-	r	n

The previous studies only addressed four, or sometimes five, segments: r, h, c, l, and ɲ. They were adapted as follows: r → n; h → t, ʔ; c → t; l → n and ɲ → n. There was not any discussion on how they were adapted other than stating that those segments are absent in coda position in Thai (Varasarin, 1984: 74-75).

This study found more alternation of some segments. The h, for example, surfaced as ʔ, k, t. Besides the number of disallowing segments in coda position in Thai, some segments that both languages allow the same in coda position were found to be adapted as shown in Table 3.

From the Optimality Theory point of view, the output form is from the result of conflicting constraints. Thus, the adaptations found in coda consonants above may not take place systematically, but they were from the conflicting of constraints. To ban the marked segments in coda position, c l ɲ r h, Thai grammar favors *c], *l], *ɲ], *r], and *h] over IDENT-IO(place). Although some segments, n n ŋ, are allowed in both languages, they are found to be adapted in some words in the context of loanwords. That is, they surfaced in both identical and adaptive forms. The adaptive form arises mostly in two-syllable words. That is from segment sequence. Thai grammar higher ranks Markedness constraints, *c], *l], *ɲ], *r], and *h] that militate against c l ɲ r and h from appearing over IDENT-IO(F). It is the result of adaptation of n n ŋ in some loanwords. Another faithfulness constraint that comes to interact is MAX-IO. The higher ranking of MAX-IO results in no segment deletion. Thai grammar prefers featural change to segment deletion.

The constraints to interact in this study could be summarized as follows:

Markedness Constraints: *[dor], *[pha], *mt, *nth, *nt, *mh, *nw, *ŋh, *ŋc *c], *l], *ɲ], *r], and *h]

Faithfulness Constraints: IDENT-IO(place), IDENT-IO(F), and MAX-IO.

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