

[t]~[s] alternation in Korean loanwords*

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Choi, Kyung-Ae. 2002. [t]~[s] alternation in Korean loanwords. *Studies in Phonetics, Phonology and Morphology*. 8-2. 289-302. The purpose of this paper is to examine the controversial phenomenon [t]~[s] alternation which appears when the lexicalized loanwords undergo nativization and analyze it in the framework of Optimality Theory. For this analysis, I preview vowel epenthesis phenomenon which is related to [t]~[s] alternation. The alternation should be explained by the consonant weakening process rather than the reanalysis of /t/ into [s] and by the interaction of the constraints OWC, Max-IO(Feature) and PAL. (**Mokwon University**)

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1. Introduction

It is generally assumed by many Korean phonologists(B.-R. Lee 2001, P.-H. Lee 1995, Oh 1996, Kang 1996, Lee et al. 1999 among others) that when a language adopts a foreign word into its vocabulary, it attempts to bring that word into conformity with its phonology, even if the attempt may be incomplete. This assumption mostly coincides with Silverman's (1992) investigation. He argues that a foreign word undergoes several steps in adoption. At first, at the perceptual level, an acoustic signal is substituted with native phonemes. Since the speakers want to keep the loanwords as close to its original form as possible at this level, the changes in the course of substitution tend to be minimal. At the operative level, native phonotactic constraints and preferences apply to the segments of the perceptual level and produce surface forms(Silverman 1992). Therefore, these two levels explain what happens in the adaptation process to the native lexicon: the source sounds are transformed into the native phonemes at the perceptual level and necessary modifications occur to fit the native syllable structure at the operative level. In other words, loanwords generally undergo two independent processes: lexicalization and nativization. The input words from a source language are evaluated by the constraint ranking specific to loanwords and the optimal outputs resulted from it are stored in the lexicon(lexicalization or adaptation process). And

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those optimal forms in the lexicon participate in the native language morpho-phonology and are evaluated by the native constraint ranking (nativization). This implies that the separate phonological component of loanwords should be stipulated aside from native phonology.

Yip(1993) argues that loanword phonology does not exist as a separate component of the grammar and that the difference between the words of a source language and borrowed words is the result of subjecting non-native inputs to the constraints that define well-formed native words. Paradis and LaCharite(1995) also insist that phonetic forms of a source language should be directly interpreted as phonological representation of the native language and stored in the lexicon. But, many Korean phonologists(B.-R. Lee 2001, P.-H. Lee 1995, Kang 1996, Lee et al. 1999, S.-C. Kim 2000 among others) who deal with the topic of loanword phonology tend to support Silverman's(1992) proposal. According to B.-R. Lee(2001:111), vowel epenthesis never happens outside the loanword adaptation process in Korean, which supports the analysis treating the adaptation and nativization processes separately.

Assuming Silverman's(1992) approach, for example, the English words *baby* and *stone* undergo the following procedure, resulting in the Korean loanwords [peibi] and [sɪ^hon], respectively(H.-S. Kang 1996).

(1) a. perceptual Level:	source language	'baby'	'stone'
	perceived level	/peipi/	/st ^h on/
b. operative level :	loanword phonology	voicing	vowel insertion
	output	[peibi]	[sɪ ^h on]

Outputs from these two levels are stored in the lexicon of the native language and operate as inputs of native phonology.

Itô and Mester(1995) discussed the phonological constraints which operate on these inputs of foreign words and native Japanese. They argue that different surface forms occur from the identical inputs in loanwords and native words, since the constraint ranking is different. The difference of ranking is due to the fact that Faithfulness Constraints of native, Sino-Japanese, assimilated foreign and unassimilated foreign words can move around among the fixed Markedness Constraints.

In this paper I will examine [t]~[s] alternation which appears when lexicalized loanwords undergo nativization such as affixation of native words and analyze it in the framework of Optimality Theory, relating to neutralization and palatalization. I will consider whether the reranking of a faithfulness constraint can explain the alternation. I will also preview vowel epenthesis phenomenon which is related to [t]~[s] alternation in loanwords.

2. [t]~[s] Alternation

2.1 Vowel epenthesis and the syllable structure

Prior to the investigation of [t]~[s] alternation, let us observe an interesting behavior of word-final obstruents in loanwords. Since the syllable structure of a source language does not always fit with that of Korean, words of a source language get the well-formed syllable structure by vowel epenthesis. The consonant clusters in a source language are shattered by the inserted vowel [ɨ], the most unmarked vowel in Korean, thus resulting in the well-formed Korean syllable structure (C)(G)V(C). Let us examine the following examples(O-M. Kang 1996)¹.

- (2) a. [p^hap^ɳ] ‘pop’ [k^həp^ɳ] ‘cup’ [kep^ɳ] ‘gap’
 [ʃut^ɳ] ‘shoot’ [net^ɳ] ‘net’
 [puk^ɳ] ‘book’ [tək^ɳ] ‘duck’
 b. [t^hi^ɳrein] ‘train’ [togɨma] ‘dogma’
 [sɨt^hi^ɳraik^ɳ] ‘strike’ [sɨk^hai] ‘sky’
 [rop^hɨ] ‘rope’ [k^hət^hɨ]² ‘cut’ [muk^hɨ] ‘mook’
 [k^həbi] ‘curb’ [pedɨ] ‘bed’ [kegɨ] ‘gag’

The epenthetic vowel [ɨ] is inserted after the syllable-final obstruents or between consonants in (2).

The problem with vowel epenthesis is that the vowel is inserted at word-final position which ends with obstruents /p, t, k/. Prevailing explanation of the epenthetic vowel depends upon No Coda Condition. It seems plausible that the epenthetic vowel appears in order to preserve the optimal unmarked syllable structure CV. However, this interpretation cannot explain why a vowel is not inserted after a sonorant consonant but only after an obstruent and why those final obstruents in (2a) do not cause the epenthetic vowel to be inserted.

Yoo(1996) explains that absence, or presence, of the epenthetic vowel depends upon the length of a vowel in a source language. That is, only when the original English word has a long vowel, the epenthetic vowel appears in the loanword; when it has a short vowel, vowel insertion does not occur. O.-M. Kang(1996), however, suggests that this interpretation should not be correct, showing the following examples, where the epenthetic vowel does not appear with an original long vowel in (3a), while it does appear with an original short vowel in (3b).

- (3) a. [kɨrup^ɳ], *[kɨrup^hɨ] ‘group’

¹ /b, d, g/ in a source language are adjusted as /p, t, k/ in the Korean lexicon, and those /p, t, k/ are voiced in the intervocalic position, being realized as [b, d, g].

² Generally, the English loanwords with a voiceless coronal stop in final position can be pronounced either with the epenthetic vowel [ɨ] or without it. For example, the English words ‘cut’ and ‘net’ are realized as [k^hət^hɨ] / [k^hət^ɳ] and [net^hɨ] / [net^ɳ], respectively.

	[ʃut ^ɿ],	*[ʃut ^{hɿ}]	‘shoot’
b.	[met ^{hɿ}]		‘mat’
	[k ^h ət ^{hɿ}]		‘cut’

Following Clements(1990) and others, P.-H. Lee(1995) insists that vowel insertion after a word-final obstruent should reflect the fact that strong consonants³ tend to appear in onset position rather than in coda. This tendency causes the occurrence of the epenthetic vowel after a word-final obstruent, which prevents a strong consonant from being in coda position. This explanation can be applied to the word-final sonorant consonant /l/ after which a vowel is never inserted, because it is natural that the weak sonorant consonant should occur in coda position.

But, more problematic fact is that the vowel is not always inserted after a word-final obstruent. Final obstruents in many Korean loanwords are pronounced as unreleased without any epenthetic vowel as illustrated in (3a) as well as (2a). The behavioral difference between onset and coda of the Korean syllable structure is that only the released obstruent can occur in onset position whereas only the unreleased obstruent is allowed in coda position(C.-W. Kim 1970, Kim-Renaud 1974, Chung 1986, Park 1990). According to H.-S. Kang(1996), vowel epenthesis occurs after a word-final obstruent, only when it is necessary that the feature [+release] of a source language should be preserved in loanwords at the perceptual level. When the original word-final obstruent of a source language is perceived as having the feature [-release], it does not violate the Korean syllable structure condition and vowel epenthesis does not occur. And [t] and [s] alternate, only when the epenthetic vowel does not exist, which will be elaborated in 2.2. This means that a native Korean speaker can perceive the feature [± release] of a source language at the perceptual level.

O.-M. Kang(1996) observed 171 Korean words which end in a stop and examined the frequency of the epenthetic vowel. The result is as follows (O.-M. Kang 1996:137):

(4)	Vowel insertion occurs	Vowel insertion does not occur	Both alternate
p	18 (60%)	10 (33%)	2 (6%)
t	35 (42%)	45 (54%)	4 (6%)
k	37 (65%)	18 (32%)	2 (3%)

In (4), the tendency of vowel insertion is stronger for the word-final /p/ and /k/ than for /t/. This implies that Korean speakers prefer the unreleased word-final stop without an epenthetic vowel for /p/ and /k/, but, in fact, they prefer vowel insertion for the word-final /t/ which is realized as an onset on the surface eventually. Since the coronal is universally unmarked (Kean 1974) and weakest in coda position(Cho 1990, Davis 1991), a vowel seems to be easily inserted after it.

³ Hooper(1976) discussed the consonant strength related to the syllable.

Rhee & Choi(2001) also tried a statistical approach to the epenthetic vowel, and suggested five important elements which affect the presence or absence of it.⁴ In fact, the appearance of the epenthetic vowel seems to depend upon many phonetic and phonological factors, which will not be discussed any further in this paper.

H.-K. Cho(1998), on the other hand, suggested that Korean loanword phonology should have multiple constraint rankings to produce multiple outputs. That is, one ranking for [k^hət^hɨ] ‘cut’ with the epenthetic vowel, and the other ranking for [k^hət^ɾ] ‘cut’ without it. This may cause a controversial problem of how many different rankings can be allowed in the native language, besides the different rankings between native words and loanwords(Itô and Mester, 1995). It should be maintained that only one way of ranking is allowed in loanword phonology in the individual language.

2.2 Unreleased word-final obstruents and [t]~[s] alternation

At first, let us examine phonological processes such as neutralization and palatalization which are related to word-final obstruents.

The word final obstruents [p^h, p], [t^h, t, c^h, c, s] and [k^h, k] in Korean native words are neutralized as unreleased stops [p^ɾ, t^ɾ, k^ɾ], respectively, as shown in (5)⁵.

- (5) a. /mulɨp^h/ [murɨp^ɾ] ‘knee’
 /sap/ [sap^ɾ] ‘shovel’
 b. /k^ɾɨ t^h/ [k^ɾɨ t^ɾ] ‘end’
 /mat (+ atɨl)/ [mat^ɾ (+ adɨl)] (→ [madadɨl]) ‘the eldest (son)’
 /k^ɾo c^h/ [k^ɾot^ɾ] ‘flower’
 /nac/ [nat^ɾ] ‘daytime’
 /nas/ [nat^ɾ] ‘sickle’
 c. /puək^h/ [puək^ɾ] ‘kitchen’
 /isak/ [isak^ɾ] ‘an ear of grain’

The neutralization process observed in (5) also applies to Korean loanwords, in so far as a native Korean speaker perceives the feature [-release]

⁴ Those five elements which affect the presence or absence of the epenthetic vowel are as follows:

- a. voicing of the obstruent
- a. the place of articulation of the obstruent
- a. the position of the obstruent in the related word and the subsequent environment
- a. tenseness of the previous vowel
- a. the total number of syllables of the word to which the obstruent belongs

These factors are also proved to affect the presence or absence of the epenthetic vowel through phonetic experiments in Lee et al.(1999).

⁵ The voiced alveolar stop [d] in a source language tends to be released in Korean loanwords, always accompanying the epenthetic vowel. (e. g. /pet/ [pedɨ] ‘bed’)

rather than [+release] of a source language at the perceptual level.

- (6) a. /sɪ^hɔp^h/ [sɪ^hɔp^ʔ] ‘stop’
 /cap/ [cap^ʔ] ‘job’
 b. /int^hənɛt^h/ [int^hənɛt^ʔ] ‘internet’
 /pisɪk^hɪt^h/ [pisɪk^hɪt^ʔ] ‘biscuit’
 c. /k^hu k^h/ [k^huk^ʔ] ‘cook’
 /hattok/ [hattok^ʔ] ‘hot dog’

As the possible Korean word-final consonants in the output are [p, t, k, l, m, n, ŋ], CodaCon can be generalized as (7) and is expected to be high ranked.

- (7) CodaCon: Only unreleased stops [p, t, k] and [l, m, n, ŋ] can be a coda consonant.

The correct outputs [kʰɪt^ʔ] in (5b) and [int^hənɛt^ʔ] in (6b) are chosen in (9) by the interaction of the constraint (7) and faithfulness constraints Max-IO(Feature) and Dep-IO(Vowel) with the same constraint ranking in (8)⁶.

- (8) CodaCon >> Dep-IO(V) >> Max-IO(F)

- (9) a. /kʰɪt^h/

	CodaCon	Dep-IO(V)	Max-IO(F)
a. kʰɪt ^h	*		
b. kʰɪt ^h ɪ		*	
c. kʰɪt ^ʔ			*

- b. /int^hənɛt^h/

	CodaCon	Dep-IO(V)	Max-IO(F)
a. int ^h ənɛt ^h	*		
b. int ^h ənɛt ^h ɪ		*	
c. int ^h ənɛt ^ʔ			*

As for the word-final sibilants [tʃ, dʒ, ʃ, ʒ, s, z]⁷ in a source language,

⁶ The features related to the faithfulness constraint, Max-IO(feature), are [place], [release] and [cont].

⁷ Since the sound system of each language is different in part, every phonetic signal of a source language is not accepted as itself in the native language. Those phonetic signals which do not exist in the native language will undergo a process of adjustment so that they can be interpreted as well-formed phonological representation in the native phonology. Consequently, the word-final obstruents [tʃ], [dʒ, ʒ, z] and [ʃ, s] in a source language are switched into the

however, they are never perceived as having the feature [-release] at the perceptual level of Korean speakers. Consequently, these sounds do not participate in the neutralization process, but cause the epenthetic vowel to be inserted as shown in (10).

- (10) /pəs/ [pəsɪ] ‘bus’ /roc/ [rodʒɪ] ‘rose’
 /tʰəcʰ/ [tʰəcʰi] ‘touch’ /eic/ [eidʒi] ‘age’
 /rəs/ [rəʃi] ‘rush’ /kerəc/ [kerədʒi] ‘garage’

This implies that it is necessary to stipulate an additional special Coda Condition for loanwords in (11) which is ranked higher than (7).

- (11) CodaCon_L: Word-final sibilants in loanwords are not neutralized.

The English loanwords /pəs/⁸ ‘bus’ and /tʰəcʰ/ ‘touch’ in (10) are realized as [pəsɪ] and [tʰəcʰi], respectively, by the following interaction of constraints, never neutralized as *[pət] and *[tʰət].

- (12) a. /bəs/ ‘bus’

	CodaCon _L	CodaCon	Dep-IO(V)	Max-IO(F)
a. pəs		*		
b. pət	*			*
c. pəsɪ			*	

- b. /tʰəcʰ/ ‘touch’

	CodaCon _L	CodaCon	Dep-IO(V)	Max-IO(F)
a. tʰəcʰ		*		
b. tʰət	*			**
c. tʰəcʰi			*	

Let us examine whether palatalization also applies to Korean loanwords. In native Korean words, palatalization occurs, when /tʰ, t/ is followed by the heteromorphemic feature [+high, -back](Choi 1991).

native phonemes [cʰ], [c] and [s], respectively, accompanying the epenthetic vowel [ɪ] for [s, z] and [i] or [u] for other sibilants, whose alternation is discussed by Oh(1992) and Choi(2002).

⁸ The native Korean word /pəs/ ‘friend’ is realized as [pət] in contrast with the English loanword [pəsɪ] ‘bus’ as shown in the following tableau.

	CodaCon	Dep-IO(V)	Max-IO(F)
a. pəs	*		
b. pət			*
c. pəsɪ		*	

- (13) a. /kat^h-i/ [kac^hi] ‘together’
 /pa t^h-i/ [pac^hi] ‘field + a subjective marker’
 b. /kut-i/ [kuci] (→ [kudʒi]) ‘firmly’
 /mat-i/ [maci] (→ [madʒi]) ‘the eldest person’

The constraint of palatalization is captured by the following.

- (14) PAL: The coronal stops share the following heteromorphemic feature [+high, -back].

The correct output [kac^hi] in (13a) is chosen by the operation of the high ranked PAL constraint as shown in (15).

- (15) /kat^h + i/

	PAL	CodaCon	Dep-IO(V)	Max-IO(F)
a. kat ^h -i	*!			
b. kat-i	*!			*
c. kac ^h -i				*

In loanwords, on the other hand, palatalization does not occur in contrast to neutralization. Let us examine the following data.

- (16) a. /int^hənet^h-i/ [int^həneʃi] ‘internet + a subjective marker’
 *[int^həneç^hi]
 b. /pisik^hit^h + i/ [pisik^hiʃi] ‘biscuit + a subjective marker’
 *[pisik^hic^hi]
 c. /ʃut^h + i/ [ʃuʃi] ‘shoot + a subjective marker’
 *[ʃuc^hi]

We expect that the consonant [t^h] in [pisik^hit^h + i] is not in word-final position any more⁹ and will be palatalized into [ç^h] followed by the high front vowel [i] in (16a). In general, however, Korean native speakers do not pronounce the word with [ç^h] but with [ʃ]. In fact, palatalization does not occur in the process of nativization of loanwords¹⁰.

As mentioned before, Itô and Mester(1995) discussed the phonological constraints which operate on the inputs of foreign words and native Japanese. They argue that different surface forms occur from the identical inputs in loanwords and native words, since the constraint ranking is different. The difference of ranking is due to the fact that Faithfulness

⁹ The case marker in Korean is regarded as a kind of clitics and forms a phonological word with the word or the morpheme to which it is attached.

¹⁰ [t]~[s] alternation occurs, when [t] is followed by [e] as well as [i] in loanwords.(e.g. /ʃut^h + i/ → [ʃuʃi] ‘shoot’ + subjective, /ʃut^h + e/ → [ʃuse] ‘shoot’ + locative)

Constraints of native, Sino Japanese, assimilated foreign and unassimilated foreign words can move around among the fixed Markedness Constraints.

Let us examine whether a correct output can be chosen, when a faithfulness constraint is ranked in different ways. The two possible rankings are given in (17). Since CodaCon and Dep-IO(V) do not operate here at all, those constraints are omitted.

- (17) a. PAL >> Max-IO(F)
b. Max-IO(F) >> PAL

The tableaux in (18)-(19) are enforced by those rankings in (17), respectively.

- (18) /int^hənet^h + i/

	PAL	Max-IO(F)
a. int ^h ənet ^h - i	*!	
b. int ^h ənet- i	*!	*
⇒c. int ^h ənec ^h - i		*
d. int ^h ənec- i		**!
e. int ^h ənes- i	*!	*

- (19) /int^hənet^h + i/

	Max-IO(F)	PAL
⇒a. int ^h ənet ^h - i		*
b. int ^h ənet- i	*	*
c. int ^h ənec ^h - i	*	*
d. int ^h ənec- i	**!	*
e. int ^h ənes- i	*	*

In (18)-(19), the correct output [int^hənef*i*] is never chosen, and [t]~[s] alternation in word-final position of Korean loanwords can not be explained by any adjustment of ranking.

S.-C. Kim(2000) tried to explain [t]~[s] alternation by neutralization. He insists that the second /t^h/ in /int^hənet^h-i/ be neutralized into [t], and resyllabified as /in.t^hə.ne.ti/, and then, the neutralized syllable-initial [t] become [s]. This analysis, however, does not seem to be plausible, because neutralization never occurs in word-medial position in Korean, and moreover, he does not explain why the syllable-initial [t] becomes [s].

According to H.-S. Kang(1999), [t]~[s] alternation is due to a nominal morpheme structure condition (20).

- (20) Morpheme Structure Constraint
*t]_{noun}: Nominal stems may not end with [t].

She suggests that the constraint (20) should be high ranked to optimize the lexicon, producing the lexicalized form /int^hənes/. This implies that there are no nouns which end in [t] in Korean and that all the English loanwords which end in /t/ in a source language are lexicalized as ending with /s/ in the Korean lexicon. In fact, however, there exist Korean native words ending in /t/ which is palatalized before a heteromorphemic high front vowel, although they are rare, as shown in (21). Besides, it is strange that the most unmarked coronal stop [t] is prohibited only at the nominal stem-final position. This observation weakens the justification of the constraint (20).

- (21) /mit/ ‘anus’
 /mat/ ‘the eldest person’
 /nat(-al)/ ‘grain’

Lee et al.(1999) also suggested the analysis which is analogous to H.-S. Kang’s(1999), although they did not establish any constraint such as (20). They insist that the input /ʃut^h + i/ in (16c) should be /ʃut-i/ and that the word-final /t/ should change into /s/ through the productive process where coronal consonants are reanalyzed into /s/. But, they did not explain why /t^h/ should be lexicalized as /t/, even when it is followed by a vowel.

This process of reanalysis also seems to be due to their observation that Korean native nouns which end in a word-final [t] do not exist. As shown in (21), however, not only the native nouns with the final [t] exist, but also Korean native verbal stem and adverbs with the final [t] frequently appear. Consequently, the fact that /t/ does not appear in word-final position of Korean nouns does not seem to be enough to justify the reanalysis of /t/ into /s/.

Moreover, according to Lee et al.(1999), another voiceless coronal obstruent /c^h/ in loanwords is expected to be reanalyzed into /s/, but it is always realized as [c^h] followed by the epenthetic vowel [i], as shown in (22).

- (22) [t^həc^hi] ‘touch’
 [p^hənc^hi] ‘punch’
 [k^hec^hi] ‘catch’

Furthermore, a clue to the reanalysis seems to be found in the following phenomenon observed in native Korean words.

- (23) a. /pat^h + i copta/ [pac^hi copt’a] ~ [paʃi copt’a]
 ‘The field (a subjective marker) is narrow’
 b. /k’oc^h + i arimtapta/ [k’oc^hi arimdapt’a] ~ [k’oʃi arimdapt’a]
 ‘The flower (a subjective marker) is beautiful.’

The expected outputs in (23a) and (23b) are [pac^hi copt'a] and [k'oc^hi arimɔapt'a], where palatalization and liaison occur, respectively. But, many Korean speakers actually pronounce them as [paʃi copt'a] and [k'oʃi arimɔapt'a]. In fact, all of the words with final /-t^h/ and /-c^h/ do not have dual pronunciations like (23). And the dual pronunciations are often found even in one speaker. Therefore, the unexpected outputs [paʃi copt'a] and [k'oʃi arimɔapt'a] should not be regarded as a result of reanalysis but just a result of misanalysis.

These observations make us hesitate to accept the suggestion of reanalysis. Rather, [t]~[s] alternation should be analyzed as a consonant weakening process.

Thus, the following constraint is necessary for the weakening process of /t/ into [s].

(24) Obstruent weakening constraint(OWC):

The word-final coronal stop is weakened into a fricative before a vowel-initial suffix.

This constraint is ranked high only in loanword phonology and makes /t^h/ become a fricative [s] before a vowel. And PAL is low ranked in loanword phonology, while it is high ranked in native phonology. /int^hənet^h + i/ and /ʃut^h + i/ in (16) are pronounced as [int^həneʃi] and [ʃuʃi], respectively, as shown in (25), in contrast to the native word /kat^h + i/ in (15).

(25) a. /int^hənet^h + i/

	OWC	Max-IO(F)	PLT
a. int ^h ənet ^h - i	*		*
b. int ^h ənət- i	*	*	*
c. int ^h ənec ^h - i	*	*	
d. int ^h ənec- i	*	**	
e. int ^h ənes- i		*	*

b. /ʃut^h + i/

	OWC	Max-IO(F)	PLT
a. ʃut ^h - i	*		*
b. ʃut + i	*	*	*
c. ʃuc ^h + i	*	*	
d. ʃuc + i	*	**	
e. ʃus + i		*	*

The interaction between the high ranked OWC and the low ranked Max-IO(F) and PAL contribute to choosing the correct output [int^həneʃi] and [ʃuʃi] in (25), while the isolated form /int^hənet^h / is never affected by OWC which operate only before a vowel, as shown in (26).

(26) /int^hənet^h/

	CodaCon	Dep-IO(V)	OWC	Max-IO(F)	PLT
a. int ^h ənet ^h	*				*
b. int ^h ənet				*	*
c. int ^h ənec ^h	*			*	
d. int ^h ənec	*			**	
e. int ^h ənes	*			*	*

3. Conclusion

I have examined the vowel epenthesis in word-final position of Korean loanwords and [t]~[s] alternation which appears in the process of nativization when the vowel epenthesis does not occur. Examining previous analyses, I found that the alternation should be explained by the consonant weakening process rather than the reanalysis of /t/ into [s] and tried to analyze it in the framework of the Optimality Theory, relating to neutralization and palatalization. Correct outputs for loanwords can be chosen through the interaction of CodaCon, CodaCon_L, OWC, Max-IO(F) and PAL. The obstruent weakening process where /t/ changes into [s] is frequently observed in historical changes in Korean. This implies that weakening of /t/ into [s] is an active phonological process in Korean and may explain the alternation in (23), even though a further study is required.

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