

## Output-oriented *t* and *s* in English loanwords in Korean\*

Soonhyun Hong  
(Inha University)

**Hong, Soonhyun. 2001. Output-oriented *t* and *s* in English loanwords in Korean.** *Studies in Phonetics, Phonology and Morphology* 7.1, 243-263. When English words are borrowed into Korean, native suffixal elements are concatenated and as a result, the resulting surface string consists of a loanword followed by a native suffix, e.g. [syup<sup>h</sup>əmak<sup>h</sup>es-e] ‘supermarket-at’. English word-final [t] before a vowel-initial suffix surfaces as [s]. On the other hand, English word-final [s] blindly surfaces as [si], e.g. [k<sup>h</sup>isi] ‘kiss’ and [k<sup>h</sup>isi-e] ‘kiss-at’, in the loanwords regardless of a following suffix. In the surface-oriented Optimality Theory, Kang 1999 proposes that the loanword and native portions of the string are not processed or evaluated simultaneously and serial derivation or multiple levels should be considered for the analysis. However, we will demonstrate that the “surface-level only” Optimality Theory can explain how the [t] and [s] of input English words are realized in the output loanwords, while keeping the original parallelism and “surface-level-only” concepts of Optimality Theory. (Inha University)

Keywords: loanwords, *s*-Neutralization, Delaryngealization, vowel insertion

### 1. Coda Neutralization and English [s] and [t] in loanwords

In Native Korean (hereafter, NK), there is Coda Neutralization (hereafter, CN) phenomenon, in which all labial and velar stops change to homorganic plain stops (/p, p', p<sup>h</sup>/->[p] and /k, k', k<sup>h</sup>/->[k]) and all coronal obstruents to [t] (/t, t', t<sup>h</sup>, s, s', c, c', c<sup>h</sup>/->[t]), in coda position.

- |                            |                                  |              |
|----------------------------|----------------------------------|--------------|
| (1) a. /pat <sup>h</sup> / |                                  | ‘rice field’ |
| citation                   | pat                              |              |
| accusative                 | pat <sup>h</sup> -il (or pas-il) |              |
| b. /nac/                   |                                  | ‘day’        |
| citation                   | nat                              |              |
| ‘day-at’                   | nac-e                            |              |
| c. /nas/                   |                                  | ‘scythe’     |
| citation                   | nat                              |              |
| accusative                 | nas-il                           |              |

---

\*“This work was supported by INHA UNIVERSITY Research Grant.” (INHA-21399) I would like to thank anonymous reviewers for their insightful suggestions and comments, though all errors are mine.



c. tip	[tɪp]	(English)
citation	t <sup>h</sup> ip	
accusative	t <sup>h</sup> ip-il	
'tip-also'	t <sup>h</sup> ip-t'o	

The adopted [p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup>] from English [p, t, k] are subject to CN, losing [lar], as citation forms in (4) show. We further observe that the neutralized [p, k] in word-final position except for neutralized [t], surface even when a vowel-initial native suffix follows the stop-final English word. We will call this phenomenon "Word-final Delaryngealization." English word-final [t] surfaces as [s] when followed by a native vowel-initial suffix, as shown in the 'pet-also' form in (4b). This also conforms to Word-Final Delaryngealization. Note in the examples above that we limit ourselves to the surface forms borrowed recently. For example, [k<sup>h</sup>it] (not [k<sup>h</sup>it<sup>h</sup>i]) is the standard surface form which shows lack of insertion of an unmarked vowel after a postvocalic obstruent stop in word-final position<sup>2</sup> (Korean Ministry of Education 1986). We observed that [t] in English words is adopted as [t<sup>h</sup>] in the corresponding loanwords, though the adopted [t<sup>h</sup>] strictly respects undominated NOCODA([lar]) on the surface.

Meanwhile, English word-final postvocalic [t] is adopted as [s] in Korean when followed by a native vowel-initial suffix, as shown in (4b) above and in (6) below, still satisfying NOCODA([lar]):

## (5) Prevocalic [t] in English

a. time [taɪm]	t <sup>h</sup> aim	
b. tape [teɪp]	t <sup>h</sup> eip (or t <sup>h</sup> eip <sup>h</sup> )	

## (6) Word-final [t] in English

a. shoot [ʃu:t]		
citation	syut	'shoot'
nominative	syus-i	
accusative	syus-il	
'shoot-at'	syus-e	
'shoot-also'	syut-t'o	
'shoot-and'	syut-k'wa	
b. supermarket [supəməɹkɪt]		
citation	syup <sup>h</sup> əmak <sup>h</sup> et	'supermarket'
nominative	syup <sup>h</sup> əmak <sup>h</sup> es-i	
accusative	syup <sup>h</sup> əmak <sup>h</sup> es-il	
'supermarket-at'	syup <sup>h</sup> əmak <sup>h</sup> es-e	
'supermarket-also'	syup <sup>h</sup> əmak <sup>h</sup> et-t'o	
'supermarket-and'	syup <sup>h</sup> əmak <sup>h</sup> et-k'wa	
c. net [net]		
citation	net	'net'

<sup>2</sup>Note that [i] is inserted after a postconsonantal stop in word-final position:  
mask [ma:sk]      masik<sup>h</sup>i

nominative	nes-i
accusative	nes-il
'net-also'	net-t'ŏ

We will also try to explain why English word-final [t] is realized as [s] in the corresponding loanword in Korean when followed by a vowel-initial native suffix. Crucially note that by “loanwords” in this paper, we mean those English words borrowed quite recently and currently being borrowed into Korean by those Korean people who have some knowledge of the English language. The borrowing of a lot more English words is still in progress. Given this situation, we assume in this paper that those Korean borrowers are somewhat familiar with the pronunciation of the original English words.

## 2. Kang's 1996, 1999, 2000 analysis

Kang 1996, 1999 argues that Korean syllable structure plays a crucial role when an English word is borrowed into Korean. Following Steriade 1991, she proposes the following constraints:

### (7) Constraints

- a. CODACONDITION(CODACON): Only /p, t, k, l, m, n, ŋ/ are allowed as codas in Korean.
- b. MAX(A<sub>f</sub>): The aperture degree in the input should appear as such in the output.
- c. DEP(V): A vocalic segment in the output should be dependent on the vocalic segment in the input.
- d. NOCODA: Syllables are open.
- e. Constraint Ranking (foreign):  
CODACON >> MAX (A<sub>f</sub>) >> DEP (V) >> NOCODA

First of all, Kang's analysis is based on the following assumptions:

### (8) Assumptions in Kang 1999

- a. Foreign words are borrowed into Korean with the phonotactic constraints of the foreign ranking.
- b. The outputs selected are stored in the lexicon as a lexical base and affixation of native morphemes occurs on these bases.

(8a) assumes that constraint reranking captures parametric differences across the sublexica including native and foreign sublexica. On the other hand, (8b) crucially assumes two separate levels of constraint rankings for evaluation of foreign borrowings. Namely, when a foreign word is borrowed, it is subject to the foreign constraint ranking within the loanword sublexicon. All foreign word-specific phonotactic constraints are

uniquely encoded in the foreign constraint ranking. Then, lexicon optimization takes place and the optimal input form is redefined within the sublexicon. After this stage, the optimized foreign output will have been redefined as a lexical base, which in turn is ready to act as input to the native affixation process to the lexical base and becomes subject to the constraints of unique native ranking for surface realization.

- (9) Lexicalization of foreign words and Nativization  
 Foreign words -> Output -> Lexicalization -> Affixation  
 Foreign Ranking Native Ranking  
 (including foreign word-specific phonotactic constraints)

(10) /bəs/ -> [pəsi]

a. Foreign Ranking

bəs A <sub>f</sub>	CODA CON	MAX (A <sub>f</sub> )	DEP(V)	NOCODA
pəs.	*!			*
pət.		*!		*
pə.si.			*	

b. After lexicon optimization:

Lexical base incorporated into the native sublexicon: /pəsi/

c. Native Ranking

/pəsi/-subject	CODA CON	DEP(V)	ONSET
pə.si.-i			*!
pə.si.-ka			

Note in the tableau in (10c) that Kang 1999 assumes for simplicity that nominative *-ka* is added when a preceding noun stem ends in a vowel while nominative *-i* is when a preceding noun stem ends in a consonant. (10a) shows that the fully syllabified *pə.sɪ.* is selected to be optimal through foreign word-specific ranking. And then through lexicon optimization, /pəsi/ is stabilized to be the lexical base ready to act as input for the native ranking in the process of native affixation.

The problem in Kang 1999's approach is that she has to assume two distinct levels of evaluation as shown in (9) and this serialism directly runs against the basic conception of parallelism in Optimality Theory. Namely, her assumption appeals to serial derivation: Output before Lexicalization becomes an input for evaluation via native constraint ranking. Another problem is that the intermediate output before Lexicalization in (9) crucially assumes intermediate syllabification, which may not necessarily

be realized on the surface.

### 3. Loanword-specific phonotactic constraints

First of all, we assume the Correspondence Theory Model (McCarthy & Prince 1995, Benua 1995 in this paper). There is a phonotactic constraint which is specific only to loanwords and Sino-Korean words, excluding native words. Native words can end in an aspirated stop when followed by a vowel-initial suffix as in (11a) whereas loanwords and Sino-Korean words cannot as in (11b) and (11c). In loanwords and Sino-Korean words, there is no word ending in a laryngeal consonant. Note below that “[” indicates the right edge of a word:

(11) (Lack of) [lar] in word-final position in Korean sublexica

a. Native Korean words		
pat <sup>h</sup> ]	pat.]	citation
pat <sup>h</sup> ]-il	pa.t <sup>h</sup> ]-il.	‘rice field-Acc’
b. Loanwords from English		
kik]	k <sup>h</sup> ik.]	citation
kik]-i	k <sup>h</sup> i.k]-i.	‘kick-Nom’
c. Sino-Korean words		
c <sup>h</sup> we-cək]	c <sup>h</sup> we.-cək.]	‘optimal’
cək-im]	cək.im.]	‘qualified’

In (11a), [t<sup>h</sup>] is realized in native word-final position when syllabified in onset position. In (11b) and (11c), however, an aspirated stop is never realized in loanword- or Sino-Korean word-final position. This suggests that there exists a following phonotactic constraint in loanwords:

(12) No-WFINAL([lar])  
[lar] is not allowed in word-final position.

This constraint is always respected in loanwords (and also in Sino-Korean words) and we assume that it is undominated in the loanword sublexicon.

In addition, consider the following native words and loanwords:

(13) Native word-final /t/		
/pat <sup>h</sup> /		‘forest’
a. citation	pat.	
b. accusative	pa.t <sup>h</sup> -il. (or pas-il)	
(14) Loanword-final /t/		
a. shoot [ʃut]		
citation	syut.	‘shoot’
nominative	syu.s-i.	
accusative	syu.s-il.	

‘shoot-at’	syu.s-e.	
‘shoot-also’	syut.-t’o.	
‘shoot-and’	syut.-k’wa.	
b. supermarket [syupəma:kit]		
citation	syu.p <sup>h</sup> ə.ma.k <sup>h</sup> et.	‘supermarket’
nominative	syu.p <sup>h</sup> ə.ma.k <sup>h</sup> e.s-i.	
accusative	syu.p <sup>h</sup> ə.ma.k <sup>h</sup> e.s-il.	
‘supermarket-at’	syu.p <sup>h</sup> ə.ma.k <sup>h</sup> e.s-e.	
‘supermarket-also’	syu.p <sup>h</sup> ə.ma.k <sup>h</sup> et.-t’o.	
‘supermarket-and’	syu.p <sup>h</sup> ə.ma.k <sup>h</sup> et.-k’wa.	
c. net [net]		
citation	net.	‘net’
nominative	ne.s-i.	
accusative	ne.s-il.	
‘net-also’	net.-t’o.	

The native data in (13) show that native word-final aspirated /t<sup>h</sup>/ is coda-neutralized to [t] in coda (13a) whereas it surfaces as [t<sup>h</sup>] when it is followed by a vowel-initial suffix and is syllabified in onset. However, English word-final [t] is realized as [t] in coda in the corresponding loanword whereas it is realized as [s], when it is followed by a vowel-initial suffix and hence is syllabified in onset(*s-Neutralization*)(Oh 1994 and others).

Based on this observation, Kang 1999, 2000 proposes the following constraint, which we are adopting in this paper:

- (15) NO-WFINAL(t)  
<sup>\*</sup>t]<sub>w</sub>  
*t* is not allowed in loanword-final position

NO-WFINAL(t) is satisfied when an input loanword-final [t] is syllabified in onset to be realized as [s] instead of [t], when followed by a vowel-initial native suffix, as shown in (14). However, it is violated when an input loanword-final [t] is syllabified in coda when followed by no native suffix or by a consonant-initial native suffix. Therefore, we assume the following constraint ranking:

- (16) Constraint ranking in loanwords  
 NOCODA([LAR])/([sib]) >> NO-WFINAL(t)

Later in this paper, we will show how these two constraints conspire with other constraints to prevent the input English word-final *t* followed by a vowel-initial native suffix from surfacing in the corresponding loanword.

#### 4. Observations and constraints in the loanword phonology

Preconsonantal [s] in English words is adopted as [si] in the corresponding loanwords with unmarked [i] inserted after it:

- (17) Preconsonantal [s] in English loanwords
- |                   |                        |
|-------------------|------------------------|
| a. mask [mask]    | masik <sup>h</sup> i   |
| b. spy [spaɪ]     | sip <sup>h</sup> ai    |
| c. strip [stri:p] | sit <sup>h</sup> i:rip |
| d. smile [smaɪl]  | simail                 |

On the other hand, prevocalic [s] in English words surfaces in the corresponding loanword whereas English word-final [s] is adopted as [si] with unmarked vowel [i] inserted in the corresponding loanword:

- (18) Prevocalic [s] in English words
- |                  |   |
|------------------|---|
| a. set [set]     | set (or set <sup>h</sup> i <sup>3</sup> ) |
| b. sirup [sirəp] | sirəp, *sirəp <sup>h</sup> i              |
- (19) Word-final [s] in English words
- |               |  |
|---------------|--|
| a. bus [bəs]  | pəsi, *pət, *pəs   |
| b. kiss [kɪs] | k <sup>h</sup> isi, *k <sup>h</sup> it, *k <sup>h</sup> is |

In the loanword phonology, the violation of undominated NOCODA([sib]) is always avoided by insertion of an unmarked vowel, [i], after [s]. Actually all the word-final sibilants in English words are always realized as sibilants in the corresponding loanwords and should always be followed by an inserted vowel [i] or [i]<sup>4</sup>, regardless of a following suffix, if any:

- (20) bus [bəs]
- |            |          |
|------------|----------|
| citation   | pəsi     |
| nominative | pəsi-ka  |
| accusative | pəsi-lil |
| 'bus-also' | pəsi-to  |
- (21) bench [bentʃ]
- |             |            |
|-------------|------------|
| citation    | bentʃi     |
| nominative  | bentʃi-ka  |
| accusative  | bentʃi-lil |
| 'kiss-also' | bentʃi-to  |
- (22) edge [edʒ]
- |          |             |
|----------|-------------|
| citation | eci or etci |
|----------|-------------|

<sup>3</sup>In this paper, we are going to focus ourselves on the data in which the postvocalic word-final [t] in the English words is syllabified in coda and is realized as [t] in the corresponding loanwords. These data are treated as more standard in Korean grammar schools and more popular in everyday speech.

<sup>4</sup>It is not clear why the inserted unmarked vowel is [i] after loanword-final s whereas it is [i] after loanword-final affricates. We leave this question for future study.

	nominative	eci-ka
	accusative	eci-lil
	'kiss-also'	eci-to
(23)	judge [dʒədʒ]	
	citation	cæci or cətci
	nominative	cæci-ka
	accusative	cæci-lil
	'kiss-also'	cæci-to

According to the data above, the prevocalic sibilant in the English word, namely the sibilant which is followed by a vowel within the same English word, is realized as sibilant in the corresponding loanword, as in *judge* [dʒədʒ] -> cæci(citation form) in (23). On the other hand, all the data above show that English word-final sibilants are realized as sibilants in the loanwords and unmarked vowel insertion always takes place after the sibilants: sibilant-V]<sub>w</sub>. Such post-sibilant vowel insertion in loanword-final position takes place regardless of whether the loanword-final sibilant is followed by a vowel-initial or consonant-initial native suffix and as a result, the final [sib] in the input English words in question is retained in the corresponding output loanwords.

Native word-final sibilants exactly pattern the same way, as shown in (24).

(24)	Native Korean words		
	a. /mas/		
	citation	mat	'taste'
	nominative	mas-i	
	accusative	mas-il	
	'taste-also'	mat-t'o	
	b. /cæc/		
	citation	cət	'milk'
	nominative	cæc-i	
	accusative	cæc-il	
	'milk-also'	cət-t'o	

In (24), native word-final sibilants on the surface are always followed by a vowel. Hence, we propose that word-final sibilants should be licensed by a following vowel. In other words, surface sibilants in Korean in general should always be followed by a vowel on the surface whether the following vowel is an inserted vowel or a suffix-initial vowel.

However, word-final sibilants behave somewhat differently in the loanwords and native words, as follows. Namely, loanword-final sibilants have to be licensed by a vowel, whether inserted or pre-existing, within the same word as in (25) below. The native word-final sibilants, however, can be licensed either by a following suffix-initial vowel across a word

boundary as in (26a) and (26b) or by a pre-existing vowel within the same word as in (26c) and (26d).

## (25) Sibilants in loanwords

a. citation	pəsi]	(20)	(English <i>bus</i> )
b. nominative	pəsi]-ka		
c. citation	bentʃi]	(21)	(English <i>bench</i> )
d. nominative	bentʃi]-ka		
e. citation	č <sup>h</sup> ansi]		(English <i>chance</i> )
f. citation	soŋ]		(English <i>song</i> )

## (26) Sibilants in native words

a. nominative	mas]-i	(24a)	(Native /mas/)
b. nominative	cəc]-i	(24b)	
c. citation	so]		‘cow’
d. citation	ca]		‘car’

From this observation, we can derive a generalization for the loanword-final sibilants: a loanword-final sibilant and a following vowel belong to the same word whether the following vowel is an inserted one or not. Note, however, that this generalization does not necessarily hold in the native Korean words.

Hence, we propose the following undominated constraint, which is specific to the loanwords:

(27) SAMEWD(SIB-V) (undominated)<sup>5</sup>

A sibilant in the input should be followed(or licensed) by a following vowel within the same word in the output.

Note, however, that English word-final *t* is realized as [s] in the corresponding loanword when followed by a vowel-initial native suffix across the word boundary:

(28) English	net
citation	net]
nominative	nes]-i

<sup>5</sup>In the case of non-sibilants, it seems that English fricative non-sibilants also surface in the loanwords:

bath[ə]	pesi
th[ə]eater	siet <sup>h</sup> ə

Though we are trying to focus English [t] and [s] in this paper, if they are considered, we will have to replace [sib] with perhaps [cont] or some other feature to generalize that all English fricatives are realized as either [s] or [c] and at the same time a vowel follows them within the same word, in the loanwords. We will leave this for future study and we will stick to the [sib] feature to focus only on how the input English segments [s] and [t] are realized in the loanwords in Korean.

accusative            nes]-il

In this case, the (output) loanword-final [s] before nominative *-i* or accusative *-il* across the word boundary was originally [t] in the corresponding English word. Namely, the output loanword-final [s] in the nominative and accusative forms (namely, output [s]) is the result of the phonological change from [t] in the English word input and hence the output sequence *s/-V* does not violate the input-to-output correspondence constraint SAMEWD(SIB-V).

There is one more observation in conjunction with the sibilants in the loanwords. As English sibilants are licensed by a following vowel, inserted or pre-existing, within the same word in the output loanwords, they are always realized in the output loanword as the result of the licensing, as shown in the sibilant data from (20) to (23). Hence we can think of the following constraint:

- (29) MAX-IO([sib]) (undominated)  
[sib] in the input has a correspondence in the output.

Since both SAMEWD(SIB-V) and MAX-IO([sib]) are never violated in the output loanwords, we assume that they are undominated in the loanword sublexicon. Note that MAX-IO([sib]) is undominated in the loanwords whereas it is perhaps ranked relatively very low in the native Korean words (see (3) for the relative ranking status of the constraint in native Korean words).

Now, consider the following loanwords:

- (30) Loanwords with [i] inserted
- |                  |                      |
|------------------|----------------------|
| a. mask [mask]   | masik <sup>h</sup> i |
| b. spy [spaɪ]    | sip <sup>h</sup> ai  |
| c. dance [dæns]  | tensi                |
| d. bench [bentʃ] | penci                |

We observe that the syllable formed by the inserted vowel is always open. However, this observation might not be always correct in the following data, in which an inserted vowel is followed by a prevocalic lateral or syllabic consonant “C<sub>1</sub>”:

- (31) The syllable in question is closed.
- |   |                                     |
|---|-------------------------------------|
| a. Inserted [i] is followed by a prevocalic lateral:    |                                     |
| clone [kloun]   | k <sup>h</sup> illon                |
| plus [pləs]   | p <sup>h</sup> illəs                |
| floppy [flɒpi]  | p <sup>h</sup> illop <sup>h</sup> i |
| block [blɒk]  | pillok, *pillok <sup>h</sup> i      |
| b. Inserted [i] is followed by a word-final syllabic C: |                                     |

film [film <sub>l</sub> ]	p <sup>h</sup> illim, *p <sup>h</sup> illim
prizm [prizm <sub>l</sub> ]	p <sup>h</sup> iricim, *p <sup>h</sup> iricimi
shamanism [ʃa:mənizm <sub>l</sub> ]	syamanicim, *syamanicimi
cycle [saikl <sub>l</sub> ]	saik <sup>h</sup> il

When the inserted vowel is followed by a prevocalic [l] as in (31a), the syllable formed by the inserted vowel prefers to be closed by geminate [ll]. According to the data in (31b), on the other hand, when the inserted vowel is followed by a word-final syllabic consonant “C<sub>l</sub>”, the syllable formed by the inserted vowel prefers to be closed. Here in this paper, we assume without further discussion that English [l] and an English syllabic consonant are directly mapped to [ll] and [iC], respectively, in the loanwords just as [t] in the English words is mapped to [t<sup>h</sup>] in the corresponding loanwords. We will leave this mapping process for future study. Hence we can generalize that except for the two types in (31), the inserted vowel forms an open syllable on the surface.

Based on this generalization, we propose the following constraint in conjunction with the inserted vowel:

## (32) ALIGN-R(V, σ)

The unmarked vowel (i.e. inserted unmarked [ɨ] or [i]) should be right-aligned with a syllable.

This constraint ensures that the syllable formed by an unmarked inserted vowel is open. Due to its inviolable nature in the loanwords as assumed previously, the constraint is undominated. Note that the data in (31) do not violate ALIGN-R(V, σ) under our assumption that English [l] and English syllabic consonants are directly mapped to [ll] and [iC], respectively, in the loanwords.

We additionally propose the following two constraints to penalize the insertion of an unmarked vowel and the deletion of a consonant in the output.

## (33) DEP-IO(V)

A vowel in the output should have a correspondent in the input.

## (34) MAX-IO(C)

A consonant in the input should have a correspondent in the output.

We note that the maximum syllable in Korean is CGVC, and complex onset or complex coda is strictly disallowed:

(35) a. citation form:	[talk]	tak]	‘chicken’
b. nominative:	[talk]-i	talk]-i	
c. accusative:	[talk]-il	talk]-il	

- d. ‘chicken-and’ [talk]-kwa tak]-k’wa
- e. ‘chicken-also’ [talk]-to tak]-t’o

(36) NOCOMPLEX(undominated)  
 Avoid complex onset or coda: \*<sub>o</sub> [CC, \*CC]<sub>o</sub>

Hence, we assume that NOCOMPLEX is undominated in Korean.  
 We propose the following overall constraint ranking for the loanwords in Korean:

(37) Constraint Ranking in the loanwords  
 NOCODA([lar])/([sib]), NOCOMPLEX, SAMEWD(SIB-V),  
 MAX-IO([sib]), NO-WFINAL([lar]), ALIGN-R(V, σ), MAX-IO(C)  
 >> DEP-IO(V)  
 >> NO-WFINAL(t)

**5. Constraint evaluation in loanwords and suffixed loanwords**

Now, consider the following loanwords:

- (38) Preconsonantal input *s* with [i] inserted
- a. mask [mask]  
 citation masak<sup>h</sup>i
  - b. spy [spar]  
 citation sip<sup>h</sup>ai

The *s* in the loanwords in (38) is followed by a consonant. The following two tableaux in (39) and (40) demonstrate how the correct output is predicted:

(39) mask [mask]                      masak<sup>h</sup>i

[mask]	NO CODA ([sib])	SAMEWD (SIB-V)	MAX-IO([sib])	NO-WFINAL ([lar])	ALIGN-R(V, σ)	MAX-IO(C)	DEP-IO(V)
a. ma.sik.]					*!		*
b. ma.si.k <sup>h</sup> i.]							**
c. mas.k <sup>h</sup> i.]	*!						*
d. mat.k <sup>h</sup> i.]			*!				*
e. mak.]						*!	

Candidate (39a) receives a fatal violation mark for higher ranked ALIGN-R(V, σ) since the inserted vowel does not close a syllable. Candidate (39b) receives two violation marks for lower ranked DEP-IO(V). Candidate (39c) fatally violates undominated NOCODA([sib]) due to the [sib] in coda. Candidate (39d) is eliminated due to fatal violation of MAX-IO([sib]). This

is because the surface [t] has lost the [sib] of the input. In candidate (39e), MAX-IO(C) is fatally violated due to deletion of the input segment *s*. Hence, candidate (39b) is correctly chosen to be optimal.

(40) spy [spai] sip<sup>h</sup>ai (from (37b))

[spai]	NO COMPLEX	SAMEWD (SIB-V)	MAX- IO([sib])	ALIGN- R(V, σ)	MAX- IO(C)	DEP- IO(V)
a. sp <sup>h</sup> a.i	*!					
b. <sup>i</sup> si.p <sup>h</sup> a.i						*

Candidate (40b) with unmarked [i] inserted after [s] is chosen to be optimal. Violation of undominated NOCOMPLEX eliminates candidate (40a).

English word-final *s* surfaces in the corresponding output loanword with [i]-insertion in word-final position. In the following tableau, we assume the native morphological rule that a word ending in a vowel is concatenated with a consonant-initial nominative marker *-ka* whereas a word ending in a consonant is with a vowel-initial nominative marker *-i*:

(41) bus [bəs]

citation  
nominative

pəsi  
pəsi-ka

[bəs]	NO CODA ([sib])	SAME WD (SIB-V)	MAX- IO ([sib])	ALIGN- R (V, σ)	MAX- IO(C)	DEP- IO(V)	NO- WF <sub>FINAL</sub> (t)
a. pəs.]	*!						
b. pət.]			*!				*
c. <sup>i</sup> pəsi.]						*	
a. pəs]-i.		*!					
b. pət]-i.			*!				*
c. <sup>i</sup> pəsi]-ka.						*	

In the first tableau in (41), candidate (a) fatally violates NOCODA([sib]) due to the [sib] in coda. Fatal violation of MAX-IO([sib]) eliminates candidate (b) since the coda-syllabified [t] in the output has lost the [sib] feature in the input. Hence, candidate (c), which violates lower ranked DEP-IO(V), is correctly predicted to be optimal. In the second tableau in (41), candidates (a) and (b) receive a fatal violation mark for higher ranked SAMEWD(SIB-V) and MAX-IO([sib]), respectively. However, candidate (c) violates only lower ranked DEP-IO(V) as an unmarked vowel is inserted in word-final position.

The following two tableaux capture the observation that English word-final *t* is realized as [s] in the output loanwords when followed by a vowel-

initial suffix:

- (42) [s]-Neutralization case  
 English net [net]  
 citation net  
 nominative nes-i

[net]	NO CODA ([sib])	SAME WD (SIB-V)	MAX- IO ([sib])	NO- WFINAL ([lar])	ALIGN- R(V, σ)	MAX- IO(C)	DEP- IO(V)	NO- WFINAL (t)
a <sup>⊗</sup> net.]								*
b nes.]	*!							
c ne.ti.]							*!	
d ne.t <sup>h</sup> i.]							*!	
e ne.si.]							*!	
a ne.t]-i								*!
b <sup>⊗</sup> ne.s]-i								
c ne.t <sup>h</sup> ]-i				*!				
d ne.ti.]-ka							*!	
e ne.t <sup>h</sup> i.]-ka							*!	
f ne.si.]-ka							*!	

In the first tableau in (42), candidate (b) is eliminated due to fatal violation of undominated NOCODA([sib]). All the candidates (c), (d), and (e) get a fatal violation mark for higher ranked DEP-IO(V) due to insertion of an unmarked vowel. However, candidate (a) violates lower ranked NO-WFINAL(t) and hence turns out to be optimal. As for the second tableau in (42), only candidate (b) does not violate any constraint. However, the other candidates violate at least one constraint.

Finally, the proposed constraint ranking can also explain word-final Delaryngealization in loanwords:

- (43) pop [pap]  
 citation: p<sup>h</sup>ap  
 nominative: p<sup>h</sup>ap-i

[pap]	NOCODA ([lar])	NO-WFINAL ([lar])	ALIGN- R(V, σ)	MAX- IO(C)	DEP- IO(V)
a. <sup>i</sup> p <sup>h</sup> ap.]					
b. p <sup>h</sup> a.p <i>i</i> .]					*!
c. p <sup>h</sup> a.p <sup>h</sup> i.]					*!
a. <sup>i</sup> p <sup>h</sup> a.p]-i					
b. p <sup>h</sup> a.p <sup>h</sup> ]-i		*!			
c. p <sup>h</sup> a.p <i>i</i> .]-ka					*!
d. p <sup>h</sup> a.p <sup>h</sup> i.]-ka					*!

In the first tableau in (43), both of the candidates (b) and (c) fatally violate DEP-IO(V) whereas candidate (c), which is optimal, does not violate any constraint. In the second tableau, candidate (a) receives no violation mark. However, candidate (b) is eliminated due to fatal violation of NO-WFINAL([lar]). Both of the candidates (c) and (d) violate DEP-IO(V) as an unmarked vowel is inserted in word-final position. As a result, candidate (a) is correctly predicted to be optimal.

### 6. Comparison with Native Korean input /t/ and /s/

In this section, we get back to the Coda Neutralization phenomenon in the Native Korean data and briefly discuss, for comparison, how the relative ranking of the proposed constraints for the loanwords changes for the native word-final /t/ and /s/.

First of all, consider the following native examples to see what happens when the unmarked vowel [i] is inserted. Note that “{ }” indicates the verb root boundary which is characterized only in the native words<sup>6</sup>.

- (44) Insertion of an unmarked vowel  
 {cap}-si-ta    cap-i-si-ta    ‘to catch-Honorific-Indicative’

As shown in (44), [i]-insertion is observed also in native Korean. We additionally observe that the syllable formed by the inserted [i] is always open. This means that high ranking status of ALIGN-R(V, σ) is also respected in native Korean.

Furthermore, the native data below show that native input /s/ surfaces

<sup>6</sup>Verb roots cannot appear alone and should be accompanied by suffixes to get the wordhood status, as shown in (44).

only when it is syllabified in onset, as in (45a). If it is syllabified in coda, on the other hand, it is subject to Coda Neutralization, as in (45b). If it is unsyllabified, it deletes to avoid violation of undominated NOCOMPLEX, as in (45c):

(45) Native input /s/			
a. citation:	[so]	so	‘cow’
nominative:	[so]-ka	so-ka	
b. citation:	[pəs]	pət, *pəsi	‘friend’
nominative:	[pəs]-i	pəs-i	
c. citation:	[kaps]	kap, *kapsi	‘price’
nominative:	[kaps]-i	kaps-i	

We also observe in the citation form of a /s/-final word in (45b) that the insertion of unmarked [i] is avoided and coda neutralization of /s/ to [t] occurs instead.

The delaryngealization phenomenon in loanword-final stop is not observed in native words:

(46) /pat <sup>h</sup> /		‘rice field’
citation	pat	
accusative	pat <sup>h</sup> -il	

This means that NO-WFINAL([lar]) plays no role in native Korean words.

We propose the following constraint ranking for native Korean words:

(47) Native Korean ranking
NOCODA([lar])/([sib]), NOCOMPLEX, ALIGN-R(V, σ), MAX-IO(C)
>> DEP-IO(V)
>> MAX-IO([sib])/([lar])

In the native ranking above, those constraints SAMEWD(SIB-V), NO-WFINAL([lar]), and NO-WFINAL(t) which are higher ranked in the loanwords are demoted to the extent that they do not have any effect on the evaluation on the native words. Furthermore, MAX-IO([sib]) is reranked below DEP-IO(V) in native Korean. Note that it is undominated in the loanwords.

Now let us show how the native ranking operates in the native words. Native word-final /s/ surfaces as either [t] or [s] on the surface:

(48) /pəs/ 'friend'  
 citation pət  
 nominative pəs-i

[pəs]	NOCODA ([sib])	ALIGN- R(V, σ)	MAX- IO(C)	DEP- IO(V)	MAX- IO([sib])
a. pəs.]	*!				
b. <sup>l.sr</sup> pət.]					*
c. pəs.i.]				*!	
a. <sup>l.sr</sup> pəs.i.-i.					
b. pət.i.-i.					*!
c. pəs.i.]-ka.				*!	

In the first tableau in (48), the [sib] in coda in candidate (a) and the insertion of a vowel in candidate (c) fatally violate higher ranked NOCODA([sib]) and DEP-IO(V), respectively. However, candidate (b) receives a violation mark for lower ranked MAX-IO([sib]) as a result of Coda Neutralization. Hence, it is optimal. In the second tableau in (48), candidate (a) receives no violation mark. Candidate (b) is eliminated due to violation of MAX-IO([sib]), as the [sib] in the input deletes in the output. Candidate (c) is also out via fatal violation of DEP-IO(V). Hence, candidate (a) is correctly predicted to be optimal.

The following is a native stem-final /t/ case in which input /t<sup>h</sup>/ surfaces either as [t] or [t<sup>h</sup>]:

(49) /pat<sup>h</sup>/ 'rice field'  
 citation pat  
 accusative pat<sup>h</sup>-il

[pat <sup>h</sup> ]	NOCODA ([sib])	NOCODA ([lar])	ALIGN-R (V, σ)	MAX- IO(C)	DEP- IO(V)	MAX- IO([lar])
a. pat <sup>h</sup> .]		*!				
b. <sup>l.sr</sup> pat.]						*
c. pas.]	*!					*
d. pa.t <sup>h</sup> i.]					*!	
a. <sup>l.sr</sup> pa.t <sup>h</sup> -il.						
b. pa.t]-il.						*!
c. pa.s]-il.						*!
d. pa.si.]-il.					*!	*

In the first tableau above, candidate (a) violates higher ranked NOCODA([lar]). Candidate (b) violates only lower ranked MAX-IO([lar]). Candidates (c) and (d) incur a fatal violation mark for higher ranked NOCODA([sib]) and DEP-IO(V), respectively. As a result, candidate (b) becomes optimal. In the second tableau, both of the candidates (b) and (c) fatally violate MAX-IO([lar]). Candidate (d) receives a fatal violation mark for DEP-IO(V). Hence, candidate (a) with no violation mark incurred becomes optimal.

### 7. Summary

[t] and [s] of the English words do not pattern together in their surface realizations in the corresponding loanwords with /t/ and /s/ of native Korean input words in their corresponding output forms. In this paper, we have attributed such phenomena of the loanwords to some loanword-specific (and hence higher ranked) phonotactic constraints (NO-WFINAL([lar]) and NO-WFINAL(t)) and higher ranked input-to-output correspondence constraints (SAMEWD(SIB-V) and MAX-IO([sib])) in the loanword sublexicon.

The following shows the proposed constraint ranking for the loanwords:

(50) Loanword Ranking

NOCODA([lar])/([sib]), NOCOMPLEX, SAMEWD(SIB-V),  
MAX-IO([sib]), NO-WFINAL([lar]), ALIGN-R(V,  $\sigma$ ), MAX-IO(C)  
>> DEP-IO(V)  
>> NO-WFINAL(t)

On the other hand, the following constraint ranking is schematically proposed for the native Korean words for comparison:

(51) Native Korean Ranking

NOCODA([lar])/([sib]), NOCOMPLEX,  
ALIGN-R(V,  $\sigma$ ), MAX-IO(C)  
>> DEP-IO(V)  
>> MAX-IO([sib])/([lar])

### REFERENCES

- BENUA, L. 1995. Identity effects in morphological truncation. *UMOP* 18, 77-136. Amherst: University of Massachusetts.  
CHO, H.-K. 1998. English loanwords and syllable structures. *Studies in Phonetics, Phonology and Morphology* 4, 273-89.  
HONG, S. 1998. Licensing and redundancy: [s]-onset neutralization. *Linguistics* 6.2, 263-87.  
ITÔ, J. 1986. *Syllable Theory in Prosodic Phonology*. PhD thesis, Amherst:

- University of Massachusetts. Published by Garland Press, New York, 1988.
- , and A. MESTER. 1995. The core-periphery structure of the lexicon and constraints on reranking. *UMOP* 18, 181-209. Amherst: University of Massachusetts.
- KANG, H.-S. 1996. English loanwords in Korean. *Studies in Phonetics, Phonology and Morphology* 2, 21-48.
- . 1999. Affixation to English loanwords. *Studies in Phonetics, Phonology and Morphology* 5.2, 291-307.
- . 2000. Similarities and differences between morphologically related words in Korean. *Proceedings of the '00 Summer Conference*, 17-36. The Phonology-Morphology Circle of Korea.
- KANG, O.-M. 1996. An optimality-theoretic Analysis of Korean loanword phonology. *Journal of Korean Linguistics* 28, 113-58.
- KOREAN MINISTRY OF EDUCATION. 1986. *Waerae-e Pyoki-pup tongilan* ('Unified rules of orthography for foreign words').
- KU, P. 1999. Choicheokseong-eseouy Youngeo Chayonge-wa Moumsapip ('English loanwords and vowel insertion in optimality theory'). *Studies in Phonetics, Phonology and Morphology* 5.1, 59-77.
- LEE, E. 1988. *Kaejeonghan Hangul Machumpup Pyojune Haeseol* ('Interpretation of revised Korean standard spelling Convention'). Seoul: Daejekkak.
- LEE, PONGHYUNG. 1995. Korean loanword phonology: An optimality perspective. *Linguistic Journal of Korea* 20, 121-52.
- LOMBARDI, L. 1995a. Laryngeal neutralization and syllable well-formedness. *NLLT* 13, 39-74.
- . 1995b. Laryngeal neutralization and alignment. *UMOP* 18, 225-247.
- MCCARTHY, J., and A. PRINCE. 1993. Prosodic morphology I: Constraint interaction and satisfaction. Ms. Amherst: University of Massachusetts and Newark: Rutgers University.
- . 1995. The Emergence of the unmarked: Optimality in prosodic morphology. *Proceedings of North East Linguistic Society* 24, 333-79.
- . 1995. Faithfulness and reduplicative identity. *UMOP* 18, 249-384. Amherst: University of Massachusetts.
- MCCARTHY, J. and P. SMOLENSKY. 1993. Optimality theory: Constraint interaction in generative grammar. Ms. Newark: Rutgers University and Boulder: University of Colorado.
- NATIONAL ACADEMY OF THE KOREAN LANGUAGE. 1997. *Seoul Thopakimal caryojip I* ('Data of Native Words in Seoul I').
- OH, M. 1994. A Reanalysis of consonant cluster simplification and s-neutralization. In Y.-K. Kim-Renaud (ed.). *Theoretical Issues in Korean Linguistics*, pp.157-74. Stanford: CSLI.
- SILVERMAN, D. 1992. Multiple scansion in loanwords phonology:

Evidence from Cantonese. *Phonology* 9, 289-328.

YOO, H.-B. 1999. Consonant cluster simplification in second language acquisition. *Studies in Phonetics, Phonology and Morphology* 5.2, 401-20.

Department of English Language and Literature  
Inha University  
253 Yonghyun-dong, Namgu  
Incheon 402-751, Korea  
E-mail: shong@inha.ac.kr