

English Loanwords and the Word-Final [t] Problem in Korean*

Stuart Davis and Hyunsook Kang
(Indiana University and Hanyang University)

Davis, Stuart and Hyunsook Kang. (2006). English Loanwords and the Word-Final [t] Problem in Korean. *Language Research* 42.2, 253-274.

English nouns that are borrowed into Korean as ending in [t] are lexicalized as if they ended in /s/. While some researchers have suggested that the lexicalization of word final [t] as /s/ reflects a general weakening process or involves something specific to loanwords, we will argue that the borrowing of English word final [t] as lexical /s/ in Korean is purely a matter internal to the morphophonology of Korean. While our claim is not a new claim since the idea is present in some of the recent literature, the detailed analysis of this within Optimality Theory and its formal connection to cases of paradigm leveling elsewhere in Korean nominal morphology as well as to diachrony is original.

Keywords: loanwords, English word-final [t], morphophonology, Korean, Optimality Theory

1. Introduction

During the current decade the study of loanwords has come to play a central role in phonological theory, especially as it relates to the role of phonetics and perception in phonology. Generally speaking there are two contrasting views. One can be termed a perceptual view and largely grows out of work such as Silverman (1992), Steriade (2001a, 2001b), and Kenstowicz (2003, 2005); the other can be termed a phonological view, best articulated in the works of La Charité and Paradis (2002, 2005). On the perceptual view, loanword adaptation is seen as a problem of perceptually matching the words of one language into another, maintaining as much phonetic information from the source word while satisfying the constraints of the recipient (or borrowing)

* This paper represents on-going collaborative research, earlier versions of which were presented at the 9th Midcontinental Workshop on Phonology (McWOP 9) held at the University of Illinois in November 2003 and at the 1st International Conference on East Asian Linguistics held at the University of Toronto in November 2006. We thank the audience at those meetings for their feedback. We would also like to specifically thank Adam Albright, Gregory Iverson, Yoonjung Kang, Michael Kenstowicz, Jungsun Kim, Dongmyung Lee, Hanyong Park, and Donca Steriade for discussion on various aspects of this paper. The usual disclaimers apply.

language. On this view, subphonemic variants should play an important role in how loanwords become adapted because borrowers try to maximize the perceptual similarity of the words from the source language in the recipient language. The phonological view as developed in the works of La Charité and Paradis emphasize the role of the bilingual in the borrowing process. Since the bilingual has access to the phonology of both the source and recipient languages, borrowing is inherently phonological, with little or no role to subphonemic variants. Korean can be used to illustrate both positions. Kenstowicz (2005) points to the interesting distinction shown in the comparison of (1a) with (1b) where the single intervocalic /l/ of the English word *cola* is realized as a geminate [l] in the Korean borrowing, but the single intervocalic /r/ of the English word *orange* is realized as the single liquid sound [r].

(1)	<u>English</u>	<u>Korean</u>
	a. cola	[k ^h olla]
	b. orange	[orenji]

Since in Korean [l] and [r] are allophones of the same liquid phoneme it would be predicted from a phonological view that they should be borrowed the same way when in the same phonological environment, such as the intervocalic environment in (1). However, the fact that they are distinguished in the borrowing strongly implies that Korean borrowers are sensitive to features that would be subphonemic in Korean (i.e., the difference between the [r] and [l] allophones of the Korean liquid phoneme). On the other hand, the borrowing of English voiceless stops into Korean as consistently aspirated is best understood as a phonological borrowing. While English aspirated stops are consistently borrowed as aspirated in Korean, as illustrated by the initial /k/ in (1a), even unaspirated voiceless stops are borrowed as aspirated into Korean. Consider the examples shown in (2). (The issue of the borrowing of word-final voiceless stops as in (2d) and (2f) will be addressed later.)

(2)	<u>English</u>	<u>Korean</u>
	a. happy	[hæp ^h i]
	b. napkin	[nap ^h ik ^h in] (also [napk ^h in])
	c. sketch	[sik ^h ec ^h i]
	d. strike	[sit ^h iraik]
	e. test	[t ^h esit ^h i]
	f. stop	[sit ^h op]

In (2a) we note that the English intervocalic consonant /p/ is not aspirated in English but is borrowed as aspirated in Korean. Similarly, the intervocalic English voiceless consonant cluster in (2b) is unaspirated, yet both consonants can

be borrowed as aspirated in Korean. The data in (2c)-(2f) show that the voiceless unaspirated stop immediately following /s/ in English is borrowed as aspirated in Korean. From one point of view this borrowing is not always perceptually the closest match. Both M Oh (1996) and H Kang (2002) have observed that for a word like *stop* in (2f) the Korean tense consonant /t'/ would make for a better perceptual approximation of the English unaspirated [t] in that word. Consequently, the consistent borrowing of English voiceless stops as aspirated in Korean is best understood as a phonological borrowing.

One implication of the above discussion is that it is probably the case that neither a perceptual view nor a phonological view alone is sufficient to understand the borrowing process. Both clearly play a role. There are also cases where neither of these views is sufficient and the borrowing language imposes a type of default structure on the loanword. A particular interesting case of this discussed by N-J Kim (1997), Kenstowicz and H-S Sohn (2001) and J Kim (2005) for North Kyungsang Korean and D Lee (2005) for South Kyungsang Korean relates to the accentuation on English loanwords in these dialects. While the details differ somewhat between North and South Kyungsang Korean the salient observation is that in the borrowing of English words into these dialects, the English accentuation is ignored despite the fact that it can be easily accommodated given the lexical nature of the Kyungsang Korean accentual system and despite the fact that Korean speakers are very good at perceiving English accentuation as shown by Altmann (2006). What can best be described as a dialect specific default accentuation pattern is imposed upon English loanwords. In a manner of speaking, both the phonetics and the phonology of English accentuation are ignored in loanword adaptation in Kyungsang Korean.

In this paper we consider the word final [t] problem in English loanwords in Korean. As is well known from the Korean loanword literature, English nouns that are borrowed into Korean as ending in [t] are lexicalized as if they ended in /s/. (H-S Sohn 2001 observes that English verbs are not borrowed into Korean; thus our discussion in this paper necessarily focuses on the borrowing of nouns.) While some researchers have suggested that the lexicalization of word final [t] as /s/ reflects a general weakening process (K-A Choi 2002, M Oh 1994) or involves something specific to loanwords (at least at some stage as suggested by S Hong (2001) and H-S Sohn (2001)), we will argue that the borrowing of English word final [t] as lexical /s/ in Korean is purely a matter internal to the morphophonology of Korean. While our claim is not a new claim since the idea is present in Hayes (1998), Albright (2002, 2003) and Y Kang (2003a), the detailed analysis of this within Optimality Theory and its formal connection to cases of paradigm leveling elsewhere in Korean is original. In Section 2 we will present the loanword data involving the borrowing of words with final [t] and discuss its connection with paradigm leveling (or

paradigm uniformity) found in Korean nominal morphology for words ending in labial or velar (noncoronal) obstruents. In Section 3 we develop an optimality-theoretic analysis that accounts for both the lexicalization of English word final [t] as /s/ in Korean borrowings as well as the paradigm leveling found with Korean nouns ending in noncoronal obstruents. In Section 4 we conclude the paper by discussing our analysis from a diachronic perspective.

2. Loanword Data and Paradigm Leveling

In this section we will consider the data showing that English words which are borrowed with final [t] have that [t] lexicalized as /s/. We will then discuss how this is connected to paradigm leveling (or paradigm uniformity) found in Korean nominal morphology with words ending in labial or velar (noncoronal). Before presenting the loanword data, we briefly touch upon relevant aspects of Korean phonology. Korean has the consonant and vowel inventory shown in (3).

(3)

	<u>Korean consonants</u>				<u>Korean vowels</u>		
	Labial	Coronal	Velar	Glottal	Front	Central	Back
lax	p	t	c	k	i	ɨ	u
aspirated	p ^h	t ^h	c ^h	k ^h	e	ə	o
tense	p'	t'	c'	k'	æ	a	
		s		h			
		s'					
	m	n	ŋ				
		l					
		y	w				

Crucial to the discussion are the following well-known aspects of Korean phonology. The Korean syllable is maximally CVC (ignoring the issue of long vowels and status of on-glides); lax stops are phonetically voiced between vowels, and all segments in the syllable coda are unreleased. The segments allowed in the coda are the sonorants [m], [n], [ŋ], [l] and the obstruents [p], [t], [k], though we only focus on coda obstruents in this paper. Most important is the Korean coda neutralization processes noted in (4).

- (4) Korean coda neutralization
- a. all labial obstruents neutralize to [p] in coda position
 - b. all coronal obstruents neutralize to [t] in coda position
 - c. all velar obstruents neutralize to [k] in coda position

An important observation about coda neutralization concerns coronals. Given that there are eight different coronal obstruents in Korean, hypothetically a neutralized [t] in coda position could be underlyingly or lexically one of eight different coronal obstruents. This case can be contrasted with neutralization of labial obstruents to [p] or the neutralization of velar obstruents to [k] where hypothetically the neutralized obstruent could be underlyingly or lexically one of only three different consonants.

With this as background let us now consider the loanword data in (5) reflecting English words that are borrowed into Korean as having a word-final [t]. We also include two examples of English source words with final /d/ in English which also get borrowed into Korean as if they ended in a word-final [t]. (We do not address the separate issue of why some English words with final stops are borrowed with epenthetic vowels as the example of *test* in (2e) which is borrowed as [t^hesit^hi] with an epenthetic vowel. That the words in (5) are not borrowed with an epenthetic vowel is clear from the unaffixed form as well as the choice of case endings. For discussion as to what factors tend to favor the insertion of an epenthetic vowel in the Korean borrowing of English words ending in word final stops, see Y Kang (2003a, 2003b).)

(5) English words that are borrowed into Korean with a word final [t]

English	Korean <u>unaffixed</u>	Korean <u>Nominative</u>	Korean <u>Accusative</u>	Korean <u>Locative</u>
a. market	[mak ^h et]	[mak ^h es-i]	[mak ^h es-il]	[mak ^h es-e]
b. cabinet	[k ^h epinet]	[k ^h epines-i]	[k ^h epines-il]	[k ^h epines-e]
c. internet	[int ^h ənet]	[int ^h ənes-i]	[int ^h ənes-il]	[int ^h ənes-e]
d. pyramid	[p ^h iramit]	[p ^h iramis-i]	[p ^h iramis-il]	[p ^h iramis-e]
e. David	[teipit]	[teipis-i]	[teipis-il]	[teipis-e]

What should be clear from an examination of the data in (5) is that English words that are borrowed into Korean as ending in [t] (exemplified by the unaffixed forms in the second column of (5)) are lexicalized in Korean with a word final /s/ and not a final /t/. This is apparent from the affixed forms in (5) where it is /s/ that occurs stem finally immediately before the vowel initial case suffix. For example, the locative form of the Korean borrowing of *market* is [mak^hes-e] not *[mak^het-e] though there is nothing phonotactically impermissible about the phoneme /t/ occurring between two vowels in Korean, as in the verbal form [tot-a] 'to rise (indicative)'.

The question that we address is why is it that words that get borrowed into Korean with a word final [t] in the unaffixed form, have that [t] lexicalized as /s/ as evidenced by the paradigms in (5). The salient observation in understanding this from our perspective is that Korean noun stems do not end in a lexical /t/. This observation has been pointed out by such researchers as H

Kang (1996), H-S Sohn (2001), Albright (2002), and Y Kang (2003a, 2003b). Consider the Korean native words in (6a-d) and the non-occurrence of (6e).

(6) Korean nouns ending in coronal obstruents

	<u>Unaffixed</u>	<u>Accusative</u>	<u>Locative</u>	<u>UR</u>	<u>Gloss</u>
a.	[pat]	[pat ^h -il]	[pat ^h -e]	/pat ^h /	field
b.	[k'ot]	[k'oc ^h -il]	[k'oc ^h -e]	/k'oc ^h /	flower
c.	[pit]	[pic-il]	[pic-e]	/pic/	debt
d.	[ot]	[os-il]	[os-e]	/os/	clothes
e.	CVt	*CVt-il	*CVt-e	*CVt	(no forms exist)

We see in (6) that if an unaffixed Korean noun ends in [t], it has to alternate with another coronal obstruent when in onset position (that is, when a vowel initial suffix is added). There are no words in modern Korean where an unaffixed noun ends in a [t] and [t] occurs before the suffix as indicated in (6e). This means that native Korean nouns that end in surface [t] never have lexical /t/ in its underlying form. As the examples in (6) show, such nouns can have a lexical /t^h/, /c^h/, /c/, or /s/, but not /t/. (Noun stems tend not to end in tense stops lexically primarily due to diachronic reasons.)

Given the salient observation that Korean nouns cannot end in a lexical /t/, then why is it that in all the loanwords in (5), the word final [t] is consistently lexicalized as /s/ and not one of the other coronal obstruents? That is, why is /s/ selected over the other coronal obstruents as the coronal of choice for the lexicalization of word final [t] in loanwords? An answer to this question has been given by Hayes (1998), Albright (2002, 2003) and Y Kang (2003b) and it makes reference to frequency. Albright (2003) specifically cites frequency data from H-K Kim and B-m Kang (2000) indicating that among native Korean words /s/-final noun stems are more frequent than noun stems ending in other coronal obstruents. According to these researchers, this statistical tendency would be observed by the native speaker and would be useful in choosing an appropriate coronal obstruent for the lexicalization of word final [t]. In this context it is worth citing Hayes (1999) who considered a similar problem from the Australian language Yidin^y and conjectured the following, "... in all cases of great difficulty ... the language learner will seize upon generalizations that are statistically useful, albeit imperfect, and make use of them to improve her ability to guess unknown inflected forms." Thus, under this view, all loanwords borrowed as ending in word final [t] are lexicalized with /s/ since native words ending in lexical /s/ are more frequent than native words that lexically end in other coronal obstruents.

While the frequency explanation for why Korean speakers lexicalize word final [t] in English loanwords as /s/ seems reasonable, it does not answer the question as to why nouns with stem-final /s/ in Korean are more frequent to

begin with. In other words, why are the frequencies the way they are? This becomes a relevant question if we note that historically Korean did have nouns that ended in lexical /t/, but all of these were reanalyzed as ending in /s/ regardless of how common these nouns were. Some examples of such nouns are given in (7).

- (7) Examples of Modern Korean nouns that historically ended in lexical /t/ which have been reanalyzed as ending in /s/ (cited from Y Kang 2003b; historical vowel changes are ignored)

	Historical	Modern Korean	English
	<u>Lexical Form</u>	<u>Lexical Form</u>	<u>Gloss</u>
a.	kat	kas	hat
b.	nat	nas	sickle
c.	mot	mos	nail
d.	pət	pəs	friend
e.	kot	kos	place

The diachronic change illustrated in (7) taken together with the loanword data in (5) strongly suggests that there are forces internal to Korean grammar that prevent nouns from being analyzed as having a word final lexical /t/ even though the surface realization of such nouns has a phonetic [t] (as seen by the unaffixed column in (5) and by the Modern Korean words in (7) which end in [t] when unaffixed: for example, [kat] ‘hat’). To put it another way, if we also consider the data in (6), there is pressure internal to Korean that forces any noun stem (or base form) that ends in a surface [t] to alternate in a conjugated form (i.e., in onset position when before a vowel initial suffix).

The pressure for a noun stem or base form in a paradigm to alternate can be captured by the optimality theoretic notion of anticorrespondence which is most developed in Hayes’s (1997, 1999) work on the Australian language Yidin^y (based on Dixon 1977) and briefly applied to loanwords in Korean with word final [t] by Y Kang (2003a). Anticorrespondence requires a base form to alternate in a certain way with related forms in a paradigm. The paradigms shown in (5) and (6) obey anticorrespondence with respect to word final [t] since that [t] in the base alternates in the relevant forms in the paradigm. While anticorrespondence may seem like an ad hoc notion, Hayes makes an intriguing observation that closely links it to paradigm uniformity. With respect to anticorrespondence in Yidin^y, Hayes (1997: 34) states, “The whole system is tightly bound by paradigm uniformity constraints ... Indeed it is precisely the existence of paradigm uniformity [in Yidin^y] that makes the entire project [anticorrespondence] look feasible.” While we do not discuss the Yidin^y data here that led Hayes to make his observation, it is noteworthy that Korean does have a strong tendency toward paradigm uniformity or leveling in its nominal sys-

tem. We will briefly show this and we will connect it formally to anticorrespondence in our optimality theoretic analysis in Section 3.

That modern Korean has a strong tendency toward paradigm uniformity in its nominal system has been noted by such researchers as Y-K Kim-Renaud (1986), M Oh (1994), Kenstowicz (1995), Hayes (1998), and Y Kang (2003b). Compare, for example, the Standard Korean and common Korean forms shown in (8a). Also consider the loanwords in (9).

(8)	<u>Standard Korean</u>	<u>Common forms</u>	<u>gloss</u>
a.	[mulip] – [mulip ^h -i]	[mulip] – [mulip-i]	knee
b.	[puæk] – [puæk ^h -i]	[puæk] – [puæk-i]	kitchen
c.	[tak] – [talk-i]	[tak] – [tak-i]	chicken

(9) English words that are borrowed into Korean with a word final [p] or [k]

	<u>Korean</u>	<u>Korean</u>	<u>Korean</u>	<u>Korean</u>	<u>Ungrammatical</u>
	<u>unaffixed</u>	<u>Nominative</u>	<u>Accusative</u>	<u>Locative</u>	<u>Alternative</u>
a.	kick [k ^h ik]	[k ^h ik-i]	[k ^h ik-il]	[k ^h ik-e]	*[k ^h ik ^h -e]
b.	tip [t ^h ip]	[t ^h ip-i]	[t ^h ip-il]	[t ^h ip-e]	*[t ^h ip ^h -e]

For each of the data items in (8) we see the unaffixed form and the form with the nominative suffix [-i]. If we first consider the (conservative) standard Korean forms ending in noncoronal stops in (8a) and (8b), we note that the final consonants at the end of the nouns, [p] in (8a) and [k] in (8b), are underlyingly aspirated, as seen by the aspirated [p^h] and [k^h] before the vowel initial suffix. Aspiration neutralizes in coda position thus resulting in [mulip] and [puæk] with unaspirated [p] and [k] in the unaffixed base forms in (8a) and (8b), respectively. On the other hand, we see that in the common Korean forms in (8a) and (8b) there is paradigm leveling so that the unaspirated [p] and [k] even appear before the vowel initial suffix. This paradigm leveling or uniformity is implicit in the loanword data in (9) where the word final noncoronal voiceless stop appears to be borrowed as lax rather than aspirated as evidenced by the lax variant of the stop that occurs before the vowel initial case suffix. Given the observation made in Section 1 of this paper that English voiceless stops are consistently borrowed as aspirated in Korean, the data in (9) where the word final voiceless stop is borrowed as lax in Korean may seem surprising; one might expect such stops to be borrowed as aspirated as shown by the ungrammatical alternative forms in (9). That these word final stops are not borrowed as aspirated reflects the influence of paradigm uniformity to the base form in the noun system. (In a sense, the English words in (9) may be borrowed with a final aspirated stop, but it would never surface because of the pull of paradigm uniformity.) In a real sense, the paradigm leveling shown by the common forms in (8a)-(8b) and by the loanword data in (9) has the effect of

wiping out potential contrast, specifically, in the examples cited the contrast between lax and aspirated stops at the end of a noun stem. Paradigm uniformity is further shown in examples like (8c) where coda consonant cluster reduction takes a potential complex coda as in /talk/ 'chicken' and reduces it to a single consonant, as in [tak]. The common form in (8c) shows that [tak] can act as a base for further affixation with the underlying /l/ of /talk/ never surfacing. Thus, we see from the data in (8) and (9) that there is a strong tendency toward paradigm leveling or uniformity in the noun system of modern Korean.

What is interesting and what has been noted by many linguists including Y-K Kim-Renaud (1986), Martin (1992), M Oh (1994), Hayes (1998), H Kang (1999), E Han (2002), Albright (2003) and Y Kang (2003b) is that paradigm leveling has extended to nouns ending in final coronal obstruents like those in (6). But here, the leveling is not to the base form as with the common forms shown in (8), but with [s]. This is reflected by the optional forms in (10) where we show the optional variants for the accusative and locative case, though the [s] variant appears before other vowel initial inflectional suffixes as well. (We leave aside a difference found in the literature as to whether the optional forms in (10) are dialectal, idiolectal, or only before certain case endings; we note instead that they seem to be found especially among younger speakers.)

(10) Optional forms with [s] for Korean nouns ending in coronal obstruents

	<u>Unaffixed</u>	<u>Accusative</u>	Optional <u>Accusative</u>	<u>Locative</u>	Optional <u>Locative</u>	<u>Gloss</u>
a.	[pat]	[pat ^h -il]	[pas-il]	[pat ^h -e]	[pas-e]	field
b.	[k'ot]	[k'oc ^h -il]	[k'os-il]	[k'oc ^h -e]	[k'os-e]	flower
c.	[pit]	[pic-il]	[pis-il]	[pic-e]	[pis-e]	debt
d.	[ot]	[os-il]		[os-e]		clothes

The data in (10a)-(10c) show that nouns that lexically end in coronal obstruents such as /t^h/ in (10a), /c^h/ in (10b) and /c/ in (10c) have optional variants with /s/ before vowel initial case suffixes. Thus the accusative form of *field* can either be [pat^h-il] or [pas-il]. The occurrence of the optional forms with [s] for data like that in (10) can be readily understood given the pull of paradigm leveling in Korean nouns shown by the data in (8) and (9) along with what was noted concerning the data in (5)-(7) that there is pressure internal to Korean that forces any noun stem (or base form) that ends in a surface [t] to alternate in a conjugated form (i.e., in onset position when before a vowel initial suffix). As noted above, paradigm leveling has the effect of wiping out contrast; specifically, in (8) and (9) the effect of leveling is to wipe out the contrast between lax and aspirated (noncoronal) stops at the end of a noun stem. In (10) paradigm leveling as reflected in the optional forms has the effect of wiping out the contrast among the different coronal obstruents. However, unlike in (8) and (9)

leveling cannot be to the base form. That is, hypothetical “optional” forms like that shown in (11a)-(11b) are impossible.

- (11) Ungrammatical hypothetical forms with [t] for Korean nouns ending in coronal obstruents

	<u>Unaffixed</u>	<u>Accusative</u>	Hypothetical <u>Accusative</u>	<u>Locative</u>	Hypothetical <u>Locative</u>	<u>Gloss</u>
a.	[pat]	[pat ^h -il]	*[pat-il]	[pat ^h -e]	*[pat-e]	field
b.	[k'ot]	[k'oc ^h -il]	*[k'ot-il]	[k'oc ^h -e]	*[k'ot-e]	flower

The hypothetical forms in (11) are similar to the common forms in (8) in that they show paradigm leveling to the unaffixed base noun. However, because the base noun ends in [t] and given the pressures for noun stems ending in [t] to alternate in conjugated forms, the hypothetical forms are ruled out since it fails to show an alternation involving the stem final [t]. Thus, the consistent alternation reflected in (10) between an unaffixed noun ending in [t] with a conjugated form having [s] satisfies the requirement for the [t] to alternate (i.e., anticorrespondence) while satisfying paradigm leveling in the sense that the [t] alternates with the same sound, namely [s]. It is in this way that the notion of anticorrespondence seems tightly bound to the occurrence of paradigm uniformity or leveling. Consequently, the loanword data in (5) where the English word final [t] is lexicalized in Korean as /s/ is thus best understood as a matter internal to the morphophonology of Korean nouns. In the next section we will consider an optimality theoretic analysis of the Korean data accounting for (5)-(11) in a unified manner.

3. Optimality-Theoretic Analysis

In the previous section we have shown how the lexicalization of English word final [t] (and [d]) as /s/ in loanwords like that in (5) is a matter internal to the morphophonology of Korean nouns. This is reflected diachronically by the native Korean words in (7) which historically ended in lexical /t/ but synchronically end in /s/. In explaining this we have referenced the notion of anticorrespondence from Hayes (1997, 1999), applied to Korean by Y Kang (2003a), which requires a word final [t] of a base form to alternate in the (relevant) forms of a paradigm when a case ending is suffixed. Following an observation by Hayes (1997) for the Australian language Yidin^y, we maintain that in Korean there is a close link between anticorrespondence and the paradigm uniformity found elsewhere in the noun system as reflected by data like that in (8) and (9). The extension of /s/ as an optional variant replacing other word final coronal obstruents shown in (10) can be understood as a way of satisfying

the requirement for the [t] to alternate (i.e., anticorrespondence) while at the same time satisfying paradigm leveling in the sense that the [t] alternates with the same sound, namely [s]. While some previous analyses such as Y Kang (2003a) have mentioned the link between paradigm uniformity and anticorrespondence, no analysis offered so far in the literature formally accounts for the range of data in (5)-(11) in a unified way in which there is a close connection between anticorrespondence and paradigm leveling or uniformity. A unified analysis would need specifically to account for the following in (12).

- (12) a. the loanword forms in (5) that are lexicalized as /s/.
 b. the fact that there are no native Korean nouns that have a lexical /t/, specifically, accounting for the change seen in (7) where historical forms that had a final lexical /t/ have been reanalyzed as having a final /s/.
 c. the optionality displayed in (10) with noun stems ending in coronal obstruents other than /s/.
 d. the Standard Korean forms (8) and the common Korean forms in (8) displaying paradigm uniformity with noncoronals.

In the analysis to be presented in this section we will develop an optimality-theoretic analysis with a minimal number of constraints that accounts for the range of phenomena listed in (12) in a unified way. Our analysis will be in the spirit of Albright's (2002, 2003) discussion of Korean and builds on the preliminary analysis found in Y Kang (2003a: 255-257) that references anticorrespondence but does not cover the full range of phenomena listed in (12).

Like Y Kang (2003a) we adopt an anticorrespondence constraint that we give in (13a). We build on her preliminary analysis by incorporating the four additional constraints in (13b)-(13e).

- (13) Constraints
- a. Anticorrespondence $t|_w$: A word-final [t] must alternate in conjugated forms.
 - b. I-O Faith: Corresponding sounds in the input and output should be identical.
 - c. Anti-faith [-continuant]: If two words are in an output-output relation then a correspondent of a word-final [-continuant] segment must not be [-continuant].
 - d. Paradigm Uniformity: Corresponding sounds in related words in a paradigm are identical.
 - e. Coda Neutralization: All coda segments are unreleased.

The anticorrespondence constraint in (13a) is modified from Y Kang (2003a:

255) who states the constraint as “When a noun ends in [t] in the citation form, change the stop to [s] before a vowel-initial suffix.” Our anticorrespondence constraint is stated more generally. Technically, it is not necessary to mention that the change or alternation occurs only before a vowel initial suffix (i.e., when the noun final coronal is in onset position) given that the constraint on coda neutralization (13e) in Korean is undominated outranking anticorrespondence. Thus, no alternation of the noun final [t] occurs when the following suffix begins with a consonant since that [t] would be in coda position (and as shown in (4b), [t] is the only coronal obstruent that can occur in coda position). Further, anticorrespondence is not relevant for Korean verbs since verb stems unlike noun stems cannot stand alone as unaffixed. The practical effect of this is that anticorrespondence will only apply to nouns. The constraint in (13b) is the familiar input-output faithfulness constraint (e.g., Kager 1999 and references cited therein) that requires the sounds in the output to be identical to that of the underlying input. The antifaithfulness constraint in (13c) emerges as part of our anticorrespondence analysis. Given the general anticorrespondence constraint in (13a) that a word-final [t] must alternate, the antifaithfulness constraint in (13c) specifies the preferred type of alternation. Here, the alternation must be with respect to the feature [continuant], so that the final [t] of the unaffixed noun alternates with a [+continuant] segment ([s]) in a conjugated form. We consider affricates here to be [-continuant]. Also, our use of antifaithfulness is somewhat different from Alderete’s (2001) use of antifaithfulness which is normally triggered by morphological processes. While it may be quite possible to replace the antifaithfulness constraint in (13c) with an obstruent markedness hierarchy that prefers fricatives to affricates (*c >> *s), we do not pursue such an alternative here. The paradigm uniformity constraint in (13d) requires that corresponding sounds in related words in a paradigm be identical. It is a type of output-to-output constraint since related output words in a paradigm are being compared. In our tableaux, paradigm sets will be shown as candidates along the lines of E Han (2003) and McCarthy (2005), though we do not fully incorporate their optimal paradigms framework. Finally, the constraint on coda neutralization in (13e) is undominated in Korean and accounts for the obstruent coda inventory of unreleased [p], [t], and [k] mentioned in (4). Since it is undominated we will not include it in the tableaux nor will we consider candidates that violate it.

The constraints in (13) are sufficient to account for the range of phenomena listed in (12). We will first consider the optimality theory tableau for one of the loanwords from (5), *internet* in (14). The constraints are ranked as given in the tableau. We will discuss the crucial rankings after each tableau.

(14) English – (*inter*)net / Korean – net, nes-il, nes-e ...

	Anti-correspondence	I-O Faith	Anti-Faith [-continuant]	Paradigm Uniformity
a. net, net-il, net-e ...	*!		*	
b. net, nec-il, nec-e ...			*!	*
➔ c. net, nes-il, nes-e ...				*

The candidates in (14) as well as in the other tableaux below are given as paradigm sets with the unaffixed form given first followed by the accusative and locative. (We do not show the nominative form so as to abstract away from the separate problem of coronal palatalization which the nominative suffix [-i] triggers.) The presentation of candidates in this way is consistent with the optimal paradigms framework. The candidate paradigm in (14a) best satisfies paradigm uniformity since it has stem final [t] in all its forms. However this violates high ranked Anticorrespondence so it is eliminated from consideration. The choice then is between the candidate paradigm sets in (14b) and (14c) where in (14b) the stem final [t] alternates with the affricate [c] in conjugated forms while in (14c) the stem final [t] alternates with [s] in conjugated forms. The latter prevails because it satisfies Anti-Faith [-continuant] since the [s] is [+continuant] while the [t] of the unaffixed form [net] is [-continuant]; (14b) violates this constraint since the affricate [c] still has the feature [-continuant]. A possible paradigm where [t] alternates with aspirated [tʰ] would be ruled out since aspirated [tʰ] is [-continuant]. One crucial ranking emerges from the tableau in (14) and is given in (15).

(15) Anticorrespondence >> Paradigm Uniformity

If Paradigm Uniformity would outrank Anticorrespondence then (14a) would wrongly be the winner. An interesting consequence of the loanword analysis in (14) is that when the surface form ending in [t] is borrowed, the lexicalization of that [t] as /s/ is a consequence of the evaluation of (14c) as being the winner. The /s/ is not borrowed from English phonology, nor is it there in the phonetics; rather it is a consequence of Korean morphophonology. (We intentionally do not show an underlying form for the loanword in (14) because, in a sense, it is not relevant. If it is borrowed phonetically with a word final [t], then the final [t] will come to be lexicalized as /s/ given the candidate evaluation in tableau (14) above.)

Next we turn our attention to data like that in (6) involving Korean nouns that lexically end in one of coronal obstruents. The tableau in (16) evaluates paradigm sets involving (6c).

(16) /pic/ 'debt' (accounting for the variants [pit], [pic-il] and [pic-e])

/pic/	Anti-correspondence	I-O Faith	Anti-Faith [-continuant]	Paradigm Uniformity
➔ a. pit, pic-il, pic-e ...			*	*
b. pit, pit-il, pit-e ...	*!	*	*	
c. pit, pis-il, pis-e ...		*!		*

The candidate paradigm set in (16b) best satisfies the paradigm uniformity constraint since it consistently has [t] throughout the paradigm, but this violates high ranked Anticorrespondence and thus is eliminated. The choice then is between (16a) and (16c) both of which respect Anticorrespondence since in each set the word final [t] of [pit] alternates in the conjugated form: it alternates with [c] in (16a) and with [s] in (16c). The winner in (16) is the candidate paradigm (16a) even though this has the [-continuant] [c] as opposed to (16c) which has the [+continuant] sound [s]. (16a) is the winner since [c] reflects the /c/ in the underlying form /pic/. Thus, the ranking that emerges from (16) is shown in (17) where I-O faith outranks Anti-Faith [-continuant]. (Technically speaking, (16a) violates I-O Faith one time since, by coda neutralization the underlying /c/ becomes [t] in the unaffixed form [pit]; (16c) violates I-O Faith multiple times. In our evaluation of the I-O Faith constraint we abstract away from violations due to coda neutralization and then indicate whether a candidate either respects I-O Faith or violates it.)

(17) I-O Faith >> Anti-Faith [-continuant]

Given the ranking established so far we now turn to the diachronic change reflected in (7) where Korean words that historically ended in lexical /t/ have been reanalyzed as ending in lexical /s/. Consider the evaluation tableau in (18) of the historical form in (7b) where the input is given with a word final lexical /t/.

(18) */nat/ 'sickle' (historical form; modern Korean /nas/)

/nat/	Anti-correspondence	I-O Faith	Anti-Faith [-continuant]	Paradigm Uniformity
a. nat, net-il, nat-e ...	*!		*	
b. nat, nac-il, nac-e ...		*	*!	*
➔ c. nat, nas-il, nas-e ...		*		*

The faithful paradigm set shown by candidate (18a) respects I-O Faith and Paradigm Uniformity. The fatal constraint that it violates is high ranked Anticorrespondence. This alone eliminates (18a). The choice then is between (18b)

and (18c). The paradigm sets in (18b) and (18c) both violate Paradigm Uniformity and I-O Faith because the underlying /t/ of the input is realized as either [c] or [s] in the conjugated output. (18c) is the winner because it satisfies Anti-Faith [-continuant] given that [t] alternates with the continuant [s] in the conjugated forms of (18c); (18b) violates the constraint since [c] is [-continuant]. Given that (18c) is the winning paradigm set, then a historical or hypothetical input with a final /t/ would quickly be reanalyzed as having a lexical /s/ rather than /t/ since, as seen in (18c), [t] never occurs in any of the conjugated forms. Diachronically, the reanalysis of nouns with final lexical /t/ as /s/ would have happened almost as soon as Anticorrespondence became higher ranked than I-O Faith. This is a crucial ranking that emerges from the tableau in (18) and is shown in (19). (In Section 4 we discuss why and when Anticorrespondence became high ranked.)

(19) Anticorrespondence >> I-O Faith

In (20) we put together the rankings in (15), (17), and (19).

(20) a. Anticorrespondence >> I-O Faith >> Anti-Faith [-continuant]
 b. Anticorrespondence >> Paradigm Uniformity

The ranking in (20) is based on the tableaux in (14), (16), and (18). While Anticorrespondence is highest ranked, there is evidence that the ranking of the other constraints is not so firm and here we will specifically focus on the ranking of I-O Faith. Let us consider data like that in (8a) and (8b) where a noun ends in a noncoronal obstruent. For the evaluation of such data the constraint Anticorrespondence is not involved in the evaluation of nouns ending in non-coronals and the Anti-Faith [-continuant] constraint is not relevant given that Korean does not permit labial or velar fricatives. The Standard Korean forms in (8a) and (8b) can be accounted for if I-O Faith outranks Paradigm Uniformity. Consider the tableau in (21) which provides an evaluation of the Standard Korean form from (8a).

(21) /mulip^h/ ‘knee’ (accounting for the Standard Korean variant [mulip], [mulip^h-i], [mulip^h-il])

/mulip ^h /	Anti-correspondence	I-O Faith	Anti-Faith [-continuant]	Paradigm Uniformity
a. multip, multip-i, multip-il ...		*!	(*)	
➡ b. multip, multip ^h -i, multip ^h -il ...			(*)	*

The candidate paradigm set in (21a) shows paradigm uniformity of the lax [p] from the nominal base [mulip] throughout the paradigm. (21a) loses to (21b) where the underlying /p^h/ of the lexical noun stem is maintained in the conjugated forms. This thus provides a ranking argument for Standard Korean that I-O Faith outranks Paradigm Uniformity as shown in (22).

(22) I-O Faith >> Paradigm Uniformity

While the ranking in (22) can account for the Standard Korean forms like that in (8a), the common Korean forms in (8a) and (8b) must reflect a reverse ranking of I-O Faith and Paradigm Uniformity. This is shown by the tableau in (23) which provides an evaluation of the common Korean form from (8a).

(23) /mulip^h/ 'knee' (accounting for the common Korean variant [mulip], [mulip-i], [mulip-il])

/mulip ^h /	Anti-correspondence	Anti-Faith [-continuant]	Paradigm Uniformity	I-O Faith
➡ a. mulip, mulip-i, mulip-il...		(*)		*
b. mulip, mulip ^h -i, mulip ^h -il ...		(*)	*!	

In (23) it is the candidate paradigm set in (23a) showing paradigm uniformity that is the winner. For this ranking, Paradigm Uniformity is ranked above I-O Faith so that (23a) reflects the effect of paradigm uniformity. While a detailed discussion of variation in optimality theory is beyond the scope of the current paper, we take it that some degree of flexibility of ranking is allowed in Optimality Theory in order to account for variation. (See Anttila and Y-m Cho (1998) for a specific proposal.) Thus (24) may be a possible ranking of Paradigm Uniformity with respect to I-O Faith.

(24) Paradigm Uniformity >> I-O Faith

Given (22) and (24), the overall ranking of the four constraints can either be in (25a) or (25b) with the variable ranking of Paradigm Uniformity.

- (25) a Anticorrespondence >> Anti-Faith [-continuant] >> Paradigm Uniformity >> I-O Faith
 b Anticorrespondence >> Anti-Faith [-continuant] >> I-O Faith >> Paradigm Uniformity

The common Korean forms then reflect the ranking in (25a) as opposed to the Standard Korean ranking in (25b). Further, if we recall from (17) that the ranking of I-O Faith over Anti-Faith [-continuant] was needed to account for (16), we see that there is complete flexibility in the ranking of I-O Faith as long as it is lower ranked than Anticorrespondence.

What is quite illuminating is that if we take the ranking reflected in (25a) for common Korean in which I-O Faith is outranked by Paradigm Uniformity so that we get paradigm uniformity effects in nouns ending in noncoronal obstruents and apply that ranking to data like that in (6) where nouns end lexically in various coronal obstruents, we will account for the optional forms shown in (10) where an [s] appears at the end of the noun stem before the case suffix rather than the underlying coronal obstruent. To see this consider the tableau in (26) accounting for the optional forms shown in (10a).

(26) /pat^h/ ‘field’ (accounting for the optional variants [pas-ɨl] and [pas-e])

/pat ^h /	Anti-correspondence	Anti-Faith [-continuant]	Paradigm Uniformity	I-O Faith
a. pat, pat ^h -ɨl, pat ^h -e ...		*!	*	
b. pat, pac-ɨl, pac-e ...		*!	*	*
➡ c. pat, pas-ɨl, pas-e ...			*	*

(26) shows that when I-O Faith is ranked lower than both Anti-Faith [-continuant] and Paradigm Uniformity it has the effect of making the constraint Anti-Faith [-continuant] stronger. While this constraint was not at issue with respect to noncoronals as shown in (23) it play an important role in the evaluation in (26). The high ranking nature of the constraint Anti-Faith [-continuant] eliminates the faithful paradigm of (26a) from further consideration. It also eliminates (26b); thus (26c) is the winner where Anti-Faith [-continuant] is respected resulting in the appearance of [s] in the conjugated forms before the case ending.

As a final point, the ranking of the constraints shown in (25a) also readily accounts for the historical forms in which lexical /t/ became reanalyzed as /s/. This is seen by the tableau in (27) below for the historical form /nat/ ‘sickle’ and should be compared to the tableau in (18).

(27) */nat/ ‘sickle’ (historical form; modern Korean /nas/)

/nat/	Anti-correspondence	Anti-Faith [-continuant]	Paradigm Uniformity	I-O Faith
a. nat, net-ɨl, nat-e ...	*!			
b. nat, nac-ɨl, nac-e ...		*!	*	*
➡ c. nat, nas-ɨl, nas-e ...			*	*

As in (18), it is still high ranked Anticorrespondence that plays the key role in preventing [t] from surfacing in the conjugated variants as shown by the violation of Anticorrespondence in (27a). The same analysis would also apply to the loanword data like in (5) with word final [t] so that [t] will not surface in any of the conjugated forms. This is shown in (28).

(28) English – (*inter*)*net* / Korean – *net*, *nes-il*, *nes-e* ...

	Anti- correspondence	Anti-Faith [-continuant]	Paradigm Uniformity	I-O Faith
a. <i>net</i> , <i>net-il</i> , <i>net-e</i> ...	*!	*		
b. <i>net</i> , <i>nec-il</i> , <i>nec-e</i> ...		*!	*	
► c. <i>net</i> , <i>nes-il</i> , <i>nes-e</i> ...			*	

Thus, either the more conservative ranking of (25b) or the more innovative ranking of (25a) accounts for the lack of nouns ending in lexical /t/, regardless of whether the source for a possible lexical /t/ may be diachronic or through borrowing. As we see from the tableaux for diachronic Korean in (18) and (27) and the tableaux for loanwords in (14) and (28) the winning candidate paradigm consistently shows alternation of word final [t] with [s]. Consequently, we can conclude that the borrowing of word-final [t] as lexical /s/ is purely a matter internal to the morphophonology of Korean.

To conclude this section, we would maintain that it is a strong point of our analysis that it is the same ranking of constraints that connects the tendency to eliminate alternations in nouns ending in noncoronals (23) with the extension of a specific alternation in nouns ending in a coronal obstruent (26). This reflects the ranking in (25a) with Paradigm Uniformity outranking I-O Faith accounting for the common forms in (8a-b) and the optional forms in (10). The more conservative Standard Korean data in (8a-b) and in (6) reflect the ranking in (25b) with I-O Faith outranking Paradigm Uniformity. The difference between the two rankings is primarily in the ranking of I-O Faith in relation to Paradigm Uniformity with Paradigm Uniformity playing a stronger role (being higher ranked) under the ranking in (25a). Under either ranking, though, final [t] in a noun stem cannot surface as such in the relevant conjugated forms as seen by the tableaux in (18) and (27) for historical forms and by the tableaux in (14) and (28) for loanwords. A matter that we intend to explore in future work that is beyond the scope of the present paper is the exact nature of the free ranking of constraints in accounting for the type of variation discussed here.

4. Conclusion

In the preceding section we have offered an optimality theoretic analysis that accounts for the range of phenomena listed in (12) in a unified way. Variation is accounted for by the free ranking of the I-O Faith constraint. The reanalysis of words with a historic final /t/ as /s/ is accounted for by the high ranking Anticorrespondence constraint as shown by the tableau in (18) and is compatible with either the ranking in (25a) or (25b). The analysis of [t] final loanwords in (5) as having a lexical /s/ is shown to be completely integrated into the Korean morphophonological system.

As a final matter it is interesting to speculate on the reasons for the emergence of the Anticorrespondence constraint in (13a) that requires word final [t] to alternate in conjugated forms. It is known that in Middle Korean there were quite a number of nouns that ended in lexical /t/. (See Ito 2006 for a recent study and references cited therein.) Also, crucially, in Middle Korean [s] could appear in coda. That is, the coda obstruent inventory in Middle Korean consisted of [p], [t], [s], and [k]. The coda neutralization pattern with respect to coronal obstruents in Middle Korean was different than in Modern Korean. In Middle Korean /c/, /c^h/, and /s/ all neutralized to [s] in coda position while /t/ and /t^h/ neutralized to [t] in coda position. The catalyst for Anticorrespondence was when [s] was no longer permitted to be in coda position (in the 16th and 17th century according to Ito). When this occurred all the coronal obstruents /c/, /c^h/, /s/, /t^h/, and /t/ neutralized to [t] in coda position. We suspect that Anticorrespondence was originally functionally motivated so as to maintain the lexical contrast among the different coronals, countering what would have been a strong tendency toward paradigm uniformity given the number of different coronals that alternated with [t] in coda position. This would have wiped out the contrast among the different nouns ending in coronal obstruents. While the general effect of Anticorrespondence was the preservation of contrast, one consequence of it was that the words originally having lexical /t/ began to have alternations so as to respect Anticorrespondence. In this way it is significant that the change of lexical /t/ to /s/ happened rather quickly and occurred regardless of the frequency of the individual lexical item. While the Anticorrespondence constraint in (13a) may seem odd, it clearly has a functional motivation in its historical context and continues to play an important role in Korean morphophonology. As shown in this paper Anticorrespondence readily explains why loanwords borrowed with word final [t] are lexicalized as /s/ in Modern Korean. And it helps explain the fact noted by Hayes, Albright, Y Kang and others that nouns that end in lexical /s/ are much more common in Modern Korean than nouns that end in other coronal obstruents.

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Stuart Davis
Linguistics Department
Indiana University, Bloomington
Memorial Hall, Room 322
1021 E. Third Street
Bloomington, IN. 47405-7005
Tel: (812) 855-6456
Fax: (812) 855-5363
E-mail: davis@indiana.edu

Hyunsook Kang
English Department
Hanyang University
Ansan-si Sangnok-gu Sa 1-dong 1271
Gyunggi-do, 425-791
Korea
Tel: 82-031-400-5348
E-mail: hskang@hanyang.ac.kr

Received: November 24, 2006

Revised version received: December 21, 2006

Accepted: December 26, 2006