Comparative markedness in Korean palatalization

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Ahn, Miyeon. 2014. Comparative markedness in Korean palatalization. *Studies in Phonetics, Phonology and Morphology* 20.1. 99-112. Two kinds of Korean palatalization – *t*- and *s-palatalization* – contrast in that while *t*-palatalization applies only across morpheme boundaries, *s*-palatalization applies across the board. McCarthy (2003) accounts for this with the ranking OO-$_{N}$PAL » IDENT » PAL wherein palatalization is usually blocked because of IDENT » PAL. However, if a PAL violation is created by morphological concatenation, then the ranking OO-$_{N}$PAL » IDENT triggers palatalization. The problem with this analysis is that it does not distinguish between *t*- and *s*-palatalization – it incorrectly predicts that *s*-palatalization should also be blocked in non-derived environments. We show that the difference between the two kinds of palatalization lies in the faithfulness violations involved. In the mapping /s/→[š], only IDENT[place] is violated; however, /t^{h} /→[t͡ʃ^{h}] violates both IDENT[place] and IDENT[strident]. The constraint that blocks palatalization of /t/ in non-derived environments in McCarthy's analysis must therefore be the IDENT[strident], a constraint that is not involved in *s*-palatalization. IDENT[place], the only faithfulness constraint involved in *s*-palatalization, has to rank below $_{O}$PAL, so that *s*-palatalization is triggered even in non-derived environments. **(Seoul National University)**

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1. Introduction

This paper explores the opacity in Korean palatalization with reference to the *Comparative Markedness* (henceforth, CM) analysis (McCarthy 2003). Consonants in Korean undergo palatalization, which results in either phonemic contrasts or allophonic variations. In this paper, we argue that the crucial difference between the two kinds of palatalization is captured by faithfulness violations. Specifically, we suggest that phonemic palatalization causes a change in both the place of articulation and stridency, i.e., it violates IDENT[place] and IDENT[strident]. In contrast, allophonic palatalization keeps the stridency and changes the place, i.e., only IDENT[place] is violated. In principle, phonemic palatalization applies only across morpheme boundary; viz., it is processed in derived environments but blocked in non-derived environments, which presents the non-derived environment blocking (NDEB) effect. Allophonic palatalization, on the other hand, is not restricted to derived-environments; rather, it exerts influences across the board. This difference in environments interacts with faithfulness in Korean palatalization.

The development of CM by McCarthy (2003) has led to the hope that the analysis successfully accounts for the classic problem – *opacity with regard to Korean palatalization*. It should be noted, however, that the analysis is

based on the incorrect assumption that every Korean palatalization is constrained to derived environments; as a result, the analysis does not apply to non-derived environments – allophonic palatalization. It would thus generate interest to develop the analysis further. In spite of the general agreement with the CM, we argue that the assumption is incorrect and that further investigations are needed in order to solve the problem. In doing so, the current CM analysis might be extended in a significant way.

The next section starts with a general sketch of the background to Korean palatalization wherein the two types of palatalization are introduced. A brief summary of current CM analysis, its application to Korean data and the problems of the analysis are dealt with in Section 3. We propose an extended account in Section 4, which mainly concerns comparison of the two kinds of palatalization, followed by its implications. Finally, Section 5 concludes this paper.

2. Background of Korean palatalization

A general palatalization process takes the format of (1).

(1) Palatalization rule

a. $C_{[+alv, -pal]} \rightarrow C_{[+pal]} \; / \_\_\_\_\_ V_{[+high, -back]}$

b. $\{t^h, t\} \rightarrow \{t\widehat{ʃ}^h, t\widehat{ʃ}\} \; / \_\_\_\_\_ \{i\}$

This rule states that a consonant which lacks a palatal feature acquires that feature when it falls in front of a high front vowel (Ahn 1998, Kang 2003, Kim 2002). The general format equally applies to Korean (1b). The application of this palatalization rule, however, results in two different types of palatalization.

(2) Two types of Korean palatalization (Ahn, S.-C. 1988: 249)[1]

a. Phonemic palatalization

t-palatalization: $\{t^h, t\} \rightarrow \{t\widehat{ʃ}^h, t\widehat{ʃ}\} \; / \_\_\_\_ \{i\}$

e.g., /pat^h + i/ → [pa.t$\widehat{ʃ}^h$i] '*field* + NOM'

b. Allophonic palatalization[2]

s-palatalization: {s} → {š} / ____ {i}

e.g., /kosi/ → [košiˇ] '*national exam*'

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[1] The phonetic symbol descriptions for palatalization vary among linguists. The variations arise especially in *n*- and *l*-palatalization because the palatalized counterparts of the two phonemes are absent in IPA. Some use [ɲ] and [ʎ] respectively, however, this does not seem correct because they are palatals not palatalized counterparts of alveolars. We assume that alveolars become alveolar palatals rather than palatals. In this paper, we will use the diacritic [ˇ] consistently.

[2] An anonymous reviewer pointed out that all coronals are palatalized. It should be awared that allophonic palatalization includes not only *s*-palatalization but also *n*-and *l*-palatalization as in /k*ini/ → [k*iňi] '*meal*' and /talli-/ → [talľi-] '*to run*'. This study is limited to *t*- and *s*-palatalization, thus, allophonic palatalization refers to *s*-palatalization only.

In Korean, coronal consonants undergo palatalization. A consonant after palatalization can be either an independent phoneme as in (2a) or an allophone of the alveolar as in (2b). In other words, in the Korean phoneme inventory, /t^h/ and /$tʃ^h$/ mark phonemic contrasts, i.e., they are independent sounds and so they contrast phonemically. On the other hand, [š], is not an independent sound but an allophone of /s/. Accordingly, while *t*-palatalization is phonemic, *s*-palatalization is allophonic. In this paper, let us use the terms – '*t-palatalization*' and '*s-palatalization*' – to refer to the two types of palatalization.

Examples in (3) and (4) illustrate how *t*- and *s*-palatalization work.

(3) *t*-palatalization

	/pat^h/ '*field*'	/$kun.t^hi$/ '*a flaw*'
affixation	/pat^h + i/	N/A
resyllabification	/$pa.t^hi$/	N/A
palatalization	[$pa.tʃ^hi$]	N/A
		[$kun.t^hi$]

As in /pat^h/, coda alveolars of stems are resyllabified onto onsets after affixations. Resyllabification by the morphological process – affixation – triggers the onsets to palatalize. The palatalization in this case is obligatory because /t^h/ and /i/ fall on the different morphological units. Yet, as shown in /$kun.t^hi$/, the same consonant /t^h/ does not palatalize. Unlike /pat^h + i/ example, /t^h/ and /i/ fall on the same morphological units. Thus, this /t^h/ fails to palatalize, and /$kunt^hi$/ becomes [$kunt^hi$] not *[$kuntʃ^hi$]. This difference can be interpreted as follows: /t^h/ is not palatalized unless a morphological process is involved. In other words, *t*-palatalization is blocked in non-derived environments but applies in derived environments, i.e., across morpheme boundaries.

S-palatalization differs from *t*-palatalization as described below.

(4) *s*-palatalization

	/kos/ '*place*'	/ko.si/ '*exam*'
affixation	/kos + i/	N/A
resyllabification	/ko.si/	N/A
palatalization	[ko.ši]	/ko.ši/
		[ko.ši]

/kos/ shows that *s*-palatalization in the derived environment applies in much the same way as *t*-palatalization in /pat^h/. /ko.si/, on the other hand, indicates allophonic palatalization occurs not only in derived but also in non-derived environments unlike *t*-palatalization. Namely, whether a morpheme boundary intervenes or not between /s/ and /i/ as in /si/ vs. /s-i/, allophonic palatalization of /s/ always applies regardless of the environments, and /s/ always become /š/ before /i/.

The table in (5) summarizes the two palatalizations.

(5) Palatalization realization

t-palatalization (phonemic palatalization)		*s*-palatalization (allophonic palatalization)	
tauto-morphemic	hetero-morphemic	tauto-morphemic	hetero-morphemic
No	Yes	Yes	Yes

The tableaux can be interpreted as follows. While every alveolar sound becomes palatalized before /i/ except the change is phonemic.
If an alveolar consonant is in a derived form, it palatalizes without any exceptions. But, a palatalized consonant does not necessarily mean that it is a derived form because it can be in a non-derived, i.e., tautomorphemic word. Now, let us consider how Korean palatalization is analyzed in CM.

3. McCarthy's Comparative Markedness Analysis

3.1 Comparative markedness

McCarthy observes that in classic OT the two conflicting constraint families – FAITH and MARKEDNESS – are not in the symmetric relation in that the output-evaluating mechanisms are not the same in the two: FAITH constraints evaluate an output with comparing it to its input counterpart while MARKEDNESS constraints assign violation marks to an output without comparing it to anything. MARKEDNESS is violated when the output is not universally unmarked. McCarthy's CM analysis starts from the idea that not only FAITH but also MARKEDNESS can compare two elements to evaluate candidates. That is, it is not necessary for MARKEDNESS constraints to make the evaluation without any comparison.

Deviating from the assumption in classic OT, CM analysis modifies MARKEDNESS constraints wherein it is divided into two separate subset constraints – old markedness ($_{O}$M) and new markedness ($_{N}$M). McCarthy assumes that one candidate is under evaluation with the most fully faithful candidate (FFC), namely, the most similar to the input. Each old and new MARKEDNESS constraints evaluate each output candidate with comparing to FFC. Simply, what exactly the constraint says is a new violation is blocked and old violation is tolerated. For instance, /ab/ → [ʔab] violates $_{O}$NOVCDOB because [b] is a voiced obstruent – the violation of NOVCDOB – and it is shared with FFC – the violation of old markedness. Likewise, /ampa/ → [amba] violates of $_{N}$NOVCDOB in that [b] is voiced and it is not shared with FFC – the violation of new markedness. (McCarthy 2003: 2).[3]

[3] In this case, the FFCs are the same as their inputs.

3.2 Comparative markedness of Korean palatalization

McCarthy's CM analysis for Korean palatalization is based on Correspondence Theory (McCarthy and Prince 1995, 1999). Correspondence Theory is about the corresponding relation between two elements in which the relation can be about input-output faithfulness (e.g., IO-MAX) or it can be about output-output faithfulness (e.g., OO-MAX).

In Korean, now that *t*-palatalization occurs in morphologically derived environments, the distinction between derived and non-derived forms is crucial. In other words, each output from derived and non-derived environments is different and the difference is captured by OO-correspondence. The extension of CM to OO-correspondence domain makes it possible to pin down the palatalizations in two different environments. OO-$_{N}$PAL, for instance, plays a role in distinguishing palatalization in derived, /t-i/, and non-derived, /ti/, environments.

(6) McCarthy's CM analysis (McCarthy 2003: 23)

			OO-$_{N}$PAL	IDENT	IO-$_{O}$PAL
a. /tot^{h}/ 'a *sail*'	☞ (FFC)	tot^{h}			
		tot$\int^{h}$		* !	
b. /tot^{h}-i/ 'a *sail* + NOM'	☞	tot$\int^{h}$i		*	
	(FFC)	tot^{h}i	* !		*
c. /mati/ 'knot'	☞ (FFC)	mati			*
		mat$\int$i		* !	

The top-ranked OO-$_{N}$PAL assigns a violation mark to *t*, which precedes *i*, when the violation of palatalization is new in OO-correspondent relation. Thus, [tot^{h}i] from /tot^{h}-i/ violates this constraint while [mati] from /mati/ does not. Similarly, [tot^{h}i] and [mati] incur violations of IO-$_{O}$PAL since [t]s before each *i* in output candidates are old and do not palatalize in IO-correspondent relation.

This analysis is firmly based on the assumption that palatalization is processed if and only if "the alveolar+*i* sequence is heteromorphemic" (McCarthy 2003: 21); thus, being blocked in tautomorphemic environments. OO-$_{N}$PAL is crucial to evaluate derived forms but the constraint is vacuously satisfied with the non-derived forms. After all, the tableau implies that the morphologically derived forms are explained in terms of OO-correspondence while morphologically non-derived ones are accounted for by IO-correspondence.

3.3 A problem

The current analysis perfectly accounts for *t*-palatalization, which has a strong distinction between derived and non-derived forms. As introduced in

the previous section, however, Korean palatalization applies to not only derived but also non-derived environments. Therefore, the current analysis might not make the correct prediction in regard to *s*-palatalization. Let us try to apply the current CM analysis to *s*-palatalization.

(7) Expected CM analysis for *s*-palatalization

			OO-$_N$PAL	IDENT	IO-$_O$PAL
a. /kos/ ‘*place*’	☞ (FFC)	kos			
		koš		* !	
b. /kos-i/ ‘*place*+NOM’	☞	koši		*	
	(FFC)	kosi	* !		*
c. /kosi/ ‘*national exam*’	☞ (FFC)	kosi			*
	☹	koši		* !	

Unlike *t*-palatalization, the same ranking does not hold in *s*-palatalization. In the derived environment, this ranking correctly evaluates [koši] from /kos-i/. In the non-derived environment, however, it wrongly select *[kosi] from /kosi/ instead of [koši]. The result leads us to consider that the current CM analysis presents difficulties for the discussion of allophonic palatalization. Let us see how it can be improved.

4. Proposal

In this section, we will revise the current analysis and develop new arguments. We argue that the main difference between *t*- and *s*-palatalization lies on the violation of faithfulness constraint – IDENT[strident]. The argument is constructed with the three following steps; firstly, we discuss that allophonic and phonemic palatalization contrast in terms of the same ranking hierarchy but different violations. Secondly, discussion of the two palatalizations in derived environments is dealt with wherein CM constraint is interpolated to the previous ranking hierarchy. Finally, we address the alternative account for Korean palatalization – local conjunction – in which IDENT[strident] is still crucial. Let us start with the discussion of allophonic palatalization.

4.1 Palatalization in non-derived environments

4.1.1 Allophonic palatalization

Kager (1999) states, in general, that when faithfulness dominates markedness (i.e., F » M), contrasts arise. But, when markedness dominates faithfulness (i.e., M » F), the contrasts are neutralized. This interaction of markedness and faithfulness accounts for allophonic palatalization. Thus, our interest is the neutralization of /s/ and /š/ can be accounted for in terms of M » F. Let us examine what kinds of constraints are involved. We start with markedness constraints.

Every sound is distinct. Its distinctive features do not change in general situation. Regarding palatalization, in normal condition /s/ and /š/ keep contrasts and, thus, /s/ does not palatalize to /š/ (e.g., /sa/ → [sa], not *[ša]). This generalization draws the following constraint.

(8) *PAL
No palatalized consonants are allowed.

The argument for this constraint is that every palatalized candidate is assigned violation marks. In specific, it says *š or *t͡ʃ. Whenever this constraint is not tolerated, the contrasts between [s] and [ši] are expressed. Otherwise /s/ is positionally neutralized to /š/ before *i* (e.g., /si/ → [ši], not *[si]).

(9) PAL
Consonants palatalize before a high front vowel.

What this constraint says is only in the context – 'before *i*' – /s/ palatalizes to /š/, i.e., it says *si. That is, context-sensitively, /s/ and /š/ lose contrasts. The two markedness constraints are different in that while *PAL is a general markedness constraint, PAL is specific. PAL is a specific constraint because its application is limited to the specified context such as 'before *i*'. Now, we need a faithfulness constraint to interact with the above two markedness constraints. The faithfulness required in this case is in (10).

(10) IDENT-IO[place] (simply, IDENT[pl])
The specification for place of articulation of an input segment
must be preserved in its output correspondent (Kager 1999: 45).

/s/ is an alveolar and /š/ is a post-alveolar. Thus, this constraint is satisfied when there is not any input-output feature difference in terms of place (e.g., /s/ → [s] or /š/ → [š]) but it is violated when the place of output differs from that of input (e.g., /s/ → [š] and /š/ → [s]).

Since the difference between /s/ and /š/ are neutralized under the ranking of M » F, IDENT[pl] is dominated by *PAL and PAL as shown below.

(11) Neutralization of /s/ and /š/
*PAL, PAL » IDENT[pl]

We have seen that positionally /š/ is prior to /s/. Thus, a positional markedness constraint that triggers palatalization outranks a general markedness constraint. Finally, the ranking of allophonic palatalization will be as in (12).

(12) Allophonic palatalization
PAL » *PAL » IDENT[pl]

Again, the ranking states that /s/ becomes /š/ context-sensitively (or positionally) but /s/ does not become /š/ context-freely (or generally). Let us put the ranking into tableau.

(13) *s*-palatalization in non-derived environments

		PAL	*PAL	IDENT[pl]
a. /sa/	☞ sa			
	ša		* !	*
b. /ša/	☞ sa			*
	ša		* !	
c. /si/	si	* !		
	☞ ši		*	*
d. /ši/	si	* !		*
	☞ ši		*	

A central issue in the tableau is that PAL is involved only with regard to /si/ and /ši/. Since PAL is a positional markedness constraint, it is not concerned with /sa/ and /ša/. On the other hand, *PAL penalizes every palatalized consonant because it is a general markedness constraint. This *PAL says, regardless of the context, a palatalized consonant is avoided. It can be noticed that the faithfulness constraint – IDENT[pl] – is tolerated because of the neutralization. Observe that only /s/ is an independent phoneme but both /s/ and /š/ are in input based on the Richness of the Base (Prince and Smolensky 2004: 205, 225).

4.1.2 Phonemic palatalization

We need to examine whether the ranking discussed above equally applies to *t*-palatalization.

(14) *t*-palatalization in non-derived environments (ver.1, to be revised)

			PAL	*PAL	IDENT[pl]
a. /t^{h}a/	☞	t^{h}a			
		tʃ^{h}a		* !	*
b. /tʃ^{h}a/	☞	t^{h}a			*
	☹	tʃ^{h}a		* !	
c. /t^{h}i/	☹	t^{h}i	* !		
	☞	tʃ^{h}i		*	*
d. /tʃ^{h}i/		t^{h}i	* !		*
	☞	tʃ^{h}i		*	

The given ranking makes incorrect predictions *[t^{h}a] for /tʃ^{h}a/ and *[tʃ^{h}i] for /t^{h}i/. In fact, it takes for granted that the ranking does not hold for *t*-palatalization because /t^h/ and /tʃ^h/ are not in allophonic relation. Rather, we need to observe that the key difference between /t/ and /tʃ^h/ is on the stridency. In other words, what is important in *t*-palatalization is that the stidency of the input and output is not identical, which lead us to the following constraint.

(15) IDENT-IO[strident]
The specification for stridency of an input segment must be preserved in its output correspondent.

IDENT[strident] incurs violations whenever /t^h/ becomes [tʃ^h] or /tʃ^h/ becomes [t^h]. The selection of [t^{h}i] from /t^{h}i/ indicates that this faithfulness constraint outranks PAL.

(16) *t*-palatalization in non-derived environments (ver. 2)

			IDENT[strident]	PAL
a. /t^{h}a/	☞	t^{h}a		
		tʃ^{h}a	* !	
b. /tʃ^{h}a/		t^{h}a	* !	
	☞	tʃ^{h}a		
c. /t^{h}i/	☞	t^{h}i		*
		tʃ^{h}i	* !	
d. /tʃ^{h}i/		t^{h}i	* !	*
	☞	tʃ^{h}i		

Both candidates [t^{h}i] and [tʃ^{h}i] from input /t^{h}i/ have one violation each, as in (16). But, [t^{h}i] is more harmonic to /t^{h}i/ than [tʃ^{h}i] because /t/ does not palatalize in a non-derived environment. It must be noticed that *s*-palatalization does not incur any violation marks for IDENT[strident] because there is no difference in stridency between /s/ and /š/; as a result, *s*-palatalization incurs only IDENT[pl] violations but *t*-palatalization violates both IDENT[pl] and IDENT[strident] in terms of faithfulness constraints.

In sum, the discussion of palatalization in non-derived environments can be summarized as follows.

(17) Ranking of *t*- and *s*-palatalization in non-derived environments
IDENT[strident] » PAL » *PAL » IDENT[pl]

4.2 Palatalization in derived environments

Now we turn to palatalization in derived environments. By reviewing the previous CM analysis, we have introduced the constraint OO-$_{N}$PAL, which is crucial to distinguish derived from non-derived palatalization. The interaction of OO-$_{N}$PAL and the previous ranking schema is illustrated below.

(18) *t*- and *s*- palatalization in derived environments

			OO-$_{N}$PAL	IDENT[strident]
a. /t^{h}-i/	(FFC)	t^{h}i	* !	
	☞	tʃ^{h}i		*
b. /tʃ^{h}-i/		t^{h}i	* !	*
	☞ (FFC)	tʃ^{h}i		
c. /s-i/	(FFC)	si	* !	
	☞	ši		
d. /š-i/		si	* !	
	☞ (FFC)	ši		

The tableau places OO-$_{N}$PAL on the highest ranking position. Obviously, OO-$_{N}$PAL must dominate IDENT[strident], since /t^{h}/ in the derived environment (i.e., /t^{h}-i/) palatalizes to [tʃ^{h}i]. The rest of constraints are ranked below OO-$_{N}$PAL automatically by (17). OO-$_{N}$PAL assigns violation marks to the candidates which are not shared with the base form in OO-correspondence (McCarthy 2003: 23). Again, since IDENT[strident] evaluates the different strident feature of /t/ and /tʃ^{h}/, all candidates from /s/ and /š/ inputs vacuously satisfy the constraint. It should be reminded that based on the CM analysis assumption, OO-$_{N}$PAL exerts its influence only in the derived environments although it applies to every candidate in the above tableau.

Finally, the ranking of *t*- and *s*-palatalization can be summarized as below.

(19) Ranking of *t*- and *s*-palatalization
OO-$_{N}$PAL » IDENT[strident] » PAL » *PAL » IDENT[pl]

We have seen that the CM constraint is crucial to evaluate optimal outputs in derived-environment. OO-$_{N}$PAL plays a role in choosing out derived forms from non-derived ones. However, because of the incorrect assumption that Korean palatalization applies to only morphologically derived environments, the CM constraint is not enough to select optimal outputs in *s*-palatalization. Thus, it is proposed that IDENT[strident] is the constraint to tell us the

difference between *t*- and *s*-palatalization. Again, the difference between phonemic and allophonic palatalization results from faithfulness of stridency.

With the tableaux in (20) and (21), we can demonstrate how the ranking schema evaluates *t*- and *s*-palatalization in derived and non-derived environments.

(20) *t*-palatalization in derived & non-derived environments (final ver.)

			OO-$_N$PAL	IDENT [str]	PAL	*PAL	IDENT[pl]
a. /t^{h}i/	☞	t^{h}i			*		
		tʃ^{h}i		* !		*	*
b. /tʃ^{h}i/		t^h i		* !	*		*
	☞	tʃ^{h}i				*	
c. /t^h-i/	(FFC)	t^{h}i	* !		*		
	☞	tʃ^{h}i		*		*	*
d. /tʃ^h-i/		t^h i	* !	*	*		*
	☞ (FFC)	tʃ^{h}i				*	

(21) *s*-palatalization in derived & non-derived environments

			OO-$_N$PAL	IDENT [str]	PAL	*PAL	IDENT[pl]
a. /si/		si			* !		
	☞	ši				*	*
b. /ši/		si			* !		*
	☞	ši				*	
c. /s-i/	(FFC)	si	* !		*		
	☞	ši				*	*
d. /š-i/		si	* !		*		*
	☞ (FFC)	ši				*	

In both of the tableaux, OO-$_N$PAL has to do with only derived forms and assigns violation marks onto the newly marked forms. Therefore, lack of palatalization in /t^{h}i/ → [t^{h}i] becomes the crucial reason of /t-i/ → *[t^{h}i] violation (McCarthy 2003: 23). IDENT[strident] is violated only in *t*-palatalization. These two tableaux refine our proposal that *t*- and *s*-palatalization are different in faithfulness violations. At the same time, a single ranking schema uniformly explains the two kinds of palatalization regardless of the environment differences.

4.3 Implications

The findings by our argument yield a couple of typological implications. One of the implications is that the analysis can make a prediction for the possible and impossible lexical items with regard to palatalization. See below.

(22) a pseudo word /sit^{h} + i/

/sit-i/			OO-$_{N}$PAL	IDENT [strident]	PAL	* PAL	IDENT[pl]
a.		šit^{h}i	* !		*	*	*
b.	(FFC)	sit^{h}i	* !		* *		
c.		sitʃ^{h}i		*	* !	*	*
d.	☞	šitʃ^{h}i		*		* *	* *

In Korean lexicon, /sit^{h}/ does not exist although it is a possible item. That is, the pseudo word is a lexical gap.[4] Hypothetically, though, when a nominative affix follows /sit^{h}/, the expected output will be [šitʃ^{h}i]. [šitʃ^{h}i] is the output of /sit^{h}-i/ because /s/ palatalizes regardless of the environment and /t^{h}/ palatalizes by the morphological process. This tableau demonstrates how the ranking hierarchy selects [šitʃ^{h}i] as a possible lexical items and the rest as impossible ones.

On the other hand, the other implication is that the ranking schema can evaluate the correct nativization of loan words. Let us give an example of a loan word /sit^{h}i/ from an English word '*city*'.

(23) a loan word /sit^{h}i/ from English '*city*'

/sit^{h}i/			OO-$_{N}$PAL	IDENT [strident]	PAL	PAL	IDENT[pl]
a.	☞	šit^{h}i			*	*	*
b.	(FFC)	sit^{h}i			* ! *		
c.		sitʃ^{h}i		* !	*	*	*
d.		šitʃ^{h}i		* !		* *	* *

Native speakers of Korean adopt [šit^{h}i] as the optimal output, which can be accounted for by the above tableau. In the case of /sit^{h}i/, both /s/ and /t/ are tautomorphemic. Since /s/ palatalizes across board and /t/ does not palatalize in non-derived environment, [šit^{h}i] becomes the output. It can be concluded that Korean nativizes the loan word /sit^{h}i/ as [šit^{h}i] and the given ranking explains and predicts this nativization.

This analysis fits well into the current phonological literature such as the structure of lexicon. It deeply correlates to the lexicon stratification model which accounts for a phonological lexicon of Japanese (Itô and Mester 1999). What exactly the two tableaux in (22) and (23) imply is the complete impossibility for *[sitʃ^{h}i] to be a lexical item. As the table shows, *[sitʃ^{h}i] is harmonically bound because *t* cannot palatalize but *s* palatalizes. This harmonic relation is possible because *s*-palatalization always applies before *i* and *t*-palatalization applies only in derived environment. That is, *t*-palatalization becomes the subset of *s*-palatalization. What it means is if *t*

[4] As a close lexical item, there is a word /sot/ '*a pot*'. In this case, * PAL operates to evaluate the optimal output.

palatalizes, then *s* palatalizes without any exceptions, but not vice versa. Therefore, *[sit͡ʃʰi] never becomes a winner in any case, i.e., the potential loser.

5. Conclusion

In this paper, we have argued that the current CM analysis with the ranking OO-$_{N}$PAL » IDENT per se does not account for Korean palatalization. The problem with this analysis is that it does not distinguish between *t*- and *s*-palatalization – it incorrectly predicts that *s*-palatalization should also be blocked in non-derived environments. Instead, we extended the CM analysis into the way that the significant difference between the two kinds of palatalization lies in the faithfulness violations, in particular, violations of IDENT[strident]. This constraint incurs violations in *t*-palatalization and the violation is not involved in *s*-palatalization. The ranking of this constraint below OO-$_{N}$PAL blocks *t*-palatalization in non-derived environment and triggers *s*-palatalization in the same environment.

To sum up, the details of the analysis clarify that (i) comparative markedness is a requisite in distinguishing derived and non-derived environments and (ii) the difference between *t*- and *s*-palatalization lies on the faithfulness violations. We illustrate that McCarthy's CM analysis successfully distinguishes between the morphologically derived and non-derived environments. But it fails to distinguish between phonemic and allophonic palatalization. This distinction depends on a better understanding of the faithfulness constraints involved. The interaction of CM and faithfulness constraints offers a unified ranking. In doing so, we elicit that the ranking schema uniformly explains both *t*- and *s*-palatalization regardless of the environment differences. Furthermore, the harmonic relation of the ranking schema enables us to infer the legible form of a pseudo or a loan word in the lexicon. The implications of this analysis for palatalization can be extended to the examination of the language such as Japanese in further research.

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