PROSODIC DOMAINS AND AMBISYLLABICITY IN OPTIMALITY THEORY

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ABSTRACT

PROSODIC DOMAINS AND AMBISYLLABICITY IN OPTIMALITY THEORY

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Selkirk 1984, 1986, Nespor & Vogel 1986 and others independently argue that PrWd structure is built from morphological structure. In Optimality Theory, Generalized Alignment (McCarthy & Prince 1993b) has been successful in encoding the close relationship between prosodic structure and morphological structure.

However, surface syllabification renders morphological boundaries opaque in a compound /CVC-VC/, in which each Root of the compound is identified as a separate PrWd in a language such as Korean (Kang 1992). In such case, owing to the requirement of ONSET, the final consonant of the first Root of the compound must be syllabified as an onset, leading to PrWd-Root misalignment. However, we show that unique-onset syllabification is empirically not tenable in Korean; a variety of phonological phenomena suggest that this consonant must be syllabified as a coda, seemingly requiring an abstract syllabification and thus posing a challenge to Optimality Theory, in which abstract syllabification is impossible.

This dissertation proposes that a Root juncture is in fact non-crisply aligned with a PrWd juncture. We further argue that the PrWd-final consonant which is followed by a vowel across a PrWd juncture is realized as ambisyllabic. This proposal is strongly supported by several Korean phonological phenomena and English flapping. We demonstrate in Korean that /n/-insertion is compelled to avoid an ambisyllabic consonant before a high front vocoid. We also show in Korean that overapplication of Coda Neutralization and underapplication of primary palatalization of a PrWd-final consonant

before a high front vocoid across a PrWd juncture are due to the ambisyllabicity of the PrWd-final consonant.

Additionally, we analyze primary palatalization, secondary palatalization and Umlaut in Korean (Iverson 1993, Kiparsky 1993 for Korean and Hume 1990). We will demonstrate that Umlaut is blocked across a secondarily palatalized coronal consonant before a high front vocoid. We propose that Umlaut and secondary palatalization are a single phonological phenomenon and secondary palatalization blocking of Umlaut results from a consipiracy to force the V-place of a high front vocoid to spread only once.

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List of Abbreviations

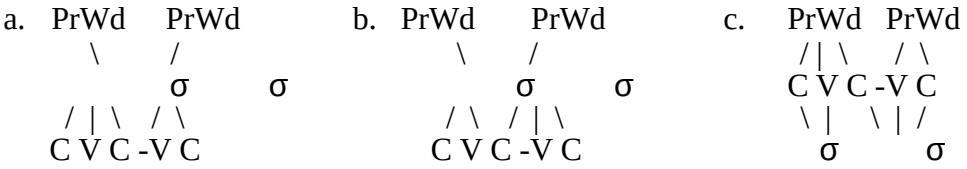
Acc	Accusative
AGT	Agentive Suffix
ADVL	Adverbial Suffix
Antidat	Antidative Suffix
Caus	Causative
Cl	Clitic
Conn	Connective Clitic
Cont	Continuant Suffix
Cop	Copular
Dat	Dative
Delim	Delimitive Clitic
Derog	Derogative Suffix
Hon	Honorific
Hum	Humble Suffix
Ind	Indicative
INFL	Inflectional Suffix
Mod	Modifying Suffix
Mood	Mood Suffix
N	Noun
Neg	Negative Suffix
NOML	Nominal Suffix
NP	Noun Phrase
Nom	Nominative
Past	Past Tense
Pl	Plural
PrWd	Prosodic Word
PhoPh	Phonological Phrase
R	Root
Tns1	Tense1
Tns2	Tense2
Top	Topic Clitic
V	Verb
VP	Verb Phrase
μ	mora
σ	syllable
ω	Prosodic Word
φ	Phonological Phrase

Chapter 1 Introduction

Selkirk 1984, 1986, Nespor & Vogel 1986, Inkelas 1989 independently argue that PrWd structure is built from morphological structure. The hypothesis that PrWd formation refers to word-internal morphological structure has been well attested cross-linguistically in the literature (Selkirk 1984, 1986, Nespor & Vogel 1986, Inkelas 1989 and Kang 1992). In Optimality Theory, which is based on surface-level output forms, Generalized Alignment (McCarthy & Prince 1993b) has been successful in encoding the close relationship between prosodic structure and morphological structure.

However, the hypothesis that PrWd fromation refers to word-internal structure poses a problem in Optimality Theory. Suppose each Root of a compound is identified as a separate PrWd in a language (for example, Korean (Kang 1992, Han 1991)). When the final consonant of the first Root of the compound is followed by a vowel-initial second Root, a problem arises as to whether the final C of the first member of the compound is syllabified uniquely as a coda and resides as the (first) PrWd-final C (as shown in (1a)) or whether it is syllabified uniquely as an onset across the inner compound boundary and becomes the (second) PrWd-initial C (as shown in (1b)) or whether a PrWd juncture is misaligned with a syllable juncture (as shown in (1c)):

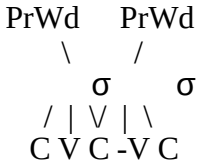
(1) Potential prosodic structures of a two-Root compound



From the perspective of the Optimality Theory, (1a) is problematic when the constraint ONSET is highly respected in Korean. And it is true that ONSET is highly respected cross-linguistically (Itô 1986, 1989). In (1b), a PrWd juncture is formed within a Root and misalignment between a PrWd juncture and a Root juncture arises. This misalignment is problematic according to the hypothesis that PrWd structure refers to morphological structure (Selkirk 1984, 1986, Nespor & Vogel 1986, Inkelas 1989). In (1c), the PrWd juncture is aligned with a Root juncture but it is not aligned with a syllable juncture. We will show in this dissertation that misalignment between a PrWd juncture and a syllable juncture is empirically not correct when we consider Korean data. Furthermore, if (1c) would be correct, the validity of the Strict Layer Hypothesis (Selkirk 1984, 1986, 1995 and others) would have to be questioned.

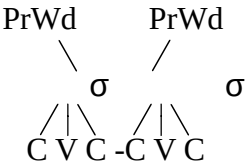
In this dissertation, we raise another possibility: namely, the PrWd-final consonant before a vowel is realized as ambisyllabic, regardless of whether a word-internal or word-external PrWd juncture is involved.

(2)



As a result, the ambisyllabic consonant itself will become a PrWd juncture. This is contrasted with a case in which a Root-final vowel or consonant is followed by a Root-initial consonant. In this, the PrWd juncture will be formed between the two consonants.

(3).



We will show that the fourth possibility (shown in (2)) is well supported by underapplication or overapplication of Korean phonological phenomena which we will provide as evidence. We are going to focus on Korean Coda Neutralization, (primary) palatalization and /n/-insertion (and English flapping).

We will first show that a word-internal PrWd juncture is formed between two Roots within a noun compound and between a prefix and a following Root in Native Korean. Actually, this argument for Korean was already made in Han 1991, 1994, Kang 1992, based on the fact that the overapplication of Coda Neutralization and the underapplication of primary palatalization are observed in the prefix-final consonant in a prefixed word and in the final consonant of the first member of a compound, before a vowel. Han provides her analysis in the framework of Prosodic Lexical Phonology (Inkelas 1989). On the other hand, Kang uses the End-based Rule (Selkirk 1986) to identify a PrWd juncture within the framework of Lexical Phonology (Kiparsky 1982, 1984). In such rule-based approaches, it is rather simple to analyze the overapplication of Coda Neutralization, since intermediate syllabification can be crucially utilized. For example, suppose a PrWd juncture is formed between two Roots within a compound. According to Kang, intermediate syllabification takes place within each PrWd (4b). As a result, after intermediate syllabification within the PrWd domain, the prefix-final consonant is syllabified as a coda and must undergo Coda Neutralization (4c) even before a vowel across a PrWd juncture. After that, surface syllabification takes place beyond a PrWd-level

and the coda-neutralized consonant is syllabified as an onset before a vowel across a PrWd juncture (see detailed discussion of this approach in section 3.2)).

(4)

		Prosodic Structure
$_{N}$[t´s $_{N}$[os]]	a. PWF (lexical):	$_{PrWd}$(t´s) $_{PrWd}$(os)
'outer' 'clothes'	b. Syll.:	$_{PrWd}$ (t´s.) $_{PrWd}$(os.)
	c. CN:	$_{PrWd}$ (t´t.) $_{PrWd}$(ot.)
	d. Resyllabification:	$_{PhoPh}$(t´.tot.)
	e output	[t´tot]

However, within the framework of the surface-based Optimality Theory, appealing to abstract syllabification as a solution to the overapplication of CN and the underapplication of primary palatalization is not possible.

When we focus on the overapplication of CN and the underapplication of primary palatalization in a consonant before a PrWd juncture, we crucially observe that the final consonant in question has the characteristics of being in coda since it is neutralized even before a vowel across a PrWd juncture. On the other hand, ONSET is highly respected in Korean. Then the overapplication of Coda Neutralization turns out to become strong evidence for the hypothesis that the PrWd-final consonant before a vowel is realized as ambisyllabic.

We also demonstrate that this hypothesis is further supported by /n/-insertion phenomenon. In Native Korean, /n/ is optionally inserted between a prefix-final consonant and a following i/y-initial Root and at the inner compound boundary between a consonant and i/y. However, Standard Sino-Korean (hereafter, Standard SK) and Kyungsang Dialect Sino-Korean (hereafter, Kyungsang SK) have their own /n/-insertion strategies. In Standard SK, for example, /n/ is inserted between a consonant and /y/ excluding /i/ within

some specific types of compounds. In Kyungsang SK, on the other hand, /n/ is inserted at all Root boundaries within a compound. The variation of /n/-insertion across different sublexica in Korean has been a mystery in the literature on Korean phonology. In the analysis of /n/-insertion in Korean, we will argue that an ambisyllabic consonant must be avoided before a high front vocoid, though more complexity with respect to this argument arises across sublexica in Korean. We further demonstrate that the ambisyllabicity hypothesis makes it possible to capture variation of /n/-insertion across sublexica within a Korean dialect and across Korean dialects.

For the analyses in this dissertation, we crucially depend on the Correspondence Theory-based OT approach that has been developed originally for reduplicative copying in McCarthy 1995, Benua 1995 and further developed as an alternative to cyclicity in Kenstowicz 1995. We will also crucially depends on the two types of Alignment: "crisp" Alignment (McCarthy & Prince 1993b) and "non-crisp" alignment (Itô, Mester & Pidgett 1994).

In Chapter 2, we introduce the basic knowledge of the Korean language, the data on which our arguments are based. In section 2.1, we enumerate Korean vowels and consonants. In section 2.2, we review the morphological characteristics of Native Korean verbs, nouns and concatenated suffixes. In section 2.3, we review Sino-Korean morphology studied in the literature.

In Chapter 3, we analyze Coda Neutralization. In section 3.1, we show that an obstruent is neutralized in coda within suffixed or cliticized words. We introduce segment-to-syllable alignment constraints in the spirit of Itô & Mester 1994 for [lar], [+cont] and [-ant] features. We argue that those features must be left aligned with a syllable. Furthermore, we further argue that a “crisp” alignment in the sense of McCarthy & Prince 1993b is necessary. In section 3.2, we introduce cases of the overapplication of CN and the underapplication of primary palatalization, which are found in the final consonant of a

prefix and the left member of a compound. We review Kang's 1992 analysis of CN based on the End-Based Rule (Selkirk 1986) in the framework of Lexical Phonology (Kiparsky 1982, 1984). We further point out some problems in Kang's analysis. Then we demonstrate that the prefix in Korean is not a prefix in a general sense but a Root, which is isolated morphologically from a following Root. In section 3.3, we propose that Native Korean morphological structure is formed by the morphological merger of a suffix, clitic or Root with a head Root in the sense of Marantz 1986, 1988. We argue that the overapplication of CN and the underapplication of primary palatalization in a Root-final consonant before a Root-initial vowel (in a Root-Root compound) provide evidence for a PrWd juncture between two Roots within a word. In section 3.4, we propose that the right edge of the Root which is followed by another Root is “non-crisp” aligned with the right edge of a PrWd in the sense of Itô & Mester 1994. We demonstrate that the PrWd-final consonant before a vowel across a PrWd juncture is realized as ambisyllabic in Native Korean (section 3.4) and in English (section 3.5). We implement the ambisyllabicity of the PrWd-final C before a V by adopting the two types of Alignment: "non-crisp" Alignment (Itô & Mester 1994) and "crisp" Alignment (McCarthy & Prince 1993b).

In section 3.7, we implement the conspiracy (in Optimality Theory) which forces the Root-final C before a following Root-initial vocoid (in a Root-Root compound) to be realized as ambisyllabic. In this case, two forces are crucially involved. One forces the Root-final C (before a Root-initial C) to be syllabified as an onset and the other forces the Root-final C to be the last segment of the PrWd. When the two forces are simultaneously satisfied, the Root-final C is realized as ambisyllabic.

In section 3.8, we provide an alternative analysis to the overapplication of Coda Neutralization. We demonstrate that constraint conjunction (Smolensky 1995) of “non-crisp” alignment and CrispEdge(σ) in the sense of Itô and Mester 1994 dispenses with

"crisp" alignment in McCarthy & Prince 1993b for the analysis of the overapplication of Coda Neutralization in Korean.

In Chapter 4, we motivate the feature [-ant] for primary /t/-palatalization and then we show that primary palatalization must be treated as an independent phonological phenomenon from secondary palatalization. Hence we argue against Kiparsky 1993, who analyzes both types of Palatalization in Korean as one uniform process (section 4.1). We also argue against Iverson 1993 (section 4.2), who appeals to Structure Preservation for the analysis of Korean palatalization. We further show that Iverson's data, which ignore secondary palatalization in coronal consonant before a high front vocoid, are not correct. This observation is already made by Kiparsky 1993. We provide evidence for this in relation with Korean Umlaut. Namely, Umlaut is blocked sorely by secondary palatalization. This view crucially argues against Hume 1990, 1992 who argued that palatalization in general blocks Umlaut in the Kyungsang Dialect of Korean (section 4.7). In our analyses of secondary palatalization and Umlaut, we will show that the two phenomena are basically the same phenomenon: namely, non-local and recursive spreading of the V-place/Cor from a high front vocoid to a preceding coronal consonant (secondary palatalization) and to a preceding back vowel (Umlaut).

Chapter 5 analyzes /n/-insertion in Korean, which has never been successfully analyzed in the literature on Korean Phonology. We will show that variation of /n/-insertion is observed across different sublexica (Native Korean and Sino-Korean) within the same Korean dialect and across Korean dialects (Standard Korean and Kyungsang Dialect). In Native Korean, /n/-insertion occurs between a C-final Root and a i/y-initial Root in a compound. Since a PrWd juncture is formed between the two Roots, we argue that ambisyllabicity of the PrWd-final consonant before a vowel across a PrWd juncture is strongly dispreferred before a high front vowel in Native Korean. We further argue that /n/-insertion is compelled to avoid an ambisyllabic consonant before a high front vowel.

We also provide a solution to the question why /t/ is not the epenthetic consonant in Korean in section 5.3. Even though /t/ is the least marked consonant cross-linguistically, more marked /n/ is the epenthetic consonant in Korean. We show that strong dispreference for /t/ before a high front vocoid in this language compels /n/ to be the epenthetic consonant.

In section 5.4, 5.5, 5.6 and 5.7, we show that variation of /n/-insertion is observed across sublexica of Korean. In Standard Korean Sino-Korean, /n/-insertion occurs after a Base, which is defined as a Root or combination of Roots (cf. Kenstowicz 1995). In Kyungsang Dialect Sino-Korean, /n/-insertion occurs between two Roots. We motivate another hypothesis that a SK Root-final C before a V-initial Root is realized as ambisyllabic. Based on this hypothesis, we analyze variations in /n/-insertion across Sino-Korean sublexica in the Standard Korean and the Kyungsang Dialect. In the analysis of /n/-insertion in Sino-Korean, we will adopt constraint reranking for variation of /n/-insertion. We crucially show that /n/-insertion constitutes another piece of evidence for the Ambisyllabicity Hypothesis. In section 5.9 and 5.10, we show that the morphological and phonological environment for /n/-insertion phenomenon partly overlaps with that of /n/-deletion phenomenon in Sino-Korean. We report that a free-standing morphological element (i.e., Base) enforces a phonological restriction in Sino-Korean. This is abnomal since phonological constraints normally refer only to prosodic structure. We demonstrate how the proposed set of constraint ranking handles the interaction of /n/-insertion and /n/-deletion.

Chapter 2 Phonological and Morphological Preliminaries of Korean

The Korean language consists of at least three sublexica: Native Korean, Sino-Korean and foreign borrowing sublexica. In this chapter, we introduce some basics of Native Korean and Sino-Korean in a descriptive way.

2.1 Vowels and Consonants in Korean

The Native Korean sublexicon accounts for less than half of the Korean lexicon and most researches on Korean phonology and morphology have been done in this sublexicon (Choi 1937, Ahn 1985 and others). In this chapter, we provide basic phonological and morphological background knowledge of the Korean lexicon.

There are ten vowel phonemes in Korean as follows:

(1) Vowel phoneme inventory[1]

	front	back	
	unround	unround	round
high	i	ˆ	u
mid	e	´	o
low	æ	a	

[1] It has been reported that some speakers have front round vowels /ü/ and /ö/ which correspond to /wi/ and /we/ in the speech of other speakers (Huh 1985: 163, Y. Kim 1955: 90, S. Lee 1954: 153).

i) a. sö or swe 'iron'
b. ö-atˆl or we-atˆl 'only son'
c. cü or cwi 'mouse'
d. c^hü or c^hwi 'wild greens'

As for the consonants, Korean has the following phonemic consonants and allophonic consonants:

(2) a. Consonantal phoneme inventory

	bilabial	alveolar	palatal	velar
stop	p, p'[2], p^h	t, t', t^h	c, c', c^h	k, k', k^h
fricative		s, s'		
nasal	m	n		N
liquid		l		
glide	w		y	h

b. Consonantal allophone inventory with respect to secondary palatalization

(Segments in parentheses are not significant in phonology (see below))

	before /i, y/ (secondary palatalization)	elsewhere
/t, t^h, t'/	tJ, t^Jh, tJ'	t, t^h, t'
/s, s'/	sJ, sJ'	s, s'
/c, c^h, c'/	cJ, c^Jh, cJ'	c, c^h, c'
/n/	nJ	n
/l/	lJ	l
/k, k^h, k'/	(kJ, k^Jh, kJ')	(k, k^h, k')
/p, p^h, p', m, N/	(pJ, p^Jh, pJ', mJ, NJ)	(p, p^h, p', m, N)

All coronal consonants are secondarily palatalized before a high front vowel. Secondary palatalization of coronal consonants is phonologically significant in that they play an important role in phonology. We will show in detail in chapter 4, that only secondarily palatalized coronal consonants block Umlaut in the Kyungsang Dialect. On the other hand,

[2] As noted in Han 1993, the production of a fortis consonant is characterized by minimal glottal opening and the approximation of the vocal folds during the occlusion and release (Kim 1965, 1970, Kagaya 1974) with accompanying muscular tension in the vocal folds and in the walls of pharynx (Hardcastle 1973, Hirose et al. 1974) and also in the vocal tract wall (Dart 1987).

dorsal and labial consonants also seem to undergo secondary palatalization before a high front vocoid. However, secondary palatalization of non-coronal consonants seem to be not significant phonologically in that secondarily palatalized non-coronal consonants is transparent to Umlaut in the Kyungsang Dialect. In this vein, secondary palatalization in non-coronal consonants seems to be the result of phonetic implementation. Namely, secondary palatalization of non-coronal consonants results from the anticipatory articulation of a following high front vocoid. This type of anticipatory articulation is expected in /ki/, for example. /k/ is a dorsal consonant. Before the back part of the tongue are aiming at the target for [k], other parts of the tongue are already moving toward their targets for the following [i] (Ladegfoged 1975: 55). As a result, the articulation of [k] is influenced by the articulation of the following [i].

In addition to those consonants, we note in this section that Korean has some allophonic consonants. Underlying /l/ is always realized as flapped [r] between vowels:

(3)	a. /oli/	[ori]	‘duck’
	b. /k´li/	[k´ri]	‘street’

On the other hand, a plain obstruent is realized as gradiently voiced between vowels. However, tense and aspirated obstruents do not become voiced in the same environment.

(4)	a. /ipul/	[ibul]	‘quilt’
	b. /aki/	[agi]	‘baby’
	c. /ap’a/	[ap’a]	‘father’
	d. /ik’i/	[ik’i]	‘moss’
	e. /ap^{h}^-/	[ap^{h}^]	‘to be sick’
	f. /cik^{h}i-/	[cɟik^{h}i]	‘to keep’

We assume that gradient voicing of a plain obstruent between two vowels results from phonetic implementation. .

Lax consonants /t, s, c, p, k/ become tensed [t', s', c', p', k'], respectively, after an obstruent.

(5) a. /hak-kyo/ [hakk'yo] 'school'
b. /ip-caN/ [ipc'aN] 'position'
c. /is'-ta/ [itt'a] 'to exist-Mood'

Another set of allophonic consonants are secondarily palatalized coronals. All coronals are realized as secondarily palatalized before a high front vocoid (Kiparsky 1993 for Korean):

(6) a. /mati/ matʲi 'node'
b. /si/ sʲi 'poem'
c. /kaci/ kacʲi 'branch'
d. /koni/ konʲi 'swan'

We will assume for the moment that those secondarily palatalized [sʲ] and [nʲ] are phonetically realized as palatals [ʃ] and [ɲ], respectively. We will discuss secondary palatalization in detail in chapter 4 with respect to interaction of secondary palatalization and Umlaut.

In Korean, the maximal syllable is CGVC in which G stands for a glide (/y/ or /w/). Korean syllable structure allows only one consonant in onset and coda on the surface.

Hence, morpheme-final post-vocalic double-consonant clusters are simplified before another consonant (Consonant Cluster Simplification).

(7) a. /anc-ta/ an-t'a 'sit-Mood'

b. /salm-ko/ sam-k'o[3] 'boil-and'

2.2 Native Korean Morphology

Korean is an agglutinative language which exhibits complex structures of verbs and nouns. In this section, we briefly describe suffixation in verbal morphology, and suffixation and cliticization in nominal morphology in Native Korean as an introduction to a later discussion of Korean prosodic domains.

In Korean verbal morphology, there are two types of bound morphemes which concatenate on the right side of a verb Root: derivational suffixes and inflectional suffixes. All derivational suffixes occur to the left of inflectional suffixes. The following shows the linear verbal template of concatenation of a verb Root and suffixes:

[3] Note that a plain obstruent is tensified after another obstruent. However, it is not clear why /k/ is tensified after /m/ in the example.

(8) Linear template of verbal morphology

	Deriva-tional	Inflectional					
Verb	Caus/ Pass	Hon	Tns1	Tns2	Style	Ind	Mood/ Verb Ending
Root	hu	ˆsi	´s’	kes’	ˆp	ni	ta
	u				sˆp	ˆsi	k’a
	ku					ˆti	ˆla
	i					nˆn	ca
	hi						ˆna
	li						ˆni
	ki						ˆmy´n
							ˆmy´
							ˆn
							ˆl
							t´n
							nˆn

a. cap-hi-si-´s’-kes’-ˆp-ni-ta ‘(Someone) was caught.’

catch-Pass-Hon-Tns1-Tns2-Hum-Ind-Mood

b. mac-hi-ˆsi-´s’-kes’-ˆp-ni-ta ‘(The honorable) probably hit (something)’

hit-Caus-Hon-Tns1-Tns2-Hum-Ind-Mood

A verb Root requires an inflectional Mood to appear as an independent word. A verb Root alone or combination of a verb Root and other inflections except a verb ending cannot appear as an independent word. Some derivational suffixes which do not change the grammatical category of the verb Root are concatenated with the verb Root as shown above. With these suffixes, the derived stem cannot appear as an independent word and requires an inflectional Mood. On the other hand, there is another type of derivational

suffix which is concatenated to the preceding verb Root and changes the grammatical category of the verb.

(9) Category-changing derivational verbal suffixes

Nominal suffixes

/m´k-i/	->	m´k-i	‘food’
eat NOML			
/kip^{h}-i/	->	kip^{h}-i	‘depth’
be-deep NOML			

Adverbial suffixes

/nop^{h}-i/	->	nop^{h}-i	‘high’
be-high ADVL			
/m´l-li/	->	m´lJ-lJi	‘distantly’
be-far ADVL			

In this case, the verb Root followed by such a derivational suffix can appear as an independent word since it is no longer a verb.

On the nominal side of Korean morphology, the following is the linear template of a noun Root plus suffixes or clitics:

(10) Linear template of nominal suffixal or clitic morphology

Noun	Pl	Dat	Antidat	Conn	Delim	Case Marker/ Topic Marker
Root	tˆl	e	s´	(k)wa	k'aci	ˆy
		eke		hako	puth´	ka/i
				pota	p'un	(l)ˆl
				c^{h}´l´m	cocha	(n)ˆn
					man	

a. ´lˆn-tˆl-k'e-s´-man-i 'only the elders'

adult-Pl-Dat-Antidat-Delim-Nom

b. toNhwa-e-s´-nˆn 'from the fairy tales'

fairy tales-Dat-Antidat-Top'

c. na-hako-man 'only with me'

I-with-only

The following examples show that the topic marker /nˆn/ is added after the clitic /wa/ 'and':

(11) suni-wa na-wa-nˆn 'As for Suni and me'

Suni-and I-and-Top

This suggests that a topic marker is also a clitic.

Suffixes and clitics are iteratively concatenated with the preceding noun Root:

(12) Noun suffixes and clitics

a. mul-ka-e-nˆn 'edge of a stream-at-Top'

water edge(suffix) at(suffix) Top

b. salam-nom-tˆl-eke-to 'people -also'

people-Derog(suffix)-Pl(clitic)-also(clitic)

There are also prefixes which concatenate with a following noun or verb Root.

(13) Korean prefixes

Before a noun Root

a. /hot^{h}-ipul/ -> hot-ipul ‘single-layer quilt’

single quilt

b. /h´s-kic^{h}im/ -> h´t-k’ichim ‘clearing one’s throat’

empty cough

c. /mac-tampæ/ -> mat-t’ampæ ‘smoking to another’s face’

together cigarettes

d. /´s-kˆlu/ -> ´t-k’ˆru ‘tree stump which is cut off diagonally’

cross stump

Before a verb Root

e. /h´s-tˆt-ta/ -> h´t-t’ˆt-ta ‘mishear’

empty hear

f. /mac-cap-ta/ -> mat-c’ap-ta ‘hold together’

together hold

g. /´s-kal-li-ta/ -> ´t-k’al-li-ta ‘miss each other’

cross be-split

Those bound morphemes which appear before a noun or verb Root are treated as prefixes in the literature (Choi 1937, Kang 1992 and references therein) due to the fact that these morphemes are bound. However, we will argue in section 3.2 of this paper that those prefixes are actually Roots and behave prosodically as a separate PrWd from a following Root.

2.3 Sino-Korean Morphology

There is another sublexicon in the Korean language: Sino-Korean. The Sino-Korean sublexicon constitutes more than half of the Korean lexicon (K.-J. Song 1986, 1992). Hence, it is important to consider phonological and morphological characteristics of Sino-Korean words in the study of the Korean language, though little study has been done on this sublexicon in the literature. In this section, we will review the historical background of Sino-Korean compounds by referring to K.-J. Song 1986, 1992. And we further review the morphological and phonological characteristics which are not shared by native Korean words.

Before the invention of the Korean alphabetical system by King Sejoing in the 15th century, Chinese characters and their modified forms had been incorporated as the standard writing system in Korean. Even after the 15th century, Chinese characters have been used side by side with the new Korean alphabetical system until present.

In Sino-Korean, each morpheme (Root) consists of maximally CGVC in which G is a glide. Hence, each SK Root is realized as a monosyllable. Each Root has its own meaning. One SK Root can appear alone as an independent word. However, the number of SK one-Root words is limited. It is observed in Song 1992, 1986 that Sino-Korean Roots can appear as an independent word only when there are no corresponding native words which have the same meaning.

(14) Data partly from K.-J. Song 1986

Native Korean morphemes	SK morphemes	meanings
ap´ci	bu (bound)	‘father’
´m´ni	mo (bound)	‘mother’
hanˆl	ch´n (bound)	‘sky’
t’aN	ci (bound)	‘earth’
hæ	il (bound)	‘sun’
tal	w´l (bound)	‘moon’
salam	in (bound)	‘man’
mul	su (bound)	‘water’
N/A	chæk (free)	‘books’
N/A	saN (free)	‘table’
N/A	coN (free)	‘bell’
N/A	mun (free)	‘door’
N/A	chaN (free)	‘window’
N/A	py´N (free)	‘disease’

Historically, a free Sino-Korean Root replaced the corresponding native Korean morpheme when the two denote the same meaning; otherwise, either the meaning of a free Sino-Korean Root or its corresponding native Korean morpheme had changed to another meaning, or the free Sino-Korean Root had become bound.

(15) data from K.-J. Song 1986

Native Korean archaic morphemes	SK morphemes	Meaning	Remarks on native Korean morphemes	Remarks on SK morphemes
on	pæk	'one hundred'	Not used	
cˆmun	ch´n	'one thousand'	Not used	
mö	san	'mountain'	Not used	
coka	cil	'nephew'		used only as a bound Root
´nni	hy´N	'elder brothers or sisters'	changed meaning 'elder sister of a female'	changed meaning 'elder brother of a male'
kyecip	ch´	'wife'	derogative 'wife' or 'woman'	'wife'
sö	kˆm	'metal'		changed meaning 'gold'
h´pha	pe	'lung'	changed meaning 'lung of an animal'	changed meaning 'lung of a man'

Sino-Korean compounds consist of more than one Root. The following examples are SK two-Root compounds:

(16) Sino-Korean compounds which consist of two Roots

a. /han-kuk/ han-kuk 'Korea'

b. /sik-taN/ sik-t'aN 'restaurant'

The two-Root Sino-Korean compounds account for most of the Sino-Korean lexicon. We introduce the term "Base" which refers to a morpheme or combination of morphemes which can appear as an independent word (Benua 1995, Kenstowicz 1995 and references therein). Though there are Sino-Korean compounds which consist of more than two Roots, they always contain either one Root, a combination of two Roots or a combination of three Roots which can appear as an independent word (i.e., Base). Throughout this paper, we will use "[ ]" to indicate Base. There are several types compounds in Sino-

Korean, for example. One type is that among the three Roots, the first two Roots are morphologically tightly connected enough to appear as an independent word (i.e., Base), and a following third Root is morphologically "stranded"or adjoined (i.e., not a member of the preceding Base): [RR]R.

(17)	a.	/[han-kuk]-in/	->	han-kuk-in	'Korean people'
		cf. /han-kuk/	->	han-kuk	'Korea'
	b.	[/sik-taN]-ka/	->	sik-t'aN-ka	'restaurant mall'
		cf. /sik-taN/	->	sik-t'aN	'restaurant'

Another type of three-Root compound[4] is that the second and third Roots are morphologically tightly connected enough to appear as an independent word and a preceding Root is morphologically stranded: R[RR].

(18)	a.	/han-[min-cok]/	->	han-min-cok	'Korean people'
		cf. /min-cok/	->	min-cok	'people'
	b.	/y´N-[mun-hak]/	->	y´N-mun-hak	'English literature'
		cf. /mun-hak/	->	mun-hak	'literature'

The morphological status of these two types of a stranded Root is somewhat controversial. Some Korean phonologists (Choi 1937 and others) treat each type either as a prefix or suffix, depending on whether the stranded Root appears before or after the Base. Some other Korean phonologists, on the other hand, treat those three-Root Sino-Korean words

[4] Actually there is another type of three-Root compounds: [RRR]. This type has no compound-internal Base and the three Roots together form a Base:

i) /[su-lyu-t^{h}an]/ su-ryu-t^{h}an 'hand grenade'

[RRR] compounds are very rare and will not be discussed in this paper

as compounds (E. Han 1994). In this paper, we will follow the latter position (see discussion in chapter 5).

Finally, Sino-Korean four-Root compounds are composed of two Bases, each of which can appear as an independent word: [RR][RR].

(19)	a.	/[mi-kuk]-[ci-to]/	->	mi-kuk-ci-to	‘map of the United States’
		cf. /mi-kuk/	->	mi-kuk	‘the United States’
		cf. /ci-to/	->	ci-to	‘map’
	b.	/[kˆp-hæN]-[y´l-c^{h}a]/	->	kˆp-hæN-ny´l-c^{h}a	‘express train’
		cf. /kˆp-hæN/	->	kˆp-hæN	‘express’
		cf. /y´l-c^{h}a/	->	y´l-c^{h}a	‘train’

Mixture of Sino-Korean Root and Native Korean nominal morphemes is rare:

(20) Combination of a Sino-Korean morpheme plus a bound native Korean morpheme (data from K. -J. Song 1986)

a.	/toN-c’ok/	toN-c’ok	‘the east’	(‘east(SK)’ ‘direction(NK)’)
b.	/mun-c’ak/	mun-c’ak	‘a leaf of a door’	(‘door(SK)’ ‘leaf(NK)’)
c.	/h´l-kaps/	h´l-k’ap	‘cheap price’	(‘cheap(SK)’ ‘price(NK)’)

Since the number of these mixed words is extremely limited, we will ignore them here. However, we note that some SK two-Root compounds with verbal meaning can appear with Native Korean auxiliary verb -ha ‘do’ and function as verbs.

(21) Combination of a Sino-Korean word plus native Korean auxiliary verb -ha ‘do’

a.	/[tʰN-ki]-ha/	tʰN-ki-ha	‘to register’
	cf. /tʰN-ki/	tʰN-ki	‘registration’
b.	/[cʰN-my´N]-ha/	cʰN-my´N-ha	‘to prove’
	cf. /cʰN-my´N/	cʰN-my´N	‘proof’
c.	/[an-næ]-ha/	an-næ-ha	‘to guide’
	cf. /an-næ/	an-næ	‘guide’
d.	/[ka-nʰN]-ha/	ka-nʰN-ha	‘be possible’
	cf. /ka-nʰN/	ka-nʰN	‘possibility’

2.4 Summary

In this chapter, we have described the basic segmental inventory of Korean and basic morphology of Native Korean and Sino-Korean. In this dissertation, we will crucially refer to the data in Native Korean and Sino-Korean of two Korean dialects (Standard Korean and Kyungsang Dialect) in reevaluating the hypothesis that word-internal prosodic domains are formed by referring to morphological structure. Therefore, the morphological structures of Native Korean and Sino-Korean words are crucial. Throughout this dissertation, we will show that variation of some phonological phenoemena across Korean sublexica results partly from the different morphological structures which Native Korean and Sino-Korean words are based on.

Chapter 3 Coda Neutralization in Korean

Korean Coda Neutralization is analyzed in this chapter by invoking "crisp" alignment in the spirit of McCarthy & Prince 1993b. The opaque behavior of Coda Neutralization at a prefixal boundary or at an inner compound boundary is analyzed without invoking rule-ordering and without an intermediate level for abstract syllabification. In this analysis, we will demonstrate that a PrWd-final C is realized as ambisyllabic before a V across a PrWd juncture.

3.1 Coda Neutralization

In Korean, there is a Coda Neutralization phenomenon in which all labial and velar stops change to homorganic plain stops (/p, p', p^h->[p] and /k, k', k^h/->[k]) and all coronal obstruents to [t] (/t, t', t^h, s, s', c, c', c^h/->[t]), in syllable-coda position. These coda obstruents are realized as phonetically unreleased, forcing a following plain obstruent to be tensified (Kim-Renaud 1974, Sohn 1987), a process which we assume is independent of coda neutralization of an obstruent.

(1)	a.	/sup^h/	sup	'forest'
		/sup^h-kwa/	sup-k'wa.	'forest-and'
		/sup^h-e/	sup^h-e	'forest-at'
	b.	/pu´k^h/	pu´k	'a kitchen'
		/pu´k^h-i/	pu´k^h-i	'a kitchen-Nom'
		/pu´k^h - pak'/	pu´k-p'ak	'outside of the kitchen'
		/pu´k^h - pak'-e/	pu´k-p'ak'-e	'the outside of a kitchen-at'

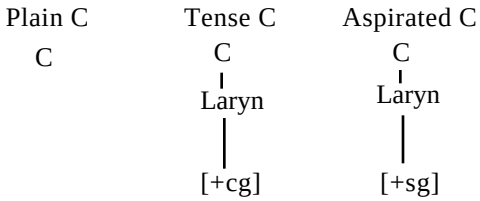
c.	/nac/	nat	'day'
	/nac-e/	nac-e	'day-during'
d.	/nas/	nat	'a scythe'
	/nas-ˆl/	nas-ˆl	'a scythe-Acc'
e.	/k'´k'-ta/	k'´k-t'a	'pick off'
	/k'´k'-´/	k'´k'-´	'pick off-Cont'

Given the data, we observe that an obstruent cannot retain these features in coda: [+cont], [+sg], [+cg][5] and [-anterior][6].

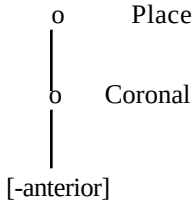
In a rule based theory, Kim 1987, S.-H. Han 1991 and others proposed via adopting hierarchical feature representation, that coda neutralization is represented by the following rule. Coda Neutralization is a process which delinks all laryngeal features such as [+sg] and [+cg], all manner features such as [+continuant], and secondary place features from the primary place node:

---

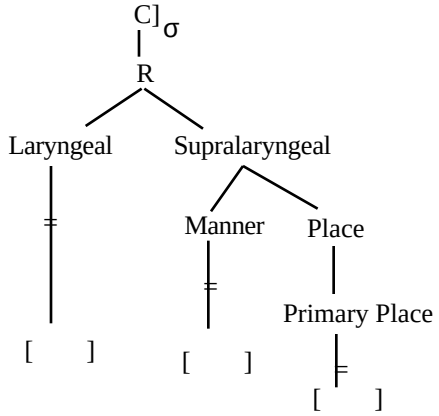
[5] We assume the following hierarchical representations for plain, tense and aspirated C's adopted from Kim 1987:



[6] We will assume that alveo-palatal consonants /c, c^{h}, c'/ have the following place representation:



(2) Coda Neutralization (K. -H. Kim 1987)

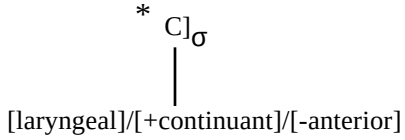


The rule above is focused on the characteristic of coda position in which [lar]/[+cont]/[-ant] are disallowed. In a constraint-based approach, this rule might be interpreted as the following negative Coda constraints, since an obstruent cannot retain [lar]/[+cont]/[-ant] feature or node in coda (Hong 1996).

(3) a. *Coda[laryngeal]

b. *Coda[+continuant]

c. *Coda [-anterior]



[laryngeal]/[+continuant]/[-anterior] are not allowed in coda.

These negative coda constraints disallow [laryngeal]/[+continuant]/[-anterior] in coda. Since only one consonant is allowed in onset and coda in Korean, when we switch the focus from coda to onset position, we may say that [laryngeal]/[+continuant]/[-anterior] node/features are allowed only in an onset.

Itô & Mester 1994 propose a new class of alignment constraint for Coda Condition in Japanese, which does not allow a consonant place in coda. The following constraint says that C-place is allowed only in syllable-initial position:

(4) Align-Left(C-place, σ)

Lombardi 1995 applies this type of alignment constraint to laryngeal neutralization:

(5) Align-Left([lar], σ)

This constraint forces a Laryngeal node to be in syllable-initial position. We can naturally extend the Laryngeal alignment constraint above to the Korean Laryngeal CN case. In Korean, however, not only the [laryngeal] node but also [+continuant] and [-anterior] features are allowed only in onset. Hence we propose the following feature alignment constraints for Korean:

(6) a. Align-Left([lar], σ)
b. Align-Left([+cont], σ)
c. Align-Left([-ant], σ)
(hereafter, Align-L(Lar, Cont, Ant))

These alignment constraints require that [laryngeal]/[+continuant]/[-anterior] features be only at the left edge of a syllable. As for alignment, we will assume for a moment the definition of alignment which is defined in McCarthy & Prince 1993b. We will show in the next section that the "crisp" alignment defined in McCarthy & Prince 1993b is

necessary in addition to “non-crisp” alignment defined in Itô and Mester 1994 (see Itô & Mester 1994 for comparison between "crisp" and "non-crisp" alignment).

In Korean, a Root-final obstruent is neutralized when the Root appears as an independent word and also before a consonant-initial clitic or inflection. However, the Root-final obstruent is not neutralized before a vowel-initial clitic or inflection. Note that /t, t^h/ palatalize to [c, c^h], respectively before suffix/clitic-initial high front vocoid /i/ or /y/. The following data are noun derivatives:

(7)	/os/		'clothes'
	a.	ot	citation form
	b.	ot-t'o	'clothes-also'
	c.	ot-k'wa	'clothes-and'
	d.	osJ-i	'clothes-Nom'
	e.	os-^l	'clothes-Acc'

(8)	/k´t^h/		'surface'
	a.	k´t	citation form
	b.	k´t-t'o	'surface-also'
	c.	k´t-k'wa	'surface-and'
	d.	k´cJ^h-i	'surface-Nom'
	e.	k´t^h-^l	'surface-Acc'

The bare noun Roots [ot] and [k´t] in (7a) and (8a) show that Root-final /s/ and /t^h/ coda-neutralize when those Roots appear alone. However, Root-final /s/ and /t^h/ do not coda-neutralize before a vowel.

Because Korean verbs cannot appear as independent words and must always be morphologically accompanied by inflections, they do not have citation forms, unlike nouns:

(9) /´p^{h}/ 'turn upside down'

a. ´p-k'o 'turn upside down-Cont'

b. ´p^{h}-´s'-´yo Past-Mood

(10) /p´s/ 'take off'

a. p´t-k'o 'take off-Cont

b. p´s-´s'-´yo Past-Mood

c. p´t-t’a Mood

(11) /kat^{h}/ 'be same'

a. kat-k'o 'be same-Cont'

b. kacj^{h}-i 'together (same-ADVL)’

c. kat^{h}-as'-´yo Past-Mood

(12) /is'/ 'exist'

a. it-k'o 'exist-Cont'

b. is'-´yo Mood (informal)

c. it-t’a Mood

(13) /ic/ 'forget'

a. it-k'o 'forget-Cont'

b. ic-´yo Mood (informal)

c. it-t’a Mood

The verbal Root-final /p^h/, /s/, /t^h/, /s'/ and /c/ and inflection-final /s'/ are realized on the surface when they appear before a vowel.

We will show that the interaction of CN and syllabification can be captured in OT by adopting the concept of Correspondence Theory (McCarthy 1995, Benua 1995). The following are correspondence constraints defined in the OT literature. All relate strings S1 (base, input, etc.) to S2 (reduplicant, output, etc.):

(14) Correspondence constraints (McCarthy & Prince 1995, Benua 1995, Zoll 1996 and others)

a. IDENT-IO[F][7]

Correspondent elements in S1 and S2 have identical values for feature [F].

b. Max-IO

Every element of S1 has a correspondent in S2.

c. DEP-IO

Every element of S2 has a correspondent in S1.

We introduce the following input-to-output correspondence constraints for the Korean data above to explain the survival of the underlying features [+cont] and [-ant] and the Laryngeal node of the Root-final obstruent before a vowel-initial suffix:

[7] IDENT-IO[F] can be violated four ways (p.c. Prof. Buckely):
a. a feature which is underlyingly linked to the segment is deleted.; this deletion also violates MAX-IO[F].
b. A new feature is inserted and is linked to the relevant segment; the insertion also violates DEP-IO[F]
c. An existing feature changes its associations so that it is not longer linked to the segment; this does not violate MAX-IO[F]
d. A feature underlyingly linked to a segment spreads so that it is now linked to the segment in question (whether or not it loses its association to the first segment; this does not violate DEP-IO[F]

(15) IDENT-IO constraints

a. IDENT-IO [+cont]

b. IDENT-IO [-ant]

c. IDENT-IO [lar]

We propose that the feature alignment constraint family is ranked above the IDENT-IO constraint family to explain the loss of underlying [lar]/[+cont]/[-ant] in a non-initial-syllable consonant on surface. Namely, it is more important for a consonant to avoid violation of a feature alignment constraint than to avoid violation of an IDENT-IO constraint. This explains CN of a Root-final obstruent in word-final position.

(16) /os/ [ot] 'clothes' citation form

/os/	Align-Left [+cont]	IDENT-IO [+cont]
os.	*!	
☞ot.		*

In the tableau above, the first candidate fatally violates higher ranked Align-Left([+cont], σ) whereas the optimal second candidate violates a lower ranked IDENT-IO[+cont]. Hence, the second candidate is optimal.

The following illustrates a case in which a Root-final [+continuant] consonant is followed by a vowel-initial suffix:

(17) /os-i/ [osʲi] 'clothes-Nom'

(secondary palatalization is ignored)

/os-i/	Align-Left [+cont]	IDENT-IO [+cont]
☞o.s-i		
o.t-i		*!

Since the second candidate, which loses [+cont] feature in the output, receives a fatal violation mark for IDENT-IO[+cont], the first candidate with no violation mark is optimal.

The following two tableaux show CN in the Root-final obstruent before a consonant-initial clitic, and lack of Coda Neutralization in the (verb)Root-final obstruent before a vowel-initial inflection, respectively. We assume that a plain obstruent tensifies, i.e., gets [+cg] after another obstruent:

(18) /os=kwa/ [okk'wa] 'clothes-and'

(Place assimilation is ignored)

/os-kwa/	Align-Left [+cont]	IDENT-IO [+cont]
os.-k'wa	*!	
☞ot.-k'wa		*

In the tableau above, the Root-final non-neutralized consonant in coda in the first candidate fatally violates higher ranked Align-Left([+cont], σ) and hence the first candidate is eliminated in favor of the second candidate, in which the Root-final coda consonant is neutralized, hence avoiding violation of Align-Left([+cont], σ). The tableau below illustrates an example in which Root-final consonant /s'/ is followed by a vowel-initial inflection and is realized on the surface without losing [+cont] and [lar]:

(19) /is'-´yo/ [is'´yo] 'exist-Decl'

/is'-´yo/	Align-Left ([+cont], σ)	Align-Left ([lar], σ)	IDENT-IO [laryngeal]	IDENT-IO [+cont]
☞i.s'-´yo				
i.s-´yo			*!	
i.t-´yo			*!	*

3.2 Overapplication of Coda Neutralization

We have seen that when a vowel-initial clitic or inflectional suffix is attached to a Root, [+cont]/[-ant]/[lar] of the Root-final obstruent are retained. And this has been explained by ranking IDENT-IO constraints below the Align-Left constraint family. However, in compounds, the overapplication of CN is observed in the final obstruent of a prefix in a prefixed word and of the left member of a compound. The final obstruent of the left member of a compound always neutralizes, regardless of whether it is followed by a consonant or a vowel or whether it appears in onset or coda position, as shown in (b)'s below:

(20)	a.	/k´t^{h}-ˆl/	->	k´t^{h}-ˆl	'outside-Acc'
	b.	/k´t^{h}-os/	->	k´t-ot	'outer garment' (‘surface’ ‘clothes’)
(21)	a.	/os-i/	->	osJ-i	'clothes-Nom'
	b.	/k´t^{h}-os-ilaN/	->	k´t-osJ-iraN	'outer garment and'
		/os-an/	->	ot-an	'clothes' inside'
		/os-tanc^{h}u/	->	ot-t'anc^{h}u	'clothes button'
(22)	a.	/nac-i/	->	nacJ-i	'day-Nom'
	b.	/nac-os/	->	nat-ot	'day clothes'
(23)	a.	/k'oc^{h}-i/	->	k'ocJ^{h}-i	'flower-Nom'
	b.	/k'oc^{h}-ilˆm/	->	k'otJ-ilˆm	'flower's name'
	c.	/k'oc^{h}-tanc^{h}u/	->	k'ot-t’anc^{h}u	‘flower-shaped button’

What is interesting in the data above is that in /k'oc^{h}-il^m/ [k'otɹ-il^m] in (23b), phonemic primary palatalization (/t/ to [c]) does not take place in the final consonant of the first member of a compound before /i/ (underapplication of primary palatalization). This is quite strange since primary palatalization always takes place before a high front vocoid in a suffixal or clitic environment, as shown below:

(24) Primary palatalization

a.	/mat-i/	macɹ-i	'the eldest son'	('eldest' 'AGT')
b.	/hæ-tot-i/	hæ-tocɹ-i	'sun-rising'	('sun' 'rise' '-ing')
c.	/pat^{h}-i/	pacɹ^{h}-i[8]	'dry field-Nom'	('dry-field' 'Nom')

Primary palatalization will be discussed in detail in chapter 4. However, we note that the final consonant of the first member of a compound is always realized neutralized and is not subject to primary palatalization.

The prefix-final consonant before a vowel-initial Root pattern together with the final consonant of the first member of a compound before a vowel-initial second member. Namely the overapplication of Coda Neutralization and the underapplication of primary palatalization are observed in the prefix-final consonant.

[8] Youngmee Cho and Eun-sook Ko pointed out that there are two possible output forms of /pat^{h}-i/: [pacɹ^{h}i] and [pasɹi]. It is not clear how we derive the two output forms from /pat^{h}-i/. Instead, we suggest that speakers may use two different underlying forms for the two different output forms: /pat^{h}-i/ and /pas-i/. However, Oh 1995 proposes that [+cont] of a following vowel affects the preceding [t] to be realized as [s].

(25) Prefixed Roots

/t´s[9]-os/	t´t-ot	'outer garment'
		(‘additional(pref)’ ‘clothes’)
/t´s-os-ˆl/	t´t-os-ˆl	'outer garment-Acc'
		(‘additional(pref)’ ‘clothes Nom(clitic)’)
/t´s-tæ-/	t´t-t'æ	'add additionally'
		(‘additional’ ‘add’)
/hot^{h}-ipul/	hotJ-ipul	‘single-layer quilt’
		(‘single’ ‘quilt’)

As shown in the data, the prefix-final consonant is neutralized before a Root-initial vowel. Furthermore, the neutralized prefix-final [t] in [hotJipul] (from / hot^{h}-ipul/) does not undergo primary palatalization (underapplication of primary palatalization). Based on the data of prefixed words, Hong 1996 observed that a prefix is realized as a uniform output and this might pattern together with the Spanish /des-/ which is always realized as [deh] before a vowel-initial or consonant-initial stem in many Spanish dialects (Kenstowicz 1995). However, we will show later in this chapter that this observation is not correct by providing evidence that those prefixes before a Root are not prefixes but Roots. And these Roots are not necessarily realized as uniform output forms.

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[9] The prefix /t´s/ never surfaces in a prefixed word in Korean. However, the choice of /t´s/ as the underlying form over /t´t/ is weakly motivated by the fact that native speakers recognize /t´s/ as UR. When they are asked "Which is the prefix in t´t-os?", their answer is **t´s-i** c´pt'usa-ipnita 't´s is the prefix.' in which t´s surfaces in the noun-Nom sequence. Furthermore, we observe that the underlying /s/ surfaces before a vowel in foreign borrowings:

i)	a.	/syup´mak^{h}´s/	sJyup´mak^{h}´t	‘supermarket’
		/syup´mak^{h}´s-e/	sJyup´mak^{h}´s-e	‘supermarket-at’
	b.	/syus/	sJyut	‘shooting’
		/ syus-i/	sJyusJ-i	‘shooting-Nom’

The data suggest that native Korean speakers treat /s/ as underlyingly present in these data.

The proposed ranking of Align-L([+cont]/[lar]/[-ant], σ) >> IDENT-IO[+cont]/[lar]/[-ant] cannot predict the overapplication case of CN in the final /t^h/ of the left member of a compound (/k´t^h-os/ -> k´t-ot) since the final /t^h/ of the left member of a compound appears in onset before a vowel.

(26) /k´t^h-os/ k´t-ot 'outer garment'

/k´t^h-os/	Align-Left ([+cont]/[lar], σ)	IDENT-IO [+cont]/[lar]
k´.t^h-os.	*!	
k´.t-os.	*!	*
☞k´.t^h-ot.		*
*☞k´.t-ot.		**!

The tableau above shows that our proposal at present incorrectly predicts that the third candidate should be optimal rather than the last candidate.

Before we seek a solution to the overapplication of CN, we will review the analysis of CN in Kang 1992 in the framework of Prosodic Lexical Phonology (Inkelas 1989, 1993). Kang assumes that phonological rules apply within strings delimited by lexical prosodic constituents like the prosodic word. But phonological rules never apply directly to morphological strings in the lexical component. Kang 1992 proposes that Prosodic Word structure is formed word-internally in Korean and is predictable. She adopts Selkirk's 1986, 1990 End-Based Theory, and applies X^0 setting into word-internal structure in Korean. Unlike Selkirk's assumption that prosodification applies at the postlexical level after the Bracket Erasure Convention, Kang argues that PrWd Formation in Korean is purely lexical and the left edge of a lexical category coincides with the left edge of the prosodic word. As a result, Kang makes the internal morphological structure visible in the lexicon.

(27) Korean PrWd formation Rule (KPWR: Lexical)

$X^0[\rightarrow {}_{PrWd}($

(X is a lexical category)

She further proposes that only lexical categories (N, V, A, ADV) map into the PrWd's in the lexicon under the assumption that prosodically dependent suffixal and clitic elements are adjoined to a preceding prosodic word lexically and postlexically, respectively:

(28) Stray Adjunction/Incorporation: the PrWd is left-headed, with leftward adjunction of stray material

a. lexical adjunction: derivational suffixes

b. postlexical adjunction: functional categorial suffixes, clitics

Kang further assumes that syllabification and Coda Neutralization have to wait until prosodic words are formed within the word-internal structure in the lexical component and that the prosodic word boundary delimits the domain of syllabification. The following shows how Kang derives [t´tot] from the prefixed Root /t´s-os/:

(29)

	Phonological Structure	
$_N$[t´s $_N$[os]]	a. PWF (lexical):	${}_{PrWd}$(t´s) ${}_{PrWd}$(os)
'outer' 'clothes'	b. Syll.:	${}_{PrWd}$ (t´s.) ${}_{PrWd}$(os.)
	c. CN:	${}_{PrWd}$ (t´t.) ${}_{PrWd}$(ot.)
	d. Resyllabification:	${}_{PhoPh}$(t´.tot.)
	e output	[t´tot]

Since PrWd Formation is a lexical process and applies before the Bracket Erasure Convention, Kang is able to derive two PrWd's within a prefixed word. Within each PrWd, syllabification and CN apply to derive the correct output. Kang argues that deriving word-internal phonological domains is predictable since each word-internal prosodic constituent corresponds to a morphological constituent. She further argues that each Root of a compound also corresponds to a separate PrWd.

Kang's analysis, however, fails to derive a correct output when a vowel-initial clitic /ilaN/ 'and' cliticizes (postlexically) to the noun Root /os/: /os-ilaN/ 'clothes-and'. According to Kang's analysis, *[o.tiraN.] will be derived. First, prosodically constrained syllabification and CN take place in the lexical component: $_{PrWd}$ (os) after lexical Prosodic Word Formation would become $_{PrWd}$ (ot.) by prosodically constrained syllabification and Coda Neutralization at a late stage of lexicon. When the clitic /ilaN/ is adjoined postlexically to $_{PrWd}$ (ot.), the wrong output *[$_{\varphi}$(o.tiraN.)] would be derived after resyllabification. The correct output should be [osiraN].

(30)	Morphological Structure		Phonological Structure	
	a. Stem:	N[os]	/os/ 'clothes'	
		clothes'	a. PWF (lexical)	$_{PrWd}$ (os)
	b. Bracket Erasure:	[os]	b. Syll.:	$_{PrWd}$ (os.)
			c. CN:	$_{PrWd}$ (ot.)
			Phrasal Structure	
	a. Cliticization:	[[os] ilaN]	d. Adjunction (postlexical):	$_{PrWd}$($_{PrWd}$(ot) ilaN)
		clothes and	e. Resyllabification:	$_{PrWd}$ (o.tilaN.)
			f. output:	*[otilaN]

The upshot of Kang's approach is to posit a PrWd juncture at the Prefix-Root boundary and at the inner compound boundary at a certain level which can refer to both morphological structure after cliticization. There are two potential solutions to Kang's argument to consider when we stick to the lexical phonology framework. One is to assume that cliticization is also lexical (Lee 1994), though lexical cliticization is problematic in Lexical Phonology since a clitic is adjoined at a phrasal level. The other one is to posit a syntactic level and also to assume that morphological structure can be referred to at the syntactic level, though this assumption violates the Bracket Erasure Convention in Selkirk 1986. These options challenge the basic theoretic assumptions of Lexical Phonology which are assumed in Kang's analysis.

There is another piece of evidence that a PrWd juncture is formed between a prefix and a following Root and at an inner compound boundary. Not only underapplication of CN, but also underapplication of primary palatalization is observed at the morphological boundary in question. Consider the following two set of examples in which primary palatalization of /t/ to [c] before /i/ across a suffixal boundary:

(31) Primary palatalization

a.	/mat-i/	maʧ-i	'the oldest son'
	oldest NOML		
b.	/kut-i/	kuʧ-i	'stubbornly'
	be-firm ADVL		
cf.	/kut-´/	kut-´	'become hard-Cont'
	be-firm Cont		

However, primary palatalization is not observed at the prefixal boundary of a prefixed word or at the inner compound boundary:

(32) Underapplication of primary palatalization in prefixed words

a.	/hot^{h}-ipul/	hotʃ-ipul	'unlined comforter'
			(‘single’ ‘comforter’)
b.	/t´s-ipul/	t´tʃ-ipul	'additional comforter'
			(‘outer’ ‘comfort’)
c.	/h´t^{h}-insim/	h´tʃ-insim	'futile charity'

(33) Underapplication of primary palatalization in compounds

a.	/pat^{h}-ilaN/	patʃ-iraN	'field ridge'	Root-Root
	cf. /pat^{h}-i/	pacʃ^{h}-i	'field-Nom'	Root-Suffix
	cf. /pat^{h}-^l/	pat^{h}-^l	'field-Acc'	Root-Suffix
b.	/p´s-il^m/	p´tʃ-ir^m	'friend's name'	Root-Root
	cf. /p´s-ilaN/	p´sʃ-iraN	'friend-and'	Root-Clitic
	cf. /p´s-^l/	p´s-^l	'friend-Acc'	Root-Suffix

Though primary palatalization will be discussed in detail in chapter 4, we observe from the data that a prefix-final coronal C behaves the same way as the final coronal consonant of the first member of a compound in that both show the underapplication of primary palatalization. This observation suggests that a prefix forms a separate prosodic domain from the following Root in a similar way as the first member of a compound forms a separate prosodic domain from the following second member of the compound. Korean is a language in which a Root is productively expanded rightward via inflecting, suffixing or cliticizing. However, prefixes are limited in their number and are added unproductively to certain Roots to the left. Furthermore, only one prefix is allowed to attach to a following Root whereas inflections and suffixes can be attached to a preceding Root more than once:

(34) a. Noun Root plus suffixes and clitics

caNsa-ci-tˆl-eke=nˆn ‘sales-person-Pl-to=Top’

sales-AGT-Pl-Dat=Top

b. Verb Root plus inflections

m´k-ˆsi-´s’-sˆpnita ‘eat-Hon-Past-Mood’

eat-Hon-Pst-Mood

c. Prefix plus a Root

h´t-caNsa ‘failed sales’

(‘empty’ ‘sales’)

d. Prefixes plus a Root (ungrammatical)

*t´t-hot-ipul ‘additional unlined comforter’

(‘additional’ ‘single’ ‘comforter’)

Hence, the morphological behaviors of a prefix do not pattern together with those of a suffix. We argue that the term "prefix" is not a correct term since some of those prefixes are actually Roots[10] to which a suffix or clitic may be attached. In the following data, we use “[ ]” to indicate a morpheme or combination of morphemes which can appear as an independent word (i.e., Base). Note that morphemes in question appear as a “prefix” in (a) and appear as a Root in (b) in the data below:

[10] Some of those “prefixal” Roots are clearly Verb Roots: for example, /nˆc-/. However, the grammatical category of other “prefixal” Roots is not clear, as pointed out by Young-mee Yu Cho (p.c.). For example, the gramatical category of /mat-/ is not clear.

(35) /mat-/

a. Prefix-[Root-suffix-suffix]

mat-hy´N-nim-tˆl	mat-hy´N-nim-tˆl	'big brother'-Hon-Pl
	(‘first (Root/pref)’ ‘brother’ ‘Suffix’)	

b. [Root-suffix]

mat-i	macJ-i	'the first son'
	(‘first’ ‘ADVL’)	

(36) /nˆc-/

a. Prefix-[Root-suffix]

nˆc-pom-ky´N	nˆt-p’om-ky´N	'late spring time'

b. [Root- INFL]

nˆc-´	nˆc-´	'to be late-Mood

(37) /tot-/

a. Prefix-[Root- INFL]

tot-po-ta	tot-p'o-ta	'to see with a favorable eye-Mood'
		(‘high’ ‘see’ ‘Mood’)

b. [Root- INFL]

tot-ta	tot-t'a	'to rise-Mood'

(38) /nac-/

a. Prefix-[Root-INFL]

nac-po-ta	nat-p'o-ta	'to look down on-Mood'
		(‘low’ ‘see Mood’)

b. [Root-INFL]

nac-as´	nac-as´	'to be low-because'

(39) /k'al-/

a. Prefix-[Root-INFL]

k'al-po-ta	k'al-po-ta	'to despise-Mood'
		(‘down’ ‘see’ ‘Mood’)

b. [Root-INFL]

k'al-a	k'ar-a	'to lay down-Cont'

(40) /yat^{h}-/

a. Prefix-[Root-INFL]

yat^{h}-po-ta	yat-p’o-ta	'to look down on-Mood'
		(‘shallow’ ‘see’ ‘Mood’)

b. [Root-INFL]

yat^{h}-a	yat^{h}-a	'to be shallow/low-Cont'

(41) /s´l-/

a. Prefix-[Root-INFL]

s´l-ik-ta	s´r-ik-t'a	'to get half-riped-Mood'
		(‘unripe’ ‘ripen’ ‘Mood’)

b. [Root-INFL-INFL]

s´l-´s'-ta	s´r-´t-t'a	'to be unripe-Past-Mood'

The data above show that many of those prefixes are actually are Roots which can be inflected productively like other Roots. We further observe that Roots are not allowed to

inflect in Korean before a Root (i.e., when “prefixed”) and hence appear only in a bare Root form. What is interesting is that they always function as a modifier which modifies the following Root. Korean has only small number of adjectives[11]. Generally, an inflected verb functions as a noun modifier in a form of a relative clause:

(42) a. $[_{NP}\ [_{S}$ nˆc-ˆn$]\ [_{N}$ pam$]]$ 'night which is late'
be-late-Mod night

b. $[_{NP}\ [_{S}$ s'a-n$]\ [_{N}$ os$]]$ 'clothes which are cheap'
be-cheap-Mod clothes

The examples in (42) are of two separate words which form a noun phrase in which the head noun is modified by a relative clause. However, those “prefixed” words which we argue to consist of two Roots, retain a single word status.

On the other hand, Noun Roots may be suffixed (and/or cliticized to) in Korean. However, when they appear before a Root, they are allowed only in a bare Root form:

(43) Noun Root-suffix

ilaN-ka	iraN-k’a	'an edge of a (field) ridge'
		(‘ridge’ ‘edge’)

Noun Root-Noun Root-suffix (i.e., suffixed noun compound)

pat^{h}-ilaN-ka	patɯ-iraN-k’a	'an edge of a dry field ridge'
		(‘dry-field’ ‘ridge’ ‘edge’)

[11] Actually, a few adjectives exist in Korean:

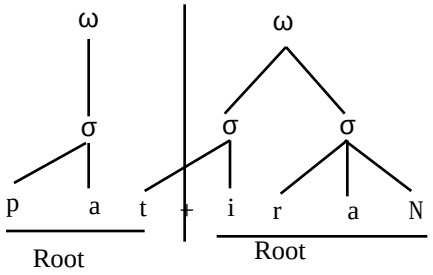
i) /sæ-sin/ sæ-sɲin ‘new shoes’

Since the overapplication of Coda Neutralization and the underapplication of primary palatalization occur between the two Roots, it is probable to assume that there is a PrWd juncture between the two Roots. The following are potential prosodic structures for a compound under the assumption that a PrWd juncture is formed at the Root-Root juncture:

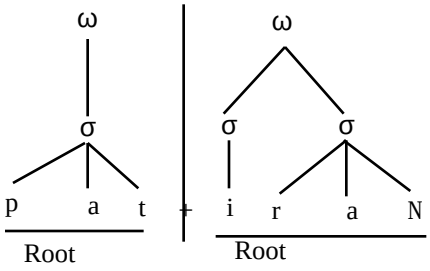
(44) Potential prosodic structures of a compound

/pat^{h}-ilaɴ/ patʃ-iraɴ 'field ridge' (Root-Root)

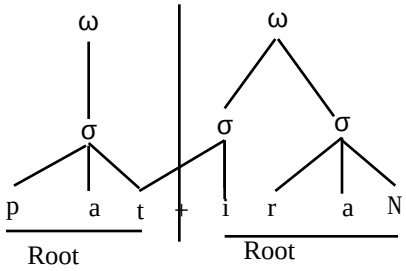
a.



b.



c.



The (first) Root-final consonant which is followed by a vowel-initial Root shows the characteristic of being in coda. We crucially observe in the data of the overapplication of CN that the (first) Root-final consonant is not allowed to retain [lar]/[+cont]/[-ant] node/features regardless of whether it is followed by a V or C. We previously showed that those features are not allowed in coda (Coda Neutralization). The underapplication of primary palatalization also suggests that the (first) Root-final consonant before a vowel-

initial Root is still in coda on the surface. Namely, primary palatalization takes place in /t, t^h, t'/ before a high front vocoid in Korean as previously shown in (31). However, primary palatalization does not take place in the (first) Root-final /t, t^h, t'/ before an i/y-initial Root, as shown in (32) and (33). Under the assumption that [-ant] spreads to a preceding /t, t^h, t'/ from a high front vocoid in primary palatalization[12], [-ant] of a Root-initial high front vocoid cannot spread to the preceding Root-final /t, t^h, t'/. This also suggests that the (first) Root-final C is still in coda and cannot inherit [-ant] from a following Root-initial i/y on surface. Hence, (44a) seems to be not a correct prosodic prosodic structure.

However, we cannot say that the (first) Root-final consonant is syllabified uniquely as a coda when it is followed by a vowel-initial Root since an onsetless syllable is worse than a codaless syllable in Korean. Let us consider the following example in which a (verb) Root-final aspirated consonant surfaces before a vowel-initial suffix:

(45) /kip^h-i/ kip^h-i 'depth'
('be deep' 'Nominal suffix')

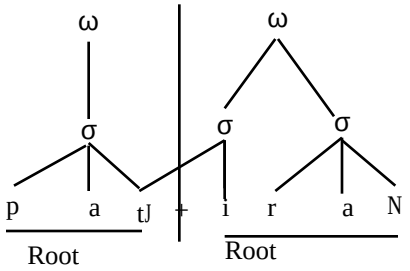
Since Root-final /p^h/ is syllabified as an onset, the underlying [lar] node appears on the surface. This shows that a consonant between two vowels is syllabified as an onset in Korean and the constraint ONSET[13] is well respected in Korean. Hence, (44b) is also problemactic.

If we assume that the (first) Root-final C is realized as ambisyllabic when followed by a vowel-initial Root, as shown in (44c), violation of ONSET will not arise. Furthermore, the overapplication of CN and the underapplication of primary palatalization

[12] This assumption will be evaluated in the chapter 4.
[13] We will eventually replace ONSET with SyllCon, which prevents a sequence of two segments in the rising sonority at a syllable boundary (Bat El to appear).

will be explained since appearance of either of [lar]/[+cont]/[-ant] in an ambisyllabic consonant will violate the higher ranked constraint Align-L([lar]/[+cont]/[-ant], σ) when we follow the definition of "crisp/sharp" alignment in McCarthy & Prince 1993b (more discussion will follow shortly). However, a problem we come across is that we cannot define the left edge of a PrWd by referring to the morphological structure. Consider the following prosodic structure in which the PrWd-final C before a V across a PrWd juncture is realized as ambisyllabic:

(46) /pat^{h}-ilaɴ/ patʃ-iraɴ 'field ridge' (Root-Root)



The left edge of the second Root is aligned with neither the left edge of a syllable or the left edge of a PrWd. There is no way to define the left edge of a PrWd by referring to the left edge of a Root. On the other hand, the right edge of the first Root is observed to be "non-crisp" aligned with the right edge of a PrWd if we adopt the "non-crisp" alignment definition in the spirit of Itô and Mester 1994b[14]. We will discuss "non-crispness" and "crispness" of alignment in detail, shortly.

[14] The definition of Non-Crisp Alignment in Ito & Mester 1994:
(i) Dfn. Align(Cat1, Edge1, Cat2, Edge2)
Let Edge1, Edge2 be either L or R. Let S be any string. Then, for any substring A of S that *is-the-content-of-a* Cat1, there is [a] substring B of S that *is-the-content-of-a* Cat2, such that there is a decomposition D(A) of A and a decomposition D(B) of B, both sub-decompositions of a decomposition D(S) of S, such that Edge1(D(A))=Edge2(D(B)).

3.3 Native Korean Morphological Structure

A Root expands rightward via suffixation and cliticization. Suffixal and clitic boundaries do not show the overapplication of CN and the underapplication of primary palatalization and hence suffixes and clitics should become part of a PrWd with a preceding Root. We argue that the right edge of a bare Root and a suffixed or cliticized Root must be defined in morphological structure in a way that the right edge of a Root before another Root and the right edge of a fully inflected word are identified as the right edge of a PrWd. The definition of the Stem is loosely defined in the literature on morphology. According to Selkirk 1983, for example, a stem is generally formed by combination of a Root plus a suffix. Furthermore, a stem is recursively defined by concatenating a suffix to a stem. Hence, adoption of the term Stem would make it difficult to define the right edge of a "prefix"-like Root in comparison with the right edge of a suffixed or cliticized Root. This is because the right edge of a Root is not necessarily identified as the right edge of a PrWd, i.e. $_{PrWd}$(Root) $_{PrWd}$(Root-Suffix).

Instead of following Selkirk, we introduce the concept of the Morphological Merger originally proposed in Marantz 1986, 1989:

(47) Morphological Merger

At any level of syntactic analysis (D-structure, S-structure, phonological structure), a relation between X and Y may be replaced by (expressed by) the affixation of the lexical head of X to the lexical head of Y.

We propose that a suffix is morphologically merged with a preceding $Root_0$ element. On the other hand, a $Root_0$ is merged with a following $Root_0$. The projected $Root_0$ from the

merger of a $Root_0$ with a following $Root_0$ is therefore headed by the second $Root_0$. The following are rewrite rules we propose for morphological mergers in Native Korean:

(48) (Head is underlined)

a. $Root_0$ --> $\underline{Root_0}$ Suffix

b. $Root_0$ --> $Root_0$ $\underline{Root_0}$

c. Mword --> $\underline{Root_0}$

We further assume that there are two types of suffixes. One type includes those suffixes which do not change the grammatical category of the $Root_0$ when they are merged with the $Root_0$. The other type includes those suffixes which change the grammatical category of the $Root_0$ when they are merged with the $Root_0$. When the latter type of a suffix is merged with a $Root_0$, we assume that the grammatical category of the suffix percolates to the higher projection. The following examples show how this proposal works:

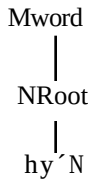
(49) Morphological structures in Native Korean

(note that "|" indicates the head of the higher projection of a $Root_0$)

(NRoot = Noun Root; VRoot = Verb Root; R = Root whose grammatical category is not clear)

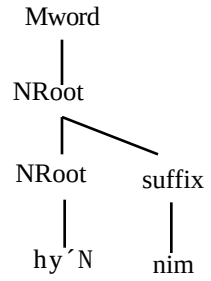
a. A bare noun

/hy´N/ hy´N 'brother'



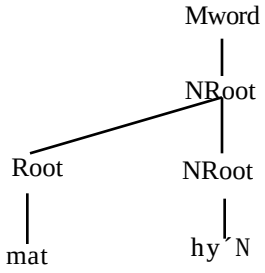
b. A suffixed noun

/hy´N-nim/ hy´N-nJim 'brother-Hon'



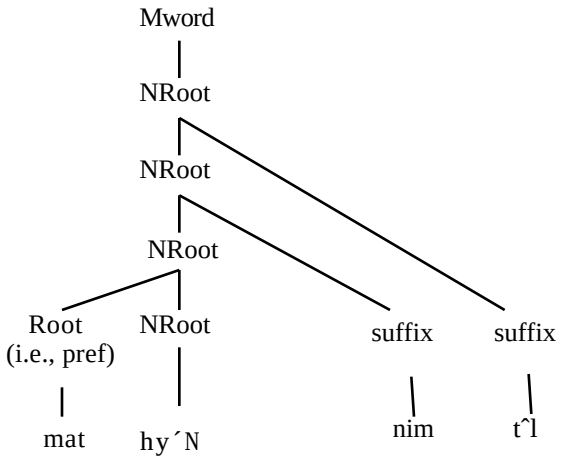
c. A bare Root preceded by a Root ("prefixed" word)

/mat-hy´N/ mat-hy´N 'big brother'



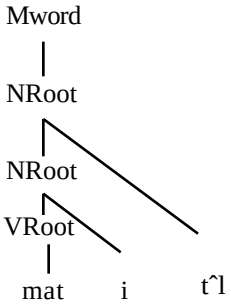
d. A suffixed Root preceded by a Root ("prefixed" word)

/mat-hy´N-nim-tˆl/ mat-hy´N-nJim-tˆl 'big brother-Hon-Pl'



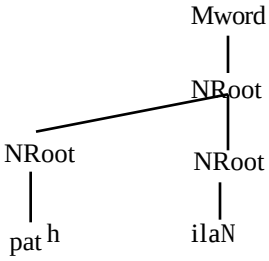
e. A suffixed verb Root

/mat-i-tˆl/ macJ-i-tˆl ‘the first-NOML-Pl’



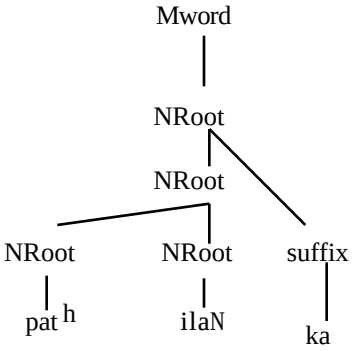
f. Two bare noun Roots (noun "compound")

/patʰ-ilaN/ patJ-iraN 'dry field ridge'



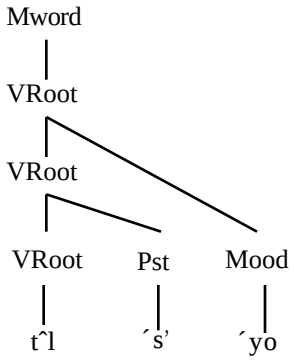
g. A suffixed noun Root preceded by a Root (suffixed noun compound)

/patʰ-ilaN-ka/ patJ-iraN-k’a 'a dry field ridge edge'



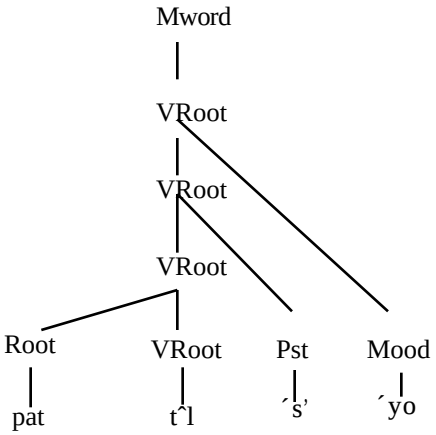
h. An inflected verb Root

/tˆl-´s'-´yo/ tˆr-´s'-´yo 'carry-Past-Mood'



i. An inflected verb preceded by a VRoot

/pat-tˆl-´s'-´yo/ pat-t'ˆr-´s'-´yo 'to lift up'



When a $Root_0$ is merged with a following $Root_0$. The merger projects to a higher projection $Root_0$ (for example, /mat-hy´N/ 'the first son' Root-Root in (48c)), the second $Root_0$ is the head of the projected $Root_0$. The first $Root_0$ does not project any more and is the maximal projection of a $Root_0$ by itself. On the other hand, the head $Root_0$ further projects to a higher $Root_0$ by morphological merger of suffixes. Based on the morphological structures above, we tentatively propose that the right edge of the maximal projection of a $Root_0$ is identified as the right edge of a PrWd.

(50) Alignment between right edges of $Root_0^{max}$ and a PrWd (tentative)

The right edge of the maximal projection of a $Root_0$ is identified as the right edge of a PrWd: Align-R($Root_0^{max}$, PrWd)

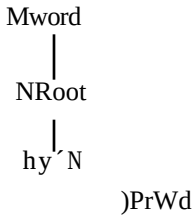
The right edge alignment between $Root_0^{max}$ and a PrWd in the morphological structures in (49) are shown as follows:

(51) Right-edge alignment between $Root_0^{max}$ and a PrWd

(NRoot = Noun Root; VRoot = Verb Root; Root = Root whose grammatical category is not clear)

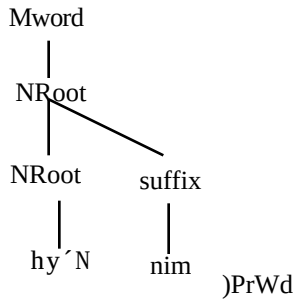
a. A bare noun

/hy´N/ hy´N 'brother'



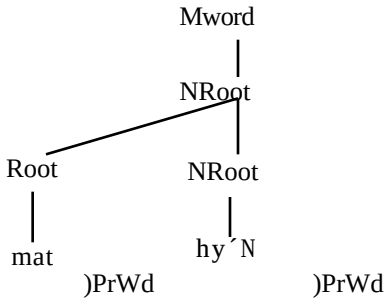
b. A suffixed noun

/hy´N-nim/ hy´N-nJim 'brother-hon'



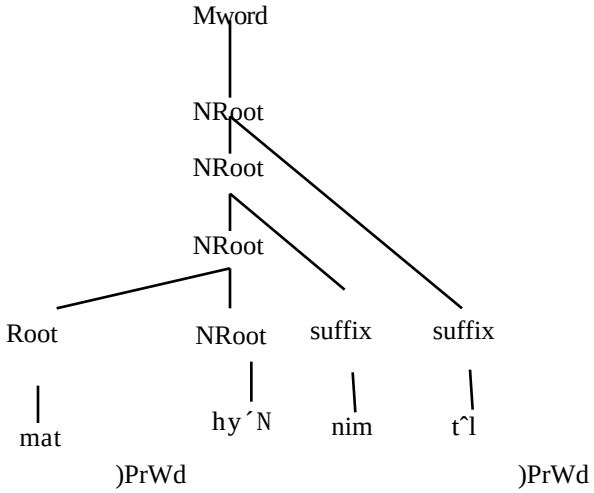
c. A bare Root preceded by a Root ("prefixed" word)

/mat-hy´N/ mat-hy´N 'big brother'



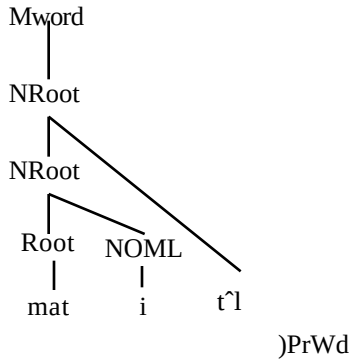
d. a suffixed Root preceded by a Root ("prefixed" word)

/mat-hy´N-nim-tˆl/ mat-hy´N-nJim-tˆl 'big brother-Hon-Pl'



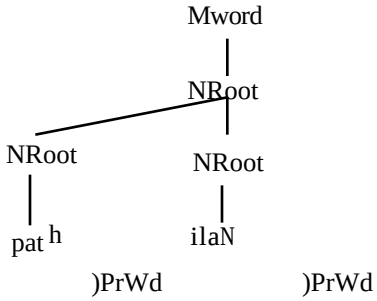
e. A suffixed verb Root

/mat-i/ macJ-i ‘the first son’



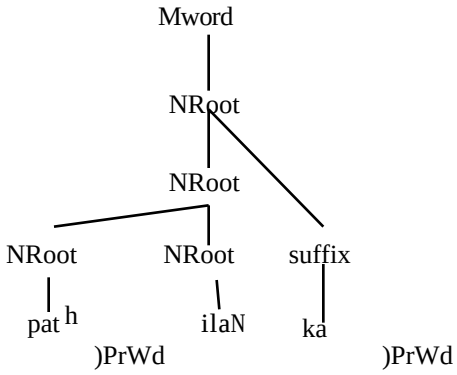
f. Two bare noun Roots (noun "compound")

/patʰ-ilaN/ patʲ-iraN 'dry field ridge'



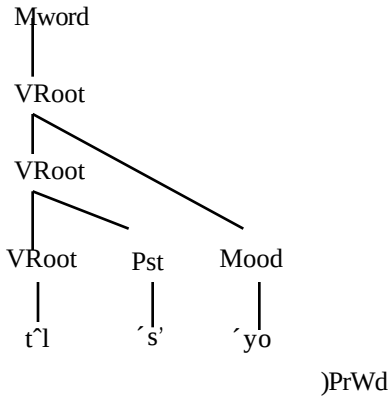
g. A suffixed noun Root preceded by a Root (suffixed noun "compound")

/patʰ-ilaN-ka/ patʲ-iraN-k'a 'dry field ridge edge'



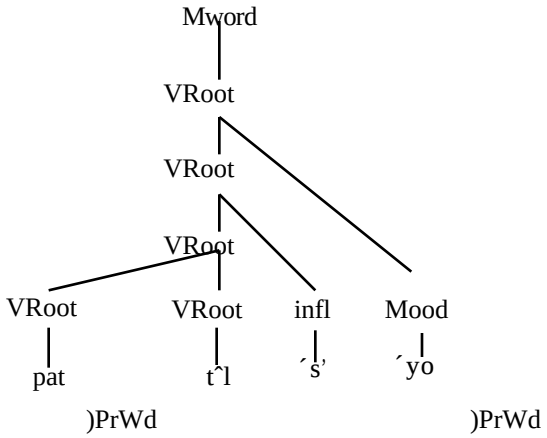
h. An inflected verb Root

/tˆl-´s'-´yo/ tˆr-´s'-´yo 'carry-Pst-Mood'



i. An inflected verb preceded by a VRoot ("prefixed" verb Root)

/pat-tˆl-´s'-´yo/ pat-t'ˆr-´s'-´yo 'to lift up'



As shown in the morphological structure, the right edge of a $Root_0^{max}$ is identified as the right edge of a PrWd.

Korean has clitics which are attached to the preceding nominal:

(52) Clitics

a. $_{NP}[\ _{N'}[\text{´lin}\ _{N}[\text{haksæN}]]]$=ilaN 'a student who is young-and'

be-young student and(Cl)

b. $_{NP}[_{CP}[$ næ-ka malha-n$]\ _{N'}[$salam$]]$=man=ˆn 'as for only the person whom I talked to'

I-Nom talk-Mod person only(Cl) Top(Cl)

As for clitics, we adopt Marantz 1986, 1988's proposal that a clitic is morphologically merged with the lexical head of the semantically or syntactically related phrase. As a result of the morphological merger of a clitic with a semantically or syntactically related host phrase, a clitic is expected to pattern together with a suffix since a clitic is merged with the

head of the preceding phrase, and the merged output takes on the category of the host phrase.

(53) Morphological merger of a clitic with a host phrasal head

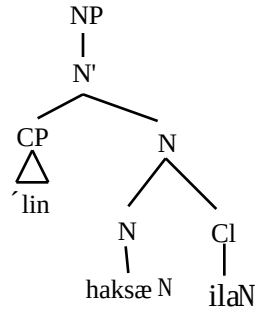
...X]x Cl] --> X-Cl]x

Hence, through a morphological merger of a clitic, we will have the following morphological structure:

(54) $_{NP}$[$_{N'}$[´lin $_{N}$[haksæN]]]=ilaN 'a student who is young-and'

'be young' 'student' 'to(Cl)'

--> $_{NP}$[$_{N'}$[´lin $_{N}$[haksæN=ilaN]]]



As a result, the right edge of the maximal projection of a $Root_0$ is still identified as the right edge of a PrWd.

3.4 "Crisp" vs. "Non-Crisp" Alignment between Edges of a $Root_0^{max}$ and a PrWd

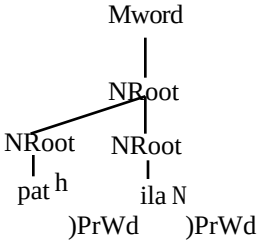
Turning back to the overapplication of CN observed in the final consonant of a "prefixal" Root in a "prefixed" word and in the final consonant of the first member of a compound (before a PrWd juncture), the Optimality Theoretic approach allows us to pursue

two options. First, we might propose that on a certain intermediate level, prosodic words are formed by referring to morphological structure. And then based on the PrWd structure, syllabification and Coda Neutralization take place. However, we have to posit a surface level to incorporate resyllabification across a PrWd juncture. On the other hand, another OT approach is to posit only the surface level without any pre-surface level for intermediate syllabification. In this chapter, we are going to pursue the latter approach, showing that the overapplication of Coda Neutralization (and the underapplication of primary palatalization) can be explained without an intermediate level in OT.

When we assume that PrWd formation refers to morphological structure in the input level, the right edge alignment of a maximal projection of a $Root_0$ and a PrWd is observed in (optional) /n/-insertion phenomenon in which /n/ is inserted between the final C of the first maximal projection of a $Root_0$ and a following i/y-initial Root (between C and i/y).

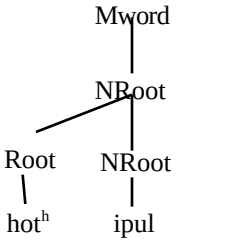
(55) (NRoot = Noun Root; Root = Root whose grammatical category is not clear)

a. /pat^h-ilaN-i/ panJ-nJiraN-i (or patJ-iraN-i) 'field ridge-Nom' (compound)



$_{PrWd}$(panJ) $_{PrWd}$(nJilaN)

b. /hot^{h}-ipul/ honJ-nJipul (or hotJ-ipul) 'unlined comforter' (“prefixed” word)

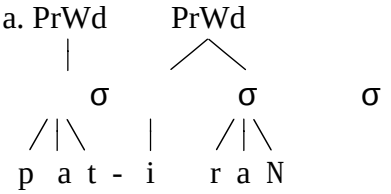


$_{PrWd}$(honJ) $_{PrWd}$(nJipul)

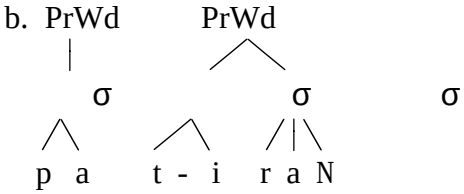
The right edges of Root$_0^{max}$’s (/hot^{h}/ and /hot^{h}-ipul/) is identified as the right edges of PrWd’s in the output forms of (55a) and (55b), in which /n/ is inserted between a Root-Root juncture and the first Root-final C is nasalized before the inserted /n/.

However, the right-edge alignment constraint might not be valid at the current stage of discussion since we have to define the prosodic structures of those outputs in (55) in which /n/-insertion does not take place. Namely, we have to decide which is the correct prosodic structure between the following two in order to evaluate the validity of the constraint ALIGN-R(Root$_0^{max}$, PrWd):

(56) a.



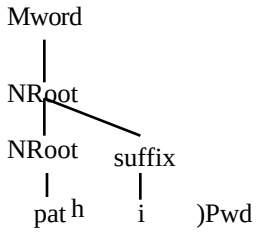
b.



Furthermore, if it were to turn out that (56b) is the correct prosodic structure, the validity of right edge alignment between a Root$_0^{max}$ and a PrWd would collapse. However, it will turn out that neither of the two potential prosodic structures is the correct prosodic structure. This is because we have another possibility: ambisyllabicity of the PrWd-final [t]. We will return to this problem shortly.

Actually, /n/-insertion provides an additional piece of evidence for the existence of a PrWd juncture after a $Root_0^{max}$. /n/-insertion in Native Korean does not take place at a suffixal or clitic boundary, while primary palatalization does take place:

(57) a. /pat^h-i/ pacJ^h-i, *panJ-nJi 'field-Nom'



b. /mat-i/ macJ-i, *manJ-nJi 'the first son' ('elder' 'ADVL')

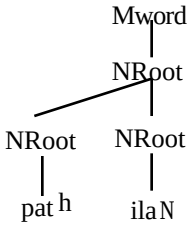
As shown in (55), on the other hand, optional /n/-insertion but not primary palatalization takes place at the morphological boundary of Root-Root. Hence, /n/-insertion between two Roots also motivates the fact that the Root-Root boundary is identified as a PrWd juncture.

When we consider potential prosodic structures including syllable structures of those words which consist of two Roots, the optimal prosodic structure should encode a PrWd juncture between two Roots due to overapplication of CN and underapplication of primary palatalization in the (first)Root-final C. Keeping this in mind, we will reconsider the following potential prosodic structures for the combination of two Roots of a "compound" word:

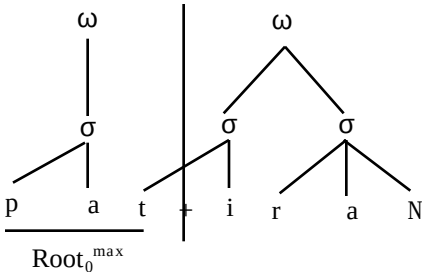
(58) Potential prosodic structures

/pat^{h}-ilaɴ/ patɹ-iraɴ 'field ridge' (noun compound)

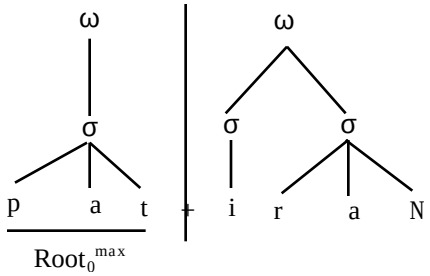
Morphological Structure



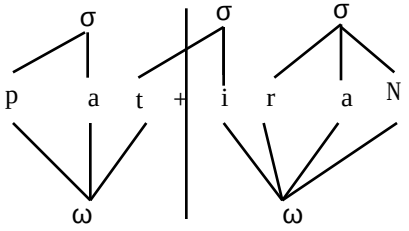
a.



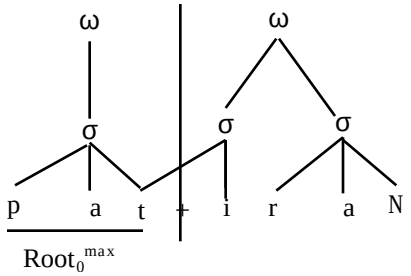
b.



c.



d.



The prosodic structure in (58a), in which the (first)Root$_0^{max}$-final consonant is syllabified as an onset and becomes the first consonant of the second PrWd, does not comply with the PrWd structure which refers to the input morphological structure. Furthermore, crisp edge alignment between a morphological category and a prosodic category cannot be utilized since a PrWd juncture is formed within a Root$_0^{max}$. Another potential problem in (58a) is that with the PrWd structure in (58a) it is difficult to capture the observation that overapplication of CN and underapplication of primary palatalization are observed in the

$Root_0^{max}$-final C. This is because the $Root_0^{max}$-final C is syllabified uniquely as an onset, and [lar]/[+cont]/[-ant] are allowed at the left edge of a syllable.

In (58b), on the other hand, the $Root_0^{max}$-final consonant is syllabified uniquely as a coda and the following PrWd-initial syllable is onsetless. Furthermore, there arises no misalignment between right edges of the $Root_0^{max}$ and a PrWd. This might explain why the $Root_0^{max}$-final C cannot retain a [lar] node (overapplication of CN), as the consonant is uniquely syllabified as a coda. However, the following onsetless syllable violates the constraint ONSET which is well respected in Korean (we will eventually replace ONSET with SyllCon[15] (Bat-El to appear) (see section 3.7 for SyllCon)).

In (58c), the configuration violates the Strict Layer Hypothesis[16] (Selkirk 1984, 1986, 1995, Nespor & Vogel 1986 and Hayes 1989). In other words, misalignment arises between a PrWd and a syllable. Selkirk 1995 provides the following four constraints on prosodic domination for the Strict Layer Hypothesis:

(59) Strict Layer Hypothesis (Selkirk 1995: 443)

i. Layeredness: No C^i dominates a C^j, $j > i$,

ii. Headness: Any C^i must dominate a C^{i-1} (except if $C^i = \sigma$),

iii. Exhaustivity: No C^i immediately dominates a constituent C^j, $j < i-1$,

iv. Nonrecursivity: No C^i dominates C^j, $j = i$

---

[15] We will explain the constraint SyllCon shortly. But the following is the definition of the syllable contact constraint:

SyllCon: Avoid rising sonority over a syllable boundary.

[16] Strict Layer Hypothesis (Hayes 1989):

The categories of the Prosodic Hierarchy may be ranked in a sequence C_1, C_2, … C_n, such that

a. all segmental material is directly dominated by the category C_n, and

b. for all categories C_i, $i \neq n$, C_i directly dominates all and only constituents of the category C_{i+1}.

(58c) violates Layeredness and Headness as a PrWd does not dominate a syllable.

In (58d), the $Root_0^{max}$-final consonant is ambisyllabic. The ambisyllabicity of the $Root_0^{max}$-final consonant may explain why the $Root_0^{max}$-final C cannot retain [lar]/[-ant]/[+cont] node/features, since it is still syllabified as a coda. On the other hand, since the $Root_0^{max}$-final C is syllabified also as an onset, it does not violate ONSET. However, this configuration may violate the tentative constraint Align-R($Root_0^{max}$, PrWd) in (50), repeated below:

(60) Alignment between right edges of a $Root_0^{max}$ and a PrWd (tentative)

The right edge of the maximal projection of a $Root_0$ is identified as the right edge of a PrWd: Align-R($Root_0^{max}$, PrWd)

Under the alignment definition of McCarthy and Prince 1993b, the right edge of the $Root_0^{max}$ is not sharply aligned with the right edge of the PrWd. In (58d), the right edge of a $Root_0^{max}$ is not crisp right aligned with a PrWd since a $Root_0^{max}$-final C is ambisyllabic.

In evaluating the potential prosodic structures for those words in which a C-final Root is followed by a V-initial Root, as shown above, the issue we have is:

(61) Assumption: The optimal PrWd structure for a compound (and a prefixed word) has to encode a Root-Root boundary as a prosodic juncture due to the overapplication of CN, underapplication of primary palatalization and /n/-insertion

Issue: If the (first) Root-final C is realized as ambisyllabic, are the right edges of a $Root_0^{max}$, a PrWd and a syllable aligned with each other?

We propose that the configuration in (58d) the the correct prosodic structure for a Root-Root compound in Korean and further propose that the constraint Align-R($Root_0^{max}$, PrWd) must be modified accordingly.

Before we discuss the potential alignment problem between right edges of a $Root_0^{max}$ and a PrWd when the $Root_0^{max}$-final consonant is ambisyllabic (58d), we will review McCarthy & Prince 1993b and Itô & Mester 1994 for different definitions of alignment. McCarthy & Prince 1993b first propose the following definition of "crisp" Alignment constraint:

(62) Dfn. Align(Cat1, Edge1, Cat2, Edge2) (McCarthy & Prince 1993b: 10)

Let Edge1, Edge2 be either L or R. Let S be any string. Then, for any substring A of S that is a Cat1, there is [a] substring B of S that is a Cat2, such that there is a decomposition D(A) of A and a decomposition D(B) of B, both sub-decompositions of a decomposition D(S) of S, such that Edge1(D(A))=Edge2(D(B)).

The definition of alignment in McCarthy & Prince requires "sharp/crisp" edge alignment between edges of two grammatical/prosodic categories. From now on, we will use the term "crisp"-alignment to refer to the definition of alignment in McCarthy & Prince.

On the other hand, Itô & Mester 1994 introduce the concept of "non-crisp" edge alignment by proposing that the concept of alignment should subsume not only "crisp" edge alignment defined in McCarthy & Prince 1993b but also alignment of edges of the two categories where a segment is doubly linked to two prosodic units ("non-crisp" edge alignment):

(63) Dfn. Align(Cat1, Edge1, Cat2, Edge2) (Itô & Mester 1994)

Let Edge1, Edge2 be either L or R. Let S be any string. Then, for any substring A of S that *is-the-content-of-a* Cat1, there is [a] substring B of S that *is-the-content-of-a* Cat2, such that there is a decomposition D(A) of A and a decomposition D(B) of B, both sub-decompositions of a decomposition D(S) of S, such that Edge1(D(A))=Edge2(D(B)).

They also propose the following CrispEdge constraint to distinguish between doubly linking and uniquely linking of a segment to a prosodic or morphological unit(s):

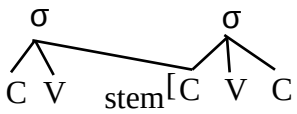
(64) CrispEdge[Pcat]

a. Dfn. Let A be a terminal (sub)string in a phonological representation, C a category of type Pcat, and A *be-the-content-of* C. Then C is *crisp* (or: *has crisp edges*) if and only if A *is-a* Pcat.

b. CrispEdge[PCat]: Pcat is crisp.

According to the definition of non-crisp alignment, the following prosodic structure meets "non-crisp" Align-Left(Stem, σ):

(65)

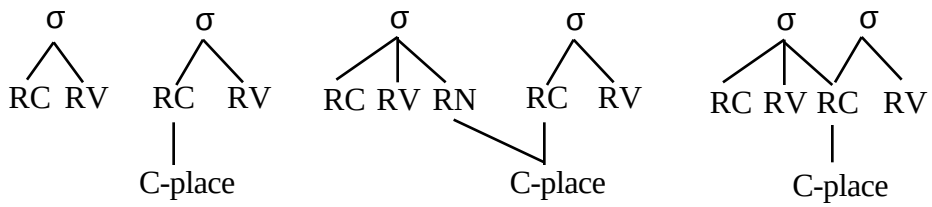


The left-most segment of the stem[17] is the left-most segment of a syllable but it is not uniquely syllabified (i.e., ambisyllabic). However, the stem-initial C violates

[17] Ito & Mester 1994 use the term "Stem" which we do not adopt in this paper. Instead, we utilize the term $Root_0^{max}$, the right edge of which is identified as the right edge of a PrWd.

CrispEdge(σ), which is assumed to be lower ranked than Align-Left(Stem, σ), as it is ambisyllabic. Itô & Mester 1994 note that there are three different cases of alignment:

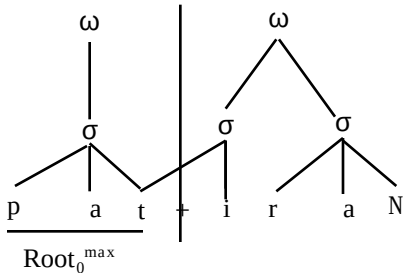
(66) a. b. c.



I & M categorize (66a) as a crisp alignment case whereas they categorize (66b) and (66c) as non-crisp alignment cases.

Turning back to the ambisyllabic case in (58d) (repeated as (67)), we observe that edges of a PrWd are "non-crisp" aligned with edges of a syllable. Recall that we use “non-crisp” alignment when we refer to the definition of alignment in Itô and Mester 1994 whereas we use “crisp” alignment when we refer to the definition of alignment in McCarthy and Prince 1993b, since we will argue in the next section that the two types of alignment must be incorporated as two separate classes of OT constraints.

(67)



The adoption of non-crisp alignment in the interpretation of Align-R($Root_0^{max}$, PrWd) allows the ambisyllabic $Root_0^{max}$ consonant to be non-crisp right-aligned with the (first)

PrWd. Furthermore, the Strict Layer Hypothesis is not violated since the $Root_0^{max}$-final C is non-crisp aligned between the right/left edges of a PrWd and a syllable and a PrWd juncture is identified as a syllable juncture. However, non-crisp interpretation of the proposed constraint ALIGN-L([lar]/[+cont]/[-ant], σ) in section 3.1 does not work since [lar]/[+cont]/[-ant] must not be allowed in an ambisyllabic consonant. As a result, we will propose in the remainder of this chapter that "crisp" and "non-crisp" alignment should be implemented as two separate classes of OT constraints: crisp alignment in McCarthy & Prince 1993b and non-crisp alignment in Itô & Mester.

As a summary of this section, we have proposed that the right edge of a $Root_0^{max}$ (i.e., the right edge of a Root before another Root) is non-crisp left aligned with a PrWd. Since a PrWd juncture is formed between two Roots in Korean, this entails that a PrWd-final C is realized as ambisyllabic before a V across a PrWd juncutre:

(68) Proposals

a. A Root-final C before a Root-initial V is realized as ambisyllabic[18].

b. A PrWd juncture is formed between two Roots.

---

[18] It seems to me that a PrWd-final C is not realized as ambisyllabic before a V across a Phonological Phrase juncture. ONSET seems to be not respected across a Phonological Phrase juncture. In Korean, a Phonological juncture is formed between the subject NP and a following VP accroding to Kang 1992, Cho 1990a and Silva 1989. The final consonant of a Phonological Phrase is not syllabified as an onset across the Phonological Phrase juncture. In the following example, "//" indicates a Phonological Phrase juncture:

(i)	a. /kaˆl o-ly´-ha-n-ta/	kaˆl // ory´-ha-n-ta	'Fall is going to come.'
	'fall' 'come-going to-do-Pres-Mood'		
	b. /k´li/	k´ri	'street'
	c. /kaˆl-isa/	kaˆr-isa	'Fall moving'

In Korean, [lateral] is allowed only in coda, (a detailed discussion will appear in the Appendix to this chapter and also chapter 6). /l/ is realized as flapped [r] within a PrWd (b) and across a PrWd juncture (c). Such flapping suggests that the PrWd-internal consonant between two vowels and the PrWd-final consonant before a vowel across a PrWd juncture may be realized as ambisyllabic. However, the final consonant of a Phonological Phrase is not realized as ambisyllabic since it is realized as [l] rather than flapped [r], as shown in (a). This suggests that the PrWd-final C before V is not realized as ambisyllabic across a Phonological Phrase.

c. Hence, a PrWd-final C is realized as ambisyllabic before a V across a PrWd juncture.

3.5 Ambisyllabic PrWd-final C and English flapping

The proposal that the PrWd-final C before a V is realized as ambisyllabic is also supported in English flapping (Kahn 1976). Consider the following minimal pair:

(69) Data from M & P 1993b, McCarthy 1993a, Itô & Mester 1994

a. saw Ted [sç:t̲ʰEd]

b. sought Ed [sç:R̲Ed]

The case at point is that PrWd-initial [t^h] in "saw Ted" is syllabified uniquely as an onset (due to obligatory aspiration). However, the PrWd-final [R] seems to be syllabified as ambisyllabic, as /t/ is realized as flapped (Kahn 1976). This observation is consistent with the proposed ambisyllabicity of the PrWd-final C before a V.

Rather than appealing to Align-L(Stem, PrWd) (McCarthy & Prince 1993b and McCarthy 1993a), we propose that the right edge of a Stem must be non-crisp aligned with the right edge of a PrWd (a similar approach is also suggested in Itô & Mester 1994: footnote 5):

(70) NON-CRISP-ALIGN-R(Stem, PrWd)

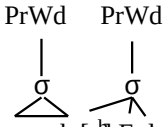
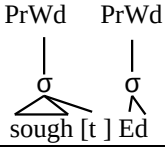
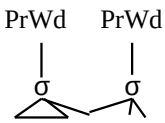
This alignment constraint and ONSET conspire to force the PrWd-final C to be realized as ambisyllabic. The following tableau shows how this conspiracy works under the following assumptions:

(71) Assumptions

a. /t/ is realized as aspirated when uniquely syllabified as an onset

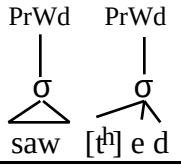
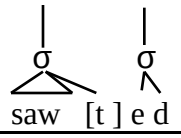
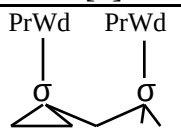
b. /t/ is realized as flapped when syllabified as ambisyllabic

(72) sought Ed [sç:ɾ̲Ed]

	NCA-R (Stem, PrWd)	ONSET
	*!	
		*!
☞ 		

On the other hand, the following tableau show how the stem-initial /t/ is realized as [t^h]:

(73) saw Ted [sç:t̪^{h}Ed]

	NCA-R (Stem, PrWd)	ONSET
☞ 		
	*!	*
	*!	

In the tableau above, the third candidate violates NCA-R(Stem, PrWd) since the right edge of the first stem is not non-crisp aligned with the right edge of a PrWd. The second candidate violates both NCA-R(Stem, PrWd) and ONSET. Hence the first candidate is optimal.

Based on the data in English and Korean, we argue that the proposed ambisyllabicity of the PrWd-final C before a V is correct in both languages.

3.6 Two Roots for a Fake Geminate and Alignment of [lar]/[+cont]/[-ant]

In Korean, when /s/ and /c/ are followed by /s/ and /c/, respectively, across a morpheme boundary, the former consonants are neutralized to [t] in a normal speech[19]:

[19] /s/ is neutralized to [t] when followed by another /s/. in a normal speech, as shown. However, the sequence /ss/ is realized as [s'] in fast/casual speech. We are not going to analyze the fast speech version in this paper.

(74) a. /is'-so/ it-s'o 'exist-Mood'

b. /is-so/ it-s’o ‘connect-Mood’

c. /ic-ci/ it-c'i 'forget-Neg Cont'

In the case of underlying fake geminates /ss/ and /cc/, the first member gets neutralized on the surface. This can be explained by the highly ranked constraint Crisp-Align-L([+cont]/[-ant], σ) (under the alignment definition of McCarthy & Prince 1993b) which forces ([+cont]/[-ant] to be at a crisp left edge of a syllable. In the examples above, we also observe that only the second member of the underlying fake geminate gets tensified.

Now consider the following data in which a coda obstruent gets neutralized

(75) a. /is-ta/ it-t'a 'connect-Mood'

b. /is'-ta/ it-t'a 'exist-Mood'

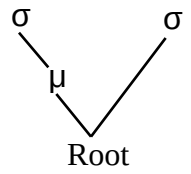
c. /ic-ta/ it-t’a ‘forget-Mood’

In the examples above, underlying /s, s’, c/ get neutralized to [t] and only the following /t/ gets tensified.

The two sets of the data suggest that the feature [lar] may have to be encoded in the second member of the fake geminate, since the first member of a fake geminate cannot retain the [lar] feature.

According to the One-Root Theory of Length(Hyman 1985, McCarthy & Prince 1986, Hayes 1989), a geminate consonant is represented as a single Root node linked to a single mora:

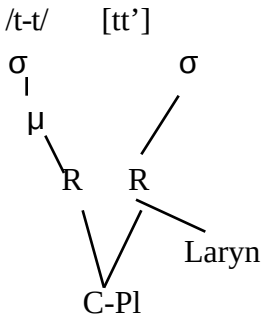
(76) Geminate in One-Root Theory



The One-Root Theory cannot represent tensification of the second member of a (fake) geminate in Korean (for more discussion, see Selkirk 1990 for Klamath).

Partly adopting the Two-Root theory of Length (Selkirk 1990), we propose that a fake geminate must be represented by two separate Roots as shown below:

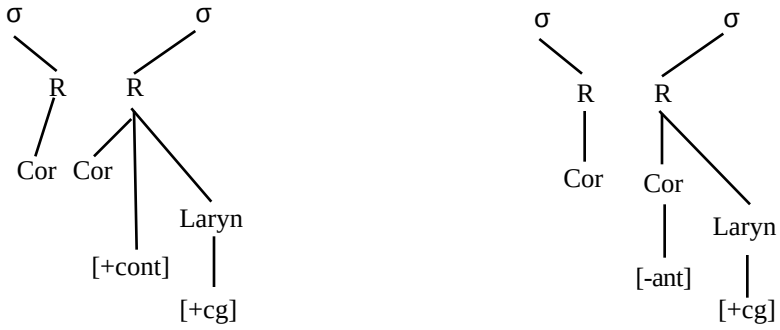
(77) Representation of a fake geminate



A fake geminate with [lar] in the second member is compatible with the proposed constraint Align-Left([lar], σ) when we adopt the concept of "crisp" alignment in McCarthy & Prince 1993b.

The partial representations of the consonant clusters in (75a) and (75c) are shown below when we adopt the hierarchical feature representation proposed in Clements & Hume 1995:

(78) a. /is'-so/ it-s'o 'exist-Mood' b. /ic-ci/ it-c'i 'forget-Neg. cont



As shown, [lar]/[+cont]/[-ant] are allowed only in the crisp left edge of a syllable[20]. [+cont] and [-ant] pattern together with [lar] in that they are allowed at the crisp left edge of a syllable. From these observations, we propose the following three (crisp) alignment constraints:

(79) CRISP-ALIGN-L([lar]/[+cont]/[-ant], σ)
(hereafter, CA-L([lar]/[+cont]/[-ant], σ))

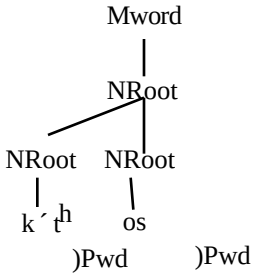
Recall that we assume that crisp and non-crisp alignment are separate classes of OT constraints. Since [lar]/[+cont]/[-ant] do not appear in coda or in an ambisyllabic segment in Korean, we will assume that it is undominated.

Now, let us turn back to the proposal that a PrWd-final C is ambisyllabic before a V. As the $Root_0^{max}$-final C before a V-initial Root is realized as ambisyllabic, we have the following surface representation for a compound in which the first member ends with a consonant and the second member begins with a vowel:

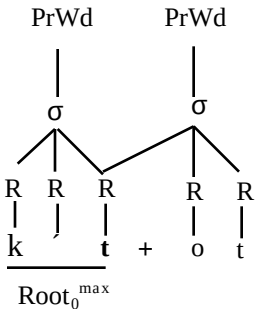
[20] Korean does not have a morpheme-internal geminate /c/ or /s/.

(80) /k´t^{h}-os/ k´t-ot 'outer garment' (compound) (‘outside' 'clothes')

Morphological structure



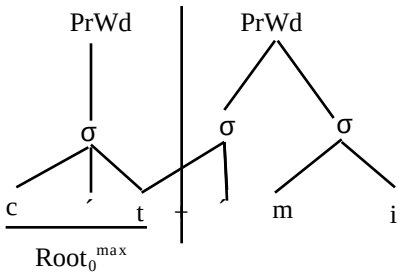
Prosodic structure



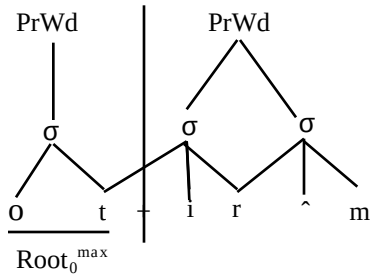
Since the Root node of the ambisyllabic [t] is not associated with a unique syllable, the underlying [lar] of the (first) Root$_0^{max}$-final /t^{h}/ will not be allowed to surface under the segmental Root node which is not crisp left-aligned with a syllable. Hence, appearance of [lar] in an ambisyllabic position will violate CA-L([lar], σ) constraint.

As for the features [+cont]/[-ant] in an ambisyllabic consonant, consider the following examples in which [+cont]/[-ant] are not realized in ambisyllabic position:

(81) /c´c-´mi/ c´t-´mi 'nanny' (‘milk' 'mom')



(82) /os-il^m/ otɹ-ir^m[21] 'clothes name'



The high ranked constraints CA-L([+cont]/[-ant], σ), violation of which is fatal in Korean, explain the disappearance of [+cont]/[-ant] in an ambisyllabic consonant.

In the next section, we will propose that ambisyllabicity of the (first) $Root_0^{max}$-final C which is followed by a V-initial Root, is ensured by the conspiracy of some constraints.

3.7 Conspiracy of Constraints for the Ambisyllabicity of a $Root_0^{max}$-final C

For the ambisyllabicity of the $Root_0^{max}$-final C before a V-initial Root, we first propose that a $Root_0^{max}$-final C must be non-crisp right aligned with a PrWd:

(83) NON-CRISP-ALIGN-R($Root_0^{max}$, PrWd) (hereafter NCA-R($Root_0^{max}$, PrWd))

Furthermore, we introduce the constraint Syllable Contact, which is based on the sonority hierarchy (Bat-El to appear, Stuart & Shin 1997):

(84) SyllCon (Bat-El to appear, Stuart & Shin 1997)

Avoid rising sonority over a syllable boundary.

[21] /l/ is realized as r in ambisyllabic position and this topic will be discused at the appendix of this chapter. We will just assume that r is ambisyllabic for the moment.

In the following example, a $Root_0^{max}$-final C is realized as ambisyllabic before /y/:

(85) a. /nˆc-y´lˆm/ nˆtJ-y´rˆm ‘late summer’ (Compound)
b. /c´c-´mi/ c´t-´mi 'nanny'

SyllCon assumes the roles of ONSET and NOCODA in the literature since ONSET and NOCODA conspire to force a consonant be syllabified as an onset before a glide in Korean. If a syllable boundary were formed between /c/ and /y/ in (85a), the configuration would violate SyllCon due to rising sonority across a syllable boundary (or violate NOCODA due to the coda [tJ]). On the other hand, if a syllable boundary were formed between /c/ and /´/ in (85), the configuration would violate SyllCon due to rising sonority across a syllable boundary (or violate both ONSET and NOCODA due to the coda [t] and the onsetless syllable). Hence, SyllCon can replace the roles of ONSET and NOCODA.

Another role of SyllCon is found in Korean nasalization phenomenon. Korean has a nasalization phenomenon in which an obstruent is nasalized before a nasal:

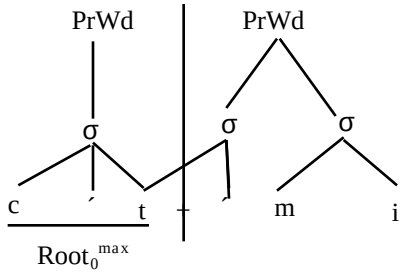
(86) a. /cip=man/ cim=man ‘house only’
b. /pu´k^h=man/ pu´N=man ‘kitchen only’

The two sets of data suggest that rising sonority across a syllable boundary is strictly prohibited in Korean and is undominated in the constraint ranking. The arguments for SyllCon have been independently proposed in Bat-El to appear for Modern Hebrew and Davis & Shin 1997 for Korean and Kazakh. We will use SyllCon throughout this dissertation instead of ONSET and NOCODA.

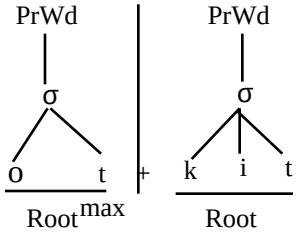
On the other hand, the proposed NCA-R($Root_0^{max}$, PrWd) is modified from the tentatively proposed Align-R($Root_0^{max}$, PrWd) in (49). For the interaction of NCA-

R(Root$_0^{max}$, PrWd) and SyllCon, consider the surface prosodic structure (87a), in which a Root$_0^{max}$-final C is realized as ambisyllabic before a vowel. Here, we observe that the right edge of a Root$_0^{max}$ is non-crisp right-aligned with a PrWd. On the other hand, when a Root$_0^{max}$-final consonant is followed by a C-initial Root, as shown in (87b), the right edge of a Root$_0^{max}$ is crisp right-aligned with the right edge of a PrWd:

(87) a. /c´c-´mi/ c´t-´mi 'nanny' (‘milk' 'mom')



b. /os-kis/ ot-k’it 'coat collar'

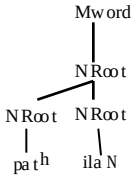


Since non-crisp alignment subsumes crisp alignment, the structure also respects NCA-R(Root$_0^{max}$, PrWd). On the other hand, SyllCon is not violated in [c´t´mi] (/c´c-´mi/) (81) and [otʃirˆm] (/os-ilˆm/) (82), since the Root$_0^{max}$-final C is realized as ambisyllabic. The effect of the NCA-R(Root$_0^{max}$, PrWd) constraint is to force the Root$_0^{max}$-final C (or V) to be the final C (or V) of a PrWd[22], whereas one effect of SyllCon is to force a C between two vowels to be syllabified as an onset. Hence if the two constraints are not violated, the result is for the Root$_0^{max}$-final C before a V to be realized as ambisyllabic.

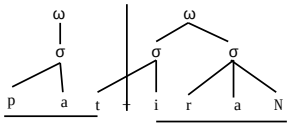
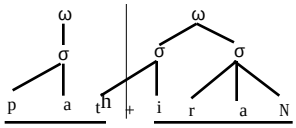
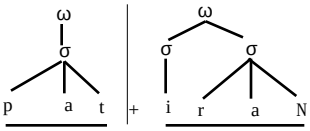
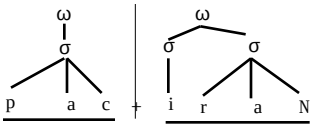
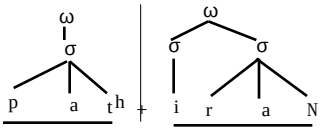
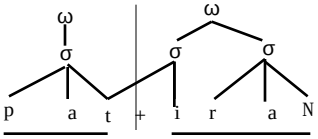
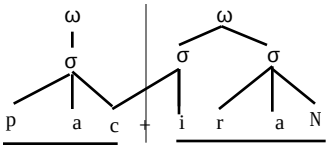
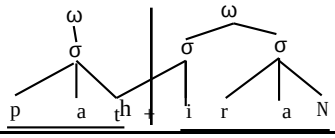
[22] This entails that the Root$_0^{max}$-final C (or V) must be the final segment of a syllable.

In the tableaux below, we will assume that CA-L([lar]/[+cont]/[-ant], σ), SyllCon and Non-crisp-Align-R constraints are unranked since there is no evidence for their relative ranking. On the other hand, we have already shown in section 3.1 of this chapter that Crisp-Align-L([lar]/[+cont]/[-ant], σ) are ranked higher than IDENT-IO[lar]/[+cont]/[-ant]. The following tableau shows how the proposed constraints interact with one another in a case of the overapplication of CN and the underapplication of primary palatalization in the $Root_0^{max}$-final consonant before a V:

(88) /pat^h-ilaɴ/ patʃ-iraɴ 'field ridge' (compound)



(secondary palatalization is ignored)

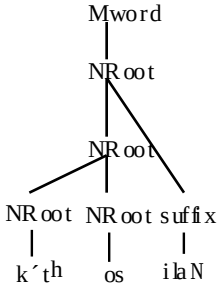
input /pat^{h}-ilaN/	CA-L ([lar]/ [-ant], σ)	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	IDENT-IO [lar]
a. 			*!	*
b. 			*!	
c. 		*!		*
d. 	*!	*		*
e. 	*!	*		
f. ☞ 				*
g. 	*!			*
h. 	*!			*

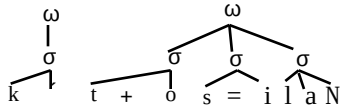
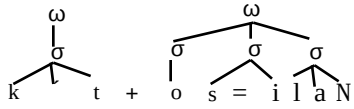
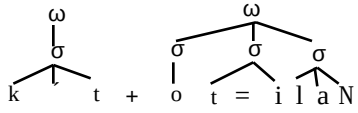
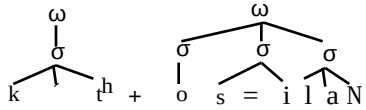
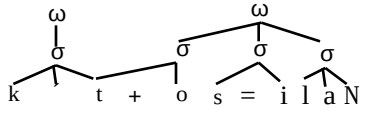
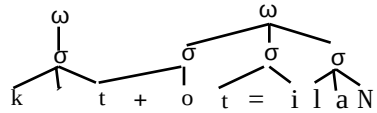
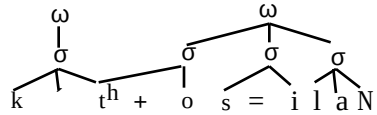
In the tableau above, candidate (f) is optimal since it violates only lower ranked IDENT-IO[lar], the violation of which is compelled by conforming to CA-L([lar]/ [-ant], σ). Candidates (a) and (b), in which the right edge of the $Root_0^{max}$ is not non-crisp aligned with the right edge of a PrWd (violation of higher ranked NCA-R), are eliminated. Candidate (c) violates highly ranked SyllCon, violation of which is fatal. Candidates (d) and (e) violate highly ranked CA-L([lar]/ [-ant], σ) and SyllCon, and are eliminated. Candidates (g) and (l) violate highly ranked CA-L([lar]/ [-ant], σ) and are eliminated in favor of the optimal candidate (f) with only one violation mark for lower ranked IDENT-IO[lar].

The following tableau illustrates the neutralization of a $Root_0^{max}$-final consonant (overapplication of the CN) and also lack of neutralization of a PrWd-internal obstruent before a V:

(89) /k´t^{h}-os=ilaN/ k´t-osJ=iraN 'outer garment and' (compound plus clitic)

outside clothes and

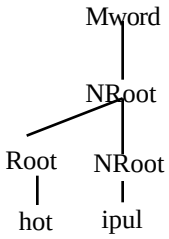


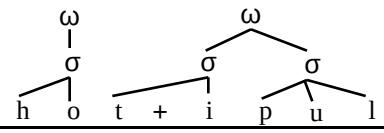
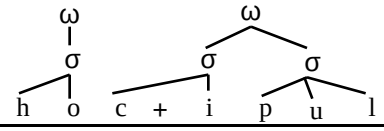
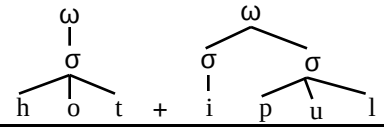
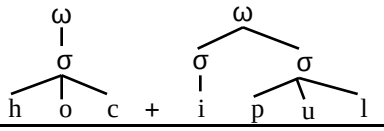
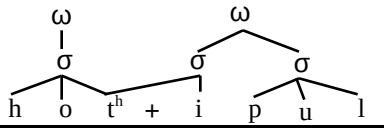
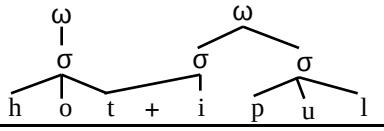
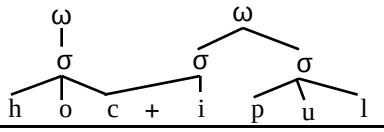
input /k´t^{h}-os=ilaN/	CA-L ([lar]/ [+cont], σ)	Syll-Con	NCA-R$_{max}$ ($Root_0$, PrWd)	IDENT-IO [lar]	IDENT-IO [+cont]
a. 			*!	*	
b. 		*!		*	
c. 		*!		*	*
d. 	*!	*			
e. ☞ 				*	
f. 				*	*!
g. 	*!				

In the tableau above, all the candidates except candidates (e) and (f) violate either high ranked CA-L, NCA-R or SyllCon. On the other hand, candidate (e) violates only low ranked IDENT-IO[lar]. Candidate (f) violates both low ranked IDENT-IO[lar] and IDENT-IO[+cont]. Hence, candidate (e) is optimal.

The following tableau illustrates the underapplication of primary palatalization of the $Root_0^{max}$-final coronal obstruent before a vowel-initial environment.

(90) /hot^h-ipul/ hotʃ-ipul 'single-layer quilt' ("prefixed" word)



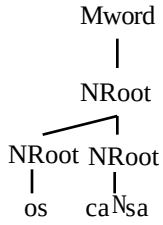
input /hot^{h}-ipul/	CA-L ([-ant], σ)	CA-L ([lar], σ)	SyllCon	NCA-R (Root$_0^{max}$, PrWd)
a. 				*!
b 				*!
c. 			*!	
d. 	*!			
e. 		*!		
f. ☞ 				
g. 	*!			

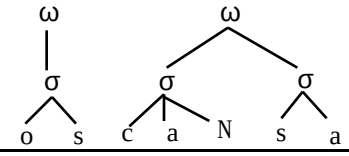
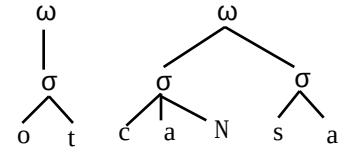
The tableau above explains why a Root$_0^{max}$-final consonant before a vowel is always realized neutralized on surface (optimal candidate (f)), showing the underapplication of palatalization. Only the candidate in (f) does not violate any constraint and is optimal.

The following tableau illustrates a case in which the final consonant /s/ of the Root$_0^{max}$ undergoes coda neutralization when it is followed by a consonant-initial Root:

(91) /os-caNsa/ ot-c'aNsa 'clothes sales' ("compound" word)

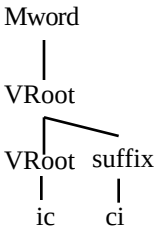
clothes sales

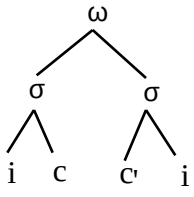
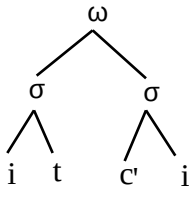
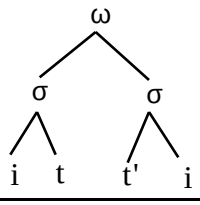


/os-caNsa/	CA-L ([+cont], σ)	SyllCon	NCA-R $(Root_0^{max}$, PrWd)	IDENT-IO [+cont]
	*!			
☞ 				*

Finally, the following tableau shows how the proposed constraint ranking predicts a correct output, given a sequence of underlying /c-c/ at an inflectional boundary within a PrWd):

(92) /ic-ci/ it-c'i 'to forget-Neg. Cont'



/ic-ci/	CA-L ([lar]/ [-ant], σ)	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	IDENT-IO [-ant]
	*			
☞ 				*
				**!

3.8 Final Remarks and Alternative Analysis

We proposed the following constraint ranking for the (over-)application of Coda Neutralization (and the underapplication of primary palatalization) observed in $Root_0^{max}$-final C before a V across a PrWd juncture:

(93) Proposed constraint ranking

CRISP-ALIGN-L([lar]/[+cont]/[-ant], σ), SyllCon,

NON-CRISP-ALIGN-R($Root_0^{max}$, PrWd)

>> IDENT-IO[+cont]/[-ant]/[lar]

Based on the constraint ranking, we analyzed Coda Neutralization without positing an intermediate stage of syllabification.

In the analysis of the overapplication of Coda Neutralization, we argued for a $Root_0^{max}$ which is the maximal/highest projection of a $Root_0$ after morphological merger of a suffixal or clitic element(s) with a preceding $Root_0$ or morphological merger of a $Root_0$ with a following head $Root_0$. And the right edge of the $Root_0^{max}$ is identified as the right edge of a PrWd. We further proposed that a PrWd-final C is realized as ambisyllabic before a V across a PrWd juncture.

In our analysis, we adopted two types of alignment: crisp alignment and non-crisp alignment. The [+cont]/[-ant]/[lar] node/features are allowed only at a crisp syllable-initial position. On the other hand, the right edge of a $Root_0^{max}$ must be non-crisp aligned with the right edge of a PrWd (NCA-R($Root_0^{max}$, PrWd)). In addition, a consonant between two vowels must be syllabified as an onset (which is forced by high ranked SyllCon). When a $Root_0^{max}$-final C is followed by a Root-initial V, it is forced to be the final C of a PrWd to avoid violation of NCA-R($Root_0^{max}$, PrWd). On the other hand, it is also forced to be syllabified as an onset to avoid violation of high ranked SyllCon. As a result, the best syllabification of the $Root_0^{max}$-final C is ambisyllabic. This explains why a $Root_0^{max}$-final C must undergo Coda Neutralization (and must not undergo primary palatalization) when followed by a V-initial Root.

So far we have discussed only the word-internal prosodic structures in Korean. However, the overapplication of Coda Neutralization and the underapplication of primary palatalization are also observed between words: namely, between an object noun and a following verb:

(94) a. [$_{VP}$ [$_{NP}$ pat^{h}] [$_{V}$ ilku-´la]] paʧ ilku-´ra 'Cultivate the dry field!'

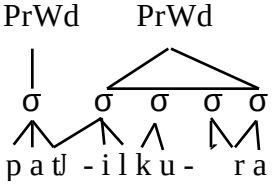
dry-field cultivate Mood

b. [$_{VP}$ [$_{NP}$ os] [$_{V}$ ip-´la]] otʃ ip-´ra 'Put clothes on!'

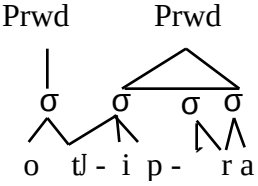
clothes wear Mood

Note that the noun and the following verb independently form a separate PrWd. The final /t/ of the noun undergoes Coda Neutralization before a V (overapplication of CN). Furthermore, the Noun-final C does not undergo primary palatalization (underapplication of primary palatalization). The hypothesis that a PrWd-final C before a V across a PrWd juncture is realized as ambisyllabic, can explain why the overapplication of CN or the underapplication of primary palatalization is observed between two words. Those two examples above have the following prosodic structures in the output:

(95) a.

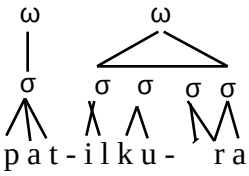
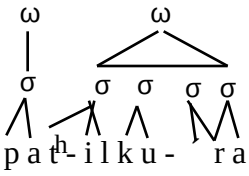
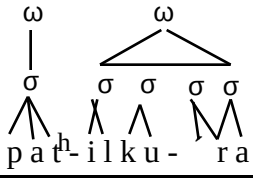
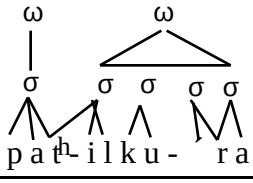
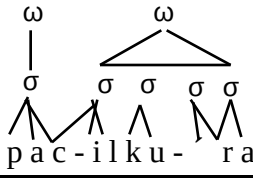
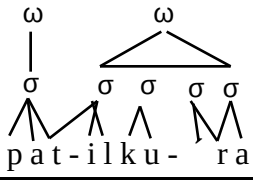


b.



Since the PrWd-final [tʃ] is ambisyllabic, it must undergo CN to avoid violation of high ranked CA-L([lar], σ). However, it cannot undergo primary palatalization since if it did, it would violate high ranked CA-L([-ant], σ). The following tableau demonstrates this:

(96) [VP [NP pat^{h}] [V ilku-´la]] pat̪ ilku-´ra 'Cultivate the dry field-Mood'

	CA-L ([lar]/[-ant], σ)	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	IDENT-IO [lar]
a 	*!	*		*
b 			*!	
c 	*!	*		
d 	*!			
e 	*!			*
f ☞ 				*

Candidate (b) is eliminated due to a fatal violation mark for high ranked NCA-R($Root_0^{max}$, PrWd). This is because the right edge of the $Root_0^{max}$ is not non-crisp aligned with the right edge of a PrWd. All the other candidates except candidate (f) violate at least one high ranked constraint. As a result, candidate (f) is optimal, since it violates only low ranked IDENT-IO[lar] as the final C of the $Root_0^{max}$ loses [lar].

Analyses of the overapplication of Coda Neutralization and the underapplication of primary palatalization crucially depend on the proposal that a PrWd-final C before a V is realized as ambisyllabic across a PrWd juncture. In the remainder of this dissertation, we will demonstrate that the ambisyllabicity of the PrWd-final C before a V provides explanatory power to the analyses of some Korean phonological phenomena which have resisted satisfactory analyses in the literature.

In this chapter, we analyzed the overapplication of CN and the underapplication of primary palatalization via adopting crisp alignment in McCarthy & Prince 1993b and non-crisp alignment in Itô & Mester 1994. However, we will show that it is possible to analyze them without appealing to the two types of alignment in McCarthy & Prince 1993b and in Itô & Mester 1994. We will demonstrate that only non-crisp alignment and the constraint CrispEdge(PCat) in Itô & Mester 1994, 1993 can explain overapplication of CN and underapplication of primary palatalization without additionally assuming crisp alignment in McCarthy & Prince 1993b. Following is the definition of CrispEdge(PCat) defined in Itô & Mester 1993:

(97) CrispEdge[Pcat]

a. Dfn. Let A be a terminal (sub)string in a phonological representation, C a category of type Pcat, and A *be-the-content-of* C. Then C is *crisp* (or: *has crisp edges*) if and only if A *is-a* Pcat.

b. CrispEdge[PCat]: Pcat is crisp.

We first propose for Korean that a syllable is crisp and that [lar]/[+cont]/[-ant] are noncrisp left aligned with a syllable:

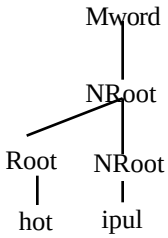
(98) a. CrispEdge[σ]: a syllable is crisp

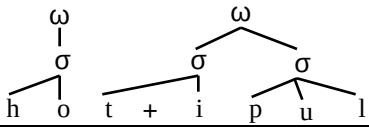
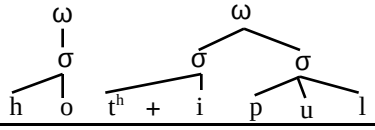
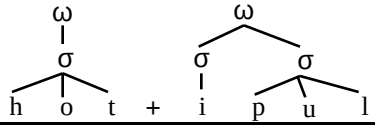
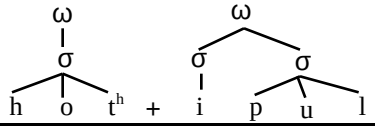
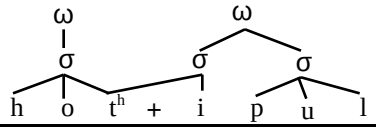
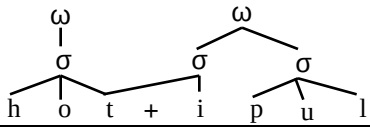
b. Noncrisp-Align-L([lar]/[+cont]/[-ant], σ)

(hereafter, NCA-L[lar]/[+cont]/[-ant], σ))

However, any ranking of the two constraints cannot explain why the (first) Root-final /t^h/ before a Root-initial V must undergo CN:

(99) /hot^h-ipul/ hotɹ-ipul 'single-layer quilt' ("prefixed" word)



input /hot^{h}-ipul/	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	**NCA-L [lar]**	**Crisp Edge(σ)**	IDENT-IO [lar]
a. 		*!			*
b. 		*!			
c. 	*!				
d. 			*!		
e. ☞ 				*	
f. *☞ 				*	*!

The tableau shows that any relative ranking of CrispEdge and NCA-L([lar]/[+cont]/[-ant], σ) could not explain the example in question. This is because candidate (f) additionally violates IDENT-IO[lar] in comparison with candidate (e), which should have been predicted to be non-optimal in favor of candidate (f). The problem is that incorporating the two constraints into constraint ranking cannot explain why [lar]/[+cont]/[-ant] appear only at a crisp left edge of a syllable.

Recall that [lar]/[+cont]/[-ant] must be crisp left aligned with a syllable. In order to implement this observation, we adopt the definition of constraint conjunction. Smolensky 1995 proposes that the conjunctive relationship may exist between two constraints. Smolensky defines the local conjunction of constraints as follows:

(100) a. Derived constraint generation

[P, Q CON} [P $\&_l$ Q CON]

("…$\&_l$…" $=_{def}$ "...locally conjoined with..")

If P and Q are members of the constraint set CON, so is the derived constraint P$\&_l$Q (read: P locally conjoined with Q"): P$\&_l$Q is violated if and only if there is some domain D in which both P and Q are violated.

b. Ranking (universal): P$\&_l$Q >> {P, Q}

Itô & Mester 1996 also demonstrate that constraint conjunction is necessary to explain the Danish stød and Japanese Rendaku.

We propose the following constraint conjunction for Korean:

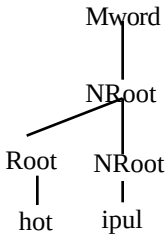
(101) Constraint Conjunction

CrispEdge[σ] & Noncrisp-Align-L([lar]/[+cont]/[-ant], σ)

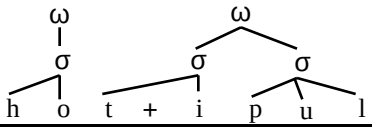
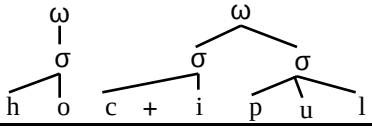
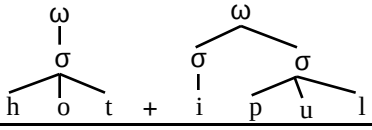
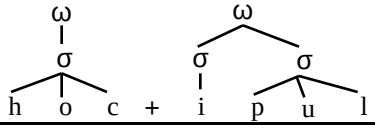
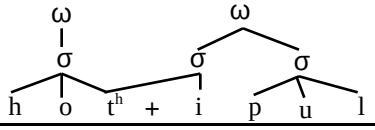
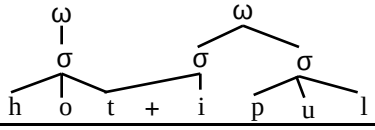
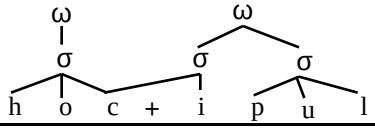
(hereafter, CRISP/ALIGN([lar]/[+cont]/[-ant]))

Since violation of CRISP/ALIGN counts only when both CrispEdge[σ] and Noncrisp-Align-L([lar]/[+cont]/[-ant], σ) are violated at the same time, the effect of CRISP/ALIGN([lar]/[+cont]/[-ant]) is to force [lar]/[+cont]/[-ant] to be crisp left aligned with a syllable. We will assume that CRISP/ALIGN is undominated in Korean since [lar]/[+cont]/[-ant] is always crisp left aligned with a syllable.

(102) /hot^{h}-ipul/ hotɯ-ipul 'single-layer quilt' ("prefixed" word)



(secondary palatalization is ignored.)

input /hot^{h}-ipul/	CRISP/ ALIGN[-ant]	CRISP/ ALIGN[lar]	SyllCon	NCA-R (Root$_0^{max}$, PrWd)
a. 				*!
b 				*!
c. 			*!	
d. 	*!			
e. 		*!		
f. ☞ 				
g. 	*!			

In the tableau above, only candidate (f) does not violate any highly ranked constraint and is optimal.

We have demonstrated that the conjoined constraint CRISP/ALIGN([lar]/[+cont]/[-ant]) can replace CA-L([lar]/[+cont]/[-ant], σ). The difference between CRISP/ALIGN ALIGN([lar]/[+cont]/[-ant]) and CA-L([lar]/[+cont]/[-ant], σ) is that the former dispenses with crisp alignment at the cost of introducing conjunction of two constraints. However, we will show in chapter 5 that constraint conjunction is necessary to explain variation of Korean /n/-insertion. On the other hand, the adoption of CRISP-ALIGN-L([lar]/[+cont]/[-ant], σ) pays the cost of assuming both non-crisp alignment and crisp alignment as two separate class of OT constraints. The decision between the two is a pending question for further study. Throughout this dissertation, however, we will use the latter constraint for simplicity.

Appendix: Flapped [r] and Constraint Reranking

We have shown in chapter 3 that the PrWd-final C before a V is realized as ambisyllabic across a PrWd juncture. However, ambisyllabicity of a consonant does not necessarily result only from a PrWd-final C before a V. Ambisyllabicity of a consonant can also arise within a PrWd. For example, underlying /l/ is realized as flapped [r] between vowels within a PrWd in Native and Sino-Korean. Such flapping suggests that the intervocalic [r] may be ambisyllabic.

First of all, consider the following data in the Native Korean sublexicon[23]:

[23] We assume that underlying /r/ does not exist in Native Korean.

(103) a. /´lkul/ ´lkul 'face'

b. /k´ul/ k´ul 'mirror'

c. /k´li/ k´ri 'street'

d. /ili/ iri 'wolf'

e. /m´l-li/ m´lɺ-lɺi 'far-ADVL'

f. /kal-li-/ kalɺ-lɺi 'to replace-Pass-'

(104) a. /maˆl-il/ maˆr-il 'town choir' (Root-Root)

b. /sikol-il/ sɺikor-il 'rural choir' (Root-Root)

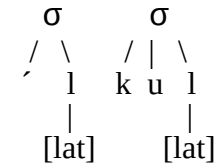
Note that underlying /l/ does not occur in morpheme-initial position in Native Korean[24]. Given the two sets of data above, we observe that /l/ is realized as flapped [r] between vowels (i.e., ambisyllabic). Underlying /l/ is realized as [l] when it is uniquely syllabified as coda or when it is preceded or followed by another /l/ across a syllable boundary. From this observation, we propose that [lat] is non-crisp right aligned with a syllable: NON-CRISP-ALIGN-R([lat], σ) (hereafter, NCA-R[lat]). NCA-R[lat] can explain why underlying /l/ is allowed to surface when it is uniquely syllabified as a coda or in a geminate across a syllable boundary:

[24] The underlying /l/ in foreign borrowings is realized as flapped [r]:

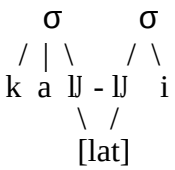
i) light [raitˆ]
love [r´pˆ]
long [roN]

These data shows that a flapped [r] can be realized in onset. However, native Korean speakers recognize [r]-initial words as foreign borrowings.

(105) a. /´lkul/ ´lkul 'face'



b. /kal-li-/ kalɺ-lɺi 'to replace-Pass-'



Since NCA-R[lat] is always respected in Korean, we assume that it is undominated. We further propose the following constraints:

(106) a. *AMBI-SYLL[lat]

[lat] is disallowed at ambisyllabic position.

b. NON-CRISP-Align-R([+rhotic], σ) (hereafter, NCA-R[+rho])

[+rhotic] is non-crisp right-aligned with a syllable.

c. IDENT-IO[lat]

d. NON-CRISP-ALIGN-R([lat], σ)[25] (hereafter, NCA-R[lat])

[lat] is at the non-crisp syllable-final.

e. Ranking: NCA-R[lat], *AMBI-SYLL[lat], NCA-R[+rho]

>> MAX-IO

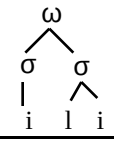
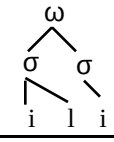
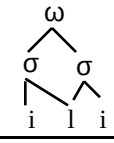
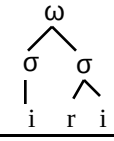
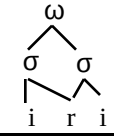
>> IDENT-IO[lat]

[25] NCA-R[+rho] and NCA-R[lat] cannot be collapsed as one since they must be separately ranked in foreign borrowings (see (112)).

High ranked *AMBI-SYLL[lat] blocks appearance of [lat] in ambisyllabic position. This prevents ambisyllabic [l] from being realized on the surface. On the other hand, since MAX-IO is high ranked, deletion of the input /l/ between two vowels must be avoided at the cost of violating IDENT-IO[lar]. The high ranked constraint NCA-R[+rho] allows [+rho] to be uniquely associated with a coda or to be doubly associated with a coda and an onset across a syllable boundary. This constraint disallows [V.rV] but allows [Vr.V] and [V·r·V] on the surface (where "·C·" = ambisyllabic C). However, [Vr.V] violates undominated SyllCon (and additionally violates low ranked IDENT-IO[lat]) since rising sonority arises across a syllable boundary. On the other hand, [V·r·V] violates only low ranked IDENT-IO[lat]. Therefore, underlying /l/ between two vowels is predicted to be realized as ambisyllabic [r].

Now, let us illustrate how these constraints interact with one another.

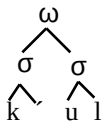
(107) /ili/ iri 'wolf'

/ili/	NCA-R [lat]	SyllCon	NCA-R [+rho]	*AMBI-SYLL [lat]	IDENT-IO [lat]
	*!				
		*!			
				*!	
			*!		*
		*!			*
☞ 					*

All candidates except the last one violate one highly ranked constraint. On the other hand, the last candidate, in which [r] is ambisyllabic, violates low ranked IDENT-IO[lat] and is optimal.

The following tableau illustrates why underlying /l/ is allowed to surface when syllabified as a coda:

(108) /k´ul/ k´ul 'mirror'

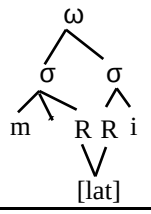
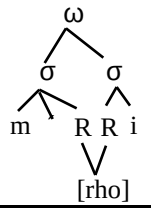
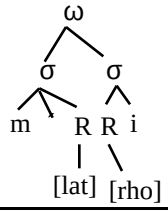
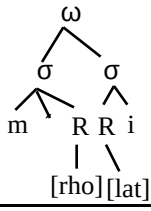
/k´ul/	NCA-R [lat]	NCA-R [+rho]	IDENT-IO [lat]
☞ 			
			*!

The coda [r] in the second candidate violates IDENT-IO[lat]. However, the first candidate does not violate any constraint. Hence the first candidate is optimal.

The following tableau shows why a geminate [l] is allowed on the surface. Note that we assume that a fake geminate is represented with two Roots (see section 3.6).

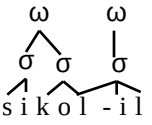
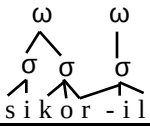
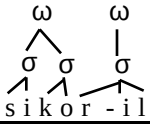
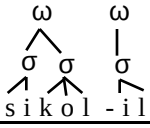
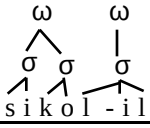
(109) /m´l-li/ m´lJ-lJi 'far-ADVL'

(secondary palatalization is ignored.)

/m´l-li/	NCA-R [lat]	NCA-R [+rho]	IDENT-IO [lat]
☞ 			
			*!
		*!	*
	*!		*

Finally, the following tableau demonstrates how the Root-final /l/ is realized as flapped [r]:

(110) /sikol-il/ sikor-il 'rural choir' (Root-Root)

/sikol-il/	NCA-R [lat]	SyllCon	NCA-R [+rho]	*AMBI-SYLL [lat]	NCA-R ($Root_0^{max}$, PrWd)	IDENT-IO [lat]
a. 				*!		
b. ☞ 						*
c. 			*!		*	*
d. 		*!				
e. 	*!				*	

Candidate (a) has ambisyllabic [l] which violates highly ranked *AMBI-SYLL[lat]. Candidate (b) violates only lower ranked IDENT-IO[lat]. Candidate (c) (fatally) violates highly ranked NCA-R[+rho] and NCA-R($Root_0^{max}$, PrWd). Candidate (d) is eliminated since it receives a violation mark for highly ranked SyllCon. Candidate (e) violates high ranked NCA-R[lat] and NCA-R($Root_0^{max}$, PrWd). As a result, candidate (b) is optimal.

We have demonstrated how input /l/ is realized as a flapped [r] between vowels. The required ambisyllabicity for flapped [r] is independent from the hypothesis that the PrWd-final C is realized as ambisyllabic before a V, since ambisyllabic flapped [r] is realized within a PrWd.

However, the hypothesis that /l/ is realized as ambisyllabic flapped [r] between vowels in Native Korean and Sino-Korean might be undermined by the data in foreign borrowings. In foreign borrowings[26], flapped [r] can appear in word-initial position:

(111)	a.	/ratio/	[ratio]	'radio'
	b.	/ramy´n/	[ramy´n]	'instant noodles'
	c.	/raitˆ/	[raitˆ]	'right'
	d.	/ropot^{h}ˆ/	[ropot^{h}ˆ]	'robot'
	e.	/laitˆ/	[raitˆ]	'light'
	f.	/lain/	[rain]	'line'

However, this observation does not undermine the argument that a flapped [r] is ambisyllabic in Native Korean and Sino-Korean. This is because when native Korean speakers hear those words in which [r] is in word-initial position, they treat them as foreign words or foreign borrowings. Since NCA-R[+rho] is violated in those examples above, we propose that it is reranked between highly ranked constraints (NCA-R[lat], *AMBI-SYLL[lat]) and low ranked IDENT-IO[lat] in foreign borrowings:

---

[26] We assume that both underlying /l/ and /r/ exist in foreign borrowings. This is because underlying /l/ and /r/ behave differently in the following cases:

i)	/kal/	[kal]	'Korean Airlines'
	/pol/	[pol]	'ball'
	/k´l/	[k´l]	'girl'
ii)	/kar/	[ka]	'car'
	/pi´r/	[pi´]	'beer'

Underlying /r/ is not permitted in coda and is deleted whereas underlying /l/ surfaces in coda. A strong dispreference for [r] in coda seems to exist in foreign borrowings.

(112) Constraint Ranking in foreign borrowings

NCA-R[lat], *AMBI-SYLL[lat],

>> NCA-R[+rho]

>> IDENT-IO[lat]

Since NCA-R[+rho] is ranked below undominated NCR-R[lat] and *AMBI-SYLL[lat] in foreign borrowings, [r] which is uniquely syllabified as an onset will be expected.

(113) /ratio/ [ratio] 'radio'

/ratio/	NCA-R [lat]	*AMBI-SYLL [lat]	NCA-R [+rho]	IDENT-IO [lat]
a. ☞ratio			*	
b. latio	*!			

In the tableau above, candidate (b) violates higher ranked NCA-R[lat]. However, candidate (a) violates lower ranked NCA-R and is optimal. The following tableau illustrates that word-initial /l/ is realized as [r]:

(114) /lain/ [rain] 'line'

/lain/	NCA-R [lat]	*AMBI-SYLL [lat]	NCA-R [+rho]	IDENT-IO [lat]
a. lain	*!			
b. ☞ rain			*	*

Candidate (a) violates highly ranked NCA-R[lat]. On the other hand, candidate (b) violates only lower ranked NCA-R[+rhotic] and IDENT-IO. Therefore, candidate (b) is optimal.

In foreign borrowings, initial /l/ or /r/ does not become another segment, e.g., /n/, as shown in the data in (111). We propose that it is due to IDENT-IO[+cont] which is ranked higher than NCA-R[+rho]. The potential output [n] from input /l/ or /r/ will lose underlying [+cont] and hence will violate IDENT-IO[+cont]. If IDENT-IO[+cont] is ranked higher than NCA-R[+rho], we can explain why another potential output [r] is preferred over [n]:

(115) /ratio/ [ratio] 'radio'

/ratio/	NCA-R [lat]	*AMBI-SYLL [lat]	IDENT-IO [+cont]	NCA-R [+rho]	IDENT-IO [lat]
a. ☞ratio				*	
b. latio	*!				
c. natio			*!		

(116) /lain/ [rain] 'line'

/lain/	NCA-R [lat]	*AMBI-SYLL [lat]	IDENT-IO [+cont]	NCA-R [+rho]	IDENT-IO [lat]
a. lain	*!				
b. ☞ rain				*	*
c nain			*!		

The following is the proposed constraint ranking for foreign borrowings:

(117) Constraint ranking for foreign borrowings

NCA-R[lat], *AMBI-SYLL[lat], IDENT-IO[+cont]

>> NCA-R[+rho]

>> IDENT-IO[lat]

As shown in (111), initial /l/ or /r/ does not become [n] in foreign borrowings. In Sino-Korean, however, initial /l/ is realized as [n] before a non-i/y vocoid (/l/-nasalization)[27].

(118) a. /lo-in/ no-in ‘old people’
b. /la-saN/ na-saN ‘nude statue’

Sino-Korean /l/-nasalization can be explained by reranking IDENT-IO[+cont] below NCA-R[+rhotic].

(119) Constraint ranking for Sino-Korean
NCA-R[lat], *AMBI-SYLL[lat]
>> NCA-R[+rho]
>> IDENT-IO[+cont]
>> IDENT-IO[lat]

In Sino-Korean, NCA-R[lat] and NCA-R[+rho] must not be violated at the cost of violating lower ranked IDENT-IO[+cont]. Hence, word-initial /l/ is predicted to be realized as [n] (violation of IDENT-IO) rather than [l] (violation of NCA-R[lat]) or [r] (violation of NCA-R[+rho].

[27] Sono-Korean does not have underlying /r/. In Sino-Korean, initial /l/ is deleted before a high front vocoid.

i) /ly´-hæN/ y´-hæN ‘trip’
/ly´k-ki/ y´k-k’i ‘baebell’

See more discussion of underlying /l/ in chapter 5.

(120) /lo-in/ no-in ‘old people’

/lo-in/	NCA-R [lat]	*AMBI-SYLL [lat]	NCA-R [+rho]	IDENT-IO [+cont]	IDENT-IO [lat]
a. loin	*!				
b. roin			*!		*
c ☞ noin				*	

Candidate (a) violates high ranked NCA-R[lat]. Candidate (b) violates NCA-R[+rho] which is ranked higher than IDENT-IO[+cont]. Candidate (c) violates lower ranked IDENT-IO[+cont] and is therefore optimal.

Chapter 4 Palatalization and Umlaut in Native Korean

It has been reported in the literature on Korean phonology (Ahn 1986, Iverson 1993 and Iverson & Wheeler 1988) that coronal consonants (/s/, /n/ and /l/) excluding /t/ and palatal /c/, undergo (allophonic) secondary palatalization before a high front vocoid. On the other hand, it has also been reported that /t/ undergoes (phonemic) primary palatalization to [c] at a suffixal or clitic boundary without undergoing secondary palatalization. It was observed by Ahn, Iverson and others that /t/ before tautomorphemic /i/ undergoes neither primary nor secondary palatalization. Contrary to this observation, Kiparsky 1993 and Lee 1972 report for Korean that underlying /c/ and /t/ undergo secondary palatalization and the /c/ which is derived from /t/ at a suffixal and clitic boundary also undergoes secondary palatalization. Based on this newer observation, we provide analyses of primary and secondary palatalization in Native Korean in the framework of OT. We will further show that Umlaut, which has been analyzed in Hume 1990, is identified as secondary palatalization.

4.1 Data of Native Korean Palatalization and Kiparsky 1993

In the literature on Korean phonology (Ahn 1986, Iverson 1993 and Iverson & Wheeler 1988), it is reported that /t, t^h/ undergo (neutralizing) primary palatalization to [c, c^h], respectively, before a high front vocoid-initial suffix or clitic environment. Note in the data below that the derived /c/ and /c^h/ also undergo secondary palatalization:

(1) /t/-palatalization

a.	/mat-i/	-> macJ-i	'the oldest son'	('oldest' ‘NOML')
b.	/kut-i/	-> kucJ-i	'stubbornly'	('to be firm' ‘ADVL')
cf.	/kut-´/	-> kut-´	'become hard-Cont'	('to be firm' 'Cont')
c.	/pat^{h}-i/	-> pacJ^{h}-i	'field-Nom'	
cf.	/pat^{h}-^l/	-> pat^{h}-^l	'field-Acc'	
d.	/kat^{h}-i/	-> kacJ^{h}-i	'together'	('to be same' 'ADVL')
cf.	/kat^{h}-a/	-> kat^{h}-a	'be same-Cont'	
e.	/put^{h}-i/	-> pucJ^{h}-i	'to make something stick to'	('to stick to' 'Caus')
cf.	/put^{h}-´/	-> put^{h}-´	'to be sticked-Cont'	

Phonemic /t/-palatalization takes place only at a morpheme boundary where a suffix or a clitic is attached to a preceding Root (Ahn 1986, Iverson 1993, Cho & Sells 1991, H. S. Kim 1982, Y. S. Kang 1991 and S.-H. Han 1991). However, previous researchers ignored the fact that the phonemically palatalized [c] is realized as secondarily palatalized [cJ]: namely, /t/ becomes [cJ], undergoing phonemic primary palatalization and allophonic secondary palatalization (K.-M. Lee 1972 and Kiparsky 1993 for Korean).

When we consider the data below, we can observe that underlying /c, c^{h}/ also automatically undergo allophonic secondary palatalization before a high front vocoid, as shown in (2a):

(2)

a.	/kac^{h}i/	kacJ^{h}i	'value'
	/c´c-i/	c´cJ-i	'milk-Nom'
b.	/ca/	ca	'ruler'
	/c´c-^l/	c´c-^l	'milk-Acc'

The underapplication of primary /t/-palatalization, however, is observed morpheme-internally, as shown in (3), in which /t/ is realized as secondarily palatalized [tʲ] before /i/ within a morpheme: no phonemic primary /t/-palatalization to [c] but only secondary allophonic palatalization is seen.

(3) Lack of phonemic primary /t/-palatalization in a non-derived environment

a.	/mati/	matʲi	'a knot'
b.	/puti/	putʲi	'please'
c.	/t^hi/	tʲ^{h}i	'a mote'
d.	/p´t^hi-/	p´tʲ^{h}i-	'to withstand'
e.	/panti/	pantʲi	'firefly'
f.	/canti/	cantʲi	'lawn'

Korean has other types of palatalization in addition to phonemic primary /t/-palatalization and allophonic secondary /t/- and /c/-palatalization: allophonic secondary /s/-, /n/- and /l/-palatalization, which were analyzed as postlexical phenomena in Lexical Phonology (Ahn 1985, 1988, Cho & Sells 1991, H. S. Kim 1982, Y. S. Kang 1991 and S.-H. Han 1991).

(4) Allophonic /s/-, /n/-, /l/-palatalization (S. Lee 1994: 73, S.-H. Han 1991: 66 and K.-M. Lee 1972)

a.	/os-i/	osʲ-i	'clothes-Nom'
b.	/si/	sʲi	'poem'
c.	/si-kan/	sʲi-kan	'time'
d.	/po-si-´s-ta/	po-sʲy-´t-t'a	'see-Hon-Pst-Mood'

e.	/mun-i/	munJ-i	'door-Nom'
f.	/k'ini/	k'inJi	'meal'
g.	/an-ny´N/	anJ-nJy´N	'hello'
h.	/col-li-/	colJ-lJi	'to be sleepy-Cau'
i.	/p'al-li/	p'alJ-lJi	'quickly' ('be-fast' 'ADVL')
j.	/talli-/	talJlJi	'to run'
k.	/holli-/	holJlJi	'to seduce'
l.	/il-lyu/	ilJ-lJyu	'first class'

Hence, we can generalize that all coronal segments undergo secondary palatalization before a high front vocoid regardless of a morpheme boundary. On the other hand, we can also generalize that underlying /t/ before a high front vocoid undergoes phonemic primary palatalization to [c] only at a morpheme boundary.

Ahn 1986[28] argues in the framework of Lexical Phonology that secondary palatalization has postlexical characteristics (i.e., allophonic, across-the-board and exceptionless) whereas primary /t/-palatalization has lexical characteristics (structure-preserving and derived environment effect). He categorizes secondary palatalization as a postlexical phenomenon and primary palatalization as a lexical phenomenon. Since he misses the fact that /c/ and /t/ undergo secondary palatalization (also in Kim-Renaud 1974), he analyzes primary palatalization as one process but analyzed secondary palatalization as three separate processes, since only coronal /n, s, l/ excluding /t, c/ cannot form a natural class:

(5) Primary /t/-palatalization (a lexical rule)

t --> c / _____{i, y}

[28] Ahn misses the observation that /t/ and /c/ undergo secondary palatalization before a high front vocoid.

(6) Secondary Palatalization (postlexical rules)

/n/-palatalization

n --> nJ / _____{i, y}

/s/-palatalization

{s, s'} --> {sJ, sJ'} / _____{i, y}

/l/-palatalization

l --> lJ / _____{i, y}

However, the three rules of secondary palatalization will be unnecessary if /t, c/ also undergo secondary palatalization. Furthermore, the lexical and postlexical dichotomy in the analysis of Korean palatalization as in Ahn 1986 leads to a rule ordering paradox with Umlaut phenomenon in Korean, as pointed out in Iverson & Wheeler 1988 and Lee 1994. In the Kyungsang dialect, back vowels are optionally fronted before a high front vowel /i/ in the speech of older generations.

(7) (Lack of) application of Umlaut in specific morphological environment (data partly from Lee 1993: 275)

a. Umlaut occurs in a derived environment

i) Nominalizer /i/

/m´k-i/	[m´ki], [meki]	'food' (‘eat’ ‘NOML’)
/son-cap-i/	[soncapi], [soncæpi]	'handle' (‘hand’ ‘grip’ ‘NOML’)

ii) Passive/Causative marker

/cap-hi/	[cap^{h}i], [cæp^{h}i]	'to be caught' (‘catch’ ‘Caus’)

/m´k-hi/ [m´k^{h}i], [mek^{h}i] 'to be eaten' (‘eat’ ‘Caus’)

iii) Nominative /i/ (cf. Y.-K. Han 1980, Y-C. Chung 1968, Y. Lee 1993)

/p´p-i/ [p´pi], [pepi] 'law-Nom'

/cam-i/ [cami], [cæmi] 'sleep=Nom'

iv) Copular /i/ (cf. Y.-K. Han 1980, Y-C. Chung 1968, Y. Lee 1993)

/p´p-i-/ [p´pi], [pepi] 'be a rule'

/s´m-i-/ [s´mi], [semi] 'be an island'

b. Umlaut occurs in a non-derived environment

/aki/ [aki], [æki] 'baby'

/nampi/ [nampi], [næmpi] 'kettle'

/´mi/ [´mi], [emi] 'mother'

/tali/ [tari], [tæri] 'to iron'

c. Exceptions in Umlaut across a morpheme boundary

i) Adverbial /i/

/kak'ap-i/ [kak'ai], *[kak'æi][29] 'near' (‘be near’ ‘ADVL’)

ii) Gerundive /ki/

/cap-ki/ [capk'i], *[cæpk'i] 'catching' (‘catch’ ‘Ger’)

/n´h-ki/ [n´k^{h}i], *[nek^{h}i] 'putting in' (‘put’ ‘Ger’)

iii) Copula /i/

/kam-i/ [kami], *[kæmi] 'to be a parsimon'

/pal-i/ [pari], *[pæri] 'to be a foot'

[29] /p/ is deleted before a vowel.

d. Umlaut has lexical exceptions within a morpheme

/n´pi/	[n´pi], *[nepi]	'width'
/napi/	[napi], *[næpi]	'butterfly'
/c´ki/	[c´ki], *[ceki]	'there/that place'

Umlaut applies in both derived and non-derived environments as in (7a & b). Only the causative/passive marker and a nominalizer suffix trigger Umlaut whereas other suffixes or clitics don't.

However, we observe that secondary palatalization blocks Umlaut (for different views but with the same effect, Iverson & Wheeler 1988, Hume 1990, Y. -S. Kang 1991, Lee 1993[30]):

(8) Umlaut blocked across a secondarily palatalized consonant

a.	/mat-i/	macJ-i, *mæcJ-i	'the eldest'
b.	/mal-li/	malJ-lJi, *mælJ-lJi	'to stop'
c.	/kasi/	kasJi, *kæsJi	'thorn'
d.	/´nni/	´nJnJi, *enJnJi	'sister'
e.	/alli-/	alJlJi, *ælJlJi	'to inform'
f.	/k´ci/	k´cJi, *kecJi	'beggar'
g.	/tac^{h}i-/	tacJ^{h}-i, *tæcJ^{h}-i	'get hurt'
h.	/´ti/	´tJi, *etJi	'where'

[30] In Iverson & Wheeler 1988, Hume 1990, Y. S. Kang 1991 and Lee 1993, they miss the fact that [c], whether derived or nonderived, undergoes allophonic secondary palatalization. Hence, the argument for palatal blocking of Umlaut goes two ways: Secondary palatalization of /s/, /l/ and /n/ and primary /t/-palatalization block Umlaut. In this paper, however, we will show that allophonic secondary palatalization, which is assumed to be spreading of the V-pl/Cor from a following /i/, is blocking Umlaut, which is assumed to be spreading of the same feature from the same source vowel to another vowel.

The assumption that secondary palatalization is postlexical and Umlaut is lexical in the framework of LP leads to a rule ordering paradox:.

(9) Two potential rule orderings

a. If Umlaut is ordered before Secondary Palatalization

UR	/kasi/
1. (lexical) Umlaut	kæsi
2. (postlexical) Secondary Palatalization	kæsʃi
Output	*[kæsʃi]

b. If Secondary Palatalization is ordered before Umlaut

UR	/kasi/
1. (lexical) Secondary Palatalization	kasʃi
2. (lexical) Umlaut	------
Output	[kasʃi]

The demonstrated ordering paradox suggests that rule-based approaches with two levels in the framework of LP are problematic.

Kiparsky 1993 correctly observes that all (phonologically derived and non-derived) coronals undergo allophonic secondary palatalization. However, Kiparsky analyzes primary and secondary palatalization as a single process which can apply lexically and postlexically in the framework of Lexical Phonology. He tries to explain why primary /t/-palatalization takes place only in a derived environment by proposing that the Non-Derived Environment Blocking effect in some phonological processes is the result of structure-building rules which apply to an underspecified representation. According to Kiparsky, structure-building rules can apply to only underspecified representations. As a result, if a

feature [F] is underlying prespecified, structure-building rules cannot override the prespecified [F]. Hence, NDEB effect is achieved.

Kiparsky's new approach to NDEB handles Korean palatalization as follows. As secondarily palatalized segments are not phonemic and arise only before a high front vocoid, secondary palatalization is automatic and obligatory. The following output sequences are not allowed on the surface:

(10) a. *[…sJa…], *[…nJu…], *[…tJo…], *[…cJa…] . . . etc.

b. *[…si…], *[…ni…], *[…ti…], *[…ci…]

Under the assumption that underlying /t, t^h/ are distinguished from /c, c^h/ by [±anterior], Kiparsky proposes that coronal segments are minimally specified as follows in terms of the feature [anterior].

(11)

	/t, t^h/	/c, c^h/	/s, n, l/
Before i	[+ant]	[0ant]	[0ant]
Elsewhere	[0ant]	[-ant]	[0ant]

According to Kiparsky, the underlying /t/ before a high front vocoid within the same morpheme is prespecified for [+anterior] but an underlying /c/ in the same position is underspecified for [-anterior], under the assumption that the following phonetic specifications of the (non-)palatalized coronals are used in Korean:

(12) from Kiparsky 1993

	t	tJ	c	cJ	s	sJ
High	-	+	-	+	-	+
Anterior	+	-	-	-	+	-
Delayed Release	-	-	+	+	-	-

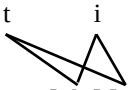
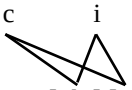
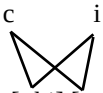
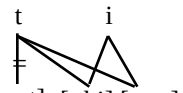
Note that Kiparsky crucially assumes that palatal /c/ is an affricate. Kiparsky assumes that both primary and secondary palatalization are uniformly represented as the spread of [-anterior] and [+high] to coronal consonants from a following [+high] front vocoid, following the proposal of Clements 1989 and Lahiri and Evers 1989 that front vowels are represented with [+coronal]. Kiparsky actually assumes that palatalization is the spreading of the Place node with dependents [-anterior] and [+high], not the independent spreading of each feature [-anterior] or [+high]. The core of his proposal is as follows though he did not spell out details:

(13) a. In the lexical component, palatalization applies to all coronals. Secondary Palatalization is also allowed to apply lexically in spite of lack of secondarily palatalized segments in the lexical inventory due to linking constraint (Hayes 1986, Itô 1986) under the assumption that multiply linked structures as a result of spreading are allowed in the lexical component.

b. In the postlexical component, palatalization applies in feature-changing fashion.

According to Kiparsky, the different realization of lexical and postlexical palatalization is due to a word-level rule at the end of the lexical component, which specifies [-anterior, +high] obstruent stops (i.e., secondarily palatalized [tʃ] before a high front vocoid at a morpheme boundary in the lexical component) as [+delayed release] (refer to the difference between /mati/ and /mat-i/ below). According to Kiparsky, this word-level delayed released rule crucially enables /mat-i/ to be realized as [macʃi] at the end of the lexical component. Kiparsky's analysis provides the following derivations for primary and secondary palatalization:

(14) Derivations according to Kiparsky 1993

Input	rules	/mati/ | [+ant]	/mat-i/ | [0ant]	/paci/ | [0ant]	/nac-i/ | [-ant]
Lexical Component	Pal.				
Word-level	[-ant, +high] --> [+delayed release]		macJi	pacJi	nacJi
Postlexical Component	Pal. (feature-changing)				
Output		[matJi]	[macJi]	[pacJi]	[nacJi]

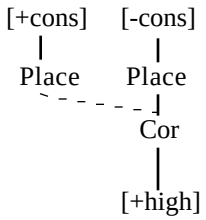
Kiparsky's analysis of Korean (primary and secondary) palatalization treats palatalization as a single process which spans both lexical and postlexical components. Furthermore, it crucially relies on underlying specification of [+ant] for /t, t^h/ before a tautomorphemic high front vocoid and underspecification of [-ant] for underlying /c, c^h/ before a tautomorphemic high front vocoid. Furthermore, Kiparsky crucially depends on the word-level delayed released rule which affects only the obstruent which inherits [-ant, +high] features via lexical palatalization. However, the problem of this approach is that it cannot explain why Umlaut is blocked in /mati/ [matJi]. We have shown that Umlaut must precede Palatalization. According to Kiparsky, postlexical application of Palatalization is assumed to derive [matJi] from /mati/. Then there is no way to explain why Umlaut is blocked, as in *[mætJi] in the Kyungsang Dialect, since palatalization must precede Umlaut.

4.2 Iverson 1993

On the other hand, Iverson 1993 tries to analyze the two types of palatalization as one uniform process within one level via appealing to Kiparsky's 1973 revised alternation condition, which restricts application of neutralization rules only to derived environments. As mentioned previously, Iverson misses the fact that not only /s/, /n/ and /l/ but also /t/ and /c/ undergo secondary palatalization. On the other hand, according to him, /t/ undergoes primary palatalization only in derived environment but /t/ and /c/ are realized as [t] and [c] (i.e., no primary or secondary palatalization), respectively, before a tautomorphemic high front vowel (i.e., in a non-derived environment).

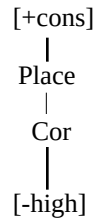
Iverson also proposes that primary and secondary palatalization are a uniform process. His rule of Palatalization is characterized as spreading of the tongue body features of a high front vocoid to a preceding underspecified consonant in the lexical component.

(15) Palatalization (lexical)



On the other hand, Iverson provides the following default configuration for those (coronal) consonants without inherent place of articulation:

(16) Default coronal consonants



Iverson proposes the following context-free underspecification for coronals:

(17) Context-free underspecification

/t, t^h, t'/	unspecified for [high]
/c, c^h, c'/	[+high]
/s, s'/	unspecified for [high]

Iverson suggests that if we adopt the reversed implication of revised alternation condition as a constraint, we can explain why phonemic primary palatalization is restricted to a derived environment whereas allophonic secondary palatalization is blind to a derived environment.

(18) a. If a rule is lexical (observes the derived environment constraint), then it is also structure-preserving (neutralizing). (Kiparsky's 1973 revised alternation condition in Iverson's interpretation)

b. If a rule application is neutralizing (structure-preserving), then it also observes the derived environment constraint. (Iverson's 1993 reversed implication of revised alternation condition)

Hence, Iverson assumes that the derived environment constraint restricts only structure-changing applications of a lexical rule. And he also assumes that Korean palatalization is a

lexical rule, based on the aforementioned observation that Umlaut is blocked across a palatal or a palatalized coronal (Hume 1990, Iverson & Wheeler 1988) (see the data in (8), the rule ordering paradox in (9)). The phonological change from the underspecified /t, t^h, t'/ (= /T, T^h, T'/) to /c, c^h, c'/ is the result of neutralizing (structure-preserving) application of the palatalization rule (15), and the neutralizing application of palatalization has to be confined to a derived representation according to the Derived Environment Constraint (18b). And the neutralizing application of palatalization in /mat-i/ to [maci] 'the first son' must involve a morpheme boundary (to avoid violation of the Derived Environment Constraint). Hence, the derived environment constraint in (18b) is respected in this case since a morpheme boundary is involved. On the other hand, the neutralizing application of palatalization in /mati/ -> *[maci] (the correct output is [matʃi]) does not respect the Derived Environment Constraint since a morpheme boundary is not involved (violation of the Derived Environment Constraint). However, the structure-changing application of lexical palatalization need not involve a morpheme boundary since the structure-changing application of the lexical palatalization is not restricted to a derived environment. Hence, structure-changing application of the lexical palatalization can occur in /si/ -> [sʃi] 'poem' and /mas-i/ -> [masʃi] 'taste-Nom' and it does not violate the Derived Environment Constraint, regardless of whether a derived environment is involved or not.

The problem in the analysis of Iverson 1993 is that he cannot explain why /t, t^h, t'/ undergo primary and secondary palatalization to [cʃ, c^hʃ, cʃ'] before a high front vocoid, as observed in this paper. This is because Iverson does not distinguish between primary /t/-palatalization and secondary /t/-palatalization. Furthermore, Iverson cannot explain why /t, t^h, t'/ undergo secondary palatalization to [tʃ, $tʃ^h$, tʃ'] before a tautomorphemic high front vocoid, as observed in this paper. Note that /mati/ is realized as [matʃi] in which /t/ is secondarily palatalized but not primarily palatalized. According to Kiparsky's account, on the other hand, the /t/ before a tautomorphemic /i/ is prespecified for [+ant] and lexical

application of palatalization is blocked due to the prespecified [+ant]. Only postlexical application of palatalization applies to change /t/ to [tʃ] (refer to the similar derivation of /mati/ in (14). Hence, Kiparsky provides a correct prediction in this case.

In this chapter, we will show that primary and secondary palatalization are independent of each other and one level is enough to analyze primary and secondary palatalization. Furthermore, we will also argue that underlying specification of [+ant] for /t, t^h/ before a tautomorphemic high front vocoid alone is enough to analyze primary palatalization.

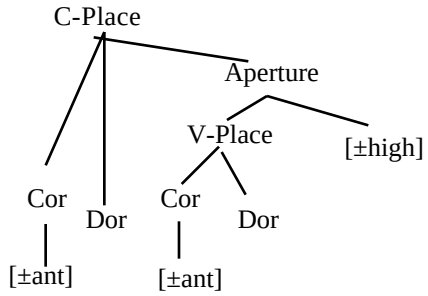
4.3 Assumed Hierarchical Feature Representations

First of all, we assume that palatal /c/ is represented as having a Coronal node with a [-anterior] dependent (Hume 1992, Clements 1991, Chomsky & Halle 1968). On the other hand, we assume that /t/ has only the Coronal node. Other coronal segments are minimally represented for place like /t/.

(19)

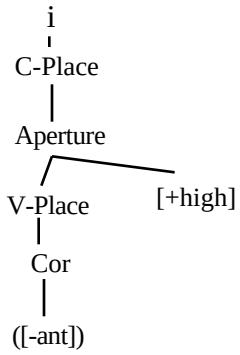
We assume the following feature geometry, adopted from Clements & Hume 1995 and Hume 1992:

(20) Feature Geometry



We further argue that a high front vocoid has the following hierarchical structure:

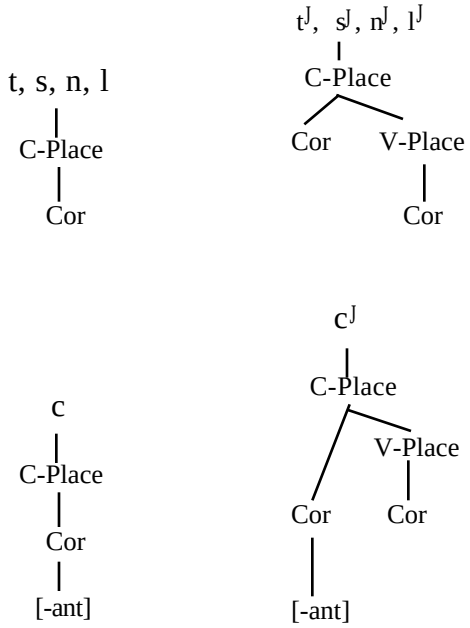
(21) Front high vocoid



where [-anterior] is a redundant feature which need not be underlyingly present (see discussion below).

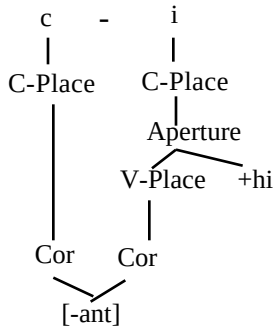
Hence, unlike those specifications assumed for primary and secondary palatalization in Kiparsky 1993 (see (12)), we will have the following representations of the non-palatalized, primarily palatalized and secondarily palatalized coronals in Korean:

(22) Hierarchical feature specifications of coronal consonants



As for the redundant feature [-ant] in a high front vocoid, we propose that [-ant] is a redundant feature in a high front vowel which surfaces only when the high front vocoid is able to obtain [-ant] by sharing it with a consonantal neighbor. We will show in the next section that the behavior of [-ant] in Korean is similar to [voice] in a nasal consonant in Yamato Japanese in Itô, Mester & Padgett 1993b (hereafter IMP). We propose that [-ant] is shared by a coronal consonant and a following high front vocoid in primary palatalization, ignoring secondary palatalization for the moment:

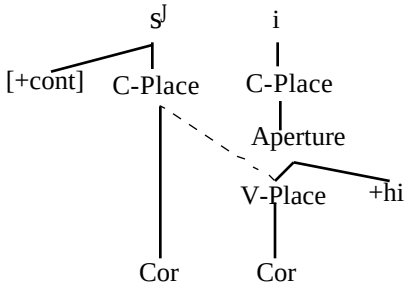
(23) [-ant] sharing in primary palatalization



(/t/ -> [c])

For comparison, we will propose in section 4.5 that secondary palatalization is represented as sharing of a V-Place node of a high front vowel with a preceding coronal consonant (see discussion in section 4.5 and 4.7):

(24) Secondary Palatalization



(/s/ -> [sʲ])

Note that in secondary palatalization, the V-Place node of a high front vocoid is shared by the preceding coronal consonant. This is the topic which will be discussed in detail in section 4.5.

4.4 Analysis of Primary Palatalization

Itô, Mester & Padgett 1993b implement the two notions licensing and redundancy in OT to explain voicing assimilation in a sequence of a nasal C and a voiceless obstruent in Yamato Japanese:

(25) Observation: a nasal must share [voice] with a following consonant (IMP 1993b)

a.	/yom-te/	yon-de	'reading'
b.	/sin-te/	sin-de	'dying'
c.	tombo	'dragonfly'	*tompo
d.	sindo-i	'tired'	*sinto-i

From the observation that a nasal must share [voice] with a following consonant, IMP propose the following LICENSE[voice] and NasVoi constraints which appeal to the two notions licensing and redundancy, respectively:

(26) a. LICEN[voice]: [voice] is licensed when linked to an obstruent

b. NasVoi: [nasal] [voice]

[nasal] implies [voice] redundantly.

c. Constraint ranking: LICENSE[voice] >> NasVoi

d. Tableaux

	LICENSE[voi]	NasVoi
☞ k a m i		*
k a m i | V	*!	
t o m p o		*!
t o m p o | V	*!	
☞ t o m b o V V		

In the first tableau above, the second candidate violates high ranked LICENSE[voi]. On the other hand, the first candidate violates low ranked NasVoi. As a result, the first candidate is optimal. In the second tableau, the last candidate does not violate any constraint and is optimal.

We are going to show that the redundant feature [-ant] of a high front vowel in Korean patterns exactly together with [voice] in Yamato Japanese in terms of feature licensing and redundancy[31]. We argue that [-ant] is a redundant feature of a high front vowel and we provide the following constraint:

(27) FRONT-HI[-ant]: [V-pl/Cor, +high] [-ant]

A front high vowel implies [-ant] redundantly.

We further argue that the consonantal feature [-anterior] must be licensed by the feature [-son][32].

[31] This observation is due to Prof. R. Noyer (p.c.).

[32] Recall that secondary palatalized [nʲ] and [lʲ] are represented with V-pl/Cor.

(28) LICENSE[-anterior]

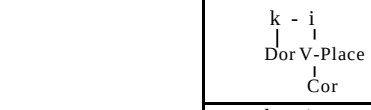
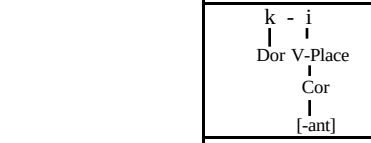
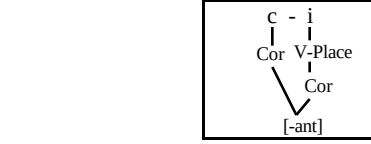
[-anterior] is licensed by [-son].

(29) Constraint ranking

LICENSE[-anterior] >> FrontHi[-ant]

The licensing constraint LICENSE[-anterior] is probable since [-anterior] is a typical coronal consonantal place feature. Furthermore, only /t/ undergoes primary palatalization (i.e., sharing [-ant] by an obstruent coronal and a following high front vocoid) excluding sonorant coronal /l, n/. The reason why /s/ does not undergo primary palatalization will be spelled out later. As a result, any [-anterior] which is associated with a high front vocoid must be licensed by being additionally linked to an obstruent. On the other hand, [-anterior] is not allowed to appear under a high front vocoid which is preceded by a non-coronal consonant. This is because the feature [dor] or [lab] in a non-coronal consonant is not compatible with [-ant] (*[dor, -ant] or *[lab, -ant]). Hence, delinking of [dor] or [lab] from the non-coronal consonant is necessary if sharing of [-ant] between the non-coronal consonant and a following high front vocoid occurs. Then delinking of [dor] violates IDENT-IO[dor]. When we assume that IDENT-IO[dor] (and LICENSE[-ant]) is ranked above FRON-HI[-ant], we can explain why [-ant] cannot be shared by a dorsal consonant and a following high front vocoid: i.e. lack of primary palatalization in /ki/. The following is a tableau to illustrate this idea:

(30) /ki/ ki ‘flag’

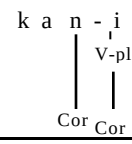
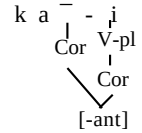
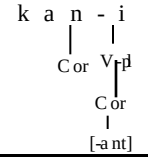
/ki/	IDENT-IO [dor]	LICENSE[-ant]	FRON-HI [-ant]
☞ 			*
		*!	
	*!		

The tableau above shows that the optimal candidate (the first candidate) does not have [-ant] under the V-place of the high front vocoid. Other candidates violate either LICENSE[-ant] or FrontHi[-ant] and are eliminated.

When a high front vowel is preceded by a coronal nasal consonant, the optimal candidate shows that [-ant] does not appear on the surface at all:

(31) /kan-i/ kanJ-i 'saltiness-Nom'

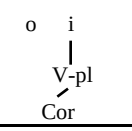
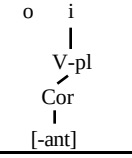
(secondary palatalization is ignored.)

/kan-i/	LICENSE[-ant]	FRON-HI [-ant]
☞ 		*
	*!	
	*!	

In the tableau above, the second and third candidates violate higher ranked LICENSE[-ant] since [-ant] is not licensed. On the other hand, the first candidate violates lower ranked FRONT-HI[-ant]. Hence, the first candidate is optimal.

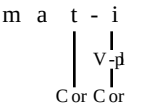
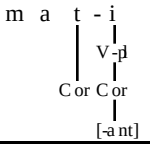
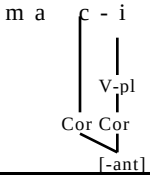
The redundant feature [-ant] will not appear under a high front vocoid which is preceded by a vowel, since it will not be licensed..

(32) /oi/ oi 'cucumber'

/oi/	LICENSE[-ant]	FRON-HI [-ant]
☞ 		*
	*!	

The following tableau illustrates how the two constraints interact with each other in primary palatalization (note that we assume tentatively that primary palatalization always involves a morpheme boundary and we ignore secondary palatalization in the following tableau):

(33) /mat-i/ maʧ-i 'first son'

/mat-i/	LICENSE[-ant]	FRON-HI[-ant]
a 		*!
b 	*!	
c ☞ 		

Candidate (a) violates FRON-HI[-ant] since [i] does not carry [-ant] under the V-pl node. Candidate (b) violates LICENSE[-ant] since [-ant] is not licensed. However, candidate (c) does not violate any constraint and is therefore optimal.

The discussion so far says that the redundant feature [-ant] of a high front vowel may appear only when it is preceded by a preceding coronal obstruent as shown in (33). However, there arises some complication with regard to the sharing of [-anterior] by a coronal consonant and a high front vocoid.

(34) a. /mat-i/ macJ-i ‘the first son’

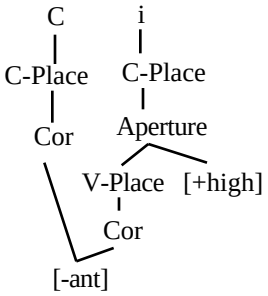
/tot-i/ tocJ-i ‘rising’

b. /mit-ko/ mit-k’o, *mic-k’o ‘believe-Cont’

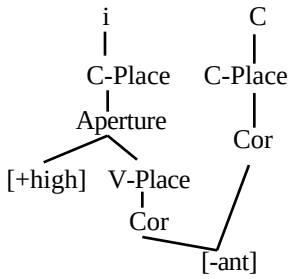
In the examples in (34a), we can say that preceding[cJ] and following [i] are sharing [-ant] and [-ant] is licensed by [cJ]. However, we have to eliminate the case (as shown in (34b) in which [-ant] of a high front vowel might be licensed by a following /t/. Namely, there are two possibilities involved for the sharing of [-anterior] of a high front vocoid with a coronal obstruent. One possibility is that [-anterior] of a high front vocoid is shared by a preceding coronal obstruent. And the second possibility is that [-anterior] of a high front vowel is shared by a following coronal obstruent.

(35) Two possibilities for [-anterior] in a high front vocoid to be licensed

a.



b.

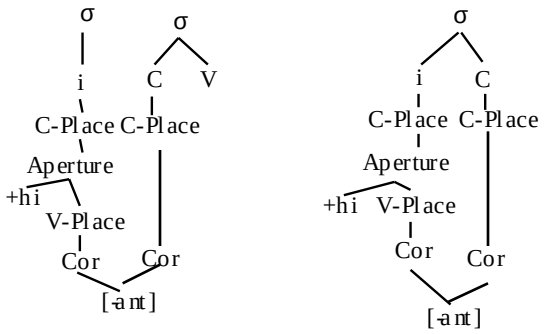


Since primary palatalization takes place only in a coronal obstruent before a high front vocoid, we have to eliminate the other possibility of [-anterior] being licensed by [-son] in the Root node of the following coronal obstruent. The constraint LICENSE[-ant] fails to eliminate this case. In chapter 3, we proposed the following segment-to-syllable alignment constraint which says that [-anterior] is allowed at the crisp left edge of a syllable:

(36) Crisp-Align-L([-ant], σ)

This seg-to-syll alignment constraint forces [-anterior] to be at the crisp right edge of a syllable. However, this constraint fails to explain why the [-anterior] of a high front vocoid must be shared by only a preceding coronal obstruent in primary palatalization (/t-i/ -> cJ-i). We have to eliminate the following two cases:

(37) a b.



In (37a), CA-L([-ant], σ) is violated since [-ant] is associated with two syllables. In (37b), however, [-ant] is crisp aligned with the left edge of a syllable and CA-L([-ant], σ) is not violated. This is problematic[33]. We modify the alignment constraint in the following way:

(38) Crisp-Align-L(C-place / Cor / [-ant] , σ)[34]

The crisp alignment constraint above says that C-place / Cor / [-ant] is allowed at the crisp left edge of a syllable. It says that any node or feature of a palatal place is crisp left aligned with a syllable. This constraint still follows the original idea of the seg-to-syll alignment type of

[33] Prof. Buckley informed me that the directionality of spreading a feature or feature sharing is a pending problem for further study in Optimality Theory.

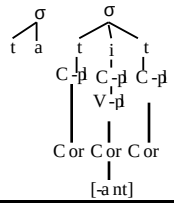
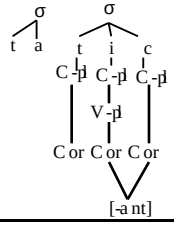
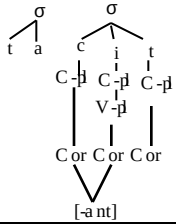
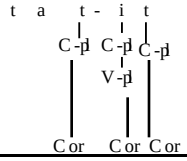
[34] This constraint is due to the insight of Prof. Noyer.

constraints in I & M 1994, who used C-Place in the constraint Non-Crisp-Align-L(C-Place, σ) for Japanese. This is because C-Place in Itô & Mester 1994 subsumes more specific [C-place: Cor, [-ant]] which is the C-place of a palatal consonant in Korean. The proposed alignment constraint requires that the palatal C-Place should be crisp aligned with the left edge of a syllable. It can eliminate (37b) since [C-place: Cor, [-ant]] is not crisp left aligned with a syllable. It can also eliminate (37a) since [-ant] is linked across a syllable boundary.

The proposed Crisp-Align-L([C-place: Cor, [-ant]], σ) can explain together with other constraints why input /t/ before a high front vocoid undergoes primary palatalization whereas the input /t/ after a high front vocoid does not undergo primary palatalization in Korean. The following sample tableau shows the interaction of constraints:

(39) Hypothetical input /tat-it/ -> tacJ-it

(secondary palatalization is ignored.)

input	C-place / Cor / [-ant] , σ)	LICENSE [-ant]	FRON-HI [-ant]
a 		*!	
b 	*!		
c ☞ 			
d 			*!

Since violation of LICENSE[-ant] is fatal, candidate (a) is eliminated. In candidate (b), C-place / Cor / [-ant] is not crisp left-aligned with a syllable since the palatal place in the coda is not crisp left aligned with a syllable. Candidate (d) is eliminated since it violates FrontHi[-ant]. As for the evaluation of the CA-L constraint in candidate (c), the Palatal place C-place / Cor / [-ant] is crisp aligned with the left edge of a syllable. And candidate (c) does not violate any constraint at

all. As a result, candidate (c) is predicted to be optimal. Note in those candidates that the secondary palatal place $\overset{\text{V-place}}{\underset{\text{[-ant]}}{\overset{|}{\text{Cor}}}}$ of a front vowel is not subject to CA-L constraint. Hence, candidate (a), for example, does not violate CA-L constraint since V-pl is involved. As a result, CA-L constraint constrains only the primary palatal place of a consonant but not the secondary palatal place of a consonant or a vowel.

Based on the discussion so far, we propose the following constraint ranking:

(40) Constraint ranking for primary palatalization

CA-L($\overset{\text{C-place}}{\underset{\text{[-ant]}}{\overset{|}{\text{Cor}}}}$, σ), LICENSE[-ant]

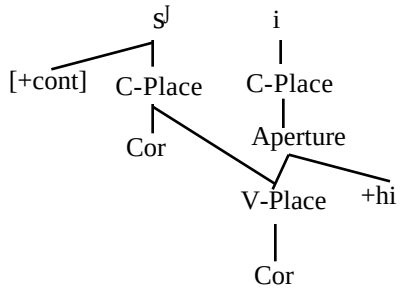
>> FrontHi[-ant]

In the analysis of Korean primary palatalization later in this chapter, we will ignore for simplicity those non-optimal candidates in which [-ant] of a high front vocoid is shared by a following coronal.

4.5 Analysis of Secondary Palatalization

As for secondary palatalization, in which a coronal consonant secondarily palatalizes before a high front vocoid, we propose the following representation in which the V-Place of a high front vowel is shared by a preceding coronal consonant:

(41) Feature sharing in secondary palatalization[35]

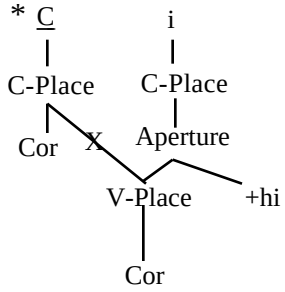


(t -> tʲ, s -> sʲ, c -> cʲ, n -> nʲ, l -> lʲ)

The spreading of the V-Place of a high front vocoid to a neighboring consonant is limited to a coronal consonant due to its close relation with coronality (Zubritskaya 1995 for Russian, Selkirk 1991).

To explain the spreading of the V-Place of a high front vocoid to a preceding coronal consonant in secondary palatalization, we propose the following constraint for secondary palatalization of a coronal consonant before a high front vocoid (p.c. Prof. Noyer):

(42) PAL:



Ill-formed (*) unless a coronal consonant and a following high front vowel share a V-Place.

[35] Primary palatalization is represented by sharing [-ant] by /t/ and a following front high vocoid whereas secondary palatalization, by sharing the V-pl/Cor by a coronal and a following front high vocoid. It may seem strange to see that sharing more structure entails a smaller change. Actually this problem stems from the feature hierarchy in Clements & Hume 1995, which is assumed in this paper. It is also possible to assume that [-back] replaces V-place/Cor in the feature hierarchy, since we will show in this chapter that secondary palatalization and Umlaut involve spreading of V-place/Cor.

Since secondary palatalization is obligatory in Korean, PAL is ranked highly in the constraint ranking.

Korean has allophonic flapped coronal [r], which is not subject to secondary palatalization. Bhat 1974: 66 also reports that /r/ resists palatalization cross-linguistically. Mester & Itô 1989 and Zoll 1996 also note that /r/ resists palatalization in Japanese mimetics. As for non-existence of secondarily palatalized version of the flapped [r], it is probable from the articulatory point of view that flapped [r] preferentially resists palatalization[36], as noted by Kim-Renaud 1974/1991: 201-202:

> "It seems natural that the flap r should escape palatalization, because the most agile front is employed in making the quick flipping contact and it would require more effort for the tongue tip to make the contact with the palatal region rather than with the alveo-dental region or for the blade of the tongue to make that flipping contact with the roof of the mouth."

Now we have to handle the idiosyncratic nature of /t/ before a tautomorphemic high front vowel which does not undergo primary palatalization. Recall that only /t/ before a high front vocoid across suffixal and clitic boundaries undergoes primary palatalization. We observe that the frequency of the /ti/ sequence within a morpheme is quite limited and morpheme-internal /ty/ does not exist at all.

We propose that morpheme-internal /t/ which appears before a high front vocoid is underlyingly specified for [+anterior], based on the observations that only underlying /t/ before a tautomorphemic font high vocoid does not undergo primary palatalization. The underlying specification of [+anterior] idea was first introduced in Kiparsky 1993 for Korean primary palatalization and secondary palatalization, though it was utilized in a different analysis of the same Korean primary palatalization (and also secondary

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[36] Prof. Noyer (p.c.) notes that Irish has secondarily palatalized [rʃ], though Irish [rʃ] is not realized as flapped but as slightly fricative.

palatalization). We propose an OT analysis with the spirit that prespecified [+ant] of /t/ before a tautomorphemic high front vocoid will block spreading of [-ant] from a following high front vocoid. There is a piece of diachronic evidence for the [+ant] prespecification in /t/ before a high front vocoid. Evidence comes from diachronic data of primary palatalization. According to K.-M. Lee 1961/1972 and Kim-Renaud 1974/1991, morpheme-internal /t/-palatalization took place around the late 17th and 18th centuries.

(43) Diachronic phonemic /t/-palatalization (Data from K.-M. Lee 1971 and K.-W. Nam 1992)

(allophonic secondary palatalization ignored)

a.	tikhi-ta	>	cikhi-ta	(> cik^{h}i-ta)	'to keep'
b.	ti-sik	>	ci-sik		'knowledge'
c.	kuti	>	kuci		'insistently'
d.	pat-ti	>	pat-ci		'to receive-Neg'
e.	tyuN-ha-ta	>	cuN-ha-ta		'to be important'
f.	taNt^{h}i	>	taNc^{h}i		'unreasonable'
g.	o-ti	>	o-ci		'to come-Neg'

The current regional variation of the result of diachronic primary palatalization is summarized as follows (K.-M. Lee 1972):

(44) a. In south-eastern Korean, /t, t^{h}, t'/ and /k, k^{h}, k'/ palatalize to phonemic [c, c^{h}, c'] before a high front vocoid and /y/ deletes.

b. In standard Korean, only /t, t^{h}, t'/ palatalize to phonemic [c, c^{h}, c'] before a high front vocoid and /y/ deletes.

c. In north-eastern Korean, palatalization does not take place at all and /ti/ sequence is still retained on the surface nowadays.

As the result of diachronic primary palatalization, morpheme-internal /ti/ and /ty/ sequence would not be expected to occur in Standard Korean. However, as shown previously, some morpheme-internal /ti/ sequences survived the diachronic primary palatalization. According to the historical data, these morphemes had a back unrounded vowel between /t/ and /i/ before the 19th century. /ˆ/-deletion in that position took place around the 19th century: /ˆ/ was deleted before /y/ which in turn became /i/. This phonological change revived the appearance of /ti/ sequence within a morpheme by the time the phonological change of ti -> ci is restricted to the derived environment only.

(45) Diachronic /ˆ/-deletion around the 19th C (Data from K.-M. Lee 1972)

(secondary palatalization is ignored)

a. ky´ntˆy-ta > ky´nti-ta 'to endure'

b. mutˆy-ta > muti-ta 'to be dull'

c. stˆy > sti > t'i 'belt'

From the synchronic point of view, primary palatalization can be viewed as lexical diffusion. Kiparsky 1988, 1995 provides English u-shortening as a typical case of lexical diffusion. English u-shortening tends to extend its phonological context from the core environment (46a) to the peripheral environments (46b) and (46c) in an idiosyncratic manner by relaxing its context on the left and on the right (Dickerson 1975).

(46) From Kiparsky 1995: 643-644

a. [-anterior] ____ [-anterior, -coronal]

cook, hook, shook, rook, brook, crook, hookah (short)

b. ____ [-anterior, -coronal]

took, book, nook, look, forsook, Wookie (short)

snook, snooker, stook, boogie, Sook, gadzooks, spook (variable)

bazooka (long)

c. [-anterior] ____

good, could, should, hood "covering", hoodwink (short)

roof, rooster, hoodlum, hoof, room, Root, hoodlum, hood "ruffian", coop, proof (variable)

brood, shoot, hoot, behoove, scoop, coon, coot, roost, groove ... (long)

Kiparsky 1995 explains this case by appealing to underspecification. The core regularity can be explained by assuming a rule which assigns a single mora to stressed /u/ between certain consonants and two moras elsewhere. The original rule which is assumed to apply in the context [-anterior] ____ [-anterior, -coronal] extends in the contexts in (46b) and (46c) by simplifying the rule's environment. The extended rule simply applies to the words which always have short [u] in the context which is reanalyzed as unmarked. On the other hand, lack of application of the rule in (46b) and (46c) is explained by lexical prespecification of two moras in words with long [u] in those contexts. The explanation for this lexical diffusion case is based on the observation that there is a systematic context (the core shortening environment) where length is systematically predictable.

Now, let us turn back to Korean primary palatalization. As was shown previously, primary palatalization takes place systematically before a high front vowel. By

prespecifying [+anterior] for /t/ before a tautomorphemic high front vocoid, we will have the following [anterior] specification for /t/:

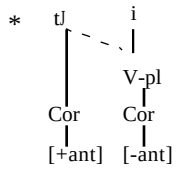
(47)		in morpheme-internal /ti/	elsewhere
	/t/	[+anterior]	Ø

Since /t/ which is prespecified for [+ant] is not allowed to additionally link to [-ant] without deleting the existing [+ant], if IDENT-IO[+ant] is highly ranked, we can explain why primary palatalization cannot take place in the prespecified /t/ for [+ant] before a tautomorphemic /i/.

Since [+ant] is not compatible with [-ant] within a segment, we propose the following phono-constraint (48) to block the case in (49):

(48) *[+ant, -ant]

(49)



In (49), /t/ is prespecified for [+ant] before tautomorphemic /i/ and the redundant [-ant] surfaces under the V-place shared by a coronal obstruent and a high front vocoid. We will assume that *[+ant, -ant] is a property of GEN rather than an actual (violable) constraint due to the inviolable nature of *[+ant, -ant]. No language has a segment which has both [+ant] and [-ant] at the same time.

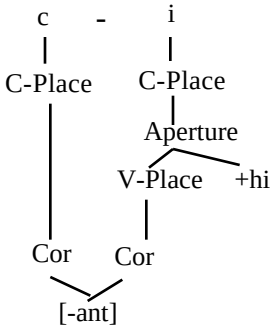
Let us turn to the data in which primary or secondary palatalization occurs:

(50) a. /mati/ matʃi ‘knot’ (Root)

b. /mat-i/ macʃ-i ‘the first son’ (Root-ADVL)

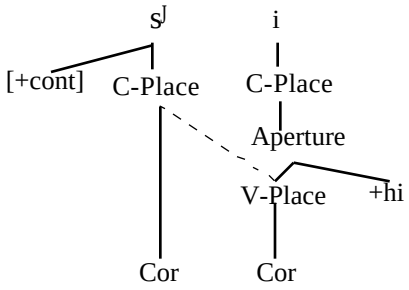
We proposed in section 4.3, 4.4 and 4.5 that primary palatalization and secondary palatalization are represented as follows:

(51) Primary Palatalization (repeated from (23) in section 4.3))



(/t/ -> [c])

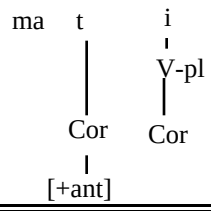
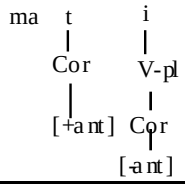
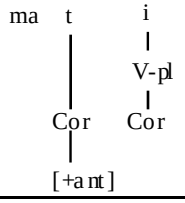
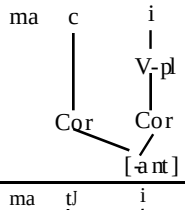
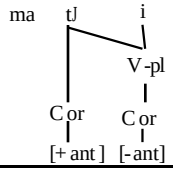
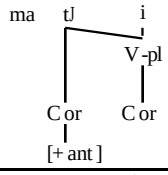
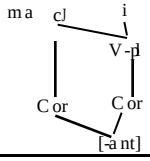
(52) Secondary Palatalization (repeated from (24) in section 4.3))



(/s/ -> [sʃ])

We further proposed that /t/ before a tautomorphemic high front vocoid is underlyingly specified for [+ant], as we treated the example in (50a) as a case of lexical diffusion. The following tableau illustrates why /t/ which is prespecified for [+ant] before a tautomorphemic /i/, does not undergo primary palatalization though it undergoes secondary palatalization:

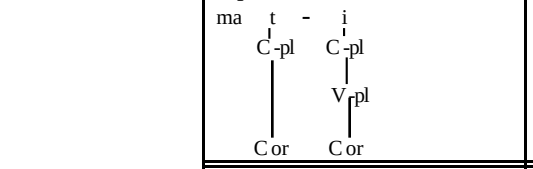
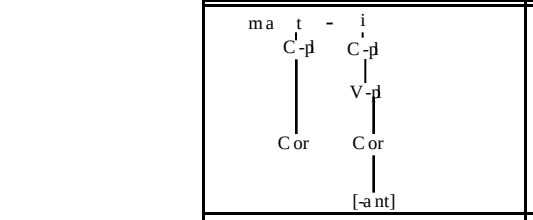
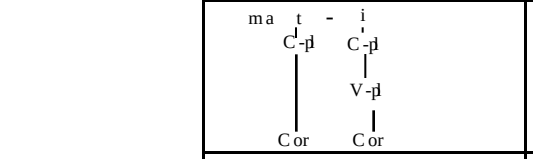
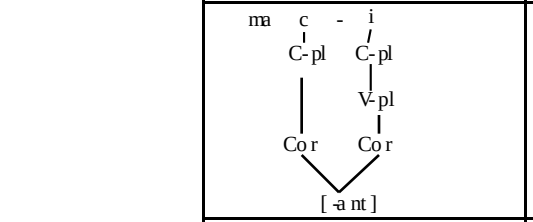
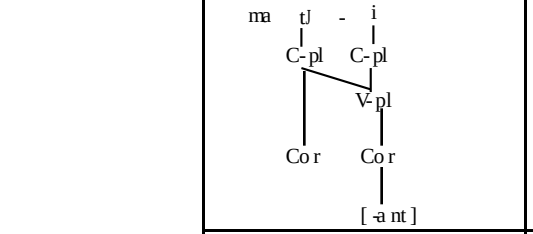
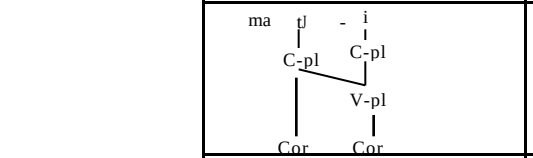
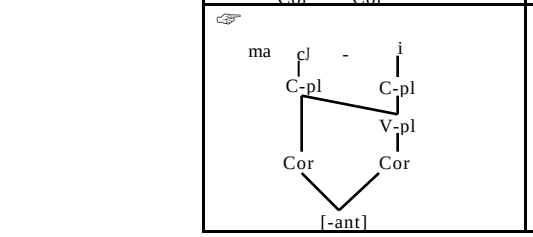
(53) /mati/ matʃi 'knot'

input	LICEN [-ant]	IDENT-IO [+ant]	PAL	FRON-HI [-ant]
				
	*!		*	
			*!	*
		*!	*	
				
☞ 				*
		*!		

The tableau above shows how the underlyingly specified [+ant] in /t/ blocks the double linking of [-ant] to the prespecified /t/ for [+ant] and a following /i/. Hence, the /t/ which is prespecified for [+ant] does not undergo primary palatalization.

Now, we are going to show why /t/ undergoes primary and secondary palatalization to [cʃ] before a high front vocoid at suffixal and clitic morpheme boundaries. Recall that /t/ before a tautomorphemic high front vocoid is prespecified for [+ant] but /t/ elsewhere is unspecified for [+ant].

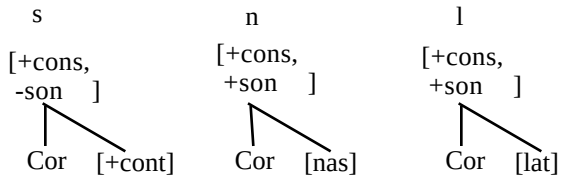
(54) /mat-i/ macJ-i 'the oldest son' (‘oldest’ ‘NOML’)

input	LICEN [-ant]	CA-L C-place / Cor / ([-ant] , σ)	IDENT-IO [+ant]	PAL	FRON-HI [-ant]
					
	*!			*	
				*!	*
				*!	
	*!				
					*!
☞ 					

In the tableau above, only the last candidate, in which primary and secondary palatalization take place, does not violate any constraint and is therefore optimal.

/n/, /s/ and /l/ undergo only secondary palatalization. We assume the following hierarchical feature representations for coronal segments in Korean:

(55) Hierarchical Feature representations for /n/, /s/ and /l/



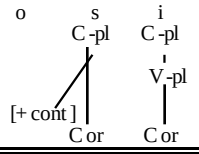
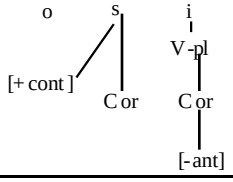
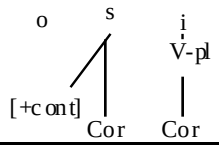
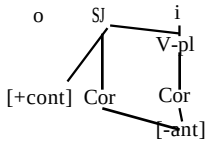
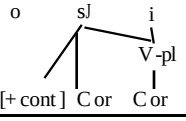
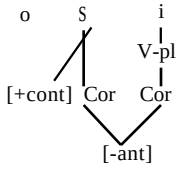
We propose the following constraint which says that continuants /s, s'/ are not compatible with [-ant] given the assumed hierarchical feature specification in (22).

(56) *[+continuant, -anterior]

This phono-constraint, which is assumed to be highly ranked, can explain why /s/ does not undergo primary palatalization to [ʃ]. Recall that we already proposed that the reason why /n/ and /l/ do not undergo primary palatalization (i.e., sharing [-ant] by a coronal obstruent and a following high front vocoid) is that [+son] in /n/ and /l/ cannot license [-ant] in Korean. We proposed that [-ant] is licensed by [-son] (i.e., LICENSE[-ant]).

The following tableau illustrates how input /s/ before /i/ is realized as secondarily palatalized [sʲ]:

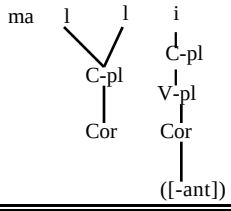
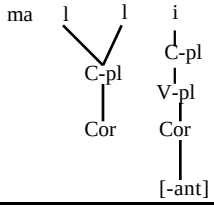
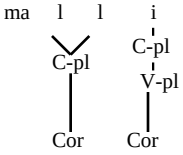
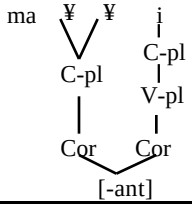
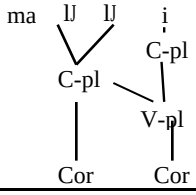
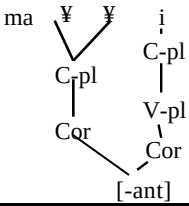
(57) /os-i/ osʃ-i ‘clothes-Nom’

input	LICEN [-ant]	IDENT-IO [+ant]	*[+cont, -ant]	PAL	FRON-HI [-ant]
					
a 	*!			*	
b 				*!	*
c 			*!		
d ☞ 					*
e 			*!	*	

Candidate (d) violates only lower ranked FRONT-HI[-ant] since /i/ does not surface with [-ant]. Since other candidates violate at least one higher ranked constraint, candidate (d) is optimal.

The following tableau illustrates how the fake geminate /l/ is realized as a secondarily palatalized [lʃlʃ]:

(58) /mal-li-/ malʃ-lʃi- ‘stop-Caus’

input	LICENSE [-ant]	IDENT-IO [+ant]	PAL	FRON-HI [-ant]
				
a 	*!		*	
b 			*!	*
c 	*!		*	
d ☞ 				*
e 	*!			

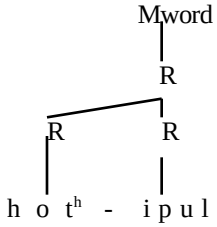
4.6 Underapplication of Primary Palatalization at a PrWd Juncture

So far we have shown that primary palatalization takes place before a high front vocoid in suffixal and clitic environments. However, the underapplication of primary palatalization is observed in a Root-final C before i/y-initial Root and is analyzed in chapter 3. On the morphological side, we proposed in chapter 3 that a suffix or clitic is morphologically merged with a preceding $Root_0$ and a $Root_0$ is morphologically merged with a following head $Root_0$. And the right edge of a $Root_0^{max}$ is always non-crisp aligned with the right edge of a PrWd (i.e., high ranked Non-Crisp-Align-R($Root_0^{max}$, PrWd)). We also proposed in chapter 3 that the underapplication of primary palatalization, which takes place between two Roots, is due to high ranked Crisp-Align-L([-ant], σ). In this section, we will demonstrate that the set of ranked constraints proposed for primary and secondary palatalization in this chapter is compatible with the set of constraints proposed in chapter 3.

Recall in the following examples that /t/ undergoes secondary palatalization but does not undergo primary palatalization across a Root-Root juncture.

(59) Lack of primary palatalization in the first Root-final /t/ before the /i/-initial second Root[37]

a. /hotʰ-ipul/ hotʲ-ipul 'unlined comforter' (‘single’ ‘comforter’)



b. /t´t-ipul/ t´tʲ-ipul 'additional comforter' (‘outer’ ‘comforter’)

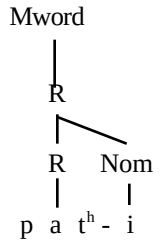
[37] The final consonant of the first Root in a Root-Root compound undergoes neutralization (/tʰ, s/ -> [t]).

c.	/h´t-insim/	h´tJ-insJim	'futile charity'	(‘futile’ ‘charity’)
d.	/pat^{h}-ilaN/	patJ-iraN	'field ridge'	(‘field’ ‘ridge’)

However, as is already shown, /t/ undergoes primary and secondary palatalization at a suffixal or clitic boundary:

(60) primary and secondary palatalization in the Root-final /t/ before a /i/-initial suffix or clitic

a.	/pat^{h}-i/	pacJ^{h}-i	'field-Nom'	Root=Suffix



b.	/pat^{h}=ilaN/	pacJ^{h}=iraN	'field-and'	Root=Clitic

In chapter 3, we proposed that the PrWd-final C is realized as ambisyllabic before a V due to the conspiracy of highly ranked SyllCon and NCA-R(Root$_0^{max}$, PrWd). Also in chapter 3, we demonstrated why the underapplication of primary palatalization takes place in Root$_0^{max}$-final C by proposing the following ranked constraints:

(61) Constraint ranking proposed in chapter 3

CA-L([-ant]/[+cont]/[lar], σ), SyllCon, NCA-R(Root$_0^{max}$, PrWd)

>> IDENT-IO[-ant]/[+cont]/[lar]

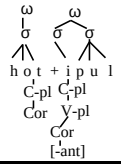
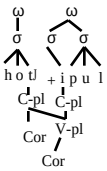
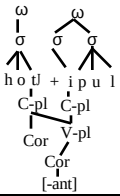
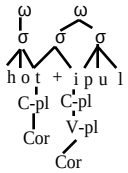
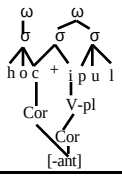
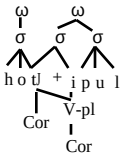
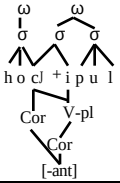
In this chapter, on the other hand, we proposed the following seg-to-syll alignment constraint which replaces Crisp-Align-L([-ant], σ):

(62) Crisp-Align-L(, σ)

is at the crisp left edge of a syllable.

We will now demonstrate how the constraint ranking above explains underapplication of primary palatalization at a PrWd juncture, with Crisp-Align-L( , σ) replacing Crisp-Align-L([-ant], σ). In the following tableau, we ignore the laryngeal feature of the first Root-final /t^{h}/ for simplicity:

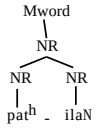
(63) /hot^{h}-ipul/ hotʃ-ipul 'unlined comforter' (Root-Root)

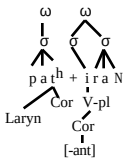
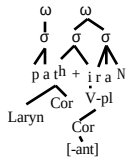
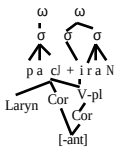
input Mword R R R hot^{h} - ipul	LICEN [-ant]	CA-L C-place Cor ([-ant] . σ)	PAL	SyllCon	NCA-R (Root$_0^{max}$, PrWd)	FRON- HI [-ant]
a.  	*!		*	*		
b.  				*!		*
c.  				*!		
d.  			*!			*
e.  		*!	*			
f. ☞  						*
g.  		*!				

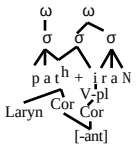
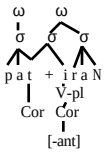
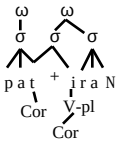
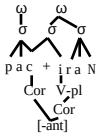
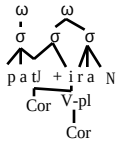
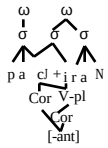
In the tableau above, candidate (f) violates only low ranked FRON-HI[-ant] since [i] does not retain [-ant]. However, other candidates violate at least one higher ranked constraint. As a result, candidate (f) in which only secondary palatalization has occurred, is optimal.

The following tableau shows why /t/ before /i/ at the Root-Root boundary also does not undergo primary palatalization. Note that /t/ in /ti/ sequence at a PrWd juncture undergoes secondary palatalization:

(64) /pat^{h}-ilaɴ/ patʃ-iraɴ 'field ridge' (Root-Root)



	LICENSE [-ant]	CA-L C-place / Cor / ([-ant] . σ)	CA-L ([lary], σ)	PAL	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	FRON-HI [-ant]
a. 	*!		*	*	*		
b. 	*!			*		*	
c. 		*!	*		*		

d. 		*!	*	*			
e. 	*!			*			
f. 				*!			*
g. 		*!		*			
h. ☞ 							*
i. 		*!					
	LICEN [-ant]	CA-L C-place Cor ([-ant] . σ)	CA-L ([lary], σ)	PAL	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	FRON-HI [-ant]

In the tableau above, all the candidates except candidate (h) violate at least one high ranked constraint. However, candidate (h) violates only low ranked FRON-HI[-ant] and is

optimal. We have just demonstrated that CRISP-ALIGN-L($\overset{\text{C-place}}{\underset{[-\text{ant}]}{\overset{|}{\underset{|}{\text{Cor}}}}}$, σ) can replace CRISP-ALIGN-L([-ant], σ).

So far we have proposed the following constraint ranking for primary palatalization and secondary palatalization in Korean:

(65) Proposed constraint ranking

LICENSE[-ant], CA-L($\overset{\text{C-place}}{\underset{[-\text{ant}]}{\overset{|}{\underset{|}{\text{Cor}}}}}$ /[lar]/[+cont], σ), PAL, *[+cont, -ant],

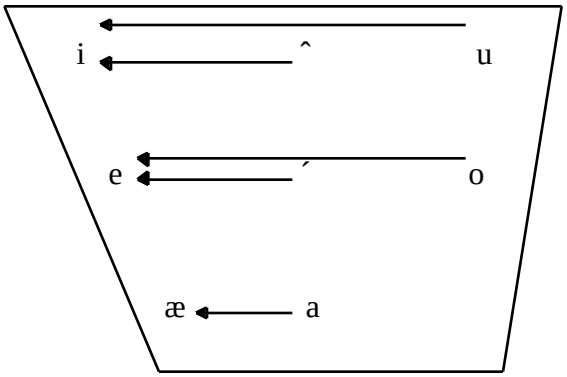
SyllCon, NCA-R($\text{Root}_0^{\text{max}}$, PrWd)

>> FRON-HI[-ant]

4.7 Umlaut in the Kyungsang Dialect

As shown previously in the data on Korean Umlaut in the Kyungsang dialect in section 4.1 of this chapter, Umlaut is a phonological phenomenon in which a back vowel optionally becomes a front vowel of the same height when followed by a high front vocoid. The following diagram shows the phonological changes of back vowels in Korean Umlaut:

(66) Vowel transitions in Korean Umlaut



Hume 1990 observes that Umlaut does not take place across a palatal consonant /c/, including a derived palatal /c/, or across secondarily palatalized [nJ, sJ, lJ]. Other intervening consonants are argued to be transparent to Umlaut. Under the assumption that primary and secondary palatalization can be unified as a single process and can be uniformly represented by spreading of [+coronal] from a high front vocoid to a preceding coronal consonant, she provides the following generalization as to Umlaut blocking:

(67) Hume's generalization as to Umlaut blocking

Observation 1: Umlaut is blocked across derived or non-derived palatal consonant c.

Observation 2: Umlaut is blocked across secondarily palatalized [nJ, sJ, lJ].

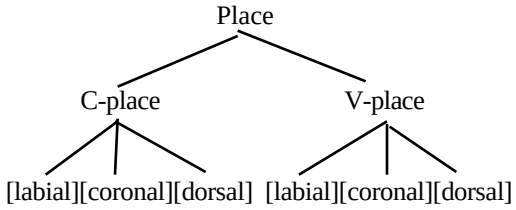
Generalization: Umlaut is blocked across a palatal consonant.

Hume's generalization as to palatal blocking of Umlaut is based on two incorrect observations that the phonological change of /t/ to a palatal before /i/ at a suffixal or clitic boundary (i.e., primary palatalization) does not involve secondary palatalization, and that /t/ does not undergo secondary palatalization before a tautomorphemic high front vocoid

(Kim-Renaud 1974, Iverson 1987, Iverson 1993 and references therein), unlike the observations provided in this paper (also in Kiparsky 1993 and K.-M. Lee 1972).

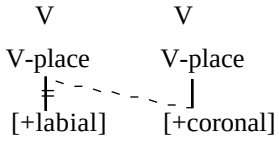
Before we consider the analysis of Umlaut in the framework of OT, we will summarize Hume's 1990 analysis of Umlaut and its palatal blocking. Hume assumes the following feature geometry, adopted from Clements 1989a:

(68) Feature Geometry (Clements 1989a)

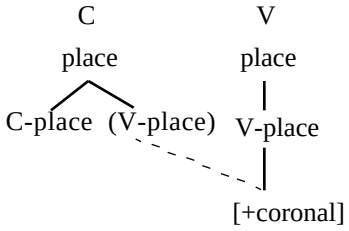


Hume assumes without detailed discussion that primary and secondary palatalization need not be distinguished and can be unified as a single process: spreading of [+coronal] of a high front vocoid to the V-place node of a preceding consonant. She further argues that Umlaut is represented by spreading of [+coronal] of a high front vocoid to a preceding back vowel.

(69) a. Umlaut



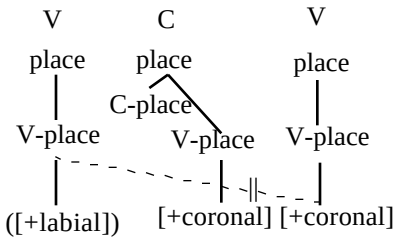
b. Palatalization



Structure preservation, which prevents cooccurrence of [+labial, +coronal], plays a crucial role in her analysis of Umlaut. In her feature geometry, palatal consonants and front

vowels are specified for [+coronal] as a dependent of V-place node. In this way, she derives the opacity of underived /c/ in Umlaut by appeal to the Line-Crossing prohibition:

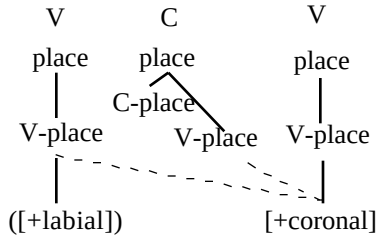
(70) Blocking of Umlaut across an underived palatal /c/



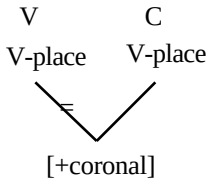
The Umlaut blocking effect across intervening derived palatalized consonants is explained by two separate steps. Namely, [+coronal] spreads to a preceding vowel across a derived palatalized coronal consonant. But according to Hume, a later Dissimilation rule delinks [+coronal] from the V-place of a preceding vowel. This Dissimilation rule is purely ad hoc.

(71) Blocking of Umlaut across derived palatalized coronal consonants

Step 1



Step 2



Hume's analysis of Umlaut is crucially based on the assumption that primary and secondary palatalization can be unified as a single process and as a result, it does not distinguish between primary and secondary palatalization. This assumption results in a wrong generalization that any intervening palatal or palatalized consonant blocks Umlaut. However, we have already shown that Umlaut is blocked only by a secondarily palatalized

consonant, and primary and secondary palatalization are independent from each other. In previous sections of this chapter, we provided the following motivation to treat primary palatalization and secondary palatalization as separate phonological phenomena:

(72) Phonological differences between primary and secondary palatalization

a. Only /t/ is subject to primary palatalization whereas all coronal consonants including /t/ are subject to secondary palatalization

b. Primary palatalization has lexical idiosyncratic exceptions (a lexical diffusion case) whereas secondary palatalization does not.

Unlike Hume's generalization that Umlaut is blocked by a palatal consonant, we observe that Umlaut consistently does not take place across a coronal consonant which has undergone secondary palatalization.

(73) Umlaut blocked by secondary palatalization

a.	/mat-i/	macJ-i, *mæcJ-i	'the eldest'
b.	/´ti/	´tJi, *etJi	'where'
c.	/mati/	matJi, *mætJi[38]	'knot'
d.	/mal-li/	malJ-lJi, *mælJ-lJi	'to stop'
e.	/kasi/	kasJi, *kæsJi	'thorn'
f.	/´nni/	´nJnJi, *enJnJi	'sister'
g.	/alli-/	alJlJi, *ælJlJi	'to inform'
h.	/k´ci/	k´cJi, *kecJi	'beggar'
i.	/tac^{h}i-/	tacJ^{h}i, *tæcJ^{h}i	'to get hurt'

[38] Hume 1990 says that optional umlaut takes place in /mati/ 'knot' in the Kyungsang Dialect. However, when I consulted with Kyungsang Dialect speakers, it turned out that umlaut does not takes place in /mati/. Umlauted [mætJi] sounds very odd to them.

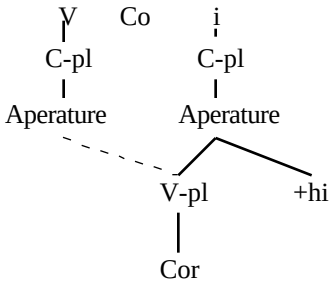
Since Hume's argument is based on the incorrect observation that /t/ is not (secondarily) palatalized before a tautomorphemic high front vocoid, Hume cannot explain why Umlaut is blocked across /t/ in /´ti/ [´tʲi] (*[etʲi]) in (73b). We propose the following generalization as to Umlaut blocking:

(74) Umlaut blocking

Umlaut is blocked across a secondarily palatalized coronal consonant.

Like secondary palatalization, which was analyzed in section 4.5, Umlaut can also be represented as the spreading of the V-place/Cor of a high front vocoid since it forces a preceding back vowel to become a front vowel before a font high vocoid. Hence, we will represent Umlaut as spreading of the V-place of a high front vocoid to a preceding back vowel.

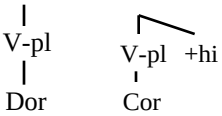
(75) Umlaut



We conclude that Umlaut and secondary palatalization are the same phenomenon. The only difference between Umlaut and secondary palatalization is that the V-place of a high front vowel spreads to a back vowel in Umlaut but it spreads to a coronal consonant in secondary palatalization.

To explain the necessity of Umlaut, we further propose the following constraint, which does not allow a surface sequence of a back vowel and a high front vocoid.

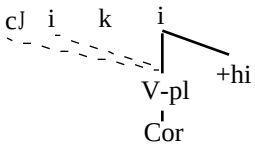
(76) *V Co V (henceforth, *DOR-C0-COR)



A sequence of a back vowel and a high front vocoid is not allowed.

As shown in section 4.1, primary palatalization is a strictly local phenomenon and only a coronal consonant and a following high front vocoid are involved in primary palatalization. And we analyzed primary palatalization in section 4.4 via interaction of licensing and redundancy in the sense of IMP 1993b. On the other hand, spreading of the V-place of a high front vocoid is not necessarily local (Hume 1990):

(77) /cuk-i-/ cJik-i- 'kill-Caus'

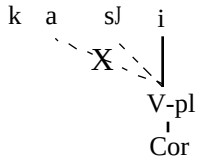


This shows that Umlaut and secondary palatalization can take place simultaneously.

On the other hand, the following examples show a case in which spreading the V-place of /i/ is blocked by secondary palatalization. According to our previous observation, Umlaut is blocked across a secondarily palatalized coronal consonant.

(78) a. /kasi/ kasʃi, *kæsʃi 'thorn'

b. /tatˆmi/ tatʃimi, *tætʃimi 'fulling block'



We propose that the blocking of the spread of the V-place of a high front vocoid across a secondarily palatalized coronal consonant is due to the conspiracy of the following two constraints:

(79) a. SPREAD[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$][39]

[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$] must be multiply linked (or spread).

b. IDENT-IO[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$]

c. Ranking:

PAL >> SPREAD[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$] >> IDENT-IO[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$] >> *DOR-C0-COR

SPREAD[F] constraint requires that a feature F be multiply linked (or spread) in the output (Padgett 1995 and others). SPREAD[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$] forces [$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$] to be multiply linked. However, spreading the feature [$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$] to a preceding segment compels violation of lower ranked IDENT-IO[$\overset{\text{V-pl}}{\underset{|}{\text{Cor}}}$].

The basic concept of the proposed constraint ranking is as follows. Consider the following potential candidates, given the input /ani/:

[39] I thank Prof. Young-mee Cho for suggesting this constraint.

(80) /ani/ [anJi] 'no'

a. a . n i
   |
  V-pl

b. a . nJ i
   \ |
  V-pl

c. æ . n i
   \ /
  V-pl

d. æ . nJ i
   \ | /
  V-pl

Candidate (a) violates high ranked PAL and SPREAD[$^{\text{V-pl}}_{\text{Cor}}$]. And it also violates lowest ranked *DOR-C0-COR due to lack of Umlaut. Candidate (b) receives one violation mark for IDENT-IO[$^{\text{V-pl}}_{\text{Cor}}$], which is compelled to avoid violation of SPREAD[$^{\text{V-pl}}_{\text{Cor}}$] and PAL. It also violates lower ranked *DOR-C0-COR due to lack of Umlaut. In this case, spreading of [$^{\text{V-pl}}_{\text{Cor}}$] of /i/ to /n/ satisfies higher ranked PAL and SPREAD[$^{\text{V-pl}}_{\text{Cor}}$]. Candidate (c) is worse than candidate (b) since it violates higher ranked PAL. It also receives one violation mark for IDENT-IO[$^{\text{V-pl}}_{\text{Cor}}$], which is compelled to avoid violation of SPREAD[$^{\text{V-pl}}_{\text{Cor}}$]. Candidate (d) is also worse than candidate (b) since it receives two violation marks for IDENT-IO[$^{\text{V-pl}}_{\text{Cor}}$] in comparison with one violation mark for IDENT-IO[$^{\text{V-pl}}_{\text{Cor}}$] in candidate (b). As a result, the best of the worst candidates is candidate (b).

Hence, the effect of the ranking SPREAD[$^{\text{V-pl}}_{\text{Cor}}$] >> IDENT-IO[$^{\text{V-pl}}_{\text{Cor}}$] is to force spreading of [$^{\text{V-pl}}_{\text{Cor}}$] of a high front vocoid (to a neighboring segment) to occur only once, unless the resulting configuration violates other higher ranked constraints such as PAL (in the case of multiple spreading of [$^{\text{V-pl}}_{\text{Cor}}$] (see the tableau in (83) for the multiple spreading case)).

The following tableau illustrates how the constraint ranking predicts that Umlaut is blocked across a secondarily palatalized consonant:

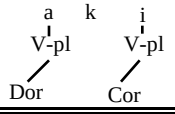
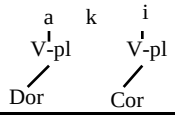
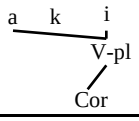
(81) /kasi/ kasJi 'thorn'

input	PAL	SPREAD V-pl [Cor]	IDENT-IO V-pl [Cor]	*DOR-C0-COR
a.	*!	*		*
b. ☞			*	*
c.			**!	
d.	*!		*	

Candidates (a) and (d) fatally violate PAL. Candidate (b) receives one violation mark for IDENT-IO[V-pl Cor] and another violation mark for lower ranked *DOR-C0-COR. However, candidate (c) receives two violation marks for IDENT-IO[V-pl Cor]. As a result, candidate (c) is optimal.

The following tableau illustrates a case in which Umlaut occurs across a non-coronal consonant:

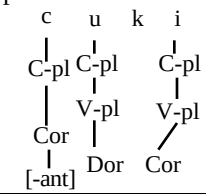
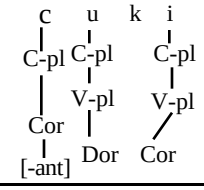
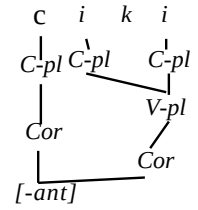
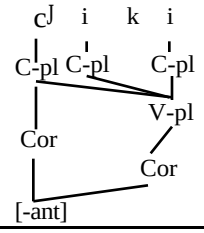
(82) /aki/ æki (or aki) 'baby'

input	SPREAD V-pl [Cor]	IDENT-IO V-pl [Cor]	*DOR-C0-COR
	*!		*
a. 			
b. ☞ 		*	

In the tableau above, candidate (a) fatally violates SPREAD[$\overset{\text{V-pl}}{\text{Cor}}$]. However, candidate (b) violates lower ranked IDENT-IO[$\overset{\text{V-pl}}{\text{Cor}}$] and is optimal.

The following is a case of Umlaut plus secondary palatalization, in which spreading of the V-place of /i/ is not limited to a neighboring consonant or vowel:

(83) /cuk-i-/ cʃik-i- 'kill'

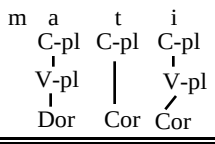
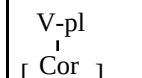
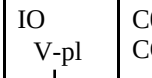
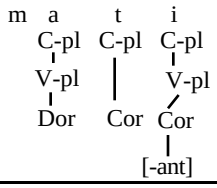
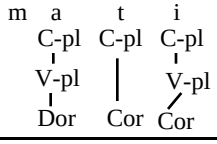
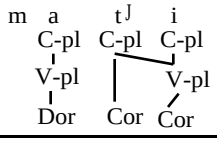
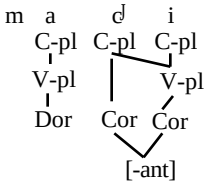
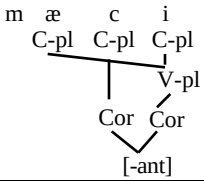
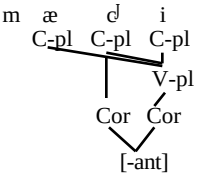
input	PAL	SPREAD V-pl [Cor]	IDENT-IO V-pl [Cor]	*DOR-C0-COR
				
a. 		*!		*
b. 	*!		*	
c.☞ 			**	

Candidate (b) is eliminated due to fatal violation of undominated PAL. Candidate (a) receives a fatal violation mark for SPREAD[V-pl Cor] whereas candidate (c) receives two violation marks for lower ranked IDENT-IO[V-pl Cor]. As a result, candidate (c) is optimal. This tableau shows that multiple spreading of [V-pl Cor] must take place to avoid violation of

highly ranked PAL. Otherwise, the ranking SPREAD[$\overset{\text{V-pl}}{\underset{\text{Cor}}{|}}$] >> IDENT-IO[$\overset{\text{V-pl}}{\underset{\text{Cor}}{|}}$] would require that spreading of [$\overset{\text{V-pl}}{\underset{\text{Cor}}{|}}$] occur only once, as shown early in this section.

We will show a case in which palatalization-blocking of Umlaut takes place across a derived palatal which has also undergone secondary palatalization.

(84) /mat-i/ macJ-i 'the eldest'

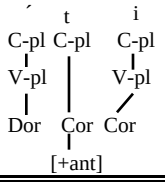
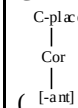
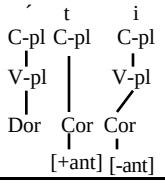
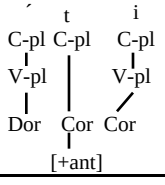
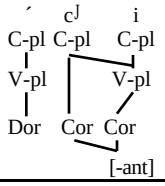
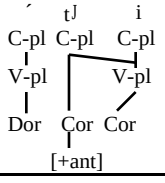
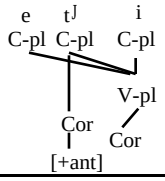
input	PAL	CA-L	Licen [-ant]	SPREAD	IDENT-IO	*DOR-C0-COR	FRON-HI [-ant]
							
a 	*!		*	*		*	
b 	*!			*		*	*
c 					*	*	*!
d ☞ 					*	*	
e 	*!				*		
f 					**!		

Candidates (a), (b) and (e) are eliminated by a violation mark for undominated PAL, which forces a coronal consonant and a following high front vowel to share the V-place.

Candidate (f) receives two violation marks for SPREAD[$\overset{\text{V-pl}}{\underset{\text{Cor}}{|}}$] in comparison with candidates (c) and (d), which receive one violation mark for the same constraint. Candidate (d) is preferred as optimal over candidate (c) since candidate (c) additionally violates FRON-HI [-ant].

Finally, consider the following tableau, in which Umlaut is blocked across the secondarily palatalized [tʃ]. Note that /t/ before a tautomorphemic /i/ is prespecified for [+ant] and is realized as secondarily palatalized [tʃ].

(85) /´ti/ ´tʃi 'where'

input	CA-L	LICEN [-ant]	IDENT-IO [+ant]	PAL	SPREAD V-pl [Cor]	IDENT-IO V-pl [Cor]	*DOR-C0-COR	FRON-HI [-ant]
								
a 		*!		*	*		*	
b 				*!	*		*	*
c 			*!			*	*	
d ☞ 						*	*	*
e 						**!		*

Candidates (a), (b) and (c) are eliminated due to at least one violation mark for a highly ranked constraint. On the other hand, candidate (d) is preferred over candidate (e) since the

former receives one violation mark for IDENT-IO[V-pl / Cor] whereas the latter, two violation marks for the same constraint.

In this section, we have proposed the following constraint ranking:

(86) Constraint ranking in the Kyungsang Dialect

SPREAD[V-pl / Cor]

>> IDENT-IO[V-pl / Cor]

>>*DOR-Co-COR, FRON-HI[-ant]

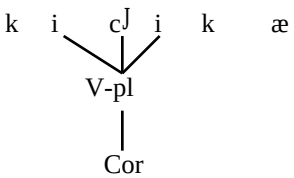
4.8 Secondary Palatalization and OCP

Before we conclude this chapter, consider the following cases in which an underlying front vowel is followed by a secondarily palatalized coronal consonant:

(87)	a. /kicikæ/	kicʃikæ	‘stretching’
	b. /ci-si/	cʃisʃi	‘instruction’

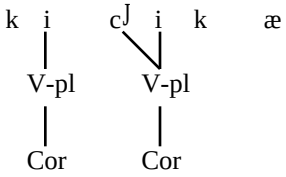
The following potential output of the example in (87a) receives one violation mark for IDENT-IO[V-pl / Cor]:

(88)	/kicikæ/	kicʃikæ	‘stretching’



We have to consider another potential candidate which is subject to OCP violation:

(89)



The configuration in (89) violates the OCP due to the sequence of two [V-pl / Cor] in addition to violation of IDENT-IO[V-pl / Cor]. We suggest that (88) is optimal since the configuration in (89) additionally violates OCP. The following tableau shows this point:

(92) /kicikæ/ kicJikæ 'stretching'

input k i c i k æ Cpl Vpl Vpl Cor Cor	PAL	SPREAD V-pl [Cor]	IDENT-IO V-pl [Cor]	OCP	*DOR-Co-COR
a. k i c i k æ Vpl Vpl Cor Cor	*!	*			
b. k i cJ i k æ Vpl Vpl Cor Cor			*	*!	
c. ☞ k i cJ i k æ Vpl Cor			*		

Candidate (a) fatally violates higher ranked PAL. Both candidates (b) and (c) violate IDENT-IO[$\overset{\text{V-pl}}{|}_{\text{Cor}}$]. However, candidate (b) additionally violates OCP. Therefore, candidate (c) is optimal. Note that the ranking between OCP and IDENT-IO is not relevant in this discussion since OCP is not crucially ranked with IDENT-IO[$\overset{\text{V-pl}}{|}_{\text{Cor}}$].

4.9 Summary

We have shown that phonemic primary /t/-palatalization, which is treated as a prototypical case of non-derived environment effect in the framework of Lexical Phonology in the literature, is an independent phenomenon from allophonic secondary palatalization in Korean. Furthermore, we showed that a paradox which arises in the lexical and postlexical dichotomy in LP in the analysis of primary and secondary palatalization can be eliminated in an OT-based approach. We analyzed primary palatalization through interaction between licensing and redundancy of the feature [-ant] in the sense of IMP 1993b. We additionally argued that palatal blocking of Umlaut in Korean is due to secondary palatalization alone, unlike the arguments in the literature which claim that palatal blocking of Umlaut is due to both primary and secondary palatalization. Following Kiparsky, we reintroduced the idea that morpheme-internal idiosyncratic /t/ before /i/ should be underlyingly specified for a "redundant" [+anterior] to explain lack of primary palatalization in the morpheme-internal /ti/ sequence.

In the analysis of Umlaut, we analyzed Umlaut as the same phenomenon as secondary palatalization (i.e., spreading of the V-place of a high front vocoid). Furthermore, we attributed blocking of Umlaut across a secondarily palatalized coronal

consonant to the conspiracy of the two constraints SPREAD[$\overset{\text{V-pl}}{|}_{\text{Cor}}$] and IDENT-IO[$\overset{\text{V-pl}}{|}_{\text{Cor}}$].

Chapter 5 Ambisyllabic C and Variation in /n/-insertion Phenomenon in Korean[40]

We provide an answer to why the epenthetic consonant in Korean is /n/, which is inserted between a consonant and a high front vocoid in some prosodic environments. We also show that ambisyllabicity of the PrWd-final C before a V plays a crucial role in the analysis of /n/-insertion in Korean. On the other hand, we show that variation in /n/-insertion arises across the Native Korean and Sino-Korean sublexica within a dialect and across the two Sino-Korean sublexica of Standard Korean and the Kyungsang Dialect.

5.1 Data of /n/-insertion in Standard and Kyungsang Native Korean

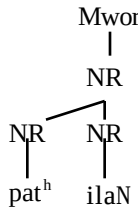
In Native Korean compounds, /n/ is inserted **optionally** between a Root-final C and a following Root-initial high front vocoid. In the morphological structure of two Root words in Native Korean below, recall that we proposed in chapter 3 that a $Root_0$ projects to another $Root_0$ via a morphological merger of a suffix or clitic with a preceding $Root_0$ or via a morphological merger of a "prefixal" $Root_0$ with a following $Root_0$.

[40] I really appreciate the insight of Prof. R. Noyer that /n/-insertion in Korean is not necessarily a PrWd-juncture-bound phenomenon. This is the starting point of the my analysis of /n/-insertion which shows variation across different sublexica within one dialect and across dialects. Without his insight and extensive discussion of Korean morphological and phonological structures, this analysis would not be possible.

(1) Optional /n/-insertion between a Root-final C and a following Root-initial high front vocoid in Native Korean

(NR = Noun Root; VR = Verb Root; R = Root whose grammatical category is not clear)

a. /pat^{h}-ilaN/ panJ-nJilaN or patJ-ilaN 'field ridge'

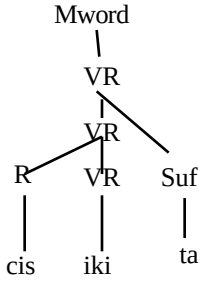


b. /k'oc^{h}-il^m/ k'onJ-nJil^m or k'otJ-il^m 'flower name'

c. /k^{h}oN-y´s/ k^{h}oN-nJy´t or k^{h}oN-y´t 'bean candy'

d. /mul-y´s/ mulJ-lJy´s or mur-y´t 'liquid candy'

e. /cis-iki-ta/ cinJ-nJiki-ta or citJ-iki-ta 'to mash indiscriminately-mood'



f. /hot^{h}-ipul/ honJ-nJipul or hotJ-ipul 'unlined comforter'

g. /t´s-yaNmal-c'ak/ t´nJ-nJyaNmal-c'ak or t´tJ-yaNmal-c'ak 'outer socks' ‘pair'

The morphological structures above show that /n/ is inserted between a Root-final consonant and a following Root-initial /i/ or /y/. On the other hand, /n/-insertion does not take place within a Root or between a Root and a suffix or a clitic (i.e., at suffixal or clitic boundary):

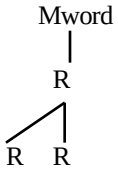
(2) Lack of /n/-insertion at a suffixal or clitic boundary

a.	/kil´k-i/	kir´k-i, *kir´N-nJi	‘wild goose’
			(‘sound of a wild goose’ ‘NOML’)
b.	/tol-i/	tor-i, *tol-nJi	‘Tol (name)’
			(‘person’s name’ ‘AGT’)
c.	/y´lˆm=ilaN/	y´rˆm=iraN, *y´rˆm=nJiraN	‘summer-and’

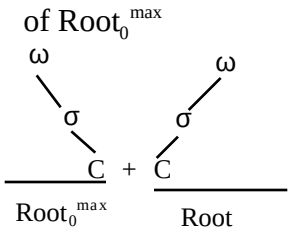
We proposed in chapter 3 that the right edge of a $Root_0^{max}$ is non-crisp aligned with the right edge of a PrWd.

(3) Prosodic structures for those words which include two Roots, given the following morphological structure:

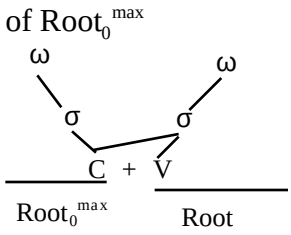
Morphological structure



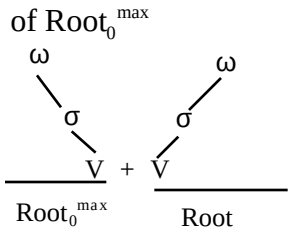
a. crisp right edge



b. non-crisp right edge



c. crisp-right edge



We will show in the next section that the ambisyllabicity of a consonant in (3b) must be avoided before a high front vowel and as a result, consonant insertion is compelled.

5.2 Dispreference for an Ambisyllabic Consonant before a High Front Vocoid

Young-mee Cho (1995) suggests the following OT constraint for /n/-insertion:

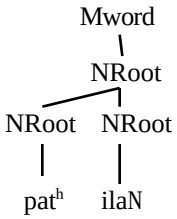
(4) *C) (i/y

*C)$_{\text{PrWd PrWd}}$(i/y (Cho 1995):

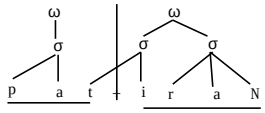
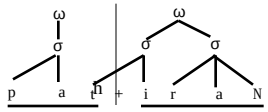
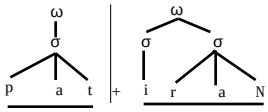
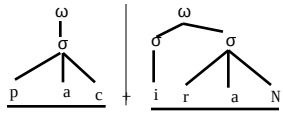
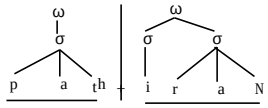
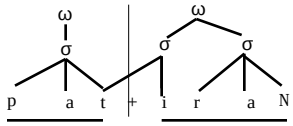
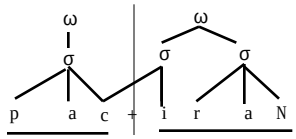
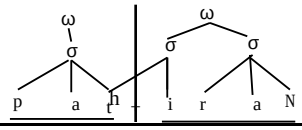
A sequence of a consonant and a high front vocoid is not allowed at a PrWd juncture.

Our analysis cannot use this constraint. We will show why the constraint cannot be incorporated in our analysis. Let us first consider the optional output which shows lack of /n/-insertion. In the analysis of overapplication of CN in the optional output which shows no /n/-insertion (chapter 3), we proposed that a PrWd-final C is realized ambisyllabic before a V across a PrWd juncture. Based on this proposal, we showed that candidates (a) and (b) in the tableau below are eliminated due to fatal violation of NCA-R(Root$_0^{\text{max}}$, PrWd). Candidates (c), (d) and (e) are eliminated due to violation of SyllCon. Candidates (g) and (h) fatally violate one of CA-L([lar]/[-ant], σ) constraints. As a result, candidate (f) is optimal, which violates only lower ranked IDENT-IO[lar].

(5) /pat^h-ilaN/ patJ-iraN 'field ridge' (compound)



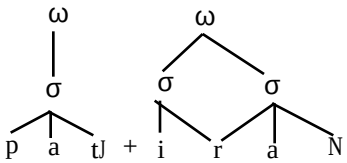
(secondary palatalization is ignored)

input /pat^{h}-ilaN/	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	CA-L([lar]/$\overset{\text{C-pl}}{\underset{\text{Cor}}{|}}_{[\text{-ant}]}$, σ)	IDENT-IO [lar]
a. 		*!		*
b. 		*!		
c. 	*!			*
d. 	*!		*	*
e. 	*!		*	
f. ☞ 				*
g. 			*!	*
h. 			*!	*

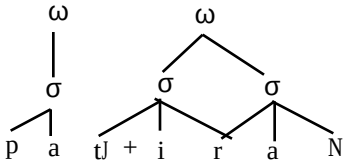
However, when we consider the other optional output which shows /n/-insertion at the Root-Root boundary, we have to eliminate the candidate (6c) below in which the PrWd-final C is realized as ambisyllabic before a high front vocoid (in favor of (6d) in which /n/ is inserted between a Root-final C and a following Root-initial high front vocoid):

(6) /pat^{h}-ilaN/ panJ-nJilaN 'field ridge'

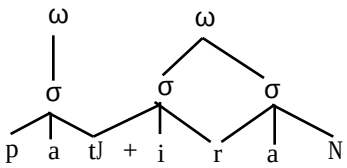
a. *



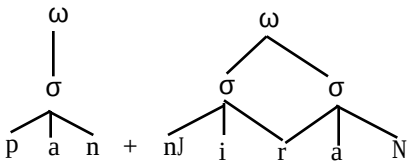
b. *



c. *



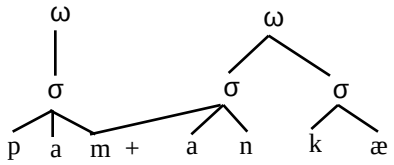
d. optimal



Unfortunately, the constraint *C) (i/y suggested in Cho 1995 does not play any role in choosing (6d) as optimal over (6c). Hence, the constraint cannot be adopted in our framework to explain why /n/-insertion occurs between two Roots.

When we consider the potential (non-optimal) output prosodic structure in (6c), we observe that the ambisyllabic C appears before a high front vocoid. An ambisyllabic consonant is allowed to appear before non-i/y vocoid as shown below (lack of /n/-insertion):

(7) /pam-ankæ/ pam-ankæ 'night fog'

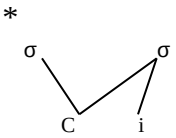


The observation we can make is that a Root-final C and a following Root-initial /i/ or /y/ is disfavored and as a result, /n/-insertion must occur at the position in question.

Based on the observation that the ambisyllabic consonant is avoided before a high front vocoid, we propose the following two constraints:

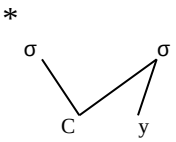
(8) AMBI Constraints

a. AMBI-/i/



An ambisyllabic C is not allowed before /i/.

b. AMBI-/y/



An ambisyllabic C is not allowed before /y/

c. Constraint Ranking

AMBI-/i/, AMBI-/y/

>> DEP-IO

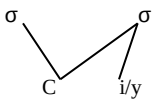
We propose that AMBI-/i/ and AMBI-/y/ are separate constraints since we will show in section 5.5 and section 5.6 that /n/ is inserted before /y/ excluding /i/ in Standard and Kyungsang Sino-Korean[41]. We further propose that the two constraints are undominated in Native Korean as /n/-insertion always[42] takes place to avoid the ambisyllabic C before a high front vocoid. Since the Root-final ambisyllabic C before a high front vowel always violates AMBI-/i/ or AMBI-/y/, if we assume that DEP-IO is lower ranked than AMBI-/i/ and AMBI-/y/, we can explain why consonant insertion must take place between two

---

[41] AMBI-/y/ seems to have a more universal characteristic than AMBI-/i/ (p.c. Prof. Noyer). In English, for example, ambisyllabic flap [ɾ] is dispreferred before /y/: "sought[ɾ] Ed" vs. "sought[t|] you". Hence, it will be more appealing to propose the following two constraints rather than AMBI-/i/ and AMBI-/y/ in (8):

i) AMBI-VOCOID

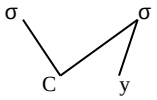
*



An ambisyllabic C is not allowed before a high front vocoid.

ii) AMBI-/y/

*



An ambisyllabic C is not allowed before /y/.

AMBI-/y/ is more specific than AMBI-VOCOID. And hence, the two constraints are in an "elsewhere" relationship. Then, we can say that AMBI-VOCOID is highly ranked in Native Korean (in which /n/ is inserted before a high front vocoid) whereas AMBI-/y/ is highly ranked in Sino-Korean (in which /n/ is inserted before /y/). However, we will use AMBI-/i/ and AMBI-/y/ throughout this chapter for simple presentation.

[42] /n/-insertion, however, is optional in Native Korean.

Roots. Namely, consonant insertion is compelled to avoid violation of highly ranked AMBI-/i/ or AMBI-/y/. We propose that AMBI-/i/ or AMBI-/y / is ranked above DEP-IO.

Let us assume for the moment that /n/ is an epenthetic consonant in Korean and hence we ignore insertion of other types of consonants. The following tableau illustrates a case in which /n/ must be inserted between two Roots. We will will use "·C·" for an ambisyllabic C throughout this paper.

(9) Schematic /CVn-iC/ CVn͡-n͡iC

("·C·" is ambisyllabic)

/CVn-iC/ Root-Root	PAL	SyllCon	NCA-R ($Root_0^{max}$, PrWd)	AMBI-/i/	DEP-IO
CVn͡.-iC		*!			
CV.n͡-iC			*!		
CV·n͡·-iC				*!	
☞ CVn͡-n͡iC					*

All candidates except the last candidate violate one constraint which is ranked higher than DEP-IO. On the other hand the last candidate violates only lower ranked DEP-IO due to /n/-insertion and is optimal.

The following is a case in which /n/-insertion occurs after /N/ in the optimal candidate:

(10) Schematic /CVN-iC/ CVN-nJiC

/CVN-iC/ Root-Root	PAL	NCA-R ($Root_0^{max}$, PrWd)	SyllCon	AMBI-/i/	DEP-IO
CV.N-iC		*!			
CVN.-iC			*!		
CV·N·-iC				*!	
☞ CVN.-nJiC					*

In the tableau above, all candidates except the last candidate fatally violates one higher ranked constraint than DEP-IO. Hence, the /n/-inserted last candidate is preferred over the other candidates since it violates only lower ranked DEP-IO.

On the other hand, let us consider another case in which the second Root-initial V is not a high front vocoid and /n/-insertion does not occur:

(11) Schematic /CVN-aC/ CVN-aC (Root-Root)

/CVN-aC/	PAL	NCA-R ($Root_0^{max}$, PrWd)	SyllCon	AMBI-/i/	DEP-IO
☞ CV·N·-aC					
CVN.-aC			*!		
CV.N-aC		*!			
CVN.-naC					*!

In the tableau above, the first candidate does not violates any constraint at all in comparison with the other candidates, in which at least one constraint is violated. Hence, it is predicted that /n/ is not inserted before non-i/y vocoid.

5.3 The problem with Epenthetic /n/

So far we have schematically shown how the two highly ranked constraints AMBI-/i/ and AMBI-/y/ compel consonant insertion at the PrWd juncture in Native Korean. However, the current discussion does not say anything as to why relatively more marked /n/ rather than unmarked /t/ is inserted at the position in question. The insertion of relatively more marked /n/ in /n/-insertion phenomenon poses a serious challenge to Optimality Theory. However, it is quite simple to build a rule in a rule-based approach. Han 1994, for example, provides the following rule for /n/-insertion:

(12) /n/-insertion Rule (Han 1994)

Ø --> n / $(...C)_{PrWd\ PrWd}$(__i/y...)

The rule above says that /n/ is inserted between a consonant and a high front vocoid at a PrWd juncture. We will discuss Han's analysis of /n/-insertion after our OT-based analysis later in this chapter. In OT, however, no such rule can be posited. Furthermore, it should be explained why /n/ is epenthetic in Korean.

Our question is why /n/, not /t/, is inserted at a PrWd juncture. In Korean, /t/ is the least marked consonant. All coronal obstruent (/s, s', t', t^h, c, c^h, c'/) are realized as the least marked consonant [t] when they are syllabified as a coda (Coda Neutralization, see chapter 3 for detailed discussion).

(13) Coda neutralization

a.	/pat^{h}/	pat	‘dry field’
b.	/os/	ot	‘clothes’
c.	/nac^{h}/	nat	‘face’
d.	/nac/	nat	‘day’

Furthermore, /t/ assimilates in place to a following more marked labial and dorsal consonant:

(14) Place assimilation

a.	/´t-ko/	´k-k’o	‘get-Cont’
b.	/t´t-p´s´n/	t´p-p’´s´n	‘outer socks’

Hence, as far as insertion of a consonant is concerned, the least marked /t/ would have to be considered as the epenthetic consonant in Korean[43].

5.4 Analysis of /n/-insertion in Standard and Kyungsang Native Korean

We are going to argue that the reason why /t/-insertion is avoided in the /n/-insertion phenomenon at a PrWd juncture is due to the “conspiracy” of OT constraints which block the appearance of allophonic variants of phonemic /t/ at PrWd-initial position. We propose that (secondarily) palatalized [tʲ] is in general not allowed:

(18) *Tʲ

(Secondarily palatalized) [tʲ], [tʲ^{h}], or [tʲ’] is disallowed.

[43] Lombardi 1996 proposes that /ʔ/ is actually the universal default C. In Korean, however, it cannot be chosen as a default consonant since Korean does not have /ʔ/ in the consonantal inventory.

However, violation of the constraint *TJ is observed in Korean when /ti/ occurs morpheme-internally:

(19) a. /titi-ta/ tJitJi-ta ‘to step on’

b. /t^{h}i/ tJ^{h}i ‘dust’

c. /t’i/ tJ’i ‘belt’

When we rank MAX-IO above *TJ, /t/ before a high front vocoid must not be deleted on the surface and /t/ is expected to be realized as [tJ].

(21) Constraint ranking

PAL, AMBI-/i/, AMBI-/y/ >> MAX-IO >> *TJ

(22) /titi-ta/ tJitJi-ta ‘to step on’

(“·C·” is ambisyllabic)

/titi-ta/	PAL	MAX-IO	*TJ
☞tJitJi-ta			**
iti-ta	*!	*	
tJii-ta		*!	*
tJiti-ta	*!		*
titJi-ta	*!		*

The proposed constraint ranking explains why the input /t/ before a tautomorphemic high front vocoid must undergo secondary palatalization and must not delete.

So far we explained the data in which underlying /t/ appears before a tautomorphemic /i/. When we consider the data in which /n/-insertion occurs, however, we have to explain why /n/-insertion is preferred over /t/-insertion (and other coronal C-insertion). We propose that *NJ is ranked below *TJ (Smolensky 1993, Prince & Smolensky 1993). This is reasonable because [tJ] is very restricted in its distribution, owing to diachronic factors as mentioned in chapter 3 (see also discussion in 4.5).

(23) Schematic /VN - iC/ VN - nJiC (Root-Root)

/VN-iC/	PAL	AMBI-/i/	MAX-IO	*TJ	*NJ	DEP-IO
a V·N·-iC		*!				
b VN.-niC	*!					*
c ☞ VN.-nJiC					*	*
d VN.-tiC	*!					*
e VN.-tJiC				*!		*

In the tableau above, candidates (b) and (d) fatally violate undominated PAL. Candidate (a) fatally violates high ranked AMBI-/i/. And candidate (e) violates *TJ. On the other hand, candidate (c) violates only *NJ and DEP-IO which are ranked lower than *TJ and is optimal.

(24) Schematic /Vn - iC/ VnJ - nJiC

/Vn - iC/	PAL	AMBI-/i/	MAX-IO	*TJ	*NJ	DEP-IO
a V·nJ·-iC		*!				
b Vn.-niC	*!					*
c☞ VnJ.-nJiC					*	*
d Vn.-tJiC				*!		*

As shown in the tableau above, the proposed constraint ranking correctly predicts that /n/-insertion occurs between /n/ and a following high front vocoid at the PrWd juncture.

On the other hand, let us consider a case in which /n/-insertion does not occur at the PrWd juncture between /n/ and a non-i/y vocoid:

(25) Schematic /Vn-aC/ Vn-aC

/Vn-aC/	PAL	AMBI-/i/	MAX-IO	*TJ	*NJ	DEP-IO
a ☞V·n·-aC						
b Vn.-naC						*!
c Vn.-taC						*!

Candidates (b) and (c) violate DEP-IO due to consonant insertion. On the other hand, candidate (a), in which no consonant insertion occurs, does not violate any constraint and is optimal.

We have demonstrated how /t/-insertion between a C and a high front vocoid at a PrWd-juncture is blocked. As for blocking of other potential consonant insertion other than /t/-insertion, we further propose the following constraints which force those secondarily palatalized coronals (such as /c, c', c^h, s, s'/) to be disallowed as an epenthetic consonant:

(26) a. *CJ:

[cJ], [cJ'] and [cJ^h] are disallowed.

b. *SJ

[s] and [sJ] are disallowed.

c. Ranking of all constraints involved:

PAL, AMBI-/i/, AMBI-/y/ >> MAX-IO >> *TJ, *CJ, *SJ >> *NJ >> DEP-IO[44]

The constraint ranking allows underlying /c/ or /s/ before a high front vocoid to be realized as secondarily palatalized, though it does not allow them to be an epenthetic consonant. Consider the following examples in which the underlying /s/ or /c/ is realized as secondarily palatalized:

(27) a. /si/ [sʲi] 'poem'

/si/	PAL	AMBI-/i/	MAX-IO	*SJ	DEP-IO
si	*!				
☞ sʲi				*	
i			*!		

b. /san/ [san] 'mountain'

/san/	PAL	AMBI-/i/	MAX-IO	*SJ	DEP-IO
☞ san					
an			*!		

(28) a. /c^{h}i-/ [cʲ^{h}i] 'to hit'

. /c^{h}i-/	PAL	AMBI-/i/	MAX-IO	*CJ	DEP-IO
c^{h}i-	*!				
☞ cʲ^{h}i				*	
i			*!		

[44] Note that the ranking between *NJ and DEP-IO is not crucial. This is because /n/-insertion before a high front vocoid always violates both constraints.

b. /ca-/ [ca] ‘to sleep’

/ca-/	PAL	AMBI-/i/	MAX-IO	*CJ	DEP-IO
☞ca					
a			*!		

Before we demonstrate that the constraint ranking does not allow /c/- or /s/-insertion before a high front vocoid, let us summarize the proposed constraint ranking for /n/-insertion in Standard and Kyungsang Native Korean:

(29) Constraint ranking for /n/-insertion in the Standard and Kyungsang Native Korean

PAL, NCA-R($Root_0^{max}$, PrWd), SyllCon, AMBI-/i/, AMBI-/y/

>> MAX-IO

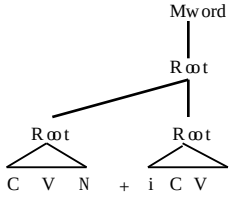
>> *TJ, *CJ, *SJ

>> *NJ

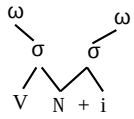
>> DEP-IO

The following tableau demonstrates why /n/ is preferred over /s/ and /c/ as an epenthetic consonant:

(30) Input



--> [CVN - nJiCV]

	PAL	NCA-R ($Root_0^{max}$, PrWd)	SyllCon	AMBI-/i/	*TJ	*SJ	*CJ	*NJ	DEP-IO
a N) (t i	*!								*
b N) (tJ i					*!				*
c N) (sJ i						*!			*
d N) (cJ i							*!		*
e ☞ N) (nJ i								*	*
f N.) (i			*!						
g .N) (i		*!							
h 				*!					

Undominated NCA-R($Root_0^{max}$, PrWd) and SyllCon force the $Root_0^{max}$-final C before a vowel to be realized as ambisyllabic. However, another undominated constraint AMBI-/i/ does not allow the $Root_0^{max}$-final C to be ambisyllabic before /i/. Hence, consonant insertion is compelled to avoid violation of any of those undominated constraints. This is why candidates (f), (g) and (h) are eliminated due to violation of SyllCon, NCA-R($Root_0^{max}$, PrWd) and AMBI-/i/, respectively. However, the inserted consonant at the PrWd juncture must be [nJ] since insertion of other consonants will violate a constraint higher ranked than *NJ (candidates (b), (c) and (d)). As a result, /n/ must be inserted at the PrWd juncture (candidate (e)).

Given the ranked constraints, we can explain two things: first, why consonant insertion is obligatory between a Root-final C and a following Root-initial high front vocoid. Second, we can also explain why /n/-insertion is preferred over /t/-, /s/- or /c/-insertion at the PrWd juncture.

Now we provide a tableau to illustrate an example in which /n/-insertion takes place at an inner compound boundary. Note that in the current analysis, we ignore the optional output in the parentheses which shows lack of /n/-insertion.

(31) /pat^{h}-ilaN/ panJ-nJiraN (or patJ-iraN) 'field ridge'

Mword NR NR NR pat^{h} - ilaN	PAL	AMBI-/i/	*NJ	DEP-IO
ω ω σ σ σ pa tJ - ila N		*!		
ω ω σ σ σ pa t - ila N	*!	*		
☞ (panJ.) (nJ ilaN)			*	*

The tableau above shows that only a (secondarily) palatalized [nJ] can be inserted at the (second) PrWd-initial position.

The following tableau illustrates /n/-insertion between a consonant and /y/ at an inner compound boundary:

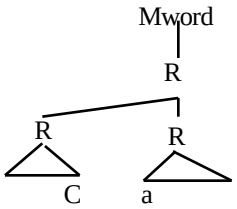
(32) /kHoN-y´s/ k^{h}oN-nJy´t 'bean candy' (compound)

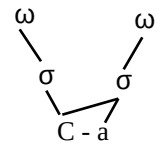
Mword / NR / NR NR / k o N - y ´ s	PAL	NCA-R ($Root_0^{max}$, PrWd)	SyllCon	AMBI-/y/	*NJ	DEP-IO
ω ω / σ σ / koN -y ´ t				*!		
(k^{h}oN.) (y´t)			*!			
(k^{h}o.) (N y´t)		*!				
(k^{h}oN.) (n y´t)	*!					*
☞(k^{h}oN.) (nJ y´t)					*	*

All candidates except the last candidate fatally violate one high ranked constraint. On the other hand, the last candidate, in which /n/ is inserted at the PrWd juncture, violates lower ranked *NJ and DEP-IO and is therefore optimal.

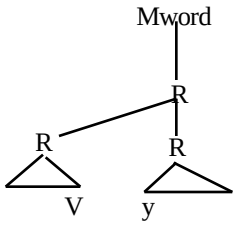
The current constraint ranking also predicts that /n/-insertion does not take place at PrWd-initial position in the other cases in which the phonological environment for /n/-insertion is not met. For graphical simplicity, we provide schematic configurations without using examples:

(33)



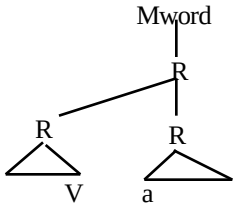
	AMBI-/i/	*NJ	DEP-IO
☞ 			
C.) (n a		*!	*

(34)



	PAL	AMBI-/y/	*NJ	DEP-IO
☞V.) (y				
V.) (nJ y			*!	*

(35)



	AMBI-/i/	*NJ	DEP-IO
☞V.) (a			
V.) (n a		*!	*

In this section, we have shown how ranked OT constraints account for /n/-insertion in the Native Korean sublexicon of Standard Korean (and also Kyungsang Dialect).

Furthermore, we demonstrated why /n/-insertion at the initial position of a PrWd is preferred over other coronal C-insertion including less marked /t/-insertion.

5.5 Optionality of /n/-insertion in Standard and Kyungsang Native Korean

Recall that /n/-insertion is **optional** in Standard and Kyungsang Native Korean. Some speakers consistently do not employ /n/-insertion in Standard and Kyungsang Native Korean. Furthermore, even a speaker's speech shows that /n/-insertion optionally takes place. In other words, inter- and intra-speaker variation occurs in /n/-insertion. We have provided the analysis of /n/-insertion cases by proposing the following constraint ranking:

(36) Constraint ranking for /n/-insertion in Standard and Kyungsang Native Korean

PAL, NCA-R($Root_0^{max}$, ω), SyllCon, <u>AMBI-/i/, AMBI-/y/</u>

>> MAX-IO

>> *TJ, *CJ, *SJ

>> *NJ

>> <u>DEP-IO</u>

We argue that optionality of /n/-insertion at the position in question in Standard and Kyungsang Native Korean is due to the fact that two constraint rankings may be used by the speakers. Namely, those speakers who do not show /n/-insertion use the following constraint ranking in which the constraint DEP-IO is switched up to such a higher ranked position that violation of DEP-IO is fatal, i.e., from last to first rank. Recall that DEP-IO does not allow insertion of a consonant. On the other hand, the two constraints AMBI-/i/ and AMBI-/y/ are reranked below the undominated DEP-IO. This means that consonant insertion is worse than an ambisyllabic consonant before a high front vocoid.

(37) Constraint ranking for lack of /n/-insertion in Native Korean sublexicon

DEP-IO, PAL, NCA-R($Root_0^{max}$, PrWd), SyllCon

>> MAX-IO, AMBI-/i/, AMBI-/y/

>> *TJ, *CJ, *SJ

>> *NJ

The following tableau demonstrates how the proposed constraint ranking works for lack of /n/-insertion at the initial position of a PrWd:

(38) /pat^{h}-ilaN/ patJ-iraN 'field ridge'

Mword NR NR NR pat + ila N	DEP-IO	PAL	AMBI-/i/	*TJ	*NJ
☞ ω ω / σ σ σ / pa tJ +i la N			*	*	
ω ω / σ σ σ / pa t +i la N		*!	*		
(pat)-(t ilaN)	*!	*			
(patJ)-(tJ ilaN)	*!			*	
(pan)-(n ilaN)	*!	*			
(panJ)-(nJ ilaN)	*!				

Since insertion of a consonant is not allowed at all, an ambisyllabic consonant is allowed to be realized before a high front vocoid.

In summary, optional lack of /n/-insertion in Standard and Kyungsang Native Korean can be captured by reranking of DEP-IO in undominated position and reranking of AMBI-/i/ and AMBI-/y/ below DEP-IO.

5.6 /n/-insertion in Standard Sino-Korean

So far we have considered the optional /n/-insertion phenomenon only in Standard and Kyungsang Native Korean. The /n/-insertion phenomenon is also observed in Standard Sino-Korean. We will demonstrate that /n/-insertion in this sublexicon shows a different behavior. Before we get to the discussion of /n/-insertion in Standard Sino-Korean, let us briefly mention several types of Sino-Korean compound words discussed previously in Chapter 2. Recall that the Base (shown with "[ ]" below), which is defined as a morpheme or combination of morphemes which can appear as an independent word, plays an important role in categorizing SK compounds, as will be discussed in this section. We will use the terms such as "[RR], R[RR], [RR]R and [RR][RR] compounds" for convenience.

(39) Types of Sino-Korean compounds based on the word-internal Base

a. [RR] compounds

ex) hak-kyo 'school', hak-ca 'scholar'

b. [RR][RR] compounds

ex) hak-kyo-kyo-yuk 'school education'

c. [RR]R compounds

ex) hak-kyo-caN '(school) principal' (hak-kyo 'school')

d. R[RR] compounds

ex) sin-hak-ki 'new semester' (hak-ki 'semester')

In Standard Native Korean, /n/ is optionally inserted between C and i/y at a PrWd juncture, as shown previously. In Standard Sino-Korean, however, /n/ is obligatorily inserted between C and /y/, but not /i/, between a Base and a following Root in [RR]R compounds (40), and between two Bases in [RR][RR] compounds (41). However, /n/-insertion does not take place between a Root and a following Base in R[RR] compounds (43), or between two Roots in [RR] compounds (44). Before we get to the discussion of morphological and prosodic structure of Standard Sino-Korean compounds, we consider the data in which /n/-insertion takes place between a Base and a following Root in [RR]R compounds:

(40) /n/-insertion in [RR]R compounds

("[ ]" indicates the Base)

a.	/[c´-kˆp]-yu/	c´-kˆm-nJyu	'low-class oil'	
b.	/[hwi-pal]-yu/	hwi-palJ-lJyu	'gasoline'	('volatile' 'oil')
c.	/[mæN-caN]-y´m/	mæN-caN-nJy´m	'appendicitis'	('appendix' 'inflammation')
d.	/[kwan-c´l]-y´m/	kwan-c´lJ-lJy´m	'arthritis'	('joint' 'inflammation')
e.	/[on-c^{h}´n]-yok/	on-c^{h}´nJ-nJyok	'hot-spring bathing'	

The following data show that /n/-insertion occurs between two Bases in [RR][RR] compounds:

(41) /n/-insertion in [RR][RR] compounds

a.	/[han-kuk]-[yu-yak]/	han-kuN-nJyu-yak	'Korean enamel'

b.	/[sam-s´N]-[yo-´p]/	sam-s´N-nJyo-´p	'Samsung ceramic industry'
c.	/[man-c^{h}an]-[yak-sok]/	man-c^{h}anJ-nJyak-sok	'dinner appointment'
d.	/[cuN-kuk]-[yo-li]/	cuN-kuN-nJyo-ri	‘Chinese food’

The two sets of the data above show that /n/ is inserted between C and /y/ at a Base-Root boundary in [RR]R and at a Base-Base boundary in [RR][RR].

The following two sets of data show that /n/-insertion does not take place between two Roots within [RR] compounds or between a Root and a following Base in R[RR] compounds:

(42) Lack of /n/-insertion in [RR] (cf. E. Han 1994)

a.	/min-yo/	minJ-yo, *minJ-nJyo	‘folk song’
b.	/yaN-yak/	yaN-yak, *yaN-nJyak	‘western medicine’
c.	/w´n-yu/	w´nJ-yu, *w´nJ-nJyu	‘crude oil’

(43) Lack of /n/-insertion between R and [RR] in R[RR] (cf. Han 1994)

a.	/mok-[yo-il]/	mok-yo-il, *moN-nJyo-il	'Thursday' ('tree' 'day')
b.	/il-[yo-il]/	ir-yo-il, *ilJ-lJyo-il	'Sunday' (‘sun’ ‘day’)
c.	/ky´N-[yaN-sik]/	ky´N-yaN-sik, *ky´N-nJyaN-sik	'light western food'
d.	/my´N-[y´n-ki]/	my´N-y´n-ki, *my´N-nJy´n-ki	'excellent performance'

Furthermore, /n/-insertion does not take place between C and /i/ even at a Base-Base boundary or at Base-Root boundary:

(44) Lack of /n/-insertion between two Bases in [RR][RR]

a.	/[tˆN-caN]-[in-mul]/	tˆN-caN-in-mul, *tˆN-caN-nJin-mul	'characters' (‘appearing’ ‘ figures’)
b.	/[sin-ny´n]-[in-sa]/	sJinJ-nJy´nJ-in-sa, *sJinJ-nJy´nJ-nJin-sa	‘New Year’s greetings’
c.	/[kin-kˆp]-[i-toN]/	kin-kˆp-i-toN, *kin-kˆm-nJi-toN	'emergency dispatch’

(45) Lack of /n/-insertion between [RR] and R in [RR]R

a.	/[kwaN-toN]-in/	kwaN-toN-in, *kwaN-toN-nJin	‘people from Kwangtong’ (‘city name’ ‘people’)
b.	/[cuN-kuk]-in/	cuN-kuk-in, *cuN-kuN-nJin	‘Chinese people’

The following summarizes the observations on /n/-insertion in Standard Sino-Korean compounds:

(46) /n/-insertion in Standard Sino-Korean

a. /n/-insertion in Sino-Korean takes place between C and only /**y**/ (**excluding /i/**) unlike in Native Korean in which /n/ is inserted between C and /i/ or /y/.

b. /n/-insertion in Sino-Korean is **obligatory** (lack of speaker’s variation) unlike that in Native Korean in which /n/-insertion is **optional** (speaker’s variation)

c. /n/-insertion in Sino-Korean takes place between two Bases in [RR][RR] and between a Base and a following Root in [RR]R:

   [RR]n[RR]

   [RR]nR

d. /n/-insertion does not take place between two Roots within [RR] or between a Root and a following Base in R[RR]:

   *[RnR]

   *Rn[RR]

e. We generalize that /n/-insertion takes place only after a C-final Base before /y/.

As for the obligatoriness of /n/-insertion in the Standard Sino-Korean compounds (46b), we are going to argue that only one type of constraint ranking for /n/-insertion is involved in Standard Sino-Korean whereas two types of constraint ranking, as was previously argued, are involved in Standard Native Korean. Based on the generalization in (46c) that /n/-insertion takes place after a C-final Base within a Standard Sino-Korean compound, we are going to define morphological and prosodic structures of Sino-Korean compounds. Since /n/ is obligatorily inserted between a C and only /y/ in Standard Sino-Korean words (46a), we are going to argue (in the next section) that /n/-insertion in Standard Sino-Korean motivates the fact that AMBI-/i/ and AMBI-/y/ are separate constraints.

In section 5.1 of this chapter, we proposed the following constraint ranking to explain why /n/-insertion is preferred over other coronal consonant insertion at a PrWd juncture in Standard and Kyungsang Native Korean:

(47) Constraint ranking in Standard and Kyungsang Native Korean

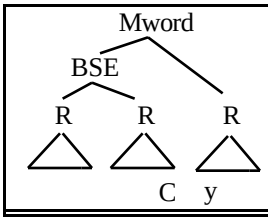
PAL

>> *TJ, *CJ, *SJ

>> *NJ

This constraint ranking is also respected in Standard Sino-Korean. In the tableau below, we will ignore for the moment the question why consonant insertion takes place:

(48) [RR]R in which the Base-final segment is C and a following Root-initial segment is /y/

	PAL	*NJ	DEP-IO
C] ny	*!		
☞C] nJy		*	

In Standard Sino-Korean, the preceding environment for /n/-insertion is a Base-final C. On the other hand, the following environment for /n/-insertion is either Root-initial /y/ or Base-initial /y/. Hence, the notion of the Base plays an important role in /n/-insertion. Based on /n/-insertion, we will define morphological structures of Sino-Korean compounds.

A Sino-Korean Root cannot be inflected or suffixed since there are no inflectional or suffixal elements in Sino-Korean. We propose that a combination of two Roots which can appear as an independent word projects to a Base[45]. On the other hand, the stranded

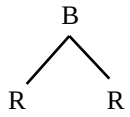
[45] Actually, some Sino-Korean Roots can appear alone (see chapter 2) and hence project to a one-Root Base.

Root in R[RR] and [RR]R compounds is adjoined to the projected Base. In the case of [RR][RR] compounds, the two Bases projects to another Base. The following are the morphological structures of different types of Sino-Korean compounds:

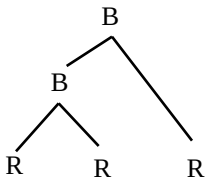
(49) Morphological structures of Sino-Korean compounds

(R = Root; B = Base)

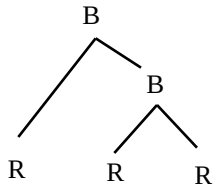
a. [RR]



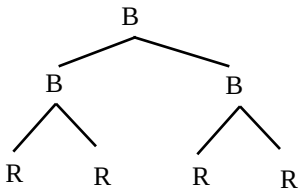
b. [RR]R



c. R[RR]



d. [RR][RR]



We can build the word-internal PrWd structures by referring to the morphological structures defined above. Note that we assume that SK morphological structure is different from that of Native Korean. This is based on several morphological and phonological characteristics of Sino-Korean Roots which are distinct from Native Korean suffixes and Roots. Sino-Korean Roots are different from Native Korean Roots in that most Sino-Korean Roots must appear as part of a Sino-Korean compound. However, Native Korean noun Roots can appear alone as an independent word. On the other hand, Native Korean verb Roots must be accompanied by inflections. However, the Sino-Korean sublexicon does not have suffixes. It has only SK Roots.

---

i) /[yak]/ yak ‘medicine’
/[yak]-kuk/ yak-kuk ‘drug store’

Recall that we proposed in chapter 3 that Native Korean suffixes morphologically merge with a preceding Root. A Sino-Korean Root can be combined with another Sino-Korean Root either on the left side or on the right side (i.e., unfixed linear order combination), unlike a Native Korean suffix, which expands a Root rightward only (Han 1994).

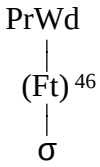
(50) Sino-Korean [RR] compounds

a.	**hak**-ki	'academic term'	('learn' 'period')
b.	**hak**-pi	'tuition'	('learn' 'fee')
c.	tæ-**hak**	'university'	('big' 'learn')
d.	c´n-**hak**	'transfer'	('change' 'learn')

Subcategorization information is not relevant to a Sino-Korean Root, unlike a Native Korean suffix, and Sino-Korean Roots are not freely combinable.

We are going to define prosodic structures of Sino-Korean compounds based on the following hierarchy of prosodic units:

(51) Prosodic hierarchy in Sino-Korean



Since /n/-insertion takes place after a Base in [RR]R and [RR][RR] compounds, we argue that the right edge of a Base must be prosodically more marked to some extent. We tentatively propose that the right edge of a Base is identified as the right edge of a PrWd.

[46] There is no need for a foot structure in Korean. So we ignore foot structure in Korean in our discussion.

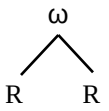
(52) NON-CRISP-ALIGN-R(BASE, PrWd)

The reason why we use non-crisp alignment for the alignment constraint above will become clear later since we will argue that a Sino-Korean Root-final C is realized as ambisyllabic before a Root-initial V. According to this constraint, we can identify prosodic structure of Sino-Korean compounds by referring to morphological structure.

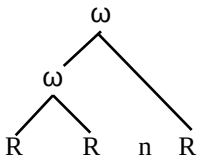
(53) Prosodic structure formation for SK compounds

("n" indicates the inserted /n/.)

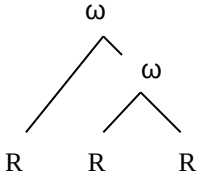
a. [RR] -> $(RR)_{PrWd}$



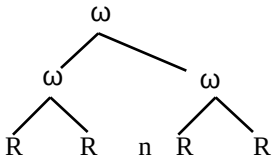
b. [RR]R -> $((RR)_{PrWd}\ R)_{PrWd}$



c. R[RR] -> $(R\ (RR)_{PrWd}\ )_{PrWd}$



d. [RR][RR] -> (RR) $_{PrWd}$ (RR) $_{PrWd}$



According to the prosodic structures above, we can say that /n/-insertion in Sino-Korean compounds takes place after a PrWd-final C (before /y/).

(54) Potential target positions for the obligatorily inserted /n/

( ) = PrWd; [ ] = Base

a. [RR][RR] -> (RR) (RR)

/[han-kuk]-[yu-yak]/ (han-kuN)-(nJyu-yak) 'Korean enamel'

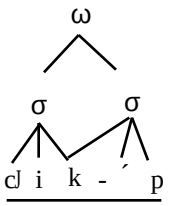
b. [RR]R -> ((R-R) -R)

/[c´-kˆp]-yu/ ((c´-kˆm)-nJyu) 'low-class oil'

Recall that /n/-insertion is optional in Native Korean. In chapter 3, we proposed that a PrWd-final consonant is realized as ambisyllabic when followed by a V across a PrWd juncture in Native Korean. On the other hand, we propose here that a Sino-Korean Root-final consonant is realized as ambisyllabic when followed by a V. Consider the following prosodic structures for different types of SK compounds in which /n/-insertion does not occur:

(55) a. [RR] -> $(RR)_{PrWd}$

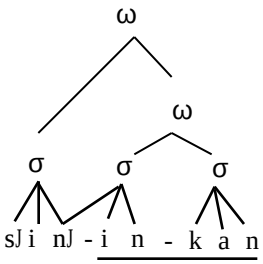
/[cik-´p]/ cJik-´p, * ciN-n´p ‘job’



job

b. R[RR] -> $(R\ (RR)_{PrWd}\ )_{PrWd}$

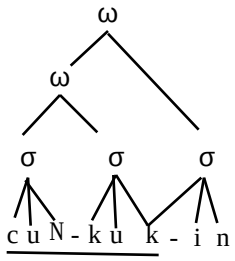
/sin-[in-kan]/ sJinJ-in-kan, *sJinJ-nJin-kan ‘new type of human being’



new human being

(56) a. [RR]R -> $((RR)_{PrWd}\ R)_{PrWd}$

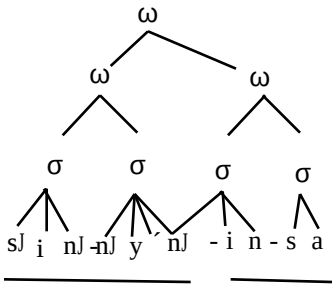
/[cuN-kuk]-in/ cuN-kuk-in, *cuN-kuN-nJin ‘Chinese people’



China people

b. [RR][RR] -> $(RR)_{PrWd}$ $(RR)_{PrWd}$

/[sin-ny´n]-[in-sa]/ sJinJ-nJy´nJ-in-sa, *sJinJ-nJy´nJ-nJin-sa 'New Year's greetings'



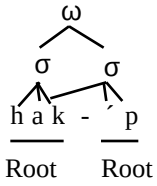
The ambisyllabicity of a Root-final C before a V across a Root juncture is motivated by certain unusual phonotactic constraints in Sino-Korean. In Sino-Korean, a laryngeal/anteriority/continuity distinction never appears in a Root-final C both underlyingly and on the surface. Namely, a Root-final C can only be one of /k, n, t, l, m, p, s, N/. However, a laryngeal/anteriority/continuity distinction is observed in a Root-initial C: i.e., t͡^{h}a-ca 'batter', p͡^{h}an-s͡a 'judge', k͡^{h}wæ-lak 'pleasure', k´m-s͡a 'prosecutor', c͡ak-kok 'composing', c͡^{h}aN-ko 'warehouse'. We previously demonstrated in chapter 3 that those features/node [+cont]/[lar]/ $\overset{\text{C-place}}{\underset{\text{Cor}}{\underset{|}{\underset{|}{\underset{[-ant]}{}}}}}$ are allowed only at the crisp left edge of a syllable:

(57) CRISP-ALIGN-L([+cont]/[lar]/ $\overset{\text{C-place}}{\underset{\text{Cor}}{\underset{|}{\underset{|}{\underset{[-ant]}{}}}}}$, σ)

These seg-to-syll alignment constraints are undominated in Korean and violation of any is fatal. The ambisyllabicity of a Root-final C before a V across a Root juncture predicts that SK will not have the distinction in continuancy, anteriority and laryngeality in a Root-final C. A SK Root is maximally (C)(G)V(C) (where G is a glide). A Root-final C is

syllabified as a coda in word-final position (e.g., sam-kak̲ 'triangle'). It is syllabified also as a coda when it is followed by a C-initial Root (e.g., ip̲-caɴ 'position') Finally, a Root-final C must be syllabified as ambisyllabic when it is followed by a vowel-initial Root according to our proposal that a Root-final C is realized as ambisyllabic before a V at a Root juncture, i.e., the ambisyllabicity of a Root-final C before a V satisfies CA-L([+cont]/[lar]/ $\overset{\text{C-place}}{\underset{\text{Cor}}{\underset{[-\text{ant}]}{|}}}$, σ) and SyllCon.

(58) /hak-´p/ hak-´p 'study'



As a result, a Root-final consonant will always be realized either as a coda or as ambisyllabic regardless of the following segment. It then is predicted that those features/node [lar]/[+cont]/[-ant] are never realized in Root-final position on the surface, since any feature or node in a Root-final C is never crisp-aligned at the left edge of a syllable. Hence, [lar]/[+cont]/[-ant] in a Root-final C never surfaces and the distinction in continuancy, anteriority and laryngeality in a Root-final C is never posited in the input.

On the other hand, consonants with [lar]/[+cont]/[-ant] can appear in Root-initial position. This is because those consonants can be uniquely syllabified as an onset and [lar]/[+cont]/[-ant] in Root-initial position will be crisp left-aligned with a syllable (e.g., /t̲^{h}a-c̲a/ 'hitter', /s̲a-ki/ 'fraud', /koN-s̲a/ 'construction'). This strongly motivates the proposal that the Root-final C before a V across a Root juncture is realized as ambisyllabic. Based on this proposal, we further argue that the right edge of a Root is non-crisp aligned with the right edge of a syllable.

(59) a. Non-Crisp-Align-R(Root, σ)

b. SyllCon

c. DEP-IO

d. Ranking

NCA-R(Root, σ), SyllCon >> DEP-IO

The high ranking status of Non-Crisp-Align-R(Root, σ) and SyllCon forces the Root-final C before a Root-initial V to be realized as ambisyllabic.

(60) /kuk-ik/ kuk-ik 'national interests'

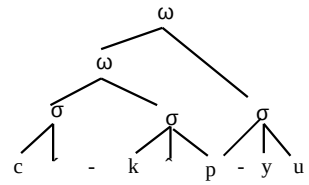
("·k·" is ambisyllabic; "C" is epenthetic)

/kuk-ik/	NCA-R (Root, σ)	SyllCon	DEP-IO
kuk.-ik		*!	
ku.k-ik	*!		
kuk-Cik			*!
☞ku·k·-ik			

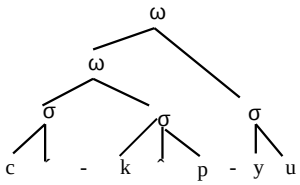
On the other hand, recall that we generalized that /n/-insertion takes place only after a C-final Base (before /y/) in Sino-Korean. Recall also that /n/ insertion occurs when the Base ends with a consonant and the following Root begins with /y/ in Sino-Korean. Hence, we have to eliminate configurations in (61a) and (61b) below in favor of the configuration in (61c):

(61) /[c´-kˆp]-yu/ c´-kˆm-nJyu ‘low-class oil’

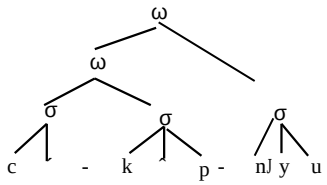
a. non-optimal



b. non-optimal

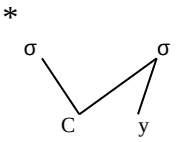


c. optimal



We can eliminate (61b) since (61b) violates highly ranked SyllCon. We also have to eliminate (61a) in favor of (61c). In section 5.2, we proposed AMBI-/y/:

(62) AMBI-/y/



An ambisyllabic C is not allowed before /y/.

Recall that we have shown in section 5.2 that any ambisyllabic consonant is dispreferred before /y/ and /i/ in Standard and Kyungsang Native Korean. And we proposed AMBI-/y/ and AMBI-/i/ for Native Korean. Hence, AMBI-/y/ is independently motivated. In Standard Sino-Korean, however, not all ambisyllabic C's are dispreferred before /y/. Since /n/-insertion occurs only after a C-final Base, a Base-internal ambisyllabic C before /y/ is allowed and hence /n/-insertion does not occur between two Roots. In the next section, on the other hand, we will show that any ambisyllabic C is dispreferred before /y/ (regardless of whether it is Base-final or Root-final) in Kyungsang Sino-Korean and hence /n/-insertion can occur even within a Base.

Turning back to the non-optimal configuration in question (61a) in Standard Sino-Korean, AMBI-/y/ alone cannot explain why only an ambisyllabic Base-final C is dispreferred before /y/. When we consider the non-optimal candidate in (61a), an ambisyllabic C is dispreferred before /y/ only if it is a Base-final C. This non-optimal configuration has the following two characteristics:

(63) Two characteristics of non-optimal (61a):

a. An ambisyllabic C appears before /y/ (violation of AMBI-/y/)

b. A Base-final C is ambisyllabic

(63a) alone violates AMBI-/y/. Suppose that (63b) violates some OT constraint. Then the constraint will be as follows:

(64) Crisp-Align-R(Base, σ)[47] (hereafter, CA-R(Base, σ))

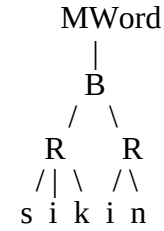
A Base is crisp right-aligned with a syllable.

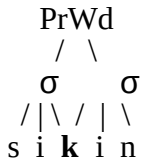
[47] The observation that a SK Root-final C and Base-final C before a Root-initial V is realized as ambisyllabic, reflects the fact that Chinese and Sino-Korean have a rigid morpheme-syllable correspondence.

CA-R(Base, σ) does not allow a Base-final C to be ambisyllabic. However, it is easily violable since a Base-final C is realized as ambisyllabic before a vocoid, as shown in (65b):

(65) a. /sik-in/ sik-in 'cannibalism'

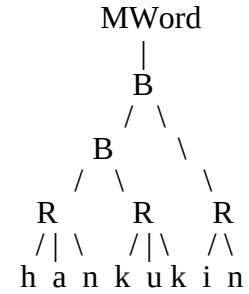
morphological structure prosodic structure

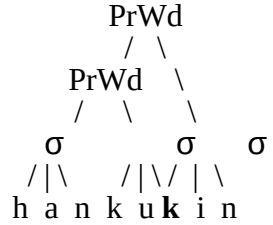




b. /[han-kuk]-in/ han-kuk-in 'Korean people'

morphological structure prosodic structure

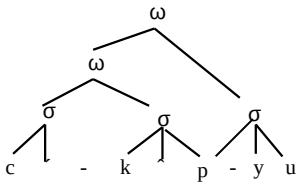




Since we generalized in section 5.6 that a Root-final C is realized as ambisyllabic before a Root-initial V, it is expected that a Base-final C is realized as ambisyllabic before a V-initial Root. Hence, CA-R(Base, σ) must be ranked very low in the constraint ranking.

Now let us consider the non-optimal candidate in (61a) again (repeated as (66) below):

(66) non-optimal



AMBI-/y/ and CA-R(Base, σ) are violated simultaneously in non-optimal candidate (66). This suggests that simultaneous violation of AMBI-/y/ and CA-R(Base, σ) is fatal in comparision with non-fatal violation of either AMBI-/y/ or CA-R(Base, σ) independently in Standard Sino-Korean. We conclude that there is a conjunction relationship (Smolensky 1995) between AMBI-/y/ and CA-R(Base, σ): i.e., simultaneous violation of AMBI-/y/ and CA-R(Base, σ) is fatal.

Smolensky 1995 proposes that the conjunctive relationship may exist between two constraints. Smolensky defines the local conjunction of constraints as follows:

(67) a. Derived constraint generation

[P, Q CON} [P $\&_l$ Q CON]

(“…$\&_l$…” $=_{def}$ “...locally conjoined with..”)

If P and Q are members of the constraint set CON, so is the derived constraint P$\&_l$Q (read: P locally conjoined with Q”): P$\&_l$Q is violated if and only if there is some domain D in which both P and Q are violated.

b. Ranking (universal): P$\&_l$Q >> {P, Q}

Itô & Mester 1996 also demonstrate that constraint conjunction is necessary to explain the Danish stød and Japanese Rendaku. Also in section 3.8 of this dissertation, we used constraint conjunction of non-crisp alignment and CrispEdge(PCat) to remove crisp

alignment as an alternative analysis to the analysis (in chapter 3) which treats non-crisp alignment and crisp alignment.as separate classes of constraints.

As for /n/-insertion in Standard Sino-Korean, /n/-insertion occurs only when a Base-final C is followed by /y/. We propose that /n/-insertion is compelled to simultaneously satisfy the following two constraints:

(68) Constraint conjunction

Crisp-Align-R(Base, σ) & AMBI-/y/

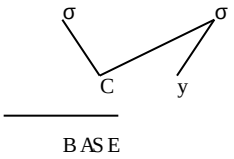
(henceforth, CA-BSE/AMBI-/y/)

Interpretation:

1. A Base-final C/V must be at the crisp right edge of a syllable.

2. An ambisyllabic C cannot occur before /y/

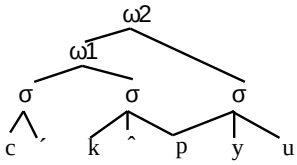
*



The CA-BSE/AMBI-/y/ is violated only when both constraints are violated at the same time. Violation of either constraint does not produce a violation mark for CA-BSE/AMBI-/y/. The proposed CA-BSE/AMBI-/y/ does not affect [RR] compounds since no Base is involved within [RR] compounds. Since CA-BSE/AMBI-/y/ is not violated in Standard Sino-Korean, we assume that it is undominated.

Now, let us consider how /n/-insertion in a [RR]R compound is explained by the proposed constraint conjunction.

(69) /[c´-kˆp]-yu/ c´-kˆm-nJyu 'low-class oil'

input /[c´-kˆp]-yu/	PAL	NCA-R (Root, σ)	CA-BSE/ AMBI-/y/	SyllCon	DEP-IO
a 			*!		
b ((c´-kˆp.)-yu)				*!	
c ☞((c´-kˆm)-nJ yu)					*

In candidate (a), the Base-final /p/ is syllabified as ambisyllabic before /y/. Hence, the first candidate simultaneously violates CA-BSE and AMBI-/y/ since the right edge of the Base is not crisp aligned with the right edge of a syllable and the (Base-final) ambisyllabic [p] appears before /y/. Violation of high ranked CA-BSE/AMBI-/y/ is fatal and is eliminated in favor of candidate (c). Candidate (b) fatally violates high ranked SyllCon. Candidate (c)violates only low ranked DEP-IO and is optimal.

So far we have shown that CA-BSE/AMBI-/y/ must be ranked above DEP-IO. We have built the following constraint ranking:

(70) Constraint ranking

PAL, NCA-R(Root, σ), CA-R(Base, σ) & AMBI-/y/, SyllCon

>> DEP-IO

Early in this section, we proposed the following constraint ranking to explain why /n/-insertion is preferred over other coronal consonant insertion:

(71) Constraint ranking

PAL

>> *TJ, *CJ, *SJ

>> *NJ

Combining these, we arrive at the following constraint ranking for /n/-insertion in Standard Sino-Korean:

(72) Constraint ranking in Standard Sino-Korean

PAL, NCA-R(Root, σ), CA-R(Base, σ) & AMBI-/y/, SyllCon

>> *TJ, *CJ, *SJ

>> *NJ

>> DEP-IO

The following tableau demonstrates how a Base-final C before non-/y/ vocoid is realized as ambisyllabic:

(73) /[han-kuk]-in/ haN-kuk-in 'Korean people'

("·C·" is ambisyllabic)

/[han-kuk]-in/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI-/y/	*NJ	DEP-IO
a. haN-kuk.-in		*!			
b. haN-ku.k-in	*!				
c. ☞ haN-ku·k·-in					
d. haN-kuk.-nJin		*!		*	*
e. haN-kuN.-nJin				*!	*

Candidate (c) does not violate any constraint and is optimal. Hence the current ranking predicts that /n/-insertion does not occur between a Base-final C and a following /i/.

The following tableau illustrates why /n/-insertion must occur between a C-final Base and /y/:

(74) /[c´-kˆp]-yu/ c´-kˆm-nJyu 'low-class oil'

/[c´-kˆp]-yu/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI-/y/	*NJ	DEP-IO
c´-kˆp.-yu		*!			
c´-kˆ.p-yu	*!				
c´-kˆ·p·-yu			*!		
c´-kˆp.-nJyu		*!		*	*
☞c´-kˆm.-nJyu				*	*

In the tableau above, all the candidates except the last candidate violate at least one constraint ranked higher than *NJ. The last candidate violates lower ranked *NJ and DEP-IO. Hence the last candidate is optimal. The current ranking correctly predicts that /n/-insertion and nasal assimilation (see also the data for Korean nasal assimilation in (86) in section 3.7) in must occur between a C-final Base and a following /y/.

We further demonstrate that the current constraint ranking also blocks /n/-insertion between a C-final Base and /w/:

(75) /[cʰaN-kyˊN]-wˊn/ cʰaN-kyˊN-wˊn ‘Changkyung Garden’

/[cʰaN-kyˊN]-wˊn/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI-/y/	*NJ	DEP-IO
a cʰaN-kyˊN.-wˊn		*!			
b cʰaN-kyˊ.N-wˊn	*!				
c ☞ cʰaN-kyˊ·N·-wˊn					
d cʰaN-kyˊN.-nwˊn					*!

In candidate (c), the Base-final [N] which is ambisyllabic appears before /w/. This configuration does not violate AMBI-/y/ and therefore the constraint conjunction CA-BASE/AMBI-/y/ is not violated. Furthermore, candidate (c) does not violate any other constraint and is optimal.

On the other hand, the following is a case in which /n/ is inserted between two Bases in a [RR][RR] compound:

(76) /[han-kuk]-[yu-yak]/ han-kuN-nJyu-yak 'Korean enamel’

(“·C·” is ambisyllabic C)

input /[han-kuk]-[yu-yak]/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI-/y/	*NJ	DEP-IO
han-kuk.- yu-yak		*!			
han-ku.k- yu-yak	*!				
han-ku·k·- yu-yak			*!		
han-kuk- nJ yu-yak		*!		*	*
☞ han-kuN-nJ yu-yak				*	*

The following tableau demonstrates why /n/ is not inserted between a consonant and a following /i/ between two Bases in [RR][RR]:

(77) /[tʰN-caN]-[in-mul]/ tʰN-caN-in-mul 'characters (in movies)’

input /[tʰN-caN]-[in-mul]/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI-/y/	*NJ	DEP-IO
tʰN-ca.N-in-mul	*!				
tʰN-caN.-in-mul		*!			
☞tʰN-ca·N·-in-mul					
tʰN-caN.-nJin-mul				*!	*

The following tableau demonstrates that /n/ is not inserted between two Bases in [RR][RR] when the first Base ends with a vowel:

(78) /[tæ-ku]-[yu-yak]/ tæ-ku-yu-yak ‘Taegu enamel’

input /[tæ-ku]-[yu-yak]/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI-/y/	*NJ	DEP-IO
☞tæ-ku- yu-yak					
tæ-ku-nJ yu-yak				*!	*

Finally, the current constraint ranking predicts that /n/ is not inserted between a stranded Root and a following Base in a R[RR] compound:

(79) /mok-[yo-il]/ mok-yo-il 'Thursday'

input /mok-[yo-il]/	NCA-R (Root, σ)	SyllCon	CA-BSE/ AMBI	*NJ	DEP-IO
mok.-yo-il		*!			
mo.k-yo-il	*!				
☞mo·k·-yo-il					
mok-nJyo-il		*!		*	*
moN-nJyo-il				*!	*

So far we have shown how the proposed constraint ranking explains /n/-insertion in Standard Sino-Korean. The following summarizes /n/-insertion in Standard Sino-Korean compounds:

(80) /n/-insertion in Standard Korean SK

([nJ] is the inserted /n/)

a. /n/-insertion after a C-final Base in a [RR]R compound:

Roots: { } { } { }

PrWd's: ((C) **n**J y)

b. /n/-insertion between two Bases in a [RR][RR] compound:

Roots: { } { } { } { }

PrWd's: ((C) (**n**J y))

c. Lack of /n/-insertion in [RR] and R[RR] compounds:

[RR} compound

Roots: { } { }

PrWd's: (C y)

R[RR] compound

Roots: { } { } { }

PrWd's: (C (y))

5.7 /n/-insertion in Kyungsang Sino-Korean

In the previous section, we have shown that /n/ is obligatorily inserted after a C-final Base in Standard Sino-Korean. However, Kyungsang Sino-Korean data show that /n/-insertion is not limited to a post-C-final Base environment before /y/, unlike /n/-insertion in Standard Sino-Korean.

(81) /n/-insertion in Sino-Korean [RR] compounds (data from E. Han 1994)

		Kyungsang SK	(Standard SK)	
a.	/[min-yo]/	minJ-nJyo	(minJ-yo)	‘folk song’
b.	/[yaN-yak]/	yaN-nJyak	(yaN-yak)	‘western medicine’
c.	/[w´n-yu]/	w´nJ-nJyu	(w´nJ-yu)	‘crude oil’

In both Standard and Kyungsang Sino-Korean compounds, on the other hand, /n/-insertion occurs between a Base-final C and /y/ in [RR]R and [RR][RR] compounds:

(82) /n/-insertion between a Base and a following Root in [RR]R compounds (Kyungsang and Standard Sino-Korean)

a.	/[sik-yoN]-yu/	sJiN-nJyoN-nJyu	'cooking oil' (‘eating-purpose’ ‘oil’)
b.	/[hwi-pal]-yu/	hwi-palJ-lJyu	'gasoline' (‘volatile’ ‘oil’)
c.	/[mæN-caN]-y´m/	mæN-caN-nJy´m	'appendicitis' (‘appendix’ ‘inflammation’)
d.	/[kwan-c´l]-y´m/	kwan-c´lJ-lJy´m	'arthritis' (‘joint’ ‘inflammation’)

e. /[on-c^{h}´n]-yok/ on-c^{h}´nJ-nJyok 'hot-spring bathing'

(83) /n/-insertion between two Bases in [RR][RR] compounds (Kyungsang and Standard Sino-Korean)

a. /[han-kuk]-[yu-yak]/ han-kuN-nJyu-yak 'Korean '
b. /[sam-s´N]-[yo-´p]/ sam-s´N-nJyo-´p 'Samsung ceramic industry'
c. /[man-c^{h}an]-[yak-sok]/ man-c^{h}anJ-nJyak-sok 'dinner appointment'
d. /[cuN-kuk]-[yo-li]/ cuN-kuN-nJyo-ri ‘Chinese food’

In Kyungsang SK compounds, however, /n/-insertion also occurs between a Root and a following /y/-initial Base in R[RR] compounds, unlike in Standard SK compounds:

(84) /n/-insertion between the first Root and a following Base in R[RR] compounds (cf. Han 1994)

		Kyungsang SK	(Standard SK)	
a.	/il-[yo-il]/	ilJ-lJyo-il[48]	(ir-yo-il)	'Sunday'
b.	/ky´N-[yaN-sik]/	ky´N-nJyaN-sJik	(ky´N-yaN-sJik)	'light Western food'
c.	/my´N-[y´n-ki]/	my´N-nJy´n-ki	(my´N-y´n-ki)	'excellent performance'

Finally, /n/-insertion does not occur before /i/ in Kyungsang SK compounds, which pattern together with Standard SK compounds:

[48] In [ilJlJyoil], /n/ is inserted between /l/ and /y/ and assimilates to a preceding /l/.

(85) Lack of /n/-insertion between a consonant and /i/ (Kyungsang and Standard SK)

Between two Roots within [RR] compounds

a. /[han-in]/ hanJ-in ‘Korean people’

b. /[cuN-in]/ cuN-in ‘middle-class people’

Between two Bases in [RR][RR] compounds

c. /[tʃN-caN]-[in-mul]/ tʃN-caN-in-mul ‘characters’

d. /[sin-ny´n]-[in-sa]/ sJinJ-nJy´nJ-in-sa ‘New Year greeting’

Between a Base and a following Root in [RR]R compounds

e. /[kwaN-toN]-in/ kwaN-toN-in ‘people from Kwangtong’

f. /[cuN-kuk]-in/ cuN-kuk-in ‘Chinese people’

Based on the /n/-insertion data in Kyungsang SK, we observe that /n/ is inserted between a Root-final C and a Root-initial /y/, as opposed to /n/-insertion in Standard SK, in which /n/ is inserted only between a Base-final C and a Root-initial or Base-initial /y/.

In section 5.6, we proposed the following constraint ranking for /n/-insertion in Standard Sino-Korean:

(86) Constraint ranking for the Standard Sino-Korean

PAL, NCA-R(Root, σ), CA-R(Base, σ) & AMBI-/y/, SyllCon

>> *TJ, *CJ, *SJ,

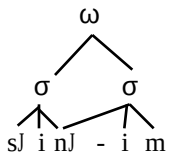
>> *NJ

>> DEP-IO,

We further proposed (in section 5.6) that the Root-final C before a V is realized as ambisyllabic in Sino-Korean.

(87) Ambisyllabicity of a Root-final C before a Root-initial V

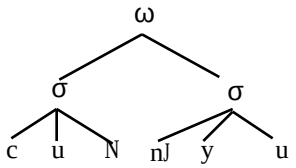
/[sin-im]/ sJinJ-im 'trust'



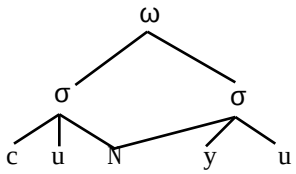
We observed in this section that /n/-insertion takes place between a Root-final C and a Root-initial /y/ in Kyungsang Sino-Korean. Consider the following two potential candidates, given a [RR] compound:

(88) /[cuN-yu]/ cuN-nJyu 'crude oil'

a. optimal candidate (via /n/-insertion)



b. non-optimal candidate (ambisyllabification without /n/-insertion)



For Kyungsang SK compounds, we have to eliminate (88b) in which the Root-final C is realized as ambisyllabic. In order to eliminate (88b) in favor of (88a), we propose that AMBI-/y/ is highly ranked in the SK sublexicon of the Kyungsang Dialect:

(89) Constraint ranking for consonant insertion (compare the ranking in Standard SK in (86))

PAL, NCA-R(Root, σ), SyllCon, AMBI-/y/

>> *TJ, *CJ, *SJ

>> *NJ

>> DEP-IO

The highly ranked AMBI-/y/ disallows any ambisyllabic C before /y/. Hence, either consonant insertion or unique coda syllabification of the Root-final C is needed to avoid violation of AMBI-/y/. However, unique coda syllabification must be avoided due to high ranked SyllCon. Hence, /n/-insertion must take place at the cost of violating low ranked *NJ and DEP-IO. The following tableau shows a case in which /n/-insertion takes place between two Roots between a C and /y/ in a [RR] compound:

(90) /[cuN-yu]/ cuN-nJyu 'crude oil'

input /[cuN-yu]/	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
a. cuN.-yu		*!			
b. cu.N-yu	*!				
c. cu·N·-yu			*!		
d. ☞cuN.-nJyu				*	*

Candidate (a) violates highly ranked SyllCon since the less sonorant Root-final C is syllabified as a coda before more sonorant /y/ across a syllable boundary. Candidate (b) violates higher ranked NCA-R(Root, σ) since the right edge of the first Root is not non-crisp aligned with the right edge of a syllable. Candidate (c) violates highly ranked AMBI-

/y/ since the Root-final C is realized as ambisyllabic before /y/. Candidate (d) violates only lower ranked *NJ and DEP-IO due to /n/-insertion and secondary palatalization. Therefore, candidate (d) is optimal.

The following tableau demonstrates why /n/-insertion does not occur between a V and /y/:

(91) /ka-yo/ ka-yo ‘popular song’

input /[ka-yo]/	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
☞ka- yo					
ka-.nJ yo				*!	*

Now consider more tableaux which demonstrate how the proposed constraint ranking works in other types of Sino-Korean compounds in the Kyungsang Dialect. The following tableau shows a case in which /n/ is inserted between a two-Root Base-final C and a following stranded Root-initial /y/ in a [RR]R compound:

(92) /[c´-kˆp]-yu/ c´-kˆm-nJyu 'cooking oil'

input /[c´-kˆp]-yu/	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
c´-kˆp.-yu		*!			
c´-kˆ.p-yu	*!				
c´-kˆ·p·-yu			*!		
c´-kˆp.-nJyu		*!		*	*
☞c´-kˆm.-nJyu				*	*

In the tableau above, all candidates except the last one violate at least one constraint higher ranked than *NJ. The last candidate violates only low ranked *NJ and DEP-IO and is optimal.

On the other hand, /n/ fails to be inserted between a Base-final C and /i/ in a [RR]R compound:

(93) /[kwaN-toN]-in/ kwaN-toN-in ‘people from Kwangtong’

input /[kwaN-toN]-in/	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
kwaN-to.N-in	*!				
kwaN-toN.-in		*!			
☞kwaN-to·N·-in					
kwaN-toN.-nJin				*!	*

The following is a case in which /n/-insertion takes place between two Bases between C and /y/ in a [RR][RR] compound:

(94) /[han-kuk]-[yu-yak/] han-kuN-nJyu-yak 'Korean enamel’

input /[han-kuk]-[yu-yak/]	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
han-ku.k- yu-yak	*!				
han-kuk.- yu-yak		*!			
han-ku·k·- yu-yak			*!		
han-kuk.-nJ yu-yak		*!		*	*
☞han-kuN.-nJ yu-yak				*	*

The current constraint ranking correctly predicts that /n/ is not inserted between a consonant and /i/ (between two Bases) in a [RR][RR] compound:

(95) /[tʰN-caN]-[in-mul]/ tʰN-caN-in-mul 'characters (in movies)'

input /[tʰN-caN]-[in-mul]/	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
tʰN-ca,N-in-mul		*!			
tʰN-caN.-in-mul	*!				
☞tʰN-ca·N·-in-mul					
tʰN-caN.-nJin-mul		*!		*	*

/n/ is inserted between a Root and a following Base in a R[RR] compound:

(96) /kyˊN-[yaN-sik]/ kyˊN-nJyaN-sJik 'light western food'

input /kyˊN-[yaN-sik]/	NCA-R (Root, σ)	SyllCon	AMBI-/y/	*NJ	DEP-IO
kyˊ.N-yaN-sJik	*!				
kyˊN.-yaN-sJik		*!			
kyˊ·N·-yaN-sJik			*!		
☞kyˊN.-nJyaN-sJik				*	*

The following summarizes /n/-insertion in Kyungsang Sino-Korean compounds:

(97) /n/-insertion in Kyungsang SK predicted by constraint ranking

Generalization: /n/ is inserted between a Root-final C and a Root-initial /y/

[RR] compound

Roots: { } { }

PrWd's: (C **n**J y)

[RR]R compound

Roots: { } { } { }

PrWd's: ((C) nJ y)

R[RR] compound

Roots: { } { } { }

PrWd's: (C (nJ y))

[RR][RR] compound

Roots: { } { } { } { }

PrWd's: ((C) (nJ y))

5.8 Summary of Constraint Rankings

So far we have proposed constraint rankings for variation of /n/-insertion in different sublexica of different dialects:

(98) a. Native Korean sublexicon of Standard and Kyungsang Dialect: two types of constraint ranking

1. /n/-insertion

PAL, NCA-R($Root_0^{max}$, PrWd), SyllCon, AMBI-/i/, AMBI-/y/ >> DEP-IO

2. No /n/-insertion

DEP-IO, PAL, NCA-R($Root_0^{max}$, PrWd), SyllCon >> AMBI-/i/, AMBI-/y/

b. SK sublexicon of Standard Korean

PAL, NCA-R(Root, σ), CA-R(Base, σ) & AMBI-/y/, SyllCon

>> DEP-IO,

c. SK sublexicon of Kyungsang Dialect

PAL, NCA-R(Root, σ), SyllCon, AMBI-/y/

>> DEP-IO

5.9 /n/-insertion and /n/- or /l/-deletion in Standard Sino-Korean

In this section, we are going to show that /n/- or /l/- deletion occurs at Base-initial position before a high front vocoid in Standard Sino-Korean. As we will show, the required phonological environment for /n/ or /l/-deletion (i.e., before /y/) overlaps with the phonological environment for /n/-insertion (i.e., between a C and /y/). We will further demonstrate in the next section how the two phenomena interact with each other, given the overlapping morphological and phonological environment.

Sino-Korean Root-initial /l/ and /n/ do not always surface, depending on the morphological/prosodic environment. First of all, n, l and Ø are contrastive Root-initially within Sino-Korean [RR] compounds:

(99) Minimal pairs in Sino-Korean words

(allophonic variations are ignored below for simplicity.)

a. /ko-ip/	ko-ip	high school admission'	cf. /ip-si/	ip-s'i	'admission exam'
b. /ko-lip/	ko-lip	isolation'	cf. /lip-caN/	ip-c'aN	'position'
c. /tæ-lo/	tæ-lo	big road'	cf. /lo-py´n/	no-py´n	'road side'

d. /tæ-no/	tæ-no	'great anger'	cf. /no-ki/	no-ki	'anger'
e. /o-ny´n/o-ny´n		'five years'	cf. /ny´n-to/	y´n-to	year'
f. /o-y´n/	o-y´n	'name'			

The data above show that the contrast among /l/, /n/ and Ø, must be retained in the UR of Sino-Korean Roots. /l/ and /n/ are neutralized in Base-initial position: /n/-deletion occurs in /ny´n-to/ [y´nto] (99e), /l/-deletion occurs in /lip-caN/ [ipc'aN] (99b) and /l/-nasalization occurs in /lo-py´n/ [nopy´n] (99c) and also see below).

Let us consider the /n/-deletion phenomenon in Sino-Korean. /n/ is deleted before /i/ or /y/ in Base-initial position.

(100) [RR] compound

a.	/[ny´n-tæ]/	->	y´n-tæ	'year'
b.	/[ny´-s´N]/	->	y´- s´N	'woman'
c.	/[nik-my´N]/	->	ik-my´N	'unanimity'
d.	/[nyo-do]/	->	yo-to	'urethra'

(101) R[RR] compound

a.	/pan- [nik-my´N]/	->	panɹ-ik-my´N	'semi-unanimity'
b.	/ku- [ny´-s´N]/	->	ku- y´-s´N	‘old fashioned women’

(102) [RR]R compound

a.	/[ny´n-tæ]-ki/	->	y´n-tæ-ki	'year'
b.	/[nyo-do]-y´m/	->	yo-to-y´m	'urethra inflammation'

On the other hand, Base-initial /n/ is retained before non-i/y vocoid.

(103)	a.	/[næ-il]/	->	næ-il	'tomorrow'
	b.	/[nam-ca]/	->	nam-ca	'man'
	c.	/[nwæ-mul]/	->	nwæ-mul	'bribe'

The intervocalic or post-consonantal /n/ is also retained even before a high front vocoid if it is not in Base-initial position. Note in the following data that secondary palatalization takes place in /n/ before a high front vocoid:

(104)	a.	/[o-ny´n]/	o-nJy´n	'five years'
	b.	/[tæ-no]/	tæ-no	'great anger'
	c.	/[ca-ny´]/	ca-nJy´	'children'
	d.	/[c^h´-ny´]/	c^h´-nJy´	‘unmarried woman’
	e.	/[nam-ny´]/	nam-nJy´	‘man and woman’
	f.	/[ki-mi]-ny´n/	ki-mi-nJy´n	‘Kimi Year’

In the /n/-deletion data above in (100 - 102), we observe that secondarily palatalized [nJ] is not allowed to appear in Base-initial position and must be deleted on the surface.

A similar phenomenon is found with Base-initial /l/. Root-initial /l/ is deleted before a high front vocoid at BASE-initial position (/l/-deletion).

(105)	a.	/[lyaN-sim]/	yaN-sim	'conscience'
	b.	/[ly´-hæN]/	y´-hæN	'trip'
	c.	/[lye-^y]/	ye-^y	'etiquette'
	d.	/[li-ca]/	i-ca	'interest'

e. /[li-pal]/ i-pal 'hair-cut'

The deletion of /l/ at Base-initial position before a high front vocoid also takes place in [RR]R, R[RR] and [RR][RR] compounds, regardless of the preceding environment:

(106) a.

/sil-[li-ca]/	sir-i-ca	'net interest'
cf. /[li-ca]/	i-ca	'interest'
/s´n-[li-ca]/	s´n-i-ca	'interest in advance'
/c´-[li-ca]/	c´-i-ca	'low interest'
/mu-[li-lon]/	mu-i-ron	'no theory'
cf. /[li-lon]/	i-ron	'theory'
/ku-[li-lon]/	ku-i-ron	'old theory'
/y´k-[li-yoN]/	y´k-i-yoN	'counter-usage'
cf. /[li-yoN]/	i-yoN	'usage'
/[w´l-mal]-[li-ca]/	w´l-mar-i-ca	'monthly interest' (‘monthly-end’ ‘interest’)

b.

/næ-[lyu-s´N]/	næ-yu-s´N	'inferior planets'
cf. /[lyu-s´N]/	yu-s´N	'planet'
/mol-[ly´m-c^{h}i]/	mor-y´m-c^{h}i	'shamelessness'
cf. /[ly´m-c^{h}i]/	y´m-c^{h}i	‘shame’
/[hæ-wæ]-[ly´-hæN]/	hæ-wæ-y´-hæN	'foreign trip'
cf. / ly´-hæN/	y´-hæN	‘trip’

On the other hand, the following data show that /l/-deletion does not take place in the Base-initial position when l is followed by a non-i/y vocoid:

(107) [RR][RR] compounds

a.	/[c´N-sin]-[lo-toN]/	c´N-sin-no-toN	'mental labor'
b.	/[ci-saN]-[lak-w´n]/	cJi-saN-nak-w´n	‘paradise on earth’
c.	/[cik-kw´n]-[lam-yoN]/	cJik-kw´n-nam-yoN	‘authority abuse’
d.	/[yuk-c^{h}e]-[lo-toN]/	yuk-c^{h}e-no-toN	‘physical labor’
e.	/[hak-c´k]-[lu-lak]/	hak-c´N-nu-lak	‘studentship omission’

The data above show that /l/ is realized as [n] when it is syllabified as an onset (/l/-nasalization).

In a rule-based theory, /n/- and /l/-deletion would be explained by the following two rules, which are in a feeding relationship:

(108) Rules

a.	/l/-Nasalization (LN):	$l \rightarrow n \; / \; \underset{\sigma}{\_\_\_}$
b.	/n/-Deletion (ND):	n -> Ø / Base[___ i/y
c.	LN is ordered before ND	

LN feeds ND in the derivation from /lyaN-sim/ to [yaN-sJim]:

(109) Derivation

		/lyaN-sim/
a.	LN	nyaN-sim
b.	ND:	yaN-sim
		[yaNsJim]

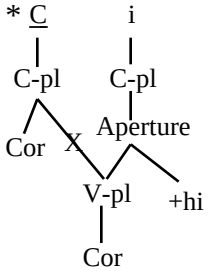
In the OT framework, we propose that a secondarily palatalized coronal sonorant consonant (i.e., [nʲ] and [lʲ]) is disallowed at Base-initial position. We provide the following constraint:

(110) *BASE[[+son, +cons, -vocalic] → V-place → Cor (hereafter, *[son]ʲ)

The constraint *[son]ʲ says that a secondarily palatalized sonorant consonant is disallowed in Base-initial position, irrespective of its surface syllabification. One interesting characteristic of *[son]ʲ is that information about position with respect to a morphological constituent (Base) enforces a phonological restriction. Normally phonological constraints refer only to prosodic structure. The importance of the Base has been discussed to analyze reduplication or to achieve the "cyclic" effect in the OT literature (Benua 1995, McCarthy & Prince 1995, Kenstowicz 1995 and others). However, we report another characteristic of the Base: the Base enforces a phonological restriction. Namely, *[son]ʲ prevents both secondarily palatalized [nʲ] and [lʲ] from appearing in Base-initial position. *[son]ʲ affects only these secondarily palatalized coronals. Since *[son]ʲ is not violated in Korean, we assume that it is undominated in the constraint ranking.

The constraints *[son]ʲ and PAL conspire to block appearance of /l/ before a high front vocoid at Base-initial position. We repeat the PAL constraint below, which has been proposed in chapter 4:

(111) PAL



Illformed (*) unless a coronal consonant and a following high front vowel share the V-pl.

The following tableau illustrates how PAL and *[son]ʲ conspire to block appearance of /n/ at BASE-initial position before /y/:

(112) /[ny´n-tæ]/ y´n-tæ 'year'

/[ny´n-tæ]/	NCA-R (Root, σ)	SyllCon	PAL	*[son]ʲ	MAX-IO
a. ny´n-tæ			*!		
b. nʲy´n-tæ				*!	
c. ☞y´n-tæ					*

The input /n/ before /y/ at Base-initial position must undergo palatalization. However, if it did, the secondarily palatalized [nʲ] would violate *[son]ʲ, which does not allow a secondarily palatalized coronal sonorant consonant at Base-initial position. To avoid violation of PAL and *[son]ʲ, deletion of the input /n/ is compelled (violation of lower ranked MAX-IO). As a result, candidate (c) is optimal.

On the other hand, the relative ranking of PAL, *[son]ʲ >> MAX-IO does not block the appearance of palatalized [nʲ] before a high front vocoid in a position other than BASE-initial position:

(113) /[o-ny´n]/ o-nʃy´n 'five years'

/[o-ny´n]/	NCA-R (Root, σ)	SyllCon	PAL	*[son]ʃ	MAX-IO
o.-ny´n			*!		
☞o.-nʃy´n					
o.-y´n					*!

The surface appearance of a non-palatalized [n] in Base-initial position before a non-i̲/y̲ vocoid is permitted according to the proposed constraint ranking:

(114) /[næ-il]/ næ-il 'tomorrow'

/[næ-il]/	NCA-R (Root, σ)	SyllCon	PAL	*[son]ʃ	MAX-IO
☞næ-il					
æ-il					*!

The tableau below illustrates /l/-deletion at Base-initial position:

(115) /s´n-[li-ca]/ s´nʲ-i-ca 'interest paid in advance' (‘in advance' 'interest')

/s´n-[li-ca]/	NCA-R (Root, σ)	SyllCon	PAL	*[son]ʲ	NCA-R [+rho]	MAX-IO	IDENT-IO[lat]
a s´n.-[li-ca]			*!				
b s´n.-[lʲi-ca]				*!			
c s´l.-[lʲi-ca]				*!			
d s´n.-[ni-ca]			*!				
e s´n.-[nʲi-ca]				*!			
f s´n.-[ri-ca]					*!		
g ☞s´·nʲ·-[i-ca]						*	
h s´-[·r·i-ca]						*	*!

All candidates except candidates (g) and (h) fatally violate a highly ranked constraint. In optimal candidate (g), [i] is in Base-initial position. This configuration does not violate *[son]ʲ since *[son]ʲ disallows a secondary palatalized sonorant consonant at Base-initial position. Candidates (g) and (h) violate MAX-IO but candidate (h) additionally violates IDENT-IO[lat]. Hence, candidate (g) is optimal. For discussion of the constraint NCA-R[+rho], refer to the appendix to chapter 3.

Now, consider the following data in which BASE-initial input /n/ is deleted (after a final vowel or consonant of a preceding Root):

(116) /ku-[ny´-s´N]/ ku-y´-s´N 'old-fashioned woman'

/ku-[ny´-s´N]/	NCA-R (Root, σ)	SyllCon	PAL	*[son]ʲ	MAX-IO
ku.-[nʲy´-s´N]				*!	
ku.-[ny´-s´N]			*!		
☞ku.-[y´-s´N]					*

(117) /pan-[nik-my´N]/ panʲ-ik-my´N 'semi-unanimity'

/pan-[nik-my´N]/	NCA-R (Root, σ)	SyllCon	PAL	*[son]ʲ	MAX-IO
pan.-[nʲik-my´N]				*!	
pan.-[nik-my´N]			*!		
pa.-[nʲik-my´N]				*!	*
☞pa·nʲ·-[ik-my´N]					*

The current proposal can also explain why Base-initial /l/ is not allowed before a high front vocoid:

(118) a. /[li-yoN]-ca/ i-yoN-ca 'user' ('usage' 'AGT")

/[li-yoN]/ i-yoN 'usage'

b. /[li-ca]-æk/ i-ca-æk 'interest amount'

/[li-ca]/ i-ca 'interest'

(119) /[li-yoN]-ca/ i-yoN-ca 'user'

/[li-yoN]-ca/	NCA-R (Root, σ)	SyllCon	PAL	NCA-R [+rho]	*[son]ʲ	MAX-IO
[lʲi-yoN]-ca					*!	
[li-yoN]-ca			*!			
[nʲi-yoN]-ca					*!	
[ni-yoN]-ca			*!			
[ri-yoN]-ca				*!		
☞[i-yoN]-ca						*

5.10 Interaction of /n/-deletion and /n/-insertion

So far, we have considered only a portion of the data in which /n/- or /l/-deletion occurs in the Base-initial position before a high front vocoid. However, as noted previously, the environment of /n/- or /l/-deletion overlaps with that of /n/-insertion. Note that /n/-insertion takes place between a Base-final C and a following /y/. Consider the following data in which the environment for /n/- or /l/-deletion and /n/-insertion overlaps:

(120) [RR][RR] compound

a.	/[an-s´N]-[ny´-ca]/	an-s´N-nJy´-ca	'women from Anseong' ('Anseong' 'women')
	cf. /[an-s´N]/	an-s´N	'Anseong (name of a city)'
	/[ny´-ca]/	y´-ca	'woman'
b.	/[han-kuk]-[ny´-s´N]/	han-kuN-nJy´-s´N	'Korean women'
	cf. /[han-kuk]/	han-kuk	'Korea'
	/[ny´-s´N]/	y´-s´N	'woman'
c.	/[kˆk-caN]-[lyo-kˆm]/	kˆk-caN-nJyo-kˆm	'movie admission fee'
	cf. /[kˆk-caN]/	kˆk-caN	'theater'
	/[lyo-kˆm]/	yo-kˆm	'fare'

The current constraint ranking predicts that the Base-initial /n/ between a C-final Base and /y/ must undergo both /n/-deletion and /n/-insertion:

(121) /[an-s´N]-[ny´-ca]/ an-s´N-nJy´-ca 'women from Anseong'

/[an-s´N]-[ny´-ca]/	NCA-R (Root, σ)	Syll-Con	PAL	CA-BSE/ AMBI	*[son]J	MAX-IO
a. [an-s´N.]-[ny´-ca]			*!			
b. [an-s´N.]-[nJy´-ca]					*!	
c. [an-s´.N]-[y´-ca]	*!					*
d. [an-s´N.]-[y´-ca]		*!				*
e. [an-s´·N·]-[y´-ca]				*!		*
f. [an-s´N.]-n [y´-ca]			*!			*
g.☞[an-s´N.]-nJ [y´-ca]						*

In candidate (a), the input second Base-initial /n/ is not allowed to be realized as [n] before /y/ (violation of PAL). If the input /n/ is realized as secondarily palatalized [nJ] (candidate (b)), it violates highly ranked *[son]J. In candidates (c), (d) and (e), the input Base-initial /n/ is deleted. However, deletion of the input /n/ violates either of highly ranked NCA-R(Root, σ), SyllCon or CA-BSE/AMBI-/y/. If the input /n/ at Base-initial position is deleted, and another /n/ is inserted and secondarily palatalized before the second Base-initial /y/ (as in candidate (g)), only lower ranked MAX-IO is violated. As a result, candidate (g) is optimal. Note that [nJ] in optimal candidate (g) does not correspond /n/ in the input. Candidates (b) and (f) are phonetically identical but involves different morphological parses. In candidate (b), [nJ] in the output corresponds to /n/ in the input, However, high ranked *[son]J does not allow [nJ] in Base-initial position.

Let us consider an example in which (second) Base-initial /l/ occurs between the first Base-final C and /y/ in the [RR][RR] input. In this case, the proposed constraint ranking predicts that the input /l/ is deleted and /n/ must be inserted before the second Base:

(122) /[kˆk-caN]-[lyo-kˆm]/ kˆk-c'aN-nJyo-kˆm 'movie admission fee'

("·C·" is ambisyllabic)

/[kˆk-caN]-[lyo-kˆm]/	NCA-R (Root, σ)	Syll-Con	PAL	CA-BSE/ AMBI-/y/	NCA-R [+rho]	*[son]J	MAX-IO
a. [kˆk-caN.]-[lyo-kˆm]			*!				
b. [kˆk-caN.]-[lJyo-kˆm]						*!	
c. [kˆk-caN.]-[nyo-kˆm]			*!				
d. [kˆk-caN.]-[nJyo-kˆm]						*!	
e. [kˆk-ca.N]-[yo-kˆm]	*!						*
f. [kˆk-caN.]-[yo-kˆm]		*!					*
g [kˆk-ca·N·]-[yo-kˆm]				*!			*
h. ☞[kˆk-caN.]-nJ [yo-kˆm]							*
i. [kˆk-caN.]-[ryo-kˆm]					*!		

If the input /l/ at the second Base-initial position is realized either as [l] or [lJ] (candidates (a) and (b)), either highly ranked PAL or *[son]J is violated. If the input /l/ is realized as either [n] or [nJ] (candidates (c) and (d)), either highly ranked PAL or *[son]J is violated. If the input /n/ is deleted and the first Base-final C is realized as ambisyllabic (candidate (g)), highly ranked CA-BSE/AMBI-/y/ is fatally violated. On the other hand, if the input /l/ at the second Base-initial position is deleted and /n/ is inserted before the second Base-initial position (candidate (h)), only lower ranked MAX-IO is violated. Candidate (i) violates highly ranked NCA-R[+rhotic]. Hence, candidate (h) is optimal.

The proposed constraint ranking says that Base-initial /n/ or /l/ are not allowed before a high front vocoid due to the conspiracy of PAL and *[son]ʲ. Hence, deletion of /n/ or /l/ must occur (i.e., violation of MAX-IO is compelled). However, /n/- or /l/-deletion in the configuration in which the Base-initial /n/ or /l/ is deleted, would result in violation of either NCA-R(Root, σ), SyllCon or CA-BSE/AMBI-/y/, depending on how the first Base-final C is syllabified. If the first Base-final C were syllabified uniquely as a coda, the configuration would violate higher ranked SyllCon. If it were syllabified uniquely as an onset, the configuration would violate higher ranked NCA-R(Root, σ). If it were syllabified as ambisyllabic, the configuration would violate the constraint conjunction of CA-R(BSE, PrWd) and AMBI-/y/. Namely, the ambisyllabic Base-final C would violate CA-R(BSE, PrWd) since the Base-final C is not crisp aligned with the right edge of the PrWd. At the same time, it also violates AMBI- /y/ since the ambisyllabic C appears before /y/. Hence, /n/-insertion must take place before the second Base-initial /y/.

We have demonstrated that the /n/ in the output in those examples in question is not the underlying /n/. Rather, the underlying /n/ deletes in Base-initial position and the /n/ in the output is the epenthetic /n/. Such interaction of deletion and insertion of a segment has been analyzed via simple faithfulness in the OT literature. In other words, the output form is faithful to the input form and /n/ in the output has to correspond to /n/ in the input. However, we demonstrated that the output /n/ is not identified as the input /n/. This is because Root-initial [nʲ] is strongly disallowed in Base-initial position. Such strong dispreference of [nʲ], which is crucially dependent on morphological structure overrides simple faithfulness in this case.

5.11 Han 1994

So far we analyzed variation in /n/-insertion phenomenon in Standard Native Korean and also Kyungsang Native Korean, Standard Sino-Korean and Kyungsang Sino-Korean via reranking of constraints in the framework of OT. Before we conclude this chapter, we will review the pioneering analysis of /n/-insertion proposed in Han 1994 in a rule-based approach.

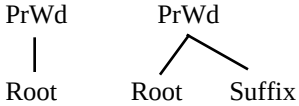
Han 1994 proposes that /n/-insertion can be described as a PrWd juncture rule which uniformly applies in Native Korean and Sino-Korean.:

(123) /n/-insertion (Han 1994):

$$\emptyset \text{ --> n / C)}_{\text{PrWd PrWd}}(\_\_\text{i/y}$$

This rule says that /n/ is inserted between a consonant and a high front vocoid at a PrWd juncture. In Native Korean, a PrWd juncture is formed at a Root-Root juncture:

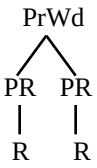
(124) Han's PrWd structure for a Native Korean word of Root-Root-suffix



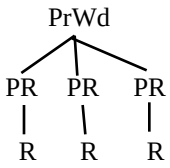
On the other hand, Han proposes the following PrWd structures for Sino-Korean compounds:

(125) Han's PrWd structures for Sino-Korean compounds[49]

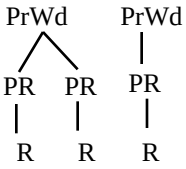
a. [RR]



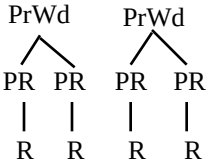
b. R[RR]



c. [RR]R



d. [RR][RR]



The PrWd structures for R[RR] and [RR]R compounds in (125b) and (125c) are different from the ones we have proposed. In our proposal, R[RR] and [RR]R compounds are represented by the following two prosodic structures:

(126) Our proposal for the prosodic structures for three-Root compounds

R[RR] -> (R (RR))

[RR]R -> ((RR) R)

The proposal in Han that the third Root in [RR]R compounds forms a separate PrWd is based on the assumption that /n/-insertion is uniform across Native Korean and Sino-Korean. Her argument is as follows: /n/-insertion takes place at a PrWd juncture in Native Korean, the existence of which is well-attested (Kang 1992, Han 1991, and also in this paper). /n/-insertion takes place between two Bases in [RR][RR] and after the Base in [RR]R. Han assumes that /n/-insertion is prosodically uniform both in Native Korean and

[49] Han introduces the "Prosodic Root (PR)", which is built from a Sino-Korean Root.

Sino-Korean. She argues that there must be a PrWd juncture between a Base and a following Root in [RR]R compounds..

However, her basic assumption that /n/-insertion is prosodically uniform in both Native Korean and Sino-Korean is not correct. First, /n/-insertion takes place between a C and /i/ or /y/ in Native Korean whereas /n/-insertion takes place between C and /y/ excluding /i/ in Sino-Korean. Furthermore, /n/-insertion takes place between two Roots within [RR] compounds in Kyungsang Sino-Korean where a PrWd juncture is not formed. In other words, /n/-insertion shows variation across different sublexica (Native Korean and Sino-Korean) and across different dialects (Standard Sino-Korean and Kyungsang Sino-Korean). Secondly, we have proved that /n/-insertion in Standard Sino-Korean can be analyzed without the assumption that a PrWd juncture is formed between a Base and a following Root in [RR]R compounds.

One potential analysis in a rule-based approach, based on the morphological structure proposed in this paper, might be to formulate different /n/-insertion rules for variation of /n/-insertion, based on our observations that /n/ is inserted after a C-final $Root_0^{max}$ in Standard Native Korean, after a Base-final C in Standard Sino-Korean and after a C-final Root in Kyungsang Sino-Korean:

(127) a. /n/-insertion in Standard and Kyungsang Native Korean

$$\emptyset \text{ --> n } / \text{ C)}_{\text{Root}^0}{}^{\text{max}} \_\_\_ \text{i/y}$$

b. /n/-insertion in Standard Sino-Korean

$$\emptyset \text{ --> n } / \text{ C]}_{\text{Base}} \_\_\_ \text{y}$$

c. /n/-insertion in Kyungsang Sino-Korean

$$\emptyset \text{ --> n } / \text{ C\}}_{\text{Root}\_\_\_\text{Root}} \{\text{y}$$

Formulation of three different rules for /n/-insertion across different sublexica or across dialects misses some similar characteristics shared by different sublexica in terms of morphological or prosodic environments for /n/-insertion. For example, /n/-insertion in those four sublexica share the characteristic that /n/ is inserted after a C-final morphological element. Furthermore, /n/-insertion takes place before /y/ both in Native Korean and Sino-Korean.

We have proposed that a PrWd-final C is realized as ambisyllabic before a vocoid in Native Korean and that a Root-final C is realized as ambisyllabic before a vocoid across a Root juncture in Sino-Korean. In Stamdard and Kyungsang Native Korean, a $Root_0^{max}$-final ambisyllabic C before /i/ or /y/ is dispreferred. In Standard Sino-Korean, a Base-final ambisyllabic C before /y/ is dispreferred. In Kyungsang Sino-Korean, a Root-final ambisyllabic C before /y/ is dispreferred. We have proposed that different aspects of dispreference of an ambisyllabic consonant across Korean sublexica are interpreted as the result of different constraint rankings, under the assumption that all constraints are shared across sublexica of a language. However, the three rules suggested in (127) are not explanatorily adquate since we have shown that strong dispreference for ambisyllabicity of a consonant before a high front vocoid causes /n/-insertion.

5.12 Summary

In this chapter, we showed that the reason why relatively more marked /n/ is inserted rather than unmarked /t/ (and also other coronals) at the boundary of a Root-Root juncture in Native Korean, is due to a set of constraints which conspire to disallow insertion of a non-/n/ coronal consonant at the PrWd juncture. Furthermore, we also extensively analyzed the /n/-insertion phenomenon, which shows variation across different sublexica of the same dialect and across two different dialects in Korean. We argued that

such variation results from different constraint rankings. We demonstrated that OT can explain such variation, based on reranking of a set of constraints which are assumed to be shared across sublexica within a language.

Finally, /n/-insertion in Korean provides strong evidence for the ambisyllabicity of the Root-final C before a Root-initial V in Korean (i.e., ambisyllabicity of the Root-final C before a Root-initial V in Native Korean and ambisyllabicity of a Root-final C before a Root-initial V in Sino-Korean).

Chapter 6 Conclusion

In this dissertation, we argued for the following proposals:

(1) Proposals

a. Native Korean

1. A Root-final consonant before a Root-initial vocoid is realized as ambisyllabic.
2. The right edge of a $Root_0^{max}$ is non-crisp aligned with the right edge of a PrWd.
3. As a result, PrWd-final consonant is realized as ambisyllabic before a vocoid.

b. Sino-Korean

1. A Root-final consonant before a Root-initial vocoid is realized as ambisyllabic.
2. The Base, which is a Root or combination of Roots which can appear as an independent word, is identified as a PrWd.
3. Hence, a PrWd-final consonant is realized as ambisyllabic before a vocoid.

Based on these proposals, we explained the overapplication of Coda Neutralization and the underapplication of primary /t/-palatalization in chapter 3 and 4. In order to explain Coda Neutralization and primary palatalization in Native Korean, we proposed that [lar]/[+cont]/$^{\text{C-pl}}_{\text{Cor}}$ $_{\text{[-ant]}}$ must be crisp aligned with the left edge of a syllable (cf. Lombardi 1995b). On the other hand, the ambisyllabicity of the PrWd-final consonant before a vocoid has been explained by the conspiracy of the two high ranked constraints NCA-

R($Root_0^{max}$, PrWd) and SyllCon. The former forces the final C of a $Root_0^{max}$ to be prosodified as the final C of a PrWd. The implication of this is for the $Root_0^{max}$-final C to be realized as a syllable coda since a PrWd-final consonant must be also a syllable-final consonant according to the Strict Layer Hypothesis (Selkirk 1995 and references therein). On the other hand, SyllCon, which replaces the role of ONSET in this paper, forces the $Root_0^{max}$-final consonant before a vocoid to be syllabified as an onset. Hence, the two high ranked constraints force the $Root_0^{max}$ -final C before a vocoid to be realized as ambisyllabic. Hence, as a result of the conspiracy, the PrWd-final C (i.e., the $Root_0^{max}$-final C) which is ambisyllabic, is not allowed to retain or inherit [lar]/[+cont]/$^{\text{C-pl}}_{\text{Cor}}$ $_{\text{[-ant]}}$, which are allowed only in a uniquely onset-syllabified consonant.

In the analysis of Native Korean palatalization, we distinguished phonemic /t/-palatalization from other allophonic coronal palatalization. The former was analyzed as primary palatalization (sharing [-ant] between /t/ and a high front vocoid) while the latter was analyzed as secondary palatalization (sharing the V-place/Cor between a coronal consonant and a high front vocoid). We also demonstrated that Umlaut is in principle the same phenomenon as secondary palatalization in that the former is the spread of the V-place/Cor from a high front vocoid to a preceding coronal and the latter is the spread of the V-place/Cor from a high front vocoid to a preceding back vowel. We also showed that primary palatalization takes place only at suffixal or clitic boundary (Iverson 1993, Kiparsky 1993). We explained the underapplication of primary palatalization within a morpheme (a case of Lexical Diffusion) by underlying prespecification of [+ant] in /t/ before a tautomorphemic high front vocoid. We also analyzed the underapplication of primary palatalization across a Root-Root juncture via the proposed Ambisyllabicity Hypothesis.

In order to capture variation of /n/-insertion in Korean, we argued that the ambisyllabicity of a PrWd-final C before a high front vocoid in Native Korean, the ambisyllabicity of a Base-final C before /y/ in Standard Sino-Korean, and the ambisyllabicity of a Root-final C before /y/ in Kyungsang Sino-Korean are dispreferred. As a result, /n/-insertion is compelled to avoid such ambisyllabic configurations. We also demonstrated that constraint reranking can capture variation of /n/-insertion in all these cases.

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