A Prosodic Analysis of l-nasalization, n-deletion and n-lateralization in Korean

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1. Introduction

In this paper I will discuss a prosodic analysis for rules related to phonotactic constraints in Korean, l-nasalization, n-deletion and n-lateralization. The Korean lexicon is composed of three sublexical strata, native Korean, Sino-Korean vocabulary and foreign loanwords. The native Korean vocabulary has the following phonotactic constraints: i) *ŋ* never occurs in the onset position; ii) a liquid does not occur in the onset position unless it is part of geminate; iii) no *n* occurs word-initially when followed by *i/y*. Thus, the three rules will be tested for whether they apply in each lexical stratum.

The goal of this paper is to support the claim that the Prosodic Hierarchy(Selkirk 1986; Selkirk and Shen 1990; Nespor and Vogel 1986; Hayes 1989) should be extended within the word (Cohn 1989); Rice 1992; Kang 1992a, b, in press). Most notably, I will provide further arguments for the extension of Selkirk's End-Based Theory (Selkirk 1986; Selkirk and Shen 1990).

The organization of this chapter is as follows. In §2, I propose rules for deriving the prosodic constituents in Korean. In §3, I show how the domains of three rules are predicted by the prosodic constituents derived in §2.

2. Constraints on Deriving Prosodic Constituents in Korean

In deriving prosodic constituents in Korean, I adopt Selkirk's End-Based Theory (Selkirk 1986; Selkirk and Shen 1990) and the **Prosodic Structure Wellformedness Constraint** (Selkirk 1981, 1984; Hayes 1989; Nespor and Vogel 1986). In Kang's (1992a) proposal, Korean takes the lexical $lex^0[$ parameter which extends Selkirk's (1986, 1990) $X^0[$ setting within the word. The **Korean Prosodic Word Rule** stated in (1), followed by (2):

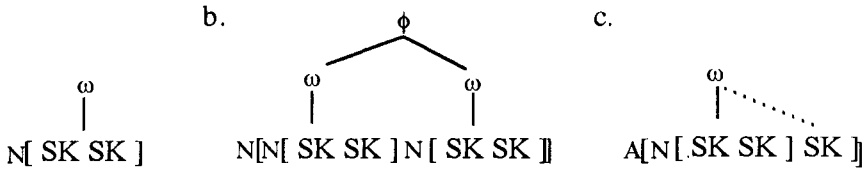
(1) Korean Prosodic Word Rule (lexical)
$lex^0[$ --> ω((lex: a lexical category)

(2) Stray Adjunction/Incorporation
ω is left-headed, with leftward adjunction of stray material(derivational suffix, functional categorial suffix.

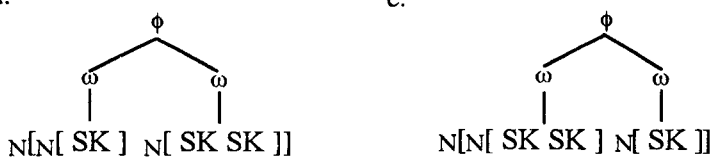
Only lexical categories (N, V, A, Adv...) map into ω's in the lexicon, and therefore, functional categorial suffixes and enclitics in Korean are incorporated into a preceding ω.

I will now discuss how PWF in the Sino-Korean vocabulary is related to the algorithm (1). The PWF for the Sino-Korean is morphologically motivated; note that a Sino-Korean monosyllabic stem has to combine, at least, with another Sino-Korean monosyllabic stem to be a well-formed word. The following shows how ω's are derived in the Sino-Korean vocabulary (SK: a monosyllabic Sino-Korean stem):

(3) a. b. c.



d. e.



The PWF in (3a) and (3b) naturally follows from the KPWR in (1); each disyllabic Sino-Korean word forms a ω on its own by the lex°[setting. However, the PWF for trisyllabic Sino-Korean words in (3c), (3d), and (3e) does not look so simple. In (3c) the disyllabic Sino-Korean noun is assigned a ω by the lex°[setting and the following monosyllabic Sino-Korean adjectival suffix adjoins to the preceding ω due to Prosodic Licensing (Itô 1986). The PWF in (3d) and (3e) is cyclic. In (3d) at the first cycle, the disyllabic Sino-Korean noun is assigned a ω because it stands in isolation; the preceding monosyllabic Sino-Korean bound stem cannot adjoin to the following ω since rightward adjunction is blocked, as stated in (2), and therefore, it is also assigned a ω at the second cycle. The situation in (3e) is the mirror image of (3d). In (3d) a disyllabic Sino-Korean noun becomes a ω and the following monosyllabic Sino-Korean stem could adjoin to the preceding ω. However, *l*-nasalization and *n*-deletion in the Sino-Korean vocabulary indicate that the monosyllabic Sino-Korean stem in (3e) forms an independent ω.

Next, the algorithm for deriving the ϕ in Korean is given in (4):

(4) Korean Prosodic Phrase Rule (KPPR)

$lex^{max}[$ ---> ϕ(

In the following section I will show how the rules in (2) and (4) predict the domains of several rules in Korean.

3. Evidence for the Prosodic Word Within the Word

In this section, I introduce three rules which must refer to the prosodic word within words in Korean.

3. 1. L-nasalization

Historically the avoidance of word-initial liquids existed even in Middle Korean (15th c.) (Wung Huh 1985: 414). This implies that there is no underlying word-initial liquid in the native vocabulary of modern Korean. Therefore, when underlying liquid-initial Sino-Korean stems were borrowed, they were subject to this phonotactic constraint. As shown in (5) - (8), the various surface forms of the underlying liquid in Sino-Korean stems are due to its interaction with *l*-weakening and *n*-lateralization: a liquid is realized as *r* in the onset (*l*-weakening); as *l* when preceded or followed by *n* (*n*-lateralization); as a geminate *l* when preceded by *l*; as *n* word-initially (*l*-nasalization);[1] as *n* word-internally when preceded by any consonant except *l* or *n* (*l*-nasalization). The target for *l*-nasalization is the last two environments:

(5)

a. N[kʰwɛ-lak] --> ω(kʰwɛrak)
'cheerful' 'enjoy' 'pleasure'

b. N[lak-wən] --> ω(nagwən)
'enjoy' 'garden' 'paradise'

c. N[N[čʌi-saŋ] N[lak-wən]] --> ω(čʌisaŋ) ω(nagwən)
'earth' 'above' 'enjoy' 'garden' 'earthly paradise'

d. N[kʌk-lak] --> ω(kʌknak) --> ω(kʌŋnak)[2]
'utmost' 'enjoy' 'Paradise of Buddhism', 'supreme bliss'

e. N[N[pok] N[lak-wən]] --> ω(pok)ω(nagwən) --> ϕ(ponnagwən)
'recover' 'enjoy' 'garden' 'Paradise Recovered'

f. N[N[sil] N[lak-wən]] --> ω(sil) ω(lagwən) --> ϕ(sillagwən)
'lose' 'paradise' 'Lost Paradise'

g. N[hwan-lak] --> ω(hwallak)
'please' 'enjoy' 'pleasure'

h. N[yəl-lak] --> ω(yəllak)
'glad' 'enjoy' 'enjoy'

i. NP[CP[IP[VP[alimtau]]-n] NP[lak-wən]] --> ϕ(ω(arimdaun)) ϕ(ω(nagwən))
'beautiful'-Pren (Pres) 'paradise' 'the paradise which is beautiful'
*ϕ(arimdaul) ϕ(ω(lagwən)

(6)

a. N[kə-lɛ] --> ω(kərɛ)
'leave' 'come' 'trade'

b. N[lɛ-waŋ] --> ω(nɛwaŋ)
'come' 'go' 'come and go'

c. N[N[ka-čʌk] N[lɛ-waŋ] --> ω(kaǰʌk) ω(nɛwaŋ) --> ϕ(kaǰʌŋnɛwaŋ)
'home' 'tribe' 'come' 'go' 'family association'

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[1] In North Korea, the word-initial *l* is usually pronounced as [l] in the onset (see *Čosənmal Hwasul*: 1975). However, there are some lexicalized words showing *l*-nasalization.

[2] The *k* assimilates to the following nasal *n* .

d. N[čaŋ-lɛ] --> ω(čaŋnɛ)
'future' 'come' 'time to come', 'future'

e. N[N[səl-waŋ] N[səl-lɛ]] --> ω(səlwaŋ) ω(səllɛ)
'word' 'go' 'word' 'come' 'argue with back and forth'

(7)

a. N[ki-lo] --> ω(kiro)
'forked' 'road' 'forked road'

b. N[lo-sən] --> ω(nosən)
'road' 'line' 'route'

c. N[N[ki-čʰa] N[lo-sən]] --> ω(kičʰa) ω(nosən)
'railway' 'train' 'road' 'line' 'train route'

d. N[heŋ-lo] --> ω(heŋno)
'go' 'road' 'path', 'road'

e. N[sən-lo] --> ω(sello)
'line' 'road' 'tract'

f. N[N[hweŋ-tan] N[lo]] --> ω(hweŋdan) ω(no) --> ϕ(hweŋdanno),
'cross' 'pass' 'road' 'crosscut' *ϕ(hweŋdallo)

g. N[mal-lo] --> ω(mallo)
'end' 'road' 'the end of life'

(8)

a. N[čʰo-lok] --> ω(čʰorok)
'grass' 'green' 'green'

b. N[lok-čʰa] --> ω(nokčʰa)
'green' 'tea' 'green tea'

c. N[san-lim] N[lok-hwa]] --> ω(sallim) ω(nokkʰwa)
'mountain"forest"green"make' 'making mountains green'

d. N[N[yəp-lok] N[so]] --> ω(yəpnok) ω(so) --> ϕ(yəmnoks'o)
'leaf' 'green' 'element' 'chlorophyll'

e. N[sin-lok] --> ω(sillok)
'new' 'green' 'spring green'

Indeed, *l*-nasalization is a synchronic rule since a systematic alternation between *l* and *n* is found in modern Sino-Korean. Sino-Korean words involved in *l*-nasalization above are not single lexical items but are complex words composed of two Sino-Korean stems, with the meaning of Sino-Korean complex words being compositional.

Before analyzing *l*-nasalization, I will discuss why the UR of the consonant in question is a liquid rather than a nasal. The fact that the initial consonant of the second Sino-Korean stem in (5a) - (8a) surfaces as *r* supports this claim; if the UR of the consonant were a nasal, the occurrences of *r* in (5a) - (8a) could not be explained. It is not clear that the UR of the liquid is *l*; however, the surface forms of (5g), (7e), and (8e), (hwallak), (sallo), and (sillok) is suggestive that it is *l*. Based on these two arguments outlined above, I will consider the UR of the target consonant to be *l*.

Let us look at the morphological environments for the alternation of *l* and *n*. The word-initial *l* becomes *n*, as shown in (5b), (6b), (7b), and (8b). Secondly,

the initial *l* of the second Sino-Korean word in a compound, N[N[ ] N[_]], surfaces as *n*, in (5c), (5e), (6c), (7c), (7f), and (8c). Thirdly, the word-internal *l* becomes *n* if preceded by any consonant except *n* or *l*, as in (5d), (6d), (7d), and (8d). Note that the sequence /n+l/ in (5g), (7e) becomes *ll* by *n*-lateralization. The sequence *ll* in (5f), (5h), (6e), and (8e) becomes a geminate by fusion. This suggests that the domain of *l*-nasalization cannot be defined in terms of a morphological constituent, but it must refer to a prosodic constituent.

However, the following examples make the story more complicated:

(9)

a. N[čʰo-lo] --> ω(čʰoro)
'beginning' 'old' 'middle age'

b. N[lo-in] --> ω(noin)
'old' 'person' 'old man'

c. N[N[pu-ča] N[lo-in]] --> ω(puǰa) ω(noin)
'rich' 'person' 'old' 'person' 'rich old man'

d. NP[CP[IP[VP[kʰi]]-n] NP[lo-in]]--> ϕ(ω(kʰin)) ϕ(ω(noin)), *(kʰillo in)
'be tall'-Pren (Pres)' 'old' 'person' ' an old man who is tall'

e. N[wən-lo] --> ω(wallo)
'principle' 'old' 'senior', 'elder'

f. N[N[pul-lo] N[čʰo]] --> ω(pullo) ω(čʰo) --> ϕ(pulločʰo)
'not' 'old' 'herb' 'an herb of eternal life'

(10)

a. N[ha-lyu] --> ω(haryu)
'down' 'flow' 'downstream'

b. N[lyu-su] --> ω(nyusu) --> ω(yusu)
'flow' 'water' 'running water'

c. N[N[čʰəŋ-san] N[lyu-su]] --> ω(čʰəŋsan) ω(nyusu),
'green' 'mountain' 'flow' 'water' 'flowing eloquence'
--> ω(čʰəŋsan)ω(yusu), *(čʰəŋsallyusu)

d. N[saŋ-lyu] --> ω(saŋnyu)
'upper' 'flow' 'upriver', 'upstream'

e. N[nan-lyu] --> ω(nallyu)
'warm' 'to flow' 'warm current'

(11)

a. N[sa-lye] --> ω(sarye)
'thank' 'etiquette' 'appreciation'

b. N[lye-iy] --> ω(nyeiy) --> ω(yeiy)
'etiquette' 'manner' 'etiquette'

c. N[N[koŋ-čuŋ] N[lye-iy]] --> ω(koŋǰuŋ) ω(nyeiy)--> ω(koŋǰuŋ)ω(yeiy)
'public' 'crowd' 'etiquette' 'manner' 'public morality', *ϕ(koŋǰuŋnyeiy)

d. N[tap-lye] --> ω(tapnye) --> ω(tamnye)
'return' 'thank' 'return courtesy'

e. N[N[saŋ-kyən] N[lye]] --> ω(saŋgyən) ω(ne), *ϕ(saŋgyəlle)
'each other' 'see' 'manner' 'the bride-bridegroom formal bow'

The same generalization holds in (9) - (11) for the distribution of *l* and *r*. Note that *l* becomes *n* word-initially in (9b), (10b), and (11b); the word-initial *n* is deleted in (10b) and (11b), when followed by *y/i*. I will discuss *n*-deletion in the next section.

Recall the derivation of ω's for the Sino-Korean vocabulary discussed. The prosodification of (5e) and (7f) *is* illustrated in (12) and (13):

(12) N[N[pok] N[lak-wən]]
'recover' 'enjoy' 'garden'
a. cycle 1: ω(lakwən)
b. cycle 2: ω(pok)
c. syll : ω(pok) ω(lakwən)
σ σ σ
d. l-nas. : __ ω(nakwən)
e. Nasal A.: ϕ(poŋnakwən)
f. voicing: ϕ(poŋnagwən)

(13) N[N[hweŋ-tan] N[lo]]
'cross' 'pass' road'
a. cycle 1: ω(hweŋtan)
b. cycle 2: ω(lo)
c. syll : ω(hweŋtan) ω(lo)
σ σ σ
d. l-nas : ___ ω(no)
e. voicing: ω(hweŋdanno)
*ω(hweŋdallo)

Note that PWF for Sino-Korean is cyclic. During the first cycle, the independent nouns *nakwən 'paradise'* in (12) and *hweŋtan* 'crosscut' in (13), are assigned ω's, respectively, by the lex°[setting.[3] During the second cycle, monosyllabic stems *pok* 'recover' and *lo* 'road', situated to the adjacent ω, are assigned ω's, as shown in (12) and (13). The adjunction of the noun *pok* to the following ω is not allowed according to (2). The case in (5e) and (7f) can be considered single lexicalized items.

I will consider *l*-nasalization as a test for Hyunsoon Kim's (1992) Minimality Condition for the Sino-Korean vocabulary. According to her analysis, (12) forms a single ω. Note that the sequence *n* + *l* surfaces as *ll* by *n*-lateralization. If (13) formed a single ω, we would get the incorrect output *(hweŋdallo) by *n*-lateralization. This suggests that the right-most Sino-Korean stem *no* 'road' in (13) does not adjoin to the preceding ω, but it forms its own ω, within which *l* becomes *n*, acting an independent ω for the domain of *l*-nasalization. Therefore, it is not clear whether there is a minimality condition or not in the Sino-Korean vocabulary.

To summarize, *l* becomes *n* at the beginning of the ω and after a consonant. Therefore, *l*-nasalization is a disjunctive rule, as formulated in (14):

(14) *l*-nasalization (only for Sino-Korean)

$$l \rightarrow n \;/\; \{\, \omega(\_\_\_\,),\ \omega(....C\_\_\_....) \,\}$$

The rule of *l*-nasalization must also refer to morphological information, since only the Sino-Korean vocabulary undergoes it.

The examples in (9e) and (10e) do not undergo *l*-nasalization, but rather *n*-

[3] In Chinese *pok* 'return' and *sil* 'lose' are independent verbs, but they became nouns when introduced into the Korean vocaburary.

lateralization within the ω. Furthermore, the Sino-Korean vocabulary does not show *n*-lateralization across ϕ's, as shown in (9d), nor across ω's, as shown in (10c) and (11e). This indicates that *n*-lateralization is also bounded by the ω. This means that both *l*-nasalization and *n*-lateralization are bounded by the ω, which raises an ordering relationship between the two rules. Let us look at (15) with respect to rule ordering:

(15) a. [wən-lo]

n-lat.	ll
l-nas.	____
	(wəllo)

b. [wən-lo]

l-nas.	nn
n-lat	____
	*(wənno)

In (15b) *l*-nasalization bleeds *n*-lateralization, while in (15a) *n*-lateralization bleeds *l*-nasalization within the ω. To get the correct surface form, *n*-lateralization has to precede *l*-nasalization within the ω.

In foreign loanwords the situation is different. The word-initial *l* of the source language undergoes *l*-weakening in Korean, surfacing as *r*, as shown in (16):

(16) label --> (rabel) lamp --> (rɛmp^{h}i) last --> (ras^{h}i)
lace --> (reisi) lane --> (rein) leisure --> (reʒə)

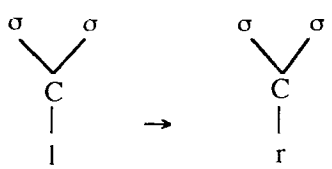
Therefore, *l*-nasalization is restricted to the Sino-Korean vocabulary.

Let us review how *l*-nasalization has been analyzed previously. All of the previous approaches started from the assumption that the UR of the consonant in question is /l/. Duk-Soo Park (1990) claims that *l* becomes *n* in the onset position, as in (17):

(17) *l*-nasalization (Park 1990)
l --> *n* / $____ (Sino-Korean words only)

The environment for both *l*-weakening and *l*-nasalization is the same onset position. To differentiate *l*-nasalization from *l*-weakening, Park adopts Kee-Ho Kim's (1987) account of *l*-weakening in which intervocalic *l* is ambisyllabic, as shown in (18):

(18) l-weakening (Kee-Ho Kim 1987)



Note that in (18), *l* is doubly linked to the consonant in the coda of the preceding syllable and to the consonant in the onset of the following syllable. Therefore, it does not undergo *l*-nasalization according to the **Linking Constraint** (Hayes 1986). However, I do not believe that *r* is ambisyllabic, since one can hear it

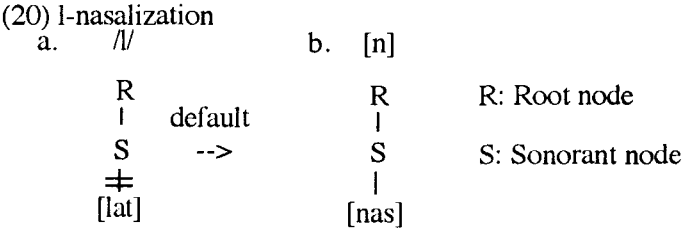
clearly occurs in the onset position. If so, the syllable boundary in (17) cannot capture the domain of *l*-nasalization explicitly.

Within non-prosodic analyses, Kee-Ho Kim's (1987) rule of *l*-nasalization, as shown in (19), is the closest to mine stated in (14):

(19) *l*-nasalization (Kim 1987)
l --> *n* / {C, #} ____

Kim's rule in (19) will be reanalyzed as a prosodic word-level rule. As shown in (20), *l*-nasalization can be explained as a delinking process:[4]

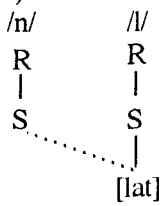
(20) l-nasalization



Delinking of the feature [lat] from *l* may derive either *n* or *r*. Therefore, assigning a default feature [nasal] under the Sonorant node in (20b) makes the consonant realized as *n*.

The non-occurrence of *l*-nasalization in the sequence *n* + *l* is due to *n*-lateralization. The rule of *n*-lateralization can be explained as a spreading of the feature [lateral] from *l* to the Sonorant node of *n*, as represented in (21):

(21) n-lateralization

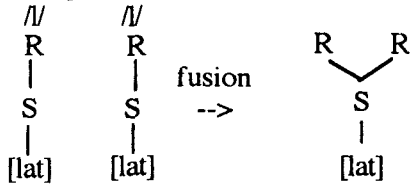


As discussed before, *n*-lateralization has to precede *l*-nasalization within the ω for the Sino-Korean vocabulary. Thus, *l*-nasalization cannot apply to the output of *n*-lateralization, since it violates Hayes' (1986) **Linking Constraint**. The structural description for *l*-nasalization is not met in (21) where the target [lateral] is doubly linked, which was also noticed by Kee-Ho Kim (1987) and Hyangsook Sohn (1987).

Next, the sequence *l* + *l* is exempt from *l*-nasalization. Kee-Ho Kim (1987) claims that the sequence *l* +*l* becomes a geminate by his modified version of Steriade's (1982) Shared Feature Convention. I believe that the sequence *l* + *l* fuses, as represented in (22):

[4] For the segement structure assumed here, see Kang(1992b).

(22) l-gemination



The fusion has to take place automatically before *l*-nasalization in (20) so that the geminate *ll* cannot undergo *l*-nasalization due to the *Linking Constraint.* Thus, the non-occurrence of *l*-nasalization in *n* + *l* or *l* + *l* is accounted for straightforwardly.

In this section I have claimed that *l*-nasalization applies only in the Sino-Korean vocabulary within the ω. The word-internal *l* in foreign loanwords becomes *r* due to *l*-weakening. Within the ω, *n*-lateralization has to precede *l*-nasalization.

3.2. N-deletion

In this section I will discuss another phonotactic rule for the Sino-Korean vocabulary. The native Korean vocabulary does not have underlying *n* before *i/y* word-initially.[5] This is due to a historical process in which underlying *n* before *i/y* had been deleted from the end of the 18th century through the beginning of the 19th century. Sino-Korean stems with the underlying *l* also follow this phonotactic constraint. The word-initial *n* or the initial consonant *l* of each member in a compound is deleted before *i/y*, but not word-internally, as shown in (23) - (25):

(23)

a. N[nam-nyə] --> ω(namnyə)
'man' 'woman' 'man and woman'

b. NP[NP[nam]-kwa NP[nyə]] --> ɸ(ω(namgwa)) ɸ(ω(yə))

c. N[nyə-ča] --> ω(yəǰa)
'woman' 'person' 'woman'

d. N[N[nyə] N[hak-sɛŋ] --> ω(yə) ω(haks'ɛŋ)
'woman' 'study' 'student' 'woman student'

e. N[N[li-hwa] N[nyə-ča] N[tɕ-hak-kyo]] --> ω(ihwa) ω(yəǰa) ω(tɕhakk'yo)
'persimmon' 'flower' 'woman' 'person' 'big-study-school' 'Ewha Womans Univ.'

f. N[N[nam-pu] N[nyə-tɛ]] --> ω(nambu) ω(yədɛ) 'something on one's
'man' 'bear' 'woman' 'head' 'carrying', back and of one's wife's head'

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[5] There are a handful of examples which show the trace of the underlying *n* before *i/y*: nyəsək 'guy', nyamynam vs. yam yam 'Yum-yum!, ye vs. nye'yes', nim vs. im 'lover'

(24)

a. N[in-nik]	-->	ω(innik)			
'hide' 'hide'		'concealing'			
b. N[nik-myəŋ]	-->	ω(ikmyəŋ)	-->	ω(iŋmyəŋ)	
'hide' 'name'		'unanimity'			

(25)

a. N[N[pɛ-nyo] N[ki]]	-->	ω(pɛnyo) ω(ki)	-->	ϕ(pɛnyogi)	
'urine' 'outlet' 'organ'		'urine'			
b. N[nyo-to]	-->	ω(yodo)			
'urine' 'line'		'urethra'			

As shown in (23a), (24a) and (25a), the underlying *n* remains intact when it occurs word-internally. But *n* is deleted word-initially in (23b), (23c), (23d), (24b), (25b). In (23e) and (23f), the initial consonant *l* of each member of a compound becomes *n*. The occurrence of *n*-deletion in a compounds also supports my claim that there must be a word-internal prosodic domain, the prosodic word.

Wung Huh (1985) and Sang-Oak Lee (1990) claim that *l*-nasalization feeds *n*-deletion when *n* is followed by *i* /*y*:

(26)

a. N[ha-lyu]	-->	ω(haryu)			
'down' 'flow'		'downstream'			
b. N[lyu-su]	-->	ω(nyusu)	-->	ω(yusu)	
'flow' 'water'		'running water'			
c. N[N[čʰəŋ-san] N[lyu-su]]	-->	ω(čʰəŋsan) ω(nyusu), *(čʰəŋsallyusu)			
'green' 'mountain' 'flow' 'water'		'flowing eloquence'			

(27)

a. N[sa-lye]	-->	ω(sarye)			
'thank' 'etiquette'		'appreciation'			
b N[lye-iy]	-->	ω(nyeiy)	-->	ω(yeiy)	
'etiquette'					
c. N[N[koŋ-čuŋ] N[lye-iy]]	-->	ω(koŋjuŋ) ω(nyeiy)-->ω(koŋjuŋ) ω(yeiy)			
'public' 'crowd' 'etiquette' 'manner'		'public morality'			

As shown in (26b), (26c), (27b), and (27c), the underlying *l* becomes *n* and it is deleted prosodic word-initially.

In foreign loanwords, the underlying *n* of the source language is not deleted before *i/y*, as shown in (28):

(28)	Newton	-->	ω(nyutʰon)	news	-->	ω(nyusʼi)
	nickel	-->	ω(nikʰɛl)	nicotine	-->	ω(nikʰotʰin)

Therefore, *n*-deletion is limited to the Sino-Korean vocabulary only.

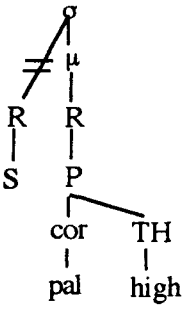
In the current analysis the *n*-deletion rule is a domain limit rule, bounded by the ω, as in (29):

(29) n-deletion (only for Sino-Korean)
n --> ø / ω(__ i/y)ω

The rule of *n*-deletion is restricted to South Korean. In North Korean word-initial *n* is actually pronounced.[6]

The rule operation for *n*-deletion can be explained as delinking of the whole timing slot of *n* before the coronal vowel *i*, as in (30):

(30)



In this section I have discussed *n*-deletion in Sino-Korean which requires a word-internal prosodic domain, the ω.

3.3. N-Lateralization

In Korean the sequences, *l* + *n* or *n* + *l*, become *ll* by *n*-lateralization. Let us first look at the domain of *n*-lateralization within the native Korean vocabulary. There is no sequence *n* + *l* in native Korean words (see Wung Huh (1985: 241)):

(31) Native Korean l + n

a. N[N[tal] nim] --> ω(tallim)
'moon' Esq.

b. N[N[tal] N[nara]] --> ω(tal) ω(nara) --> ϕ(tallara)
'moon' 'nation' 'the moon world'

c. N[N[til] N[noli]] --> ω(til) ω(nori) --> ϕ(tillori)
'field' 'picnic'

d. N[N[pyəl] N[nara]] --> ω(pyəl) ω(nara) --> ϕ(pyəllara)
'star' 'nation' 'the stellar world'

e. [[til] [namul] --> ω(til) ω(namul) --> ϕ(tillamul)
'field' 'green (vegetables)' 'green vegetables growing in the field'

f. N[səl-nal] --> ω(səllal)
'New Year' 'day' 'New Year's Day'

(32)

a. NP[CP[IP[NP[nɛ-ga] VP[mək]]-il] NP[namul]]
I-Nom eat-Pren (Fut) green (vegetables)
'green vegetables that I will eat.'

---

[6] Some words in North Korean show *n*-deletion:

ϕ(ω(nɛga)) ϕ(ω(məgɨl)) ϕ(ω(namul))

--> ϕ(nɛgaməgɨl) ϕ(namul), * ϕ(nɛgaməgɨl) ϕ(lamul)

b. NP[CP[IP[VP[mək]]-il] NP[namul]] --> ϕ(ω(məgɨl)) ϕ(ω(namul))

eat-Pren (Fut) green (vegetables) RS --> ϕ(məgɨllamul)

'green vegetables that (e) will eat'

c. NP[CP[IP[VP[maŋha]]-l] NP[nala]] --> ϕ(ω(maŋhal)) ϕ(ω(nara))

'perish'-Pren (Fut) nation RS --> ϕ(maŋhallara)

'a country that will perish'

At the morphological word-level, *n*-lateralization applies across stem + suffix boundaries, as shown in (31a), or across compound-internal boundaries, as shown in (31b) - (31e). At the phrasal level, *n*-lateralization applies in (32b) and (32c) where the two adjacent non-branching ϕ's are in the same ϕ by ϕ-restructuring(RS), while it does not in (32a) where the sequence *l* + *n* are in the separate ϕ's. This indicates that *n*-lateralization is bounded by the ϕ and restructuring applies from left to right. Therefore, *n*-lateralization in the native Korean vocabulary is informally stated as in (33):

(33) n-lateralization (in the native Korean vocabulary)

n --> *l* / ϕ(... __ *l*...) (mirror image)

The rule in (33) says that *n* becomes *l* when preceded or followed by *l* within the ϕ, by a domain span rule.

Let us move on to *n*-lateralization in words of the non-native origin. In foreign loanwords *n*-lateralization does not apply. The underlying sequence *n* + *l* in (34) becomes *n* + *r* due to *l*-weakening. In (34b), the sequence *l* + *n* across compound-internal boundaries stays the same. On the other hand, Sino-Korean words show *n*-lateralization. In (35), the Sino-Korean stem-initial consonant *n* assimilates to the preceding Sino-Korean stem-final lateral *l* within the ω. In (36), the Sino-Korean stem-final consonant *n* assimilates to the Sino-Korean stem-initial lateral *l* within the ω:

(34) NA in foreign loanwords

a. N[N[kʰətʰin] N[lain]] --> ω(kʰətʰin) ω(rain)

'curtain' 'line'

b. N[N[hol] N[rəmpɜ]] --> ω(hol) ω(nəmbɜ) --> ?ϕ(holləmbɜ)

'hall' 'number'

(35) Sino-Korean l + n

a. N[čʰal-na] --> ω(čʰalla)

'short time' 'short time' 'short time'

b. QP[pʰal Q[nyən]] --> ω(pʰallyən)

'eight' 'year'

(36) Sino-Korean n + l[7]

---

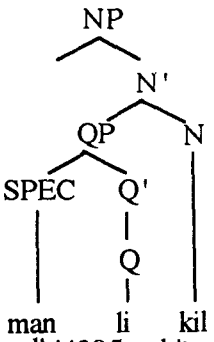
[7] There are exceptions to *n*-lateralization.: (c) and (d) in below undergo *l*-nasalization:

a. N[il-či-lo] --> ω(iljiro) b.N[čoŋ-lo] --> ω(čoŋno)

a. N[si<u>n</u>-<u>l</u>a] --> ω(si<u>ll</u>a)
'new' 'silk' 'Silla Kingdom'
b. N[na<u>n</u>-<u>l</u>o] --> ω(na<u>ll</u>o)
'warm' 'furnace' 'heater'
c. N[sa<u>n</u>-<u>l</u>im] --> ω(sa<u>ll</u>im)
'mountain' 'forest' 'forest on a mountain'
d. NP[QP[č^{h}ə<u>n</u> Q[<u>l</u>i] N[kil]] --> ω(č^{h}ə<u>ll</u>i) ω(kil) --> ϕ(č^{h}ə<u>ll</u>ik'il)
'thousand' 'Clas. (4295 yards)'

The classifiers *nyən* 'year' and *li* '4295 yards' are considered quantifiers. The internal structure of NP containing QP is as illustrated in (37):

(37)



'ten thousand' '4295 yd.''road'

a. ω(malli) ω(kil) : lex^{o} [
b. ϕ(malligil) : lex^{max} [

Following the KPWR, the noun *kil* 'road' is assigned a ω, as shown in (37a). The function words in QP, *man li* , can not be assigned ω by (1). However, since all elements in a sentence have to be exhaustively parsed, the QP *man li* as a whole must be a ω by the *Prosodic Structure Wellformedness Condition*, since it is a sister to the following noun *kil* 'road' in the Prosodic Hierarchy.

So far I have shown that *n*-lateralization in the Sino-Korean vocabulary applies within the ω. In the following paragraphs, I will show that *n*-lateralization is not applicable at the ϕ-level in Sino-Korean words. The prosodic word-initial *l* in Sino-Korean words becomes *n*, known as *l*-nasalization. In the relative clauses (38a) and (38b), native Korean verbs modify the Sino-Korean head noun that begins with *l*. In (39), a Sino-Korean word-final consonant *n* is followed by a Sino-Korean stem-initial consonant *l*; in those cases *l* becomes *n* by *l*-nasalization:

(38)

a. NP[CP[IP[VP[k^{h}i]]-n] NP[<u>l</u>o-in]] --> ϕ(ω(k^{h}i<u>n</u>)) ϕ(ω(<u>n</u>oin)), *ϕ(k^{h}i<u>ll</u>oin)
'be tall'-Pren (Pres)' 'old' 'person' 'the old person who is tall'

'the second' 'street' 'Tlčhi Street' 'bell' 'street' 'čorno Street'

c. N[sin-mun-lo] --> ω(sinmu<u>nn</u>o), * ω(sinmu<u>ll</u>o) 'Sinmun Street'
'new' 'hear' 'street'

b. NP[CP[IP[VP[alimtau]]-n] NP[lak-wən]] --> ϕ(ω(arimdaun)) ϕ(ω(nagwən))
beautiful-Pren (Pres) 'paradise' 'the paradise which is beautiful'
* (arimdaullagwən))

(39)

a. N[N[saŋ-kyən] N[lye]] --> ω(saŋgyən) ω(nye) --> ϕ(saŋgyənnye)
'each other' 'see' 'manner' 'the bride-bridegroom formal bow', *ϕ(saŋgyəllye)

b. N[N[ki-pon] [li-lon]] --> ω(kibon) ω(niron) --> ω(kibon) ω(iron)
'basic' 'principle' 'principle' 'discuss' 'basic theory' --> ϕ(kibonniron),* ϕ(kipolliron)

The derivation of (38a) and (39a) is exemplified, as in (40) and (41):

(40) NP[CP[IP[VP[k^{hi}]]-n] NP[lo-in]]
'be tall'-Pren (Pres)' 'old' 'person'
'the old man who is tall'

a. lex°[: ω(k^{hi}in) ω(loin)
b. l-nasal. : ____ ω(noin)
c. lex^{max}[: ϕ(ω(k^{hi}in)) ϕ(ω(noin))
d. n-later. : _____
(k^{hi}nnoin)

(41) N[N[saŋ-kyən] N[lye]]
'each other' 'see' 'manner'
'newlywed's formal bow'

a. lex°[: ω(saŋgyən) ω(lye)
b. l-nas : _____ ω(nye)
c. lex^{max}[: ϕ(ω(saŋgyən)) ϕ(ω(nye))
d. n-later : _____
ϕ(saŋgyənnye)

By the lex°[setting, two ω's are derived, as shown in (40a) and (41a). Within the second ω, the prosodic word-initial *l* becomes *n* by *l*-nasalization. The lex^{max}[setting derives two ϕ's in (40c) and one ϕ in (41c). Therefore, the structural description for *n*-lateralization is not met. These are crucial examples which indicate that the prosodic word bounded *l*-nasalization precedes the prosodic phrase level rule *n*-lateralization. The interesting fact is that the domain of *n*-lateralization in the native Korean vocabulary is the ϕ, while in the Sino-Korean vocabulary is the ω. Thus, in the Sino-Korean vocabulary, both *n*-lateralization and *l*-nasalization are bounded by the ω. As discussed in §2, for the Sino-Korean vocabulary *n*-lateralization must precede *l*-nasalization within the ω in (36). Therefore, the ordering must be included in the rule formalization of *n*-lateralization. I claimed above that for the native Korean vocabulary, the prosodic-word bounded rule *l*-nasalization applies before the prosodic-phrase bounded rule *n*-lateralization. On the other hand, for the Sino-Korean vocabulary, *n*-lateralization precedes *l*-nasalization within the ω; no Sino-Korean words show *n*-lateralization within ϕ. This conclusion is superior to Kee-Ho Kim (1987) and Duck-Soo Park's (1990) analyses.

Arguing against Kim's analysis, Park proposes the following:

(42)

a. In Korean, the initial syllabification takes place at the end of the word cycle.
b. In the presence of a syllable structure, the application of syllable-structure sensitive rules takes place before any other rule.

Both Kim and Park claim that *l*-nasalization is a syllable-sensitive rule in that syllable-initial *l* becomes *n*, while *n*-lateralization is a syllable-insensitive rule. The syllable-sensitive *l*-nasalization precedes the syllable-insensitive rule of *n*-

lateralization across compound-internal boundaries, or word boundaries at the phrasal level, as shown in (43). Word-internally, the syllable insensitive rule of *n*-lateralization precedes the syllable-sensitive rule of *l*-nasalization, as shown in (44):

(43)

	N[N[hanin] N[lok]]
a. syll:	\ \ / / \ /
	σ σ σ
b. l-nas.	n
	(haninnok)
	'Korean directory'

(44)

	N[sanlim]
a. syll:	_____
b. n-lat	ll
	(sallim)
	'forest'

However, there is no reason for syllabification to be delayed after *n*-lateralization in (44). In the current analysis, syllabification is assigned after ω's are formed. Thus, there is no distinction between syllable-sensitive rules and syllable-insensitive rules, but only whether a rule is bounded by the ω or the φ(see Kang(1992a, b). In this section I have shown that *n*-lateralization is bounded by the φ.

4. Conclusion

In this paper I have shown that *l*-nasalization, *n*-deletion and *n*-lateralization in Korean can be analyzed within a prosodic analysis. This is superior to other non-prosodic analyses: in the previous analyses, there is no restriction on the domain of those rules while the current one does. These rules also refer to the word-internal prosodic constituent, the prosodic word.

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