

An ordering paradox as constraint interaction: alternation of *n* and *l* in Korean

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Um, Yongnam. 2002. An ordering paradox as constraint interaction: alternation of *n* and *l* in Korean. *Studies in Phonetics, Phonology and Morphology* 0.0. 00–000. In this paper, I deal with the cases in which, when *n* and *l* abut, one is totally assimilated to the other. In general, the coronal *n* becomes *l* when it is preceded or followed by *l*. However, there are cases in which *l* becomes *n* when it is preceded by *n*. Thus, from a rule-based perspective it appears that two rules apply intrinsically in a mutually bleeding order, that is, in a reverse order in different environments. This difference depends on the prosodic word boundary across which the sequence arises. To account for this apparent paradox, I propose an Optimality-Theoretic analysis, which relies on stratum-specific faithfulness and position-specific faithfulness. (Wonkwang University)

Keywords: ordering paradox, cyclicity, syllable contact, markedness, positional faithfulness, stratum-specific faithfulness, optimality

1. Introduction

In Korean, adjacent nasal *n* and liquid *l* in any order are prohibited, that is, the adjacent liquid and nasal are avoided in the same place of articulation (**nl/*ln*). Such a sequence does not occur within a morpheme. However, if such a sequence arises across a morpheme boundary or in foreign loans, three strategies are employed to meet the constraint: (i) epenthesis, (ii) deletion, and (iii) assimilation.

In this paper, I will deal with the cases in which, when *n* and *l* abut, one is totally assimilated to the other. In general, the coronal *n* becomes *l* when it is preceded or followed by *l*. However, there are cases in which *l* becomes *n* when it is preceded by *n*. Thus, from a rule-based perspective it appears that two rules (a) $n \rightarrow l / _ l$ and (b) $l \rightarrow n / n _$ apply intrinsically in a mutually bleeding order, that is, in a reverse order in different environments: rule (a) before rule (b) in some environments, but rule (a) after rule (b) in others. This difference depends on the prosodic word boundary across which the sequence arises. Thus, in a rule-based approach the notion of lexical stratum or cyclicity may appear to be appealing to cope with this apparent paradox. To account for this apparent paradox, I propose an OT analysis, which relies on stratum-specific faithfulness and position-specific faithfulness. And I suggest functional motivations for the constraints involved and their ranking. I will discuss the flaws of previous rule-based analyses, which did not take into account non-Sino-Korean loanwords. Then I will conclude this paper by showing

how an optimality-theoretic account explains why such a difference in alternation arises in different environments.

2. Alternation between *n* and *l*: apparent paradox

In Korean, the coronal *n* becomes *l* when it is followed or preceded by *l*, as in the examples in (1i) and (1ii) below:

- (1) i. when *n* is followed by *l*
- a. /sən.lo¹/ [səllo] ‘railway’ (cf. to:lo [to:ro] ‘road’)
 - b. /wən.lon/ [wəlloŋ] ‘principle’ (cf. sə.lon [səron] ‘introduction’)
 - c. /tʃi:n.ljək/ [tʃi:lljək] ‘endeavor’ (cf. no.ljək [no:ljək] ‘effort’)
- ii. when *n* is preceded by *l*
- a. /mal.njən/ [malljən] ‘old age’ (cf. so:njən [so:njən] ‘boy’)
 - b. /pul.niŋ/ [pulliŋ] ‘incapability’ (cf. ju.niŋ [ju:niŋ] ‘ability’)
 - c. /sil.næ/ [sillæ] ‘indoor’ (cf. sa.næ ‘within the company’)

However, there are other cases in which, when *l* is preceded by *n*, *l* becomes *n* as in the examples (2i) below:

- (2) i. when *n* is followed by *l*
- a. /k^hin/ /latio/ [k^hinnadio] ‘big radio’
(cf. /sæ/ /latio/ [særadio] ‘new radio’; /latio/ [radio])
 - b. /sin/ /lamjən/ [sinnamjən] ‘an instant noodle’
(cf. /tʃ^ha/ /lamjən/ [tʃ^ha ramjən] ‘tea noodle’; /lamjən/ [ramjən])
 - c. /tehelan/ /-lo/ [teheranno] ‘Tehelan street, a street in Seoul’
(cf. /il.tʃi/ /-lo/ [ildʒiro] ‘a street in Seoul’)
 - d. /im.un/ /-lon/ [imunnon] ‘phonology’
(cf. /tʃa.ju/ /-lon/ [tʃajuron] ‘J. S. Mill’s *On Liberty*’)
 - e. /tʃ^hu.tʃin/ /-ljək/ [tʃ^hudʒinnnjək] ‘driving force’
(cf. /ij.tʃi/ /-ljək/ [ijdʒirjək] ‘will power’)
 - f. /mjən/ /-lju/ [mjənnju] ‘kind of noodles’
- ii. when *n* is preceded by *l*
- a. /sə:l/ /nal/ [sə:llal] ‘New Year’s Day’
 - b. /tal/ /nala/ [tallara] ‘moon (as a country)’
 - c. /sul/ /nolæ/ [sulloræ] ‘wine song’
 - d. /pul/ /napi/ [pullabi] ‘fire moth’
 - e. /kwail/ /noŋ.sa/ [kwaillonʒa] ‘fruit farming’
(cf. /pu.noŋ/ [punonʒ] ‘rich farmer’)

If two rules (a) $n \rightarrow l / _ l$ and (b) $l \rightarrow n / n _$ are posited for the examples in (1i) and (2i) respectively as in a rule-based approach, then rule (a) should apply before rule (b) for the examples in (1i), while they should

¹ In this paper I use the period (.) for word-internal Sino-Korean morpheme boundary and the hyphen (-) for nominal and verbal inflectional endings and Sino-Korean affix boundary.

apply in a reverse order for the examples in (2i).² This difference depends on the prosodic word boundary across which the sequence arises.

3. Word-initial *l* avoidance

In native or Sino-Korean words the liquid *l* is not allowed in word-initial position. In native Korean words the liquid *l* does not appear in word-initial position, and in Sino-Korean words the morpheme-initial etymological *l* is realized as *n* or \emptyset in word-initial position, as the following examples show:

- (3) a. /lo.pjən/ [nobjən] ‘roadside’ (cf. (1ia), (2ic))
 b. /lon.tʃiŋ/ [nondʒiŋ] ‘proof’ (cf. (1ib), (2id))
 c. /ljək.hak/ [jək^hak] ‘dynamics’ (cf. (1ic), (2ie))
 d. /lak.wən/ [nakwən] ‘paradise’ (cf. /k^hwæ.lak/ [k^hwærak] ‘joy’)
 e. /læ.il/ [næil] ‘tomorrow’ (cf. /tʃən.læ / [tʃəllæ] ‘tradition’)
 f. /lu.kak/ [nugak] ‘pavilion’ (cf. /po.lu/ [poru] ‘fort’)

This phenomenon has long been called ‘*twuum pepchik*’ or ‘*meli soli kyuchik*’ (*word-initial sound rule*) in Korean traditional grammars. In most rule-based analyses the examples as in (3) were considered as the outputs of the rule $l \rightarrow n / \# _$, as in traditional grammars. However, Lee (1972) and Cheun (1978) assumed a rule $l \rightarrow n / \{C[-cont], \#\} _$ and $l \rightarrow n / \{C, \#\#\} _$ respectively for the examples in (3). One step further, Iverson and Kim (1987) argued that they are the results of syllable-initial *l* avoidance rather than word-initial *l* avoidance and should be considered as the outputs of a rule like $l \rightarrow n / \sigma[_]$. Han (1993) also followed suit. Lee (1972), Cheun (1978), and Han (1993) assumed, and Iverson and Kim argued, that the examples as in (3) are the outputs of the same process as the examples as in (4) below.

- (4) a. /tʃ^həp.lo/ [tʃ^həmno] ‘short cut’
 b. /kjək.lon/ [kjəŋnon] ‘heated discussion’
 c. /nam.lo/ [namno] ‘southern street’
 d. /saŋ.lon/ [saŋnon] ‘detailed discussion’

They considered the examples as in (1i) as the outputs of another process (‘lateralization’ or ‘liquidization’) that applies earlier, and ignored the examples as in (2i) except Han, who considers only the examples as in

² Another rule (c) $n \rightarrow l / l _$ will be required additionally for the examples in (1ii) and (2ii) unless it is collapsed with (a) $n \rightarrow l / _ l$ into one mirror-image rule (d) $n \rightarrow l \% l _$. If two separate rules (a) and (c) are posited, the rule (c) will not be crucially ordered with the rule (b), let alone with the rule (a). However, if the mirror-image rule (d) is posited instead of two rules (a) and (c), it should be crucially ordered with the rule (b). In any case grammatical information is necessary for the rules.

(2ic-f). However, it is hard to maintain that the examples as in (3) and (4) are due to one and the same process as assumed by Lee (1972) and Cheun (1978). Furthermore, it is even less likely that they are due to syllable onset neutralization as argued by Iverson and Kim (1987) and as assumed by Han (1993). To maintain their claim, they assume that the rule of lateralization $n \rightarrow l \% l _$ applies before the rule of nasalization $l \rightarrow n / \{C, \#\} _$ or the rule of neutralization $l \rightarrow n / _ _$. Further, Iverson and Kim (1987) and Han (1993) had to assume that l is ambisyllabic intervocalically. However, they do not provide any convincing evidence for why l alone is ambisyllabic intervocalically among the Korean consonants.

In non-Sino-Korean foreign loans l is realized in word-initial position in contrast to native and Sino-Korean words, as shown in (5) below.

- | | | |
|---|--------------------------------------|----------|
| (5) a. /lentʃi/ | [rendʒi] | ‘lens’ |
| b. /lat ^h in/ | [rat ^h in] | ‘Latin’ |
| c. /loma/ | [roma] | ‘Rome’ |
| d. /lok ^h et ^h i/ | [rok ^h et ^h i] | ‘rocket’ |
| e. /lopot ^h i/ | [robot ^h i] | ‘robot’ |

These examples show that l -nasalization is not due to syllable onset neutralization as argued by Iverson and Kim (1987) or as assumed by Han (1993). They may argue that the examples as in (5) are exceptions to the syllable onset neutralization because they are foreign loans. However, like word-medial l 's their initial l 's are subject to nasalization when they are preceded by a consonant other than l , as shown in (6) below.

- | | | |
|-------------------------------------|------------------------------|------------------------|
| (6) a. /koki:p/ /latio/ | [kogi:mnadio] | ‘high-quality radio’ |
| b. /omok/ /lentʃi/ | [omɔŋnendʒi] | ‘concave lens’ |
| c. /sun.kim/ /lek ^h oti/ | [suŋgimnek ^h odi] | ‘golden disk’ |
| d. /toŋ/ /loma/ | [toŋnoma] | ‘Eastern Roman Empire’ |
| (cf. /il/ /lupul/ | [illubul] | ‘one ruble’) |

This shows that word-initial $l \rightarrow n$ and word-medial $l \rightarrow n$ do not have the same function, though the former was motivated by the latter as I will discuss below.

Within a syllable there is no motivation that l in the syllable onset should become n whether it is in word-initial or in word-medial position. Rather, I argue that word-medial $l \rightarrow n$ is due to (syntagmatic) syllable contact whereas word-initial $l \rightarrow n$ is due to word-initial l avoidance [lexicalization] or syllable contact depending on the words (Sino-Korean vs. non-Sino-Korean foreign loan words). There is no native Korean word that begins with l ,³ and thus word-initial l avoidance is lexicalized in native

³ One anonymous reader has mentioned that *liil* is a native Korean word that has l initially. Names for Korean consonant letters are disyllabic words, and they have the consonant which

words. The origin of this lexicalization may be related to syllable contact. When a word-initial *l* is preceded by another word ending in a consonant that is less sonorous than *l*, that is, a consonant other than *l*, it becomes *n*, as shown by foreign loan words in (6) above. Thus, if a word begins with *n* rather than *l* underlyingly, it will change (to *l*) only after word-final *l*, but if a word begins with *l*, it will change (to *n*) after all of the consonants but *l*. Therefore if a word begins with *n*, more of its surface forms will be identical in its initial segment to its underlying form (and to its surface forms) than it would if it begins with *l*. Surface forms of a word tend to be identical as closely as possible and in as many instances as possible (Burzio 1997, 1998). In particular, it is expected that identity or similarity is more significant in perceptually salient positions like word margins (word-initial and word-final positions). Word-initial *l* avoidance also complies with general word-initial strengthening, excluding the weakest consonant *l* from the word-initial position. In the case of foreign loans, they are consistently influenced by their original forms in donor languages since Korean's contact with foreign languages is now consistent through language education, broadcasting, newspapers, etc. and the number of the speakers who can speak foreign languages increases. And once a foreign loan word is written with an initial *l* in the Korean orthography, the word seems to be lexicalized with an initial *l* since now there are few illiterate speakers in Korea. This is also true of Sino-Korean words, which have an initial *l* in North Korea. This seems to show that preservation or avoidance of word-initial *l* is a matter of lexicalization seeing that foreign loan words can have an initial *l* though native Korean words do not have an initial *l*. Native Korean and Sino-Korean words are lexicalized so that they avoid word-initial *l*. A loanword undergoes certain processes due to the constraints of the new language when it is borrowed from a foreign language. And the word form that has undergone such processes is entered in the lexicon (e.g. *k^hilisimasi* 'Christmas' with inserted *i*'s).

4. Syllable contact and adjustment of strength of consonants

In the previous section I argued that word-medial *l* → *n* and liquid avoidance in word-initial position (word-initial *l* → *n*) are motivated independently. In this section I will consider word-medial *l* → *n* and other related phenomena.

In Korean, if the onset consonant of a syllable is more sonorous than the coda consonant of the immediately preceding syllable (across a morpheme boundary), the onset and/or the coda adjust their sonority so that the coda is no less sonorous than the onset, as we see in the examples below.

they denote in their initial and final positions (e.g. *nin*). Thus syllable initial and final use of the consonant is exemplified in its alphabetical name. The initial *l* in *lil* is retained due to this specific constraint.

- (7) when an obstruent is followed by a nasal
- | | | |
|--------------------|-------------|----------------------|
| a. /ip.mun/ | [immun] | ‘introduction’ |
| b. /tʰup-ni/ | [tʰumni] | ‘(Is it) cold?’ |
| c. /mit-ni/ | [minni] | ‘(Do you) believe?’ |
| d. /kuk.mjən/ | [kuŋmjən] | ‘situation’ |
| e. /puk/ /man.tʃu/ | [puŋmandʒu] | ‘Northern Manchuria’ |
- (8) when an obstruent is followed by a liquid
- | | | |
|---------------------|--------------|------------------------|
| a. /ap.ljək/ | [amnjək] | ‘pressure’ |
| b. /tʰəs/ /lotʰali/ | [tʰənotʰari] | ‘first traffic circle’ |
| c. /tok.lip/ | [toŋnip] | ‘independence’ |
- (9) when a nasal is followed by a liquid
- | | | |
|---------------|-----------|----------------|
| a. /tʰim.lje/ | [tʰimnje] | ‘baptism’ |
| b. /tiŋ.lok/ | [tiŋnok] | ‘registration’ |
- (10) when a coronal nasal is followed by a liquid
- | | | |
|---------------|-----------|------------------|
| a. /pa.n.lon/ | [pa:llon] | ‘objection’ |
| b. /pun.lju/ | [pullju] | ‘classification’ |
- (11) when a liquid is followed by another one
- | | | |
|--------------|----------|-----------|
| a. /mul.li/ | [mulli] | ‘physics’ |
| b. /no:l-lə/ | [no:llə] | ‘to play’ |

An obstruent consonant in the syllable coda is sonorantized via nasalization when it is followed by a sonorant consonant (nasal or liquid), as evidenced in (7) and in (8), and a liquid *l* in the syllable onset becomes a nasal *n* when preceded by a syllable coda consonant that is lower in sonority except when preceded by a coronal nasal *n*, as in (10). When a liquid *l* in the syllable onset is preceded by a coronal nasal *n*, the latter becomes *l* as in (10). When a liquid *l* in the syllable onset is preceded by another *l* in the syllable coda, there is no change as in (11), as expected.

Vennemann (1988) discusses extensively preferable syllable structures and syllable contacts. He examines the changes in syllable structure in the (pre)history of languages (especially Germanic and Romance languages) and suggests preference laws for syllable structure, which specify the preferred syllable patterns of natural languages as well as determine the direction of syllable structure change. He compares consonants in terms of their consonantal strength instead of sonority. His notion of strength is opposite to that of sonority. He discusses 3 preference laws for individual syllables and 7 preference laws for sequences of syllable. Among them it is the Contact Law that is relevant to the Korean examples in (7–10) above. He proposes the Contact Law:

Contact Law (= Vennemann's (67))

A syllable contact A^sB is the more preferred, the less the Consonantal Strength of the offset A and the greater the Consonantal Strength of the onset B; more precisely – the greater the characteristic difference $CS(B) - CS(A)$ between the Consonantal Strength of B and that of A. (Vennemann 1988: 40)

Further, he lists seven types of syllable contact change that are employed to improve bad syllable contacts. Among them Strength Assimilation is the one that is employed to improve bad syllable contacts as for the Korean examples above. Strength Assimilation has two subtypes: (a) Regressive assimilation and (b) Progressive assimilation, as cited below:

Strength Assimilation (= Vennemann's (87.5))

(a) Regressive assimilation: $A.B > C.B$, where the Consonantal Strength of C is less than that of A and greater than or equal to that of B

(b) Progressive assimilation: $A.B > A.C$, where the Consonantal Strength of C is less than that of B and greater than or equal to that of A

(Vennemann 1988: 50)

In Korean examples in (7–10) above, it is due to regressive assimilation that obstruent consonants in the syllable coda are nasalized before sonorant consonants in the syllable onset as in (7) and in (8), and it is due to progressive assimilation that a liquid *l* in the syllable onset becomes a nasal *n* after a consonant in the syllable coda that is the lower in sonority as in (8) and (9) except when it is preceded by a coronal nasal *n* as in (10). When *n* in the syllable coda abuts *l* in the syllable onset, one of them assimilates to the other, regressively as in (1i, 10) or progressively as in (2i) depending on the prosodic boundary. Then, why is it that regressive assimilation is employed for the examples as in (1i), whereas progressive assimilation is employed for the examples as in (2i)? We can find answers for this in Vennemann's study.

Vennemann proposes one law concerning Strength Assimilation, as follows.

Strength Assimilation Law (= Vennemann's (58))

If Consonantal Strength is assimilated in a syllable contact, the Consonantal Strength of the stronger speech sound decreases.

(Vennemann 1988: 35)

He provides numerous examples from Italian, Latin, Germanic, Sidamo (Cushitic), etc. that support this law. This law is supported by the Korean examples above except for the cases in which *l* becomes *n* as in (8) and

(10) (and (2ii)). This law is supported by the Korean examples above except for the cases in which *l* becomes *n* as in (8) and (10) (and (2ii)). Then, why is it that such apparent counterexamples exist in Korean for the law that is well supported by other languages and seems to ‘stand a good chance of being valid.’ Vennemann (1988: 39) mentions that exceptions may be found and suggests two possible motivations that cause the exceptions to the law. One of them, which is relevant to the Korean data, is that, where the syllable boundary coincides with a morphological boundary, the direction of assimilation may be determined by a desire to protect the integrity of a stem or suffix.

First, let us consider the examples as in (9) and (10) above. When a liquid follows a nasal, a bad syllable contact arises, as predicted by the Contact Law. If the consonantal strength of the stronger speech sound decreases when consonantal strength is assimilated to improve a bad syllable contact, as declared by (13), it is expected that the nasal in the syllable coda assimilates to the liquid *l* in the syllable onset as in (10). However, we see that when the nasal in the syllable coda is not a coronal nasal *n*, the consonantal strength of the weaker sound *l* in the syllable onset increases, and the *l* becomes a nasal. When a coronal nasal *n* in the syllable coda changes to a liquid *l*, which is also a coronal, it changes just its manner (stricture) of articulation. On the other hand, if labial and velar nasals are to assimilate to the liquid *l*, they should change both their manner and place of articulation to become *l* since there are no labial and velar liquids in Korean. However, if this is allowed, too many homophonous forms will arise. Hence, the morpheme-initial *l* changes to *n* instead of morpheme-final nasals unlike when the syllable-final nasal has the same place of articulation as the syllable-initial *l*. The integrity of the morphemes tends to be preserved as faithfully as possible.

We can account for the examples in (8) in a similar manner. When an obstruent is followed by a liquid *l*, the obstruent becomes a nasal as when it is followed by a nasal as in (7), and the liquid *l* also becomes a nasal *n* as when it is preceded by a non-coronal nasal as in (9). They compromise and assimilate mutually with each other, the obstruent decreasing its strength one step down and the liquid increasing its strength one step up. Obstruents do not change radically to become *l* before *l* as non-coronal nasals do not as in (9). In Korean, when a consonant assimilates to another consonant to improve a bad syllable contact, it changes just one step whether in manner or place of articulation, that is, it changes minimally.

5. Avoidance of **nl* and **ln*

Adjacent coronal sonorants in different manner of articulation do not surface in Korean. In this section I will consider how the sequences *nl* and *ln* are avoided in Korean.

First, I will discuss how they are avoided in native Korean words. The consonantal sequences *nl* and *ln* do not occur within a native Korean morpheme. Those sequences do not also surface in a native Korean word, which consists of a stem and, if needed, a sequence of suffixes. In the case of nominal suffixes, though there are suffixes having the forms beginning with an initial *n* or *l*, such as *-nin* (top.) and *-lil* (acc.), they have allomorphs, *-in* and *-il*, that are used after consonant-final stems: *-in* and *-il* occur after consonant-final stems, as in (12a,b,d) below, and *-nin* ~ *-(i)n* and *-lil* ~ *-(i)l* after vowel-final stems, as in (12c,e) below.⁴ And potential *l*-initial nominal suffixes, such as *-ilo* (instr./dir.), have a preceding bridge vowel *i*, as in (12e,f).

(12) no *nl* or *ln* sequence in a native Korean nominal word

a. /hanil-in/	[hanirin]	‘sky (top.)’
b. /kjosil-in/	[kjosilin]	‘classroom (top.)’
c. /na-in/	[nan]	‘I (top.)’ (~ /na-nin/ [nanin])
d. /sin-il/	[sinil]	‘shoes (acc.)’
e. /na-il/	[nal]	‘I (acc.)’ (~ /na-lil/ [naril])
f. /son-ilo/	[soniro]	‘with a hand’
(cf. /k ^h al-ilo/	[k ^h allo]	‘with a knife’)
g. /san-ilo/	[saniro]	‘to a mountain’
(cf. /tʃəl-ilo/	[tʃəllo]	‘to a temple’

Therefore, there is no case in which a noun stem ending in *n* or *l* composes *nl* or *ln* with a suffix-initial *l* or *n* across a morpheme-boundary.

In the case of verbal suffixes, there are *n*-initial suffixes, such as *-nin* (pres.) and *-ni* (inter.). When they follow *l*-final verb stems, the sequence *ln* is avoided via deletion: the stem-final *l* is lost before the suffix-initial *n* as in (13) below.

(13) when an *l*-final verb stem is followed by an *n*-initial suffix

a. /sa:l-nin/	[sa:nin]	‘live (pres.)’
b. /no:l-ni/	[no:ni]	‘play (inter.)’
c. /tal-ni/	[tani]	‘be sweet (inter.)’

Potential *n*-initial verbal suffixes that have an initial vowel *i* after consonants other than *l* do not have the initial vowel *i* after *l*-final stems as after vowel-final stems. When such a suffix is added to a *l*-final verb stem, the stem-final *l* is also lost to avoid the sequence *ln* if *n* is to come after *l*.

(14) a. /sa:l-in /	[sa:n]	‘live (past)’
(cf. /mæk-in/	[mægɪn]	‘eat (past)’)
b. /tal-inik’a/	[tanik’a]	‘be sweet (caus.)’

⁴ Allomorphs *-nin* and *-lil* for vowel-final nouns are reduplicative forms for *-in* (top.) and *-il* (acc.): e.g. *na-in-in* *nanin* ‘I (top.)’, *na-il-il* *nalil* ‘I (acc.)’.

(cf. /mək-inik'a/	[məginik'a]	'eat (caus.)'
c. /no:l-ini/	[no:ni]	'play (cont.)'
(cf. /mək-ini/	[məgini]	'eat (cont.)'

Notice that the vowel *i* is retained after *l*-final nouns as in (12a,b) whereas it does not appear after *l*-final verbs as in (14a,b,c), inducing stem-final *l*-loss.

After *l*-final nouns the initial vowel *i* of suffixes with initial *i* + *n* function to protect the stem-final *l* from loss. Noun stems as free forms are more integral and robust to formal change than verb stems as bound forms.

Now let us consider other cases where potential *ln* or *nl* sequences are avoided. There are examples where *lh*-final verbs are followed by *n*-initial suffixes as in (15):

(15) a. /silh-ni/	[silli]	'be hateful (inter.)' (~ [silini]) ⁵
b. /silh-nja/	[sillja]	'be hateful (inter.)' (~ [silinja])
c. /olh-ni/	[olli]	'be right (inter.)' (~ [ollini])
d. /olh-nja/	[ollja]	'be right (inter.)' (~ [ollinja])
e. /ilh-ni/	[illi]	'lose (inter.)' (~ [ilini])
f. /ilh-nja/	[illja]	'lose (inter.)' (~ [ilinja])
g. /k'ilh-ni/	[k'illi]	'boil (inter.)' (~ [k'ilini])
h. /k'ilh-nja/	[k'illja]	'boil (inter.)' (~ [k'ilinja])
i. /ilh-nin/	[illin]	'lose (pres.)'
j. /k'ilh-nin/	[k'illin]	'boil (pres.)'

Though the stem-final *h* is lost, the *l* in the stems is not lost and the suffix-initial *n* changes to *l*. Interestingly, variant suffix forms with the initial *i* such as *silini*, *ollini*, *ilini* and *k'ilini* are found in certain dialects (including my dialect). As with nominal suffixes, potential *l*-initial verbal suffixes, such as *-ilə* (pur.) and *-ili* (int.), have a preceding bridge vowel *i* as in (16) below, and thus the sequence *nl* does not occur.

(16) a. /sin-ilə/	[sinirə]	'wear shoes (purp.)'
(cf. /sa:l-ilə/	[sa:llə]	'live (purp.)'
b. /sin-ili/	[siniri]	'wear shoes (int.)'
(cf. /sa:l-ili/	[sa:lli]	'live (int.)'
c. /sin-il/	[sinil]	'wear shoes (fut.)'
(cf. /sa:l-il/	[sa:l]	'live (fut.)'

⁵ Both the forms with the initial vowel *i* (*-ini*, *-inja*) and the forms with it (*-ni*, *-nja*) are entered in Korean dictionaries. In *Yonsei Hankwuke Sacen* (1998) and *Pyocwun Kwuke Taysacen* (1999) it is mentioned that the forms with the initial vowel *i* are used with stative verbs with a final consonant and that *-ninja* instead of *-inja* or *-nja* is used with non-stative verbs.

Let us consider the suffix-initial vowel *i* with respect to sequences *nl* and *ln* and syllable contact. It is controversial whether the suffix-initial vowel *i* is deleted or inserted, that is, whether it is underlying or derived. Most Korean phonologists assume that the suffix-initial vowel *i* is underlying and it is deleted in certain environments. This is because, if it is assumed that it is inserted, it does not seem to be possible apparently to predict in what environment it is inserted since there are suffixes that have the vowel *i* as in (17) and those that do not as in (18) in the same environment.

(17) the suffix *-(i)ni* (cont.)

a. /mək- <i>ini</i> /	[məgini]	‘eat (cont.)’
b. /sim- <i>ini</i> /	[simini]	‘plant (cont.)’
c. /no:l- <i>ini</i> /	[no:ni]	‘play (cont.)’

(18) the suffix *-ni* (inter.)

a. /mək- <i>ni</i> /	[məŋni]	‘eat (inter.)’
b. /sim- <i>ni</i> /	[simni]	‘plant (inter.)’
c. /no:l- <i>ni</i> /	[no:ni]	‘play (inter.)’

In this controversy, however, there is a fact that has been ignored. If we look at the distribution of the suffix-initial vowel *i* more closely, we can find that it is not totally unpredictable in which environment the vowel appears. The vowel *i* does not appear before stop- or affricate-initial suffixes, that is, a suffix-initial *i* + stop or affricate sequence is not found. By contrast, the suffixes do not exist that have an initial *l* without the preceding vowel *i*. In Korean, there are a number of stop- or affricate-initial suffixes (e.g., *-to*, *-ta*, *-ko*, *-tʃi*, *-ke*, *-tʃa*, *-taka*, *-tolok*) and (*i*)*l*-initial suffixes (e.g., *-ilo*, *-il*, *-ili*, *-ilə*, *-iljə*, *-ila*, *-illə*). The fact is this: the suffix-initial vowel *i* does not appear before stops or affricates, which are the least sonorous and most optimal as syllable onset, while it always appears before a liquid *l*, which is the most sonorous and least optimal for a syllable onset, except when it follows another liquid which is equally sonorous. In the case of fricatives and nasals, on the other hand, two types coexist—those which have the initial *i* and those which do not have it. Even in this category, however, there is also some asymmetry though the reason is not clear: in the case of fricatives the vowel *i* appears only in honorific suffixes (e.g. *-isi-*); in the case of nasals, sentence-final suffixes do not have the initial *i* while non-final suffixes have it except for the present suffix *-nin*. (However, there is some variation among dialects and different lexical types of stems as we saw in (15) above.)

In any event, it seems clear that the suffix-initial vowel *i* is related to the syllable contact.⁶ If *l* occurred in suffix-initial position, the sequences like plosive + *l* and nasal + *l* including the sequence *nl*, which should be avoided, would be expected to arise. Then, some strategies would have to be employed to avoid them. If assimilation were employed, we would have a number of homophones as in the following:

- (19) a. */pap-lo/ *[pamno] ‘with rice’ (cf. /pap-ilo/ [pabiro])
 b. */pam-lo/ *[pamno] ‘to the night’ (cf. /pam-ilo/ [pamiro])
 c. */sin-lo/ *[sillo] ‘with shoes’ (cf. /sin-ilo/ [siniro])
 d. /sil-lo/ [sillo] ‘with tread’ (cf. /sil-ilo/ [sillo])

We can see that underlying forms are faithfully protected against radical change of assimilation thanks to the vowel *i*. We can see that in a native Korean word, the sequence *nl* among others is avoided by the vowel *i* and the sequence *ln* by the vowel *i* or deletion of the more sonorous consonant *l* in the syllable coda. Thus, the function of the suffix-initial vowel *i* is clear.

Now let us consider Sino-Korean words. Sino-Korean morphemes are all monosyllabic. Though one monosyllabic morpheme can be a word by itself, most Sino-Korean words are composed of two monosyllabic morphemes. Therefore the sequences *ln* and *nl* come to arise in many Sino-Korean words. However, they do not surface since they are adjusted according to a constraint that prohibits such sequences in Korean. In disyllabic Sino-Korean words that are composed of two morphemes, cross-morphemic *nl* and *ln* sequences surface as *ll*, that is, the coronal *n* is assimilated to *l* when it is adjacent to *l* as we saw in (1) in section 2. Though we can consider that the avoidance of the sequence *nl* is due to a bad syllable contact, its mirror-image sequence *ln* does not make up a bad syllable contact. Therefore we have to find the other motivation for the avoidance of the sequence *ln*. As we see in the examples above, the fact that the sequences *nl* and *ln* do not appear within a morpheme and they are avoided by the bridge vowel *i* or consonantal loss show that such sequences are avoided. Thus a (surface) constraint should be motivated to disallow those sequences.

Let us consider the motivation for the change of *n* → *l* rather than *l* → *n* to avoid the sequences *nl* and *ln*. We can find it in the Strength Assimilation Law, cited in section 4. The less sonorous consonant *n* changes to the more sonorous *l*. As Vennemann (1988: 40) points out, word-medial consonants are generally weaker than word-initial consonants. This fact seems to be relevant to this phenomenon. We can find evidence that the (oral) liquid geminate *ll* is more natural than the nasal geminate *nn*

⁶ Most Korean traditional grammarians have maintained that the suffix-initial vowel *i* serves to break consonant clusters. However, this view does not seem to be correct. Rather, it is related to sonority.

in word-medial position. There are Sino-Korean words in which the sequence *nm* is pronounced as *ll* and those words in which the sequence *nn* is totally restructured as *ll* as shown in (20) below. However, there is no example in which the sequence *ll* changes to *nn*.

- (20) i. variation between medial *nm* and *ll*
- | | | |
|-------------------|-----------------------------|-----------------------|
| a. /tan.njəm/ | [tannjəm] ~ [talljəm] | ‘resignation’ |
| b. /kwə:n.noŋ-il/ | [kwə:nnoŋil] ~ [kwə:lloŋil] | ‘Day for Agriculture’ |
| c. /si:n.njəm/ | [si:nnjəm] ~ [si:lljəm] | ‘conviction’ |
- ii. historical change of medial *nm* > *ll*
- | | | | |
|--------------------------------|------------------------------|---------------------------|-----------------------------------|
| a. /ko:n.nan/ | > /ko:l.lan/ | [ko:llan] | ‘trouble’ (*konnan) |
| b. /sən.noŋ-t ^h aŋ/ | > /səlləŋ.t ^h aŋ/ | [səlləŋt ^h aŋ] | ‘soup’ (*sənnəŋt ^h aŋ) |
| cf. /kan.nan/ | > /ka.nan/ | [kanan] | ‘poverty’ (*kannan) |

Furthermore, it is hard to find the geminate *nm* within a native Korean morpheme while the geminate *ll* is legion. I can find only one native morpheme that has the geminate *nn*: *ənni* ‘elder sister’. Specifically, in mimetics, in which the unmarked seem to emerge, the geminate *nm* does not occur though the geminate *ll* is much favored, as in the examples in (21) below.

- (21) a. /tʃ^hallaŋ/
- | | | |
|-------------------------|----------------|---------------------------------|
| [tʃ ^h allaŋ] | ‘rippling’ | |
| b. /həlləŋ/ | [həlləŋ] | ‘loosely’ |
| c. /nallim/ | [nallim] | ‘darting (a tongue) in and out’ |
| d. /tʃəllim/ | [tʃəllim] | ‘limping’ |
| e. /həlle-pəlt’ək/ | [həllebəlt’ək] | ‘panting and puffing’ |

Thus, the Korean lexicon shows that an oral geminate *ll* is less marked than a nasal geminate *nm* word-medially.

6. Conflicting changes

Before moving on to main discussion in this section I will define the prosodic word in Korean briefly because it is relevant to the present discussion. Basically I use the term in the same sense as in Kang (1992). Among others syllabification and resyllabification define prosodic word in Korean. First, syllabification takes place within a prosodic word and then resyllabification reapplies across the word boundary. Syllable-sensitive processes such as syllable-final neutralization show initial syllabification as in the examples such as [sot^h][alæ] ‘below kettle’ [sodaræ], [sot^h][ilim] ‘kettle name’ [sodirim] ~ [sonnirim], [[sot^h] -e] ‘to the kettle’ [sot^he], [[sot^h] -i] [sot^hi] ‘to the kettle’ [sot^he]. In general, minimal free forms function as prosodic words. Prefixes also function as prosodic words while suffixes do not. (See Kang 1992 for details).

In the previous section I discussed how the sequences *nl* and *ln* are avoided in Korean and suggested that the motivation for their change to *ll* can be found in the Strength Assimilation Law proposed by Vennemann. I also provided some evidence that a liquid geminate *ll* is more natural (less marked) than a nasal geminate *nn* in word-medial position in Korean.

As we saw in (2i) earlier, however, there are cases in which the sequence *nl* changes to a nasal geminate *nn* rather than a liquid geminate *ll*. Let us consider the motivation for this difference in the resolution of two adjacent segments *n* and *l* that cannot both surface and thus compete for dominance. We saw that the sequence *nl* does not occur in a native prosodic word thanks to the bridge vowel *i*. And also a native Korean word and another native Korean word do not make up a sequence *nl* across a word boundary since there is no native Korean word that begins with *l*. (Native Korean morphemes make up *ln* to be resolved as in *sal-ni* ‘live (inter.)’, *tal-nim* ‘moon (hon.)’, and *pul+napi* ‘fire moth’, though.) Thus, all the cases in which the sequence *nl* arises involve Sino-Korean or other foreign loans.

First, let us consider the cases in which the word that has an initial *l* or *n* is a Sino-Korean word. Word-initial *l* is avoided in Korean: native Korean words do not have an initial *l* and Sino-Korean words whose first morpheme has an initial *l* etymologically have *n* initially on the surface when it is used in isolation or after a word that ends in a segment other than *l*, as the examples in (22) below show.

- (22) a. /non.tʃæŋ/ [nondʒæŋ] ‘debate’
 (cf. /pa:n.lon/ [pa:llon] ‘objection’, /tʰo:.lon/ [tʰo:ron] ‘discussion’)
 b. /sæ/ /non.tʃæŋ/ [sænonndʒæŋ] ‘new debate’
 c. /su.kip/ /non.tʃæŋ/ [sugimnonndʒæŋ] ‘debate on demand/supply’
 d. /kin/ /non.tʃæŋ/ [kinnonndʒæŋ] ‘big debate’
 e. /motin/ /non.tʃæŋ/ [modinnonndʒæŋ] ‘all the debates’
 f. /tʃə:.tʃil/ /non.tʃæŋ/ [tʃə:dʒillonndʒæŋ] ‘bad debate’

Most Korean linguists assume that Sino-Korean words that have an etymological *l* initially have an initial *l* underlyingly and that they change their initial *l* to *n* due to a synchronic rule. However, it seems more appropriate to assume that they have an initial *n* rather than *l* due to a constraint. This is because most Sino-Korean words can be used in isolation like nouns and have grown old. They are learned as a whole and the morphological relations among Sino-Korean words are learned later when one learns Chinese characters and expands his/her lexicon. In any event, it seems to be due to the fact that they have an initial *n* when they are used in isolation rather than due to the assimilation of the underlying *l* to the preceding consonant that Sino-Korean words that have an initial *l* etymologically have *n* after the words ending in *n* (22d,e) as well as those ending in a consonant other than *l* (22c). The fact that Sino-Korean words

that have an initial *l* etymologically have an initial *n* after a vowel-final word (22b) while their first morphemes have an *l* word-medially after vowel-final morphemes in (disyllabic) Sino-Korean words (e.g. /t^ho:lon/ [t^ho:ron] ‘discussion’) shows that their initial *n* is not due to syllable contact.

Now let us consider trisyllabic Sino-Korean words in which the second morpheme ends in *n* and the third morpheme has an *l* underlyingly as in (23) below. As I mentioned above, most Sino-Korean words are composed of two monosyllabic morphemes though there are monosyllabic words (see 2if). However, there are also trisyllabic Sino-Korean words as in (23) below and (2id–e) earlier.

- (23) when a suffix is added to a disyllabic word
- | | | |
|-----------------|------------|---------------------|
| a. /su.sən-ljo/ | [susənnjo] | ‘repair charge’ |
| b. /nak.san-li/ | [naksanni] | ‘Naksan village’ |
| c. /mu.sin-lon/ | [muʃinnon] | ‘atheism’ |
| d. /sin.mun-lo/ | [sinmunno] | ‘a street in Seoul’ |

In these examples the final syllable cannot be a word since it is not used in isolation and it is a bound morpheme. In general, trisyllabic Sino-Korean words contain one disyllabic Sino-Korean word and one additional Sino-Korean morpheme preceding or following it. The (monosyllabic) Sino-Korean morpheme preceding or following the disyllabic Sino-Korean word in a trisyllabic Sino-Korean word can be considered as a prefix and suffix, respectively. In (23) above, disyllabic Sino-Korean words are contained in trisyllabic words, in which the final *l*-initial morphemes are suffixes. Thus, it is not because it is in the word-initial position that the *l* in the final syllable becomes *n*. It is clear that this is due to syllable contact. Then why does the *l* become *n* rather than *l* in contact with the preceding *n*? It seems that we can find the motivation in the difference of the status of the disyllabic word and the final monosyllabic suffix. That is, they do not have the same status. In the disyllabic words within which the sequence *nl* becomes *ll* the two composing morphemes are bound and have equal status. However, in the trisyllabic Sino-Korean words as in (23) above, the first disyllabic words are used independently while the final syllables are bound forms. Thus the retention of the word-final segment *n* rather than the bound suffix-initial *l* can be attributed to the fact that the disyllabic words are used in isolation and thus perceptually salient. As Vennemann points out, the direction of assimilation may be determined by a desire to protect the integrity of a stem or suffix. And McCarthy and Prince (1994) point out the integrity of a stem is more significant than that of a suffix.

There are also examples where *l*-final words about *n*-initial suffixes, as in (24) below. As it is expected the sequence *ln* is resolved into *ll*. This observes both dominance of word over suffix and word-internal *ll* over *nn*.

- (24) a. /kjəul-næ/ [kjəullæ] ‘all the winter’
 b. /manil-næ/ [manillæ] ‘garlic smell’
 c. /kjo.sil-næ/ [kjo.sillæ] ‘inside the classroom’
 d. /kjəŋ.tʃal-nim/⁷ [kjəŋ.tʃallim] ‘policeman (hon.)’

Now let us consider the cases in which *l*-initial non-Sino-Korean foreign loan words follow *n*-final words. Non-Sino-Korean foreign loans in isolation may have an initial *l* on the surface. I give some examples in which the sequence *nl* surfaces as *nm* in (25) below.

- (25) a. /tʃən/ /ləsia/ [tʃənnəsia] ‘whole Russia’
 b. /motin/ /lailak/ [modinnairak] ‘all the lilacs’
 c. /hun.ljən/ /lak^het^hi/ [hulljənnak^het^hi] ‘racket for training’
 d. /on/ /lain/ [onnain] ‘on-line’

While a word and a suffix concatenate in the examples in (23), both members that concatenate are prosodic words and thus a word boundary is involved in the examples in (25) above. Thus, we cannot appeal to the prosodic difference for the retention of the word-final *n* over word-initial *l* in the examples in (24) above as for the examples in (23). In these examples, the difference between *n* and *l* lies in their position, that is, they are in the word-final and initial position, respectively. This suggests that we have to appeal to their positional difference. Then, why does *n* in word-final position wins over *l* in word-initial position? As Vennemann (1988: 40) points out, word-initial consonants tend to be stronger than word-medial consonants. The change of the word-initial *l* to *n* assimilating to the word-final *n* is a strengthening of the word-initial segment, preserving the integrity of the word-final segment *n* at the same time. Furthermore, *l* ([r]) as a word-initial segment is not so native as *n* as native Korean words and Sino-Korean words do not have an initial *l*. *l*-initial foreign loans also undergo the change of *l* to *n* due to syllable contact when they follow the words ending in a consonant other than *l*, as illustrated in (6) in section 3. It is reasonable that, when they compete, word-initial *l*, whose laterality alternates with nasality and is unstable anyway, is more prone to the change than word-final *n*, whose nasality is stable. The fact is also relevant that in Korean word-final contrast between *n* and *l* is far more significant functionally than word-initial contrast between *n* and *l*, which is in general neutralized. Specifically, there is a very important syntactic structure in which word-final contrast between *n* and *l* represents opposite meanings. In Korean, relative pronouns do not exist and certain verbal suffixes

⁷ There are examples where *l* is lost before *n* such as *atil-nim* [adinim] ‘son (hon.)’, *t’alnim* [t’anim] ‘daughter (hon.)’ and *hanil-nim* [haninim] ‘sky (hon.), God’. These examples are comparable to those in (13). These forms seem to have been relexicalized as *atinim*, *t’anim* and *haninim* respectively.

function as noun modifiers. Such suffixes are differentiated depending on different tense/aspect. Especially, the suffix for past/perfective and the suffix for future are contrastive only by their final coronal segment *l* and *n*, as the examples in (26) below show.

- (26) a. /kot^hi-in/ /latio/ [kot^hinnadio] ‘repaired radio’
 b. /kot^hi-il/ /ladio/ [kot^hilladio] ‘radio to be repaired’
 c. /salat^hi-in/ /læmp^hi/ [saradzinnæmp^hi] ‘disappeared lamp’
 d. /salat^hi-il/ /læmp^hi/ [saradzillæmp^hi] ‘lamp to disappear’

If the two suffixes were contextually neutralized in their final segments into *l* before *l*-initial foreign loans such as the examples in (26), a serious problem would arise in recovering their meanings. Thus, the integrity of the final segment *n* is significant enough to be preserved in the syllable contact at the expense of the word-initial *l*, which alternates with *n* anyway in the language.

As I observed above with respect to the examples in (22), word-initial *n* is not due to syllable contact though general word-initial *l* avoidance may have originated reflecting syllable contact (see section 3). Thus the change of word-initial *l* to *n* in the examples as in (27) below should also be attributed to word-initial *l* avoidance though it appears to be due to positional dominance.

- (27) when a prefix is added to a disyllabic word
 a. /sin-lo.sən/ [sinnosən] ‘new line’ (/sin-//no.sən/)
 b. /sin-lon.tʃæŋ/ [sinnontʃæŋ] ‘new debate’ (/sin-//non.tʃæŋ/)
 c. /tʃin-lok.sæk/ [tʃinnoksæk] ‘dense green’ (/tʃin-//nok.sæk/)

It seems natural that the examples as in (22) and (27) also contribute to the resolution of *nl* to *ll* rather to *nn* in the examples as in (25).

Finally I will discuss the examples which appear to be exceptions to the argument above. We find some speakers pronounce the words in (28) as indicated.

- (28) a. /im.un-lon/ [imullon] ‘phonology’ (/im.un.lon/)
 b. /sin.mun-lo/ [sinmullo] ‘a street in Seoul’ (/sin.mun.lo/)
 c. /on-lain/ [ollain] ‘on-line/online’ (/onlain)

We notice that these words have similar structures: word plus affix. It seems that the speakers who pronounce the words in (28) as indicated recognize them as single words without internal word plus affix structure. That is, the words are restructured into single words, and word-internal preference of *ll* over *nn* is applied.

7. An OT account

In this section I will look at the facts that have been discussed above from the perspective of constraint-based Optimality Theory. Because I have discussed the phenomena and their motivations at length in the previous sections, I will discuss the constraints which are relevant to the alternation of *n* and *l* in Korean and determine their ranking in this section.

We saw that adjacent coronal sonorants in different manner of articulation do not surface in Korean. We saw that this constraint is so pervasive in Korean phonology and lexical structures tend to comply with this constraint. Korean speakers also experience difficulties in learning *ln* sequence in foreign languages as in *ll n'y a ...* in French. Thus we have to recognize the constraint **nl/*ln*. In addition to this constraint there is a constraint against a word-initial liquid. Thus, I posit word-initial liquid avoidance constraint **_{wd}[l/r]*. However, it applies only to native and Sino-Korean words that have been nativized, but not to non-Sino-Korean loanwords. This fact can be accounted for by appealing to stratum-specific faithfulness as Fukazawa, Kitahara, and Ota (1998) did for Japanese. Thus I propose stratum-specific faithfulness constraint ID-IO(liquid)-F(oreign) which applies to the lexical stratum of non-Sino-Korean loanwords. In section 6 I showed that word-final position wins over word-initial position. Thus I propose positional faithfulness constraints with respect to *n* and *l* since *n* and *l* are segments relevant to *n/l* alternation: ID-IO(nasal, C)_{wd}] and ID-IO(liquid, C)_{wd}]. These interact with general faithfulness constraints ID-IO(liquid) and ID-IO(nasal), which are dominated. In section 4 we saw that if the onset consonant of a syllable is more sonorous than the coda consonant of the immediately preceding syllable, the onset and/or the coda adjust their sonority so that the optimal syllable contact obtains. As Vennemann's Syllable Contact Law predicts, in Korean the onset consonant of a syllable should not be more sonorous than the coda consonant of the immediately preceding syllable. Thus I propose syllable contact constraint SON(Cod ≥ Ons). These eight constraints seem to be sufficient to account for the *n/l* alternation.

Now let us consider their ranking. First, the constraints **nl/*ln* and SON(Cod ≥ Ons) are not dominated, that is, they are not violated. Thus their relative ranking is not determined. The positional markedness constraint **_{wd}[l/r]* is 'sandwiched' in between the stratum-specific faithfulness constraint ID-IO(liquid)-F and the general faithfulness constraint ID-IO(liquid), giving the ranking ID-IO(liquid)-F >> **_{wd}[l/r]* >> ID-IO(liquid). This reflects the fact that the underlying *l* should change in word-initial position due to word-initial avoidance, but that non-Sino Korean foreign loans retain their initial *l*. The fact that the coronal *n* becomes *l* when it is preceded or followed by *l* but that *l* becomes *n* when it is preceded by word-final *n* shows that faithfulness to liquid is generally ranked above faithfulness to nasal except for the word-final position. Thus we can find a general ranking ID-IO(liquid) >> ID-IO(nasal). The fact that *l*

becomes n when it is preceded by word-final n can be accounted for by ranking the more specific positional faithfulness constraint ID-IO(nasal, C_{wd}) over the faithfulness constraint ID-IO(liquid). If the ranking ID-IO(liquid) >> ID-IO(nasal) and the ranking ID-IO(nasal, C_{wd}) >> ID-IO(liquid) are combined, the ranking ID-IO(nasal, C_{wd}) >> ID-IO(liquid) >> ID-IO(nasal) obtains. Now we see that the ranking block ID-IO(liquid)-F >> *_{wd}[l/r] >> ID-IO(liquid), which was determined above, refers to liquids. Since the constraints for faithfulness to liquid make up a hierarchical block in this way, the whole block replaces ID-IO(liquid) in the ranking hierarchy ID-IO(nasal, C_{wd}) >> ID-IO(liquid) >> ID-IO(nasal). Then the ranking hierarchy ID-IO(nasal, C_{wd}) >> ID-IO(liquid)-F >> *_{wd}[l/r] >> ID-IO(liquid) >> ID-IO(nasal) obtains. We see that the constraint ID-IO(liquid, C_{wd}) dominates the constraint *_{wd}[l/r] in the examples in (29) below.

- (29) a. /tʃən.tʃ^həl/ /lo.sən/ [tʃəntʃ^həllosən] ‘subway line’
 b. /kail/ /nolæ/ [kaillolæ] ‘autumn song’
 c. /kjəul/ /njətʃa/ [kjəulljətʃa] ‘winter woman’

Thus, the ranking ID-IO(liquid, C_{wd}) >> *_{wd}[l/r] obtains. The constraint ID-IO(liquid, C_{wd}) and the constraint ID-IO(liquid)-F do not interact. Then the ranking ID-IO(liquid)-F, ID-IO(liquid, C_{wd}) >> *_{wd}[l/r] obtains. If we place this ranking to the hierarchy ID-IO(nasal, C_{wd}) >> ID-IO(liquid)-F >> *_{wd}[l/r] >> ID-IO(liquid) >> ID-IO(nasal), the hierarchy ID-IO(nasal, C_{wd}) >> ID-IO(liquid)-F, ID-IO(liquid, C_{wd}) >> *_{wd}[l/r] >> ID-IO(liquid) >> ID-IO(nasal) obtains. Finally, the undominated *nl/*ln and SON(Cod ≥ Ons) should be placed to the hierarchy. They do not interact with ID-IO(nasal, C_{wd}). Thus the ranking hierarchy *nl/*ln, SON(Cod ≥ Ons), ID-IO(nasal, C_{wd}) >> ID-IO(liquid)-F, ID-IO(liquid, C_{wd}) >> *_{wd}[l/r] >> ID-IO(liquid) >> ID-IO(nasal) obtains. However, we find that the constraint ID-IO(liquid, C_{wd}) do not interact only with ID-IO(liquid)-F but also with the constraint ID-IO(nasal, C_{wd}). Thus I will place the constraint along with higher constraints for the present because we do not have any means to show this ranking relation graphically—linearly or in tableau as yet. Hence the final hierarchy *nl/*ln, SON(Cod ≥ Ons), ID-IO(nasal, C_{wd}), ID-IO(liquid, C_{wd}) >> ID-IO(liquid)-F >> *_{wd}[l/r] >> ID-IO(liquid) >> ID-IO(nasal).

Below I give some examples in which these constraints are involved. I use alphabetical letters to represent the constraints for typographic convenience.

A = *nl/*ln; B = SON(Cod ≥ Ons); C = ID-IO(nasal, C_{wd}); D = ID-IO(liquid, C_{wd}); E = ID-IO(liquid)-F; F = *_{wd}[l/r]; G = ID-IO(liquid); H = ID-IO(nasal).

- (30) tʃin.li true reason [tʃilli] ‘truth’

/tʃin.li/	A	B	C	D	E	F	G	H
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a.	tʃinli	*!	*						
b.	tʃilli								*
c.	tʃinni							*!	

(31) tʃa.pon ‘capital’ - lon ‘theory’ tʃaponlon [tʃabonnon] ‘theory of capital’

	/tʃa.pon//lon/	A	B	C	D	E	F	G	H
a.	tʃabonlon	*!	*						
b.	tʃabollon			*!					*
c.	tʃabonnon							*	

(32) pul ‘fire’ + napi ‘butterfly’ pulnapi [pullabi] ‘fire moth’

	/pul//napi/	A	B	C	D	E	F	G	H
a.	pulnabi	*!							
b.	pullabi						*		
c.	punnabi				*!			*	

(33) tal ‘moon’ - nim ‘(hon.)’ talnim [tallim] ‘moon (hon.)’

	/tal//nim/	A	B	C	D	E	F	G	H
a.	talnim	*!							
b.	tallim						*		
c.	tannim				*!			*	

(34) latio ‘radio’ latio [radio] ‘radio’

	/latio/	A	B	C	D	E	F	G	H
a.	radio						*		
b.	nadio					*!		*	

(35) sin ‘new’ - latio ‘radio’ sinladio [sinnadio] ‘new radio’

	/sin//latio/	A	B	C	D	E	F	G	H
a.	sinladio	*!	*				*		
b.	silladio			*!					
c.	sinnadio					*		*	

8. Conclusion

In this paper, I have discussed phonological aspects related to the phenomenon of *n/l* alternation in Korean. When the sequence *nl* or *ln* arise, the coronal *n* becomes *l*. However, there are cases in which *l* becomes *n* when it is preceded by *n*. From a rule-based perspective it appears that two rules apply intrinsically in a mutually bleeding order, that is, in a reverse order in different environments. To account for this apparent paradox, I have proposed an OT analysis which relies on stratum-specific faithfulness

and position-specific faithfulness, and showed that the constraints are ranked so that the unmarked structure such as *ll* emerges unless faithfulness asserts itself as in perceptually prominent position such as the edge of a prosodic word. Apparent paradox results from interaction between different constraints.

This analysis provides a very interesting case for positional faithfulness, stratum-specific faithfulness, and positional markedness. Word-initial *l* avoidance in native and Sino-Korean words is a lexicalization of the less ‘marked’ *n* word-initially, respecting the larger number of surface forms. The most sonorous consonant *l* is too high in sonority (‘marked’) in syllable onset position. The syllable-initial *l* is minimally strengthened to *n* when preceded by a consonant other than *l* and *n*. Accordingly, the word- and suffix-initial *l* alternates with *n*. Word-final *n* and *l* are stable while ‘marked’ word-initial *l* alternates with *n* in surface forms due to the syllable contact (cf. Vennemann 1988). The surface forms are respected in the higher ranking of faithfulness to word-final position over faithfulness to word-initial position though word initial and final positions are both perceptually salient. Faithfulness to the word is in general ranked more highly than faithfulness to the suffix (McCarthy and Prince 1994), and this also accounts for the higher ranking of faithfulness to word-final position over faithfulness to suffix-initial position. On the other hand, in word-medial position, which is not perceptually salient, the more sonorous *l* wins over the less sonorous *n*, producing a geminate *ll* more sonorous than a geminate *nn*. I showed some evidence that an oral geminate *ll* is less marked than a nasal geminate *nn* intervocalically (cf. Vennemann 1988). In mimetic words, in which the unmarked emerge, the *nn* does not occur though the *ll* is much favored, and *nn* changes to *ll* in some Sino-Korean words.

Appendix

List of abbreviations

acc.	accusative
caus.	causal
cont.	continuative
dir.	directional
fut.	future
instr.	instrumental
int.	intentional
inter.	interrogative
OT	Optimality Theory
pres.	present
purp.	purposive
top.	topic marker

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