Prosodic Compounding in Japanese and Korean*

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1. Introduction

Recent literature on Prosodic Phonology has shown that prosodic domains are derived from but not necessarily coextensive with syntactic or morphological domains and the correct phonological generalization can only be captured in terms of the prosodic structure (Selkirk 1980, 1986, Nespor and Vogel 1986, Booij and Rubach 1984, 1987, Hayes 1989, Inkelas and Zec 1990, and others).

Prosodic compounding in Japanese and Korean provides an argument for the theory that lexical prosodic constituents are formed largely on the basis of morphological structures and hence they are distinct from metrical constituents such as the mora, the syllable and the foot (Cohn 1989, Inkelas 1989, 1993, Zsiga 1992).

In this paper, by examining various phonological phenomena in Japanese and Korean that crucially refer to a certain prosodic domain in their proper formulations, I argue that the existence of two lexical prosodic categories —the prosodic root (R) and the prosodic word (ω)—must be recognized and accordingly there are two types of compounds in both languages. In addition, I suggest a way to handle a subclass of compounds which I call "asymmetric" compounds and propose that Japanese R–compounds have a distinct prosodic structure from Korean R–compounds.

2. Compounds in Korean

2. 1. The Prosodic Word and *n*-Insertion

Showing that the application of various phonological phenomena such as Coda Neutralization, Palatalization and Stray Erasure are bounded by a specific prosodic domain, I have argued in Han (1993) that the domain in question does not correspond to any morphosyntactic constituent and it must be characterized prosodically. That domain, which is referred to as the prosodic word (ω), includes a stem plus any adjacent suffixes. A prefix and the following stem, or two stems of a compound, constitute two separate prosodic words, like in Hungarian (Nespor and Vogel 1986), Italian (Nespor 1984) and Polish (Booij and Rubach 1984, 1987).

Before going into the discussion of Korean compounding, let us first consider *n*-Insertion, since the discussion on Korean compounding that follows largely relies on the question of the morphological structures in which *n*-Insertion applies or does not apply. *n*-Insertion is responsible for the *n*/ϕ alternation in the words in (1) and (2).

(1) Native Compounds
    [[puək^h] [il]]   [puəŋnil]
    'kitchen' 'work'   'kitchen work'
    [[pat^h] [ilaŋ]]   [panniraŋ]
    'field' 'ridge'   'the ridge of a field'
    [[k^{h}oŋ] [yəs]]   [k^{h}oŋnyət]
    'bean' 'candy'   'bean candy'

(2) Prefixed Words
    [cit [iki-]]   [cinnigi-]
    'indiscriminately' 'to mash' 'to mash'
    [hot^h [ipul]]   [honnibul]
    'single' 'comforter'   'unlined comforter'
    [tət [yaŋmal]]   [tənnyaŋmal]
    'extra' 'socks'   'oversocks'

As shown in (1) and (2), *n*, which is not present in a bare stem, appears between two stems or between a prefix and the following stem when the first stem or the prefix ends in a consonant and the following stem begins

with i or y (Choi 1955, Chung 1980, Huh 1965, Kim 1970, Kim–Renaud 1974).[1] Translated into prosodic terms, n–Insertion inserts n between two prosodic words. The rule can be formulated as a domain–juncture rule as in (3).[2]

(3) n–Insertion

$\phi \rightarrow n/[...C]_\omega\_\_[i...]_\omega$

Thus, n–Insertion must crucially refer to the prosodic word in its proper formulation, providing evidence for the existence of the prosodic word.

2. 2. Two Types of Compounds

In Korean, there is a class of compounds each of which consists of free stems as in (4). In accordance with the discussion in the preceding subsection, I assume that each component of these compounds constitutes a separate prosodic word and refer to these compounds as ω–compounds.

(4) prosodic word (ω) compounds

[[mok] [soli]]   [moks'ori]
'throat' 'sound'   'voice'

[[hankuk] [yəŋhwa]]   [hanguŋnyəŋhwa]
'Korea' 'movie'   'Korean movie'

(5) lists another class of compounds. The constituents of these compounds are Sino–Korean roots all of which are monosyllabic (Song 1986).

[1] n–Insertion seems to be obligatory for some words but optional for other words. n tends to be inserted more readily when the final consonant of the first prosodic word is a sonorant, especially, l, than when it is an obstruent.

[2] The environment of n–Insertion varies slightly depending on whether the second prosodic word is native or Sino–Korean. When it is native, n is inserted between a consonant and i or y. But when it is Sino–Korean, n is inserted between a consonant and only y, excluding i. So, [pannil] from [[patʰ] [il]] 'working in a field' where il 'work' is a native word is constrasted with [kukk'yəŋil] (*[kukk'yəŋnil]) from [[[kuk] [kyəŋ]] [il]] 'national holiday' where il 'day' is Sino–Korean.

(5) prosodic root (R) compounds

[[tæ] [hak]]   [tæhak]
'big' 'learning'   'college'
[[ca] [toŋ]]   [cadoŋ]
'self' 'move'   'automatic'

I propose that each Sino–Korean root forms a prosodic constituent distinct from the prosodic word on the grounds that (i) the majority of Sino–Korean morphemes are bound and (ii) the phonological properties of Sino–Korean compounds are different from those of ω–compounds.[3] I argue that each Sino–Korean root constitutes the prosodic domain smaller than the prosodic word—namely the prosodic root (R) and term the compounds in (5) R–compounds.[4] Adopting Inkelas's model of Prosodic Lexical Phonology, I formulate the following prosodic compounding rule to accomodate the two types of compounds.[5, 6]

(6) Compounding (Korean)

Morphological constituency	Morphological constituency	Prosodic constituency
[x] [y] →	[xy]	$[[x]_{\not{p}} [y]_{\not{p}}]_{\not{p}}$

The prosodic compounding rule in (6) creates one constituent morphologically. Prosodically, it also generates one constituent yet its internal structure is visible such that a compound forms two domains internally and the prosodic type of a component must be identical with that of the entire compound as well as that of the other component. As we will see later, the prosodic type of components is determined by the left constituent of a compound.

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[3] There are some Sino–Korean morphemes that can be used independently as a word e.g. $c^haŋ$ 'window', mun 'door' and $pəp$ 'law'.

[4] Not only the compounds made up of Sino–Korean roots but also the compounds composed of native verb roots such as $o-$ 'to come' $+ka-$ 'to go'$\rightarrow oka-$ 'to come and go', $tol-$ 'to turn'$+po-$ 'to see'$\rightarrow tolpo-$ 'to take care of' can be considered as R –compounds. The latter class is relatively small.

[5] Selkirk (1982) and Itô and Mester (1991 class lectures) claim that the constituents of a compound must be of the same type. The same effect is obtained by the prosodic compounding rule itself as formulated in (6).

[6] The reason why I make the category p, recursive will be discussed in the next subsection.

Although the existence of the prosodic root in Korean is motivated by bound roots, I extend the category to free morphemes, arguing that all lexical morphemes can form a prosodic root whether they are bound or free, and that free prosodic roots are raised to the prosodic word.[7]

2. 3. Phonological Difference between the Two Types of Compounds

n–Insertion applies between two elements of a ω–compound as shown in (1). By contrast, there is no *n* inserted between two elements of a R–compound even though the segmental requirement is met.

(7) [[min] [yo]]   [minyo] (*[minnyo])
        'people' 'song'   'folk song'
        [[yaŋ] [yak]]   [yaŋyak] (*[yaŋnyak])
        'Western' 'medicine'   'Western medicine'
        [[wən] [yu]]   [wənyu] (*[wənnyul])
        'origin' 'oil'   'crude oil'

Thus, the contrast between (1) and (7) indicates that the constituents of the compounds in (1) are prosodically distinct from those of the compounds in (7).

The prosodic compounding rule schema formulated in (6) produces the prosodic structures as given in (8), upon the recognition of the two lexical prosodic categories, namely the prosodic root and the prosodic word.
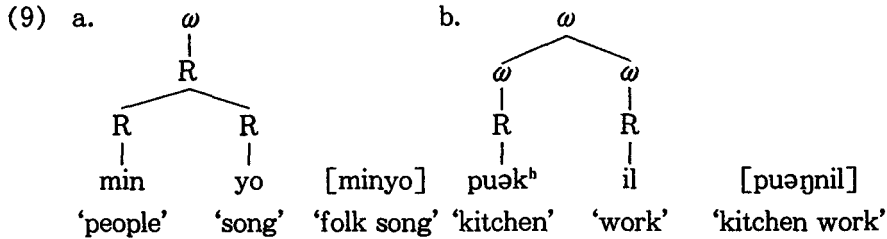
(8) a. R–compound   b. ω–compound

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          R                      ω
        /   \                  /   \
       R     R                ω     ω
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Accordingly, the R–compound [[min] [yo]] 'folk song' has the prosodic structure as in (9a) and the ω–compound [[puəkʰ] [il]] 'kitchen work' is represented as in (9b).

In (9a), two prosodic roots are combined and constitute another prosodic root and then the higher, free prosodic root is raised to the prosodic word. On the other hand, in (9b), the type raising from the prosodic root to the

[7] I have argued in Han (1993) that Korean prefixes also constitute separate prosodic words.

prosodic word operates first and then two prosodic words are combined. Consequently, n–Insertion, a ω–juncture rule, applies to the prosodic–word

(9) a.   b.

min   yo   [minyo]   puək^h   il   [puəŋnil]
'people' 'song' 'folk song' 'kitchen' 'work' 'kitchen work'

compound [[puək^h] [il]] but not to the prosodic–root compound [[min] [yo]], as the latter does not satisfy the prosodic condition of the rule. Thus, (9) demonstrates that compounds such as [[min] [yo]] are derived at a distinct level from compounds such as [[puək^h] [il]].

2. 4. "Asymmetric" Compounds

The two types of compounds— ω–compounds and R–compounds —however, do not exhaust all the compounds found in Korean. There also seem to exist other types of compounds that have not been discussed much in the literature before. Let us look at the compounds in (10) and (11).

(10) [[simin] [kwən]]   [simink'wən]
      'citizen' 'right'   'citizenship'
      [[sekye] [sa]]   [segyesa]
      'world' 'history'   'world history'
      [[ənə] [hak]]   [ənəhak]
      'language' 'study'   'linguistics'

(11) [[nyə] [pæu]]   [yəbæu]
      'female' 'actor'   'actress'
      [[am] [kəlæ]]   [amgəræ]
      'dark' 'deal'   'illegal trade'
      [[tan] [kəli]]   [tangəri]
      'short' 'distance'   'short distance'

The compounds in (10) appear to be composed of a prosodic word and a prosodic root. The left members in (10), *simin* 'citizen', *sekye* 'world' and *ənə* 'language' are free stems which consist of two Sino–Korean bound roots

whereas the right members *kwən, sa* and *hak* are bound roots. On the other hand, the situation is reversed in (11). The constituents of the compounds in (11) are a prosodic root and a prosodic word. The right members *pæu* 'actor', *kəlæ* 'transactions' and *kəli* 'distance', which themselves are composed of two Sino–Korean roots, are independent words in Korean while the left members *nyə, am,* and *tan* are bound roots.

Thus, contrary to the prosodic compounding rule in (6), the compounds in (10) and (11), which I tentatively refer to as "asymmetric" compounds, appear to be composed of the constituents of different prosodic types. In light of (6), "asymmetric" compounds must be analyzed either as ω-compounds or as R-compounds; that is, the two sisters must be of the same prosodic type. I show that this is in fact the case. *n*-Insertion provides crucial evidence for this.[8]
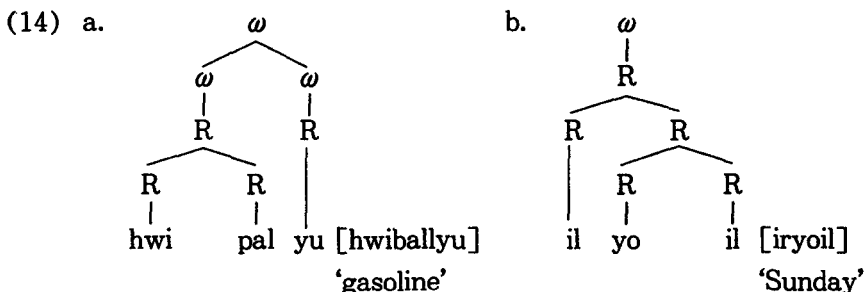
(12) [[sikyoŋ] [yu]]   [sigyoŋnyu]
        'edible' 'oil'   'cooking oil'
        [[hwipal] [yu]]   [hwiballyu] (<[hwibalnyu])
        'volatile' 'oil'   'gasoline'
        [[mæŋcaŋ] [yəm]]   [mæŋjaŋnyəm]
        'appendix' '···itis'   'appendicitis'

(13) [[il] [yoil]]   [iryoil] (*[illyoil]<*[ilnyoil])
        'sun' 'day of the week'   'Sunday'
        [[kyəŋ] [yaŋsik]]   [kyəŋyaŋsik] (*[kyəŋnyaŋsik])
        'light' 'Western food'   'light Western food'
        [[myəŋ] [yənki]]   [myəŋyəngi] (*[myəŋnyəngi])
        'fame' 'performance'   'excellent performance'

(12) and (13) demonstrate that *n* is inserted in the compounds in (12) — the compounds of a prosodic word plus a prosodic root, but never in the compounds in (13) — the compounds of a prosodic root plus a prosodic word. On the basis of this observation, I propose that the compounds of a prosodic word plus a prosodic root must be treated as ω-compounds, and the compounds of a prosodic root plus a prosodic word as R-compounds.

Thus it appears that a prosodic root is promoted to the status of the pro-

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[8] The change from [hwibalnyu] into [hwiballyu] is due to an independent rule of *n*-Lateralization.

sodic word in the former type of compounds even though it is impossible in normal circumstances, whereas a prosodic word seems to be demoted to the status of the prosodic root in the latter type of compounds. In either way, both members of a compound are made to be prosodic constituents of the same type, either the prosodic root or the prosodic word. It seems to depend on the left member whether a compound must be treated as a R–compound or a ω–compound, despite the fact that the right member is the head morphologically. Given the internal structures of R–compounds and ω–compounds as in (8), the compounds [[hwipal] [yu]] 'gasoline' and [[il] [yoil]] 'Sunday' can be analyzed respectively as follows:

(14) a.

(14) exhibits the fact that the composition of *hwipal* and *yu* takes place at the level of the prosodic word but that of *il* and *yoil* at the level of the prosodic root. Hence, only the former meets the structural description of *n*–Insertion.

It might be argued that the reason for the non–application of *n*–Insertion in (14b) is due to the branching structure in the right member of the compound (cf. Japanese Rendaku; Otsu 1980, Itô and Mester 1986). In other words, it might be accounted for by stipulating a condition in the description of *n*–Insertion that the rule does not apply when the right constituent has a branching structure. However, compounds such as [[kul] [[yaŋ] [sik]]] (→[kullyaŋsik]) 'oyster culture' and [[tʰɨkpyəl] [[yakan] [yəlcʰa]]] (→[tʰɨkp'yəllyagannyəlcʰa]) 'special night train' demonstrate that such an analysis is impossible. In [[kul] [[yaŋ] [sik]]] 'oyster culture', [kul] 'oyster' is an independent noun and forms a prosodic word by itself and [yaŋsik] 'culture' is also a prosodic word whose constituents [yaŋ] and [sik] are bound roots. *n*–Insertion applies in this compound although the right constituent has a branching structure. The only difference between [[kul] [[yaŋ] [sik]]] and [[il] [yo] [il]]] (14b) is that the left

constituent can form a prosodic word by itself in the former, but not in the latter. In [[tʰɨkpyəl] [[yakan] [yəlcʰa]]] 'special night train', all three constituents are independent nouns. Note that n is inserted both between [tʰɨkpyəl] 'special' and [[yakan] [yəlcʰa]] 'night train' and between [yakan] 'night' and [yəlcʰa] 'train'. These examples show that n-Insertion applies at the juncture of two prosodic words regardless of the branchingness of the right constituent whether the right constituent itself is a ω-compound or a R–compound.

The following minimal pair illustrates clearly that compounding in Korean can occur at two different levels in the prosodic hierarchy and what matters in determining the type of compounding is the prosodic category type of the left constituent.

(15) a.

```
              ω
          ┌───────┐
          ω       ω
          │       │
          R       R
          │       │
         nun     yak     [nunnyak]
        'eye'  'medicine' 'eyedrops'
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b.

```
          ω
          │
          R
       ┌──────┐
       R      R
       │      │
       an     yak     [anyak]
      'eye' 'medicine' 'eyedrops'
```

Both compounds are disyllabic and have the same meaning. The only difference lies in the left member of each compound; the left constituent *nun* 'eye' in (15a) is a native Korean word but *an* 'eye' in (15b) is a bound root of Chinese origin. n is inserted only in [[nun] [yak]] which is formed at the level of the prosodic word.

Let us turn to the question of why the left constituent of a compound determines the type of compounding. To this end, I hypothesize that Korean adopts the unmarked value in the directionality of prosodification—i. e. prosodification proceeds from left to right. In (14a), the left constituent *hwipal* is prosodified as a prosodic word. Then the right consituent *yu*, even though it alone does not form a prosodic word in usual circumstances, is forced to be prosodified as a prosodic word in order to observe the compounding rule, which requires that both components of a compound be of the same prosodic type. The same rule is also at work in the compound [[il] [yoil]] (14b), but it is forced to be analyzed as a root compound, as the left constituent is a prosodic root.

As demonstrated in (14), there is a process of unusual promotion from the prosodic root to the prosodic word in Korean compounding (14a) but

there is no real demotion from the prosodic word to the prosodic root involved. What looks like demotion is only apparent as in (14b) and it is actually due to the fact that compounds such as [[il] [yoil]] are formed at the level of the prosodic root. Considering that the nature of prosodification is structure–building, it is expected that there would be no process such as demotion that would destroy previously–built prosodic structures.

2. 5. *n*–Insertion in the Kyungsang Dialect

The discussion on *n*–Insertion made so far has been based on the relevant data in the standard Seoul dialect. This subsection deals with the question of how *n*–Insertion operates in the Kyungsang dialect, which is spoken in the Southeastern area of Korea.

There is no difference between the Seoul dialect and the Kyungsang dialect in the application of *n*–Insertion in native word compounds as in (1), prefixed words as in (2) and the compounds of a prosodic word and a prosodic root as in (12). What is common in all of the three cases is that each word consists of two prosodic words. Thus, *n* is inserted at the juncture two prosodic words both in the Seoul dialect and in the Kyungsang dialect.

A difference, however, arises when we consider the application of *n*–Insertion in R–compounds.

(16)		Seoul	Kyungsang
	[[min] [yo]]	[minyo]	[minnyo]
	'people' 'song'	'folk song'	
	[[yaŋ] [yak]]	[yaŋyak]	[yaŋnyak]
	'Western' 'medicine'	'Western medicine'	
	[[wən] [yu]]	[wənyu]	[wənnyu]
	'origin' 'oil'	'crude oil'	

(17)		Seoul	Kyungsang
	[[il] [[yo] [il]]]	[iryoil]	[iĺyoil] (<[iĺnyoil])
	'sun' 'day of the week'	'Sunday'	
	[[kyəŋ] [[yaŋ] [sik]]]	[kyəŋyaŋsik]	[kyəŋnyaŋsik]
	'light' 'Western food'	'light Western food'	
	[[myəŋ][[yən] [ki]]]	[myəŋyəngi]	[myəŋnyəngi]
	'fame' 'performance'	'excellent performance'	

Unlike in the Seoul dialect, *n*–Insertion in the Kyungsang dialect applies in all the instances of R–compounds in (16) and (17) whether they are composed of two bound roots as in (16), or of a bound root plus a stem as in (17). However, it is not the case even in the Kyungsang dialect that *n* is inserted in every sequence of a consonant and *i/y*. There is no *n*–Insertion between a stem and a suffix.
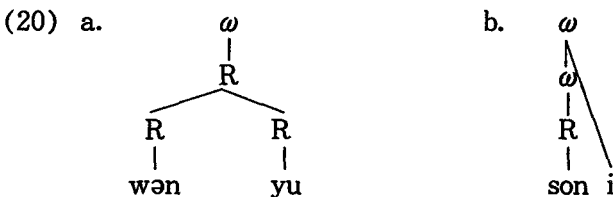
(18) Seoul/Kyungsang

[[son] i] [soni] (*[sonni])

'hand' Nom. 'hand (Nom.)'

[[mun] i–] [muni–] (*[munni–])

'door' Copula 'to be a door'

Some prosodic condition is still needed to describe *n*–Insertion in the Kyungsang dialect properly. I propose that *n*–Insertion in the Kyungsang dialect applies at the juncture of two prosodic roots.

(19) *n*–Insertion (Kyungsang dialect)

$\phi \rightarrow n/[...C]_R\_\_[i...]_R$

Once *n*–Insertion is characterized as a R–juncture rule as in (19), only the words in (1), (2), (12), (16) and (17) meet the structural description of (19) to the exclusion of the words in (18), since there exists a R–juncture in the words in the former group but there is none in the words in (18). Compare the internal prosodic structure of [[wən] [yu]] 'crude oil' and that of [[son] i] 'hand (Nom.)'.

(20) a.

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        ω
        |
        R
      __|__
     R     R
     |     |
    wən    yu
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b.

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     ω
     /\
    ω  \
    |   \
    R    \
    |     \
   son    i
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Thus, the difference in the application of *n*–Insertion with respect to R–compounds between the two dialects results from the distinction in the prosodic environment of the rule of *n*–Insertion; *n*–Insertion is a *ω*–juncture rule in the Seoul dialect whereas the same rule is a R–juncture rule in the Kyungsang dialect. This is an instance of the cases in which the choice of prosodic domains is a dimension along which dialects differ.[9]

n–Insertion in the Kyungsang dialect is appealing in the prosodic perspective in that it shows that dialectal differences are derivable from the choice of prosodic domains and furthermore it provides an argument for the prosodic root as an independent prosodic unit.

3. Compounds in Japanese

3. 1. Two Types of Compounds

Analogous to Korean, Japanese also exhibits two classes of compounds: one class comprises compounds composed of free stems (21) and the other class compounds that consist of Sino–Japanese roots (22) (Kageyama 1982, Poser 1984, Itô and Mester 1991 class lectures). I refer to the former class as *ω*–compounds and the latter class as R–compounds.[10]

(21) word (*ω*)–compounds
      [[asa] [kiri]]   [asagiri]
      'morning' 'mist'   'morning mist'
      [[kyooik]] [seesak]]   [kyooikuseesaku]
      'education' 'policy'   'educational policy'

(22) root (R)–compounds
      [[dai] [gak]]   [daigaku]
      'big' 'learn'   'college'
      [[sek] [yu]]   [sekiyu]
      'stone' 'oil'   'petroleum'

These two classes of compounds show distinct characteristics from each other with respect to certain phonological rules. In what follows, two phonological alternations—the V/ϕ alternation and the *p/h* alternation—are taken to demonstrate this distinction.

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[9] According to Zec (1993), dialects in Serbo–Croatian differ as to what prosodic domain each dialect chooses.

[10] The compounds which Poser (1984) refers to as reduced compounds can also be classified as R–compounds. e.g. *but*– 'to hit' +*kom*– 'to be full'→*bukkom*– 'to drive into', *nor*– 'to ride'+*kir*– 'to cut'→*nokkir*– 'to ride across'

3.2. The V/φ Alternation

There is a well-known morpheme-final V/φ alternation in Sino-Japanese compounds (Kuroda 1965, McCawley 1968, Itô 1986, Vance 1987, Tateishi 1990, Itô and Mester 1991 class lectures). (23) and (24) show that *u* alternates with φ between two compound members depending on what the following segment is.

(23) a. [[bet] [tak]]   [bettaku]
       'separate' 'house'   'detached villa'
       [[bet] [ke]]   [bekke]
       'separate' 'line'   'branch family'
       [[bet] [sit]]   [bessitu]
       'separate' 'room'   'separate room'

     b. [[bet] [doo]]   [betudoo]
        'separate' 'building'   'separate building'
        [[bet] [mee]]   [betumee]
        'separate' 'name'   'alias'
        [[bet] [iN]]   [betuiN]
        'separate' 'temple'   'separate temple'

(24) a. [[gak] [koo]]   [gakkoo]
        'learning' 'school'   'school'
        [[gak] [ki]]   [gakki]
        'learning' 'term'   'school term'

     b. [[gak] [neN]]   [gakuneN]
        'learning' 'year'   'school year'
        [[gak] [tyoo]]   [gakutyoo]
        'learning' 'chief'   'school president'
        [[gak] [iN]]   [gakuiN]
        'learning' 'institute' 'school'

Along the lines of Itô (1986) and Tateishi (1990), I assume that all the Sino-Japanese morphemes are underlyingly monosyllabic. Then, the V/φ alternation in (23) and (24) can be analyzed as involving Epenthesis rather than Syncope, and the gemination effects at compound boundaries result from Tier Conflation and Spreading or Fusion. Roughly speaking, after

Tier Conflation, Fusion applies if two consonants are identical and Spread-
ing operates if the following consonant is more specified than the preceding
consonant. When neither process can apply, Epenthesis inserts an epenthet-
ic vowel *u* or *i* such that *i* is inserted when the preceding consonant con-
tains palatal feature and otherwise *u* is inserted.[11] Itô (1986) and Tateishi
(1990) also note that syllabification does not cross Sino–Japanese mor-
pheme boundaries. Otherwise, instead of *betui*N and *gakui*N, the wrong
forms **beti*N and **gaki*N would be derived from [[bet] [iN]] and [[gak]
[iN]]. The fact that the prosodic root is the bounding domain for
syllabification lends support to the argument that the prosodic root is an in-
dependent prosodic category in Japanese. In this paper, I will not be con-
cerned with how Spreading or Fusion operates but will focus on the prosod-
ic environments that the V/ϕ alternation is sensitive to.

The compounds in (25) contrast with those in (23a) and (24a).
Although the segmental environments are the same as in (23a) and (24a),
the compounds in (25) surface with the epenthetic vowel *u* instead of with
geminates.

(25) [[assyuk] [kuuki]]   [assyuku kuuki] (*[assyukkuuki])
      'compression' 'air'   'compressed air'
      [[kyooik] [kikaN]]   [kyooiku kikaN] (*[kyooikkikaN])
      'education' 'organization' 'educational organization'
      [[bussit] [syugi]]   [bussitu syugi] (*[bussissyugi])
      'material' 'principle'   'materialism'
      [[tokubet] [kyuukoo]]   [tokubetu kyuukoo] (*[tokubekkyuukoo])
      'special' 'express'   'special express'
      [[dokurit] [seNsoo]]   [dokuritu seNsoo] (*[dokurisseNsoo])
      'independence' 'war'   'the Revolutionary War'

It is obvious that in (25), Epenthesis applies rather than Fusion or
Spreading. The only difference between (23) and (24), and (25) is that the
compounds of the former class are R–compounds while the compounds of
the latter class are ω–compounds. This being taken into consideration, Ep-
enthesis in ω–compounds can be construed as a way of satisfying licensing

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[11] Mester and Itô (1989) argue that each consonant in Japanese is specified for
palatality.

requirement at the ω–level. At the end of ω–level, an epenthetic vowel is inserted to rescue unsyllabified consonants and the application of the Epenthesis has the effect of blocking Fusion or Spreading. Thus the V/ϕ alternation motivates the claim that in Japanese, compounds of free stems are prosodically distinct from compounds of bound roots.

3.3. The p/h Alternation

McCawley (1968) states that there is no need to distinguish between *p*, *h*, and *f* underlyingly in native Japanese and Sino–Japanese morphemes as their distribution is rule–governed.[12] *p* occurs only in geminates or after "mora nasal" (i.e. in the form of the sequence *mp*) and *h/f* elsewhere; *f* appears only before *u*, and *h* elsewhere. In other words, *p* occurs only in doubly–linked structures (Single *p* Constraint; Itô and Mester 1991 class lectures). I adopt the position that *p* is the underlying representation and there is a rule that converts all singly–linked *p*'s into *h* (McCawley 1968, Grignon 1985, Itô and Mester 1991 class lectures). The following Sino–Japanese compounds illustrate the *p/h* alternation.

(26) a. [[buN] [poo]]   [bumpoo]
        'writing' 'law'   'grammar'
        [[siN] [paN]]   [simpaN]
        'new' 'edition'   'new edition'
        [[saN] [po]]   [sampo]
        'scatter' 'walk'   'stroll'
        [[syut] [paN]]   [syuppaN]
        'come out' 'edition'   'publication'
        [[bet] [pyoo]]   [beppyoo]
        'separate' 'table'   'attached table'

   b. [[poo] [rit]]   [hooritu]
        'law' 'law'   'law'
        [[sak] [piN]]   [sakuhiN]
        'make' 'goods'   'works'

[12] As is well–known, Japanese morphemes are classified into four lexical strata — Native, Sino–Japanese, Mimetic, and Foreign stratum — on the basis of differences in phonological characteristics (McCawley 1968, Vance 1987).

[[ryo] [pi]]   [ryohi]
'travel' 'spend'   'traveling expenses'
[[gak] [pu]]   [gakuhu] (〉[gakufu])
'music' 'record'   'musical score'

In the words in (26a), Spreading from the initial consonant of the second compound element to the final consonant of the first element results in geminates or partial geminates, which block the rule that changes p to h. However, Spreading is impossible in the compounds in (26b) and in consequence, all the singly–linked p's are realized as h on surface.

However, parallel to the Vowel Epenthesis examined in the preceding subsection, the $p \rightarrow h$ rule is bounded by a certain prosodic domain and the ω –compounds in (27) demonstrate that that domain must be the prosodic word.

(27) [[simbuN] [paitat]]   [simbuN haitatu] (*[simbumpaitatu])
       'newspaper' 'delivery'   'newpaper delivery'
       [[buppiN] [pokeN]]   [buppiN hokeN] (*[buppimpokeN])
       'goods' 'insurance'   'property insurance'
       [[aNzeN] [posyoo]]   [aNzeN hosyoo] (*[aNzemposyoo])
       'safety' 'guarantee'   'security'

In a ω–compound, the initial p of the second member turns to h although a mora nasal precedes it. From this, it is clear that the $p \rightarrow h$ rule needs to refer to a prosodic condition besides the environment of the singly–linked structure. It is only across the boundaries of R–compounds that p occurs since the application of the rule is bounded within the ω–domain.[13]

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[13] An alternative account would be conceivable that what is bounded within each half of a compound is spreading, not the $p \rightarrow h$ rule; in other words, p cannot spread its place features to the preceding placeless nasal across the compound boundary and in consequence, the singly–linked p is changed to h. Yet, the following compounds where spreading applies across the compound boundary demonstrate that this alternative is untenable.

[[deNsiN] [hasira]]   [deNsimbasira]
'telegraph' 'pole'   'telegraph pole'
[[nipoN] [hare]]   [nihombare]
'Japan' 'clear weather' 'ideal weather'

In these ω–compounds, h in the second element becomes b due to Rendaku and the place features of b spreads to the preceding nasal across the compound boundary. Rendaku, however, cannot apply to the second members in (27) because they are Sino–Japanese.

3. 4. "Asymmetric" Compounds in Japanese

As in Korean, in addition to the regular R–compounds and ω–compounds, there are also "asymmetric" compounds in Japanese. The compounds in (28) and (29) appear to consist of prosodic constituents of different types.

(28) [[syokutak] [eN]]   [syokutakueN]
      'table' 'salt'   'table salt'
      [[bizyut] [kaN]]   [bizyutukaN]
      'fine art' 'building'   'art gallery'
      [[aNkok] [gai]]   [aNkokugai]
      'dark' 'street'   'the underworld'

(29) [[tyoo] [kyori]]   [tyookyori]
      'long' 'distance'   'long distance'
      [[bi] [syooneN]]   [bisyooneN]
      'beautiful' 'boy'   'handsome youth'
      [[kee] [oNgak]]   [keeoNgaku]
      'light' 'music'   'light music'

The compounds in (28) are composed of a stem plus a bound root; the left constituents *syokutaku* 'table', *bizyutu* 'fine art' and *aNkoku* 'dark' are free stems which themselves comprise two bound roots whereas the right constituent *eN*, *kaN*, and *gai* are bound roots. On the other hand, in the compounds in (29), the left constituents *tyoo*, *bi*, and *kee* are bound roots and the right constituents are free stems composed of two bound roots.

However, a close examination of the phonological behaviors of these compounds reveals that they actually behave like regular compounds. The V/ϕ alternation and the p/h alternation provide evidence. First, let us consider the V/ϕ alternation in "asymmetric" compounds.

(30) [[aturyok] [kee]]   [aturyokukee] (*[aturyokkee])
      'pressure' 'measure'   'pressure gauge'
      [[bizyut] [ka]]   [bizyutuka] (*[bizyukka])
      'fine art' 'person'   'artist'
      [[tokubet] [sek]]   [tokubetuseki] (*[tokubesseki])
      'special' 'seat'   'special seat'

(31) [[zat] [kaNzyoo]]   [zatukaNzyoo] (*[zakkaNzyoo])
     'miscellany' 'account'   'miscellaneous accounts'
     [[puk] [kazaN]]   [fukukazaN] (*[fukkazaN])
     'double' 'volcano'   'compound volcano'
     [[puk] [kaityoo]]   [fukukaityoo] (*[fukkaityoo])
     'vice–' 'president'   'vice president (of an association)'
     [[gyak] [koogek]]   [gyakukoogeki] (*[gyakkoogeki])
     'counter' 'attack'   'counterattack'

As illustrated in (30) and (31), what appears at the boundaries of "asymmetric" compounds is an epenthetic vowel, not geminates. Particularly, note that *u* is inserted in the left constituents of the examples in (31) although they cannot normally build a prosodic word by themselves.

The situation is very much like regarding the *p/h* alternation. The rule that changes *p* to *h* is bounded within each element of an "asymmetric" compound whether it is a bound root or a free stem.

(32) [[manneN] [pit]]   [manneNhitu] (*[mannempitu])
     '10,000 years' 'pen'   'fountain pen'
     [[kineN] [pi]]   [kineNhi] (*[kinempi])
     'commemoration' 'monument' 'monument'
     [[zikaN] [pyoo]]   [zikaNhyoo] (*[zikampyoo])
     'time' 'table'   'time table'

(33) [[siN] [pakkeN]]   [siNhakkeN] (*[simpakken])
     'new' 'discovery'   'new discovery'
     [[taN] [patyoo]]   [taNhatyoo] (*[tampatyoo])
     'short' 'wave'   'short wave'
     [[kiN] [poNi]]   [kiNhoNi] (*[kimpoNi])
     'gold' 'standard'   'gold standard'

(32) and (33) show that the *p→h* rule applies within each half of the "asymmetric" compounds and that the prior application of the rule blocks spreading across the compound boundary.[14]

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[14] [kineNhi] 'monument' from [[kineN] [pi]] is contrasted with [kinembi] 'anniversary' which is from the combination of two prosodic words *kineN* 'commemoration' and *hi* 'day'. Rendaku changes *h* to *b* since *hi* 'day' is a native Japanese morpheme and then labial features spread to the preceding nasal.

3.5. Prosodic Structures of Japanese Compounds

The phonological characteristics of Japanese "asymmetric" compounds discussed in the preceding subsection lead us to conclude that those compounds must be treated as ω–compounds whether they are compounds of a prosodic word plus a prosodic root, or compounds of a prosodic root plus a prosodic word. Thus, a prosodic root, which otherwise cannot form a prosodic word, is forced to be promoted to the status of a prosodic word. Hence, assuming that in a parallel fashion to Korean, every lexical morpheme can form a prosodic root in Japanese whether it is native or Sino-Japanese, or it is bound or free, I propose that the following prosodic compounding rule accomodates the two types of Japanese compounds.

(34) Compounding (Japanese)

Morphological constituency		Morphological constituency	Prosodic constituency
$[x]\,[y]$	$\rightarrow$	$[xy]$ ·	$[[x]_{\mu}\,[y]_{\mu}]_{\mu+1}$

While the prosodic compounding rule (34) forms one morphological constituent, it forms two separate prosodic domains whose prosodic types are identical. However, unlike the Korean compounding rule, (34) requires that the prosodic type of the entire compound should not be the same as that of its daughters but should be the immediately higher prosodic category. Thus, the rule does not create recursive prosodic structures.

The prosodic representations of the outputs of the compounding rule (34) are given in (35).[15]

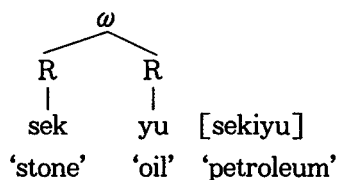(35) a. R–compound   b. ω–compound

As shown in (35a), the combination of two prosodic roots never builds another prosodic root in Japanese, but always builds the next higher prosodic constituent, namely, the prosodic word, which constitutes a difference between Japanese compounding and Korean compounding. That is to say
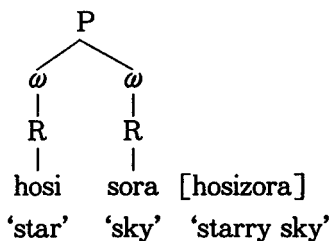
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[15] The category P in (35b) is assumed to be the next higher prosodic category than the prosodic word, which is yet to be defined.

that the prosodic category R is not recursive in Japanese. In terms of the structures in (35), a R–compound *sekiyu* 'petroleum' can be analyzed as in (36a) and a ω–compound *hosizora* 'starry sky' as in (36b).
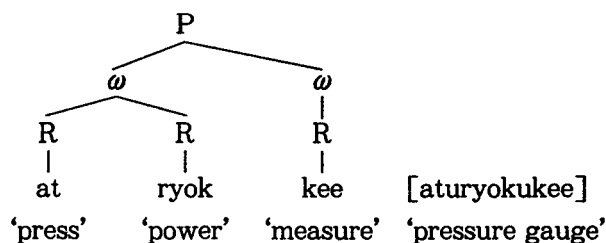
(36) a.

```
                    ω                        b.        P
                   / \                               /   \
                  R   R                             ω     ω
                  |   |                             |     |
                 sek  yu  [sekiyu]                  R     R
                                                    |     |
                'stone' 'oil' 'petroleum'          hosi  sora  [hosizora]
                                                   'star' 'sky'  'starry sky'
```
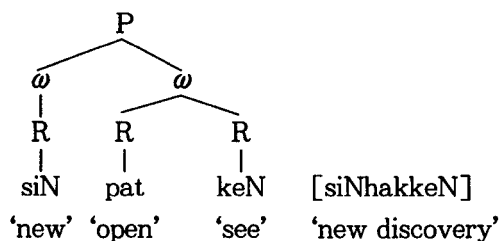
Turning to "asymmetric" compounds, the prosodic structure of *aturyokukee* 'pressure gauge' and that of *siNhakkeN* can be represented as in (37) and (38).

(37)

```
                        P
                      /    \
                    ω        ω
                   / \       |
                  R   R      R
                  |   |      |
                  at  ryok   kee      [aturyokukee]
                'press' 'power' 'measure'  'pressure gauge'
```

(38)

```
                    P
                  /   \
                ω      ω
                |     / \
                R    R   R
                |    |   |
               siN  pat  keN     [siNhakkeN]
              'new' 'open' 'see'   'new discovery'
```

As the compounding of two prosodic roots is required to form a prosodic word by (34), the left element *aturyoku* 'pressure' in (37) and the right element *hakkeN* 'discovery' in (38) each constitute a prosodic word. Then, the sisters are forced to be prosodified as a prosodic word with a view to observing the compounding rule. In consequence, all the "asymmetric" compounds in Japanese, be they a compound of a prosodic word plus a prosodic root, or a compound of a prosodic root plus a prosodic word, pattern with regular ω–compounds phonologically.

4. Potential Problems

Given the analysis of Japanese and Korean compounds put forward so far, there seem to be certain aspects in which the present analysis is at variance with some previous works in Prosodic Phonology.

First, the present analysis conflicts with the end–based theory of prosodic domains (Selkirk 1986, Cohn 1989). Han (1993) and Kang (1993) argue that the prosodic word in Korean must be defined by specifying the left ends of lexical categories. Their end–based approach and the present analysis yield the same results with regard to pure ω–compounds as in (1), prefixed words as in (2), and pure R–compounds as in (5). However, their predictions are not in accord with each other as far as "asymmetric" compounds are concerned. According to the end–based definition of the Korean prosodic word, the compounds as in (12)—compounds of a free stem plus a bound root—would constitute one prosodic word and the compounds in (13)—compounds of a bound root plus of free stem—would creat two prosodic words. That is the exact reverse of what the analysis proposed here predicts, and consequently it cannot account for the application or nonapplication of n–Insertion in the "asymmetric" compounds as in (12) and (13).

The same situation also holds true in Japanese. Selkirk and Tateishi (1988) derive Japanese prosodic words by locating the left edges of lexical items. Yet, this end–based approach fails to generate the expected prosodic domains for a class of "asymmetric" compounds—compounds that consist of a free stem plus a bound root. These facts lead us to conclude that the end–based approach is not adequate to derive expected prosodic domains in Japanese and Korean. Rather, the definition of the prosodic word concerns the properties of morphological constituents—whether they are free or bound, or whether they are a prefix or a suffix and so on. If a constituent is a free stem or a prefix, it can build a prosodic word. All suffixes are adjoined leftward to the preceding prosodic domain and become a part of it.[16]

Secondly, the present analysis runs contrary to the Strict Layer Hypothesis (Selkirk 1984, 1986, Nespor and Vogel 1986, Hayes 1989).

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[16] With Inkelas (1989, 1993)'s prosodic subcategorization frame, this falls out naturally without any adjunction process.

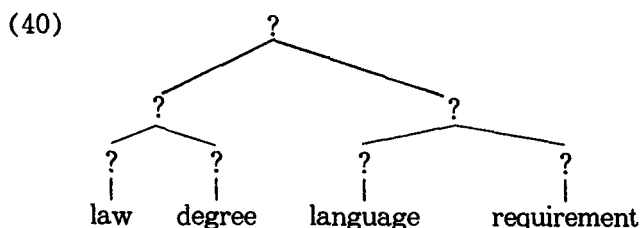(39) Strict Layer Hypothesis (Hayes 1989)

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

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

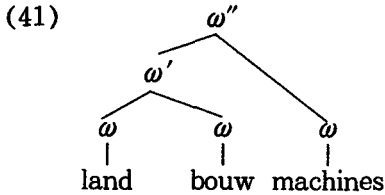b. for all categories C_i, $i \neq n$, C_i directly dominates all and only constituents of the category C_{i+1}.

According to the hypothesis in (39), a given nonterminal unit of the prosodic hierarchy is composed of one or more units of the immediately lower category. However, the recursive structures in Korean compounds violate the Strict Layer Hypothesis in that a node dominates another node of the same type; a prosodic root dominates another prosodic root and a prosodic word dominates another prosodic word.

What should be noted at this point is that the hypothesis in (39) is closely related to the claim of the standard prosodic hierarchy theory that the mora, the syllable and the foot serve as prosodic categories below the prosodic word (Nespor and Vogel 1986, Selkirk 1986, Zec 1988). Inkelas (1989) rejects the claim that those constituents accomodate the domains for lexical phonological rules. Instead, capturing the generalization that lexical rule domains correspond roughly to morphological constituents, she proposes that sublexical prosodic constituents are largely derived from morphological structure. She refers to the mora, the syllable and the foot as metrical constituents distinct from prosodic constituents. This paper follows Inkelas (1989) and assumes that lexical rule domains are formed based on morphological structure.

Thus any approach to assign apropriate prosodic domains to cyclic lexical phonological rules would involve a violation of the standard version of the Strict Layer Hypothesis as given in (39). For instance, given that compounding can occur recursively, how the nodes in (40) be characterized?
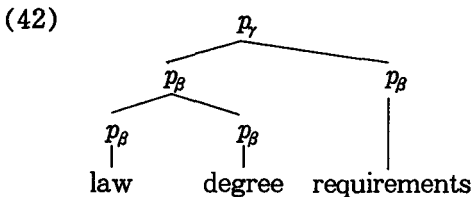
(40)

```
                    ?
           _____|_____
          ?                  ?
       ___|___          _____|_____
      ?       ?        ?           ?
      |       |        |           |
     law    degree  language   requirement
```

Booij (1984) gives the following prosodic structure for the compound *landbouwmachines* (Dutch) 'agricultural machinery'.

(41)

$$\omega''$$

```
              ω″
            /    \
         ω′        \
        /  \         \
       ω    ω         ω
       |    |         |
     land  bouw    machines
```

Although Booij calls ω' and ω'' projections of the prosodic word, what he means by projections of a prosodic word is not clear, and he treats them as if they were a prosodic word. I interpret ω' and ω'' as self–embedding prosodic categories.

Similarly, Inkelas (1989) represents *law degree requirements* as in (42).

(42)

```
              p_γ
            /     \
         p_β       p_β
        /   \        |
     p_β     p_β      |
      |       |       |
     law    degree  requirements
```

(41) and (42) indicate that as long as we assume that the lexical prosodic domains are derived from morphological structure, a violation of the Strict Layer Hypothesis is unavoidable.

In facing this problem, Inkelas (1989) proposes that the Strict Layer Hypothesis should be viewed as a constraint on parsing algorithms rather than a constraint on representation, and she phrases the new constraint as in (43) (for details, see Inkelas 1989).

(43) Strict Parsing Condition (Inkelas 1989).

Group a string of prosodic units of type X^p into units of the immediately higher category, X^{p-1}.

The Strict Parsing Condition is inoperative with respect to affixation, cliticization or prosodic compounding since it constrains only the construction of the constituents by the Prosodic Constituent Formation Algorithm, which, as the most general source of prosodic constituent formation, applies when a morphological constituent does not have an appropriate prosodic category.

5. Conclusion

In this paper, I have attempted to give a prosodic characterization of Japanese and Korean compounds by examining their behaviors with respect to certain phonological phenomena. It has been proposed that there are two distinct types of compounds in both languages— R–compounds and ω–compounds.

It has been argued that such a distinction makes it possible to give a proper analysis for various phonological phenomena —the p/h alternation and the V/φ alternation in Japanese, and n–Insertion in Korean. This distinction has also provided a straightforward explanation for the difference between the Seoul dialect and the Kyungsang dialect of Korean regarding n–Insertion; the dialectal difference is derivable from the choice of prosodic domains. Apparent counterexamples—compounds that appear to consist of prosodic constituents of different types—have turned out in fact to belong to the two regular types. In Korean, these compounds are split into two classes depending on the prosodic type of the lefthand constituent while in Japanese, all these compounds pattern with the prosodic–word compounds. This divergence between Japanese and Korean has been attributed to the difference in the recursiveness of the prosodic categories in compounding; the prosodic categories are recursive in Korean compounding but not in Japanese compounding.

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ABSTRACT

Prosodic Compounding in Japanese and Korean

Eunjoo Han

Prosodic compounding in Japanese and Korean provides an argument for the theory that lexical prosodic constituents are formed on the basis of morphological structures (Cohn 1989, Inkelas 1989, Zsiga 1992). In this paper, it is proposed that two lexical prosodic categories—the prosodic root and the prosodic word—must be recognized to account for two distinct types of compounds in both languages. It is argued that such a distinction makes it possible to give a proper characterization for various phonological phenomena —the p/h alternation and the V/ϕ alternation in Japanese, and n-Insertion in Korean. This distinction also provides a straightforward analysis on the difference between the Seoul dialect and the Kyungsang dialect of Korean with regard to n-Insertion; the dialectal difference is derivable from the choice of prosodic domains. Apparent counterexamples—compounds that appear to consist of prosodic constituents of different types—turn out to belong to either of the two types. In Korean, these compounds are split into two classes depending on the prosodic type of the left constituent while in Japanese, all these compounds pattern with the prosodic-word compounds. This divergence between Japanese and Korean is attributed to the parametric difference in the recursiveness of the prosodic root; the prosodic root is recursive in Korean but not in Japanese.

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