

博士論文

論文題目 **Morphophonology of Japanese Compounding**
(日本語複合語の形態音韻論)

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LIST OF ABBREVIATIONS

BR	base to reduplicant
C	any consonant
CC	complex compounding
COMP	component of a compound
DVD	dvandva compounding
ER	etymological reflex
GEN	generator component of Optimality Theory
IO	input to output
IP-RDP	intensive/plural reduplication
L	Loanword
M-RDP	mimetic reduplication
NC	normal compounding
OO	output to output
OT	Optimality Theory
RED	reduplicative morpheme
SJ	Sino-Japanese
V	any vowel
Y	Yamato

LIST OF SYMBOLS

//	input representation
[]	prosodic word
{ }	morphological constituent/set of input morphemes
-	morpheme boundary
H	morphological headedness
*	ungrammatical structure
σ	syllable
μ	mora
'	accent location

In OT tableau:

*	constraint violation
*!	fatal constraint violation
→	winning candidate
✕	incorrect winning candidate
←	desired winner that lost in the output selection

Chapter 1

Introduction

1.1 Introduction

1.1.1 Aims

This dissertation has two aims; one is descriptive, and the other is theoretical. The descriptive aim is to illustrate morphophonological variations in Japanese compounding. It will be shown that compounding patterns of this language exhibit interesting morphophonological variety. The theoretical aim is to argue for a mechanism that governs the morphophonology of compounding within the framework of Optimality Theory (OT; Prince & Smolensky 1993). I will pay special attention to two kinds of linguistic structures: the stratified structure of the lexicon, and the morphological structure of compounds.

It has been reported that lexical stratification caused by the etymological origins of words, which I call the etymological reflex (ER) classification, derives from phonological and morphophonological varieties. Such intra-language variations, which have been one of the main issues in theoretical phonology, are reported to be found in many languages, such as English (Kiparsky 1982, Benua 1997), Korean (Lee 2003), Fox (Inkelas & Zoll 2003), Hebrew (Becker 2003), and Turkish (Inkelas, Orgun, & Zoll 1996, Inkelas & Zoll 2003). Japanese, which is examined in this dissertation, is another such case (McCawley 1968, Vance 1987, Ito & Mester 1995ab, 1999, Fukazawa et al. 1998, Tanaka 2002, and many others).

Morphological structure is, of course, important in morphophonological inquiries; it is a widely accepted fact that morphological structure plays a central role in the morphophonological behavior of human language (Selkirk 1982, Kiparsky 1983, McCarthy & Prince 1994, among many others). In Japanese, many studies suggest that morphophonological operations, such as *rendaku* application and compound accentuation, crucially depend on the morphological structure of words (Otsu 1985, Ito & Mester 1986, 1998, 2003, Kubozono 1993, 1995, 1997, Tanaka 2001, Nishimura 2007, among many others).

Through analyzing variations in Japanese compounding, I will argue how these two structures play a crucial role in the morphophonology of this language, and I will propose a morphophonological mechanism that governs compounding within the framework of OT. It will be revealed that multidimensional correspondence plays a key role in the morphophonological system of compounding (McCarthy & Prince 1995, Spaelti 1997, Struijke 1997, Benua 1998). In addition, it will be illustrated that the

morphological branching structure of compounds, which has been traditionally introduced to explain morphophonological phenomena, is not essential in phonological investigation. The phonological structure of compounds can be derived from the interaction among universal constraints and the morphological headedness specification without assuming external relationships among morphemes.

1.1.2 Findings and Proposals

From a descriptive point of view, this dissertation will reveal the following points about Japanese compounding:

(1) descriptive findings

- i. Morphophonological behavior varies among the compounding patterns in Japanese;
- ii. The ER classification of the Japanese lexicon (i.e., Yamato, Sino-Japanese, Loanwords, and Mimetics) plays a crucial role not only in phonology but also in the morphology and morphophonology of this language;
- iii. The influence of base words plays a crucial role in morphophonological variations of Japanese compounding.

From a theoretical point of view, this dissertation argues for the following points within the framework of OT:

(2) theoretical proposals

- i. Combined with Correspondence Theory (McCarthy & Prince 1995, Benua 1997), OT can accurately account for the morphophonological variations among compounding patterns in Japanese;
- ii. Relativization of correspondence is necessary not only in input-output (IO) correspondence but also in output-output (OO) correspondence;
- iii. The default specification in relativized correspondence relations is the one that relates to the highest-ranked constraints;
- iv. The morphological branching structure of compounds should be replaced by OO correspondence relations among morphologically related words in phonological inquiries.

1.1.3 Target of Analysis

This dissertation deals with the morphophonology of Japanese compounding.

Compounding is a fundamental morphological operation exhibited by most human languages, and it is acquired by children earlier than any other morphological operation (Spencer 1991, Lieber & Štekauer 2009). However, regardless of its common nature, compounding is not easily defined, and numerous proposals have been made toward defining this morphological operation (see, e.g., Lieber & Štekauer 2009).

Because I aim to analyze the morphophonological behavior of Japanese compounds but not morphological terminology, the precise cross-linguistic definitions of compounding and compounds are beyond the scope of the dissertation. Rather, I wish to briefly explain compounding in this language. In this dissertation, I will mainly analyze normal compounding, dvandva compounding, and two patterns of reduplication, which I refer to as intensive/plural reduplication and mimetic reduplication. Surface products of these morphological operations share the following two conditions:

(3) A compound:

- i. consists of two (or more) phonological realizations of a stem¹ or a word; and
- ii. forms a single prosodic word (=a single accentual domain).

Note that these conditions relating to “compounds” in this dissertation attach special importance to their phonological properties.

(3i) is similar to the widely accepted condition for compounding, which defines a compound as being characterized by a combination of two (or more) words (see, e.g., Crystal 2008, Lieber & Štekauer 2009). However, (3i) requires only two surface phonological realizations of a stem. The practical difference between the two conditions is whether reduplication is included in compounding. This morphological operation is excluded from compounding under the widely accepted condition above: one of the participants in this morphological operation is a reduplicative (RED) morpheme that lacks any phonetic specification and is therefore unable to be realized as a single word at the surface level. This dissertation, however, analyzes two reduplication patterns as members of Japanese compounding. Because reduplication in Japanese is total reduplication—whereby the RED morpheme copies the whole segmental structure of a base stem, which is the phonetic source of this word formation—reduplication and other compounding patterns are superficially very similar. I claim that Japanese reduplication should be phonologically regarded as a compounding pattern, even though it does not

¹ I exclude Sino-Japanese bound morphemes that are mainly found in bimorphemic root conjunction from Japanese stems (cf. Ito & Mester 1996) because these morphemes lack the morphological independency that normal Japanese stems exhibit.

satisfy the morphological condition of compounding. It will be illustrated that there are significant similarities (and interesting differences) between morphophonological behavior in canonical Japanese compounding and that in the two reduplication patterns. Therefore, I believe it is worthwhile to compare the morphophonological behavior in Japanese reduplication with that in other compounding patterns in this language.

(3ii) also declares that a compound in this dissertation is defined phonologically. I wish to limit the focus of the analysis on compounding that forms a single prosodic word. Prosodic concatenation is one of the generally accepted cross-linguistic characteristics of compounding (Lieber & Štekauer 2009). In Japanese, this criterion entails that a compound may have at most one accent, otherwise it follows the flat pattern, which lacks an accent. As Kubozono (1995) reported, some complex compounds can optionally consist of two prosodic words, such as [*doitsu-bun̩gaku-kʰookai*]~[*doitsu*]-[*bun̩gaku-kʰookai*] “literature association in Germany.” I will analyze such complex compounds and their optional prosodic division as long as they can also be pronounced as a single prosodic word.²

1.1.4 Note on Data

This dissertation relies heavily on data that derive from the intuition of native speakers of Japanese. I will therefore adapt quite a few experimental data that are seldom found in ordinary speech but are derived from the reflections of native speakers. It is quite curious that whereas such an approach with respect to linguistic data is generally accepted in syntactic analysis, it is not so common in (morpho)phonological inquiries. Such data have received little attention in previous studies of Japanese phonology and morphology. I believe that the data and analysis presented in this dissertation will contribute to further research into human language.

The newly reported data in this dissertation require further investigation. The grammaticality or ungrammaticality of the data has been confirmed by native speakers of Japanese.³ It is, however, possible that other speakers of Japanese may find some of the data difficult to accept because there is no guarantee that two native speakers of a language share entirely the same grammar. I believe such discrepancies can provide

² Kubozono also reported some complex compounds that are never pronounced as a single prosodic word, for example, [*tʃiisana*]-[*ʃiNsetsu-undoo*] “small kindness movement” and [*dʒijuu*]-[*miNfutoo*] “the Liberal Democratic Party.” The great majority of such compounds are proper nouns or contain a phrasal structure, which is exceptional in compounding. I assume that such exceptional cases are derived independently from the general compounding mechanism of Japanese.

³ These speakers are university students and graduate students who live in the Kanto and Tokai areas (3 males and 9 females, 19-36 years old).

further valuable data on Japanese morphophonology.

1.1.5 Organization

This dissertation consists of five chapters. Chapter 1 is this introductory chapter. Chapter 2 examines morphophonological data regarding Japanese compounding. In that chapter, the four patterns of compounding in Japanese—namely normal compounding, dvandva compounding, intensive/plural reduplication, and mimetic reduplication—are illustrated. Chapter 3 argues for the basic morphophonological mechanism of Japanese compounding within the framework of OT. Chapter 4 provides an account for morphophonological variations among the Japanese compounding patterns described in Chapter 2 within the OT framework. Chapter 5 presents the concluding remarks.

1.2 Japanese Phonetics and Phonology

This section offers a brief overview of Japanese phonetics and phonology as the background for the analysis in this dissertation.⁴ I will illustrate the phonetic inventory of Japanese, allophonic variations, syllable structure, and the basic accentuation rules in the language. I will also introduce simplified phonetic symbols and descriptive symbols, which I will use in the following chapters for the sake of simplicity.

1.2.1 Vowels

The vowel system of Japanese is relatively simple. This language has a five-vowel system, as shown in (4):

(4) Japanese vowel inventory

	i		u	High
	e		o	Middle
		a		Low
Front	Central		Back	

The Japanese vowel inventory consists of a high front vowel [i], a high back vowel [u], a mid-front vowel [e], a mid-back rounded vowel [o], and a central low vowel [a]. The great majority of native Japanese speakers pronounce the high back vowel as an unrounded vowel, and therefore it should be indicated by [ɯ], as shown above. I will,

⁴ For a fuller overview of Japanese phonetics and phonology, see McCawley (1968), Vance (1987, 2008), Tsujimura (1996), and Labrune (2012), among others.

however, use [u] to indicate this vowel for descriptive simplicity, as stated below:

(5) descriptive simplification: vowel

[ɯ] → [u]

Vowel length is contrastive in this language; every vowel can be realized as both a short vowel (monomoraic) and a long vowel (bimoraic), which is indicated by two identical vowels. Although all of the five long vowels are found in Japanese, their distribution is biased among the ER classes: whereas some long vowels are prohibited in Yamato and Sino-Japanese, all vowels can be long in Loanwords, as illustrated below:

(6) a. Yamato: ii, *ee, *aa, oo, uu^{5 6}

ii “good” ooi “many” kuu “eat”

b. Sino-Japanese: *ii, ee, *aa, oo, uu⁷

meeree “order” roodoo “work” kuutjuu “in the air”

c. Loanwords: ii, ee, aa, oo, uu

kii “key” reeto “rate” aato “art”

koora “cola” suupu “soup”

Another interesting fact about Japanese long vowels is that the sequences /ei/ and /ou/ are neutralized in most cases into long vowels [ee] and [oo], respectively, at the surface level with a few exceptions.^{8 9} This vowel alternation takes place independently from the ER classification. A few examples are shown below:

⁵ There are a few lexical exceptions, e.g., *kaasaN* “mother,” and *neesaN* “sister.”

⁶ A high back long vowel [uu] is found only in inflected verbs.

⁷ A high front long vowel [ii] and a central low long vowel [aa] are impossible in a Sino-Japanese morpheme but possible in a bimorphemic word, e.g., *tʃii* “status,” and *haaku* “understanding.”

⁸ The exceptions of this neutralization are found in some Loanword items, e.g., *supeiN* “Spain,” *eito*, **eeto* “eight,” *souru~sooru* “Soul,” and *windouzu~windoozu* “Windows.”

⁹ This neutralization may not happen in very careful speech.

(7) a. /ei/ → [ee]

SJ: /eigo/ → [eego]

“English”

L: /deit/ → [deeto]

“date”

b. /ou/ → [oo]

SJ: /koukou/ → [kookoo]

“senior high school”

L: /kout/ → [kooto]

“coat”

1.2.2 Consonants

Let us move on to consonants in Japanese. The consonant inventory of this language is shown in (8), where voiceless segments are shown on the left and voiced segments on the right if there is a voicing variety:

(8) Japanese consonant inventory

	Bilabial	Alveolar	Alveolar-palatal	Palatal	Velar	Uvular	Glottal
Stop	p/b	t/d			k/g		
Fricative	ϕ	s/z	ç/ʒ	ç			h
Affricate		ts/dz	tç/dʒ				
Nasal	m		n	ɲ	ŋ	ɴ	
Flap		r					
Approximant	w			j			

[ɴ]: a moraic nasal segment without place specification

In this dissertation, I will make the following replacement of four phonetic symbols for the sake of descriptive simplicity:

(9) descriptive simplification: consonants

a. [ϕ] → [f]

b. [r] → [r]

c. [ç] → [ʃ]

d. [ʒ] → [ʒ]

Obstruents and nasals can be geminated in Japanese. In this dissertation, a sequence of two identical consonant symbols indicates a consonant geminate as illustrated below:

- | | | | | | | |
|------|---------|------------|---------|-----------|----------------------|-----------|
| (10) | happa | “leaf” | otto | “husband” | tokk ^j uu | “express” |
| | sunobbu | “snob” | roddo | “rod” | doggu | “dog” |
| | tjisso | “nitrogen” | furejju | “fresh” | mahha | “Mach” |
| | annai | “guide” | komma | “comma” | kanjjae | “thought” |

Whereas voiceless obstruent geminates are found in all the ER classes, their voiced counterparts are found only in the Loanword class, as we will examine in 1.4.2.¹⁰

1.2.3 Allophonic Relations

This section briefly examines major allophonic relations in Japanese phonology.

When a nasal segment is followed by a consonant with closure at the surface level, place assimilation takes place; otherwise, it is realized as a uvular nasal [N], as shown in (11):

- | | | | |
|------|----|-----------------------------------|------------------|
| (11) | a. | /paN/ + /matsuri/ → [pam-matsuri] | “bread festival” |
| | | bread festival | |
| | | /paN/ + /doroboo/ → [pan-doroboo] | “bread thief” |
| | | bread thief | |
| | | /paN/ + /kuzu/ → [paŋ-kuzu] | “breadcrumbs” |
| | | bread dust | |
| | | /paN/ → [paN] | “bread” |
| | | bread | |
| | b. | /kam/ + /-ta/ → [kanda] | “bite-PAST” |
| | | bite PAST | |

¹⁰ Voiced obstruent geminates in Loanword items optionally become devoiced when the morpheme contains another voiced obstruent, as shown below:

a. /dog/ → [doggu]~[dokku] “dog”

b. /bed/ → [beddo]~[betto] “bed”

See Nishimura (2003a, 2006) and Kawahara (2005) for a theoretical account.

In Yamato, Sino-Japanese, and some Loanword items, the alveolar obstruents, [t], [d], [s], and [z] are palatalized when they appear before a palatal vowel [i], as shown below:

- (12) a. $t \rightarrow tʃ / _ i$: [katʃi], *[kati] “win”
 b. $d \rightarrow dʒ \sim ʒ / _ i$: [raʒio], *[radio] “radio”
 c. $s \rightarrow ʃ / _ i$: [ʃiiN], *[siiN] “scene”
 d. $z \rightarrow dʒ \sim ʒ / _ i$: [dʒimbabue], *[zimbabue] “Zimbabwe”

In a similar fashion, the alveolar stops [t] and [d] alternate to the affricates [ts] and [dz] (or [z] in some word-internal contexts, as illustrated below), respectively, when they are followed by a high back vowel [u], as seen here:

- (13) a. $t \rightarrow ts / _ u$: [tatsu], *[tatu] “stand”
 b. $d \rightarrow dz \sim z / _ u$: [çindzuu] ~ [çinduu] “Hindu”

A voiced alveolar fricative [z] and a voiced alveolar affricate [dz] exhibit complementary distribution; [dz] is found in the word-initial position, in the post-nasal position, and in a geminate cluster and [z] in other contexts.¹¹ Consider the following examples:

- (14) a. /zu/ + /kaN/ → [dzukaN], *[zukaN] “illustrated dictionary”
 figure dictionary
 /fukaN/ + /zu/ → [fukandzu], *[fukaNzu] “bird’s-eye view”
 looking down figure
 /kidz/ → [kiddzu], *[kizzu] “kids”
 kids

¹¹ However, Maekawa’s (2010) corpus-based study suggests that the realization of [z], [dz], [ʒ], and [dʒ] mainly depends on the time that speakers can use for the articulation but not on the phonological position of the sounds: the closure occurs when sufficient time for the articulation is provided.

b. /tʃi/ + /zu/ → [tʃizu], *[tʃidzu] “map”
 land figure

A voiced palatal fricative [ʒ] and a voiced palatal affricate [dʒ] exhibit the similar relationship, as in (15):

- (15) a. /ʒi/ + /kaN/ → [dʒikaN], *[ʒikaN] “time”
 time interval
- /saN/ + /ʒi/ → [sandʒi], *[saNʒi] “three o’clock”
 three time
- /bridʒ/ → [buriddʒi], *[buriʒʒi] “bridge”
 bridge
- b. /go/ + /ʒi/ → [goʒi], *[godʒi] “five o’clock”
 five time

In Japanese, a voiceless bilabial fricative [ɸ], a voiceless palatal fricative [ç], and a voiceless glottal fricative [h] are allophonic variations: whereas [ha], [he], and [ho] are possible, *[hu] and *[hi] are not, and they are realized as [ɸu] and [çi], respectively, as shown below:

- (16) a. h → h / __ e : [heddo] “head”
 b. h → h / __ a : [hatto] “hat”
 c. h → h / __ o : [hotto] “hot”
 d. h → ç / __ i : [çiito], *[hiito] “heat”
 e. h → ɸ / __ u : [ɸuudo], *[huudo] “hood”

A unique phonological phenomenon in Japanese is the quasi-allophonic relationship between a voiceless bilabial stop [p] and a voiceless glottal fricative [h]. In Yamato and Sino-Japanese, these two sounds behave as if they are allophonic variations, although they are not phonetically similar to each other, as shown below:

- (17) a. Yamato
- | | | | | |
|---------|---|---------|--------|------------------|
| /har/ | | → | [haru] | “stretch” |
| stretch | | | | |
| | | | | |
| /çik/ | + | /har/ | → | [çipparu] “pull” |
| pull | | stretch | | |
- b. Sino-Japanese
- | | | | | | |
|----------|---|----------|---|------------|------------|
| /hai/ | + | /tatsu/ | → | [haitatsu] | “delivery” |
| delivery | | achieve | | | |
| | | | | | |
| /jiN/ | + | /hai/ | → | [jimpai] | “worry” |
| mind | | delivery | | | |

1.2.4 Syllable structure

Japanese has a relatively simple syllable structure. The majority of Japanese syllables are open syllables, and closed syllables are allowed only under several restricted conditions. Onset is optional. Neither complex onsets nor complex codas are allowed. The following serve as examples, whereby a period represents a syllable boundary:

- (18) a. (C)V: i “stomach” a.na “hole”
 hai.ta.tsu “delivery” do.gu.ma “dogma”
- b. (C)VC: dog.gu “dog” gak.koo “school”
 bat.ta “grasshopper” hap.pa “leaf”
- c. (C)VN: han.tai “opposition” daŋ.gai “cliff”
 ham.maa “hammer” kaŋ.gae “thought”
- d. aN “idea” paN “bread”
 ha.keN “dispatch” ki.riN “giraffe”

A few examples of open syllables are shown in (18a). A syllable coda is allowed if it is the first segment of a consonant geminate, as in (18b), or that of a nasal-obstruent cluster in which the two segments share the place of articulation, as in (18c). As shown in (18d), a nasal coda that phonologically lacks place specification is the only consonant found in the word-final position. A coda consonant in Japanese is a mora-bearing unit, and therefore a CVC syllable is bimoraic.

1.2.5 Accentuation

Finally, let us briefly examine the basic system of word accentuation in Japanese. Japanese is a mora-based pitch-accent language; the location of an accent is represented by the pitch pattern of the morae in the word. As I noted in 1.1.3, accentuation plays a key role in the analysis of Japanese compounding; this morphological operation generally involves prosodic concatenation, and therefore a compound basically has at most one accent. Accentual variations among the compounding patterns will be described in Chapter 2.

The pitch of the first mora in a Japanese word must be low unless the word has a word-initial accent or the word initial mora is the first half of a long syllable (the initial lowering rule; Haraguchi 1977). The accent of a word falls on the mora before the pitch goes down. The second mora of a heavy syllable cannot have an independent accent. It is possible for a word not to have any pitch fall. There are two possibilities in such a case: one is a word-final accent, and the other the flat pattern, which lacks any accent. These two patterns can be distinguished when a word is followed by a particle. If a word has a word-final accent, then the following particle has a low pitch. On the other hand, if a word does not have such an accent, then the following particle has a high pitch.

The location of a word accent is unpredictable, and therefore it must be lexically specified. If a word consists of N syllables, there are logically N+1 accent patterns, including the flat pattern. For example, a trisyllabic-trimoraic word may have four variations, as shown in (19), where the pitch of a mora is indicated by H (high pitch) and L (low pitch), and the location of the accent is indicated by the apostrophe immediately after the accented mora:

- | | | | |
|------|---------------|--------|---------|
| (19) | a. ho'teru | HLL | “hotel” |
| | b. koko'ro | LHL | “heart” |
| | c. atama'(ga) | LHH(L) | “head” |
| | d. sakana(ga) | LHH(H) | “fish” |

(19a), which begins with a high pitch followed by low pitches, exhibits an initial-accent pattern. In (19b), which has a pitch fall between the second and third morae, the accent falls on the second mora. (19c) exhibits a word-final accent and (19d) an accentless “flat” pattern. The pitch patterns of a word with a final accent and that of an accentless word are identical, but differences emerge when they are followed by postpositional particles, as shown in (19c) and (19d).

Accent patterns are distinctive in Japanese; they can differentiate words whose segmental structures are exactly identical. The following serve as examples:

- (20) a. ha'ji HL ha'ji'(ga) LH(L) ha'ji(ga) LH(H)
 chopsticks bridge edge
- b. mu'jiro HLL mu'jiro(ga) LHH(H)
 rather straw mat

These facts suggest that Japanese speakers must learn the location of accent as part of the lexical information of stems.

As stated in 1.1.3, the two components of a compound are prosodically concatenated through compounding, that is, a compound has a single accent even though it consists of two components, each of which originally has its own accent. Consider the following examples:

- (21) onna' + koko'ro → onna-go'koro
 LHH LHL LHH HLL
 woman heart woman's mind

Each of the two stems *onna* and *kokoro* independently has a lexical accent, which appears when they are pronounced as simple words. On the other hand, in the compound *onna-gokoro*, the accent falls on the first mora of the second component, which originally does not have an accent.

The location of the accent in compounds depends on many factors, such as syntactic categories, the lexical properties of morphemes, and morphological structures. I will discuss this issue in Chapters 2 and 4 by focusing on the original accent of the head component.

1.2.6 Descriptive Symbols

In addition to the phonetic symbols shown in 1.2.2 and 1.2.3 and the accent-marking apostrophe used in 1.2.5, I will adapt several symbols in this analysis for the sake of descriptive convenience. These symbols themselves lack any phonetic information.

A hyphen “-” indicates a morpheme boundary in compounds. For example, a compound consisting of *kawa* “river” and *usagi* “hare” is represented as *kawa-usagi* “river hare.”

A pair of square brackets “[...]” indicates a prosodic word. For example, whereas [inu-neko] indicates that this sequence forms a single prosodic word and therefore forms a single accent pattern, the sequence [inu] [neko] consists of two prosodic words, each of which may independently have an accent.

A pair of curly brackets “{...}” represents a morphological constituent. I adopt this to illustrate the morphological structure of complex compounds. For example, in *midori-{kawa-usagi}* “green river hare,” the second and third stems form a constituent, which is the second component of this complex compound. It will also be used to indicate a constituent in compounding at the input level.

A subscript “_H” indicates morphological headedness in a compound. Consider for example the following compounding:

$$(22) \quad \begin{array}{ccc} \{/usagi/_{\text{H}}, /kawa/\} & \rightarrow & [kawa-usagi] \quad \text{“river hare”} \\ \text{hare} \quad \text{river} & & \end{array}$$

The underlying representation of a compound is a set of two or more morphemes, as in (22). In this compounding, one of the components, /usagi/, is underlyingly specified as the head of a compound, and it is realized as the second component of the compound in the surface representation. The headedness specification can be given not only to a single morpheme but also to a set of morphemes that is the underlying representation of an embedded compound. Consider the following example:

$$(23) \quad \begin{array}{ccc} \{ \{ /usagi/_{\text{H}}, /kawa/\}_{\text{H}}, /midori/\} & \rightarrow & [midori-kawa-usagi] \\ \text{hare} \quad \text{river} \quad \text{green} & & \text{“green river hare”} \end{array}$$

In this case, a set of morphemes that is the underlying representation of the embedded compound *kawa-usagi* is underlyingly specified as the head of the complex compound *midori-kawa-usagi*.

1.3 Theoretical Framework: Optimality Theory

The theoretical argument in this dissertation is developed under the framework of OT (Prince & Smolensky 1993, McCarthy & Prince 1993ab). In this section, I will briefly outline the fundamental mechanisms of this framework and indicate how it works in establishing input-output mapping. I will also briefly explain Correspondence Theory (McCarthy & Prince 1995, Spaelti 1997, Struijke 1997, Benua 1997), which is one of

the most important sub-theories in OT. It will be shown that the concept of Correspondence Theory multidimensionally plays an important role in morphophonological variations in Japanese compounding.

OT, which was first proposed by Prince & Smolensky (1993), is a constraint-based linguistic theory and has mainly developed in the field of generative phonology from the 1990s to the present (for an overview of the framework, see Archangeli & Legendre 1997, Kager 1999, McCarthy 2002, among others). The central claim of this theory is that the essential part of grammar consists of constraints. Whereas the set of constraints is universal, their hierarchies are different across languages. These OT constraints are not inviolable: a violation of a constraint is tolerated if it is necessary to satisfy another constraint that is ranked higher. Any systematic variation in human language is derived from the interaction among universal constraints.

The present study adopts this framework not only because it has been the dominant theory in recent phonological inquiries but also because it has several advantages for morphophonological analysis. One of these advantages is parallelism:

(24) **Parallelism:**

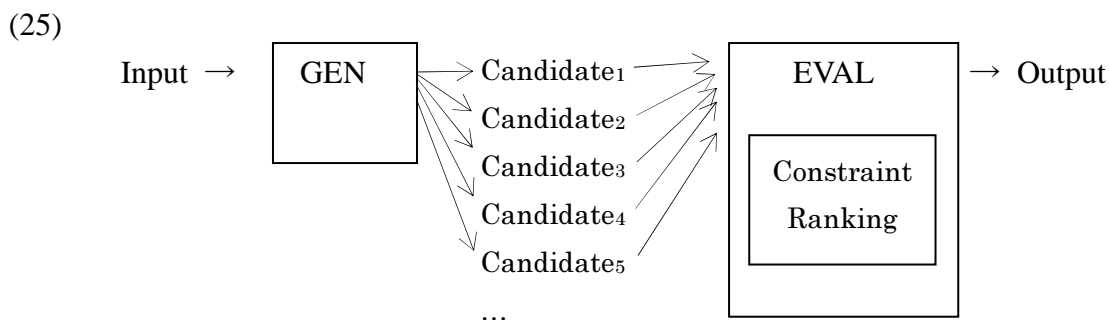
All constraints pertaining to some type of structure interact in a single hierarchy.

This property of OT grammar shows that unlike rule-based derivational theories (Chomsky & Halle 1968, and their followers), which allow multiple derivational operations, there is only one-level derivation in OT.¹² Parallelism is significant in inquiries into the morphology-phonology interface because it allows dealing with linguistic elements that belong to two different linguistic levels within a single derivation. For example, McCarthy & Prince (1993) proposed the generalized alignment approach to explain the phonology-dependent behavior of infixes in Tagalog. Morphophonological studies on reduplication in various languages have also been one of the moving forces in the theoretical development of OT (McCarthy & Prince 1995, 1999). In Japanese phonology, accentuation in morphologically complex contexts is a major topic in this framework (Kubozono 1993, Tanaka 2005, Alderete 1999, and many others). Because the present dissertation also examines morphophonological phenomena, this framework is therefore an appropriate subject to address.

¹² An OT framework with serial derivations has also been proposed (Prince & Smolensky 1993, McCarthy 2000, among others).

1.3.1 OT Architecture

In OT, a grammar of human language consists of two functions: a powerful generator (GEN), which derives an infinite set of output candidates, and an evaluator (EVAL) that evaluates all the candidates according to a hierarchy of constraints (CON) and singles out the real output, which receives the highest evaluation among the candidates. The overall scheme of input-to-output mapping in OT is as follows:



Input consists of some linguistic information, including phonetic segments and features, prosodic structures, morphological categories, syntactic features, and semantic features. Any kind of linguistic information can potentially serve as input to this framework, and no language-specific restriction is allowed at the input level in OT; therefore, the set of possible input for grammar is logically infinite and universal (Prince & Smolensky 1993, Smolensky 1996). This is one of the important concepts in OT and is called richness of the base (ROTB). Needless to say, this does not mean that all languages share the same set of lexical items. The set of lexical items can vary among languages, and this is in fact one of the major sources of language variety. Lexical items are also possible inputs to this system, but they are arbitrarily selected and form only a small portion of all possible input. In other words, a set of lexical items in any language is some subset of the entire input set, which is universal among all languages. One of the most important consequences of ROBT is that any systematic variation in human language, including both inter-language variations and intra-language variations, derives from the hierarchy of universal constraints and not from anywhere in the grammar or lexicon.

Generator (GEN) is a function that derives output candidates from a given input. GEN's most significant characteristic is its creativity: this function is able to produce any change in the structure of a given input. This property is called freedom of analysis. Take the phonological input /dog/ as an example. From this input, GEN derives candidates, such as [dog], [dug], [dogz], [god], [tog], [kot], [dogg], [dddooogg], [dogdog], [kat], [kad], [kkkaaattt], [flangode], [beristengowakwak], and many others.

Because there is no restriction on GEN's productive power, any phonological structure is possible among the set of candidates. As a result, the set of candidates generated by GEN is also infinite.

Evaluator (EVAL) is a function that singles out the real output among the set of output candidates generated by GEN with respect to the hierarchy of constraints. Because the evaluation of candidates proceeds in a parallel manner, as argued above, it is possible to examine the interaction between two areas, such as morphology and phonology, within this framework. We will see how EVAL works in selecting the optimal output in the following section.

Constraints (CON) and constraint ranking play the central role in selecting optimal input to output mappings. One of the most important properties of OT constraints is their violability: any constraints in OT are essentially violable, but their violations must be minimal. The violation of a constraint is tolerated only if it is necessary to satisfy another constraint that is ranked higher in the constraint ranking. Whereas OT constraints are universal, most of their hierarchies (constraint ranking) are language-specific, and therefore they must be acquired. Since there is no language-specific restriction on input in OT, any systematic linguistic variation must be yielded by some difference among the constraint hierarchies.

The universal constraints can be basically classified into two groups: one is markedness constraints, and the other is faithfulness constraints. Markedness constraints prohibit some particular structure along with universal markedness in human language. Faithfulness constraints require identity between two structures that are related in some way, such as input to output, base to reduplicant, and a morphologically simple form to a complex form. The role of faithfulness constraints will be illustrated at length in 1.3.2 and 1.3.3 within the concept of Correspondence Theory.

Output is the candidate that receives the highest evaluation among those generated by GEN. It should be noted that a winning candidate does not need to be perfect. Rather, the actual output almost always violates some constraints that are ranked lower.

1.3.2 How to Select the Optimal Output

Let us demonstrate how input-output mappings are established within the OT framework. Consider a language in which every syllable has an onset, and consonant epenthesis occurs to eliminate onsetless syllables from the output level. Within the OT

framework, this phonological phenomenon should be understood as an interaction between two constraints: one penalizes any onsetless syllables and the other bans segmental epenthesis in input-to-output mapping. Prince & Smolensky (1993) stated the former, a member of the markedness constraint family, as follows:

(26) **ONSET:** *_[σ]V (‘Syllables must have an onset.’)

This constraint requires that syllables must not begin with vowels; it bases on the relative unmarkedness of a syllable with an onset to an onsetless syllable. The other constraint, which is a member of the faithfulness constraint family, is shown below:

(27) **DEP-IO:** Every element of output structure has a correspondence in input structure (McCarthy & Prince 1995).

This constraint prohibits segmental epenthesis at the output level. Let us assume an input is /e/; consider the following tableau, which illustrates how these two constraints are violated:

(28)

input /e/	ONSET	DEP-IO
a. e	*	
b. te		*

A star indicates the violation of a constraint. Because this input lacks a consonant, its fully-faithful output candidate (28a), which is generated by GEN, lacks an onset and therefore violates **ONSET**. This candidate satisfies **DEP-IO** because the only output segment [e] corresponds to the input segment /e/. GEN also creates an output candidate that has syllable onset, as shown in (28b). Whereas this candidate satisfies **ONSET**, it violates **DEP-IO** for obtaining the onset segment [t], which does not correspond to any input segment. In this case, the output selection depends on the hierarchy between the two constraints. Because this language allows consonant epenthesis to eliminate onsetless syllables at the output level, the optimal candidate must be (28b). This phonological situation suggests that **ONSET** dominates **DEP-IO**, as shown below:

(29) **ONSET** >> **DEP-IO**

The following tableau illustrates how this constraint hierarchy correctly differentiates the two candidates:

(30)

input /e/	ONSET	DEP-IO
a. e	*!	
b. →te		*

A solid line between two constraints indicates that the left one dominates the right one. The optimal output is marked by an arrow, and a star with an exclamation mark indicates a fatal violation. It is shown that candidate (30b) (= [28b]) gets a better evaluation than the fully-faithful candidate (30a) (= [28a]), which fatally violates **ONSET**. In other words, candidate (30b) is more harmonic than (30a). Because no other candidate is more harmonic than candidate (30b), it is selected as the optimal output from this input. Note that the winning candidate (30b) does not perfectly satisfy the constraints at issue; it still violates **DEP-IO**. However, this violation is tolerated because it is necessary to satisfy **ONSET**, which ranks above **DEP-IO** in the constraint ranking (29).

Let us now assume that the input is /te/. Because this input already has an onset segment, no consonant epenthesis is necessary. This situation is explained in the following tableau:

(31)

input /te/	ONSET	DEP-IO
a. →te		
b. e	*!	

Whereas candidate (31a), a fully-faithful candidate from this input, satisfies both constraints, candidate (31b) fatally violates **ONSET**, and therefore candidate (31a) is chosen. In this case, the faithfulness constraint **DEP-IO** is not violated by either of the candidates, and therefore it does not affect the result of the output selection. In addition to the violation of **ONSET**, candidate (31b) also incurs a violation of the faithfulness constraint, which bans consonant deletion; but this also does not affect the result. Note that this output selection is wholly independent of the constraint hierarchy: candidate (31a) is more harmonic than (31b) in any constraint hierarchy. This fact indicates that

/te/ → [e] mapping (i.e., onset deletion) never occurs under this constraint set. This relationship between the two candidates is called *harmonic bounding* (Samek-Lodovici & Prince 1999): candidate (31b) is harmonically bounded by (31a). As a consequence, both inputs /e/ and /te/ are neutralized into the output form [te], which has an onset segment; furthermore, an onsetless syllable never emerges at the output level under this constraint hierarchy.

Now, let us examine another constraint hierarchy, in which the two constraints are reversed, as shown below:

(32) **DEP-IO** >> **ONSET**

The result is a grammar that allows onsetless syllables. The following tableau illustrates the realization of an onsetless syllable under the constraint hierarchy (32):

(33)

input /e/	DEP-IO	ONSET
a. →e		*
b. te	*!	

Because the input underlyingly lacks an onset segment, the fully-faithful candidate (33a) lacks an onset segment, and therefore it incurs a violation of **ONSET**. However, this violation is tolerated because onset epenthesis makes the output structure violate **DEP-IO**, which is ranked above **ONSET**, as in candidate (33b). As a consequence, candidate (33a) is chosen. Note that a syllable with an onset is still allowed in this language. Like the evaluation in (31), an input with the onset segment /te/ is faithfully realized, as in the following tableau:

(34)

input /te/	DEP-IO	ONSET
a. e		*!
b. →te		

Because candidate (34b) violates neither of the two constraints, it receives a higher evaluation than candidate (34a), which violates the markedness constraint. Again, candidate (34a) is harmonically bounded by (34b).

In this section, we have seen that the two constraints **DEP-IO** and **ONSET** can correctly explain both a language that allows an onsetless syllable and one that does not. The important point here is that the ranking of the two constraints predicts that there is no language that allows onsetless syllables but prohibits syllables with an onset; in any ranking with these two constraints, such a language never emerges.

1.3.3 Correspondence Theory

Let us further investigate the workings of faithfulness constraints. The original theory of faithfulness constraints proposed in Prince & Smolensky (1993), called Containment Theory, assumes that output contains all structures in the input and that some structures have surface phonological realization whereas others do not. Whether each structure has phonological realization at the output level depends on the interaction among universal constraints, which are ranked differently among languages. This assumption was later abandoned in Correspondence Theory (McCarthy & Prince 1995, Benua 1997), which formulates faithfulness constraints based on the correspondence between two related structures.

In Correspondence Theory, a faithfulness constraint is called “a correspondence constraint.” A correspondence constraint requires identity between two structures that are linked by some correspondence relation. McCarthy and Prince (1995) stated correspondence as follows:

(35) Correspondence:

Given two strings S_1 and S_2 , correspondence is a relation \mathfrak{R} from the elements of S_1 to elements of S_2 . α (an element of S_1) and β (an element of S_2) are referred to as correspondents of one another if $\alpha\mathfrak{R}\beta$.

Some pairs of structures are proposed to be S_1 and S_2 , such as input and output, and a base form and its derived form. The requirement of a correspondence constraint sometimes conflicts with markedness constraints if a source structure contains a marked structure or its cause. As we have seen in the previous section, conflict between markedness constraints and faithfulness constraints is one of the main concerns in OT output selection. Such interaction among universal constraints, which are ranked differently across languages, yields various phonological and morphophonological diversities.

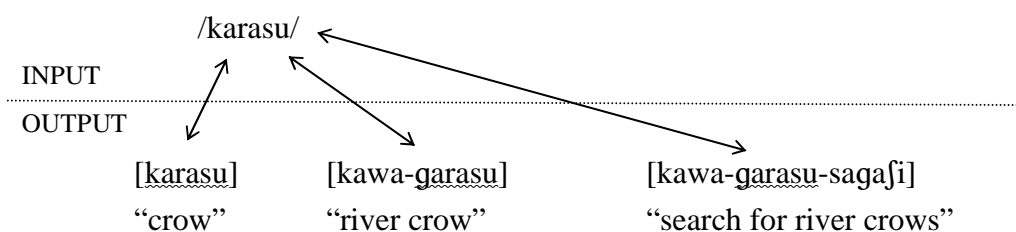
In this dissertation, three types of correspondence are discussed: input-output (IO) correspondence, output-output (OO) correspondence, and base-reduplicant (BR)

correspondence. It will be shown that faithfulness constraints based on these three types of correspondence play a crucial role in the morphophonological variations of Japanese compounding. In the following subsections, I will briefly examine each of these three types of correspondence.

IO correspondence (McCarthy & Prince 1995)

The first and most fundamental type of correspondence is that between an input form (underlying representation) and its output counterpart. This correspondence plays a crucial role in all input-to-output mapping; a faithfulness constraint for this correspondence relation requires that an output structure be identical to its input. Therefore, this type of correspondence constraint is violated if there is a discrepancy between the input representation and its output form. Examples of this correspondence are shown in (36), in which a double arrow indicates a correspondence relation:

(36) IO correspondence:



The input stem /karasu/ “crow” can be realized as a simple word *karasu*, and there is an IO correspondence relation between these two forms. This stem can also be a component of compounds, such as *kawa-garasu* and *kawa-garasu-sagafi*. Again, the IO correspondence links the input to each of these compound components. In these cases, a faithfulness constraint on obstruent voicing for this correspondence relation is violated because the stem undergoes *rendaku* (sequential voicing) through compounding.

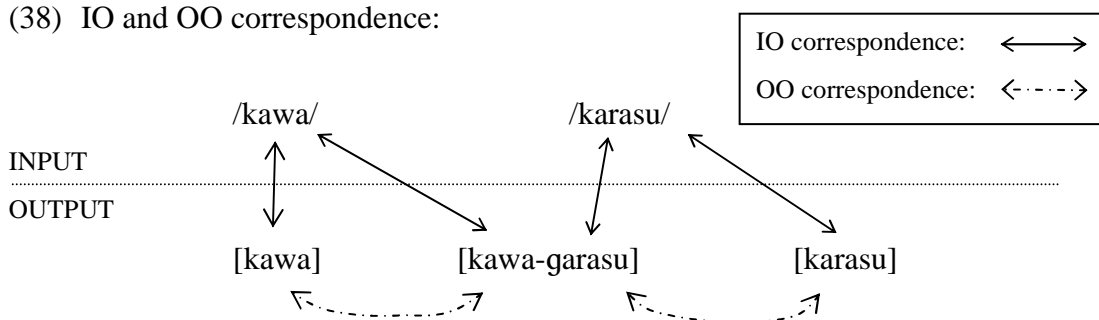
OO correspondence (Benua 1997)

The second type of correspondence is that between two outputs that share an underlying base morpheme. Benua (1997) originally proposed this type of correspondence when analyzing morphophonological phenomena in which transderivational identity plays a crucial role in various languages. She claimed that various types of word formation, including compounding, involve the OO correspondence relation, as quoted below:

(37) All types of morphological derivation are mirrored by transderivational correspondence relation; affixation, truncation, reduplication, ablaut, consonant mutation, mapping to template, compounding, or any other type of word formation requires an OO-correspondence relation between the derived word and an output base. (Benua 1997: 28)

When two output structures share the same input morpheme, they are considered morphologically related and linked by an OO correspondence relation. OO correspondence in a compound basically has multiple relations because compounding involves two or more phonological realizations of stems. The following shows IO and OO correspondence relations for a normal compound *kawa-garasu* “river crow”:

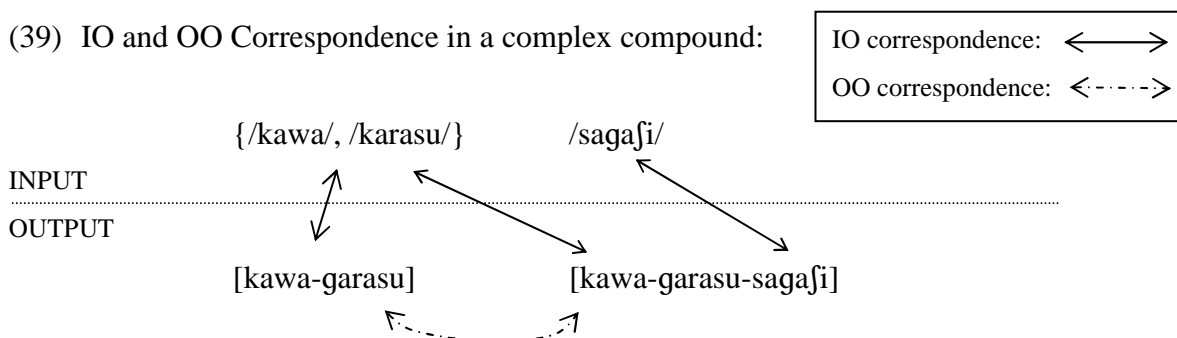
(38) IO and OO correspondence:



The compound *kawa-garasu* “river crow” consists of two free stems, /kawa/ “river” and /karasu/ “crow,” which can appear as independent simple words, as shown above. Because each of these two simple words shares its input with a component of the compound, an OO correspondence relation is established between the simple word and the compound. As with an IO correspondence constraint, an OO correspondence constraint requires identity between two structures that stand in OO correspondence. This constraint is violated when two output structures standing in correspondence differ from each other. In (38), the rendaku application in the second component of the compound causes a violation of this constraint.

OO correspondence is possible between compounds. A compound that contains another compound as its component has an OO correspondence relation with the compound that shares an underlying representation with the embedded compound. The following is an example:

(39) IO and OO Correspondence in a complex compound:



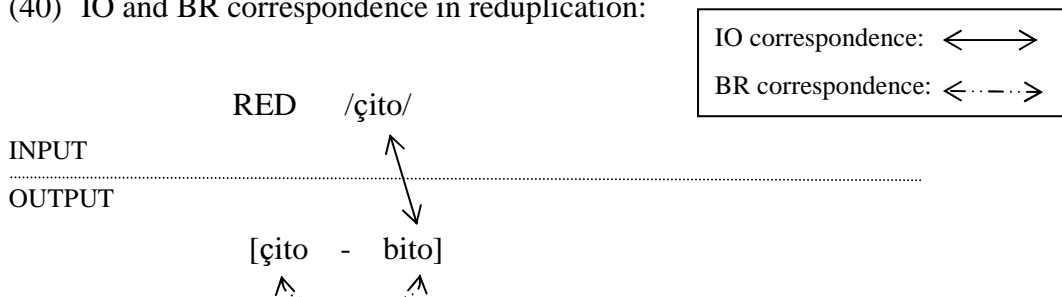
The simple compound *kawa-garasu* and the non-head component of the complex compound *kawa-garasu-sagaʃi* are related by OO correspondence because they are derived from the same morpheme set at the input level. The input structure and OO correspondence in complex compounding will be further examined in Chapter 3.

I claim that the majority of the morphophonological variations in Japanese compounding are caused by interaction among markedness constraints and OO correspondence constraints, which are relativized into two stem types. A more complete discussion of relativization of OO correspondence constraints will be presented in Chapters 3 and 4.

BR correspondence (McCarthy & Prince 1995)

BR correspondence is established through reduplication. A reduplicated word underlyingly consists of a base morpheme and a reduplicative (RED) morpheme, which is phonologically empty. The segmental structure of a RED morpheme copies the structure of the base at the output level. The phonological identity between these two morphemes is guaranteed by this type of correspondence relation. This situation is best described by the following example:

(40) IO and BR correspondence in reduplication:



The input of a reduplicated compound *çito-bito* “people” consists of a RED morpheme and the base morpheme /çito/ “person.” Because a RED morpheme lacks a phonological

structure, no IO correspondence is established between the RED morpheme and its output counterpart. The segmental structure of the reduplicant is supplied by the base morpheme at the output level; a BR correspondence constraint requires identity between the base morpheme and the reduplicant. BR correspondence constraints are violated when the base and the reduplicant in reduplicated words are phonologically different.

It should be noted that two proposals have been made for the IO correspondence relation in reduplication. The original view, proposed by McCarthy & Prince (1995), assumes that IO correspondence links the input of a base morpheme with its output counterpart, as illustrated in (40) above. Spaelti (1997) and Struijke (1997, 1998) proposed another view, whereby IO correspondence is established between a base morpheme and the whole output structure of a reduplicated word. In 4.2.3.4, it will be shown that morphophonology in Japanese reduplication favors the latter view.

1.4 Lexical Stratification in Japanese

1.4.1 Introduction

A large number of studies have suggested that the lexicon of human language is not uniformly formed, but rather may comprise several classes that phonologically vary. In such investigations, several kinds of classification have been argued as the sources of this phonological variety, such as syntactic classes (Smith 1997), morphological classes (McCarthy & Prince 1995, Benua 1997), and etymological classes (English, Kiparsky 1982, Benua 1997; Korean, Lee 2003; Fox, Inkelas & Zoll 2003; Hebrew, Becker 2003; Turkish, Inkelas, Orgun, & Zoll 1996, Inkelas & Zoll 2003, and many others).

In this dissertation, I will analyze the morphophonology of Japanese compounding by focusing on the role of lexical classification caused by the third source noted above. It is well known that the phonological lexicon of this language is considered a showcase example of stratified structure derived by the etymological origin of words (McCawley 1968, Vance 1987, Ito & Mester 1995ab, 1999, and many others).

Whereas the precise classification of the Japanese lexicon varies across studies, four major classes—Yamato (native), Sino-Japanese, Loanwords, and Mimetics, which I refer to as ER classes—are widely accepted.¹³ ¹⁴ The Japanese ER classes are

¹³ Several proposals have been made to justify further division of these four classes. For example, Takayama (1999) and Ito & Mester (2003) claim that Sino-Japanese should be divided into the normal class and the common class when analyzing the application of *rendaku*; whereas this morphophonological operation is impossible in the normal class, it occurs in the common class if other conditions are satisfied. In addition, Ito & Mester

classified according to the synchronic phonological and morphological characteristics of each lexical item. It should be noted that etymological or diachronic information has little—and probably no direct—influence on the construction of the Japanese morphophonological lexicon, though with a few exceptions the synchronic ER classification is quite similar to the diachronic classification. The surface similarities of the ER classification to Japanese etymology are simply “relics” of the history of this language. Therefore, having grammatical knowledge about these ER classes does not necessarily mean that speakers of Japanese understand the etymological origins of Japanese words.

There are actually mismatches between the ER classification and the historical background of a number of Japanese words. For example, *karuta* “playing cards,” which was originally borrowed from Portuguese during the sixteenth century, morphophonologically behaves as a Yamato stem; it undergoes *rendaku*, which is prohibited in the Loanword class, when it appears in the head position of a normal compound, as in *iroha-garuta* “poetry cards.” Even when the speaker knows that the etymological origin of this word is not native Japanese but a European language, this knowledge produces no change in morphophonological operation. The important point here is that such etymologically incorrect classifications are not at all problematic to the ER classes. Rather, this example shows that the ER classification is psychologically real; whereas the historical origin of words is not important in Japanese grammar, knowledge of the ER classification of words is necessary for speakers to be able to perform morphophonological operations correctly.

In this dissertation, I further propose that classification of the lexicon is triggered not only by the (morpho)phonological characteristics of words, but also by morphological motivations. As I will illustrate in the following chapters, the formation of Japanese compounds heavily depends on the ER classification. Whereas normal compounding (NC) is possible independently from the ER classes, the other patterns of compounding—*dvandva* compounding (DVD), intensive/plural reduplication (IP-RDP), and mimetic reduplication (M-RDP)—are blocked by this lexical property. The following table shows a summary of this morphological diversity:¹⁵

(1995ab, 1999) classify Loanword items into two classes according to their degree of assimilation into the native phonology.

¹⁴ Fukazawa et al. (1998) further argue that classification of the lexicon can be done based on phonological alternation when analyzing the intra-language phonological diversity of Japanese. They claim that classification of the lexicon is possible only when it is motivated by a phonological alternation. In their view, stratification of the lexicon can be quite different from an etymology-based classification.

¹⁵ I exclude the Mimetics class from this table because it is not appropriate for

(41) formation of compounds among the ER classes

	NC	DVD	IP-RDP	M-RDP
Yamato	<i>Possible</i>	<i>Possible</i>	<i>Possible</i>	<i>Possible</i>
Sino-Japanese	<i>Possible</i>	<i>Impossible</i>	<i>Impossible</i>	<i>Impossible</i>
Loanwords	<i>Possible</i>	<i>Impossible</i>	<i>Impossible</i>	<i>Possible</i>

Normal compounding, which is one of the most fundamental word formation processes in Japanese, is fully grammatical in all classes. Dvandva compounding and intensive/plural reduplication are possible only in the Yamato class, but ungrammatical in the Sino-Japanese and Loanword classes. Mimetic reduplication is possible in the Yamato and Loanword classes but not in the Sino-Japanese class. I claim that this diversity is part of the knowledge on which Japanese speakers depend to form a stratified lexicon in addition to other synchronic linguistic data, including (morpho)phonological characteristics and syntactic categorizations. Without assuming such stratification of the lexicon, it would seem quite difficult, and likely impossible, to sufficiently capture the intra-language diversity of Japanese, which is widely related to its phonology and morphology.

1.4.2 Japanese ER Classes

In this dissertation, I assume that the Japanese lexicon consists of four classes: Yamato (native), Sino-Japanese, Loanwords, and Mimetics (sound-symbolic items). The following is a brief introduction to the background of these ER classes.

Yamato (Native) class

The Yamato class mainly consists of native Japanese morphemes. This class exhibits a relatively simple phonological structure compared with the other classes. In other words, this class is phonologically the most restricted class in Japanese, as we will see in 1.4.4. The great majority of Yamato morphemes are trimoraic or shorter. This class includes part of the noun vocabulary and almost all of the verbs and adjectives (or adverbs depending on the context) of Japanese.

In Chapter 2, it will be shown that Yamato stems can be a component of all four compounding patterns. This fact is interesting because it means that this class is morphologically the least restricted of the classes, though it is the most restricted in

comparison with the other classes because of its morphological and semantic narrowness, as I will explain below.

terms of phonology.

Sino-Japanese class

The Sino-Japanese class consists of morphemes that were mainly borrowed from Chinese from around the sixth century.¹⁶ One of the most interesting characteristics of Sino-Japanese morphemes is their segmental structure: a morpheme in this class has either a (C)V, (C)VV, (C)VN, or (C)VC(V) form, and the phonological specification of the second mora is heavily restricted (Tateishi 1990, Kawahara et al. 2003).

Sino-Japanese is also characterized by its unique word formation process. The great majority of Sino-Japanese morphemes are bound morphemes (aka Sino-Japanese roots); these are found only in bimorphemic word formation, which I call “root conjunction.”¹⁷ The following are examples:

(42) Sino-Japanese root conjunction

kaN + koo	→	kaŋkoo	“sightseeing”
view scenery			

ʃit + ka	→	ʃikka	“accidental fire”
lose fire			

Because Sino-Japanese root conjunction does not satisfy the conditions of compounding in this dissertation, which I indicated in 1.1.3, it will be excluded from the main analysis. I will, however, examine this kind of word formation when a comparison among compounding patterns is of particular interest.

Almost all Sino-Japanese words, the majority of which are derived from root conjunction, are nouns. However, quite a few of them can be used as verbs when they are conjoined with a light verb *-suru* “do” or as adjectives with an adjectivizing particle *-na*. The following are examples:

¹⁶ Some Sino-Japanese morphemes were coined in Japanese. For example, *doo* “work” has no origin in Chinese. However, this fact seems to have no synchronic influence on the phonology and morphology of this class.

¹⁷ This Sino-Japanese specific word formation is often called “root compounding.” However, this conventional name is rather misleading because the morphological process does not meet the general definition of “compounding,” which requires underlying free morphemes.

- (43) a. $\text{beŋk}^{\text{joo}} + \text{-suru}$ → $\text{beŋk}^{\text{joo-suru}}$ “study (v.)”
 study (N.) do
- $\text{r}^{\text{jokoo}} + \text{-suru}$ → $\text{r}^{\text{jokoo-suru}}$ “travel (v.)”
 travel (N.) do
- b. $\text{seeketsu} + \text{-na}$ → seeketsu-na “sanitary”
 sanitariness ADJ.
- $\text{kook}^{\text{juu}} + \text{-na}$ → $\text{kook}^{\text{juu-na}}$ “exclusive”
 high-grade ADJ.

In Chapter 2, it will be illustrated that this class is heavily restricted in the Japanese compounding system, though various structures are possible in bimorphemic root conjunction, which is a specific morphological operation of this class.

Loanword class

The Loanword class consists of items that were borrowed relatively recently from other languages. The great majority of these words come from English. This class is phonologically the least restricted in Japanese: any phonological structure that is allowed in the other classes is also a possible structure in the Loanword class, and some structures are allowed only in this class. Unlike Yamato and Sino-Japanese, this class contains relatively long morphemes, such as *komp^juutaa* “computer” and *intorodakufoN* “introduction.” Whereas morphemes in this class are basically nouns, as with Sino-Japanese quite a few of them can be used as verbs or adjectives when the light verb *-suru* or the adjectivizing particle *-na* are adjoined. The following are examples:

- (44) a. $\text{supootsu} + \text{-suru}$ → supootsu-suru “play sports”
 sport do
- $\text{doraibu} + \text{-suru}$ → doraibu-suru “drive (a car)”
 driving do

b. kuriin + -na → kuriin-na “clean”
being clean ADJ.

dendʒarasu + -na → dendʒarasu-na “dangerous”
being dangerous ADJ.

In the following chapter, it will be demonstrated that this class is intermediate between the Yamato and Sino-Japanese classes in the Japanese compounding system. As argued above, this fact is rather interesting because this class forms the most peripheral part of the phonological lexicon in Japanese.

Mimetic class

The Mimetic class consists of ideophones and onomatopoeic morphemes. One of the most prominent characteristics of this class is morpheme shape; somewhat similar to the Sino-Japanese class, almost all mimetic morphemes can be classified into three segmental structures—CVV, CVN, and CVCV. Another fact I wish to focus on is that almost all members of this class have reduplicated counterparts (see, e.g., Hamano 1998).

I will exclude the Mimetic class from the main focus of this dissertation and refer to this class when necessary in comparisons with the other three classes. The reason for this exclusion is that compared with the other three classes, this class is narrow, not only in a morphological sense but also in a semantic sense; in principle, morphemes in this class can indicate only aspects or conditions of something. This narrowness in meaning semantically blocks many compounding patterns, and it makes it difficult to compare morphological and morphophonological phenomena of this class with those of the others.

1.4.3 Relativized Faithfulness Approach

Within the OT framework, any systematic phenomenon is considered to be a result of interaction among universal constraints, as was indicated in 1.3.1. It has been argued that intra-language phonological diversity is also explained as an interaction between markedness constraints and faithfulness constraints. Very roughly speaking, studies on this topic can be classified into two approaches: the relativized ranking approach (i.e., the constraint re-ranking approach; Ito & Mester 1995, Tanaka 2002, Inkelas & Zoll 2003, and others), whereby a subgrammatical class in a language independently posits a constraint ranking; and the relativized faithfulness constraint approach (Ito & Mester

1995, 1999, 2003, Fukazawa et al. 1999, Smith 1997, Kawahara et al 2003, and others), which we will examine below.

In this dissertation, I will follow the relativized faithfulness approach, which was originally proposed by Fukazawa et al. (1998) and Ito & Mester (1999). In this approach, it is proposed that a faithfulness constraint is relativized according to the classification of the phonological lexicon. Each faithfulness constraint derived in this way is sandwiched between two markedness constraints, one of which dominates the other, as illustrated below:

(45) ... $M_1 \gg \text{FAITH-CLASS}_1 \gg M_2 \gg \text{FAITH-CLASS}_2 \gg M_3 \gg \text{FAITH-CLASS}_3 \gg M_4 \dots$

This approach is superior to the relativized ranking approach because it is able to deal with hybrid compounds in a simpler fashion (Fukazawa et al. 1998).

As we will see later, the Yamato class consists of the most unmarked phonological inventory, whereas the Loanword class may have marked phonological structures, and the Sino-Japanese class lies intermediate between the two. This markedness hierarchy can be stated as follows:

(46) markedness hierarchy of Japanese phonology:
 Loanword (L) > Sino-Japanese (SJ) > Yamato (Y)

Combining the two hierarchies above, we can obtain the following constraint ranking scheme:

(47) ... $M_1 \gg \text{FAITH-L} \gg M_2 \gg \text{FAITH-SJ} \gg M_3 \gg \text{FAITH-Y} \gg M_4 \dots$

Markedness constraints that come between these faithfulness constraints will be given in the following section.

1.4.4 Phonological Diversity among the ER Classes

Let us further examine the phonological diversity among the Japanese ER classes under the relativized faithfulness approach. In this section, I will consider the following markedness constraints that conflict with the faithfulness constraints in (47):

- (48) ***NT**: Postnasal segments are voiced.
***PALATAL**: No palatalized consonants.
***SINGLE-P**: No non-geminate [p].
NO-D_m²: At most one voiced obstruent is allowed in a morpheme.
***DD**: No voiced obstruent geminates.
SYLL(ABLE)-STR(UCTURE)
***COMPLEXCODA**: No complex onset.
***COMPLEXONSET**: No complex coda.
***PLACELESS**: A segment has a place.
AGREE (place): A consonant cluster shares the same place of articulation.

SYLL-STR is a set of the four markedness constraints, and regulates the basic syllable structure of Japanese. The detailed effects of these constraints will be argued in the following subsections. The following table summarizes the relationship between these markedness constraints and the three ER classes:

(49) Japanese phonological diversity

	*NT	*PALATAL	*SINGLE-P	NO-D_m²	*DD	SYLL-STR
Yamato	√	√	√	√	√	√
Sino-Japanese	*	*	√	√	√	√
Loanwords	*	*	*	*	*	√

∗: violable, √: inviolable

Whereas the Yamato class must obey all of the constraints in (48), the Loanword class can violate them except for **SYLL-STR**. Sino-Japanese words can violate ***NT** and ***PALATAL**, but must follow the others. Following (47), these facts suggest that these markedness constraints are ranked as shown below:

- (50) **SYLL-STR** >> **FAITH-L** >> ***DD, NO-D_m², *SINGLE-P**
>> **FAITH-SJ** >> ***PALATAL, *NT** >> **FAITH-Y**

In the following subsections, I will illustrate that this constraint ranking correctly explains the phonological diversity among the Japanese ER classes while examining the effects of the markedness constraints in (48) one by one.

1.4.4.1 Postnasal Voicing

Let us first examine a markedness constraint that causes postnasal voicing. In the Yamato class, a voiceless obstruent is not allowed immediately after a nasal segment, though a voiced obstruent can be found in the same position, as shown below:

(51) tombo, *tompo “dragonfly” danjo, *danjo “dumpling”

The same restriction is also observed in the past-tense suffix *-ta* when it follows a verb root that ends with a nasal segment. Consider the following examples:

- (52) a. tabe + -ta → tabeta, *tabeda “eat-PAST”
 eat PAST
- b. kas + -ta → kafita, *kafida “lend-PAST”
 lend PAST
- (53) a. ſin + -ta → ſinda, *ſinda “die-PAST”
 die PAST
- b. kam + -ta → kanda, *kanda “bite-PAST”
 bite PAST

The Japanese past-tense suffix *-ta* is faithfully realized when it follows a verb stem that does not end with a nasal segment, as in (52ab). This suffix gets voiced as *-da* when it conjuncts with a verb stem whose final segment is a nasal, as in (53ab).¹⁸ On the other hand, a voiceless segment is possible in the postnasal position in Sino-Japanese and Loanwords, as illustrated below:

- (54) a. Sino-Japanese:
- | | | | |
|--|-----------------------|-----------------|--|
| | ſintai “body” | kanjaku “sense” | |
| | sempai “one’s senior” | teNSai “genius” | |

¹⁸ A verb stem that ends with /g/ also exhibits similar voicing even though it does not end with a nasal segment:

e.g., ojog + -ta → ojoida “swim-PAST”
 swim PAST

This exceptional case should be regarded as one of the relics of diachronic change in Japanese.

b. Loanwords:

minto	“mint”	saŋk ^j uu	“thank you”
comp ^j uutaa	“computer”	aNsaa	“answer”

These post-nasal voiceless obstruents do not undergo voicing.¹⁹

Within the OT framework, the following markedness constraint is proposed for postnasal voicing:

(55) *NT: Postnasal segments are voiced (Prince & Smolensky 1993).

In the constraint hierarchy of Japanese, this markedness dominates the faithfulness constraint for the Yamato class and is dominated by that of the Loanword and Sino-Japanese classes, as shown below:

(56) FAITH-L >> FAITH-SJ >> *NT >> FAITH-Y

The following tableau illustrates that this constraint ranking correctly accounts for the postnasal voicing in Yamato and postnasal voiceless segments in Loanwords and Sino-Japanese:

(57)

	Input: /tompo/	FAITH-L	FAITH-SJ	*NT	FAITH-Y
Yamato	a. tompo	NA	NA	*!	
	→b. tombo	NA	NA		*
Sino-Japanese	→c. tompo	NA		*	NA
	d. tombo	NA	*!		NA
Loanwords	→e. tompo		NA	*	NA
	f. tombo	*!	NA		NA

In Yamato, the winning candidate is (57a), in which postnasal voicing is applied to satisfy *NT, which violates the faithfulness constraint for the Yamato class. Because this constraint is outranked by the markedness constraint, the violation is tolerated in this class. In Sino-Japanese and Loanwords, postnasal voiceless segments are faithfully

¹⁹ There are, however, a few exceptions, e.g., *d3ampaa~d3ambaa* “jumper jacket.”

realized, as in (57c) and (57e), thanks to the faithfulness constraints for these classes, which crucially dominate *NT.

1.4.4.2 Palatal Restriction

In the Yamato class, palatalized consonants are prohibited in most phonological contexts; they are basically allowed only before the palatal vowel [i]²⁰. Consider the following examples:

- (58) a. çikari “light” $\text{k}^{\text{j}}\text{ita}$ “north” $\text{m}^{\text{j}}\text{ise}$ “shop” $\text{t}^{\text{j}}\text{ikai}$ “close (adj.)”
 b. * çekari * $\text{k}^{\text{j}}\text{ata}$ * $\text{m}^{\text{j}}\text{ose}$ * $\text{t}^{\text{j}}\text{sukai}$

Examples in (58a) are actual Yamato words with palatal consonants followed by the palatal vowel [i]. (58b) shows that these palatal consonants cannot be followed by the other vowels in this class. On the other hand, there is no such restriction in either the Sino-Japanese or Loanword class, as shown below:

- (59) a. Sino-Japanese:
 $\text{r}^{\text{j}}\text{okoo}$ “travel” $\text{m}^{\text{j}}\text{aku}$ “the pulse”
 $\text{k}^{\text{j}}\text{oka}$ “permission” $\text{ki}^{\text{j}}\text{ŋ}^{\text{j}}\text{o}$ “goldfish”
 $\text{b}^{\text{j}}\text{oo}$ “seconds” çaku “hundred”
- b. Loanwords:
 $\text{m}^{\text{j}}\text{uuto}$ “mute” $\text{k}^{\text{j}}\text{uuto}$ “cute”
 $\text{t}^{\text{j}}\text{fekku}$ “check” $\text{komp}^{\text{j}}\text{uutaa}$ “computer”
 $\text{g}^{\text{j}}\text{ararii}$ “gallery” juutoraru “neutral”

In these classes, palatal consonants can be easily found immediately before non-palatal vowels.

To capture this restriction on palatalized consonants in the Yamato class within the OT framework, I tentatively assume a markedness constraint that penalizes the existence of palatalized consonants, as shown below:^{21 22}

²⁰ Palatal fricatives [ç] and [ç̺] are allowed before a non-palatal low vowel [a], such as in *faberu* “speak,” and *çareru* “fawn.” I ignore these cases as exceptional ones to simplify the argument.

²¹ This tentative constraint should be understood as a set of markedness constraints, each of which prohibits an individual palatal segment, such as * $[\text{r}^{\text{j}}]$, * $[\text{k}^{\text{j}}]$, and * $[\text{m}^{\text{j}}]$.

²² The realization of palatal consonants before palatal vowels, shown in (58a), is

(60) ***PALATAL**: No palatalized consonants.

The faithfulness constraint for the Yamato class is dominated by this constraint, whereas the reverse is true for the Loanword and Sino-Japanese classes, as shown below:

(61) **FAITH-L** >> **FAITH-SJ** >> ***PALATAL** >> **FAITH-Y**

The following tableau illustrates that constraint ranking (61) correctly predicts the palatal restriction in the Yamato class and its violation in the Loanword and Sino-Japanese classes:

(62)

	Input: /m ^j o/	FAITH-L	FAITH-SJ	*PALATAL	FAITH-Y
Yamato	a. m ^j o	NA	NA	*!	
	→b. mo	NA	NA		*
Sino-Japanese	→c. m ^j o	NA		*	NA
	d. mo	NA	*!		NA
Loanwords	→e. m ^j o		NA	*	NA
	f. mo	*!	NA		NA

Whereas the realization of palatal consonants is blocked by ***PALATAL** in the Yamato class, as shown in (62b), this constraint can be violated to satisfy the faithfulness constraints in the other two classes, as shown in (62c) and (62e).

1.4.4.3 Single [p] Restriction

One of the unique characteristics of Japanese phonology is found in the behavior of a voiceless bilabial stop [p]. This consonant exhibits a quasi-allophonic relationship with a voiceless glottal fricative [h], and [p] is only possible as a member of a consonant geminate in the Yamato and Sino-Japanese classes. Consider the following examples:

motivated by a markedness constraint that prohibits non-palatal consonants before palatal vowels.

- (63) Yamato:
- | | | |
|--------------|-----------------|------------------|
| a. /pa/: | ha, *pa | “leaf” |
| b. | nappa | “leaf vegetable” |
| c. /pataku/: | hataku, *pataku | “whisk” |
| d. | çippataku | “slap” |

In the Yamato class, an underlying /p/ cannot be realized as [p] but rather alternates to [h] (or its allophonic variants depending on the following vowel) when it is realized as a single segment at the output level, as in (63a) and (63c). However, Yamato words may have a surface [p] as a member of a geminate, as in (63b) and (63d). The situation is almost the same in Sino-Japanese, as shown in (64):

- (64) Sino-Japanese:
- | | | |
|-----------|---------------------|---------------|
| a. /pat/: | hattatsu, *pattatsu | “development” |
| b. | ɸuppatsu | “departure” |
| c. /pai/: | haitatsu, *paitatsu | “delivery” |
| d. | ɸimpai | “worry” |

These example words are products of Sino-Japanese root conjunction. An underlying /p/ in Sino-Japanese roots alternates to [h] or its variants when it is a single segment at the output level, as in (64a) and (64c). However, this segment is faithfully realized as [p] when it is a member of a geminate, as in (64b), or a member of a partial geminate (e.g., a nasal-obstruent cluster), as in (64d). On the other hand, there is no such restriction on [p] in the Loanword class; [p] can be found in contexts other than geminates in Loanwords. A few examples are shown below:

- (65) Loanwords:
- | | | | | | |
|----------|----------|--------|---------|--------|-----------|
| pairotto | “pilot” | peepaa | “paper” | poteto | “potato” |
| repooto | “report” | kopii | “copy” | purin | “pudding” |

The alternation of /p/ to [h] or its variants never takes place in the Loanword class.

Ito & Mester (1995ab) assume a tentative constraint that prohibits non-geminate [p] at the output level:

(66) ***SINGLE-P**: No non-geminate [p].

They propose that this constraint is sandwiched between **FAITH-L** and **FAITH-SJ**, as shown below:

(67) **FAITH-L** >> ***SINGLE-P** >> **FAITH-SJ** >> **FAITH-Y**

Tableau (68) shows that constraint ranking (67) correctly derives the variation on single [p] restriction among the ER classes:

(68)

	Input: /pa/	FAITH-L	* SINGLE-P	FAITH-SJ	FAITH-Y
Yamato	a. pa	NA	*!	NA	
	→b. ha	NA		NA	*
Sino-Japanese	c. pa	NA	*!		NA
	→d. ha	NA		*	NA
Loanwords	→e. pa		*	NA	NA
	f. ha	*!		NA	NA

Whereas non-geminate [p] realization is blocked by ***SINGLE-P** in the Yamato and Sino-Japanese classes, as in (68b) and in (68d), respectively, the violation of this constraint is tolerated in the Loanword class, as in (68e). The following tableau demonstrates that [p] can be faithfully realized when it is a member of a geminate in all of the ER classes:

(69)

	Input: /happa/	FAITH-L	* SINGLE-P	FAITH-SJ	FAITH-Y
Yamato	→a. happa	NA		NA	
	b. hahha	NA		NA	*!
Sino-Japanese	→c. happa	NA			NA
	d. hahha	NA		*!	NA
Loanwords	→e. happa			NA	NA
	f. hahha	*!		NA	NA

Because ***SINGLE-P** only penalizes non-geminate [p], it never blocks the realization of

geminate [p] in any of the ER classes.

1.4.4.4 OCP Effect on Obstruent Voicing

In the Yamato and Sino-Japanese classes, more than one voiced obstruent is prohibited within a morpheme: every morpheme in these classes can contain one voiced obstruent at most. A few examples are shown below:

- (70) a. Yamato:
- | | | | | |
|--------|---------|------|-------|-------|
| fuda | “label” | buta | “pig” | *buda |
| taguru | “pull” | daku | “hug” | *dagu |
- b. Sino-Japanese:
- | | | |
|--------------------|--------------|---------------------|
| dʒutsu | “skill” | *dʒuzu |
| batsu | “punishment” | *bazu |
| g ^h oku | “gem” | *g ^h ogu |

A morpheme with two (or more) voiced obstruents is ungrammatical in these two classes. On the other hand, there is no restriction on the number of voiced obstruents in Loanword morphemes.²³ Morphemes with two or more voiced obstruents are found in this class. The following are a few examples:

- (71) Loanwords:
- | | | | | | |
|--------------------|---------|---------|-------------|--------|----------------|
| g ^h agu | “gag” | dʒiruba | “jitterbug” | bagu | “computer bug” |
| doguma | “dogma” | buzaa | “buzzer” | dabide | “King David” |

It is generally accepted that a voiced obstruent is marked compared with its voiceless counterpart. Within the framework of OT, this universal markedness on obstruent voicing is explained by the following constraint:

- (72) **No-D**: An obstruent is voiceless.

It is clear that this constraint is violable in all of the ER classes in which voicing on the obstruent is distinctive. Ito & Mester (1998, 2003) point out that the self-conjoined

²³ Optional devoicing is also found in a few Loanword morphemes, e.g., *godiba~gotiba* “Godiva,” *bagudaddo~bakudaddo* “Baghdad,” and *badominton~batominton* “badminton.”

constraint of **No-D** plays a crucial role in the phonological structure of Japanese morphemes.²⁴ The conjoined constraint whose domain is a morpheme is shown below:

(73) **NO-D_m²**: At most one voiced obstruent is allowed in a morpheme.

When this constraint is dominant, the realization of more than one voiced obstruent is prohibited within a single morpheme. This conjoined constraint dominates the faithfulness constraint for the Yamato and Sino-Japanese classes, but it is dominated by the faithfulness constraint for the Loanword class, as shown below:

(74) **FAITH-L** >> **NO-D_m²** >> **FAITH-SJ** >> **FAITH-Y**

With this constraint ranking, the OCP effect on voicing in the Yamato and Sino-Japanese classes and its invalidness in the Loanword class are illustrated in tableau

(75):

(75)

	Input: /bagu/	FAITH-L	NO-D_m²	FAITH-SJ	FAITH-Y	No-D
Yamato	a. bagu	NA	*!	NA		**
	→b. baku	NA		NA	*	*
Sino-Japanese	c. bagu	NA	*!		NA	**
	→d. baku	NA		*	NA	*
Loanwords	→e. bagu		*	NA	NA	**
	f. baku	*!		NA	NA	*

NO-D_m² correctly blocks the simultaneous realization of two voiced obstruents within a single morpheme in the Yamato and Sino-Japanese classes, as shown in (75b) and (75d), respectively. The violation of this conjoined constraint is accepted in the Loanword class as in (75e). As we will see in the following chapters, the OCP effect on obstruent voicing is an important factor that blocks the application of rendaku in compounding.

²⁴ For the mechanism of local constraint conjunction, see Smolensky (1995, 1997).

1.4.4.5 Voiced Geminate Restriction

Japanese allows obstruents to be geminated, as illustrated in 1.2.2 and 1.2.4, but there is a restriction on their voicing. In the Yamato and Sino-Japanese classes, only voiceless obstruents can be geminated, as shown below:

- (76) a. Yamato:
 katta “buy-PAST” jappari “after all” tsukkiru “break across”
 *kadda *jabbari *tsuggiru
- b. Sino-Japanese:
 hattatsu “development” fippai “failure” çiffi “inevitable”
 *haddatsu *fjibbai *çiddzi

In both classes, whereas voiceless obstruent geminates are found, their voiced counterparts are ungrammatical. Again, this restriction is not effective in the Loanword class.²⁵ Voiced geminates are grammatical in this class:

- (77) Loanwords:
 eggu “egg” uddo “wood” eddzi “edge”
 doggu “dog” beddo “bed” bagudaddo “Baghdad”

Ito & Mester (1995ab) propose a markedness constraint that prohibits voice obstruent geminates, as shown in (78):

- (78) ***DD**: No voiced obstruent geminates.

Like ***SINGLE-P** and **No-D_m²**, this constraint is ranked between **FAITH-L** and **FAITH-SJ**, as shown below:

- (79) **FAITH-L** >> ***DD** >> **FAITH-SJ** >> **FAITH-Y**

The following tableau illustrates how ranking (79) correctly explains the voicing variation on obstruent geminates among the ER classes:

²⁵ In this class, voiced obstruent geminates are optionally devoiced when a morpheme contain another voiced obstruent, e.g., *doggu~dokku* “dog” (Nishimura 2003a, 2006, Kawahara 2006, cf. Ito & Mester 1995ab).

(80)

	Input: /uddo/	FAITH-L	*DD	FAITH-SJ	FAITH-Y
Yamato	a. uddo	NA	*!	NA	
	→b. utto	NA		NA	*
Sino- Japanese	c. uddo	NA	*!		NA
	→d. utto	NA		*	NA
Loanwords	→e. uddo		*	NA	NA
	f. utto	*!		NA	NA

***DD** correctly eliminates a voiced obstruent geminate in the Yamato and Sino-Japanese classes, as shown in (80b) and in (80d), respectively. On the other hand, the violation of this markedness constraint can occur in the Loanword class, as shown in (80e).

1.4.4.6 Syllable Structure

In addition to the constraints we have seen above, we also need a set of markedness constraints that governs the syllable structure of Japanese. It should include the following markedness constraints:

- (81)
- a. ***COMPLEXCODA**: No complex onset.
 - b. ***COMPLEXONSET**: No complex coda.
 - c. ***PLACELESS**: A segment has a place.
 - d. **AGREE** (place): A consonant cluster shares the same place of articulation.

Every syllable in Japanese follows all of these markedness constraints. For the sake of descriptive simplicity, I will assume a tentative constraint **SYLL(ABLE)-STR(UCTURE)**, which assumes the effect of each of these constraints. Because all the constraints in (81) are inviolable in Japanese, **SYLL-STR** dominates all of the faithfulness constraints for the three ER classes, as shown in (82):

- (82) **SYLL-STR** >> **FAITH-L** >> **FAITH-SJ** >> **FAITH-Y**

This ranking guarantees the basic syllable structure of Japanese, which I illustrated in 1.3: a syllable that violates any of the constraints in (81) is excluded from the surface representation of Japanese, independent from the ER classification.

Chapter 2

Data: Compounding Patterns in Japanese

2.1 Introduction

This chapter presents morphological and morphophonological data related to Japanese compounding. As indicated in 1.1, I will chiefly examine four compounding patterns that form the main part of the Japanese compounding system: normal compounding (NC), dvandva compounding (DVD), intensive/plural reduplication (IP-RDP), and mimetic reduplication (M-RDP). A few examples of these compounding patterns are shown below:

(1) a. normal compounding:

sakura + matsuri	→	sakura-matsuri	“cherry festival”
cherry festival			

jama + nobori	→	jama-nobori	“mountain climbing”
mountain climbing			

b. dvandva compounding:

oja + ko	→	oja-ko	“parent and child”
parent child			

inu + neko	→	inu-neko	“dog and cat”
dog cat			

c. intensive/plural reduplication:

çito	→	çito-bito	“people”
person			

samu(i)	→	samu-zamu	“chilly”
cold			

d. mimetic reduplication:

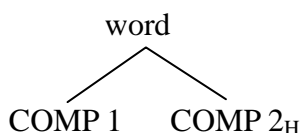
pika → pika-pika “sparkling”
flash

ʃiwa → ʃiwa-ʃiwa “wrinkled”
wrinkle

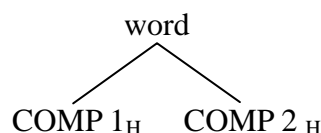
Normal compounding in (1a) is an operation that conjoins two stems asymmetrically and forms a right-headed structure. Dvandva compounding, on the other hand, conjoins two stems evenly and forms a double-head structure, as shown in (1b). Reduplication repeats the phonological structure of a stem. Intensive/plural reduplication, as shown in (1c), involves additional information, such as intensity, plurality, and repetition to a base word. Mimetic reduplication, as shown in (1d), derives mimetic expression from a base word. Further examples of these compounding patterns will be illustrated in subsequent sections.

These compounding patterns can be distinguished by the headedness specification and the position of the head component in a compound. The following illustrates the morphological structure derived from normal compounding and dvandva compounding:

(2) a. normal compounding



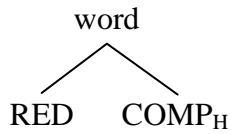
b. dvandva compounding



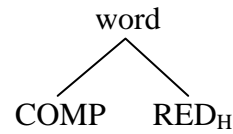
COMP indicates a component that participates in compounding. In simple (bimorphemic) compounding, both components are stems. However, a compound may contain another compound as its component in normal compounding. I will call such word formation “complex compounding (CC).” When a component has a morphological head status, it is indicated by the subscript “_H.” Japanese compounding basically follows the right-hand head rule (Williams 1981, Kageyama 1982), which requires that head components occupy the right-hand position of a compound. Normal compounding in (2a) is representative of this rule. A violation of this rule is, however, tolerated in dvandva compounding, which involves two head components, as in (2b).

Let us move on to the structures of the two reduplication patterns, which are shown below:

(3) a. intensive/plural reduplication



b. mimetic reduplication



Reduplication can be distinguished from normal compounding and dvandva compounding by its participants; in the two reduplication patterns, a reduplicative compound consists of a base component (COMP in [3a] and [3b]), which is the phonological source of a compound, and a reduplicant (RED) morpheme, which is phonologically empty. The surface phonological and phonetic specifications of a RED morpheme are supplied by the base stem. The difference between the two patterns can be illustrated by the order of the morphemes and the headedness specification. Whereas the right-hand component attains the head status in both patterns, the component is the base stem in intensive/plural reduplication and the RED morpheme in mimetic reduplication, as shown in (3). These morphological structures will be justified in subsequent sections, which analyze morphological and morphophonological variety among the four compounding patterns.

It will also be revealed that the etymological reflex (ER) classification plays a significant role in these morphological operations. Whereas all ER classes are found in normal compounding, Yamato is the only possible class in dvandva compounding and intensive/plural reduplication. In mimetic reduplication, Yamato and Loanword items are possible participants.

The theoretical basis for the morphophonological data presented in this chapter will be given in Chapters 3 and 4 within the framework of Optimality Theory (OT; Prince & Smolensky 1993). It will be shown that the relationship between a word and the component of a compound that derived from an identical input representation causes morphophonological variations in Japanese compounding.

2.2 Normal Compounding

2.2.1 Introduction

Let us first examine the morphology and morphophonology in normal compounding, in which one of the components modifies the other to form an endocentric structure.²⁶

²⁶ I ignore compounds with exocentric structure, e.g., *asa gao* “morning face (the name of a flower),” in the analysis of this dissertation. They should be considered lexicalized

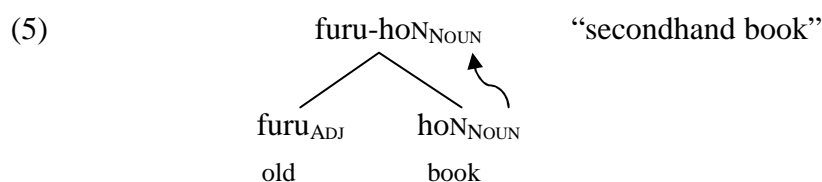
Because this pattern is the most frequent compounding pattern in Japanese morphology, its products are usually simply called *fukugoogo* “compound” in Japanese. I will, however, refer to this compounding pattern and its products, respectively, as normal compounding and normal compounds so as to distinguish them from other compounding patterns and their products.

2.2.2 Structure

Normal compounds are characterized by an endocentric asymmetrical structure: the lexical category of the right-hand component of the compound is carried over to the whole compound (the right-hand head rule; William 1981, Kageyama 1982), and the right-hand component also behaves as the morphological head of the compound. The structure of a compound word derived by this morphological operation is shown again below:



This structure shows that the right-hand component (COMP 2) is the head of a compound, whereas the left-hand component (COMP 1) is not. The following example illustrates the dominance of the head component:



In (5), the two components of the compound *furu* and *hoN* are an adjective and a noun respectively, and the whole compound *furu-hoN* is a noun, which refers to a kind of book. It is reasonable to consider that the compound takes its lexical category from the right-hand component. A few other examples of such right-hand headedness are shown below:

exceptions.

(6) a. *adjective + noun* → *noun*:

kusa + kame → kusa-game “stink turtle”
smelly turtle

jawaraka + keeki → jawaraka-keeki “soft cake”
soft cake

b. *noun + adjective* → *adjective*:

hada + samui → hada-zamui “chilly”
skin cold

inaka + kusai → inaka-kusai “provincial”
country smelly

c. *noun + verb* → *verb*:

tabi + tatsu → tabi-datsu “start off a trip”
travel depart

katatji + tsukuru → katatji-zukuru “form”
shape make

In all examples in (6), a compound inherits its lexical category from the right-hand component, which also behaves as the semantic head. These facts support the structure shown in (4).

2.2.3ER Classes

One of the significant characteristics of normal compounding is its indifference to the ER classification: a member of any ER class can be either of the two components. In other words, none of the ER classes blocks this compounding pattern in any position. Consider a few examples below:

(7) a. Yamato:

hana + kotoba → hana-kotoba “the language of flowers”
flower word

fune + tsukuri → fune-zukuri “making ships”
ship making

b. Sino-Japanese:

gendai + ſakai → gendai-ſakai “modern society”
modern society

tʃooki + k^luuka → tʃooki- k^luuka “long vacation”
long term vacation

c. Loanwords:

biitʃi + sakkaa → biitʃi-sakkaa “beach soccer”
beach soccer

fiʃʃu + karee → fiʃʃu-karee “fish curry”
fish curry

In all of the ER classes, this morphological operation is possible as shown above. Interestingly enough, normal compounding is the only pattern that lacks sensitiveness to the ER classification in Japanese; every other compounding pattern posits some restrictions on the ER classification of its components, as we will see in the following sections.

Another significant outcome of this feature is the mixture of the ER classes. There is no restriction on the combination of the ER classes, and all possible combinations are commonly found, as shown below:

- (8) Y-SJ: *tombo* + *kenk^juu* → *tombo-kenk^juu* “study of dragonflies”
 dragonfly study
- Y-L: *ebi* + *supagettii* → *ebi-supagettii* “shrimp spaghetti”
 shrimp spaghetti
- SJ-Y: *benk^joo* + *tsukue* → *benk^joo-zukue* “study desk”
 study desk
- SJ-L: *kook^juu* + *hoteru* → *kook^juu-hoteru* “high-grade hotel”
 high-grade hotel
- L-Y: *furawaa* + *matsuri* → *furawaa-matsuri* “flower festival”
 flower festival
- L-SJ: *sakkaa* + *taikai* → *sakkaa-taikai* “soccer tournament”
 soccer contest

Such hybrid ER structure is only possible in normal compounding, but basically impossible in other compounding patterns, as we will see later.

2.2.4 Rendaku

One of the most prominent morphophonological phenomena in normal compounding is rendaku application. Rendaku, sometimes called “sequential voicing,” is a voicing phenomenon on the first segment of the second component in a compound. A normal compound provides one of the contexts that trigger the application of rendaku. Consider the following example:

- (9) *jama* + *sakura* → *jama-zakura*, **jama-sakura* “mountain cherry tree”
 mountain cherry tree

The first segment of the second component *sakura* “cherry tree” is a voiceless alveolar fricative /s/ in the underlying representation, and it is faithfully realized as [s] if the morpheme forms a simple word at the surface level; however, it undergoes voicing and is realized as a voiced alveolar fricative [z] in the normal compound. This voicing is possible for all voiceless consonants in Japanese, and some of them exhibit

neutralization based on the allophonic relations of the language. A few other examples are shown below:²⁷

- | | | | |
|------|----------------|--|---------------|
| (10) | a. /t/ → [d]: | ame + tama → ame-dama
candy ball | “candy ball” |
| | b. /ts/ → [z]: | inotʃi + tsuna → inotʃi-zuna
life rope | “lifeline” |
| | c. /tʃ/ → [ʒ]: | hana + tʃi → hana-ʒi
nose blood | “nosebleed” |
| | e. /s/ → [z]: | natsu + sora → natsu-zora
summer sky | “summer sky” |
| | f. /ʃ/ → [ʒ]: | jama + ʃiro → jama-ʒiro
mountain castle | “hill castle” |
| | g. /k/ → [g]: | umi + karasu → umi-garasu
sea crow | “murre” |
| | h. /h/ → [b]: | gomi + hako → gomi-bako
garbage box | “garbage can” |
| | i. /f/ → [b]: | te + fukuro → te-bukuro
hand bag | “gloves” |
| | j. /ç/ → [b]: | tabi + çito → tabi-bito
travel person | “traveler” |

Not only nouns, but also verbs and adjectives, both of which categorically belong to the Yamato class, are possible targets of this morphophonological operation, as shown below:

²⁷ See Ito & Mester (2003) for a very extensive list of Japanese compounds that exhibit rendaku. It should, however, be noted that the authors do not distinguish normal compounding from intensive/plural reduplication in their list.

- (11) a. rendaku in verbs:
- | | | | |
|---------------|------------|---------------------------|--------------|
| tema + toru | → | tema-doru, *tema-toru | “delay” |
| trouble | take | | |
|
 | | | |
| kami + kakaru | → | kami-gakaru, *kami-kakaru | “be amazing” |
| god | be covered | | |
- b. rendaku in adjectives:
- | | | | |
|--------------|-------|-------------------------|-----------------|
| hada + samui | → | hada-zamui, *hada-samui | “chilly” |
| skin | cold | | |
|
 | | | |
| hara + kuroi | → | hara-guroi, *hara-kuroi | “black hearted” |
| belly | black | | |

It is, however, reported that the application of rendaku depends on the morphosyntactic structure of a compound. In compounds whose head is a deverbal noun, the application of rendaku tends to be blocked if the non-head component is an argument of the verb (Kawakami 1953, Sugioka 1986, Yamaguchi 2011).²⁸ If the non-head component is an adjunct, rendaku is applied if the phonological condition is satisfied. A few examples are shown below:

- (12) a. sakana + tsuri → sakana-tsuri, *sakana-zuri “fishing”
- | | | | |
|------|--|---------|--|
| fish | | fishing | |
|------|--|---------|--|
- b. iso + tsuri → iso-zuri, *iso-tsuri “fishing at a rocky shore”
- | | | | |
|-------------|--|---------|--|
| rocky shore | | fishing | |
|-------------|--|---------|--|

It is also well known that the rendaku application is blocked if the target word contains an underlying voiced obstruent. This rendaku blocking effect is called Lyman’s Law after Benjamin Lyman, who first reported this phenomenon to the Western academic community (Lyman 1894, Ito & Mester 1998, 2003). The effect of Lyman’s Law is best illustrated by the following examples:

²⁸ There are, however, quite a few exceptions to this tendency:

e.g.,		çito + koroʃi	→	çito-goroʃi	“murder”
		person	killing		

(13) Lyman's Law effect:

- a. futa: nabe + futa → nabe-buta, *nabe-futa “pot lid”
 pot lid
- b. fuda: nabe + fuda → nabe-fuda, *nabe-buda “pot label”
 pot labell

The two stems *futa* “lid” and *fuda* “label” form a minimal pair over the voicing of the second obstruents. Whereas *rendaku* applies to *futa*, as in (13a), it is blocked in *fuda*, as in (13b), although they share the same stem-initial voiceless fricative /f/. Another few examples of this phenomenon are shown in (14):

(14) Lyman's Law effect:

- umi + hebi → umi-hebi, *umi-bebi “sea snake”
sea snake
- tetsu + kabuto → tetsu-kabuto, *tetsu-gabuto “steel helmet”
steel helmet
- kami + ſibai → kami-ſibai, *kami-zibai “picture show”
paper play
- tori + tſigai → tori-tſigai, *tori-zigai “mistake”
take mistake

The application of *rendaku* to the second components in (14), which already have a voiced obstruent in their underlying representation, is ungrammatical.

A large number of studies have pointed out that the *rendaku* application depends on the ER classification, and it is true that this morphophonological operation is mainly observed when the target word belongs to the Yamato class, as shown above. However, the Yamato vocabulary is not the only target of this morphophonological operation; quite a few Sino-Japanese words undergo *rendaku* when they appear in the second position in normal compounding. The following is a list of some Sino-Japanese words that undergo *rendaku* (some of these examples are from Ito & Mester 2003):

(15) rendaku application in Sino-Japanese:

a. /t/ → [d]:

kiri + taNsu → kiri-daNsu “paulownia drawers”
paulownia drawers

mizu + teppoo → mizu-deppoo “water gun”
water gun

ju + toofu → ju-doofu “boiled tofu”
hot water tofu

b. /s/ → [z]:

kaku + satoo → kaku-zatoo “lump sugar”
angle sugar

c. /ʃ/ → [ʒ]:

ao + ʃaʃiN → ao-ʒaʃiN “blueprint”
blue photograph

saʃimi + ʃooju → saʃimi-ʒooju “soy sauce for sashimi”
sashimi soy sauce

d. /tʃ/ → [ʒ]:

junomi + tʃawaN → junomi-ʒawaN “teacup”
drinking tea bowl

nobori + tʃooʃi → nobori-ʒooʃi “improving condition”
rising condition

- e. /k/ → [g]:
- | | | |
|--|---------------|------------------------|
| ojako + keŋka →
parent-child quarrel | ojako-geŋka | “parent-child quarrel” |
| kuruma + kaiŋa →
car company | kuruma-gaiŋa | “car company” |
| usu + keŋoo →
light makeup | usu-geŋoo | “light makeup” |
| hatsu + keeko →
first training | hatsu-geeko | “first training” |
| fuju + keŋiki →
winter scenery | fuju-geŋiki | “winter scenery” |
| deŋki + kotatsu →
electric foot-warmer | denki-gotatsu | “electric foot-warmer” |
- f. /h/ → [b]:
- | | | |
|--|---------------------------|------------------------------|
| safimi + hootŋoo →
sashimi carver | safimi-bootŋoo | “carver for sashimi” |
| kawa + h ^h ooŋi →
leather cover | kawa- b ^h ooŋi | “leather cover” |
| te + h ^h ooŋi →
hand rhythm | te-b ^h ooŋi | “beating time with the hand” |
- g. /f/ → [b]
- | | | |
|-------------------------------------|--------------|-------------------|
| ŋikiN + fusoku →
fund lack | ŋikim-busoku | “lack of funds” |
| dai + fukiN →
table dustcloth | dai-bukiN | “table dustcloth” |

- h. /ç/ → [b]
 taka + çifa → taka-bifa “high-handed manner”
 high hisha (a Japanese chess piece)

It is difficult to assume that such rendaku-undergoing Sino-Japanese words synchronically belong to the Yamato class because some of them contain phonological structure that is impossible in the Yamato class. For example, *keyka* in (15e) contains a postnasal voiceless obstruent, and *hⁱooŋi* in (15f) begins with a palatal consonant which is never found in Yamato morphemes. Therefore, I claim that these Sino-Japanese words are lexically specified as possible targets of rendaku.

Whereas quite a few Sino-Japanese words undergo rendaku, as shown above, some Yamato stems resist rendaku in normal compounding (Rosen 2003, Nishimura 2007). Such stems should be termed “rendaku immunes.” Consider the following examples:

(16)	rendaku immunes:			
	haʃi:	kire + haʃi → cut edge	kire-hasi, *kire-basi	“cutting piece”
	saki:	tabi + saki → travel destination	tabi-saki, *tabi-zaki	“travel destination”
	ʃimo:	kawa + ʃimo → river lower	kawa-ʃimo, *kawa-ʒimo	“downstream”
	sumi:	kata + sumi → mate corner	kata-sumi, *kata-zumi	“obscure corner”
	kemuri:	tutʃi + kemuri → dirt smoke	tutʃi-kemuri, *tutʃi-gemuri	“cloud of dust”
	çime:	uta + çime → song princess	uta-çime, *uta-bime	“diva”
	çimo:	kawa + çimo → leather string	kawa-çimo, *kawa-bimo	“leather string”

The application of rendaku in these stems through normal compounding is unattested although the phonological and morphological conditions of this morphophonological operation are satisfied. It must be concluded, therefore, that these stems are lexically specified to be inert to the rendaku phenomenon. Interestingly, these morphemes undergo rendaku in intensive/plural reduplication, as we will see in 2.4.3.3.

Let us move our attention to the Loanword class. Members of this class are categorically excluded from the possible target of this morphophonological operation. A few examples are shown below:

- (17) rendaku blocking in Loanwords:
- | | | |
|-------------------|-------------------------------------|-------------------|
| kukkingu + peepaa | → kukkingu-peepaa, *kukkingu-beepaa | “cooking paper” |
| cooking | paper | |
| | | |
| suisen + toire | → suisen-toire, *suisen-doire | “flush toilet” |
| flush | toilet | |
| | | |
| boosui + suutsu | → boosui-suutsu, *boosui-zuutsu | “waterproof suit” |
| waterproof suit | | |
| | | |
| itfigo + keeki | → itfigo-keeki, *itfigo-geeki | “strawberry cake” |
| strawberry cake | | |

Although the phonological and morphological contexts are satisfied in every example in (17), the application of rendaku is not attested. This operation is not grammatical because the second components in these compounds belong to the Loanword class, which is categorically immune to rendaku. It should also be noted that unlike the rendaku immunes in the Yamato class described above, a stem in the Loanword class never undergoes rendaku in any morphological construction.

In sum, the rendaku application partially depends on the ER classification. Whereas the Loanword class is categorically excluded from the target of this morphophonological operation, each of the Yamato and Sino-Japanese morphemes must be lexically specified as to whether they undergo rendaku. It should be noted that there is no significant difference between the Yamato and Sino-Japanese classes over this morphophonological operation. In Nishimura (2007, 2008), I proposed the morphological correspondence approach to the application of rendaku and explained this partial dependence on the ER classification. Following this line of argument, the theoretical account for the rendaku application will be analyzed within the framework of OT in 4.2.

2.2.5 Accentuation

A great deal of effort in the phonological study of Japanese has been devoted to compound accentuation, especially in normal compounding (McCawley 1968, 1977; Kubozono 1993, 1995; Poser 1990; Tsujimura & Davis 1987; Tanaka 2005; and many others). These studies showed that accentuation in normal compounding is quite complicated because several factors, such as moraic length, syllable structure, the

original accent of the morphemes (the base accent in compounding), syntactic categories, and inflection can affect its realization. Because a more complete study of Japanese compound accentuation would require another dissertation, I will mainly focus on the influence of the ER classification and the base accent in compounding.

As we will see below, Yamato nouns and Loanword nouns behave in a similar fashion in compound accentuation, whereas the accentuation in Sino-Japanese compounds is quite different. This fact is interesting because, as we saw in 1.4, segmental phonology suggests that Sino-Japanese is intermediate between Yamato and Loanwords in the Japanese lexicon. I believe that this difference is due to the morphological differences among them; whereas Yamato and Loanword nouns are morphologically simple unless they undergo compounding, Sino-Japanese words are already morphologically complex in most cases: the great majority of Sino-Japanese words are derived through bimorphemic root conjunction, which I illustrated in 1.4.2. As we will see, the morphological complexity of components plays a very crucial role in the morphophonology of compounding.

It will also be shown that the original accent of stems plays a significant role in some normal compounds. The accent of some particular words is retained through compounding when they appear in the head component of a compound and resist the default compound accent rule, which ignores the original accent location of compound components except for that of prosodically long components. I refer to this phenomenon in compound accentuation as the “base-accent effect.”

As argued in the previous studies noted above, the most important factor in Japanese compound accentuation is the moraic length of the head component. Depending on this fact, the default noun compound accent rule can be stated as follows:

(18) default compound accent rule:

- i) When the head component is bimoraic or shorter, the accent falls on the final syllable of the first component;
- ii) When the head component is trimoraic or quadrimoraic, the accent falls on the first syllable of the second component;
- iii) When the head component is quinquimoraic or longer, the lexical accent is retained.

Generally speaking, the compound accent falls on the periphery of the morphological boundary. The precise location is decided by the moraic length of the head component of a compound, as stated in (18i) and (18ii). However, because word accent in Japanese

must be near the right edge of a prosodic word, this rule is ignored when the head component is longer than quadrimoraic and the base accent of the head component succeeds the accent of a whole compound, as in (18iii).

Let us first examine Yamato and Loanword compounds whose head components are short. Consider the following examples:²⁹

(19) a. monomoraic head: Yamato

ore'ndzi + su' → orendzi'-su "orange vinegar"
orange vinegar

nettai + ka → netta'i-ka "tropical mosquito"
tropical zone mosquito

b. bimoraic head: Yamato

kafimija + i'to → kafimija'-ito "cashmere thread"
cashmere thread

sakura + hana' → sakura'-bana "cherry blossom"
cherry flower

c. bimoraic head: Loanwords

jawa'raka + pa'N → jawaraka'-paN "soft bread"
soft bread

ru'umu + ki'i → ruumu'-kii "room key"
room key

When the second component in normal compounding is monomoraic, as in (19a), or bimoraic, as in (19b) and (19c), the accent falls on the last syllable of the first component, as stated in (18i). Note that the original accent location of the head components is not important in compound accentuation in all of the above cases.

Let us turn our attention to compounds whose head components are trimoraic or quadrimoraic. Consider the following examples:³⁰

²⁹ A monomoraic Loanword stem is very rare.

³⁰ Almost all Yamato stems are shorter than four morae.

- (20) a. trimoraic head: Yamato
- | | | | | | |
|-------|---|---------|---|--------------|----------------|
| onna' | + | koko'ro | → | onna-go'koro | "woman's mind" |
| woman | | heart | | | |
-
- | | | | | | |
|---------|---|---------|---|--------------|----------------|
| mura' | + | musume' | → | mura-mu'sume | "village girl" |
| village | | girl | | | |
-
- | | | | | | |
|-------|---|-----------|---|--------------|--------------------|
| bo'ro | + | kakafi | → | boro-ka'kafi | "ragged scarecrow" |
| rag | | scarecrow | | | |
- b. trimoraic head: Loanwords
- | | | | | | |
|---------|---|---------|---|----------------|------------|
| te'rebi | + | do'rama | → | terebi-do'rama | "TV drama" |
| TV | | drama | | | |
-
- | | | | | | |
|-----------|---|-------|---|---------------|-------------------|
| jasai | + | karee | → | jasai -ka'ree | "vegetable curry" |
| vegetable | | curry | | | |
- c. quadrimoraic head: Loanwords
- | | | | | | |
|---------------------|---|----------|---|-----------------------------|-----------------|
| i'r ^j oo | + | robo'tto | → | ir ^j oo-ro'botto | "medical robot" |
| medical | | robot | | | |
-
- | | | | | | |
|---------|---|---------|---|----------------|---------------|
| mi'ruku | + | kooçi'i | → | miruku-ko'oçii | "milk coffee" |
| milk | | coffee | | | |
-
- | | | | | | |
|---------|---|-----------|---|------------------|-----------------|
| ki'nseN | + | tora'buru | → | kiNsen-to'raboru | "money trouble" |
| money | | trouble | | | |
-
- | | | | | | |
|--------|---|---------|---|-----------------|-----------------|
| minami | + | amerika | → | minami-a'merika | "South America" |
| south | | America | | | |

When the second component is trimoraic, as in (20a) and (20b), or quadrimoraic, as in (20c), the accent falls on the first syllable of the second component, as stated in (18ii). Again, the original location of the accent in the head component is ignored in compound accentuation.³¹

³¹ It should, however, be noted that quadrimoraic Loanword stems optionally exhibit the base-accent effect. Consider the following compounds, which consist of pairs of

Finally, (21) shows compound accentuation with a quinquimoraic or longer head component:

- (21) quinquimoraic or longer head:
- | | | | | | |
|-----------------------|---|----------------|---|-------------------------------|--------------------------|
| no'og ¹ oo | + | sa'ieNsu | → | noog ¹ oo-sa'ieNsu | “agricultural science” |
| agriculture | | science | | | |
| | | | | | |
| oogata | + | aake'edo | → | oogata-aake'edo | “big arcade” |
| big | | arcade | | | |
| | | | | | |
| ɲiɲi | + | rosandze'rusu | → | ɲiɲi-rosandze'rusu | “West Los Angeles” |
| west | | Los Angeles | | | |
| | | | | | |
| na'ma | + | koŋkuri'ito | → | nama-koŋkuri'ito | “freshly mixed concrete” |
| raw | | concrete | | | |
| | | | | | |
| kita | + | amusute'rudamu | → | kita-amusute'rudamu | “North Amsterdam” |
| north | | Amsterdam | | | |

When the second component is quinquimoraic or longer, sub-rule (18iii) is applied. In all of the above examples, the original accent of the second component is retained, and it acts as the accent for the whole compound.

In addition to this general pattern, it should be noted that there is a strong tendency for a compound to lack accent when it is quadrimoraic or shorter. In such cases, the compound ignores the default compound accent rule (18) and follows the flat pattern. Some examples are shown below:

morphemes identical to those in (20c):

- | | | | | | |
|----------------------|---|-----------|---|------------------------------|-----------------|
| i'r ^o oo | + | robo'tto | → | i'r ^o oo-robo'tto | “medical robot” |
| medical | | robot | | | |
| mi'r ^u ku | + | kooç'i'i | → | miruku-kooç'i'i | “milk coffee” |
| milk | | coffee | | | |
| ki'Nsen | + | tora'buru | → | ki'Nsen-tora'buru | “money trouble” |
| money | | trouble | | | |

In each of these compounds, the original accent location of the second component is retained in the compound, and it acts as the accent for the whole compound. This optionality is presumably caused by the influence of subrule (18iii), which is examined below.

(22) a. trimoraic:

ta'ra + ko → tara-ko "cod roe"
cod child

tana + ta → tana-da "terraced rice field"
shelf rice field

ko + ka'me → ko-game "baby turtle"
child turtle

te + kami' → te-gami "letter"
hand paper

ne + sake → ne-zake "nightcap"
sleep alcohol

b. quadrimoraic:

sakura + ki' → sakura-gi "cherry tree"
cherry tree

kusa' + ka'ma → kusa-gama "scythe"
grass sickle

no'ra + inu' → nora-inu "stray dog"
outdoor dog

tabi' + ċito → tabi-bito "traveler"
travel person

ki'so + we'bu → kiso-webu "basic Web (site)"
basic Web

kome' + paN → kome-paN "rice bread"
rice bread

Like the compounds in (19) and (20), which follow the default rule (18i) and (18ii), the

original accent location of the head component is ignored in these compounds.

Thus far, we have seen that normal compounds follow the default accent rule (18) unless they lack an accent, as shown in (22), and that the base accent is ignored unless the head component of a compound is longer than quadrimoraic. It is, however, reported that some particular words resist the default rule (18) and preserve the base accent of the head component through compounding, although they are quadrimoraic or shorter. A few Loanword examples are shown below (Kubozono 1995, Tanaka 2005):

(23) base-accent effect: Loanwords:

ka'fe	+	ba'a	→	kafe-ba'a	“café bar”
café		bar			
tezu'kuri	+	ha'mu	→	tezukuri-ha'mu	“handmade ham”
handmade		ham			
ha'da	+	kuri'imu	→	hada-kuri'imu	“skin cream”
skin		cream			
çitsujoo	+	bita'miN	→	çitsujoo-bitam'iN	“necessary vitamin”
necessity		vitamin			

In (23), the head morphemes originally have an accent, and this is maintained in compounds that violate the default compound accent rule (18). Some Yamato stems also exhibit the same phenomenon. A few examples are shown below:

- (24) base-accent effect: Yamato
- | | | | | | |
|-------------|---|-----------|---|----------------|--------------------|
| pe'ruʃa | + | ne'ko | → | peruʃa-ne'ko | “Persian cat” |
| Persia | | cat | | | |
| ɲiwaka | + | a'me | → | ɲiwaka-a'me | “shower” |
| sudden | | rain | | | |
| denʃo | + | ha'to | → | denʃo-ba'to | “carrier pigeon” |
| message | | pigeon | | | |
| ta'nuki | + | ʃi'ru | → | tanuki-ʃi'ru | “raccoon dog soup” |
| raccoon dog | | soup | | | |
| usu | + | mura'saki | → | usu- mura'saki | “light purple” |
| light | | purple | | | |

I claim that such words that exhibit the base-accent effect in compounding are lexically specified as an exception to the default compound accent rule (18). The theoretical account for this phenomenon will be given in 4.3 within the framework of OT.

Let us turn to compound accentuation in Sino-Japanese. Free stems in this class follow the default compound accent rule (18) when they appear in the head position of a normal compound, unless they follow the flat pattern. A few examples are shown below:

- (25) a. monomoraic head:
- | | | | | | |
|----------------------|---|---------|---|-------------------------|--------------------|
| jooro'ppa | + | ʃu' | → | jooroppa'-ʃu | “European species” |
| Europe | | species | | | |
| se'ŋk ^j o | + | ku' | → | seŋk ^j o'-ku | “electoral ward” |
| election | | ward | | | |
- b. binomoraic head:
- | | | | | | |
|----------------|---|--------|---|-------------|----------------------|
| fu'ufu | + | a'i | → | fuufu'-ai | “conjugal affection” |
| married couple | | love | | | |
| ɲuuʒoo | + | ke'N | → | ɲuuʒo'o-keN | “entrance ticket” |
| entrance | | ticket | | | |

Because Sino-Japanese morphemes are monomoraic or bimoraic, the compound accent falls on the final syllable of the first component in these cases. On the other hand, bimorphemic Sino-Japanese words exhibit the base-accent effect. Consider the following examples:

(26) a. bimoraic head:

çimitsu + ki'tʃi → çimitsu-ki'tʃi “secret base”
secret base

k'oodoo + bo'tʃi → k'oodoo-bo'tʃi “cemetery”
fellowship graveyard

b. trimoraic head:

ge'ndai + ʃa'kai → gendai-ʃa'kai “modern society”
modern society

zuujaku + ka'igi → zuujaku-ka'igi “executive meeting”
executive meeting

c. quadrimoraic head:

niho'N + bu'ŋgaku → nihom-bu'ŋgaku “Japanese literature”
Japan literature

te'suto + ko'okai → tesuto-ko'okai “test voyage”
test voyage

d. quadrimoraic head (final accent):

kindai + tenno'o → kindai-tenno'o “modern emperors”
modern emperor

kook^juu + koor^jo'o → kook^juu-koor^jo'o “high-grade perfume”
high-grade perfume

Most Sino-Japanese words have an initial accent unless they follow the flat pattern, and their accent locations are maintained in normal compounding, as in (26a), (26b), and

(26c). Some Sino-Japanese words that end with a long vowel may have a word-final accent, and such words also exhibit the base-accent effect, as in (25d).³²

Simple Sino-Japanese words, the great majority of which are derived through bimorphemic root conjunction, are quadrimoraic at most and, as argued above, such short words in Japanese often exhibit the flat pattern. Such accentless Sino-Japanese words follow the default accent rule (18) in normal compounding. A few examples are shown below:

(27) a. trimoraic head:

guru'upu + kikaku → guruupu-ki'kaku "group project"
 group project

jaku'butsu + izoN → jakubutsu-i'zoN "substance dependence"
 substance dependence

b. quadrimoraic head:

ku'rabu + katsudoo → kurabu-ka'tsudoo "club activity"
 club activity

ka'ku + kaihatsu → kaku-ka'ihatsu "nuclear development"
 nuclear development

The accent falls on the first mora of the head component as stated in the default rule (18).

Unlike noun compounding, the accentuation of verb compounds is quite uniform. Japanese verbs can be classified into two groups according to their accent patterns: they exhibit either the flat pattern or the penultimate pattern, in which the penultimate mora has an accent. In normal compounding, all verb compounds have the penultimate pattern. The following are examples of verb compounds:

³² Some Sino-Japanese words with a final accent exhibit an optionality on the locations of compound accents, as shown below:

terebi + koo3o'o → terebi·koo3o'o~terebi·ko'o3oo "TV factory"
 TV factory

- (28) a. bimoraic verb head:
- | | | | | | |
|-----------|---|--------|---|--------------|-------------|
| nusu'm(u) | + | kiku | → | nusumi-gi'ku | “eavesdrop” |
| steal | | listen | | | |
-
- | | | | | | |
|--------|---|-------|---|------------|--------|
| kar(u) | + | to'ru | → | kari-to'ru | “reap” |
| cut | | take | | | |
-
- b. trimoraic verb head:
- | | | | | | |
|-------|---|-------|---|------------|-------------|
| os(u) | + | akeru | → | oʃi-ake'ru | “push open” |
| push | | open | | | |
-
- | | | | | | |
|--------|---|----------|---|----------------|--------|
| kataʃi | + | tsuku'ru | → | kataʃi-zuku'ru | “form” |
| shape | | make | | | |
-
- c. quadrimoraic verb head:
- | | | | | | |
|---------|---|----------|---|-----------------|-------------------|
| ta't(u) | + | hataraku | → | tatʃi-hatara'ku | “work diligently” |
| stand | | work | | | |
-
- | | | | | | |
|--------|---|----------|---|--------------|---------|
| çik(u) | + | torae'ru | → | çit-torae'ru | “seize” |
| pull | | catch | | | |

It is not clear whether a verb with a penultimate accent shows the base-accent effect in compounding, because both accentual patterns in base forms are neutralized into the penultimate pattern in compounds.

Finally, let us briefly examine the accentuation of compounds whose heads are adjectives. The accentuation of adjectives is very similar to that of verbs; their accent pattern in simple words can follow either the flat pattern or the penultimate pattern, and these two patterns are neutralized into the penultimate pattern in normal compounding. The following serve as examples:

(29) a. trimoraic adjective head:

ha'da + samu'i → hada-zamu'i "chilly"
skin cold

usu(i) + akai → usu-aka'i "light red"
light red

b. quadrimoraic adjective head:

çito + koi'ji'i → çito-koi'ji'i "lonely"
person lonely

ki'soku + tada'ji'i → kisoku-tada'ji'i "regular"
discipline right

Again, it is not clear whether some adjectives exhibit the base-accent effect because both patterns are neutralized into the penultimate pattern through compounding.

2.3 Dvandva Compounding

2.3.1 Introduction

Dvandva compounding, also known as coordinative compounding or copulative compounding, is a specific type of compounding in which each of the two participants shares the status of morphological head, and it often has the form of “x and y” or “x or y.”³³ This type of compounding is found in Sanskrit, Mandarin, Vietnamese, Tibetan, Indian English, Erza Mordvin, and many other languages (Wälchli 2005, Bauer 2008, 2009, and others).

It is well known that part of the Japanese vocabulary is also the target of this compounding pattern. This section offers data on the morphological and morphophonological behavior of Japanese dvandva compounding and its relationship to the ER classification. It will be shown that the morphological characteristics of this compounding pattern also involve several morphophonological characteristics, which should be distinguished from those in normal compounding reviewed in the previous section (see also Kageyama 1982, Ueda 1985, Kurisu 2005, and Labrune 2006).

Whereas normal compounding has few morphological and lexical restrictions,

³³ The precise classification and definition of dvandva compounding varies across studies (Scalise & Bisetto 2009).

as argued in the previous section, dvandva compounding requires similarity between its participating components in several aspects. For example, this compounding pattern is impossible when the two components do not share the same syntactic category: though noun-noun, verb-verb, and adjective-adjective are possible combinations in dvandva compounding, these categories cannot be mixed, such as noun-verb, adjective-noun, and noun-adjective. As Kageyama (1982) argued, both syntactic category and semantic relationship are important in dvandva compounding; that is, this type of compounding is impossible unless the two components are semantically close, such as *eda-ha* “branches and leaves” and *inu-neko* “dog and cat,” or are in some way opposite, such as *oja-ko* “parent and child” and *ue-fita* “up and down.”

The ER classification is also an important factor in dvandva compounding. Unlike normal compounding, in which any of the ER classes can participate, dvandva compounding is basically possible only when both components belong to the Yamato class in a morphologically simple context, as we will examine in 2.3.3.

Dvandva compounding can take place in normal compounds. Interestingly, some of the above morphological restrictions can be violated by dvandva compounds in morphologically complex contexts. This issue will be examined in 2.5.

Dvandva compounds should not be confused with coordinate expressions in which two words coincidentally adjoin in a sentence. In such cases, unlike dvandva compounding, the concatenation of prosodic structure does not take place, and therefore each of the two words independently posits its own prosodic structure and accent pattern. The following examples exhibit prosodic concatenation in dvandva compounding:

- (30) a. /inu'/ + /ne'ko/ → [inu-neko] “dog and cat”
 LH HL LHHH
- b. Taroo-ga [inu-neko-o] konomu.
 LHHHH
 Taro-NOM dog cat-OBJ like-PRES
 “Taro likes dogs and cats.”

(30a) is a dvandva compound that consists of *inu* “dog” and *neko* “cat.” This compound forms a single prosodic word and exhibits the flat accent pattern even though each of the two components independently has an original accent. (30b) shows a sentence that contains this dvandva compound. Conversely, a coordinate construction does not form a

single prosodic word. Consider the following examples:

(31) a. Taroo-ga [inu'] [ne'ko-o] konomu.

LH HLL

Taro-NOM dog cat-OBJ like-PRES

“Taro likes dogs and cats.”

b. Taroo-ga [ooki'i] [inu'] [tjiisa'i] [ne'ko-o] konomu.

LHHL LH LHHL HLL

Taro-NOM big dog small cat-OBJ like-PRES

“Taro likes big dogs and small cats.”

c. *Tatoo-ga [ookii inu tjiisai ne'ko-o] konomu.

LHHHHHHHHHHL

Taro-NOM big dog small cat-OBJ like-PRES

“Taro keeps big dogs and small cats.”

d. Taroo-ga [inu'-to] [ne'ko-o] konomu.

LHL HLL

Taro-NOM dog-and cat-OBJ like-PRES

“Taro likes dogs and cats.”

(31a) shows two words, *inu* and *neko*, which are arranged parallel in a sentence. Note that each of the two words independently has an accent. The grammatical independency of the two words is also justified by the fact that these two words can be independently modified by adjectives, as shown in (31b). Such modification is impossible within a dvandva compound that forms a single prosodic word, as shown in (31c). The coordinate construction in (31a) is quite similar to the construction in (31d), in which the two words are conjoined by the coordinative particle *-to* “and.” These two constructions are almost identical both semantically and prosodically. Therefore I conclude that a coordinative expression like (31a) is derived from (31d) by deleting the conjunction particle. A dvandva compound and such a coordinative construction cannot be outwardly distinguished when the first component lacks an accent and the second component begins with a high pitch. The following serve as examples:

- (32) a. [kitsune-ta'nuki] "fox and raccoon dog"
 LHH HLL
- b. [kitsune(-to)][ta'nuki] "fox and raccoon dog"
 LHH(H) HLL

(32a) is a dvandva compound that consists of *kitsune* "fox" and *tanuki* "raccoon dog." This compound is prosodically very similar to a coordinative construction in which these two words coincide, as in (32b). As shown below, such a misleading construction is often found in constructions with two Sino-Japanese words:

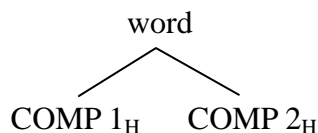
- (33) a. [seeʒi][keeza'i] "politics and economy"
 LHH HHHL
- b. [nemmatsu][ne'Nʃi] "the end of the year and the new year"
 LHHH HLL

As we will see below, Sino-Japanese words cannot form a dvandva compound, which involves prosodic concatenation. These word sequences should be analyzed carefully and should not be confused with dvandva compounds.

2.3.2 Structure

Unlike the asymmetrical structure derived through normal compounding, which was presented in 2.1.2, dvandva compounding involves a symmetrical morphological structure because the components share the same status, i.e., the morphological head of a compound. This structure and a concrete example are illustrated below:

- (34) a. structure in dvandva compounding



- b.
-
- ```

graph TD
 root[inu-neko_NOUN "dog and cat"] --> inu[inu_NOUN "dog"]
 root --> neko[neko_NOUN "cat"]

```

Both components in a dvandva compound have the head status, as in (34a), and their lexical categories agree with that of the whole compound, as in (34b). It is interesting that dvandva compounding does not follow the right-hand head rule, which other compounding patterns in Japanese appear to strictly follow. This violation is, of course, caused by the fact that a dvandva compound has two heads, and they cannot occupy the right-hand position at the same time. As Kageyama (1982: 236) pointed out, this double-head structure is justified by that fact that each of the head components can independently posit its reference. For example, *oja-ko* “parent and child” denotes two individuals, and *ebi-kaḡi* “shrimp and crab” denotes two kinds of shellfish.

### 2.3.3 ER Classes

Another difference between normal compounding and dvandva compounding is sensitivity to the ER classification; dvandva compounding is possible in Yamato but basically impossible in Sino-Japanese and Loanwords. This restriction causes dvandva compounds to be relatively small word groups compared with normal compounds. The following illustrates dvandva compounding involving Yamato nouns:

- (35) a. trimoraic
- |                  |   |                |                                  |
|------------------|---|----------------|----------------------------------|
| <i>oja + ko</i>  | → | <i>oja-ko</i>  | “parent and child”               |
| <i>eda + ha</i>  | → | <i>eda-ha</i>  | “branch and leave”               |
| <i>kusa + ki</i> | → | <i>kusa-ki</i> | “plant and tree”                 |
| <i>ta + hata</i> | → | <i>ta-hata</i> | “rice field and vegetable field” |
| <i>te + aḡi</i>  | → | <i>te-aḡi</i>  | “hand and leg”                   |
| <i>me + hana</i> | → | <i>me-hana</i> | “eye and nose”                   |

b. quadrimoraic:

- |                      |   |                    |                     |
|----------------------|---|--------------------|---------------------|
| <i>ame + kaze</i>    | → | <i>ame-kaze</i>    | “rain and wind”     |
| <i>inu + neko</i>    | → | <i>inu-neko</i>    | “dog and cat”       |
| <i>umi + jama</i>    | → | <i>umi-jama</i>    | “sea and mountain”  |
| <i>ḡizi + ḡiza</i>   | → | <i>ḡizi-ḡiza</i>   | “elbow and knee”    |
| <i>ḡiru + joru</i>   | → | <i>ḡiru-joru</i>   | “day and night”     |
| <i>tsutḡi + suna</i> | → | <i>tsutḡi-suna</i> | “dirt and sand”     |
| <i>ebi + kaḡi</i>    | → | <i>ebi-kaḡi</i>    | “shrimp and crab”   |
| <i>ika + tako</i>    | → | <i>ika-tako</i>    | “squid and octopus” |
| <i>tema + ḡima</i>   | → | <i>tema-ḡima</i>   | “effort and time”   |
| <i>haru + natsu</i>  | → | <i>haru-natsu</i>  | “spring and summer” |

c. quinquimoraic:

|                 |             |                  |
|-----------------|-------------|------------------|
| migi + çidari → | migi-çidari | “right and left” |
| nifi + çigafi → | nifi-çigafi | “west and east”  |
| mae + uşiro →   | mae-uşiro   | “forth and back” |

Dvandva compounding is also possible for verbs, adjectives, and their nominal forms that categorically belong to the Yamato class. The following are some examples of these types of dvandva compounds:

(36) a. verbs:

|                |                                  |
|----------------|----------------------------------|
| asobi-aruku    | “have fun and walk, gad about”   |
| kai-ataeru     | “buy and give”                   |
| kaki-aratameru | “write and change, correct”      |
| tsukai-suteru  | “use and throw away”             |
| mi-kiku        | “see and hear, know”             |
| mi-şiru        | “see and know, come to know”     |
| çiroi-atsumeru | “pick up and gather”             |
| hori-ateru     | “dig and find, strike”           |
| motfi-hakobu   | “hold and transport, carry”      |
| matfi-nozomu   | “wait and hope, look forward to” |

b. verbal nouns:

|                  |                                   |
|------------------|-----------------------------------|
| nomi-tabe        | “drinking and eating”             |
| iki-şini         | “alive or dead”                   |
| mi-kiki          | “seeing and hearing, experience”  |
| hafiri-aruki     | “running and walking”             |
| uri-kai          | “selling and buying, trade”       |
| jomi-kaki        | “reading and writing, literacy”   |
| tatfi-furumai    | “standing and behaving, behavior” |
| tatfi-çiki       | “addition and subtraction”        |
| age(ru)-sage(ru) | “raising and lowering”            |
| ake(ru)-şime(ru) | “opening and closing”             |



- (37) a. adjectives:
- |                     |                  |
|---------------------|------------------|
| ama-karai           | “sweet and hot”  |
| ama-zuppai          | “sweet and sour” |
| ita-kajui~ita-gajui | “sore and itchy” |
| heta-umai           | “poor and good”  |
- b. adjectival nouns:<sup>34</sup>
- |                    |                            |
|--------------------|----------------------------|
| ama(i)-kara(i)     | “sweet and hot”            |
| taka(i)-çiku(i)    | “high or low, height”      |
| sema(i)-çiro(i)    | “narrow or wide, extent”   |
| atsu(i)-samu(i)    | “hot or cold”              |
| ita(i)-kaju(i)     | “itch and pain”            |
| urefi(i)-kanafi(i) | “happy and unhappy”        |
| ii-warui           | “good or bad”              |
| ookii-tfiisai      | “big or small”             |
| umai-mazui         | “tasty or tasteless”       |
| umai-heta          | “good or poor”             |
| jofii-afi          | “good or bad; quality”     |
| suki-kirai         | “like and dislike, liking” |
| kiree-kitanai      | “clean or dirty”           |

Conversely, dvandva compounding is impossible in Sino-Japanese. Two Sino-Japanese words cannot be coordinately conjoined to form a single prosodic word, as illustrated below:

---

<sup>34</sup> An adjectival suffix *-i* in some compounds can be optionally omitted.

- (38) Sino-Japanese dvandva compounds (ungrammatical):<sup>35 36 37</sup>
- |                                             |   |                                              |                                 |
|---------------------------------------------|---|----------------------------------------------|---------------------------------|
| k <sup>j</sup> ooiku + keŋk <sup>j</sup> uu | → | *[k <sup>j</sup> ooiku-keŋk <sup>j</sup> uu] | “education and research”        |
| koʒiN + ʃakai                               | → | *[koʒiN-ʃakai]                               | “individuals and society”       |
| kaki + tooki                                | → | *[kaki-tooki]                                | “summer and winter”             |
| kookoo + daigaku                            | → | *[kookoo-daigaku]                            | “high schools and universities” |
| seeʒi + keezai                              | → | *[seeʒi-keezai]                              | “politics and economy”          |

Note that these pairs of Sino-Japanese words can form a coordinative construction in which each of the two words independently constitutes a prosodic word, as shown below:

- (39) Sino-Japanese coordinative construction:
- |                                              |                                 |
|----------------------------------------------|---------------------------------|
| [k <sup>j</sup> ooiku][keŋk <sup>j</sup> uu] | “education and research”        |
| [ka'ki][to'oki]                              | “summer and winter”             |
| [kookoo][daigaku]                            | “universities and high schools” |
| [seeʒi][ke'ezai]                             | “politics and economy”          |

As argued in 2.3.1, it should be noted that this construction is sometimes indistinct from dvandva compounds at the surface level. For example, the ungrammatical dvandva compound \*[seeʒi-keezai] is almost phonetically identical to the coordinative construction [seeʒi][keezai]. Unlike the ungrammatical compounds in (37), these coordinative constructions are often found in sentences. The following illustrates this contrast:

---

<sup>35</sup> Some pairs of Sino-Japanese bimorphemic words that share a second morpheme sometimes form dvandva compounds, such as *zeyki-kooki* “the first semester and second semester” and *jotoo-jatoo* “the ruling party and the opposition.” I wish to keep such morphologically exceptional cases beyond the scope of this discussion.

<sup>36</sup> A large number of Sino-Japanese words exhibit coordinative structure, which is very similar to dvandva compounds. A few examples are shown below:

|            |   |         |                          |
|------------|---|---------|--------------------------|
| seN + haku | → | sempaku | “boats and ships”        |
| ʃuu + ʃi   | → | ʃuufi   | “income and expenditure” |
| ʃiN + riN  | → | ʃinriN  | “woods and forests”      |

As argued in 1.4.2, I exclude such bimorphemic root conjunction from the compounding patterns of Japanese.

<sup>37</sup> Some Japanese speakers accept “short” Sino-Japanese dvandva compounds, such as *dofa ʒari* “dirt and gravel” (Hideki Zamma, personal communication).

- (40) a. \*Taroo-ga [k<sup>j</sup>ooiku-ke'ŋk<sup>j</sup>uu]-o okonatta.  
 LHHHHLLL  
 Taro-NOM education research-OBJ do-PAST  
 "Taro did education and research."
- b. Taroo-ga [k<sup>j</sup>ooiku][keŋk<sup>j</sup>uu]-o okonatta.  
 LHHH LHHH  
 Taro-NOM education research-OBJ do-PAST  
 "Taro did education and research."

Whereas dvandva compounding, which involves prosodic concatenation, is impossible as in (40a), coordinate constructions, which do not require prosodic concatenation, are fully grammatical, as in (40b). These two types of word sequences should not be confused.

Similarly, the Loanword class is not a possible target of dvandva compounding; Loanword stems cannot be coordinately conjoined to form a single prosodic word. A few examples are shown below:

- (41) Loanword dvandva compounds (ungrammatical):<sup>38</sup>
- |                 |   |                  |                   |
|-----------------|---|------------------|-------------------|
| raisu + paN     | → | *[raisu-paN]     | "rice and bread"  |
| tii + kooçii    | → | *[tea-kooçii]    | "tea and coffee"  |
| razio + terebi  | → | *[razio-terebi]  | "radio and TV"    |
| raketto + booru | → | *[raketto-booru] | "racket and ball" |

Again, these pairs of Loanword stems are found in coordinate constructions, which must be distinguished from dvandva compounds, as shown below, where the accent location of each word is indicated by an apostrophe:

- (42) Loanword coordinative constructions:
- |                   |                   |
|-------------------|-------------------|
| [ra'isu][pa'N]    | "rice and bread"  |
| [ti'i][kooçi'i]   | "tea and coffee"  |
| [ra'zio][te'rebi] | "radio and TV"    |
| [rake'tto][booru] | "racket and ball" |

---

<sup>38</sup> These words are grammatical as normal compounds:

|       |                 |                   |
|-------|-----------------|-------------------|
| e.g., | [razio-terebi]  | "TV with a radio" |
|       | [raketto-booru] | "racquetball"     |

In these constructions, each of the two Loanword stems independently forms a prosodic word, and they cannot be prosodically concatenated with each other, which dvandva compounding requires. The contrast between dvandva compounds and coordinative constructions is illustrated in (43):

- (43) a. \*Taroo-ga [raisu'-paN]-o tʃuumON-ʃita.  
 LHHHL  
 Taro-NOM rice bread-OBJ order do-PAST  
 “Taro ordered rice and bread.”
- b. Taroo-ga [ra'isu][pa'N]-o tʃuumON-ʃita.  
 LHH HL  
 Taro-NOM rice bread-OBJ order do-PAST  
 “Taro ordered rice and bread.”

As with the Sino-Japanese cases shown above, dvandva compounding in Loanwords, which requires forming a single prosodic word, is ungrammatical, as in (43a). On the other hand, coordinate construction, which does not require prosodic concatenation, is grammatical, as in (43b).

### 2.3.4 Morpheme Order

As a morphological operation, dvandva compounding does not restrict the order between the two morphemes; they are basically reversible. However, despite the equal morphological status, there seems to be a tendency toward particular orders of the two components. As Kageyama (1982) reported, some semantic relations, such as positive and negative, male and female, older and younger, and other social and cultural priorities between the two components tend to “fix” the morpheme order inside compounds. Some of Kageyama’s examples are shown below:<sup>39 40</sup>

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<sup>39</sup> In Kageyama’s analysis, Sino-Japanese root conjunction, which I exclude from the patterns of Japanese compounding, as argued in 1.4.2, is included in Japanese compounding patterns. He also points out that quite a few exceptions to his generalization are found in Sino-Japanese words, such as *nan-i* “difficulty and easiness” and *son-toku* “loss and gain.” This fact can be regarded as evidence that Sino-Japanese root conjunction is quite different from the compounding patterns of Japanese.

<sup>40</sup> Kageyama also provides several counter-examples for these tendencies.

(44) a. positive-negative:

aru-nafi “existence or nonexistence”

jofi-afi “good or bad, quality”

katfi-make “win or lose”

b. older-younger:

oja-ko “parent and child”

c. male-female:

osu-mesu “male and female”

The reversed version of these dvandva compounds, such as *nafi-aru* “nonexistence or existence” and *ko-oja* “child and parent” are not found.

Acknowledging Kageyama’s generalization, Labrune (2006) further pointed out that the phonological structure of morphemes can affect the morpheme order in Japanese dvandva compounding.<sup>41</sup> She statistically revealed that the initial segment of constituents plays an important role in deciding the morpheme order; morphemes starting with vowels (i.e., morphemes that lack initial consonants) and /j/ are significantly preferred in the first position, whereas morphemes with an initial /k/ and /h/ are preferred in the second position. Conversely, morphemes that start with /k/, /h/, and /s/ are relatively rare in the first position, whereas morphemes that lack initial consonants are relatively rare in the second position. Labrune gave *are-kore* “that and this” and *achira-kochira* “in that direction and in this direction” as typical examples of her findings.

However, I would claim that these tendencies are caused by subsidiary elements and not a morphological rule of dvandva compounding. There are quite a few dvandva compounds in which the morpheme order is reversible. Some examples are shown below:

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<sup>41</sup> In addition to dvandva compounds, Labrune also examined compounds of abbreviated loanword items, such as *poke-mon* “Pocket Monsters,” and ideophonic echo words, such as *mecha-kucha* “messy.” She called dvandva compounds and these special types of compounds “non-headed Japanese binary compounds.”

(45) a. noun dvandva compounds:

|                          |                      |
|--------------------------|----------------------|
| ebi-kaŋi, kaŋi-ebi       | “shrimp and crab”    |
| çiŋi-çiŋa, çiŋa-çiŋi     | “elbow and knee”     |
| migi-çidari, çidari-migi | “right and left”     |
| ŋiro-kuro, kuro-ŋiro     | “white and black”    |
| tsuki-hoŋi, hoŋi-tsuki   | “the moon and stars” |

b. verb (verbal noun) dvandva compounds:

|                            |                       |
|----------------------------|-----------------------|
| aruki-haŋiru, haŋiri-aruku | “walk and run”        |
| nomi-tabe, tabe-nomi       | “drinking and eating” |

c. adjectival noun dvandva compounds:

|                                  |                        |
|----------------------------------|------------------------|
| atsu(i)-samu(i), samu(i)-atsu(i) | “hot and cool”         |
| taka(i)-çiku(i), çiku(i)-taka(i) | “high and low, height” |
| umai-mazui, mazui-umai           | “tasty or tasteless”   |

The existence of such reversible compounds suggests that the morpheme order within dvandva compounding is not morphologically decided but is basically flexible. The inflexibility of some dvandva compounds is probably caused by lexical blocking; for example, *aru-naŋi* in (44a) and its reversed form *naŋi-aru* are both morphologically grammatical and share an identical meaning, but the subsidiary tendency favors and lexicalizes the former. Consequently, the realization of the latter is suppressed by this lexicalized dvandva compound.

### 2.3.5 Rendaku

One of the most significant morphophonological characteristics of Japanese dvandva compounding is found in the application of rendaku; it is ungrammatical in this type of compounding. A few examples are shown below:

(46) a. noun dvandva compound::

|                                  |                       |
|----------------------------------|-----------------------|
| ebi + kaŋi → ebi-kaŋi, *ebi-gaŋi | “shrimp and crab”     |
| eda + ha → eda-ha, *eda-ba       | “branches and leaves” |
| oja + ko → oja-ko, *oja-go       | “parent and child”    |

b. verb (verbal noun) dvandva compounds:

|                 |                                 |                      |
|-----------------|---------------------------------|----------------------|
| miru + kiku     | → mi-kiku, *mi-giku             | “see and hear”       |
| tsukau + suteru | → tsukai-suteru, *tsukai-zuteru | “use and throw away” |
| iki + ſjini     | → iki-ſjini, *iki-zjini         | “alive and dead”     |
| uri + kai       | → uri-kai, *uri-gai             | “selling and buying” |

c. adjectival noun dvandva compounds:<sup>42</sup>

|                   |                                     |                |
|-------------------|-------------------------------------|----------------|
| atsu(i) + samu(i) | → atsu(i)-samu(i), *atsu(i)-zamu(i) | “hot or cold”  |
| ookii + tſiisai   | → ookii-tſiisai, *ookii-zſiisai     | “big or small” |

This morphophonological phenomenon is interesting because these Yamato words undergo rendaku in normal compounding, as we have seen in 2.2.4. A few examples are shown below:

(47) rendaku in normal compounds:

|              |                          |                   |
|--------------|--------------------------|-------------------|
| sawa + kaji  | → sawa-gaji, *sawa-kaji  | “freshwater crab” |
| stream crab  |                          |                   |
| inu + ſjini  | → inu-zjini, *inu-ſjini, | “death in vain”   |
| dog death    |                          |                   |
| hada + samui | → hada-zamui~hada-samui  | “chilly”          |
| skin cold    |                          |                   |

Because phonological contexts in (46) are essentially similar to those in (47), it is plausible to think that some morphological factor blocks the application of rendaku in dvandva compounding. I will provide a theoretical account of this issue in 4.2.

### 2.3.6 Accentuation

Let us turn our attention to accentuation dvandva compounding. In noun dvandva compounding, the first component often plays a significant role in accentuation; the accent of the first component is preserved in many cases. Interestingly enough, the accentuation in the second component, which is sometimes crucial in normal

<sup>42</sup> Some adjective dvandva compounds exceptionally undergo rendaku:

|                     |                       |                  |
|---------------------|-----------------------|------------------|
| e.g., amai + suppai | → ama-zuppai          | “sweet and sour” |
| itai + kajui        | → ita-kajui~ita-gajui | “sore and itchy” |

compounding, as illustrated in 2.2.5, is totally irrelevant to the accentuation in noun dvandva compounding. Consider the following examples:

(48) noun dvandva compounds:

|                |   |             |                      |
|----------------|---|-------------|----------------------|
| ʃi'ro + ku'ro  | → | ʃi'ro-kuro  | “white and black”    |
| ha'ru + natsu' | → | ha'ru-natsu | “spring and summer”  |
| u'mi + jama'   | → | u'mi-jama   | “sea and mountain”   |
| me' + hana     | → | me'-hana    | “eyes and a nose”    |
| jama' + kawa'  | → | jama'-kawa  | “mountain and river” |
| kusa' + ki'    | → | kusa'-ki    | “plant and tree”     |

Take the first compound in (48) *ʃiro-kuro* for an example. The original accent of both components is on the first mora. In the dvandva compound, the original accent of the first component is preserved, whereas that of the second component is deleted. When the first component lacks an accent, the compound accent falls on the last syllable of the second component, as shown in (49):

(49) noun dvandva compounds:

|               |   |              |                   |
|---------------|---|--------------|-------------------|
| ebi + kaɲi    | → | ebi'-kaɲi    | “shrimp and crab” |
| ue + ʃita     | → | ue'-ʃita     | “up and down”     |
| miɟi + ɟidari | → | miɟi'-ɟidari | “right and left”  |
| ɲiʃi + ɟigaʃi | → | ɲiʃi'-ɟigaʃi | “west and east”   |

As in normal compounding in (22), quadrimoraic or shorter compounds tend to lack an accent in this type of compounding. Here are a few examples:

(50) noun dvandva compounds (the flat pattern):

|              |   |           |                  |
|--------------|---|-----------|------------------|
| inu' + ne'ko | → | inu-neko  | “dog and cat”    |
| ɟiʒi' + ɟiza | → | ɟiʒi-ɟiza | “elbow and knee” |
| kabe + juka  | → | kabe-juka | “wall and floor” |

Owing to this tendency, many dvandva compounds in Japanese do not have an accent.

Accentuation in verb dvandva compounding is quite different from that in the above noun dvandva compounding, but it is similar to verb normal compounding, which exhibits the penultimate pattern, as illustrated in (28). Consider the following examples:



(51) verb dvandva compounds:

|                    |   |                 |                              |
|--------------------|---|-----------------|------------------------------|
| ka'ku + aratame'ru | → | kaki-aratame'ru | “write and change, correct”  |
| mo'tsu + hako'bu   | → | motʃi-hako'bu   | “hold and bring, carry”      |
| tsukau + sute'ru   | → | tsukai-sute'ru  | “use and throw away”         |
| mi'ru + ʃiru'      | → | mi-ʃi'ru        | “see and know, come to know” |

In this type of dvandva compounding, the accent always falls on the penultimate mora, following the general verb accent rule. Different from noun dvandva compounding, the original accent of the first component is insignificant. Conversely, verbal nouns exhibit a different accent pattern, as shown below:

(52) verbal noun dvandva compounds:

|                |   |              |                                   |
|----------------|---|--------------|-----------------------------------|
| uri' + kai'    | → | uri'-kai     | “selling and buying”              |
| jomi' + kaki'  | → | jomi'-kaki   | “reading and writing, literacy”   |
| asobi + aruki' | → | asobi-a'ruki | “having fun and walking, gadding” |

This type of compound seems to follow the default compound accent rule (18).

Accentuation in adjective and adjectival noun dvandva compounds generally follows the normal adjective accentuation pattern. Consider the following examples:

(53) a. adjective dvandva compounds:

|                |   |            |                  |
|----------------|---|------------|------------------|
| ama'i + kara'i | → | ama-kara'i | “sweet and hot”  |
| ita'i + kaju'i | → | ita-kaju'i | “sore and itchy” |

b. adjectival noun dvandva compounds:

|                  |   |               |                        |
|------------------|---|---------------|------------------------|
| ama'i + kara'i   | → | amai-kara'i   | “sweet and hot”        |
| taka'i + hiku'i  | → | takai-hiku'i  | “high and low, height” |
| ooki'i + ʃiisa'i | → | ookii-ʃiisa'i | “big or small”         |

In these dvandva compounds, accent falls on the penultimate mora just as in normal compounds whose head component is an adjective, which is illustrated in (29). As illustrated in (37b), the deletion of the adjectival suffix *-i* is possible in several adjectival noun dvandva compounds. In such cases, similar to the noun dvandva compounds in (50), the flat pattern often emerges when they are quadrimoraic. The following serve as examples:

(54) adjective noun dvandva compounds (the flat pattern):

|                 |   |           |                   |
|-----------------|---|-----------|-------------------|
| ama'i + kara'i  | → | ama-kara  | “sweet and hot”   |
| sema'i + çiro'i | → | sema-çiro | “narrow and wide” |
| atsu'i + samu'i | → | atsu-samu | “hot and cold”    |

## 2.4. Reduplication

### 2.4.1 Introduction

This section surveys the morphophonological varieties of reduplication in Japanese. Although Japanese has a rich system of reduplication, theoretical investigations into this type of word formation have been heavily biased: most morphophonological studies on Japanese reduplication have focused on its occurrence in mimetics (Hamano 1998; Nasu 1999, 2002; Mester & Ito 1989; and many others); few studies have dealt with reduplication in other classes (Kurafuji 2002; Nishimura 2004, 2007; Kurisu 2005; Vance 2006). In this section, I will examine reduplication in all Japanese ER classes and demonstrate that the ER classification crucially affects the grammaticality of this morphological operation.

### 2.4.2 Classification

First, I wish to point out that reduplication in Japanese can be classified into two sub-patterns, which I will call intensive/plural reduplication (IP-RDP) and mimetic reduplication (M-RDP). Because these two patterns are total reduplication, in which the whole segmental structure of the base is fully copied in the reduplicant at the surface level, they look superficially very similar. However, they can be distinguished by their morphosemantic characteristics.

Intensive/plural reduplication is operated to express plurality in nouns, intensity in adjectives, and repetition or duration in verbs. Some examples appear below:

(55) intensive/plural reduplication:

a. nouns:

|      |          |           |            |
|------|----------|-----------|------------|
| çito | “man”    | çito-bito | “people”   |
| mura | “village | mura-mura | “villages” |

b. adjectives:

|         |         |           |                         |
|---------|---------|-----------|-------------------------|
| haja(i) | “early” | haja-baja | “earlier than expected” |
| samu(i) | “cold”  | samu-zamu | “very cold”             |

c. verbs:

|            |        |               |                 |
|------------|--------|---------------|-----------------|
| kasane(ru) | “pile” | kasane-gasane | “repeatedly”    |
| aruk(u)    | “walk” | aruki-aruki   | “while walking” |

Note that in all of the above cases, this reduplication adds only some trivial information to the base word without changing the semantic property of the base itself. Reduplicated nouns still have the semantic properties of the original nouns, and likewise with verbs and adjectives. They obtain only plurality, intensity, repetition, and duration when undergoing this type of reduplication.

On the other hand, mimetic reduplication derives mimetic expression. The primal target of this operation is mimetic (onomatopoeic/sound symbolic) items. A few examples are shown below:

(56) mimetic reduplication: Mimetics

|          |             |           |              |
|----------|-------------|-----------|--------------|
| pika(ri) | “flashing”  | pika-pika | “glittering” |
| beto(ri) | “sticky”    | beto-beto | “sticky”     |
| goso(ri) | “squirming” | goso-goso | “squirming”  |

As argued in 1.4.2, one of the prominent characteristics of the mimetic class is its relative uniformity in phonology, morphology, and semantics. This uniformity can also be found in reduplication; the great majority of mimetic items can be a target of this reduplication pattern.<sup>43</sup> Mimetic items lexically contain onomatopoeic or sound symbolic meaning, and their reduplicated versions retain such meaning. In other words, there is no conspicuous change in meaning between a simple mimetic word and its reduplicated form, which is different from mimetic reduplication in the other ER classes, which I will illustrate below.

Whereas a great deal of effort has been made with morphophonological investigations into reduplication in mimetic items, as noted above, little attention has been given to that in other classes. However, the mimetic class is not the only class that undergoes mimetic reduplication; Yamato and Loanword stems are also possible targets of this morphological operation. A few examples are shown in (57):

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<sup>43</sup> See comprehensive lists of Japanese Mimetic items in Hamano (1989).

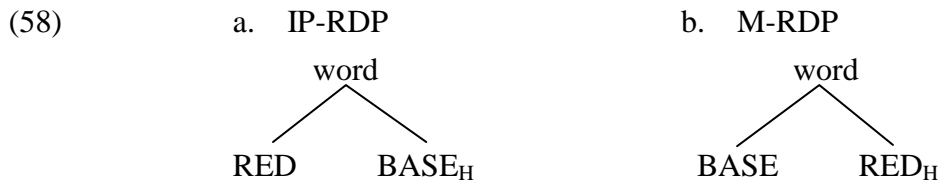
- (57) a. Yamato:
- |             |           |                  |            |
|-------------|-----------|------------------|------------|
| <i>fiwa</i> | “wrinkle” | <i>fiwa-fiwa</i> | “wrinkled” |
| <i>ibo</i>  | “knot”    | <i>ibo-ibo</i>   | “knotted”  |
- b. Loanwords:
- |                         |               |                                          |               |
|-------------------------|---------------|------------------------------------------|---------------|
| <i>g<sup>h</sup>aru</i> | “flashy girl” | <i>g<sup>h</sup>aru-g<sup>h</sup>aru</i> | “flashy”      |
| <i>rabu</i>             | “love”        | <i>rabu-rabu</i>                         | “lovey-dovey” |

As with mimetic items, the products of mimetic reduplication in these classes have adjectival or adverbial meanings, even though the base stems are nouns. Thus, unlike intensive/plural reduplication in (55), mimetic reduplication involves a substantial change in lexical category when the base stem is a Yamato or Loanword stem; the base of this reduplication pattern can be either a noun or a verb, and its product is an adjective, an adverb, or their nominal forms. Take *fiwa-fiwa* in (57a) as an example. Though the base of this reduplicated compound is the Yamato noun *fiwa* “wrinkle,” the reduplicated form *fiwa-fiwa* is not a noun, but rather behaves as an adjective or adjectival noun. Additionally, the base word is not the semantic head of the reduplicated form; the reduplicated form is not a kind of wrinkle but a state caused by wrinkles. This lexical and semantic change holds true in Loanword reduplication. For example, *rabu* in (57b) is a noun that means “love,” but its reduplicated form *rabu-rabu* is not a noun but an adjective, adverb, or their nominal forms, and it does not represent a kind of love but a harmonious atmosphere between lovers.

In the following sections, it will be demonstrated that these two types of reduplication also exhibit different morphophonological behavior both with respect to each other and with respect to the other compounding patterns that we saw in the two previous sections.

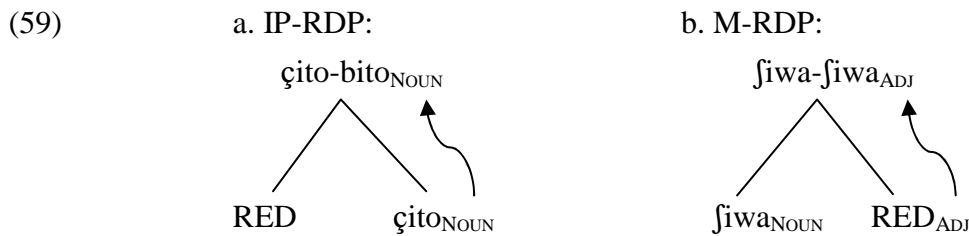
### 2.4.3 Structure

The difference between intensive/plural and mimetic reduplication can be explained as a difference between their morphological structures. I propose the following structure with headedness specification for these two reduplication patterns:



Both types of reduplication exhibit the head-final structure, which is the basic structure of word formation in Japanese (Kageyama 1982). “RED” indicates a reduplicative morpheme that lacks any phonological specification. “BASE” is a base stem that is the phonological source of the whole reduplicated compound. This stem supplies phonological information to the RED morpheme at the surface level. Note that the base in these structures is the phonological source of a reduplicated word, and this should not be confused with the morphological head. Therefore, the phonological source of reduplication is not necessarily the morphological source. This discrepancy actually occurs in mimetic reduplication, as illustrated in (58b), in which the morphological head of the whole word is not BASE but RED, which is phonologically null and provides adjectival (or adverbial) status in this type of reduplication.

Let us examine these two different structures with concrete examples. Consider the following examples:



As argued above, the lexical category of a reduplicated word derived by intensive/plural reduplication is taken over from the base stem. This fact is explained by structure (58a); as illustrated in (59a), the lexical category of the head stem *çito*, which is also the base in this compounding, is carried over to the whole compound, and therefore the reduplicated word *çito-bitō* obtains the noun status. On the other hand, there is a substantial lexical difference between a reduplicated word and its base stem in mimetic reduplication. This disagreement is also explained by structure (58b), in which the head is not the base stem but a RED morpheme; as shown in (59b), the lexical category of the whole compound *fiwa-fiwa* is provided by the RED morpheme, which has an adjectival status, but not by the nominal base *fiwa*. This adjectival RED morpheme guarantees the adjectival status of reduplicated words derived through mimetic reduplication.

In Chapter 3, it will be shown that this structural difference between the two patterns is derived from the morphological headedness specification and a constraint that requires the right-headed structure.

#### 2.4.4 Intensive/Plural Reduplication

Let us further examine morphology and morphophonology in intensive/plural reduplication. In this section, it will be shown that this reduplication pattern provides interesting data on the morphology and morphophonology of Japanese compounding.

##### 2.4.4.1 ER Classes

One of the most prominent characteristics of this morphological operation is its dependency on the ER classification; whereas this type of reduplication is possible for Yamato stems, it is impossible in the Sino-Japanese and Loanword classes.

Yamato nouns, adjectives, and verbs are possible target of intensive/plural reduplication. When this reduplication patterns applied to Yamato nouns, it represents plurality. Consider the following examples:

(60) Yamato noun reduplication

a. monomoraic base:

|    |        |       |              |
|----|--------|-------|--------------|
| çi | “day”  | çi-bi | “every day”  |
| ki | “tree” | ki-gi | “many trees” |

b. bimoraic base:

|       |            |            |                  |
|-------|------------|------------|------------------|
| jama  | “mountain” | jama-jama  | “many mountains” |
| çito  | “person”   | çito-bito  | “people”         |
| mura  | “village”  | mura-mura  | “many villages”  |
| aſi   | “foot”     | aſi-aſi    | “many feet”      |
| kami  | “god”      | kami-gami  | “many gods”      |
| kata  | “person”   | kata-gata  | “everyone”       |
| sore  | “it”       | sore-zore  | “each of them”   |
| ſima  | “island”   | ſima-zima  | “islands”        |
| tsuki | “month”    | tsuki-zuki | “per month”      |
| ware  | “I”        | ware-ware  | “we”             |

c. trimoraic base:

|        |          |               |                   |
|--------|----------|---------------|-------------------|
| tokoro | “place”  | tokoro-dokoro | “some places”     |
| kokoro | “heart”  | kokoro-gokoro | “each heart”      |
| konomi | “liking” | konomi-gonomi | “various likings” |

Take the first pair of *jama* and *jama-jama* as an example. Since Japanese grammar lacks differences in grammatical number, *jama* can mean both a single mountain and plural mountains. The number of mountains may be understood from the context. This word can be reduplicated as *jama-jama* and obtain plurality.

It should, however, be noted that plurality in these reduplicated words is somewhat different from grammatical plurality found in many languages, such as English, French, Tahitian, and Hebrew. In many cases, this type of reduplication is unable to indicate two items, even though its surface representation consists of two phonological realizations of the base stem; it must indicate more than two items, as shown below:

- (61) a. \*futatsu-no jama-jama “two mountains”  
cf. ooku-no jama-jama “many mountains”
- b. \*futatsu-no jima-zima “two islands”  
cf. itsutsu-no jima-zima “five islands”
- c. \*futari-no çito-bito “two people”  
cf. ikujin-no çito-bito “some people”

Not only nouns but also adjectives, which categorically belong to the Yamato class, are also possible targets of intensive/plural reduplication. Unlike the plurality in noun reduplication shown above, adjectives become emphasized through reduplication and are often used as adverbs, as shown below:

(62) Yamato adjective reduplication:<sup>44</sup>

|         |         |           |                         |
|---------|---------|-----------|-------------------------|
| ao(i)   | “blue”  | ao-ao     | “clear blue”            |
| samu(i) | “cold”  | samu-zamu | “very cold”             |
| kuro(i) | “black” | kuro-guro | “thin black”            |
| karu(i) | “light” | karu-garu | “very lightly”          |
| haja(i) | “early” | haja-baja | “earlier than expected” |

When the base of reduplication is a verb, the reduplicated form represents repetition, duration, or simultaneity of the action, as illustrated below:

(63) Yamato verb reduplication:

|            |          |               |                       |
|------------|----------|---------------|-----------------------|
| kawaru     | “change” | kawaru-gawaru | “alternately”         |
| hanare(ru) | “leave”  | hanare-banare | “being separated”     |
| jasum(u)   | “rest”   | jasumi-jasumi | “often having a rest” |

Poser (1990) pointed out that when the base stem is monomoraic, vowel augmentation makes both the base and reduplicant bimoraic in the reduplicated form. The following serve as examples:

(64) Yamato verb reduplication (monomoraic base):

|        |         |                 |                 |
|--------|---------|-----------------|-----------------|
| mi(ru) | “look”  | mii-mii, *mi-mi | “while looking” |
| ne(ru) | “sleep” | nee-nee, *ne-ne | “oversleeping”  |
| s(uru) | “do”    | ʃii-ʃii, *ʃi-ʃi | “while doing”   |

Whereas intensive/plural reduplication makes the Yamato vocabulary rich, as illustrated above, items in the other ER classes never undergo this morphological operation. Let us examine the Loanword class first. The following examples show the ungrammaticality of intensive/plural reduplication in this class:<sup>45</sup>

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<sup>44</sup> Japanese has a similar word formation, which involves an adjectivizing suffix *-ʃii*:

|       |         |         |               |                 |
|-------|---------|---------|---------------|-----------------|
| e.g., | karu(i) | “light” | karu-garu-ʃii | “thoughtlessly” |
|       | samu(i) | “cold”  | samu-zamu-ʃii | “bleak”         |
|       | jowa(i) | “weak”  | jowa-jowa-ʃii | “weak looking”  |

<sup>45</sup> Some of these examples are possible in child language (Haruka Fukazawa, personal communication).



(65) Loanword reduplication (ungrammatical)

a. bimoraic base:

|      |         |            |                   |
|------|---------|------------|-------------------|
| paN  | “bread” | *pam-paN   | “pieces of bread” |
| peN  | “pen”   | *pem-peN   | “pens”            |
| piN  | “pin”   | *pim-piN   | “pins”            |
| tabu | “tab”   | *tabu-tabu | “tabs”            |
| kii  | “key”   | *kii-kii   | “keys”            |
| webu | “web”   | *webu-webu | “webs”            |
| faN  | “fan”   | *faN-faN   | “fans”            |
| tagu | “tag”   | *tagu-tagu | “tags”            |
| baa  | “bar”   | *baa-baa   | “bars”            |
| gumi | “gummy” | *gumi-gumi | “gummies”         |

b. trimoraic base:

|        |                 |                |                  |
|--------|-----------------|----------------|------------------|
| terebi | “TV”            | *terebi-terebi | “TVs”            |
| baggu  | “bag”           | * baggu-baggu  | “bags”           |
| keeki  | “piece of cake” | *keeki-keeki   | “pieces of cake” |
| geemu  | “game”          | *geemu-geemu   | “games”          |
| booru  | “ball”          | *booru-booru   | “balls”          |
| kurasu | “class”         | *kurasu-kurasu | “classes”        |

c. quadrimoraic or longer base:

|                         |            |                                                  |             |
|-------------------------|------------|--------------------------------------------------|-------------|
| repooto                 | “report”   | *repooto-repooto                                 | “reports”   |
| pureijaa                | “player”   | *pureijaa-pureijaa                               | “players”   |
| supootsu                | “sport”    | *supootsu-supootsu                               | “sports”    |
| komp <sup>h</sup> uutaa | “computer” | *komp <sup>h</sup> uutaa-komp <sup>h</sup> uutaa | “computers” |

In all examples in (65), intensive/plural reduplication is ungrammatical. They show that the moraic length of a base word is completely irrelevant to this ungrammaticality. It must be concluded that Loanword stems are categorically excluded from this morphological operation.

As with the Loanword class, intensive/plural reduplication is impossible in the Sino-Japanese class.<sup>46</sup> Examples in (65) below show that Sino-Japanese free morphemes cannot have a reduplicated form that is derived by intensive/plural

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<sup>46</sup> There are a few lexical exceptions, e.g., *fu-fu* “various kinds,” *dai-dai* “for generations,” and *fi-fi-son-son* “descendants.”

reduplication:

(66) Sino-Japanese reduplication (monomorphemic; ungrammatical):

a. monomoraic base:

|    |              |        |               |
|----|--------------|--------|---------------|
| sa | “difference” | *sa-sa | “differences” |
| ha | “group”      | *ha-ha | “groups”      |
| ʃi | “teacher”    | *ʃi-ʃi | “teachers”    |
| ʃo | “book”       | *ʃo-ʃo | “books”       |

b. bimoraic base

(i) CVi morpheme:

|     |                |          |                  |
|-----|----------------|----------|------------------|
| ai  | “love”         | *ai-ai   | “loves”          |
| kai | “party”        | *kai-kai | “parties”        |
| gai | “harm”         | *gai-gai | “much harm”      |
| tai | “body”         | *tai-tai | “bodies”         |
| dai | “title, theme” | *dai-dai | “titles, themes” |
| hai | “lung”         | *hai-hai | “lungs”          |

(ii) CVV morpheme:

|     |               |          |                |
|-----|---------------|----------|----------------|
| see | “family name” | *see-see | “family names” |
| zee | “tax”         | *zee-zee | “taxes”        |
| ree | “example”     | *ree-ree | “examples”     |
| ree | “spirit”      | *ree-ree | “spirits”      |

(iii) CVN morpheme:

|     |                 |          |                       |
|-----|-----------------|----------|-----------------------|
| kiN | “money”         | *kiŋ-kiN | “much money”          |
| keN | “sword”         | *keŋ-keN | “swords”              |
| kaN | “can”           | *kaŋ-kaN | “cans”                |
| gaN | “cancer”        | *gaŋ-gaN | “cancers”             |
| haN | “group”         | *haN-haN | “groups”              |
| fuN | “piece of dung” | *fuN-fuN | “pieces of dung”      |
| buN | “sentence”      | *bum-buN | “sentences”           |
| biN | “bottle”        | *bum-buN | “bottles”             |
| beN | “excrement”     | *bem-beN | “pieces of excrement” |
| hoN | “book”          | *hoN-hoN | “books”               |
| waN | “bowl”          | *waN-waN | “bowls”               |

(iv) CVCV morpheme:

|       |           |              |                  |
|-------|-----------|--------------|------------------|
| eki   | “station” | *eki-eki     | “stations”       |
| seki  | “seat”    | *seki-seki   | “seats”          |
| saku  | “plan”    | *saku-saku   | “plans”          |
| setsu | “section” | *setsu-setsu | “sections”       |
| tetsu | “iron”    | *tetsu-tetsu | “pieces of iron” |
| retsu | “queue”   | *retsu-retsu | “queues”         |

Neither the moraic length nor the segmental structure has any effect on the ungrammaticality of intensive/plural reduplication in this class. Sino-Japanese bimorphemic words, which are derived through root conjunction of bound morphemes, are also excluded from the possible targets of intensive/plural reduplication. Some examples appear in (67):

(67) Sino-Japanese reduplication (bimorphemic base; ungrammatical)

a. bimoraic base:

|       |            |              |             |
|-------|------------|--------------|-------------|
| kiki  | “crisis”   | *kiki-kiki   | “crises”    |
| dʒiko | “accident” | *dʒiko-ʒiko  | “accidents” |
| katʃi | “value”    | *katʃi-katʃi | “values”    |
| kizi  | “article”  | *kizi-kizi   | “articles”  |

b. trimoraic base:

|                     |           |                                          |             |
|---------------------|-----------|------------------------------------------|-------------|
| k <sup>j</sup> ooʃi | “teacher” | *k <sup>j</sup> ooʃi-k <sup>j</sup> ooʃi | “teachers”  |
| b <sup>j</sup> ooki | “illness” | *b <sup>j</sup> ooki-b <sup>j</sup> ooki | “illnesses” |
| kaigi               | “meeting” | *kaigi-kaigi                             | “meetings”  |
| kekka               | “result”  | *kekka-kekka                             | “results”   |

c. quadrimoraic base:

|         |                   |                  |                     |
|---------|-------------------|------------------|---------------------|
| kookoo  | “high school”     | *kookoo-kookoo   | “high schools”      |
| juuʒiN  | “friend”          | *juuʒiN-juuʒiN   | “friends”           |
| gaikoku | “foreign country” | *gaikoku-gaikoku | “foreign countries” |

This pattern of reduplication is not allowed in this class with any moraic length. We reach the same conclusion as with the Loanword case above; the Sino-Japanese class is categorically excluded as a possible target for intensive/plural reduplication.

#### 2.4.4.2 Rendaku

I previously pointed out that the application of rendaku in intensive/plural reduplication is different from that in normal compounding (Nishimura 2007). In intensive/plural reduplication, rendaku is obligatorily applied unless blocked by the phonological context. The following serve as examples:

(68) a. Yamato noun reduplication:

|        |          |                               |               |
|--------|----------|-------------------------------|---------------|
| kami   | “god”    | kami-gami, *kami-kami         | “many gods”   |
| çito   | “person” | çito-bito, *çito-çito         | “people”      |
| ʃima   | “island” | ʃima-ʒima, *ʃima-ʃima         | “islands”     |
| tsuki  | “month”  | tsuki-zuki, *tsuki-tsuki      | “per month”   |
| tokoro | “place”  | tokoro-dokoro, *tokoro-tokoro | “some places” |

b. Yamato adjective and verb reduplication:

|            |         |                               |                   |
|------------|---------|-------------------------------|-------------------|
| kuro(i)    | “black” | kuro-guro, *kuro-kuro         | “thin black”      |
| karu(i)    | “light” | karu-garu, *karu-karu         | “very lightly”    |
| hanare(ru) | “leave” | hanare-banare, *hanare-hanare | “being separated” |

The Lyman’s Law effect, which blocks the rendaku application in normal compounding, as illustrated in (13) and (14) in 2.2.4, is still observed in intensive/plural reduplication.

Consider the following examples:

- (69) Lyman's Law effect:
- |       |          |                          |               |
|-------|----------|--------------------------|---------------|
| kazu  | “number” | kazu-kazu, *kazu-gazu    | “numerous”    |
| tsugi | “next”   | tsugi-tsugi, *tsugi-zugi | “alternately” |

Rendaku in these compounds is impossible because the bases originally contain voiced obstruents.

When the base of intensive/plural reduplication begins with a voiceless obstruent and does not originally have any voiced obstruent, rendaku almost always takes place as shown in (68). I have found only three exceptions to this generalization, which are shown below:

- (70)
- |         |             |                       |                 |
|---------|-------------|-----------------------|-----------------|
| a. kore | “this”      | kore-kore, *kore-gore | “thus and thus” |
| b. kaku | “like this” | kaku-kaku, *kaku-gaku | “thus and thus” |
| c. tsu  | “port”      | tsu-tsu~tsu-zu        | “every port”    |

Example (70a) should be compared with a similar expression *sore-zore* “each of them,” in which rendaku is applied. (70b) often accompanies another reduplicated word *fika-zika* as in *kaku-kaku fika-zika* “thus and thus.” This idiomatic expression is interesting because rendaku is applied only in the latter reduplicated word. In (70c), the application of rendaku is optional. This word is found only in the idiomatic expression *tsu-tsu ura-ura~tsu-zu ura-ura* “everywhere.” These examples do not seem to be problematic for the above generalization when we regard them as lexicalized expressions.

Another interesting fact about rendaku in intensive/plural reduplication is that the rendaku immunes, which resist rendaku in normal compounding, undergo voicing through this compounding pattern (Rosen 2003, Nishimura 2004, 2007). The following examples show the rendaku blocking effect in normal compounding:

(71) Yamato rendaku immunes in normal compounding:

hafi: kire + hafi → kire-hafi, \*kire-bafi “cutting piece”  
cut edge

saki: tabi + saki → tabi-saki, \*tabi-zaki “travel destination”  
travel destination

fimo: kawa + fimo → kawa-fimo, \*kawa-zimo “downstream”  
river lower

sumi: kata + sumi → kata-sumi, \*kata-zumi “obscure corner”  
side corner

However, they obligatorily undergo rendaku in intensive/plural reduplication, as shown below:

(72) rendaku immunes in intensive/plural reduplication

|      |               |                       |                     |
|------|---------------|-----------------------|---------------------|
| hafi | “edge”        | hafi-bafi, *hafi-hafi | “every edge”        |
| saki | “destination” | saki-zaki, *saki-saki | “every destination” |
| fimo | “lower”       | fimo-zimo, *fimo-fimo | “the lower classes” |
| sumi | “corner”      | sumi-zumi, *sumi-sumi | “every corner”      |

It appears reasonable that this discrepancy in the rendaku application between normal compounding and intensive/plural reduplication is caused by the structural differences between them.

#### 2.4.4.3 Accentuation

Unlike normal compounding and dvandva compounding, accentuation in intensive/plural reduplication is quite simple and uniform. It almost always follows the default compound accent rule (18) in 2.2.5. The following serve as examples:

(73) a. bimoraic base:

|           |            |                |
|-----------|------------|----------------|
| ka'mi     | kami'-gami | “gods”         |
| mura'     | mura'-mura | “villages”     |
| çito      | çito'-bito | “people”       |
| a'o       | ao'-ao     | “clear blue”   |
| samu'(i)  | samu'-zamu | “chilly”       |
| tabe'(ru) | tabe'-tabe | “while eating” |

b. trimoraic base:

|             |                |                 |
|-------------|----------------|-----------------|
| koko'ro     | kokoro-go'koro | “in each mind”  |
| tokoro'     | tokoro-do'koro | “some places”   |
| aru'k(u)    | aruki-a'ruki   | “while walking” |
| kasane'(ru) | kasane-ga'sane | “repeatedly”    |

c. quadrimoraic base:

|              |                    |                           |
|--------------|--------------------|---------------------------|
| koroga's(u)  | korogasi-ko'rogasi | “while rolling something” |
| tobikoe'(ru) | tobikoe-to'bikoe   | “while jumping over”      |

When the base has fewer than four morae, the accent falls on the antepenultimate mora of a compound, as in (73a) and (73b). If the base is quadrimoraic or longer, the accent falls on the first mora of the second component, as in (73c). In all the above cases, the location of the base accent does not interfere in compound accentuation. I conclude that the location of the accent in intensive/plural reduplication is fully dependent on the surface moraic structure and that there is no base-accent effect as can be observed in normal and dvandva compounding.

Another interesting aspect with respect to this morphophonological phenomenon is that the flat pattern, which lacks a surface accent, is never allowed in this compounding pattern. As discussed in 2.2.5, there is a tendency for a quadrimoraic or shorter compound to have the flat pattern in Japanese. However, as indicated in (73a), intensive/plural reduplication never produces the flat pattern even if the reduplicated word is quadrimoraic. This characteristic of intensive/plural reduplication must be compared with the accentuation of mimetic reduplication, which almost always results in the flat pattern when the reduplicated word is quadrimoraic, as we will examine in 2.4.4.3.

## 2.4.5 Mimetic Reduplication

Let us move now to mimetic reduplication, which derives adjectives (or adverbs depending on the context) from a base stem. As I noted above, previous studies on Japanese reduplication have mainly focused on reduplication of items in the Mimetic class; it is probably true that the canonical target of mimetic reduplication is mimetic items and that reduplication in the other classes is a derivative operation. However, this section mainly analyzes mimetic reduplication involving non-mimetic items, as argued in 1.4.2. The morphology and morphophonology of mimetic reduplication is interesting when we compare it with the other compounding patterns in Japanese, as will be examined in this section.

### 2.4.5.1 ER Classes

Compared with intensive/plural reduplication, mimetic reduplication is relatively open to the ER classes. In addition to the mimetic class, this morphological operation is possible in the Yamato and Loanword classes. Though Sino-Japanese words are not a target of this compounding pattern, a very similar morphological operation is found in the root conjunction of Sino-Japanese morphemes.

First, let us examine mimetic reduplication in the Yamato class. Nouns, verbs, and adjectives in this class are all possible targets of this type of compounding. The following shows mimetic reduplication in which the base component is a Yamato noun:

(74) Yamato nouns:<sup>47</sup>

|       |             |             |                    |
|-------|-------------|-------------|--------------------|
| ami   | “net”       | ami-ami     | “net-like”         |
| aho   | “fool”      | aho-aho     | “foolish”          |
| iro   | “color”     | iro-iro     | “various kinds”    |
| utʃi  | “inside”    | utʃi-utʃi   | “unofficial”       |
| ʃiwa  | “wrinkle”   | ʃiwa-ʃiwa   | “wrinkled”         |
| tsubu | “grain”     | tsubu-tsubu | “grainy”           |
| tsuja | “gloss”     | tsuja-tsuja | “glossy”           |
| ʃima  | “stripes”   | ʃima-ʃima   | “striped”          |
| moja  | “mist”      | moja-moja   | “misty”            |
| motʃi | “rice cake” | motʃi-motʃi | “soft and elastic” |

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<sup>47</sup> Japanese has a similar word formation, which involves an adjectivizing suffix *ʃii*:

|       |      |          |               |                    |
|-------|------|----------|---------------|--------------------|
| e.g., | baka | “fool”   | baka-baka-ʃii | “foolish”          |
|       | mizu | “water”  | mizu-mizu-ʃii | “fresh”            |
|       | doku | “poison” | doku-doku-ʃii | “flashy, virulent” |



|       |                 |             |                          |
|-------|-----------------|-------------|--------------------------|
| mitji | “road”          | mitji-mitji | “on the way”             |
| kobu  | “bump”          | kobu-kobu   | “bumpy”                  |
| kona  | “powder”        | kona-kona   | “powdery”                |
| komi  | “inclusiveness” | komi-komi   | “inclusive”              |
| nami  | “wave”          | nami-nami   | “wavy”                   |
| notji | “after”         | notji-notji | “ever after”             |
| koke  | “moss”          | koke-koke   | “mossy”                  |
| ketji | “cheapskate”    | ketji-ketji | “stingy”                 |
| gomi  | “garbage”       | gomi-gomi   | “full of garbage”        |
| hone  | “bone”          | hone-hone   | “containing small bones” |

As argued in 2.4.1, this type of reduplication is characterized by lexical and semantic differences between the base stem and its reduplicated counterpart. Unlike intensive/plural reduplication, in which the lexical and semantic properties of the base stem are fully inherited by the reduplicated form, the base stem does not behave as the lexical head of the compound in mimetic reduplication. Consider the following examples:

- (75) a. iwa-ni koke-ga haeru. “Moss grows on the rock.”  
rock-LOCATIVE moss-NOM grow
- b. \*iwa-ni koke-koke-ga haeru. “Moss grows on the rock.”  
rock-LOCATIVE moss-RED-NOM grow
- c. iwa-ga koke-koke-da. “The rock is mossy.”  
rock-NOM moss-RED-ASSERTIVE
- d. koke-koke-na iwa “a mossy rock”  
moss-RED-ADJ rock

A Yamato stem *koke* is a noun that signifies moss, as in (75a). However, the reduplicated word *koke-koke* is not a noun and does not signify a kind of a moss, as in (75b), but is rather used as an adjective that signifies a state of something caused by moss, followed by an assertive or adjectivizing particle, as in (75c) and (75d), respectively. Such disagreement is found in all of the examples in (74).

A Japanese verb (and its nominal form) is also a possible target of mimetic

reduplication. Almost all verbs in Japanese belong to the Yamato class, and they may also have a reduplicated form that is different from one derived through intensive/plural reduplication, as argued above. Some examples are shown in (76):

(76) Yamato verbs<sup>48</sup>

a. bimoraic base:

|          |                              |           |                              |
|----------|------------------------------|-----------|------------------------------|
| age(ru)  | “raise”                      | age-age   | “uplifting”                  |
| os(u)    | “push”                       | ose-ose   | “overwhelming”               |
| suke(ru) | “show through”               | suke-suke | “transparent”                |
| suk(u)   | “be free”                    | suki-suki | “be free”                    |
| sube(ru) | “slip”                       | sube-sube | “smooth”                     |
| kam(u)   | “stutter”                    | kami-kami | “stuttering”                 |
| kom(u)   | “be crowded”                 | komi-komi | “crowded”                    |
| tob(u)   | “jump”                       | tobi-tobi | “skipping”                   |
| kire(ru) | “move quickly”               | kire-kire | “agile”                      |
| jige(ru) | “escape”                     | jige-jige | “escapist” (adj.)            |
| maze(ru) | “mix”                        | maze-maze | “mixed”                      |
| mote(ru) | “popular with the other sex” | mote-mote | “popular with the other sex” |
| nobi(ru) | “delay”                      | nobi-nobi | “delayed”                    |
| nure(ru) | “get wet”                    | nure-nure | “wet”                        |
| jore(ru) | “wear out”                   | jore-jore | “shabby”                     |
| jase(ru) | “get thin”                   | jase-jase | “thin”                       |
| çie(ru)  | “get cold”                   | çie-çie   | “cold”                       |
| çijas(u) | “cool”                       | çija-çija | “cold”                       |
| hage(ru) | “bald”                       | hage-hage | “bald”                       |

<sup>48</sup> Again, similar word formation with an adjectivizing suffix *fii* is also possible:

|       |          |              |               |                |
|-------|----------|--------------|---------------|----------------|
| e.g., | nare(ru) | “accustom”   | nare-nare-fii | “too familiar” |
|       | hare(ru) | “clear”      | hare-bare-fii | “bright”       |
|       | take(ru) | “be excited” | take-dake-fii | “ferocious”    |

b. trimoraic base:

|            |                   |               |               |
|------------|-------------------|---------------|---------------|
| kozire(ru) | “get complicated” | kozire-kozire | “complicated” |
| togire(ru) | “pause”           | togire-togire | “pausingly”   |
| kasure(ru) | “crack”           | kasure-kasure | “cracked”     |
| osore(ru)  | “fear”            | osoru-osoru   | “fearfully”   |
| wakare(ru) | “divide”          | wakare-wakare | “divided”     |

Again, unlike intensive/plural reduplication with verbs, a reduplicated form in this pattern loses its verbal property and behaves as an adjective or adverb depending on the context. Take *suke(ru)* “show through” as an example. Though this word is originally a verb, the reduplicated form *suke-suke* cannot be used as a verb in a sentence, as shown in (77):

(77) a. gurasu-ga suke-ru. “The glass shows through.”  
glass-NOM show through

b. \*gurasu-ga suke-suke-ru. “The glass shows through.”  
glass-NOM show through

Instead, this reduplicated word can be used as an adjective followed by an assertive or adjectivizing particle, as shown in (78):

(78) a. gurasu-ga suke-suke-da. “The glass is transparent.”  
glass-NOM transparent-ASSERTIVE

b. suke-suke-na gurasu “a transparent glass”  
transparent-ADJ glass

Such a substantial lexical and semantic difference between the base word and the reduplicated form is found in all verb reduplication in (76).

Japanese adjectives (or their nominal forms), which also categorically belong to the Yamato class, are possible targets of mimetic reduplication. Some examples appear in (79):

(79) Yamato adjectives

a. *-i* adjectives:

|          |             |             |             |
|----------|-------------|-------------|-------------|
| atsu(i)  | “hot”       | atsu-atsu   | “very hot”  |
| usu(i)   | “thin”      | usu-usu     | “vaguely”   |
| samu(i)  | “cold”      | samu-samu   | “cold”      |
| kowa(i)  | “scary”     | kowa-kowa   | “scary”     |
| jowa(i)  | “weak”      | jowa-jowa   | “weak”      |
| ama(i)   | “indulgent” | ama-ama     | “indulgent” |
| kitsu(i) | “tight”     | kitsu-kitsu | “tight”     |
| nuku(i)  | “warm”      | nuku-nuku   | “warm”      |
| seko(i)  | “stingy”    | seko-seko   | “stingy”    |
| juru(i)  | “loose”     | juru-juru   | “loose”     |
| jasu(i)  | “easy”      | jasu-jasu   | “easily”    |
| noro(i)  | “slow”      | noro-noro   | “slow”      |
| hoso(i)  | “slender”   | hoso-hoso   | “slender”   |

b. *-na* adjective:

|         |              |         |               |
|---------|--------------|---------|---------------|
| ija(na) | “disgusting” | ija-ija | “unwillingly” |
|---------|--------------|---------|---------------|

Since mimetic reduplication derives reduplicated words with the adjectival property, as shown in the noun and verb reduplication examples above, no significant change in meaning takes place in the reduplicated forms, as in (79).<sup>49</sup>

(80) a. Taroo-ga kodomo-ni ama-i. “Taro is indulgent to his child.”  
Taro-NOM child-DAT indulgent

b. Taroo-ga kodomo-ni ama-ama-da. “Taro is indulgent to his child.”  
Taro-NOM child-DAT indulgent-ASSERTIVE

Another source of mimetic reduplication is the Loanword class. Stems in this class, the great majority of which are nouns, can undergo this morphological operation and obtain an adjectival or adverbial meaning. Some examples are shown below:

---

<sup>49</sup> This fact sometimes makes it difficult to distinguish mimetic reduplication from intensive/plural reduplication, because in both cases adjectives do not undergo substantial change; for example, *jowa-jowa* “weak, weakly,” can be derived from both patterns.

(81) Loanword nouns:<sup>50</sup>

a. bimoraic base:

|                    |               |                                       |               |
|--------------------|---------------|---------------------------------------|---------------|
| rabu               | “love”        | rabu-rabu                             | “lovey-dovey” |
| ero <sup>51</sup>  | “eroticism”   | ero-ero                               | “erotic”      |
| g <sup>j</sup> aru | “flashy girl” | g <sup>j</sup> aru-g <sup>j</sup> aru | “flashy”      |
| debu <sup>52</sup> | “fat”         | debu-debu                             | “fat”         |
| rori               | “pedophilia”  | rori-rori                             | “girlish”     |
| meka               | “machine”     | meka-meka                             | “mechanical”  |

b. trimoraic base:

|                     |             |                                         |                  |
|---------------------|-------------|-----------------------------------------|------------------|
| piŋku               | “pink”      | pinku-pinku                             | “pink”           |
| dorama              | “TV drama”  | dorama-dorama                           | “drama-like”     |
| riaru               | “realistic” | riaru-riaru                             | “very realistic” |
| k <sup>j</sup> uuto | “cute”      | k <sup>j</sup> uuto-k <sup>j</sup> uuto | “cute”           |
| hepii               | “heavy”     | hepii-hepii                             | “heavy”          |

c. quadrimoraic base:

|          |           |                   |               |
|----------|-----------|-------------------|---------------|
| raburii  | “lovely”  | raburii-raburii   | “lovely”      |
| toraburu | “trouble” | toraburu-toraburu | “troublesome” |
| herufii  | “healthy” | herufii-herufii   | “healthy”     |

Similar to Yamato noun dvandva compounds, as illustrated in (74) and (75), Loanword reduplicated words are not nouns but adjectives or adverbs even though their base stems are nouns. Consider the following examples:

---

<sup>50</sup> Some Japanese speakers accept *fii* adjectives with Loanword reduplication:

|       |                    |           |                                           |              |
|-------|--------------------|-----------|-------------------------------------------|--------------|
| e.g., | g <sup>j</sup> aru | “girl”    | g <sup>j</sup> aru-g <sup>j</sup> aru-fii | “flashy”     |
|       | meka               | “machine” | meka-meka-fii                             | “mechanical” |

<sup>51</sup> Exceptional as a Loanword item, this stem can form a non-reduplicated adjective *ero-i* “erotic.”

<sup>52</sup> This word does not have any foreign etymological origin. However, considering its phonological structure, which contains two voiced obstruents, I place it in the Loanword class.

- (82) a. Taroo-ga g<sup>j</sup>aru-o konomu. “Taro likes flashy girls.”  
 Taro-NOM flashy girl-OBJ like
- b. \*Taroo-ga g<sup>j</sup>aru-g<sup>j</sup>aru-o konomu. “Taro likes flashy girls.”  
 Taro-NOM flashy girl-OBJ like
- c. Keito-ga g<sup>j</sup>aru-g<sup>j</sup>aru-da. “Kate is flashy.”  
 Kate-NOM flashy girl-RED-ASSERTIVE
- d. g<sup>j</sup>aru-g<sup>j</sup>aru-na fuku “flashy clothes”  
 flashy girl-RED-ADJ clothes

A Loanword stem *g<sup>j</sup>aru* is a noun, as in (82a), but its reduplicated form cannot be used as a noun, as in (82b). Instead, the reduplicated word is used as an adjective followed by an assertive or adjectivizing particle, as in (82c) and (82d), respectively.

Whereas mimetic reduplication is very productive in the Yamato and Loanword classes, as shown above, this compounding pattern is impossible in Sino-Japanese. Interestingly, however, a similar word formation is found in bimorphemic root conjunction. Let us first examine Sino-Japanese words. The following indicates that mimetic reduplication is impossible when the base component is a Sino-Japanese bimorphemic word:

(83) Sino-Japanese bimorphemic base (ungrammatical)

a. bimoraic base:

|                    |             |                                        |             |
|--------------------|-------------|----------------------------------------|-------------|
| kiso               | “basic”     | *kiso-kiso                             | “basic”     |
| k <sup>j</sup> ogi | “falseness” | *k <sup>j</sup> ogi-k <sup>j</sup> ogi | “false”     |
| taki               | “variety”   | *taki-taki                             | “various”   |
| fii                | “arbitrary” | *fii-fii                               | “arbitrary” |

b. trimoraic base:

|                    |             |                                        |             |
|--------------------|-------------|----------------------------------------|-------------|
| kooka              | “expensive” | *kooka-kooka                           | “expensive” |
| jojuu              | “margin”    | *jojuu-jojuu                           | “easy”      |
| taʃoo              | “a little”  | *taʃoo-taʃoo                           | “a little”  |
| k <sup>j</sup> ooi | “threat”    | *k <sup>j</sup> ooi-k <sup>j</sup> ooi | “amazing”   |

c. quadrimoraic base:

|           |              |                      |              |
|-----------|--------------|----------------------|--------------|
| konnaN    | “difficulty” | *konnaŋ-konnaN       | “difficult”  |
| ſindzitsu | “truth”      | *ſindzitsu-ſindzitsu | “true”       |
| kettee    | “decision”   | *kettee-kettee       | “decisive”   |
| hoŋkaku   | “legitimate” | *hoŋkaku-hoŋkaku     | “legitimate” |

Every base word in (83) consists of two Sino-Japanese bound morphemes and is derived through bimorphemic root conjunction.

However, a morphological operation very similar to mimetic reduplication is often found in Sino-Japanese root conjunction, which I exclude from the Japanese compounding patterns. Some examples are shown below:

(84) reduplication in Sino-Japanese root conjunction

a. CV root:

|     |        |         |                |
|-----|--------|---------|----------------|
| tſi | “late” | tſi-tſi | “tardily”      |
| ta  | “many” | ta-ta   | “many          |
| ko  | “each” | ko-ko   | “each of them” |

b. CVV root:

|                   |            |                                     |                     |
|-------------------|------------|-------------------------------------|---------------------|
| k <sup>j</sup> oo | “horrible” | k <sup>j</sup> oo-k <sup>j</sup> oo | “fearfully”         |
| roo               | “resonant” | roo-roo                             | “resonantly”        |
| zuu               | “pile”     | dzuu-zuu                            | “(understand) well” |
| juu               | “gentle”   | juu-juu                             | “easily”            |

c. CVN root:

|     |          |          |                 |
|-----|----------|----------|-----------------|
| eN  | “extend” | eN-eN    | “draggingly”    |
| taN | “pale”   | tan-taN  | “indifferently” |
| ſiN | “deep”   | ſiN-ſiN  | “silently”      |
| moN | “writhe” | mom-moN  | “writhingly”    |
| zuN | “order”  | zun-dzuN | “in turn”       |

d. CVCV root:

|       |            |             |             |
|-------|------------|-------------|-------------|
| ſuku  | “moderate” | ſuku-ſuku   | “solemnly”  |
| moku  | “silence”  | moku-moku   | “silently”  |
| ſetsu | “earnest”  | ſetsu-ſetsu | “earnestly” |
| futsu | “bubble”   | futsu-futsu | “bubbling”  |

Through this reduplication pattern, these reduplicated forms obtain adjectival or adverbial meanings in the same manner as mimetic reduplication in Yamato and Loanwords.

#### 2.4.5.2 Rendaku

One of the prominent morphophonological differences between intensive/plural and mimetic reduplication is found in the application of rendaku. Whereas this morphophonological operation may occur in the former, as argued in 2.4.3.3, it does not take place in the latter.<sup>53</sup> Consider the following examples:

- (85) a. *jiwa* “wrinkle”
- |         |                                       |                |
|---------|---------------------------------------|----------------|
| NC:     | <i>kao-ziwa</i> , * <i>kao-jiwa</i>   | “face wrinkle” |
| IP-RED: | <i>jiwa-ziwa</i> , * <i>jiwa-jiwa</i> | “wrinkles”     |
| M-RED:  | <i>jiwa-jiwa</i> , * <i>jiwa-ziwa</i> | “wrinkled”     |
- b. *koke* “moss”
- |         |                                       |              |
|---------|---------------------------------------|--------------|
| NC:     | <i>mizu-goke</i> , * <i>mizu-koke</i> | “water moss” |
| IP-RED: | <i>koke-goke</i> , * <i>koke-koke</i> | “mosses”     |
| M-RED:  | <i>koke-koke</i> , * <i>koke-goke</i> | “mossy”      |

The Yamato stems in (85) undergo rendaku in normal compounding and intensive/plural reduplication, but this is impossible in mimetic reduplication. I claim that this morphophonological variation is caused by differences in morphological structure, discussed in 2.4.2; the second component, which is the target of rendaku, is the base stem in normal compounding and intensive/plural reduplication, whereas it is the RED morpheme in mimetic reduplication. The theoretical account for this phenomenon will be presented in 4.2.3.4 within the framework of OT.

#### 2.4.5.3 Accentuation

Let us turn our attention to accentuation in mimetic reduplication. Like accentuation in intensive/plural reduplication, that in mimetic reduplication ignores the base accent, but it depends on the moraic length of compounds. However, the types of accentuation in the two reduplication patterns are different.

As with normal compounding and intensive/plural reduplication, accentuation

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<sup>53</sup> There are a few exceptions to this generalization, such as *kona-gona* “powdery.”



in this compounding pattern is sensitive to the moraic length of the base stem. When the base word is bimoraic, a reduplicated word exhibits the flat pattern independent of the original accent location of the base words. The following serve as examples:

(86) bimoraic base:

|           |                |            |              |
|-----------|----------------|------------|--------------|
| ami'      | “net”          | ami-ami    | “net like”   |
| ra'bu     | “love”         | rabu-rabu  | “love-dovey” |
| ʃiwa      | “wrinkle”      | ʃiwa-ʃi wa | “wrinkled”   |
| kire'(ru) | “move quickly” | kire-kire  | “agile”      |
| jowa'(i)  | “weak”         | jowa-jowa  | “weak”       |

As I argued in 2.2.5, there is a tendency in Japanese for quadrimoraic words to lack accents. It seems reasonable to consider that this tendency is also effective in mimetic reduplication.

When the base word is trimoraic, the accent falls on the initial mora of the second component in this type of reduplication. The following serve as examples:

(87) trimoraic base:

|             |                   |                |               |
|-------------|-------------------|----------------|---------------|
| ri'aru      | “realistic”       | riaru-ri'aru   | “realistic”   |
| do'rama     | “drama”           | dorama-do'rama | “drama-like”  |
| koʒire'(ru) | “get complicated” | koʒire-ko'ʒire | “complicated” |
| kasure'(ru) | “crack”           | kasure-ka'sure | “cracked”     |

It should be noted that these cases follow the default rule of Japanese compound accentuation (18), which we saw in 2.2.5. It appears that the base accent is probably ignored in this pattern, while some words retain their base accent in the reduplicated form as a result.

The base-accent effect in mimetic reduplication is found in longer words. When the base word is quadrimoraic, the base accent is retained in the reduplicated word, as illustrated below:

(88) quadrimoraic base:

|           |           |                    |               |
|-----------|-----------|--------------------|---------------|
| tora'buru | “trouble” | toraburu-tora'buru | “troublesome” |
| he'ruʃii  | “healthy” | heruʃii-he'ruʃii   | “healthy”     |
| ra'burii  | “lovely”  | raburii-ra'burii   | “lovely”      |

This base-accent effect is similar to that in normal compounds with a quadrimoraic base, which I illustrated in 2.2.5. The difference between the two patterns is that whereas the base-accent effect on a quadrimoraic base is optional in normal compounding, it is obligatory in mimetic reduplication.

## 2.5 Complex Compounding

### 2.5.1 Introduction

In the Japanese compounding system, a compound may have a morphologically complex structure whose constituent is also a compound. In other words, a compound may be embedded as a component within another compound. Interestingly, some structures that are blocked by the ER classification are found within complex compounds, and some morphophonological operations that occur in simple compounding do not occur in complex compounds depending on the morphological context, as we will see in this section. The theoretical account for these data will be given in Chapters 3 and 4.

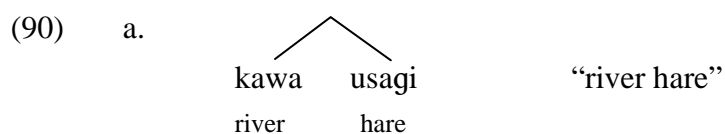
In this section, I will consider normal compounding as an operation applied to morphologically complex structures, and I wish to keep the other three compounding patterns—dvandva compounding, intensive/plural reduplication, and mimetic reduplication—beyond the scope of the discussion; this is because whereas normal compounding has strong productivity even with morphologically complex components, the other patterns cannot have such complex components. The following examples show this contrast:

- (89)
- |            |                                                           |                                                                   |
|------------|-----------------------------------------------------------|-------------------------------------------------------------------|
| a. NC:     | kawa-usagi-mukafi-banafi<br>river hare ancient story      | “old story of a river hare”<br>cf. usagi-banafi “story of a hare” |
| b. DVD:    | *oja-inu-ko-neko<br>parent dog child cat                  | “parent dogs and young cats”<br>cf. inu-neko “dog and cat”        |
| c. IP-RDP: | *tabi-bito-tabi-bito<br>travel person travel person       | “many travelers”<br>cf. ŋito-bito “people”                        |
| d. M-RDP:  | *tate-ŋiwa-tate-ŋiwa<br>vertical wrinkle vertical wrinkle | “wrinkled with vertical lines”<br>cf. ŋiwa-ŋiwa “wrinkled”        |

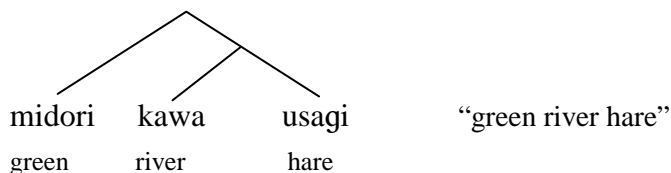
In (89a), the two compounds, *kawa-usagi* and *mukafi-banafi*, are combined and form a single prosodic word by normal compounding. This type of complex compound can be easily produced by native speakers of Japanese and is often found in their actual speech. However, as illustrated in (89b-d), the other three compounding patterns cannot contain a compound as one of their components. (89b) shows the ungrammaticality of dvandva compounding in which the components are compounds; the two compounds, *oja-inu* “parent dog” and *ko-neko* “young cat,” cannot be conjoined by this compounding pattern. (89c) shows that intensive/plural reduplication is also unable to contain compounds as its components; the compound *tabi-bito* “traveler” is not a possible target of intensive/plural reduplication. The same is true for mimetic reduplication. The compound *tate-ziwa* “vertical wrinkle” cannot be embedded in mimetic reduplication, as in (86d). As I will illustrate below, it should be noted that except for intensive/plural reduplication, the products of these compounding patterns can be components of normal compounds.

### 2.5.2 Normal Compounding

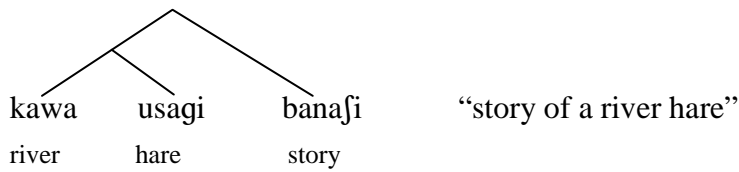
As we saw in section 2.1, normal compounding is the most frequent compounding pattern in Japanese, and this holds true in morphologically complex contexts; a normal compound often contains another normal compound as its constituent. The following serve as examples:



b. right-branching compound

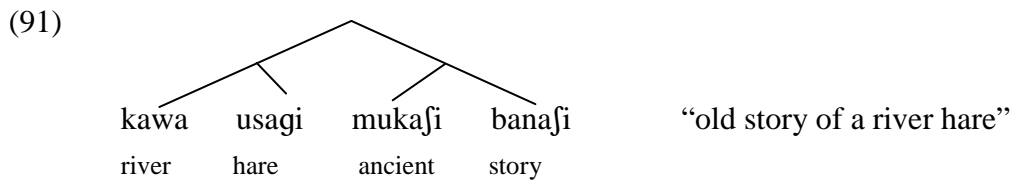


c. left-branching compound

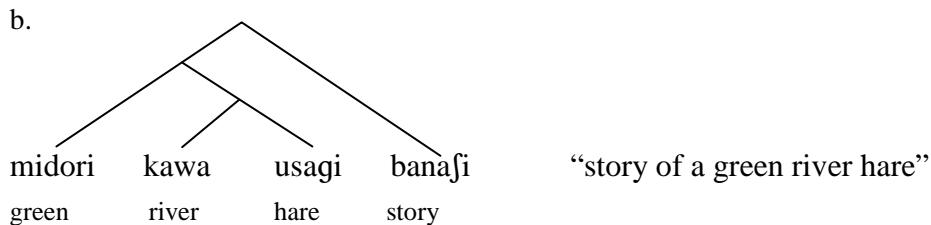
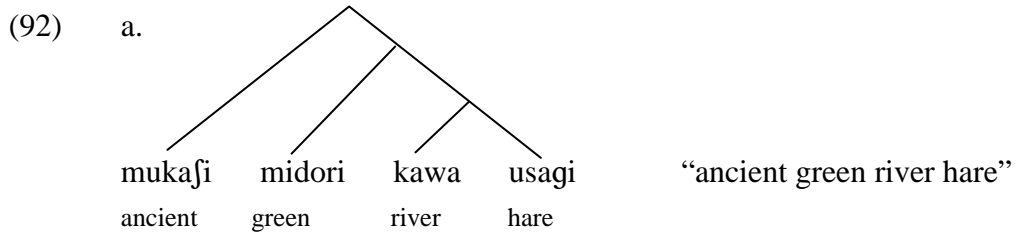


(90a) is a simplex normal compound *kawa-usagi* “river hare.” This compound can be both the head component of a compound, as in (90b), and the non-head component, as in (90c). The morphological structure of (90b) is called right-branching structure and that of (90c) left-branching structure.

A more complex structure is also possible in normal compounding. The following example (91) shows that both constituents in normal compounding can be normal compounds:



Complex compounds can be a component of a more complex compound, as shown below:



The structure of normal compounding can be more complex, as shown below, where curly brackets indicate morphological constituents:

- (93) a. {muka<sup>fi</sup> - {midori- {kawa- usagi} } }-bana<sup>fi</sup>  
 ancient green river hare story  
 “story of an ancient green river hare”
- b. { {muka<sup>fi</sup> - {midori- {kawa-usagi} } }-bana<sup>fi</sup> }-ken<sup>k</sup>uu  
 ancient green river hare story study  
 “study of stories of an ancient green river hare”
- c. gendai- { { {muka<sup>fi</sup> - {midori- {kawa-usagi} } }-bana<sup>fi</sup> }-ken<sup>k</sup>uu }  
 modern ancient green river hare story study  
 “modern study of stories of an ancient green river hare”

A native speaker of Japanese can produce and understand normal compounds with a more complex structure than (93a-c). I conclude that there is no morphological restriction on complexity in normal compounding.

### 2.5.3 Dvandva Compounding

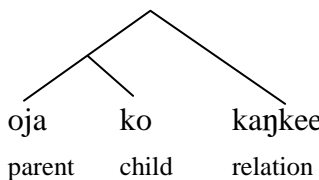
In addition to normal compounding, dvandva compounding is also possible inside a normal compound. A dvandva compound can be the head component of a normal compound. The following serve as examples:

- (94) a.
- “parent and child”
- b.
- “parent hare and young hare”

- c.      kindzoku-te-afi            “metal arm and leg”  
           metal    arm leg
- dzetsumetsu-kusa-ki        “extinct herb and tree”  
           extinction    herb tree
- k<sup>j</sup>odai-inu-neko            “giant dog and cat”  
           giant    dog    cat

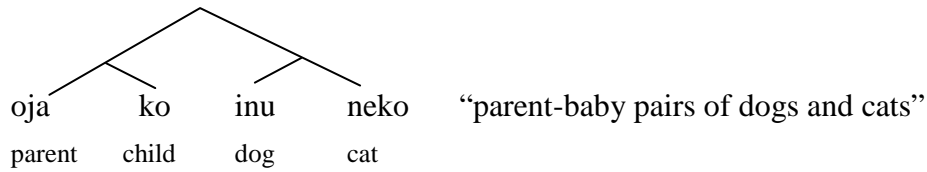
(94a) is a simplex dvandva compound, and it can be the head component of a normal compound, as in (94b). This complex compound forms right-branching structure. Complex compounds in (94c) have the same right-branching structure as (94b).

A dvandva compound can also occupy the non-head component of a normal compound. Consider the following examples:

- (95) a.       “relation between a parent and a child”  
           oja      ko      kankee  
           parent    child    relation
- b.      inu-neko-zaffi            “magazine about dogs and cats”  
           dog    cat    magazine
- çizi-çiza-kuriimu        “cream for elbows and knees”  
           elbow knee cream
- natsu-fuju-kaisai            “opening in summer and winter”  
           summer winter opening

The complex compound in (95a) forms left-branching structure, and it subcategorizes the dvandva compound *oja-ko* as its non-head component. Examples in (95b) share the same structure as (95a). It is also possible for both components in normal compounding to be dvandva compounds. Consider the following example:

(96)



In (96), two dvandva compounds, *oja-ko* “parent and child” and *inu-neko* “dog and cat” are combined through normal compounding.

An interesting point I wish to note here is that dvandva constructions, which are ungrammatical as simplex compounds, can be found as the non-head components of normal compounds. As illustrated in 2.3.3, this compounding pattern is quite sensitive to the ER classification. I give some examples below:

(97) a. Yamato dvandva compound:

çiži-çiza “elbow and knee”  
elbow knee

miği-çidari “right and left”  
right left

tsukai-suteru “use and throw away”  
use throw away

jomi-kaki “reading and writing, literacy”  
reading writing

ama-karai “sweet and hot”  
sweet hot

b. Sino-Japanese dvandva compound (ungrammatical):

\**ŷakai-koʒiN* “society and individual”  
society individual

\**kaki-tooki* “summer and winter”  
summer winter

\**kiso-oojoo* “basic and applied”  
basic application

\**kookoo-daigaku* “high school and university”  
high school university

\**ŷihon-ŷokoku* “Japan and other countries”  
Japan countries

c. Loanword dvandva compounds (ungrammatical):

\**raʒio-tereʒi* “radio and TV”  
radio TV

\**raisu-paN* “rice and bread”  
rice bread

\**raketto-booru* “racket and ball”  
racket ball

\**kompj<sup>i</sup>uutaa-kamera* “computer and camera”  
computer camera



d. hybrid dvandva compounds (ungrammatical):

\*kuruma-deNʃa “car and train” (Y-SJ)  
 car train

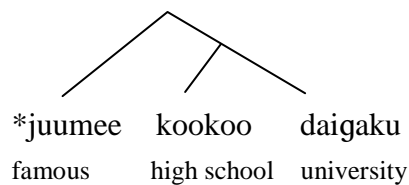
\*tʃuugoku-amerika “China and the U.S.” (SJ-L)  
 China the U.S.

\*sake-zuusu “alcohol and juice” (Y-L)  
 alcohol juice

Dvandva compounding is possible in Yamato, as in (97a), but it is ungrammatical for Sino-Japanese and Loanwords, as in (97b) and (97c), respectively. Because dvandva compounding requires similarity between the two components, hybrid dvandva compounds, whose components do not share the same ER class, are also ungrammatical, as in (97d).

This restriction holds true for the head component of compounds that form right-branching structure. As argued in (94) above, a Yamato dvandva compound, which can be an independent dvandva compound, can also be the head component of normal compounds. Conversely, neither a Sino-Japanese dvandva compound, Loanword dvandva compound, nor hybrid compound, all of which are ungrammatical as simple compounds, can occupy this position. Consider the following examples:

(98) a. \*juume-e-kookoo-daigaku “famous high school and university”



b. \*risoo-fakai-koziN “ideal society and individual”  
 ideal society individual

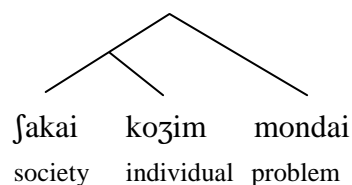
\*kindai-jihON-fokoku “modern Japan and other countries”  
 modern Japan countries

- c. \**ŋingata-razio-tere*bi “new type radio and TV”  
 new type radio TV
- \**tenisu-raketto-booru* “racket and ball for tennis”  
 tennis racket ball
- d. \**kook<sup>j</sup>uu-sake-zuusu* “high grade alcohol and juice”  
 high grade alcohol juice
- \**k<sup>j</sup>uuŋiki-kuruma-deŋŋa* “old type car and train”  
 old type car train

The ungrammaticality of simplex compounding is taken over in complex compounding when it appears in the head component position. In other words, the head position requires a component to be grammatical as a simplex compound.

However, the restriction on the ER classification in dvandva compounding is ignored when it occurs in the non-head component of normal compounding. Consider the following examples:

- (99) a. *ŋakai-kozim-mondai* “problem between a society and an individual”



- b. *kaki-tooki-kaisai* “opening in summer and winter”  
 summer winter opening

*kiso-oojoo-keŋk<sup>j</sup>uu* “basic and applied studies”  
 basic application study

*ŋihoN-ŋokoku-doomee* “alliance between Japan and other countries”  
 Japan countries alliance

In (99a), a normal compound subcategorizes a Sino-Japanese dvandva as its non-head component. Compounds in (99b) share the same morphological structure with (99a).

Loanword dvandva compounds and hybrid dvandva compounds can also be the non-head components of normal compounds. Consider the following examples:

- (100) a. razio-terebi-koo3oo “factory of radios and TVs”
- ```

graph TD
    A[razio-terebi-koo3oo] --- B[razio]
    A --- C[terebi]
    A --- D[koo3oo]
    B --- B1[radio]
    C --- C1[TV]
    D --- D1[factory]

```
- b. raisu-paN-setto “set of rice and bread”
rice bread set
- raketto-booru-meekaa “manufacturer of rackets and balls”
racket ball manufacture
- kompjuutaa-kamera-foppu “shop of computers and cameras”
computer camera shop
- c. sake-zuusu-hambai “selling alcohol and juice”
alcohol juice selling
- kuruma-deNja-tsuukiN “commuting by car and train”
car train commuting
- tjuugoku-amerika-kankee “relation between the U.S. and China”
China the U.S. relation

In (100a) and (100b), the non-head component of a compound forms a Loanword dvandva compound, which is ungrammatical as a simplex compound, as shown in (97c). Examples in (100c) are complex compounds whose non-head component forms a hybrid dvandva compound. These compounds share a left-branching morphological structure with (100a).⁵⁴

⁵⁴ As Shibatani (1990:245) reported, this type of morphological structure is also allowed in English, e.g., *mother-child interaction*, *employer-employee relationship*, although English basically prohibits simple dvandva structure.

2.5.4 Reduplication

Interestingly, the two patterns of Japanese reduplication behave quite differently from each other in morphologically complex contexts; though intensive/plural reduplication never occurs in such contexts, products of mimetic reduplication can be a component of normal compounding.

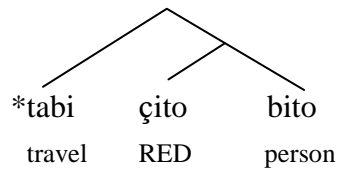
Let us examine intensive/plural reduplication first. This compounding pattern cannot be a component of compounding. Consider the following examples:

- (101) a.
- | | | | | |
|-----|------|--------|--------|---------------------|
| * | çito | bito | sagaçi | “search for people” |
| RED | | person | search | |
- cf. çito-bito “people”
çito-sagaçi “search for a person”
- b. *mura-mura-hoomoN “visiting many villages”
RED village visiting
- *kuçi-guçi-mondai “problem involving many countries”
RED country problem
- *kuro-guro-bata “deep-black flag”
RED black flag

A compound in (101a) subcategorizes the reduplicated word *çito-bito* “people.” Though the embedded reduplicated compound occurs as a simple compound, the complex compound is ungrammatical. Complex compounds in (101b), which share the same structure as (101a), are ungrammatical even though the embedded dvandva compounds are found as simple compounds.

It is also impossible for intensive/plural reduplication to appear in the head component of a compound. The following serve as examples:

(102) a.



“traveling people”

cf. çito-bito “people”

tabi-bito “traveler”

b. *inaka-mura-mura
countryside RED village

“countryside villages”

*jama-kuni-guni
mountain RED country

“mountainous countries”

*mukaſi-kami-gami
ancient RED god

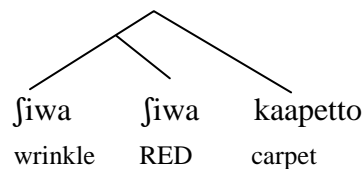
“ancient gods”

As illustrated in (102a), a complex compound whose head component is a reduplicated compound, *çito-bito*, which can be an independent simplex compound, is not grammatical. (102b) provides further examples.

The ungrammaticality of intensive/plural reduplication in morphologically complex contexts shows that this morphological operation is different from normal compounding in which the two components are accidentally identical, but rather constitutes one of the independent compounding patterns. As argued above, there is no restriction on normal compounding occurring inside complex compounds.

Let us move now to mimetic reduplication in a morphologically complex context. Unlike intensive/plural reduplication, there is no restriction on this type of reduplication in a morphologically complex context. The following examples show that this type of compound can be the non-head component of a normal compound:

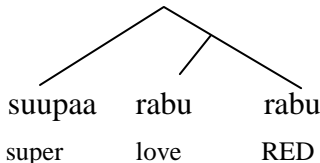
(103) a.



“wrinkled carpet”

- b. kire-kire-doriburu “agile dribbling (soccer)”
 cut RED dribble
- ama-ama-tesuto “easy examination”
 easy RED examination
- rabu-rabu-kaᅇkee “lovey-dovey relationship”
 love RED relation

Because a reduplicated word derived through mimetic reduplication has an adjectival meaning, adjective-noun compounds like the above examples are found often, as in (103). Also, this type of reduplicated compound can be the head component of a normal compound. A few examples are shown below:

- (104) a.  “very lovey-dovey”
 super love RED

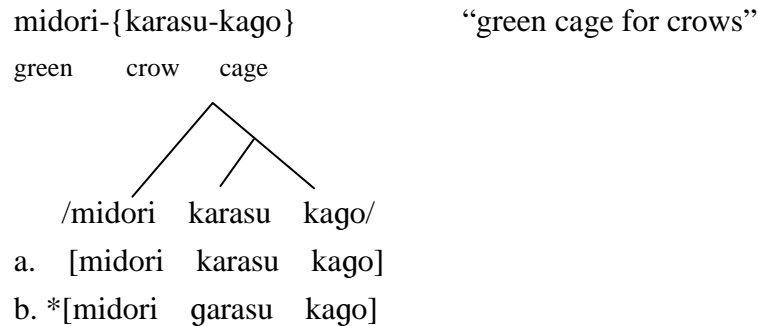
- b. geᅇkai-komi-komi “crowded to the limit”
 limit crowded RED

- kandzen-suke-suke “completely transparent”
 complete show through RED

2.5.5 Rendaku and Branching Structure

It is well known that the application of rendaku is sensitive to the morphological structure of compounds (Otsu 1980, Ito & Mester 1986, 2003). When the second component in normal compounding is morphologically complex, the application of rendaku is blocked. The following illustrates rendaku blocking in a complex compound with right-branching structure:

(105) rendaku blocking in a right-branching compound:



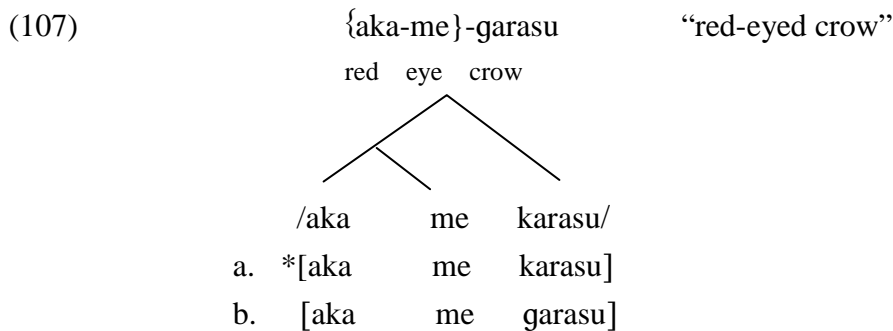
In (105), a simplex normal compound *karasu-kago* “cage for crows” is embedded in the complex compound. In this structure, rendaku does not take place in the first segment of the embedded compound, as in (105a). Although it is the head component of the compound, the application of rendaku is ungrammatical, as in (105b). Further examples that share the same structure are provided in (106):

(106) mukaji-**{kawa-inu}**, *mukaji-**{gawa-inu}** “ancient river dog”
 ancient river dog

nuri-**{haji-ire}**, *nuri-**{baji-ire}** “painted case for chopsticks”
 paint chopstick put

kaori-**{kusa-ki}**, *kaori-**{gusa-ki}** “aromatic herbs and trees”
 scent herb tree

However, having left-branching structure does not affect the application of rendaku. In a complex compound with left-branching structure, the head component undergoes rendaku if its conditions are satisfied, as illustrated in (107):

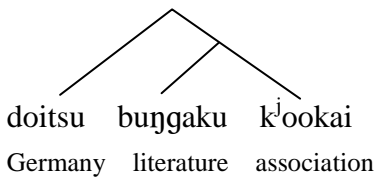


In (107), a normal compound *aka-me* “red eye” is embedded in a complex compound as its non-head component. This structure does not block the application of *rendaku*, as in (107a) and (107b). Further examples of the same situation are provided in (108):

- (108) {kawa-usagi}-banafi, *{kawa-usagi}-hanafi “story of river hares”
river hare story
- {nuri-bafi}-bako, *{nuri-bafi}-hako “painted chopstick case”
paint chopstick box
- {oja-ko}-genka, *{oja-ko}-kenka “parent-child quarrel”
parent child quarrel

2.5.6 Branching Structure and Prosodic Structure

Kubozono (1995) points out an interesting asymmetry between right-branching and left-branching structures with regard to the prosodic concatenation of compounds. He reports that some complex compounds can be prosodically divided into two and thus have two accents when they possess right-branching structure. This phenomenon often occurs when a compound consists of Sino-Japanese words or Loanwords. Consider the following example:

- (109)
- 
- doitsu bungaku k'ookai “literature association in Germany”
Germany literature association
- a. [doitsu-bungaku-k'ookai]
b. [doitsu][bungaku-k'ookai]

This right-branching complex compound can be pronounced as a single prosodic word, as in (109a), or as two prosodic words, as in (109b). This prosodic division is wholly optional and yields no semantic difference. Further examples that share the same morphological structure with (109) are shown in (110):

(110) [k^looto-motʃi-matsuri] ~ [k^looto][motʃi-matsuri]
 Kyoto rice cake festival
 “rice cake festival in Kyoto”

[kokusai-kaŋk^loo-mondai] ~ [kokusai][kaŋk^loo-mondai]
 international environment problem
 “international environmental problem”

[bosuton-reddo-sokkusu] ~ [bosuton][reddo-sokkusu]
 Boston red sox
 “Boston Red Sox”

Conversely, left-branching structure does not allow this optionality for prosodic structure, as illustrated below:

(111)

```

      / \
     /   \
    doitsu  \
            / \
           /   \
          bunḡaku klookai
  
```

doitsu bunḡaku k^lookai “German-literature association”
 Germany literature association

a. [doitsu-bunḡaku-k^lookai]
 b. *[doitsu][bunḡaku-k^lookai]

This complex compound can be pronounced as a single prosodic word, as in (111a), but not as two prosodic words, as in (111b). Kubozono argues that this asymmetry is caused by the markedness of right-branching structure. Further examples of this asymmetry are shown below:

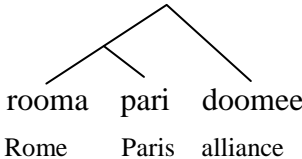
(112) [jawaraka-motʃi-matsuri], *[jawaraka][motʃi-matsuri]
 soft rice cake festival
 “festival of soft rice cake”

[jooʒi-kʰooiku-senʃkoo], *[jooʒi][kʰooiku-senʃkoo]
 infant education major
 “infant education major”

[biitʃi-sakkaa-tʃiimu], *[biitʃi][sakkaa-tʃiimu]
 beach soccer team
 “beach soccer team”

Interestingly, as Kubozono also pointed out, in some complex compounds whose non-head component is a dvandva compound, prosodic division occurs even though the compound has the same structure as (111). Consider the following example:

(113)



“Rome-Paris alliance”

rooma pari doomee
 Rome Paris alliance

a. [rooma-pari-doomee]
 b. [rooma][pari-doomee]

This complex compound can be pronounced either as a single prosodic word, as in (113a), or as two prosodic words, as in (113b). Further examples of this optionality are shown below:

(114) [k^jooiku-keŋk^juu-kaigi] ~ [k^jooiku][keŋk^juu-kaigi]

education research meeting

“meeting on education and research”

[kooçii-kootʃa-ʃoppu] ~ [kooçii][kootʃa-ʃoppu]

coffee tea shop

“coffee and tea shop”

[indo-jooroppa-gozoku] ~ [indo][jooroppa-gozoku]

Indo Europe language family

“the Indo-European language family”

These complex compounds share the same structure with (113) and exhibit optionality in forming prosodic structure. I claim that this prosodic difference between (111) and (113), which share the same branching structure, is caused by the structural difference between a normal compound and a dvandva compound, both of which are embedded in complex compounds. A theoretical account of this morphophonological variation will be given in 3.4.

2.5.7 Accentuation

Finally, let us examine accentuation in complex compounding. To this end, complex compounds should first be classified into two types depending on the structure of their head component; one type has a head component that consists of a single stem, and the other has a head component that forms an embedded compound. The former behaves similarly to simple compounding, which shows both the default pattern and the base-accent effect, as examined in 2.2.5, whereas the latter always exhibits the base-accent effect.

When the head component of a complex compound is a simple stem, the default accent pattern emerges in most cases; the accent falls following the default compound accentuation rule (18) in 2.2.5. A few examples are shown below:

- (115) kariforunja-ore'ndzi + su' → kariforunja-orendzi'-su
 California orange vinegar "California orange vinegar"
- enka-bijnii'ru + i'to → enka-bijiiru'-ito
 vinyl chloride thread "vinyl chloride thread"
- oja-koo'koo + musume' → oja-kookoo-mu'sume
 filial piety daughter "dutiful daughter"
- ziŋkoo-tʃi'noo + robo'tto → ziŋkoo-tʃinoo-ro'botto
 artificial intelligence robot "artificial intelligence robot"

In each of these cases, the accent of the head stem does not appear at the surface level and the accent location of the complex compound is determined by the default compound accent rule (18). The structure and accent location of the non-head component have no significance whatsoever.

However, it is not the case that every complex compound follows the default rule (18); as in the case of simple compounding which we examined in 2.2.5, some particular stems exhibit the base-accent effect when they occupy the head position in this type of compounding. Consider the following examples:

- (116) ɕigaʃi-a'furika + ne'ko → ɕigaʃi-afurika-ne'ko
 East Africa cat "East African cat"
- natsu-asa + a'me → natsu-asa-a'me
 summer morning rain "rain in a summer morning"
- ramu'-ɲiku + ha'mu → ramu'-ɲiku-ha'mu
 lamb meat ham "lamb ham"
- ɕizi-ɕiza + kurii'mu → ɕizi-ɕiza-kurii'mu
 elbow and knee cream "cream for elbows and knees"

In each of these examples, the original accent location of the head stem is retained in the complex compound, violating the default compound accentuation rule (18). Again, the accent location of non-head components is not significant in such complex compounds.

The accentuation of complex compounds whose head is an embedded compound is much simpler; the accent of the head component is always retained in a complex compound. In other words, they always show the base-accent effect. Interestingly, the variety of the compounding pattern is not at all significant; all of the compounding patterns behave similarly in accentuation of complex compounding. Consider the following examples:

(117) a. normal compound head

kawa' + te-bu'kuro → kawa-te-bu'kuro
 leather gloves “leather gloves”

mi'dori + kawa-u'sagi → midori-kawa-u'sagi
 green river hare “green river hare”

oja' + perufa-ne'ko → oja-perufa-ne'ko
 parent Persian cat “parent Persian cat”

b. dvandva compound head

dzetsumetsu + kusa'-ki → dzetsumetsu-kusa'-ki
 extinction herbs and trees “extinct herb and tree”

ki'ndzoku + te'-afi → kindzoku-te'-afi
 metal arms and legs “metal arms and legs”

In (117a), normal compounds occupy the head position of compounds, and in (117b), the head components are dvandva compounds. However, this structural difference does not yield any difference in accentuation; the base-accent effect emerges in all of the cases above.

As we have seen in 2.5.2, complex compounds can be the head component of a further complex compound. The accentuation in such cases is the same as we have seen so far. Consider the following examples:

- (118) pe'ruʃa + midori-kawa-u'sagi → peruʃa-midori-kawa-u'sagi
 Persia green river hare "Persian green river hare"
- kook^juu + kawa-te-bu'kuro → kook^juu-kawa-te-bu'kuro
 high-grade leather gloves "high-grade leather gloves"

The accent location of the head component, which is a complex compound, is taken over through further compounding.

When the head compound originally has the flat pattern, which lacks an accent, the compound accent falls following the default compound accentuation rule (18). A few examples are shown below:

- (119) ʃio' + tara-ko → ʃio-ta'ra-ko
 salt cod roe "salt cod roe"
- pe'ruʃa + kuro-neko → peruʃa-ku'ro-neko
 Persia black cat "Persian black cat"
- kook^juu + inu-neko → kook^juu-i'nu-neko
 high grade dog cat "high grade dog and cat"
- kandzeN + suke-suke → kandzeN-su'ke-suke
 complete transparent "completely transparent"

This default accent realization is, of course, because the embedded compound does not have an original accent, and therefore the base-accent effect is cancelled. Again, the accent location of the non-head component is insignificant.

Chapter 3

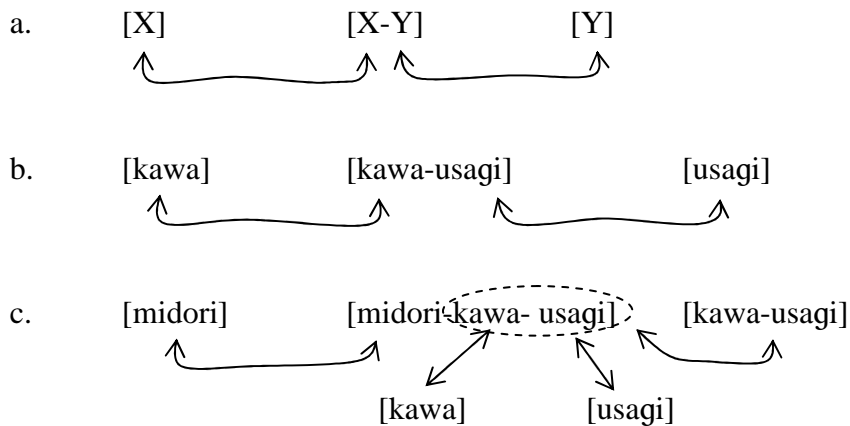
Japanese Compound Formation in OT

3.1 Introduction

This chapter investigates the mechanism governing Japanese compound formation within the framework of Optimality Theory (OT; Prince & Smolensky 1993). As noted in 1.3.1, one of the main claims of OT is that any systematic variation—both among languages and within a language—is derived from interaction among constraints that are common to all human languages, but not from any other factors in the grammar. In this and the following chapter, it will be demonstrated that morphophonological varieties among Japanese compounding patterns are also derived from the interaction among universal constraints.

In particular, I claim that the surface phonological structure of compounds is governed by the output-output (OO) correspondence among morphologically related words (Benua 1997), which is illustrated in 1.3.2. Consider the following illustration:

(1) OO correspondence:



As indicated in (1a), a component of a compound has OO correspondence relations with another independently existing word that shares the same underlying representation with the component. A concrete example appears in (1b): a simple (bimorphemic) compound *kawa-usagi* “river hare” has OO correspondence relations with the simple (monomorphemic) words *kawa* “river” and *usagi* “hare” because they share the same underlying stems. OO correspondence relations are also found in complex compounding, as shown in (1c): a trimorphemic complex compound, *midori-kawa-usagi* “green river hare,” relates not only to the three simple words *midori* “green,” *kawa*, and *usagi*, but

also with a simple compound, *kawa-usagi*. It will be demonstrated that such relations at the output level are crucial to the morphophonological variety in Japanese compounding.

3.2. Prosodic Concatenation

As examined in Chapters 1 and 2, one of the most significant morphophonological characteristics of Japanese compounding is concatenation of prosodic structure. When two free stems, each of which can independently form a prosodic structure as a simple word, are concatenated in compounding, they form a single prosodic structure and share a single accent. In this section, I will argue how the prosodic concatenation in compounding proceeds under the framework of OT.

First, the compounding mechanism needs a structural constraint that induces concatenation in the prosodic structure. Ito & Mester (2003) proposed that the following structural constraint, which favors less prosodic structures, induces prosodic concatenation in compounding:

- (2) *STRUC[ω]: A prosodic word is prohibited.

This constraint, which simply penalizes any prosodic structure at the output level, should be considered one of the family constraints of *STRUC, which proscribes realizing any structure at the output level (Prince & Smolensky 1993); this constraint specializes its target in prosodic structure. How *STRUC[ω] is violated by prosodic structure at the output level is shown in quasi-tableau (3), where a prosodic word is indicated by square brackets ([...]) and components of a compound by X, Y, and Z:

- (3)

Input: {/X/, /Y/, /Z/}	*STRUC[ω]
a. XYZ	
b. [XYZ]	*
c. [X][YZ]	**
d. [X][Y][Z]	***

Candidate (3a) is an output without any prosodic structure. If this candidate is selected as the optimal output, the input does not possess any phonological realization at the output level. Since this candidate likewise lacks a prosodic word, it fully satisfies

***STRUC[ω]**. On the other hand, candidate (3b) consists of a single prosodic word, and it violates ***STRUC[ω]** once. Gen, which can create an infinite set of output candidates, also provides a candidate that consists of more than one prosodic word, as (3c) and (3d); however, such candidates incur violations according to the number of prosodic words they form. Since ***STRUC[ω]** favors fewer prosodic words, the prosodically null candidate (3a) succeeds when this markedness constraint outranks any other rival constraint.

Of course, ***STRUC[ω]** must be outranked by some other constraints in the constraint hierarchy of Japanese (and all other natural languages); otherwise, no prosodic word would appear at the surface level of this language. Therefore, we need another constraint that guarantees the realization of input morphemes in prosodic structure. **LEX≈PRWD**, which was proposed by Prince & Smolensky (1993), is such a constraint:

(4) **LEX≈PRWD**: Every lexical word corresponds to a prosodic word.

This constraint requires that a lexical word (a lexical morpheme) form prosodic structure at the output level. When this constraint dominates ***STRUC[ω]**, output without prosodic structure is eliminated from the surface level, as illustrated in tableau (5):

(5)

Input: {/X/, /Y/}	LEX≈PRWD	*STRUC[ω]
a. XY	*!	
→b. [XY]		*
c. [X][Y]		**!

Candidate (5a) lacks any prosodic structure and therefore exhibits neither a pitch pattern nor accent. In Japanese (and any other language), such structure is never allowed at the output level. This fact is accounted for by the fatal violation of **LEX≈PRWD**. The winning candidate is (5b), which satisfies **LEX≈PRWD** and forms a minimal prosodic structure. Although this structure contravenes ***STRUC[ω]**, this violation is subsequently tolerated to satisfy **LEX≈PRWD**. Candidate (5c), which consists of two prosodic words, also satisfies this constraint because both words independently correspond to a prosodic word. However, this candidate incurs excessive violations of ***STRUC[ω]** and is therefore defeated by (5b).

A compound sometimes divides into two prosodic words for various reasons.

This phenomenon can be explained if some other constraint preventing prosodic concatenation dominates *STRUC[ω], as shown in tableau (6), where a dummy constraint, C_1 , intervenes in the prosodic concatenation:

(6)

Input: {/X/, /Y/}	LEX \approx PRWD	C_1	*STRUC[ω]
a. XY	*!		
b. [XY]		*!	*
→c. [X][Y]			**

One possible constraint for C_1 in (6) is a markedness constraint that to some extent restricts the length of a prosodic word. A long word consisting of three or more stems tends to divide its prosodic structure into two, as argued in 2.4.7 (Kubozono 1995). For example, a complex compound *doitsu-daNsU-tjiimu* “dance team from Germany” can be pronounced either as a single prosodic word [doitsu-daNsU-tjiimu] or as two prosodic words [doitsu][daNsU-tjiimu]. This optional pronunciation can be explained when a constraint prohibiting a long prosodic word dominates *STRUC[ω], as demonstrated in the following tableau:

(7) CC: *doitsu-daNsU-tjiimu* “dance team from Germany”

Input: {/doitsu/, /daNsU/, /tjiimu/}	LEX \approx PRWD	PW<7 μ	*STRUC[ω]
a. doitsu-daNsU-tjiimu	*!		
b. [doitsu-daNsU-tjiimu]		*!	*
→c. [doitsu][daNsU-tjiimu]			**
d. [doitsu][daNsU][tjiimu]			***!

PW<7 μ is a constraint that requires a prosodic word shorter than seven morae. Candidate (7b) fatally violates this constraint, and it induces division of a prosodic word, as the winning candidate (7c) exhibits. Another strong candidate in this selection is *[doitsu-daNsU][tjiimu], which also satisfies **PW<7 μ** , dividing the prosodic structure in two. This candidate is excluded by the OO correspondence constraint, which requires identity among prosodic structures of morphologically related words. We will examine this line of argument in 3.4.

3.3 Headedness and Input Structure

As argued in Chapter 2, morphological headedness plays a significant role in the formation of phonological structure in compounding. As Kageyama (1986) argued, Japanese morphology generally obeys the right-hand head rule (Williams 1981). Within the framework of OT, such a rule can be interpreted as an effect of an alignment constraint (McCarthy & Prince 1993). I propose that an alignment constraint, **HEAD-RIGHT**, which was originally proposed in syntactic analysis (Grimshaw 1995; McCarthy 2002), should be introduced to morphology to motivate right-headedness in word formation.⁵⁵

(8) **HEAD-RIGHT:**

The right edge of a morphological head coincides with the right edge of the prosodic word.

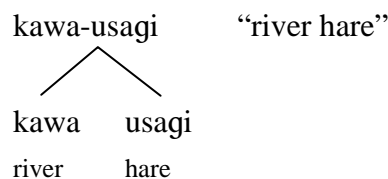
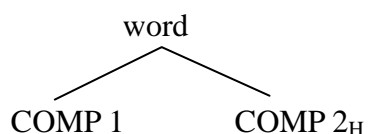
This alignment constraint requires that the head component of a compound be realized in the right-most position of a prosodic word. With this constraint, the input of any compounding pattern does not need to contain a morphological linear structure (i.e., order of morphemes); rather, such structures are derived from the effect of the alignment constraint and headedness specification in the input representation.

3.3.1 Simple Compounding

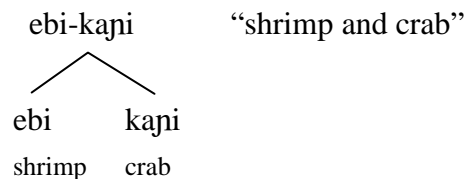
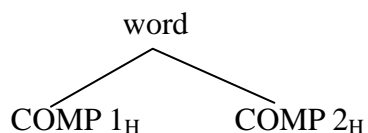
This section demonstrates how constraint ranking with the alignment constraint **HEAD-RIGHT** works in deriving the correct output structure of the compounding patterns of Japanese. First, I will compare the input and output structure of normal compounding with those of dvandva compounding. As argued in 2.2.2 and 2.3.2, a normal compound consists of a head component and non-head component, whereas a dvandva compound consists of two head components. This difference and concrete examples are presented below, where the head component is indicated by “**H**”:

⁵⁵ Grimshaw proposed a similar **HEAD-LEFT** constraint, which favors the left-headed over the right-headed structure. The interaction between these two alignment constraints explains the effect of the head parameter. In right-headed (head-final) languages, including Japanese, this constraint is dominated by **HEAD-RIGHT**.

(9) NC:



(10) DVD:



These branching structures are conventionally common in analyses of compounding. However, it will be shown that the branching structure of a compound is not essential at any level of morphophonological analysis of Japanese compounding within the OT framework.

Let us first examine normal compounding. The following serves as an example of input-to-output mapping in this compounding pattern, which forms the right-headed structure:

(11) {/usagi/_H, /kawa/} → [kawa-usagi] “river hare”

The input of a normal compound is a set, which consists of the head component—indicated by “H”—and the non-head component, and there is no linear order between them. Conversely, the output form needs the linear order to form a phonological structure. Constraint ranking with **HEAD-RIGHT** is able to derive the correct output form without morpheme order at the input level. This constraint is dominated by the two constraints that we examined above, as indicated below:

(12) **LEX≈PRWD** >> ***STRUC**[ω] >> **HEAD-RIGHT**

The following tableau (13) shows how this constraint ranking selects the correct right-hand head structure in normal compounding:

(13) NC: *kawa-usagi* “river hare”

Input: {/usagi/ _H , /kawa/}	LEX≈PRWD	*STRUC[ω]	HEAD-RIGHT
a. <i>kawa-usagi</i>	*!		
b. [<i>usagi-kawa</i>]		*	*!
→c. [<i>kawa-usagi</i>]		*	
d. [<i>usagi</i>] [<i>kawa</i>]		**!	
e. [<i>kawa</i>] [<i>usagi</i>]		**!	

Candidate (13a), which lacks prosodic structure, is eliminated by **LEX≈PRWD** in the same manner as argued above.⁵⁶ Both the left-headed (13b) and right-headed candidates (13c) satisfy this structural constraint in forming prosodic structure. The latter is selected as the winner by the alignment constraint **HEAD-RIGHT**, which requires that the head component realize the right-most position of a prosodic word. Candidates (13d) and (13e), in which each of the two components independently forms a prosodic word, also satisfy **HEAD-RIGHT**, but they fatally violate ***STRUC[ω]**.⁵⁷

Let us turn our attention to the structure of dvandva compounds. As illustrated above, the difference between the input of a normal compound and that of a dvandva compound is the number of head components: the input of a dvandva compound consists of two head components, whereas a normal compound contains one head component. The following serves as an example of the input-output mapping in dvandva compounding.

(14) {/ebi/_H, /kaji/_H} → [*ebi-kaji*], [*kaji-ebi*] “shrimp and crab”

Since the morpheme order in dvandva compounding is basically reversible, as observed in 2.3.4, two different outputs are derived from a single input set.⁵⁸ The following tableau shows how the pair of double-head structures is derived under constraint ranking (12):

⁵⁶ As argued above, candidates without prosodic structure never appear at the surface level. In the rest of this section, I omit such candidates from the tableaux.

⁵⁷ These candidates also fatally violate **REALIZE-MORPHEME**, as we will examine in 3.4.

⁵⁸ I ignore the tendencies of morpheme order in dvandva compounds caused by the subsidiary elements and lexical blocking, which I illustrated in 2.3.4, to simplify the argument.

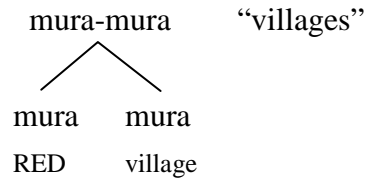
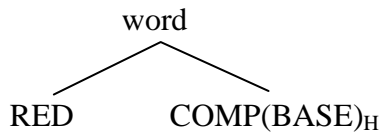
(15) DVD: *ebi-kajni, kajni-ebi* ‘shrimp and crab’

Input: {/ebi/ _H , /kajni/ _H }	*STRUC[ω]	HEAD-RIGHT
→a. [ebi-kajni]	*	*
→b. [kajni-ebi]	*	*
c. [ebi] [kajni]	**!	
d. [kajni] [ebi]	**!	

Since both input components are morphological heads, it is impossible to satisfy **HEAD-RIGHT** if the output forms a single prosodic word, as in candidates (15a) and (15b). However, forming a prosodic word for both head components fatally violates *STRUC[ω], as in (15c) and (15d). As a result, realization of two head components within a single prosodic word is tolerated despite violation of the alignment constraint. This constraint hierarchy cannot distinguish the linear order between two head components in dvandva compounding. As argued in 2.3.4, it is not necessary for the morpheme order in dvandva compounding to be grammatically determined—at least not in terms of morphophonological grammar.

Let us turn to the structure of reduplicative compounds. It is not easy to judge which of the two morphemes in a reduplicated word is the morphological head component, because reduplication in Japanese is total reduplication, whereby the whole segmental structure of the base stem is copied to the reduplicant (RED) morpheme. Since there appears to be no evidence in the phonological structure, I will depend on morphosemantic evidence, as argued in 2.4.2: whereas intensive/plural reduplication adds only slight semantic information to the base stem, mimetic reduplication may cause a substantial change in meaning and syntactic category. The morphological structures that explain this difference are shown below, with examples:

(16) intensive/plural reduplication:



(17) mimetic reduplication:



Note that both types of reduplication satisfy the right-hand head rule (Williams 1982; Kageyama 1982), which is one of the fundamental principles of Japanese morphology. In intensive/plural reduplication, the morphological head component is the base stem, which is also the phonological head of this pattern; the surface segmental structure of the RED morpheme is supplied by this morpheme. Conversely, there is a discrepancy between phonology and morphology in mimetic reduplication: the morphological head in this pattern is not the base but the RED morpheme, which lacks phonological structure. The surface phonetic representation of this morpheme is supplied by the base, which morphologically forms the non-head component.

As in normal compounding and dvandva compounding, linear order between two components in these reduplication patterns is not essential in OT analysis. Examples of input-output mappings are shown below:

- (18) a. IP-RDP: {/mura/_H, RED} → [mura-mura_H] “villages”
 b. M-RDP: {RED_H, /jiwa/} → [jiwa-jiwa_H] “wrinkled”

The right-headed structure of these reduplication patterns is derived from interaction of the constraints in (12).

The following tableau shows the output selection in intensive/plural reduplication:

(19) IP-RDP: *mura-mura* “villages”

Input: {/mura/ _H , RED}	*STRUC[ω]	HEAD-RIGHT
a. [mura _H -mura]	*	*!
→b. [mura-mura _H]	*	
c. [mura _H] [mura]	**!	
d. [mura] [mura _H]	**!	

Candidates (19a) and (19b), which differ in their morpheme order, are phonologically identical. **HEAD-RIGHT** favors (19b), which forms the right-headed structure, over (19a),

which forms the left-headed structure; (19c) and (19d), in each of which the two morphemes independently form a prosodic word, are excluded by excessive violation of *STRUC[ω].

The structure in mimetic reduplication is also determined by constraint ranking (12). The selection of surface structure derived through mimetic reduplication is illustrated in tableau (20):

(20) M-RDP: /iwa-iwa/ “wrinkled”

Input: {RED _H , /iwa/}	*STRUC[ω]	HEAD-RIGHT
a. [iwa _H -iwa]	*	*!
→b. [iwa-iwa _H]	*	
c. [iwa _H][iwa]	**!	
c. [iwa][iwa _H]	**!	

Again, the phonological structure of candidates (20a) and (20b) is identical, and the alignment constraint for the morphological head chooses (20b) as the actual structure. The output segmental representation of the RED morpheme is filled by the effect of a base-reduplicant (BR) correspondence constraint, which requires phonological identity between the base and reduplicant (McCarthy & Prince 1995). This point will be more closely examined in Chapter 4.

3.3.2 Relativization of the Head Alignment Constraint

As we have seen above, the alignment constraint for head components **HEAD-RIGHT** plays a key role in the morpheme order selection at the output level. This constraint also governs the formation of dvandva compounds, which heavily depends on the ER classification. To give an account of this morphological variation, I assert that **HEAD-RIGHT** should be relativized along with the ER classification and ranked differently in the constraint ranking of Japanese.

As reviewed in 2.3.3, while dvandva compounding is possible when the two components are Yamato stems, Loanword and Sino-Japanese items cannot participate in this compounding pattern. I contend that this morphological variation should be understood as a difference in the phonological realization of head components. Since dvandva compounding involves two head components, it is impossible for them to simultaneously occupy the right-most position, which is the appropriate head position in Japanese compounding. Therefore, one of the two head components of a dvandva compound is forced to occupy another position. While this situation is tolerable for

Yamato head words, this is not the case with Loanwords and Sino-Japanese head words.

Within the OT framework, this difference is captured by relativization of a constraint, which I illustrated in 1.4.3; I claim that **HEAD-RIGHT** should be relativized to each of the three classes, and ranked differently as shown in (21):

- (21) **LEX≈PRWD** >> **HEAD-RIGHT-L, HEAD-RIGHT-SJ**
 >> ***STRUC[ω]** >> **HEAD-RIGHT-Y**

While **HEAD-RIGHT** for Yamato words retains the same ranking as the previous version, that for Sino-Japanese and Loanwords dominates ***STRUC[ω]**, which motivates prosodic concatenation in compounding. As I will claim in 3.3.3, a constraint for the Loanword class also behaves as a default constraint; if an input does not have ER class specification, the highest-ranked constraint among relativized constraints is automatically applied.

As noted above, Yamato morphemes can form a dvandva compound. This new constraint ranking (21) can still provide a correct account for this fact, as demonstrated in the following tableau:

- (22) DVD: *ebi-kajni, kajni-ebi* “shrimp and crab”

Input: {/ebi/ _H , /kajni/ _H }	HEAD-RIGHT -SJ/L	*STRUC[ω]	HEAD-RIGHT -Y
→a. [ebi-kajni]	NA	*	*
→b. [kajni-ebi]	NA	*	*
c. [ebi][kajni]	NA	**!	
d. [kajni][ebi]	NA	**!	

This output selection for Yamato dvandva compounding is practically identical to that in (15). The violation of **HEAD-RIGHT** for the Yamato class is tolerated in forming a single prosodic word from the two head components. Since both input stems are Yamato items, the **HEAD-RIGHT** constraints for the Sino-Japanese and Loanword classes are inactive in this case.

The two alignment constraints ranked higher in (21) are significant when the input components are Sino-Japanese words or Loanword stems. The following tableau shows the ungrammaticality of Sino-Japanese dvandva compounding:

(23) DVD: **kookoo-daigak*, **daigaku-kookoo* “high school and university”

Input: {/kookoo/ _H , /daigaku/ _H }	HEAD-RIGHT -SJ	*STRUC[ω]	HEAD-RIGHT -Y
a. [kookoo-daigaku]	*!	*	NA
b. [daigaku-kookoo]	*!	*	NA
→c. [kookoo][daigaku]		**	NA
→d. [daigaku][kookoo]		**	NA

Both candidates (23a) and (23b), which form dvandva compounds, violate **HEAD-RIGHT-SJ** because one of the two head components is not in the right-most position of the output form. These candidates are defeated by (23c) and (23d), which satisfy the head alignment constraint forming a prosodic word for each of the two head components. This result demonstrates that a Sino-Japanese dvandva compound is never realized at the output level.

In Loanword dvandva compounding, the same result is obtained, as demonstrated below:

(24) DVD: **pan-raisu*, **raisu-pan* “bread and rice”

Input: {/paN/ _H , /raisu/ _H }	HEAD-RIGHT -L	*STRUC[ω]	HEAD-RIGHT -Y
a. [pan-raisu]	*!	*	NA
b. [raisu-pan]	*!	*	NA
→c. [pan][raisu]		**	NA
→d. [raisu][pan]		**	NA

The input consists of two Loanword stems, each of which has the head specification. Again, dvandva compounds (24a) and (24b) are defeated by (24c) and (24d), in which each of the head components independently forms a prosodic word. As a result, dvandva compounding in this class is likewise not realized.⁵⁹

3.3.3 Complex Compounding

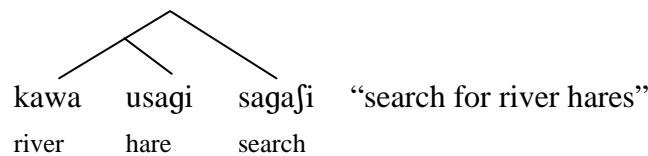
Let us turn our attention to structure derived through complex compounding. As

⁵⁹ A hybrid dvandva compound whose first component is a Yamato stem, such as **sake zuusu* “alcohol and juice,” is excluded because dvandva compounding requires the two components be identical in several aspects including ER class specification.

illustrated in 2.5, a compound may contain another compound as its component. In this section, I will illustrate that morpheme order in a complex compound is determined by correspondence relations between morphologically related words. As in simple compounding examined above, the input of a complex compound lacks a linear morpheme order. The difference between simple and complex compounding lies in the structure of the input; whereas the input of a simple compound consists of two stems (or a stem and a RED morpheme in reduplication), that of a complex compound may have an input set of another compound as its component.

Let us first examine complex compounding involving left-branching structure, with *kawa-usagi-sagaſi* “search for river hares” as an example. This complex compound consists of three stems, and the first two form an embedded compound, which can be independently realized as a simple normal compound, *kawa-usagi* “river hare.” Input and output structures of this complex compound are shown below:

(25) {/sagaſi/_H, {/kawa/, /usagi/_H} } → [kawa-usagi-sagaſi]



Note that I provide the branching structure above just for the sake of clarity and, as argued above, it is not essential at any level of morphophonological derivation. Let us examine how the surface structure is derived as an optimal output under constraint ranking (21). Consider the following tableau:

(26) CC: *kawa-usagi-sagaſi* “search for river hares”

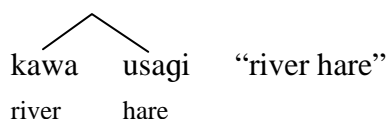
Input: {/sagaſi/ _H , {/usagi/ _H , /kawa/}}	*STRUC[ω]	HEAD-RIGHT -Y
a. [sagaſi-usagi-kawa]	*	*!
✗ b. [usagi-kawa-sagaſi]	*	
→c. [kawa-usagi-sagaſi]	*	
d. [kawa-usagi], [sagaſi]	*!*	
e. [kawa], [usagi], [sagaſi]	**!*	

In (26), there is a problem with this output selection. Constraint ranking (21) cannot distinguish the intended winner (26c) from candidate (26b), which is not an appropriate

output from this input (a wrong winner is indicated by ✖). It should be noted that the alignment constraint **HEAD-RIGHT** is unable to evaluate the internal structure of a compound: it simply examines whether the head component of a compound coincides with the right edge of a prosodic word, and it is not sensitive to the position of the head component of an embedded compound. In the case of (26), the **HEAD-RIGHT** constraint is satisfied if the head component, *sagafi*, is on the right edge of the candidates at the surface level. Therefore, both candidates satisfy **HEAD-RIGHT**. The problem lies in the fact that the difference between candidates (26c) and (26d) is the linear order of the morphemes. No markedness constraint is able to distinguish one from the other because the morpheme order itself does not yield any marked structure here. Input-output (IO) correspondence constraints are also ineffective for this problem because the linear order of the stems is not specified at the input level. IO correspondence constraints can penalize candidates only when there is some discrepancy between the input and output. An IO correspondence constraint is never sensitive to information that does not appear at the input level.

I assert that in addition to **HEAD-RIGHT**, morpheme order in a complex compound is governed by the morpheme order of another compound that is morphologically related to the complex compound. Let us consider (25) again. The embedded compound of (25) shares its input with a simple compound, *kawa-usagi* “river hare,” which independently exists from complex compounding, as examined in the previous section. The input and structure of this compound, which I will call the “base compound,” are shown below:

(27) {/usagi/_H, /kawa/} → [kawa-usagi]



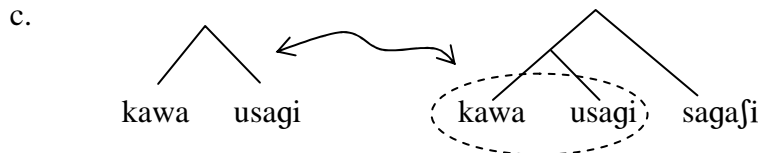
I will show in the following paragraphs that the correct morpheme order of (25) is guaranteed by the fact that the morpheme order of the base compound (27) is taken over by (25).

Within the OT framework, the relationship between two morphologically related outputs is called OO correspondence (Benua 1998). The following (28) shows an OO correspondence relation between *kawa-usagi-sagafi* and *kawa-usagi*:⁶⁰

⁶⁰ I omit several insignificant OO correspondences here. For example, the head component of the complex compound *sagafi* also has an OO correspondence relation

(28) a. $\{/sagafi/H, \{/usagi/H, /kawa/\}\} \rightarrow$ kawa-usagi-sagafi
 search hare river “search for river hares”

b. $\{/usagi/H, /kawa/\} \rightarrow$ kawa-usagi “river hare”



At the input level, the underlying representation of the simple base compound *kawa-usagi* is identical to that of the embedded compound in the complex compound, *kawa-usagi-sagafi*, i.e., $\{/usagi/H, /kawa/\}$, as shown in (28a) and (28b). When two outputs or constituents of outputs share an identical underlying structure, an OO correspondence is established between them. Therefore, in the present case, there is a correspondence between the two output structures, as shown in (28c), where correspondence is indicated by the bidirectional arrow. Note again that branching structures are shown here just for the sake of clarity; they are not essential at any level of morphophonological mapping.

I propose that the linear order of morphemes in a complex compound is governed by a faithfulness constraint, **LINEARITY**, which is one of the correspondence constraints originally proposed by McCarthy & Prince (1995). They state this correspondence constraint as follows:

(29) **LINEARITY:**

‘ S_1 is consistent with the precedence structure of S_2 , and vice versa.’

Let $x, y \in S_1$ and $x', y' \in S_2$

If $x \Re x'$ and $y \Re y'$, then

$x < y$ iff $\neg (y' < x')$

As explained in 1.3.2, S_1 and S_2 are structures that stand in correspondence with each

with a monomorphemic base word, *sagafi* “search.” However, such a correspondence does not play an important role in the selection of the correct morpheme order because it never provides crucial information on the morpheme order in a compound. For the same reason, I omit such insignificant OO correspondence relations in subsequent illustrations.

other. This constraint is violated when some segmental reversal occurs between two correspondent structures. I claim that the OO version of this constraint, **LINEARITY-OO**, in which S_1 and S_2 are morphologically related words or components of a word, plays a crucial role in determining the linear morpheme order in complex compounding. This constraint favors a candidate that shares the linear order of the embedded compound with the base compound over a candidate that does not. It should be noted that while this correspondence constraint is wholly phonological, it can control the morpheme order of a compound at the output level by relating with OO correspondence. Adding this constraint to the ranking (12), we obtain the following constraint ranking:

(30) **LEX≈PRWD** >> **HEAD-RIGHT-L/SJ** >> ***STRUC[ω]** >>
HEAD-RIGHT-Y, LINEARITY-OO

The following tableau shows how this correspondence constraint works in selecting the correct morpheme order:

(31) CC: *kawa-usagi-sagafi* “a search for river hares”

Input: {/sagafi/H, {/usagi/H, /kawa/}}	*STRUC[ω]	HEAD-RIGHT -Y	LINEARITY -OO
O-Base: [kawa-usagi] ⁶¹			
a. [sagafi-usagi-kawa]	*	*!	*
b. [usagi-kawa-sagafi]	*		*!
→c. [kawa-usagi-sagafi]	*		

Candidates (31a), (31b), and (31c) are identical, respectively, to (26a), (26b), and (26c). The difference between tableaux (26) and (31) is that the simple compound *kawa-usagi*, which shares the underlying representation with the embedded compound, participates in the output selection as an O(utput)-base. It should be noted that the morpheme order of this base compound is independently decided, as detailed in the previous section. The correspondence constraint **LINEARITY-OO** penalizes disagreement in the segmental order between the embedded compound and base compound. Candidates (31a) and (31b) incur a violation of this OO correspondence constraint because the segmental order of the embedded compound does not agree with the base compound. The optimal candidate is (31c), which satisfies **LINEARITY-OO**, sharing its segmental order with the

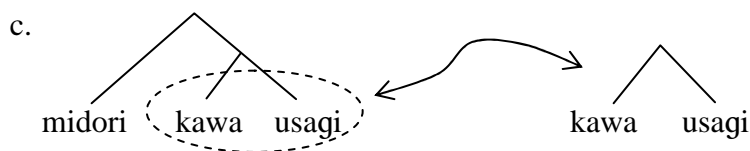
⁶¹ In this chapter, I omit monomorphemic base words in OT tableaux because they are in no way significant in deciding the morpheme order of the complex compound, as argued in footnote 61.

base compound. The ranking between **LINEARITY-OO** and the other constraints is not crucial in this evaluation because the two candidates share identical violations except for the OO correspondence constraint.

As illustrated in 2.5, an embedded compound can be the head component in complex compounding. The following shows input, structure, and a significant OO correspondence relation in a right-branching complex compound, *midori-kawa-usagi* “green river hare,” and a simple compound, *kawa-usagi* “river hare”:

(32) a. $\{ \{ /usagi/_{H}, /kawa/ \}_{H}, /midori/ \} \rightarrow \text{midori-kawa-usagi}$ “green river hare”
 hare river green

b. $\{ /usagi/_{H}, /kawa/ \} \rightarrow \text{kawa-usagi}$ “river hare”



In the complex compound (32a), the embedded compound *kawa-usagi* is the head component, and it shares input structure with the independent simple compound, *kawa-usagi*, in (32b). Therefore, they are linked to each other by an OO correspondence relation, as in (32c). The following tableau shows how the constraint ranking (30) evaluates this complex compounding:

(33) CC: *midori-kawa-usagi* “green river hare”

Input: $\{ \{ /usagi/_{H}, /kawa/ \}_{H}, /midori/ \}$ O-Base: [kawa-usagi]	HEAD-RIGHT -L	LINEARITY-OO
a. [usagi-kawa-midori]	*!	*
b. [kawa-usagi-midori]	*!	
c. [usagi-midori-kawa]		*!
d. [midori-usagi-kawa]		*!
☞ e. [kawa-midori-usagi]		
→f. [midori-kawa-usagi]		

Since **HEAD-RIGHT** examines the head component of a compound, as argued above, the target of this constraint in the present case is the embedded compound. Since a compound is not a lexical entry but a derived word, the head component of this complex

compound lacks any ER class specification. I claim that in such a case, the component obtains the specification whose correspondence constraint is ranked in the highest position to keep the structure of an unfamiliar word as much as possible.⁶² Therefore, in this case, **HEAD-RIGHT-L** is selected for the default constraint.⁶³ In this output selection, we have again a problem with morpheme order. Candidates (33a) and (33b), whose right-most morpheme is *midori*, which is not the head component of this compound, violate **HEAD-RIGHT-L**. Candidates (33c) and (33d) violate **LINEARITY-OO** because they do not share morpheme order with the base compound. These violations are fatal, and these ungrammatical candidates are therefore correctly ruled out. However, this constraint ranking cannot distinguish candidate (33e), which must be ruled out, from the correct output candidate (33f) because both (33f) and (33e) satisfy the two constraints: their right-most component is one of the morphemes, which form the head component, and their morpheme orders agree with the base compound. The difference between these two candidates is the morpheme order of the embedded compound. It should be noted that **HEAD-RIGHT-L** is unable to discriminate between the candidates, because this constraint concerns only the position of the head component of a whole compound.

Now, we need another constraint that controls the morpheme order within an embedded compound. In addition to **LINEARITY** above, McCarthy & Prince (1995) proposed the following constraint:⁶⁴

(34) **CONTIGUITY:**

The portion of S_1 standing in correspondence forms a contiguous string, as does the correspondent portion of S_2 .

This constraint requires that two related structures share the same segmental contiguous relationship, and it is violated when some intrusion or deletion occurs within the contiguous string. I maintain that the OO version of this correspondence constraint, **CONTIGUITY-OO**, is crucial in output selection in complex compounding. With this new constraint, constraint ranking (30) should be revised as follows:

⁶² I will further argue for this default specification of the ER classification in 4.1.1.1.

⁶³ Of course, it does not mean that derived words belong to the Loanword class. They can not have ER class specification unless they are lexicalized.

⁶⁴ They further classified this correspondence constraint into I-CONTIGUITY, which prohibits deletion of input elements, and O-CONTIGUITY, which prohibits intrusion in these elements.

(35) **LEX \approx PRWD** >> **HEAD-RIGHT-L/SJ** >> ***STRUC**[ω] >>

HEAD-RIGHT-Y, LINEARITY-OO, CONTIGUITY-OO

This constraint ranking can correctly distinguish the intended output from the ungrammatical output candidate. Consider the following tableau:

(36) CC: *midori-kawa-usagi* “green river hare”

Input: {{/usagi/ _H , /kawa/ _H , /midori/}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base: [kawa-usagi]	-L	-OO	-OO
a. [kawa-midori-usagi]			*!
→b. [midori-kawa-usagi]			

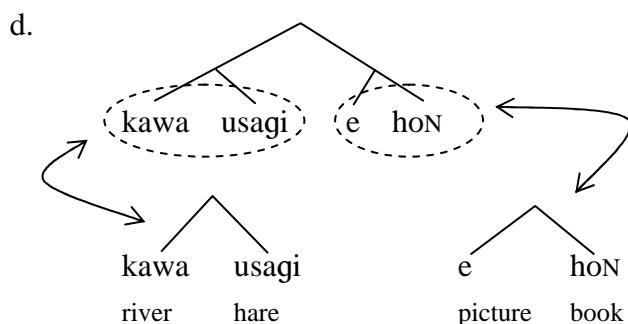
In candidate (36a), which is identical to candidate (33e), an embedded head compound, *kawa-usagi*, is intruded by a morpheme, *midori*; therefore, this candidate incurs a violation of **CONTIGUITY-OO** because the segmental contiguous relationship in the embedded compound is not identical to that of the base compound. On the other hand, candidate (36b), which is identical to (33f), satisfies this constraint because there is no intrusion within the embedded compound. This candidate is consequently selected as the optimal output.

As illustrated in 2.5.2 and 2.5.3, a compound can be further complex in Japanese. The constraint ranking (35), into which we have introduced **LINEARITY-OO** and **CONTIGUITY-OO**, identifies the correct structure in such complex compounding. Let us first examine a complex compound that consists of two normal compounds. The following illustrates OO correspondence relations in a complex compound, *kawa-usagi-e-hoN* “picture book of river hares”:

(37) a. $\{\{/hoN/_H, /e/_H\}, \{/usagi/_H, /kawa/_H\}\} \rightarrow$ kawa-usagi-e-hoN
 book picture hare river “picture book of river hares”

b. $\{/hoN/_H, /e/_H\} \rightarrow$ e-hoN “picture book”

c. $\{/usagi/_H, /kawa/_H\} \rightarrow$ kawa-usagi “river hare”



In a complex compound (37a), two simple compounds are embedded; i.e., *kawa-usagi* “river hare” and *e-hoN* “picture book.” These two can independently form simple compounds, as shown in (37b) and (37c). Each of these pairs shares input structure, and two OO correspondence relations are therefore involved in the output selection. The following tableau shows that constraint ranking (35) successfully singles out the correct output for this double-branching complex compound:

(38)CC: *kawa-usagi-e-hoN* “picture book of river hares”

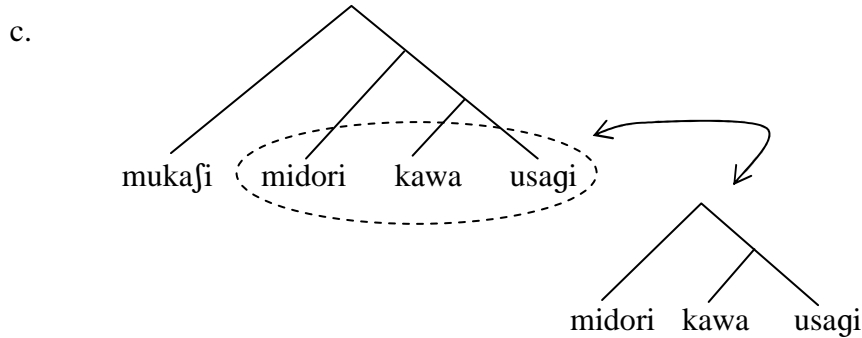
Input: $\{\{/hoN/_H, /e/_H\}, \{/usagi/_H, /kawa/_H\}\}$ O-Base: [kawa-usagi], [e-hoN]	HEAD-RIGHT -L	LINEARITY -OO	CONTIGUITY -OO
a. [hoN-e-usagi-kawa]	*!	**	
b. [e-hoN-kawa-usagi]	*!		
c. [usagi-kawa-e-hoN]		*!	
→d. [kawa-usagi-e-hoN]			
e. [kawa-e-usagi-hoN]			*!*

Similar to (33), the head component in this compounding is the embedded compound *e-hoN*, which lacks ER class specification. Therefore, **HEAD-RIGHT-L** requires that this head component be realized in the right-most position. The optimal candidate is (38d), which shares morpheme order with its base compounds. Candidate (38e) also satisfies **LINEARITY-OO** because the morpheme orders in the base compounds are preserved.

However, this candidate fatally violates **CONTIGUITY-OO** because the contiguous relations in the base compounds are severed in this candidate.

A complex compound can be a component of another compound. Again, the order of morphemes is determined under constraint ranking (35). The following illustrates how correct morpheme order is determined in a complex compound whose head component is also a complex compound:

- (39) a. $\{\{\{/usagi/_{\text{H}}/kawa/_{\text{H}}/midori/_{\text{H}}/muka\text{ji}/\}\} \rightarrow \text{muka\text{ji}}\text{-midori-kawa-usagi}$
 hare river green ancient “ancient green river hare”
- b. $\{\{\{/usagi/_{\text{H}}/kawa/_{\text{H}}/midori/_{\text{H}}/muka\text{ji}/\}\} \rightarrow \text{midori-kawa-usagi}$ “green river hare”



(40) CC: *muka\text{ji}-midori-kawa-usagi* “ancient green river hare”

Input: $\{\{\{/usagi/_{\text{H}}/kawa/_{\text{H}}/midori/_{\text{H}}/muka\text{ji}/\}\}$ O-Base: [midori-kawa-usagi], [kawa-usagi]	HEAD-RIGHT -L	LINEARITY -OO	CONTIGUITY -OO
a. [usagi-kawa-midori-muka\text{ji}]	*!	**	
b. [usagi-kawa- muka\text{ji}-midori]		*!*	*
c. [usagi-muka\text{ji}-kawa-midori]		*!*	*
d. [muka\text{ji}-usagi-kawa-midori]		*!*	
e. [muka\text{ji}-midori-usagi-kawi]		*!*	
→f. [muka\text{ji}-midori-kawa-usagi]			

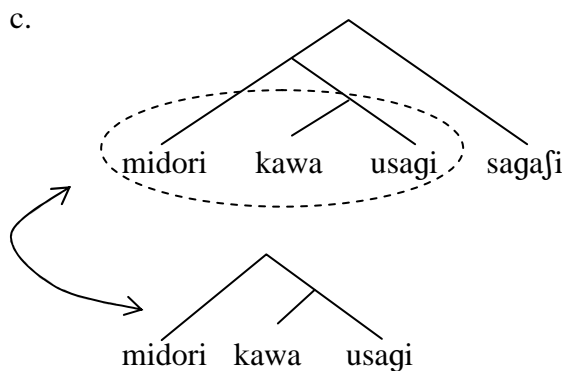
We have already examined the morpheme order of the base compound *midori-kawa-usagi* in (33) and (36). The two correspondence constraints require preservation of this morpheme order and contiguity, and **HEAD-RIGHT-L** requires that it be realized on the right edge. Consequently, candidate (40f), which satisfies all three constraints, wins.

The situation is similar in a complex compound whose non-head component is

also a complex compound. Consider the following scheme and tableau, which illustrate the structure, OO correspondence relation, and the output selection of a complex compound, *midori-kawa-usagi-sagafi* “search for green river hares”:

(41) a. $\{/sagafi/_H, \{/usagi/_H, /kawa/_H\}_H midori\}$ → midori-kawa-usagi-sagafi
 search hare river green “search for green river hares”

b. $\{\{/usagi/_H, /kawa/_H\}_H /midori/_H\}$ → midori-kawa-usagi “green river hare”



(42) CC: *midori-kawa-usagi-sagafi* “search for green river hares”

Input: $\{/sagafi/_H, \{/usagi/_H, /kawa/_H\}_H midori\}$ O-Base: [midori-kawa-usagi], [kawa-usagi]	LINEARITY	CONTIGUITY	HEAD-RIGHT
	-OO	-OO	-Y
a. [sagafi-usagi-kawa-midori]	*!		*
b. [midori-sagafi-kawa-usagi]		*!	*
c. [sagafi -midori-kawa-usagi]			*!
d. [kawa-usagi-midori-sagafi]	*!		
→e. [midori-kawa-usagi-sagafi]			

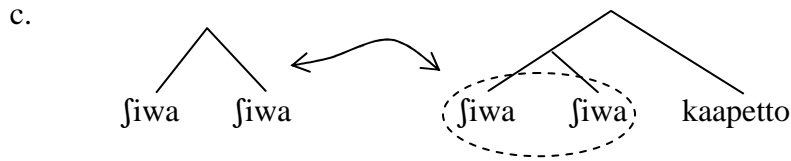
HEAD-RIGHT-Y requires that the head component, *sagafi* “search,” which belongs to the Yamato class, be realized as the right-most element, and the morpheme order of the embedded compound has to be identical to that of the base compound according to the two OO correspondence constraints. Candidate (42e), which satisfies these three constraints, is selected as the optimal candidate.

Thus far, we have examined complex compounds whose components are normal compounds. However, as illustrated in 2.5, other types of compounding can be found within a compound, except for intensive/plural reduplication. The following illustrates the structure and output selection of a compound whose non-head component

is a mimetic reduplicated compound:

(43) a. {kaapetto_H, {RED_H, /jiwa/}} → jiwa-jiwa-kaapetto “wrinkled carpet”
 carpet wrinkle

b. {RED_H, /jiwa/} → jiwa-jiwa “wrinkled”



(44) CC: *jiwa-jiwa-kaapetto* “wrinkled carpet”

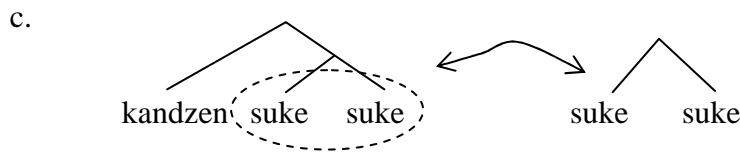
Input: {kaapetto _H , {RED _H , /jiwa/}}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base: [jiwa-jiwa]	-L	-OO	-OO
a. [kaapetto-jiwa-jiwa]	*!		
b. [jiwa-kaapetto-jiwa]	*!		*
→c. [jiwa-jiwa-kaapetto]			

The alignment constraint **HEAD-RIGHT-L** correctly singles out the optimal output, which requires that the Loanword head component *kaapetto* be realized on the right edge of the complex compound. The two OO correspondence constraints are not crucial in this structure.

This type of reduplicated compound can also be the head component of a complex compound, as illustrated below:

(45) a. {{RED_H, /suke/}_H, kandzen} → kandzen-suke-suke “completely transparent”
 show through complete

b. {RED_H, /suke/} → suke-suke “transparent”



(46) CC: *kandzeN-suke-suke* “completely transparent”

Input: {{RED _H , /suke/} _H , kandzeN}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base: [suke-suke]	-L	-OO	-OO
a. [suke-suke-kandzeN]	*!		
b. [suke-kandzeN-suke]			*!
→c. [kandzeN-suke-suke]			

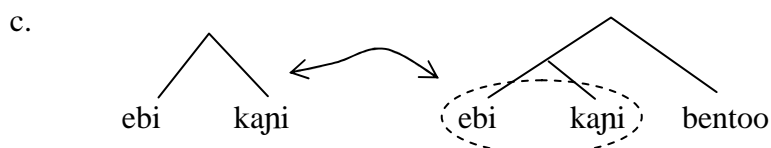
The OO correspondence constraint **CONTIGUITY-OO** requires that the mimetic reduplicated compound *suke-suke* be realized as a contiguous sequence. Therefore, candidate (46b), which satisfies **HEAD-RIGHT-L**, is excluded because the non-head component *kandzeN* intrudes into the reduplicated word, and candidate (46c) is consequently selected as the optimal output.

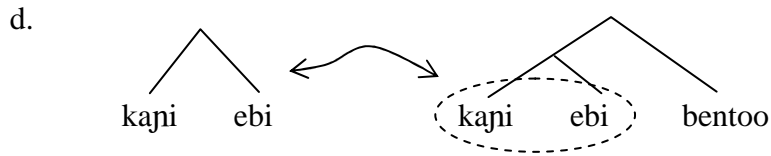
Let us conclude this section by examining dvandva structure within a compound. As illustrated in 2.5.3, a dvandva compound can be found in a morphologically complex context. I assert that such morphological structures can be classified into two types: one is based on an independent dvandva compound and therefore has an OO correspondent relationship with the dvandva compound; the other lacks such an O-base and OO correspondence.

As argued in 2.3.3, whereas dvandva compounding is possible in Yamato words, it is not possible in Sino-Japanese and Loanwords in simple compounding. This fact entails that only Yamato dvandva compounds can form the base of a complex compound that contains a dvandva compound. Since dvandva compounding exhibits optionality in morpheme order when forming a double-head structure, as shown in (22), a complex compound containing a dvandva compound also shows the same optionality. The following serves as an example of this pattern:

(47) a. {/bentoo/_H, {/ebi/_H, /kani/_H}} → ebi-kani-bentoo, kani-ebi-bentoo
 lunch shrimp crab “shrimp-crab lunch”

b. {/ebi/_H, /kani/_H} → ebi-kani, kani-ebi “shrimp and crab”





A complex compound containing a dvandva compound may have two forms from a single input set, as in (47a). This optionality is derived from that of a simple dvandva compound, as shown in (47b). Since there are two possible bases in this complex compounding, two correspondences are established, as in (47c) and (47d). The following tableau shows that constraint ranking (35) correctly works in the output selection of this complex compounding basing on the two correspondences:

(48)CC: *ebi-kaji-bentoo*, *kaji-ebi-bentoo* “shrimp-crab lunch”

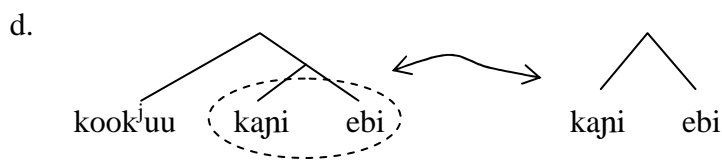
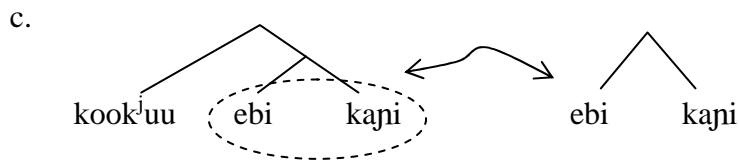
Input: {/bentoo _H , {/ebi _H , /kaji _H } } O-Base: [ebi-kaji] / [kaji-ebi]	HEAD-RIGHT -SJ	LINEARITY -OO	CONTIGUITY -OO
a. [bentoo-ebi-kaji]	*!	*	
b. [bentoo-kaji-ebi]	*!	*	
c. [ebi-bentoo-kaji]	*!	*	*
d. [kaji-bentoo-ebi]	*!	*	*
→e. [ebi-kaji-bentoo]		*	
→f. [kaji-ebi-bentoo]		*	

Both candidates (48e) and (48f), in which the head component is on the right-edge of the whole compound, satisfy **HEAD-RIGHT-SJ**. Note that since this compound has two possible O-bases (i.e., *ebi-kaji*, and *kaji-ebi*), it is impossible for output candidates to agree with both of them at the same time. Therefore, every candidate violates the **LINEARITY-OO**. Consequently, the two forms are equally selected as optimal outputs from the input of this compound.

A Yamato dvandva compound can also be the head component in complex compounding, as argued in 2.5.3. The following serves as an example of such a pattern:

(49) a. $\{\{/ebi/_H, /kaji/_H\}_H, /kook^j_{uu}/\} \rightarrow kook^j_{uu}\text{-ebi-kaji}, kook^j_{uu}\text{-kaji-ebi}$
 shrimp crab high-grade “high-grade shrimp and crab”

b. $\{/ebi/_H, /kaji/_H\} \rightarrow \text{ebi-kaji}, \text{kaji-ebi}$ “shrimp and crab”



Like a complex compound whose non-head component is a dvandva compound, which we examined in (47) and (48), this pattern exhibits optionality in morpheme order, as in (49a). This optionality is caused by the simple compound shown in (49b) and the two correspondences in (49c) and (49d), which are based on it. The following tableau illustrates how these two forms are derived from a single input set:

(50)CC: $kook^j_{uu}\text{-ebi-kaji}$ “high-grade shrimp and crab”

Input: $\{\{/ebi/_H, /kaji/_H\}_H, /kook^j_{uu}/\}$ O-Base: [ebi-kaji] / [kaji-ebi]	HEAD-RIGHT -L	LINEARITY -OO	CONTIGUITY -OO
a. [ebi-kaji-kook ^j _{uu}]	*!	*	
b. [kaji-ebi-kook ^j _{uu}]	*!	*	
c. [ebi-kook ^j _{uu} -kaji]		*	*!
d. [kaji-kook ^j _{uu} -ebi]		*	*!
→e. [kook ^j _{uu} -ebi-kaji]		*	
→f. [kook ^j _{uu} -kaji-ebi]		*	

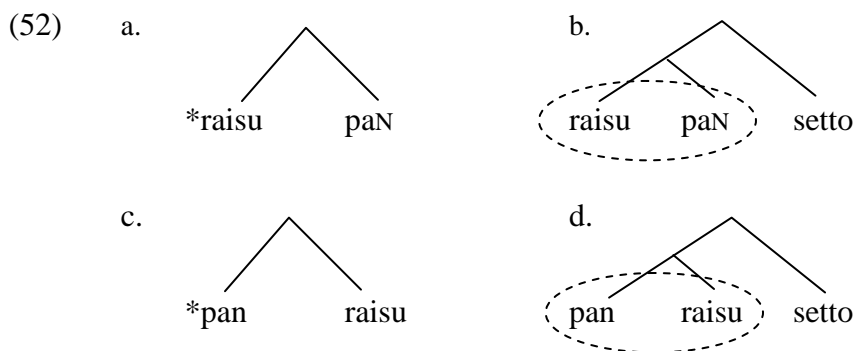
Again, candidates (50e) and (50f), both of which satisfy the three constraints and correspond to the two possible bases, equally win.

As illustrated in 2.5.3, the restriction on the ER classification in dvandva compounding disappears in some morphologically complex contexts: not only Yamato words but also Sino-Japanese words and Loanwords can be found in the non-head component of a complex compound. I propose that this type of compounding has a different input structure from other complex compounding patterns, which we have

examined above. Taking the complex compound *pan-raisu-setto* “set of bread and rice” as an example, the input-output mapping of this compound is as in (51):

- (51) a. $\{ /setto/H, \{ /raisu/H, /paN/H \} \} \rightarrow \text{pan-raisu-setto, raisu-paN-setto}$ “set of bread and rice”
 set rice bread
- b. $\{ /setto/H, /paN/, /raisu/ \} \rightarrow \text{pan-raisu-setto, raisu-paN-setto}$ ⁶⁵
- c. $\{ /raisu/H, /paN/H \} \rightarrow *[\text{raisu-paN}], *[\text{pan-raisu}], [\text{raisu}] [\text{paN}]$ “bread and rice”

There are two possible representations for the input of this compound, as in (51a) and (51b). Whereas (51a), which has the same structure as (47a), contains a simple dvandva compound as its non-head component, (51b) lacks such an internal structure. As argued in 2.3.3 and 3.3.2 above, dvandva compounding is possible only for Yamato stems. Therefore, the two Loanword stems are ungrammatical when they are realized as a simple dvandva compound, and they must be realized as two different prosodic words, as in (51c). It should be noted that (51b) lacks an OO correspondence relation with (51c) because, unlike (51a), the input of (51b) does not contain that of (51c). The following exhibits that there is also no OO correspondence between (51a) and (51c):



Since dvandva compounds (52a) and (52c) cannot exist at the output level, there is no OO correspondence relation between these compounds and the non-head component of a complex compound even though they share the same underlying representation. As a result, whichever the input structure, OO correspondence does not play a significant role in the formation of a dvandva compound that contains (or seems to contain) a Loanword

⁶⁵ Complex compounds *ebi-kaji-bentoo* and *kaji-ebi-bentoo*, which I examined in (47), may have similar input structure, in which stems in non-head components do not have the headedness specification.

dvandva compound. The following tableaux illustrate how constraint ranking (35) is also able to select the correct output in this complex compounding. Mappings (51a) and (51b) correspond, respectively, to tableaux (53) and (54):

(53) CC: *pan-raisu-setto, raisu-paN-setto* “set of bread and rice” from (51a)

Input: {/setto/ _H , {/raisu/ _H , /paN/ _H }}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base:	-L	-OO	-OO
a. [setto-pan-raisu]	*!		
b. [setto-raisu-paN]	*!		
c. [paN-setto-raisu]	*!		
d. [raisu-setto-pan]	*!		
→e. [pan-raisu-setto]			
→f. [raisu-paN-setto]			

(54) CC: *pan-raisu-setto, raisu-paN-setto* “set of bread and rice” from (51b)

Input: {/setto/ _H , /raisu/, /paN/}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base:	-L	-OO	-OO
a. [setto-pan-raisu]	*!		
b. [setto-raisu-paN]	*!		
c. [paN-setto-raisu]	*!		
d. [raisu-setto-pan]	*!		
→e. [pan-raisu-setto]			
→f. [raisu-paN-setto]			

In both (53) and (54), the two OO correspondence constraints are vacuously satisfied because this compounding does not involve any significant OO correspondence relation that provides any indication for morpheme order. We obtain the same result from the two different input sets: candidates that satisfy **HEAD-RIGHT** are selected simultaneously as winners.

The situation with respect to Sino-Japanese dvandva compounding can be accounted for in the same fashion. For example, the IO mapping of a complex compound, *k'ooiku-kenk'uu-puran* “plan for education and research,” whose non-head component forms a dvandva structure with two Sino-Japanese words, is shown below:

- (55) a. {/puraN/H, {/k^jooiku/H, /keŋk^juu/H}} → k^jooiku-keŋk^juu-puraN, keŋk^juu-k^jooiku-puraN
 plan education research “plan for education and research”
- b. {/puraN/H, /k^jooiku/, /keŋk^juu/} → k^jooiku-keŋk^juu-puraN, keŋk^juu-k^jooiku-puraN
- c. {/k^jooiku/H, /keŋk^juu/H} → *[k^jooiku-keŋk^juu], *[keŋk^juu-k^jooiku], [k^jooiku] [keŋk^juu]
 “education and research”

As shown in (55a) and (55b), there are two possible representations for the input in this complex compound, and the two Sino-Japanese words in the non-head component are reversible in the output. These two Sino-Japanese words cannot form a simple dvandva compound as in (55c), and therefore, no OO correspondence relation is involved in the morpheme order selection of these complex compounds. The following tableaux illustrate the output selection in this compounding within constraint ranking (35). Tableaux (56) and (57) explain, respectively, mappings (55a) and (55b):

- (56) CC: *k^jooiku-keŋk^juu-puraN, keŋk^juu-k^jooiku-puraN* “plan for education and research” from (55a)

Input: {/puraN/H, {/k ^j ooiku/H, /keŋk ^j uu/H}} O-Base:	HEAD-RIGHT -L	LINEARITY -OO	CONTIGUITY -OO
a. [puraŋ-k ^j ooiku-keŋk ^j uu]	*!		
b. [puraŋ-keŋk ^j uu-k ^j ooiku]	*!		
c. [keŋk ^j uu-puraŋ-k ^j ooiku]	*!		
d. [k ^j ooiku-puraŋ-keŋk ^j uu]	*!		
→e. [k ^j ooiku-keŋk ^j uu-puraN]			
→f. [keŋk ^j uu-k ^j ooiku-puraN]			

participates in the morpheme order selection in this type of compounding. The following tableaux show that the correct outputs are derived from the two input representations above under constraint ranking (35). Tableaux (59) and (60) correspond, respectively, to (58a) and (58b):

(59) CC: *soba-raisu-setto*, *raisu-soba-setto* “set of noodles and rice”

Input: {/setto/ _H , {/soba/ _H , /raisu/ _H }}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base:	-L	-OO	-OO
a. [setto-soba-raisu]	*!		
b. [setto-raisu-soba]	*!		
c. [soba-setto-raisu]	*!		
d. [raisu-setto-soba]	*!		
→e. [soba-raisu-setto]			
→f. [raisu-soba-setto]			

(60) CC: *soba-raisu-setto*, *raisu-soba-setto* “set of noodles and rice”

Input: {/setto/ _H , /soba/, /raisu/}	HEAD-RIGHT	LINEARITY	CONTIGUITY
O-Base:	-L	-OO	-OO
a. [setto-soba-raisu]	*!		
b. [setto-raisu-soba]	*!		
c. [soba-setto-raisu]	*!		
d. [raisu-setto-soba]	*!		
→e. [soba-raisu-setto]			
→f. [raisu-soba-setto]			

In the above two tableaux, candidates in which the head component, *setto*, which belongs to the Loanword class, occupies the right-most position are selected as optimal outputs, satisfying **HEAD-RIGHT-L**. Again, the two OO correspondence constraints are vacuously satisfied in every case.

As we have seen in this section, constraint ranking with OO correspondence constraints can correctly account for the morpheme order of complex compounding without assuming morphological branching structures. I will argue in the following sections and in Chapter 4 that OO correspondence among morphologically related words is also crucial in accounting for different morphophonological variations in Japanese compounding, such as optional prosodic word division, the application of

rendaku, and compound accentuation.

3.4 Prosodic Division in Complex Compounding

As we have seen in 2.5.6, Japanese complex compounds are sometimes pronounced as two prosodic words. In this section, I will illustrate that OO correspondence also plays an important role in this optional prosodic division: this operation is possible only when identity in the prosodic structure between morphologically related words is maintained. In the OT framework, prosodic division that interrupts the OO identity is blocked by its correspondence constraint.

Kubozono (1995) pointed out that a right-branching complex compound that contains Loanword or Sino-Japanese words can be optionally pronounced as two prosodic words, as we have seen in 2.5.6. An example of this phenomenon appears again below:

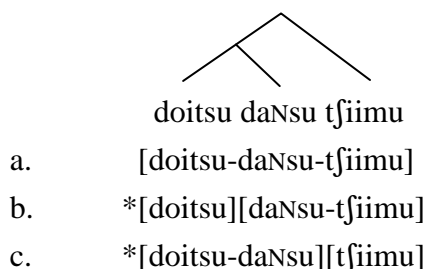
- (61) *doitsu-daNs-u-tʃiimu* “dance team from Germany”
Germany dance team



- doitsu daNs u tʃiimu
- a. [doitsu-daNs-u-tʃiimu]
b. [doitsu][daNs-u-tʃiimu]
c. *[doitsu-daNs][tʃiimu]

The complex compound *doitsu-daNs-u-tʃiimu* “dance team from Germany” can be pronounced as a single prosodic word, as in (61a), or as two prosodic words, as in (61b), whereas a division like (61c) is ungrammatical. Kubozono argued that the optional prosodic division in (61) should be compared with that in a left-branching compound. Consider a complex compound (62) that consists of the same stems as the complex compound (61):

- (62) *doitsu-daNsu-tʃiimu* “team of German dance”
 Germany dance team



In this case, no prosodic division is grammatical: it forms a single prosodic word, as in (62a), but it cannot be pronounced as two prosodic words, as in (62b) and (62c). It is obvious that the difference in the two morphological structures yields this phonological variation between (61) and (62).

Kubozono claimed that such optional prosodic division is caused by the markedness of right-branching structure. In this view, prosodic division breaks the marked right-branching structure into unmarked ones. A compound with left-branching structure is never divided, because it is structurally already unmarked. However, Kubozono does not clarify why right-branching structure is marked and left-branching one is not. It is unlikely that the morphological structure of compounds directly causes markedness in phonology.

Ito & Mester (2003) argued that prosodic division in complex compounds is caused by a mismatch between grammatical structure and prosodic structure in the compound. Within the OT framework, they introduce a grammar-prosody interface constraint, **ANCHOR-L**(w, ω), which requires that the left edge of the grammatical word coincide with that of the prosodic word. They demonstrated how a right-branching compound violates the self-conjoined version of this constraint whereas a left-branching compound does not. The following tableau shows how this violation triggers prosodic division in a right-branching compound:

(63) prosodic anchoring approach (Ito & Mester 2003): right-branching compound

Input: {X{YZ}}	ANCHOR-L (w, ω) ² _s	* STRUC [ω]	ANCHOR-L (w, ω)
a. [XYZ]	*!	*	** (Y) , * (Z)
→b. [X][YZ]		**	* (Z)
c. [XY][Z]	*!	**	** (Y)
d. [X][Y][Z]		***!	

As in (63a), when the three morphemes form a single prosodic word, the second component of the right-branching compound (Y) violates **ANCHOR-L**(w, ω) twice, and it therefore fatally violates the conjoined constraint, **ANCHOR-L**(w, ω)²_s. The winner is candidate (63b), which divides the prosodic word into two to cancel the violations of **ANCHOR-L**(w, ω)²_s. Conversely, the left-branching compound does not have to divide its prosodic structure because it incurs no violation of this conjoined constraint, as illustrated below:

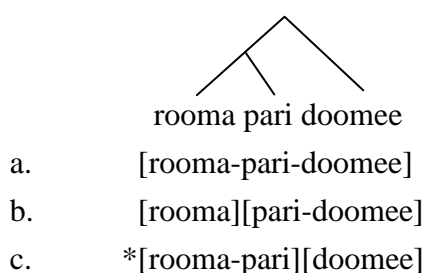
(64) prosodic anchoring approach (Ito & Mester 2003): left-branching compound

Input: {{XY}Z}	ANCHOR-L (w, ω) ² _s	* STRUC [ω]	ANCHOR-L (w, ω)
→a. [XYZ]		*	*(Y), *(Z)
b. [X][YZ]		**!	*(Z)
c. [XY][Z]		**!	*(Y)
d. [X][Y][Z]		***!	

In candidate (64a), which forms a single prosodic word, the second component of the compound violates **ANCHOR-L**(w, ω) once. because the self-conjoined constraint, **ANCHOR-L**(w, ω)²_s, is violated only when a single segment violates the simple consonant twice, candidate (64a) satisfies this condition and is the winner in this output selection.

Thus far, Ito & Mester’s **ANCHOR-L** approach appears to work well. However, I wish to point out that the approach incurs a serious problem when we examine prosodic division in a compound that contains a dvandva structure. As Kubozono pointed out, prosodic structure can also be divided in a complex compound that contains a dvandva structure as its non-head component. Consider the following example:

(65) *rooma-pari-doomee* “Rome-Paris alliance”
 Rome Paris alliance

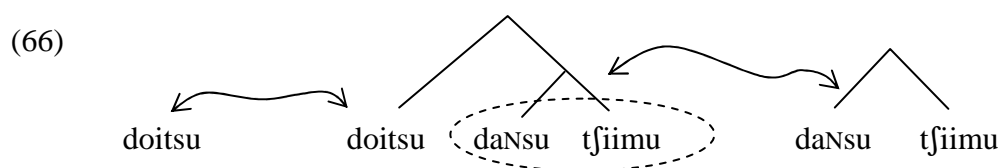


This complex compound can be pronounced as a single prosodic word, as in (65a), or as

two prosodic words, as in (65b). Note that this type of compound has left-branching structure but not the right-branching one, which Kubozono assumed to be the trigger of the prosodic division. This variation also goes against Ito & Mester’s **ANCHOR-L** approach; although the second morpheme of (65b) incurs only one violation of **ANCHOR-L**(w, ω), prosodic division occurs. To provide a unified account of the two variations of prosodic division in compounding, it is inappropriate to identify morphological structure as the cause: the right-branching compound in (62) and the compound containing a dvandva structure in (65) are not structurally similar. What the two compounds have in common is that they consist of three stems.

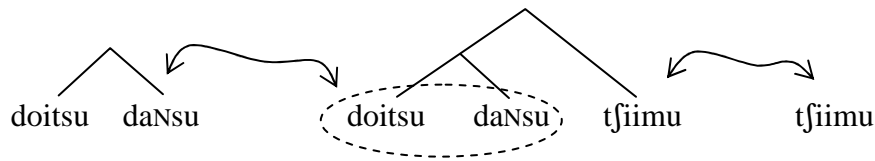
I argue, therefore, that a complex compound can be prosodically divided not because its morphological structures are marked but simply because it is too long to form a single prosodic word. This view can explain the above two variations in prosodic division in a unified way. One problem that must be solved with this approach is the asymmetry between right-branching and left-branching structures: why is prosodic division blocked in the latter even though it consists of three stems?

To solve this problem, I propose that the division in complex compounds is governed by OO correspondence between two morphologically related compounds. As demonstrated in the previous section, a complex compound has an OO correspondence relation with its base word, whose input representation is identical to that of the complex compound. The following shows the OO correspondence relations that are involved with a right-branching complex compound, *doistu-daNsU-tʃiimu* “dance team from Germany,” and its output base words:



This complex compound can be realized as a single prosodic word [doitsu-daNsU-tʃiimu] or two prosodic words [doitsu][daNsU-tʃiimu], as shown in (61). It should be noted that this prosodic division does not interfere with the above OO identity; rather, it is in accordance with the prosodic structures of the base words. However, the situation is different for a left-branching compound. The following shows OO correspondence involved with a left-branching complex compound, *doistu-daNsU-tʃiimu* “team of German dance,” and its base words:

(67)



In this type of complex compounding, prosodic division like *[doitsu][daNs'u-tʃiimu] is ungrammatical, as shown in (62). In this case, such prosodic division is against the OO identity: a prosodically continuous sequence in the base compound, *doitsu-daNs'u*, is broken in the complex compound. This difference between right-branching and left-branching structures in the OO identity accounts for the variation in prosodic division.

The above argument suggests that in our OT account, at least two new constraints, which conflict with each other over the prosodic division in compounding, are necessary. One is a markedness constraint, which incurs division in a long prosodic word, and the other is an OO correspondence constraint, which requires an identical prosodic structure between components of a complex compound and its output base words.

Let us examine first the motivating constraint. According to OT, any structure at the output level is marked to some extent (Prince & Smolensky 1993). This view holds true for the prosodic structure of a word. We have already examined *STRUC[ω], which uniformly prohibits the existence of a prosodic word without examining its internal structure. Note that this constraint cannot be a motivating constraint for prosodic division in complex compounding because it involves an extra prosodic word, which adds another violation to this constraint. In addition to this constraint, I propose a set of markedness constraints that limit the length of a prosodic word. Consider the following constraint scheme:

(68) **PW**< $n\mu$ >: A prosodic word is shorter than n morae ($n \in \mathbb{N}$).

This scheme generates constraints that require an output form shorter than a particular length. From this scheme, we can obtain the following constraint hierarchy:

(69) ... >> **PW**< 10μ > >> **PW**< 9μ > >> **PW**< 8μ > >> **PW**< 7μ > >> **PW**< 6μ > >> ...

This hierarchy favors a shorter prosodic word at the output level. The actual limitation with the prosodic word is determined by conflicts between this hierarchy and other constraints. It should be noted that these constraints are not sensitive to the

morphological structure of the output forms: they examine phonological length of candidates without regard to their internal morphological structure.

Roughly speaking, the division of a prosodic word in Japanese complex compounding is possible when it contains seven morae or more, as illustrated in 2.5.6.⁶⁶ This fact can be accounted for by a constraint ranking, in which *STRUC[ω], which disfavors prosodic division, is dominated by PW<7μ and the higher constraints in (69); however, it crucially dominates PW<6μ and the lower constraints. The following tableau illustrates how this ranking incurs the prosodic division in a right-branching complex compound:

(70) CC: *doitsu-daNs-u-tʃiimu* “dance team from Germany”

Input: { /tʃiimu/ _H /daNs/ } _H /doitsu/ }	PW<7μ	*STRUC[ω]	PW<6μ
O-Base: [daNs-u-tʃiimu]			
a. [doitsu-daNs-u-tʃiimu]	*!	*	*
→b. [doitsu][daNs-u-tʃiimu]		**	*
✘ c. [doitsu-daNs][tʃiimu]		**	*
d. [doitsu][daNs][tʃiimu]		***!	

Candidate (70a), which forms a single prosodic word from three stems, fatally violates PW<7μ because it contains nine morae. The correct output (70b) satisfies this constraint in dividing prosodic words. Candidate (70d) also satisfies this constraint, but is excluded because of excessive prosodic division, which fatally violates *STRUC[ω]. Candidate (70c) is also ungrammatical, but it is incorrectly singled out as the winner; this constraint ranking cannot distinguish the correct output (70b) from (70d). Therefore, this incorrect candidate will be eliminated by another constraint. I will argue this issue below.

Almost every right-branching complex compound exhibits optionality in prosodic division when it contains seven or more morae, as illustrated in (65). This prosodic variety is accounted for by assuming that the hierarchy between PW<nμ constraints higher than PW<6μ in (69) and *STRUC[ω] is not fixed and that they can

⁶⁶ In fact, it is not clear which of the constraints in (69) is the most crucial in Japanese because, besides the length of words, the prosodic division of compounds is affected by various aspects, such as semantic relations among components, the familiarity of compounds, and the ER classification. It is probably true that several of the constraints in (69) interact with other constraints governing these factors. Moreover, the optionality of this phenomenon hinders detailed analysis. For these reasons, I wish to leave a close analysis of this point to future investigation.

freely form various rankings. For example, when ***STRUC[ω]** is ranked between **PW<10 μ** and **PW<9 μ** , prosodic division in a compound consisting of nine or fewer morae is blocked, as demonstrated in the following tableau:

(71) CC: *doitsu-daNs-u-tfiimu* “dance team from Germany”

Input: { /tʃiimu/ _H /daNs <u>u</u> / _H /doitsu/ }	*STRUC[ω]	PW<9μ
O-Base: [daNs <u>u</u> -tʃiimu]		
→a. [doitsu-daNs <u>u</u> -tʃiimu]	*	*
b. [doitsu][daNs <u>u</u> -tʃiimu]	**!	
c. [doitsu-daNs <u>u</u>][tʃiimu]	**!	
d. [doitsu][daNs <u>u</u>][tʃiimu]	**!*	

Two possible constraint rankings in (70) and (71) yield two possible optimal outputs, (70b) and (71a), from the identical input set. In the same fashion, if ***STRUC[ω]** dominates all **PW<n μ** constraints, prosodic division is not allowed however long the complex compound is.

Now, let us turn our attention to the cases in which prosodic division is never grammatical. As illustrated in (67), this morphophonological operation is blocked by OO identity between a complex compound and its base compound: a continuous prosodic sequence in the base compound must also be retained in the complex compound. I assert that **CONTIGUITY-OO**, which we introduced into the argument in 3.3.3, is also crucial to this issue. I provide an explanation of this correspondence constraint again below:

(72) **CONTIGUITY:**

The portion of S_1 standing in correspondence forms a contiguous string, as does the correspondent portion of S_2 .

The OO version of this correspondence constraint requires that two related output structures share the same contiguous segmental relation. It is violated when two contiguous segments in one structure are separated in the corresponding structure. I pointed out above that a difference in morpheme order between two compounds that stand in OO correspondence triggers a violation of this constraint.

I claim that prosodic division in a compound may also trigger a violation of **CONTIGUITY-OO**. When prosodic division takes place in a compound, each of the components forms an independent prosodic structure. In such a case, the two prosodic

words cannot be regarded as a contiguous string because their phonological structures are disconnected. In other words, two such prosodic words are completely independent of each other in phonology even though they morphologically form a single structure. Therefore, when two structures stand in OO correspondence relation and prosodic division takes place in one but not in the other, **CONTIGUITY-OO** is violated.

We relegated **CONTIGUITY-OO** to the lowest rank in the above argument because there was no evidence for ranking this constraint. Now, we have obtained the evidence for it: to block prosodic division, this OO correspondence constraint must outrank **PW<7 μ** and higher constraints, which incur the prosodic division, as in (73):

(73) **CONTIGUITY-OO** >> **PW<n μ (n \geq 7)** >> ***STRUC[ω]** >> **PW<n μ (n<7)**

This constraint ranking correctly rules out ungrammatical prosodic division in a right-branching compound, which we left unsolved in (70), as demonstrated below:

(74) CC: *doitsu-daNsU-tʃiimu* “dance team from Germany”

Input: { {/tʃiimu/ _H /daNsU/} _H /doitsu/ }	CONTIGUITY	PW<nμ	*STRUC[ω]
O-Base: [daNsU-tʃiimu]	-OO	(n \geq 7)	
→a. [doitsu][daNsU-tʃiimu]			**
b. [doitsu-daNsU][tʃiimu]	*!		**

Candidates (74a) and (74b) are identical, respectively, to (70b) and (70c). Candidate (74a) satisfies **CONTIGUITY-OO** because every contiguous relationship in the base words is retained. On the other hand, (74b) fatally incurs a violation of this constraint because a contiguous string in the base compound [daNsU-tʃiimu] is phonologically divided in this candidate. Consequently, (74a) is singled out as the optimal output.

Let us now move on to a left-branching compound. As illustrated above, no prosodic division is allowed in this type of compound. Consider the following tableau, which evaluates a left-branching compound under the constraint ranking (73):

(75) CC: *doitsu-daNsu-tfiimu* “team of German dance”

Input: {/tʃiimu/ _H ,{/daNsʊ/ _H /doitsu/}}	CONTIGUITY	PW<n_μ	*STRUC[ω]
O-Base: [doitsu-daNsʊ]	-OO	(n≥7)	
← a. [doitsu-daNsʊ-tʃiimu]		*!	*
b. [doitsu][daNsʊ-tʃiimu]	*!		**
☞ c. [doitsu-daNsʊ][tʃiimu]			**

Candidate (75b), whose surface structure is identical to (74a), fatally violates **CONTIGUITY-OO** because the contiguous sequence in the base compound *doitsu-daNsʊ* is divided in this candidate. The intended winner is (75a), in which the three underlying stems are realized within a single prosodic word. However, this candidate is incorrectly defeated by (75c), whose surface structure is identical to (74b). Note that (75c) satisfies **CONTIGUITY-OO** because the two prosodic words in this candidate agree with the base words of this compound.

I wish to point out that the ungrammaticality of (75c) is caused by the fact that although the third morpheme, *tʃiimu*, is the head of this compound, its phonological structure is realized as though it were a simple word. That is to say, the head component of this compound is phonologically identical to the corresponding monomorphemic base word *tʃiimu*. This identity between the head morpheme and the base word is phonologically favorable: this candidate fully satisfies all OO correspondence constraints, which require phonological identity between the two corresponding output structures. At the same time, it is morphologically problematic because the morphological headedness of the compound, which the third morpheme receives as input information, is not represented in its phonological structure at the output level.

Within the OT framework, Kurisu (2003) proposed the constraint **REALIZE-MORPHEME**, which requires that every single morpheme in underlying representation receives some phonological realization. Kurisu’s original formulation of this constraint is shown below:

(76) **REALIZE-MORPHEME(RM)**:

Let α be a morphological form, β be a morphosyntactic category, and $F(\alpha)$ be the phonological form from which $F(\alpha+\beta)$ is derived to express a morphosyntactic category β . Then **RM** is satisfied with respect to β iff $F(\alpha+\beta) \neq F(\alpha)$ phonologically.

In proposing this constraint, Kurisu analyzed various phonological phenomena in

concatenative and nonconcatenative morphology in a unified way.

This constraint is also crucial in compounding. I suggest that the headedness specification in compounding should be one of the morphosyntactic categories in Kurisu’s proposal, and it is therefore also a target of this morphology-phonology interface constraint. Therefore, **RM** requires that the head stem of a compound be phonologically different from its corresponding base word, which is not the head of a compound.⁶⁷ In other words, the head stem of a compound must contain some phonological evidence for “being the head.” In compounding, this requirement of **RM** is generally satisfied by concatenation between the head stem and other component of a compound, as demonstrated below:

(77) **RM** in compounding

Input: {/X/, /Y/ _H }	RM
a. [X][Y]	*!
→b. [XY]	

In candidate (77a), the output structure of the head stem, /Y/, is phonologically identical to its corresponding base word, [Y], although it has the head specification of a compound. In such a case, **RM** is violated because the head specification receives no phonological indication at the output level. This candidate is defeated by (77b), which satisfies **RM** concatenating the head stem to the non-head component. As a consequence, this morpheme motivates prosodic concatenation in simple compounding.⁶⁸

I maintain that in the constraint ranking of Japanese, **RM** dominates all **PW<nμ** constraints, which motivate prosodic division in a complex compound, as shown below:

(78) **RM, CONTIGUITY-OO** >> **PW<nμ** (n≥7) >> ***STRUC[ω]** >> **PW<nμ** (n<7)

This constraint ranking correctly identifies the optimal output in a left-branching compound, which never undergoes prosodic division, as demonstrated in the following tableau:

⁶⁷ A “base word” in this argument corresponds to a “bare stem” in Kurisu’s terminology.

⁶⁸ However, this constraint cannot promote prosodic concatenation in a right-branching complex compound. Therefore, ***STRUC[ω]**, which I introduced as a motivating constraint of prosodic concatenation, is still necessary.

(79) CC: *doitsu-daNs-u-tʃiimu* “team of German dance”

Input: {/tʃiimu/ _H ,{/daNs/ _H /doitsu/}}	RM	CONTIGUITY	PW<7μ	*STRUC[ω]
O-Base: [doitsu-daNs]		-OO		
→a. [doitsu-daNs-u-tʃiimu]			*	*
b. [doitsu][daNs-u-tʃiimu]		*!		**
c. [doitsu-daNs][tʃiimu]	*!			**

This tableau is a renewed version of (75). Candidate (79c), which is incorrectly selected as the optimal output in (75), violates **RM** because its head morpheme is phonologically identical to its base word at the output level. Since this violation is fatal, candidate (79a), whose head morpheme is concatenated with the non-head component, is consequently selected as the optimal output.

It should be noted that **RM** does not block prosodic division in a right-branching compound. Consider the following tableau, which evaluates a right-branching compound, *doitsu-daNs-u-tʃiimu* “dance team from Germany”:

(80)CC: *doitsu-daNs-u-tʃiimu* “dance team from Germany”

Input: {{/tʃiimu/ _H /daNs/ _H /doitsu/}	RM	CONTIGUITY	PW<7μ	*STRUC[ω]
O-Base: [daNs-u-tʃiimu]		-OO		
a. [doitsu-daNs-u-tʃiimu]			*!	*
→b. [doitsu][daNs-u-tʃiimu]				**
c. [doitsu-daNs][tʃiimu]	*!	*		**
d. [doitsu][daNs][tʃiimu]	*!*	*		***

Candidates (80a) and (80b) satisfy **RM** because the phonological realization of their head stems, /tʃiimu/ and /daNs/, is phonologically different from their monomorphemic base words, which are concatenated. On the other hand, **RM** penalizes candidates (80c) and (80d): their head stems are phonologically identical to the base words. As a result, (80a) wins.

Constraint ranking (78) also correctly accounts for the optional prosodic division in a complex compound that contains a dvandva structure, which Ito & Mester’s **ANCHOR-L** approach incorrectly blocks. Consider the following tableau:

(81)CC: *rooma-pari-doomee* “Rome-Paris alliance”

Input: {/doomee/ _H , {/rooma/,/pari/}} ⁶⁹ O-Base:	RM	CONTIGUITY -OO	PW<7μ	*STRUC[ω]
a. [rooma-pari-doomee]			*!	*
→b. [rooma][pari-doomee]				**
c. [rooma-pari][doomee]	*!			**
d. [rooma][pari][doomee]				***!

The important point is that **CONTIGUITY-OO**, which plays a significant role to block ungrammatical prosodic division in a left-branching compound as in (79), is vacuously satisfied by all candidates in this output selection because the non-head component **rooma-pari* cannot independently exist as a simple dvandva compound. Therefore, the prosodic division between the two non-head stems is licensed as in (81b). As in the case of the compound with right-branching structure illustrated in (71), the optionality of the prosodic division is guaranteed by variation in constraint ranking: if ***STRUC[ω]** dominates **PW<9μ**, candidate (81a) is selected as an optimal output.

RM also guarantees that a simple compound never undergoes prosodic division however long it may be. Constraint ranking (78) can provide a correct account of this blockage. Consider the following tableau, which evaluates a relatively long simple compound *oosutoraria-tairiku* “the Australian continent”:

(82) NC: *oosutoraria-tairiku* “the Australian continent”

Input: {/tairiku/ _H , /oosutoraria/}	RM	PW<11μ
→a. [oosutoraria-tairiku]		*
b. [oosutoraria][tairiku]	*!	

Since candidate (82a) contains 11 morae within a single prosodic word, it violates **PW<11μ** and its lower counterparts. This violation is, however, tolerated because (82b), in which prosodic division takes place to satisfy **PW<11μ**, fatally violates **RM**, which crucially dominates all **PW<nμ** constraints. As a result, (82a) wins. In this way, prosodic division in a long simple compound is uniformly blocked.

Thus far, we have examined several cases in which prosodic division is blocked to satisfy **RM**. However, **RM** is not inviolable in Japanese: it can be violated in dvandva

⁶⁹ Output forms [pari-rooma-doomee]~[pari][rooma-doomee] are also derived from this input. However, I omit this variation of surface structure for the sake of simplicity.

compounding. As argued in 3.3.1, Loanwords and Sino-Japanese words are prohibited from forming a dvandva structure in simple compounding. This fact suggests that **HEAD-RIGHT** for these ER classes, which militates against a double-head structure, dominates **RM**, as shown below:

(83) **HEAD-RIGHT-L, HEAD-RIGHT-SJ** >> **RM** >> ***STRUC[ω]** >> **HEAD-RIGHT-Y**

The following tableau demonstrates that a dvandva compound in the Loanword class is never formed in simple compounding:

(84) DVD: **pan-raisu, *raisu-paN* “bread and rice”

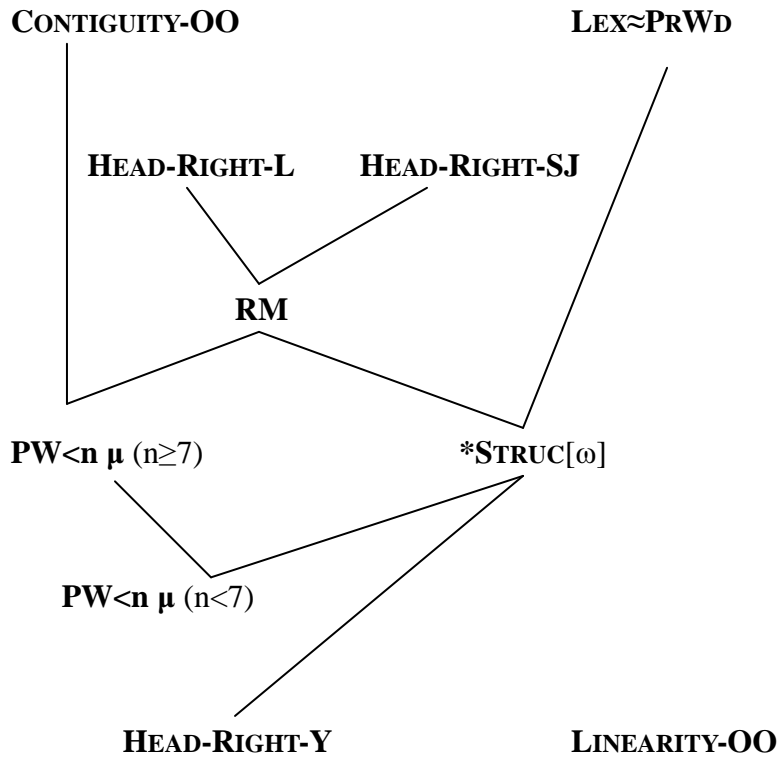
Input: {/paN/ _H , /raisu/ _H }	HEAD-RIGHT-L	RM	*STRUC[ω]
a. [pan-raisu]	*!		*
b. [raisu-paN]	*!		*
→c. [pan][raisu]		**	**
→d. [raisu][paN]		**	**

Candidates (84a) and (84b), which form dvandva compounds, fatally violate **HEAD-RIGHT-L**. Conversely, candidates (84c) and (84d) violate **RM** twice because the two head stems are realized as simple words. However, these violations are tolerated because they are necessary to satisfy **HEAD-RIGHT-L**, and they are selected as optimal winners. This result shows that Loanword dvandva compounds never appear at the surface level. Sino-Japanese dvandva compounds are also ruled out by **HEAD-RIGHT-SJ** in the same fashion.

3.5 Summary

This chapter has demonstrated a mechanism that governs prosodic concatenation and the surface morpheme order of Japanese compounds within the framework of OT. The morphophonological variations in Japanese compounding are correctly explained by the interaction of universal constraints. The following scheme is an overview of the hierarchy among constraints, which we have examined in this chapter:

(85)



Note that the hierarchy between **PW<nμ** ($n \geq 7$) and ***STRUC[ω]** is not fixed and therefore variations in constraint ranking emerge, as argued above. This variation causes the optionality in prosodic division in complex compounding. The ranking of **LINEARITY-OO** is not crucial to the argument of this chapter; **LINEARITY-OO** correctly works anywhere in the ranking.

I chiefly illustrated that, with the alignment constraint for the morphological head **HEAD-RIGHT**, two correspondence constraints, **LINEARITY-OO** and **CONTIGUITY-OO**, play a significant role in deciding the surface morpheme order and the optional prosodic division of complex compounds. Although they are phonological correspondence constraints, which require identity between two phonological structures of relating outputs, they can control the morpheme order in complex compounds combining with OO correspondence relations. As I argued, the branching structure and linear order of morphemes in the input representation of a compound are not essential. Instead, correct surface phonological structure is derived from morphological headedness specification and the OO correspondence relations, which are independently necessary in morphophonological theory, through interaction of universal constraints.

In addition, it was demonstrated that the relativization of **HEAD-RIGHT** to the three ER classes is necessary to correctly explain the variation between dvandva compounding, which heavily depends the ER classification, and normal compounding. Interacting with other constraints, **RM** can correctly control the optionality of prosodic division in complex compounding.

Chapter 4

Morphophonological Variety of Japanese Compounding in OT

4.1 Introduction

In this chapter, I will give a theoretical account of the morphophonological variety in Japanese compounding, which was reviewed in Chapter 2, within the framework of Optimality Theory (OT; Prince & Smolensky 1993, McCarthy & Prince 1995), focusing mainly on the application of *rendaku* and compound accentuation. It will be revealed that these two morphophonological operations shed light on the morphophonological mechanism of Japanese compounding, in which multi-dimensional correspondence relations play a crucial role (McCarthy & Prince 1995, Benua 1997, Spaelti 1997, Struijke 1998).

4.1.1 Correspondence Relations in Compounding

As seen in Chapter 2, Japanese compounding exhibits various morphophonological variations. I claim that a majority of such variations are derived from differences in correspondence relations. We have already examined the workings of correspondence relations and constraints based on them in Japanese phonology and morphophonology. The phonological variety among the etymological reflex (ER) classes is accounted for by the input-output (IO) correspondence relations, which are relativized to each of the classes, as argued in 1.4.4. As demonstrated in Chapter 3, the output-output (OO) correspondence relations are crucial in the formation of complex compounds. This chapter further investigates how such relations derive from morphophonological variations in Japanese compounding. Especially, I propose that not only IO correspondence but also OO correspondence should be relativized to two classes to give a correct account of the base effect that derives several morphophonological variations in Japanese compounding. In addition to the two correspondence relations, base-reduplicant (BR) correspondence interacts with other constraints in reduplication. It will be shown that Japanese morphology provides important evidence for the theoretical model of reduplication.

4.1.1.1 Relativization of OO Correspondence

I propose that the morphophonological variations among Japanese compounding patterns largely depend on OO correspondence relations, which are relativized to two classes. These two classes, which I will call OO class I and OO class II, vary in the strength of the OO correspondence relation. OO class I exhibits strong OO

correspondence, whereas OO class II exhibits weak OO correspondence. These relations are established independently of the ER classification, and a speaker must therefore learn to which of the two classes a stem is attached from its morphophonological behavior.⁷⁰ The idea of relativization of OO correspondence is not new. Benua (1998) originally proposed relativization of OO correspondence relations to explain several morphophonological variations. For example, Benua assumed two correspondence relations for English affixes to explain the famous variation between class 1 and class 2 affixes.

The hierarchy relation between the two constraints is fixed: an OO constraint for OO class I, which exhibits a stronger OO identity, always dominates that for OO class II, as expressed below:

- (1) **FAITH-OO-I >> FAITH-OO-II**

When a constraint that triggers morphophonological alternation is sandwiched between the two OO constraints, as shown below, a morphophonological variation emerges:

- (2) **FAITH-OO-I >> C₁ >> FAITH-OO-II**

Under this constraint ranking, whereas the morphophonological operation motivated by C₁ is suppressed in OO class I, it is permitted in OO class II if no other constraint blocks it.

I propose that the default value in correspondence relations is the one that relates to the highest-ranked constraint. Therefore, for OO correspondence in Japanese, OO class I serves as the default class; when there is no evidence for OO correspondence classification, the class I specification is automatically given to a stem or larger morphological constituent as a default specification if it is necessary to evaluate the output candidates. This default specification is especially crucial when a derived word is involved in compounding. A derived word, which is not stored in the lexicon and has no lexical specification, automatically receives the OO class I specification when this information is required in some morphophonological operation. This default value for OO correspondence classification represents a conservative tendency of the phonological grammar: it attempts to preserve the original structure of input structure as much as possible when the morpheme is unfamiliar to a speaker, and drastic

⁷⁰ However, as we will see later, differences in the classification may be ignored by higher-ranked IO correspondence constraints.

phonological alternations are allowed only in the familiar vocabulary; e.g., nonce words lack any specifications in terms of the lexical category and often behave similarly to Loanword items, which constitute the phonologically least-restricted class in Japanese.⁷¹ In the following sections, I will demonstrate the accuracy of this proposal by analyzing the application of rendaku and accentuation in Japanese compounding.

4.2 Rendaku Variation

Let us turn our attention to a theoretical account of morphophonological phenomena in Japanese compounding. In this section, I analyze the application and blocking of rendaku in Japanese compounding within the framework of OT.

Before presenting an OT account of the rendaku phenomenon, let us review how the ER classification and compounding patterns are related to this morphophonological operation. The following table summarizes the applicability of rendaku in the four compounding patterns in the three ER classes:

(3) applicability of rendaku

	NC	DVD	IP-RDP	M-RDP
Yamato	possible	impossible	possible	impossible
Sino-Japanese	possible	NA	NA	NA
Loanwords	impossible	NA	NA	impossible

It should be noted that “possible” in this table does not signify that rendaku always takes place but that the concerned class and pattern do not block its application. As argued in Chapter 2, the application of rendaku is blocked by various linguistic factors other than the ER classification and the patterns of compounding. However, “impossible” means that the rendaku application is always blocked—even if its phonological and other morphological conditions are satisfied—and “NA” indicates that the compounding pattern is impossible in the concerned class. The above table shows that dvandva compounding, mimetic reduplication, and the Loanword class are categorically excluded from the possible contexts and targets of this morphophonological operation.

⁷¹ It might be more reasonable to think that no Loanword item has lexical specification of the ER classification, while Sino-Japanese and Yamato items must lexically specify it. From this view, correspondence constraints for the Loanword class should be simply considered as default constraints.

In particular, I wish to emphasize the similarity between the Yamato and Sino-Japanese classes; in these ER classes, *rendaku* application is essentially possible. The only difference between the two is that intensive/plural reduplication, in which Yamato stems undergo *rendaku*, is morphologically prohibited in Sino-Japanese. As noted in Chapter 2, it is true that the great majority of *rendaku* undergoers are Yamato stems and most Sino-Japanese words are immune to *rendaku*. However, I claim that this quantitative difference can be ignored when we compare the Yamato and Sino-Japanese classes with the Loanword class: this morphophonological operation is never grammatical in Loanword compounding. In this dissertation, I focus more on the qualitative difference between the Loanword class and the other two classes than the quantitative difference between the Sino-Japanese and Yamato class.

Rendaku does not always occur—even when the ER class and compounding pattern allow it, as was examined in Chapter 2. The application of this operation is blocked by various linguistic factors. Let us briefly review when this morphological operation is blocked. I classify seven factors of *rendaku* blocking, as follows.

(i) phonological context:

Rendaku requires some phonological context for its operation. *Rendaku* is a voicing operation on obstruents, and it therefore takes place only when the first segment of the second component of a compound is a voiceless obstruent. Otherwise, no voicing realization occurs:

e.g., /kawa/ + /açiru/_H → [kawa-açiru], *[kawa-daçiru] “river duck”
 river duck

(ii) OCP effect on obstruent voicing (the Lyman’s Law effect):

A stem does not undergo *rendaku* when it underlyingly contains a voiced obstruent even when the first segment is a voiceless obstruent. This restriction is generally regarded as one of the OCP effects, which prohibit coincidence of identical structure (Lyman 1894, Ito & Mester 1998, 2003, Nishimura 2003, 2006):⁷²

e.g., /kawa/ + /tokage/_H → [kawa-tokage], *[kawa-dokage] “river lizard”
 river lizard

⁷² There are a few well-known exceptions to this restriction:

e.g., /nawa/ + /haŋigo/ → [nawa-baŋigo] “rope ladder”
 rope ladder

e.g., DVD: /ebi/_H + /kabi/_H → [ebi-kabi], *[ebi-gabi] “shrimp and crab”
 shrimp crab
 M-RDP: /ʃiwa/ + RED_H → [ʃiwa-ʃiwa], *[ʃiwa-ziwa] “wrinkled”
 wrinkle

(vii) morpho-syntactic context—object-verb compounding:

In verb-head compounds when the first component is the object of the head verb, the rendaku application is often blocked (Kawakami 1953, Sugioka 1984, Yamagushi 2011):⁷³

e.g., /kusa/ + /kari/ → [kusa-kari], *[kusa-gari] “mowing”
 grass cut

In the following sections, I will analyze these rendaku-blocking phenomena in terms of the following threefold grouping: in (i) and (ii), the application of rendaku is phonologically blocked; in (iii), (iv), and (v), the correspondence relations (McCarthy & Prince 1995, Benua 1998) play a crucial role; in (vi) and (vii), the morphological condition blocks the application of rendaku.

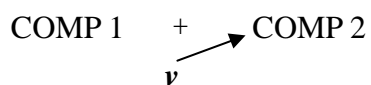
4.2.1 Rendaku Mechanism

In this section, I will examine the morphophonological mechanism of the rendaku phenomenon within the OT framework. The argument in this section essentially follows the “rendaku as a linking morpheme” approach of Ito & Mester (2003). They proposed that the source of rendaku voicing is a feature-size morpheme that is morphologically inserted between two components in compounding. This morpheme should be considered a prefix that marks the head component, as shown in (4), in which the linking morpheme is indicated by “v”:

⁷³ There are quite a few exceptions to this tendency:

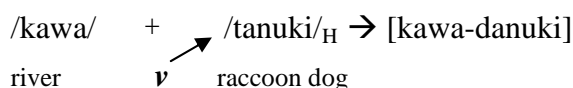
e.g., /mazo/ + /kari/ → [mazo-gari] “witch hunting”
 witch hunting

(4) linking morpheme insertion in compounding:



This linking morpheme phonologically consists of a [+voice] feature, and it is realized in a rendaku-voicing phenomenon. A concrete example in a bimorphemic normal compound is shown below:

(5) rendaku in *kawa-danuki* “river raccoon dog”:



The first segment of a Yamato stem /tanuki/, which is the head component in this compounding, is underlyingly voiceless, and it combines with the linking morpheme at the surface level. The first segment then receives a [+voice] feature and becomes voiced in the compound.

The insertion of the linking morpheme is morphologically governed: as Ito & Mester (2003) argue, the linking morpheme is inserted only when the two components in a compound exhibit a modifier-head relation. With this rule, Ito & Mester excluded dvandva compounding and object-verb compounding from the target of the linking morpheme insertion. I propose that in addition to these two patterns, the linking morpheme is not inserted in mimetic reduplication. As argued in 2.4.2, the head component in this pattern is not a free stem but a reduplicant (RED) morpheme, which does not contain any phonological representation, and there is no clear modifier-head relation between the two components. With this morphological rule, the rendaku-blocking effect in (vi) and (vii) above is explained: since the linking morpheme, which causes the voicing in rendaku, is not inserted between the two components, rendaku voicing does not occur.

Let us turn our attention to the OT analysis. To guarantee the realization of the linking morpheme “*v*,” a faithfulness constraint for feature specification is necessary.⁷⁴

⁷⁴ Ito & Mester (2003) originally assumed that **REALIZE-MORPHEME (RM)** guarantees the voicing realization of the linking morpheme. However, as argued in 3.4, **RM** requires that a morpheme only has some phonetic realization. After all, we need a faithfulness constraint that guarantees realization of the voicing feature to explain the rendaku phenomenon.

Consider the following constraints:

(6) **MAX(IMALITY):**

Every element of S_1 has a correspondence in S_2 (McCarthy & Prince 1995).

MAX-IO(voice):

A [+voice] feature in input is realized in output (Lombardi 1995, LaMontagne & Rice 1995).

MAX(IMALITY) is a type of correspondence constraint and was originally proposed by McCarthy & Prince (1995) as a constraint against segmental deletion. Later, Lombardi (1995) and LaMontagne & Rice (1995) proposed to extend it to feature specifications. I claim that **MAX-IO(voice)** above motivates the realization of the linking morpheme in the rendaku operation. This constraint requires the linking morpheme to be realized somewhere in the output form. This constraint conflicts with another faithfulness constraint, **IDENT-IO(voice)**, shown below:

(7) **IDENT(ITY):**

Let α be a segment in S_1 and β be a correspondent of α in S_2 .

If α is [γ F], then β is [γ F].

(McCarthy & Prince 1995)

IDENT-IO(voice):

No voicing change in input-output mapping.

IDENT(ITY) is a type of correspondence constraint that penalizes featural change in a segment. **IDENT-IO(voice)** requires an output segment to be identical in voicing to its input counterpart. Therefore, this constraint is violated when the linking morpheme is realized as a [+voice] feature somewhere in the output. When **MAX-IO(voice)** dominates **IDENT-IO(voice)**, the linking morpheme is realized as a [+voice] feature in a segment at the output level, violating **IDENT-IO(voice)**. In constraint ranking of Japanese, **IDENT-IO(voice)** is relativized to the ER classes, as argued in 1.4.3. The location of the voicing realization in rendaku is governed by an alignment constraint that requires an affix to be realized as a prefix (McCarthy & Prince 1993). Consider the following:

(8) a. **ALIGN**(affix, L, stem, L):

The left edge of an affix coincides with the left edge of a stem.

b. **ALIGN**(ν , L, M head, L):

The left edge of the linking morpheme ν coincides with the left edge of the morphological head.

(8a) is a general alignment constraint for a prefix. This alignment constraint requires an affix to be realized in the initial position of the head component. (8b) is the specific version for the linking morpheme ν . When this constraint is dominant, the linking morpheme appears as voicing in the first segment of the head component in a compound.

I claim that the following constraint ranking explains the realization of the linking morpheme in a Yamato compound:

(9) **ALIGN**(ν , L, M head, L) >> **MAX-IO**(voice) >> **IDENT-IO**(voice)-Y

The following tableau shows how this constraint ranking correctly predicts the rendaku application in a normal Yamato compound, *kawa-danuki* “river raccoon dog,” under constraint ranking (9):

(10) NC: *kawa-danuki* “river raccoon dog”

Input: {/tanuki/ _H , /kawa/, ν }	ALIGN-ν	MAX-IO (voice)	IDENT-IO (voice)-Y
a. kawa-tanuki		*!	
b. gawa-tanuki	*!		*
→c. kawa-danuki			*

Candidate (10a), in which rendaku does not occur, fatally violates **MAX-IO**(voice). In (10b) and (10c), the linking morpheme is realized as a voicing feature that violates **IDENT-IO**(voice) for the Yamato class. These two candidates are distinguished by **ALIGN- ν** ; whereas the former violates it, the latter satisfies it. Candidate (10c), which satisfies the two higher-ranked constraints, is singled out as the winner.

As summarized above, the application of rendaku is blocked by various factors. In such cases, **Max-IO**(voice) is violated since the voicing feature of the linking morpheme ν is not represented at the output level. In the following sections, I will provide an account of such rendaku-blocking effects in the OT framework.

4.2.2 Rendaku Blocking by Phonological Context

First, let us investigate cases where the phonological structure of the head stem in a compound blocks the application of rendaku. When the first segment of a target stem is not a voiceless obstruent, rendaku does not apply, and any other phonological operation that makes the rendaku application possible likewise does not occur. In such a case, the violation of **MAX-IO**(voice) is tolerated, and only concatenation of stems takes place through compounding. This suggests that rendaku is a moderate morphophonological operation that does not cause any structural change other than voicing.

Let us examine vowel-initial stems first. The following tableau demonstrates normal compounding whose head stem begins with a vowel:

(11) NC: *kawa-açiru* “river duck”

Input: {/açiru/ _H , /kawa/, <i>v</i> }	ALIGN-<i>v</i>	DEP-IO	MAX-IO (voice)	IDENT-IO (voice)- Y
→a. <i>kawa-açiru</i>			*	
b. <i>kawa-daçiru</i>		*!		
c. <i>kawa-abiru</i>	*!			*

Candidate (11a) violates **MAX-IO**(voice) because the linking morpheme does not have any realization at the output level. (11b) satisfies **MAX-IO**(voice), inserting an obstruent segment that is not contained in the input. This candidate, however, fatally violates **DEP-IO**, which prohibits segmental epenthesis as demonstrated in 1.3.2. As in (11c), realization of the linking morpheme in a word-internal segment is also impossible because this candidate fatally violates **ALIGN-*v***. It should be noted that (11a) vacuously satisfies **ALIGN-*v*** since this feature morpheme is deleted in the output form. As a result, (11a) defeats the other candidates and is selected as the optimal output.

A stem-initial voiced obstruent also intervenes in this morphophonological operation. As with a vowel-initial stem, only concatenation applies to a stem that begins with a voiced obstruent through compounding, as demonstrated below:

(12) NC: *midori-gama* “green toad”

Input: {/gama/ _H , /midori/, <i>v</i> }	ALIGN- <i>v</i>	DEP-IO	MAX-IO (voice)	IDENT-IO (voice)-Y
→a. <i>midori-gama</i>			*	
b. <i>midori-kama</i>			*	*!

The head stem, *gama* “toad,” is a member of the Yamato class. Similar to (11a), (12a) wins even though it violates **MAX-IO**(voice). Any other operation, such as devoicing in (12b), is ungrammatical.⁷⁵

When the head stem begins with a sonorant segment, the situation is almost identical, as shown below:

(13) NC: *midori-neko* “green cat”

Input: {/neko/ _H , /midori/, <i>v</i> }	ALIGN- <i>v</i>	IDENT-IO (nasal)	MAX-IO (voice)	IDENT-IO (voice)-Y
→a. <i>midori-neko</i>			*	
b. <i>midori-deko</i>		*!		*
c. <i>midori-nego</i>	*!			

Candidate (13a), in which only stem concatenation occurs, defeats any other candidate that involves a phonological alternation, such as denasalization in (12b).

Another phonological incident that blocks rendaku application is the OCP effect in voiced obstruents. When the head component of a compound underlyingly contains a voiced obstruent, rendaku application is not possible—even when the first segment of a target stem is a voiceless obstruent. This rendaku-blocking effect is also known as Lyman’s Law after Lyman’s (1894) report. Within the OT framework, Ito & Mester (1998, 2003) proposed that the local conjunction of constraints (Smolensky 1995, 1997) correctly accounts for this phenomenon. They suggested a constraint that simply penalizes voicing on obstruents:

(14) **NO-D**: An obstruent is voiceless.

⁷⁵ Such a devoiced candidate is problematic in rendaku analysis with **REALIZE-MORPHEME**. Since this constraint requires only some phonological change in the output structure, it cannot distinguish voicing from devoicing. Therefore, in addition to this constraint, a constraint that favors voicing over devoicing is necessary.

This constraint represents the relative unmarkedness of voiceless obstruents compared with their voiced counterparts. Ito and Mester claimed that self-conjunction of this constraint is necessary to correctly account for the OCP effect in rendaku application:

(15) **No-D²m** (=No-D&mNo-D): No two voiced obstruents per morpheme domain.

This constraint is violated when **No-D** is violated twice by a single morpheme. This conjoined constraint conflicts with **Max-IO(voice)**, which requires realization of the linking morpheme, *v*, over the application of rendaku. Consider the following tableau, which shows rendaku blocking in the compound *kawa-tokage* “river lizard”:

(16) NC: *kawa-tokage* “river lizard”

{/tokage/ _H , /kawa/, <i>v</i> }	No-D²m	Max-IO (voice)	IDENT-IO (voice)- Y	No-D
→a. <i>kawa-tokage</i>		*		*
b. <i>kawa-dokage</i>	*!		*	**

The head component, *tokage*, is a Yamato stem that underlyingly contains a voiced obstruent. If rendaku takes place in this stem, as in candidate (16b), it violates the conjoined constraint **No-D²m** since the head stem contains two voiced obstruents at the output level. This candidate is defeated by candidate (16a), which does not undergo rendaku and therefore violates **Max-IO(voice)**.

4.2.3 Rendaku and Correspondence Relations

This section examines cases in which the application of rendaku is blocked by correspondence relations in compounding. In the previous chapter, I considered how OO correspondence plays a significant role in the formation of prosodic words in complex compounding. In this section, it will be shown that the three major correspondence relations—IO correspondence, OO correspondence, and BR correspondence—are crucial in the application and blocking of rendaku.

4.2.3.1 Rendaku Immune Class

Let us first examine cases in which IO correspondence blocks the application of rendaku. As illustrated in 2.2.4, Loanword stems never undergo rendaku. This morphophonological characteristic of Loanwords should be compared with the phonological characteristic of this class: it allows marked phonological structures that

are prohibited in the other classes. As we have seen in 1.4.2, this phonological characteristic is derived from the strong identity between input and output. It seems natural to assume that the rendaku-blocking effect is also derived from this requirement regarding phonological identity.

Within the OT framework, such categorical immunity to morphophonological operations is explained by the effect of an IO correspondence constraint; this correspondence constraint for the Loanword class crucially dominates **MAX-IO(voice)**, which triggers the rendaku application, as shown below:

(17) **IDENT-IO(voice)-L** >> **MAX-IO(voice)**

The following tableau shows how rendaku in *imo-keeki* “potato cake,” whose head component belongs to the Loanword class, is blocked under this constraint ranking:

(18) NC: *imo-keeki* “potato cake”

{ /keeki/H, /imo/, v }	IDENT-IO (voice)-L	MAX-IO (voice)
→a. imo-keeki		*
b. imo-geeki	*!	

The winning candidate (18a) violates **MAX-IO(voice)** since the voicing feature in the linking morpheme does not have any realization at the output level. However, this violation is tolerated because it is necessary to satisfy **IDENT-IO(voice)-L**, which is ranked higher than the rendaku trigger constraint. Candidate (18b), to which rendaku is applied, fatally violates **IDENT-IO(voice)-L** and is therefore rejected.

4.2.3.2 Rendaku Immune Stems

IO correspondence is not the only correspondence relation that can block rendaku voicing in compounding. OO correspondence can have a rendaku-blocking effect: it requires phonological identity between the component of a compound and its corresponding base word. As seen in 2.2.4, not all Yamato stems undergo rendaku even when the phonological and morphological conditions are satisfied: some Yamato stems show lexical immunity to this morphophonological operation in normal compounding (Rosen 2003, Nishimura 2007). Similarly, Sino-Japanese stems can also be classified into two groups in terms of their rendaku applicability. Whereas the majority of Sino-Japanese items resist rendaku voicing, quite a few undergo this

morphophonological operation, as illustrated in 2.2.4. I claim that these variations within each of the ER classes are derived from OO correspondence constraints that are relativized to the two groups.

The rendaku immunity of these Yamato and Sino-Japanese items should be distinguished from that of Loanword items. As noted in 2.4.4, the Loanword class is categorically excluded from the target of rendaku, which means that every Loanword stem is immune to rendaku voicing. This also holds true for the newly acquired Loanword vocabulary. Therefore, rendaku immunity can be understood as a phonological characteristic of the Loanword class rather than of each Loanword stem. Within the OT framework, this categorical immunity is accounted for by constraint ranking (17), in which the IO correspondence constraint for voicing dominates the constraint that triggers rendaku voicing, as demonstrated in 4.2.3.1. On the other hand, rendaku immunity in some Yamato and the majority of Sino-Japanese items is independent of the phonological characteristics of the items. Each of these two classes consists of rendaku-immune items and rendaku-undergoing items, and there is no significant phonological or morphological difference between the rendaku-immune and rendaku-undergoing items except for the immunity to rendaku. Therefore, morphophonological processes, such as the application of rendaku, should be distinguished from the ER classification, which regulates the “pure” phonological and morphological characteristics of each of the classes.

I claim that the relativization of OO correspondence, which I illustrated in 4.1.1.1, is necessary to explain this phonology-morphophonology disagreement. With this approach, all stems in Japanese belong to either OO class I or OO class II; OO class I consists of rendaku-immune stems, and OO class II of rendaku-undergoing stems. Since this OO classification is entirely independent of the ER classification, a speaker learns to which OO class a stem belongs by observing its morphophonological behavior. This approach has the advantage of separately capturing morphophonological operations from “pure” phonological phenomena. Whereas the possible phonological structure is licensed by IO correspondence, morphophonological operations are governed by OO correspondence. It should be noted that this classification for OO correspondence does not yield any systematic diversity in simple words because it only requires phonological identity between two morphologically related words.

In rendaku application, the following OO correspondence constraint plays a crucial role:

(19) **IDENT-OO(voice):**

Let α be a segment in output₁ and β be a correspondent of α in output₂, which shares an underlying representation with output₁.

If α is [γ voice], then β is [γ voice].

This OO correspondence constraint prohibits voicing disagreement between two morphologically related words. As claimed in 4.1.1.1, this constraint is relativized to OO class I and OO class II. The rendaku variation among the three ER classes is explained by the following constraint ranking:

(20) **IDENT-IO(voice)-L, IDENT-OO(voice)-I >> MAX-IO(voice)**
 >> **IDENT-OO(voice)-II, IDENT-IO(voice)-SJ >> IDENT-IO(voice)-Y**

This constraint ranking is a combined product of the IO correspondence hierarchy for the ER classes, which was examined in 1.4.3, and the OO correspondence hierarchy in (2), which yields morphophonological variety. Again, **MAX-IO(voice)** serves as a motivating constraint of rendaku voicing.

Let us first examine a rendaku-undergoing stem. The following tableau demonstrates rendaku application in a Yamato compound, *kawa-danuki* “river raccoon dog,” whose head stem, *tanuki* “raccoon dog,” is a member of the Yamato class and OO class II:

(21) NC: *kawa-danuki* “river raccoon dog”

Input{/tanuki/ _H , /kawa/, v}	IDENT-OO	MAX-IO	IDENT-OO	IDENT-IO
Base: [tanuki], [kawa] ⁷⁶	(voice)-I	(voice)	(voice)-II	(voice)-Y
a. kawa-tanuki	NA	*!		
b. →kawa-danuki	NA		*	*

As in the optimal candidate (21b), the violation of **IDENT-OO(voice)-II** is tolerated to satisfy **MAX-IO(voice)**, which requires realization of the linking morpheme *v*.

Conversely, when a head stem is a member of OO class I, which requires strong phonological identity between the head stem and its corresponding base word, rendaku voicing is blocked, as demonstrated below:

⁷⁶ In contrast to Chapter 3, in this chapter I show all O-bases of a compound in question.

(22) NC: *tabi-saki* “travel destination”

Input: {/saki/ _H , /tabi/, <i>v</i> }	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-Y
O-Base: [saki], [tabi]				
a. →tabi-saki		*	NA	
b. tabi-zaki	*!		NA	*

The head stem of this compound, *saki* “end,” is a member of the Yamato class and OO class I. In other words, it is a rendaku-immune Yamato stem. As with candidate (22b), the realization of the linking morpheme satisfies **MAX-IO**(voice), but it causes a fatal violation of **IDENT-OO**(voice)-I. The winning candidate is (22a), in which the linking morpheme does not achieve phonological realization. Consequently, the rendaku application in this compound is not licensed.

As noted in 1.4.2, the great majority of Sino-Japanese stems are lexicalized products of bimorphemic root conjunction. Since such stems are lexical items, they are able to possess OO class specification. Both rendaku application and blocking in such lexicalized Sino-Japanese words are accounted for in the same manner in this approach. Consider the following tableaux:

(23) NC: *kuruma-gaija* “car company”

Input: {/kaija/ _H , /kuruma/, <i>v</i> }	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-SJ
O-Base: [kaija], [kuruma]				
a. kuruma-kaija	NA	*!		
b. →kuruma-gaija	NA		*	*

(24) NC: *kuruma-fakai* “car society”

Input: {/fakai/ _H , /kuruma/, <i>v</i> }	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-SJ
O-Base: [fakai], [kuruma]				
a. →kuruma-fakai		*	NA	
b. kuruma-zakai	*!		NA	*

Whereas the Sino-Japanese stem *kaija* “company” in (23) is a member of OO class II, *fakai* “society” in (24) is a member of OO class I. This difference in the OO correspondence specification causes the variation in rendaku application: whereas this operation occurs in *kaija*, as in (23), it is ungrammatical in *fakai*, as in (24). The case of a Sino-Japanese word that is not lexicalized will be shown in 4.2.3.3 below.

As argued in 4.2.3.1, rendaku is blocked by IO correspondence in a compound whose head component is a Loanword stem. This holds true in the relativized OO approach. The effect of the OO correspondence constraint is overridden by the IO correspondence constraint for the Loanword class, which is ranked above the two OO correspondence constraints. Therefore, even if the head stem of a compound belongs to OO class II, rendaku is blocked by the IO constraint, as demonstrated below:

(25) NC: *imo-keeki* “potato cake”

Input{/keeki/H, /imo/, <i>v</i> }	IDENT-IO (voice)-L	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II
→a. imo-keeki		NA	*	
b. imo-geeki	*!	NA		*

Candidate (25a) violates **MAX-IO**(voice) because it does not have realization of the linking morpheme. However, the morpheme realization causes a fatal violation of **IDENT-IO**(voice)-L, as in (25b). As a result, (25a) is selected as the optimal output. This IO correspondence priority to OO correspondence categorically excludes the Loanword class from the target of rendaku application.

Let us conclude this section by comparing the relativized OO correspondence approach with an alternative approach to this morphophonological phenomenon, which I call the relativized IO correspondence approach. Following Takayama’s (1999, 2005) analysis, Ito & Mester (2006) argued that rendaku-undergoing Sino-Japanese words form an independent sublexical class that is separate from the normal (rendaku-immune) Sino-Japanese class. Ito & Mester explained the rendaku variation between the two classes by assuming that each of them is independently governed by a different set of IO correspondence constraints. Ito & Mester did not analyze rendaku-immune stems in the Yamato class, but it is natural to consider that this approach should be applied to rendaku variation in this class. At first glance, this approach would appear to be appropriate—at least descriptively—to the problem we are tackling. As argued above, the difference in the application of rendaku occurs when the two IO correspondence constraints for voicing sandwich a constraint that causes rendaku voicing in the constraint ranking of Japanese. In the same fashion, this approach can account for rendaku variation among Sino-Japanese words.

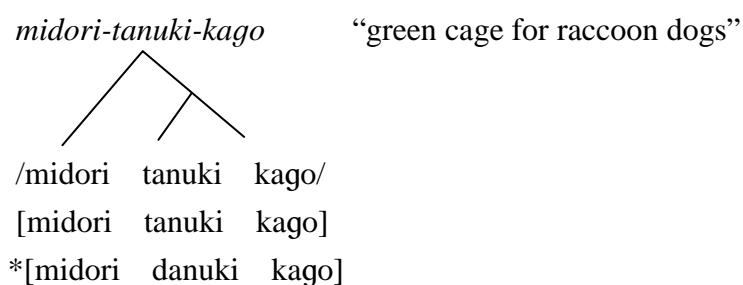
I claim, however, that this approach does not provide a plausible account of the entire lexical structure of Japanese. The striking fact is that except for the applicability

of rendaku, there is no significant phonological or morphological difference between the rendaku-immune and rendaku-undergoing stems in the Yamato and Sino-Japanese classes. As noted in Chapters 1 and 2, a lexical class generally behaves differently from other classes in several respects, such as phonological inventories, possible phonological processes, morpheme size, selection of epenthetic segments, and possible word formation, including compounding (see also McCawley 1968, Ito & Mester 1995ab, 1999, and many others). If rendaku-immune and rendaku-undergoing stems constitute different sublexical classes of the Japanese vocabulary, it naturally follows that they behave differently in respects other than the application of rendaku. However, there is no evidence for such differences in their phonological and morphological behaviors. Why do the two groups in the Yamato and Sino-Japanese classes lack any differences except for the application of rendaku? I believe it is impossible to answer this question in an explicit way under the relativized IO correspondence approach, except by ignoring the phonological and morphological identities between the rendaku-immune and rendaku-undergoing stems in Yamato and Sino-Japanese. Such a compromise solution lacks explanatory adequacy, and it is therefore difficult to accept. The relativized OO correspondence approach that I propose does not present such problems because morphophonological operations are explained separately from the classification of the lexicon, as argued above.

4.2.3.3. Rendaku in Complex Compounding

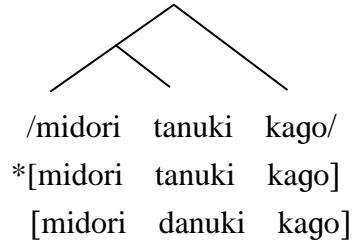
The relativized OO correspondence approach can also provide an accurate account of the morphophonological characteristics of complex compounds. As illustrated in 2.5.5, the applicability of rendaku in a complex compound depends on its morphological structure; whereas left-branching structure allows the application of rendaku, right-branching structure blocks it (Otsu 1980, Ito & Mester 1985, 2003). The following examples illustrate this asymmetry:

(26) a. right-branching compound:

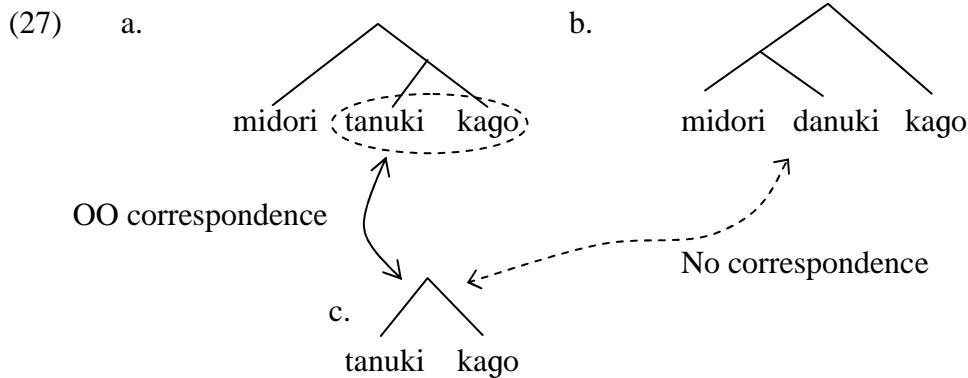


b. left-branching compound:

midori-danuki-kago “cage for green raccoon dogs”



In Nishimura (2007), revising the original proposal of Ito & Mester (2003), I claimed that the cause of the rendaku blocking in (26a) is the OO correspondence relation between the complex compound *midori-tanuki-kago* “green cage for raccoon dogs” and the base compound *tanuki-kago* “cage for raccoon dogs,” which is an independently existing simple compound. As argued in 3.3.3, the existence of this OO relation is guaranteed by the fact that the second component of the complex compound shares underlying representation with the base compound. However, a left-branching compound does not have such relation with the simple compound since the two do not share an underlying structure, except for their underlying stems. The following scheme presents this situation:



Of course, (27b) has an OO correspondence relation with its base compound, *midori-danuki* “green raccoon dog.” However, this OO correspondence does not interfere in the application of rendaku in the complex compound; rather, it confirms this voicing operation in the second stem.

As argued in 4.1.1.1, a derived word, including a compound, does not have lexical specification regarding the OO correspondence classification because it is not a lexical item; therefore, it automatically receives OO class I specification as the default value. The following tableau shows that the rendaku-blocking effect proceeds correctly

in a right-branching complex compound with the default OO specification:

(28) CC: *midori-tanuki-kago* “green cage for raccoon dogs”

Input: { /kago/ _H /tanuki/, ν } _H /midori/, ν }	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-Y
O-Base: [tanuki-kago], [midori], [tanuki], [kago]				
a. →midori-tanuki-kago		**		
b. midori-danuki-kago	*! (tanuki-kago)	*	* (tanuki)	*

Rendaku in the second stem, *tanuki*, is blocked by **IDENT-OO**(voice)-I. On the other hand, this voicing operation takes place in a left-branching complex compound, as demonstrated below:

(29) CC: *midori-danuki-kago* “cage for green raccoon dogs”

Input: { /kago/ _H , { /tanuki/ _H /midori/, ν }, ν }	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-Y
O-Base: [midori-danuki], [midori], [tanuki], [kago]				
a. midori-tanuki-kago	*! (midori-danuki)	**		
b. →midori-danuki-kago		*	* (tanuki)	*

In this case, **IDENT-OO**(voice)-I favors the application of rendaku, as it requires phonological identity with the base compound in which this operation occurs.

This approach also correctly predicts the rendaku-blocking effect in newly coined Sino-Japanese. As examined in 1.4, almost all Sino-Japanese morphemes can participate in bimorphemic root conjunction. With this word formation, a native speaker of Japanese can freely coin a new Sino-Japanese word. Such new words never undergo rendaku, although a Sino-Japanese word is a potential target of this morphophonological operation, as argued in 2.2.4 and 4.2.3.2. For example, a speaker can coin a new word, *tʃaʃi* “the history of tea,” with two Sino-Japanese morphemes /tʃa/ “tea” and /ʃi/ “history.” A speaker of Japanese knows that the application of rendaku to this word is ungrammatical when it appears as the head of a compound even though he or she has

never previously heard this bimorphemic word. This rendaku-blocking effect is explained in a similar way to that of a right-branching complex compound, demonstrated in (30). Consider the following tableau:

(30) NC: *kindai-tʃaʃi* “the modern history of tea”

Input: { /tʃa/, /ʃi/ } _H , /kindai/, <i>v</i> O-Base: [tʃaʃi], [kindai]	IDENT-OO (voice)- I	MAX-IO (voice)	IDENT-IO (voice)- SJ	IDENT-OO (voice)- II
→a. <i>kindai-tʃaʃi</i>		*		NA
b. <i>kindai-ʒaʃi</i>	*! (tʃaʃi)		*	NA

Since the head component in this compounding is not a lexical stem but a derived word, it does not have a lexical OO specification, and it therefore automatically receives the OO class I specification. As we have seen above, this default specification prefers the underapplication of rendaku; hence, candidate (30a) is selected as a grammatical form in this compounding.

In their final analysis, Ito & Mester (2003) rejected their OO correspondence approach; instead, they proposed the prosodic anchoring approach, in which rendaku and accentuation in complex compounds are governed by a self-conjoined constraint of a grammar-prosody interface constraint, **ANCHOR-L**. It has already been demonstrated in 3.4 that this approach is insufficient in providing a full account of the optional prosodic division in complex compounds.

Ito & Mester rejected the OO correspondence approach for two reasons. First, they believed that this approach would incorrectly block rendaku with rendaku-undergoing stems in simple compounds. This incorrect blocking occurs because Ito & Mester assumed only one type of OO correspondence relation, and this always interferes in the morphophonological operation. However, the proposal presented in this dissertation, which relativizes the OO correspondence into two groups, can correctly account for the variation between rendaku-undergoing and rendaku-immune words, as argued above.

The second reason for Ito & Mester rejecting the OO correspondence approach is the problem of the missing base. According to the authors, it is unclear how the existence of the base compound with which the component of a complex compound relates is guaranteed: a native speaker of Japanese can create a new right-branching

complex compound with the structure {A-*{B-C}*} and correctly predict the rendaku-blocking effect on B even though he or she has never uttered or heard the compound {B-C}. Ito & Mester regarded this missing-base situation as a serious problem for the OO correspondence approach: without knowledge of the base compound, the OO correspondence relation, which blocks the rendaku application, cannot be established. However, I wish to make it clear that such a situation does not raise any problems in the OO correspondence approach adopted in this dissertation. I claim that knowledge of the base word is provided by native speakers' strong productivity in compounding: this strong productivity makes it possible to create a new complex compound, and it also guarantees the potential existence of the base compound. Since compounding is basically a word-word concatenating operation, the component of a compound always has a corresponding base word.⁷⁷ With the OO correspondence approach presented in this study, once the existence of the base word is guaranteed, even when a speaker possesses no knowledge about the base, OO class I specification is automatically received and rendaku application is blocked.

4.2.3.4 Rendaku in Reduplication

This section examines the rendaku phenomenon in reduplication. The two patterns of Japanese reduplication show a clear contrast with this morphophonological operation: whereas rendaku application can occur in intensive/plural reduplication, it is ungrammatical in mimetic reduplication. In particular, rendaku always takes place if the phonological condition is satisfied in intensive/plural reduplication. Interestingly, even a rendaku-immune stem, which resists rendaku in normal compounding as examined in 4.2.3.2, undergoes rendaku in intensive/plural reduplication, as illustrated in 2.4.3.2. It will be shown that this morphophonological contrast between normal compounding and intensive/plural reduplication provides important evidence in investigating the morphophonological system of Japanese compounding.

In the OT analysis of reduplication, in addition to IO correspondence, BR correspondence, which is established between the base (R-base) and the RED morpheme, plays an essential role (McCarthy & Prince 1995).⁷⁸ Since a RED morpheme does not originally have any phonological structure, this must be provided at

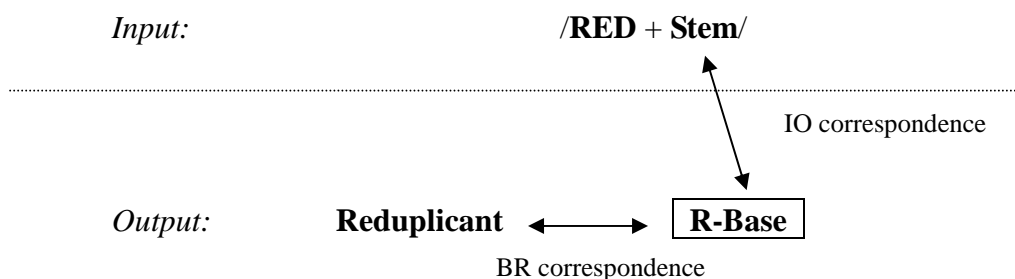
⁷⁷ The two reduplication patterns are not in agreement with this generalization. The rendaku application in these patterns will be examined in 4.2.3.4.

⁷⁸ Note that "the base" in BR correspondence is a different term from "the base word (O-base)" in OO correspondence: the former indicates the phonological source stem of the reduplicated compound concerned, whereas the latter indicates an independently existing word that is morphologically related to the compound in question. To clarify this difference, in this section I refer to the former as the "R-base" (reduplication base).

the output level; BR correspondence constraints require that a RED morpheme be phonologically identical to the corresponding R-base stem. McCarthy & Prince (1995) demonstrated that the interaction between the two types of correspondence constraints and markedness constraints that triggers phonological changes can correctly explain morphophonological variations among reduplications in many languages.

Investigation of reduplication has also motivated theoretical development of the IO correspondence relation. McCarthy & Prince (1995) originally proposed the following model of reduplication:

(31) basic model (McCarthy & Prince 1995)

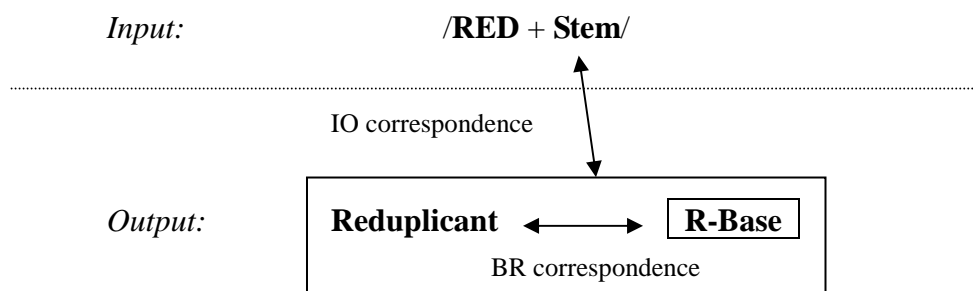


In this reduplication model, the IO correspondence relation is established between the stem, which is the phonological source of the reduplicated word, and the R-base, which is the morphological counterpart of the stem at the output level. The phonological identity between the R-base and the reduplicant is governed by the BR correspondence relation. According to this view, phonological realization of the stem is covered by the R-base and there is no direct correspondence between the stem and the reduplicant.⁷⁹ Therefore, an IO correspondence constraint is violated when there is phonological disagreement between the stem and the R-base. As we will see later, this model has a serious problem in dealing with rendaku application in Japanese reduplication.

An alternative model for correspondence in which the stem does not directly correspond with the R-base but with the whole reduplicated word has been proposed in several studies (Struijke 1997, 1998, Spaelti 1997, Raimy & Idsardi 1997, Yip 1998). The following scheme depicts this version of correspondence relations in reduplication:

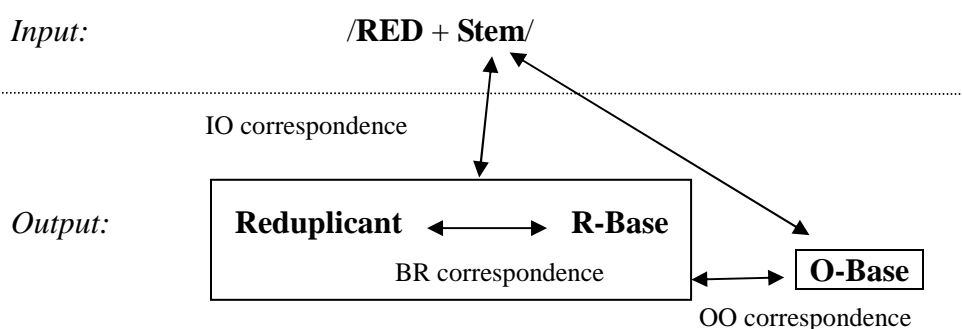
⁷⁹ McCarthy & Prince (1995) rejected the “full model,” in which the IO correspondence is established both between the stem and the R-base and between the stem and the reduplicant; they demonstrated that such a model incorrectly predicts a reduplication pattern that is not found in human languages.

(32) word faithfulness model (Struijke 1997, 1998)⁸⁰



In this model, the phonological realization of the stem is covered by both the R-base and the reduplicant; that is, the whole reduplicated word. Therefore, an IO correspondence constraint is satisfied if the structure in the stem is preserved either in the reduplicant or in the R-base; i.e., somewhere in the output form. As with the basic model, the phonological identity between the R-base and the reduplicant is guaranteed by the BR correspondence. I propose that the OO correspondence, which plays a crucial role in redaku application and blocking, should be understood in terms of the word faithfulness model; the O-base word corresponds to the whole reduplicated word, as illustrated below:

(33) word faithfulness model with OO correspondence



With this model, an OO correspondence constraint is satisfied if the phonological structure of the O-base is also found somewhere in the whole reduplicated word. These IO and OO correspondence structures give a stem two places for its phonological realization. This situation makes it possible for the two conflicting phonological

⁸⁰ Besides these correspondence relations, Struijke (1997, 1998) claims that there is an independent correspondence relationship between the stem and base to explain the phonological asymmetry between the base and reduplicant. Since this correspondence is not significant in Japanese reduplication, I omit it in this scheme.

requirements to be imposed on a rendaku-immune stem in intensive/plural reduplication; i.e., OO identity and rendaku voicing. Conversely, a stem in normal compounding has to put one of the two requirements before the other since a stem possesses only one output component in this compounding pattern: a rendaku-immune stem chooses the OO identity, whereas a rendaku-undergoing stem chooses rendaku voicing. Consequently, a morphophonological variation between intensive/plural reduplication and normal compounding emerges.

Let us examine how the reduplication model (33) correctly singles out the optimal output in Japanese reduplication within the OT framework. As we saw in 2.4, the two reduplication patterns in Japanese are total reduplication, and no change occurs except for rendaku voicing between the R-base and the reduplicant. This is explained by the fact that almost all BR correspondence constraints, such as **MAX-BR** and **DEP-BR**, which prohibit segmental deletion and epenthesis, respectively, are ranked so highly in constraint ranking in Japanese that they cannot be violated. Variations of **IDENT-BR**, which penalizes disagreement in feature specification between the R-base and the reduplicant, are also ranked highly, except for that of voicing, which is shown below:

(34) **IDENT-BR**(voice):

Let α be a segment in the base and β be a correspondent of α in the reduplicant.
If α is [γ voice], then β is [γ voice].

Rendaku application may cause a violation of this constraint. This constraint must be dominated by **IDENT-OO**(voice)-II, as shown below:

(35) **ALIGN**(ν , L, M head, L), **IDENT-OO**(voice)-I >> **MAX-IO**(voice)>>
IDENT-OO(voice)-II >> **IDENT-IO**(voice)-Y, **IDENT-BR**(voice)

Constraint ranking (35) can accurately account for the application of rendaku in intensive/plural reduplication and the underapplication in mimetic reduplication.

Let us first examine intensive/plural reduplication. Take the Yamato stem *çito* “person” as an example. This stem undergoes rendaku in normal compounding, as in *tabi-bito* “traveler,” and therefore, this stem is lexically specified as a member of OO class II. The following tableau shows how rendaku is applied to this stem in intensive/plural reduplication:⁸¹

⁸¹ In this and following tableaux in this section, I omit **ALIGN**(ν , L, M head, L), which is inviolable in Japanese, as space is limited. All candidates shown in the tableaux satisfy

(36) IP-RDP: *çito-bito* “people”

Input: {/çito/ _H , <i>v</i> , RED}	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-Y	IDENT-BR (voice)
a. çito-çito	NA	*!			
b. →çito-bito	NA				*
c. bito-bito	NA		*!	*	

Candidate (36a), in which rendaku does not take place, fatally violates **MAX-IO**(voice). The winning candidate is (36b), which undergoes rendaku, violating **IDENT-BR**(voice). This candidate satisfies both **IDENT-OO**(voice)-II and **IDENT-IO**(voice)-Y since the reduplicant (the first component) is identical to the input stem and the O-base. (36c), in which voicing occurs in both components, satisfies **IDENT-BR**(voice). However, this double rendaku application fatally violates **IDENT-OO**(voice)-II since the voicing value of the first segment of the O-base disagrees with its corresponding segment, both in the reduplicant and in the R-base. This ungrammatical candidate provides evidence of ranking between **IDENT-OO**(voice)-I and **IDENT-BR**(voice): if they were reversed, the double rendaku application would be grammatical.

I turn now to the fact that rendaku-immune stems undergo rendaku through intensive/plural reduplication, taking the rendaku-immune stem *saki* “end” as an example. Since this stem is a member of OO class I, as examined in (22) above, the application of rendaku is blocked in normal compounding, as in *tabi-saki* “travel destination.” However, it is grammatical in intensive/plural reduplication, as in *saki-zaki* “every destination.” The following tableau demonstrates how constraint ranking (35) correctly accounts for this phenomenon under the word faithfulness model (33):

(37) IP-RDP: *saki-zaki* “every destination”

Input: {/saki/ _H , <i>v</i> , RED}	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-Y	IDENT-BR (voice)
a. saki-saki		*!	NA		
b. →saki-zaki			NA		*
c. zaki-zaki	*!		NA	*	

this constraint. Note that this alignment constraint is not violated when the linking morpheme *v* is deleted at the output level; instead, **MAX-IO**(voice) is violated in such a case.

Candidate (37a), in which rendaku does not occur, fatally violates **MAX-IO(voice)** since the linking morpheme lacks phonological realization at the output level. The winning candidate is (37b), in which voicing takes place in the second component. This candidate satisfies both **IDENT-OO(voice)-I** and **IDENT-IO(voice)-Y** since the first component is identical to the input stem and the O-base. (37c) violates the two correspondence constraints because of the voicing for both components.

It should be noted that unlike the case for the word faithfulness model (33), the basic model (31) incorrectly blocks rendaku application to rendaku-immune stems in intensive/plural reduplication. The following tableau deals with the same input set as (37), but the candidate evaluation is conducted with the basic model:

(38) IP-RDP: **saki-saki* “every destination” with the basic model

Input: {/saki/ _H , v, RED} O-Base: [saki]	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-OO (voice)-II	IDENT-IO (voice)-Y	IDENT-BR (voice)
a. \emptyset saki-saki		*	NA		
b. \leftarrow saki-zaki	*!		NA	*	*
c. zaki-zaki	*!		NA	*	

The intended output is candidate (38b), but it is defeated by wrong output (38a), in which rendaku does not take place. The cause of the defeat is the ranking between **IDENT-OO(voice)-I** and **MAX-IO(voice)**: the OO correspondence constraint blocks the phonological realization of the linking morpheme in the same manner as in normal compounding, illustrated in tableau (22). Changing the ranking of the constraint cannot solve this problem: the intended form (38b) is harmonically bounded by (38c), in which voicing occurs in both components; therefore, (38b) never results in any constraint ranking with the basic model.

Finally, this section is concluded with an examination of mimetic reduplication, in which rendaku never occurs. In this reduplication pattern, rendaku does not take place simply because the linking morpheme is not morphologically inserted, as I claimed in 4.2.1. The following tableau demonstrates the ungrammaticality of rendaku application in this compounding pattern:

(39) M-RDP: *fiwa-fiwa* “wrinkled”

Input: {/fiwa/, RED _H }	IDENT-OO (voice)-I	MAX-IO (voice)	IDENT-IO (voice)-Y	IDENT-BR (voice)	IDENT-OO (voice)-II
→a. <i>fiwa-fiwa</i>	NA				
b. <i>fiwa-ziwa</i>	NA		*!	*	
c. <i>dziwa-ziwa</i>	NA		*!		*

Since the stem *fiwa* “wrinkle” undergoes rendaku in normal compounding, as in *kao-ziwa* “face wrinkle,” this Yamato stem belongs to OO class II. However, the OO classification of this stem is not significant at all here since the linking morpheme, which is the source of the rendaku voicing, is not provided in this pattern, as argued in 4.2.1. As a result, candidate (39a), which simply duplicates the base stem without rendaku voicing, is selected as the optimal output. This result is the same even if the stem is a member of OO class I because the winning candidate does not violate any correspondence constraint in this reduplication pattern.

4.3 Compound Accent Variation

Let us now turn to variation in Japanese compound accentuation. As shown in Chapter 2, Japanese compounds exhibit variation in terms of the base-accent effect: whereas the majority of stems follow the default compound accent rule, some stems hold the same accent location as the base word; this is identical to the lexical accent location of the stem when it appears as the head component of a compound. It will be shown that similar to what was found in the rendaku analysis above, OO correspondence between morphologically related words plays a crucial role in this morphophonological variation.

The analysis in this section does not cover the whole accentuation system of Japanese compounding. Since to investigate the fuller system of Japanese compound accentuation requires another dissertation, I want to focus on the variation of the base-accent effect in noun compounding. Additionally, the main target of the analysis will be limited to trimoraic or shorter stems to simplify the argument. As we have seen in 2.2.5, the length of the head component plays a significant role in compounding accentuation of this language. However, how the difference in the length of head components relates to Japanese compound accentuation is a question that I want to keep beyond the scope of this discussion. Since the mechanism of the variation of the base-accent effect, which I will develop in this section, is independent of this issue, it

can be applied to both compounding with short head components and that with long head components. For theoretical accounts of issues that I will not argue, refer to McCawley (1968, 1977), Tsujimura & Davis (1987), Poser (1990), Kubozono (1993, 1995), Tanaka (2005), and many others.

The base-accent effect is not found in every compounding pattern. The following table summarizes the relationship between the base-accent effect and the four compounding patterns:

(40) base-accent effect in Japanese compounding

NC	DVD	IP-RDP	M-RDP
Yes / the 2 nd comp.	Yes / the 1 st comp.	No	No

The base-accent effect is found in normal compounding and dvandva compounding. In mimetic reduplication and intensive/plural reduplication, there is no base-accent influence: the accentuation in these patterns is wholly uniform with few lexicalized exceptions. It should be noted that if there is a base-accent effect on accentuation, the head component of a compound is preserved, whereas the non-head component is never significant: in normal compounding, the head component is in the second position, whereas both components are heads in a dvandva compound.

It should also be noted that the base-accent effect in normal compounding and that in dvandva compounding are not wholly identical. The former exhibits lexical variation: in normal compounding, some stems are lexically specified to show the base-accent effect, and others follow the default-accent rule. However, the base-accent effect is almost always obligatory in dvandva compounding: the first component shares its accent with the base word if it has an original accent. The following sections show how this difference is derived from the difference in the morphological structure between the two compounding patterns.

4.3.1 Compound Accent Mechanism

First, let us briefly examine the basic mechanism of Japanese compound accentuation within the OT framework. As seen in Chapter 2, the majority of Japanese noun compounds follow the default-accent rule, which avoids accentuation on the final and penultimate morae. The following constraints are necessary to explain the accentuation in Japanese noun compounding (Kubozono 1997, Tanaka 2005):

- (41) **IDENT-IO**(head accent): The accent location in the output is identical to that of the head stem in the input.⁸²
- ***FINAL/μ'**: The accented mora is not final in the prosodic word.
- ***FINAL/σ'**: The accented syllable is not final in the prosodic word.
- ***FINAL/FT'**: The accented foot is not final in the prosodic word.
- RIGHTMOST**: A peak of prominence lies on the right edge of the prosodic word.

In addition to these constraints, a constraint that requires compounds to have an accent is necessary:

- (42) **COMPOUNDACCENT**: A compound has an accent.

This constraint is basically inviolable in Japanese compounding.⁸³ I propose that the following ranking, which is almost identical to one of Kubozono's proposals, accounts for the default compound accent in compounds with short heads:⁸⁴

- (43) **COMPOUNDACCENT, *FINAL/μ' >> *FINAL/σ' >> *FINAL/FT' >> IDENT-IO(HA) >> RIGHTMOST**

The following tableaux demonstrate how this constraint ranking produces the default compound accent:⁸⁵

⁸² As a faithfulness constraint for an accent, Kubozono (1997) and Tanaka (2005) proposed **PARSEACCENT** and **MAX(accent)**, respectively, instead of this constraint.

⁸³ This constraint is violated in short compounds that follow the flat pattern, such as *kuro-neko* "black cat," which I illustrated in 2.2.5. I ignore this fact to simplify the argument in this section. This violation is probably caused by the accent deletion in short prosodic words, which Japanese phonology imposes independently from compound accentuation.

⁸⁴ Kubozono originally proposed the following ranking variation, which is derived by reranking the constraints to explain the variation in Japanese compound accent:

i) ***FINAL/μ'** >> **PARSEACCENT** >> ***FINAL/σ'** >> ***FINAL/FT'** >> **RIGHTMOST**

ii) ***FINAL/μ'** >> ***FINAL/σ'** >> **PARSEACCENT** >> ***FINAL/FT'** >> **RIGHTMOST**

iii) ***FINAL/μ'** >> ***FINAL/σ'** >> ***FINAL/FT'** >> **PARSEACCENT** >> **RIGHTMOST**

In my proposal, such reranking of the constraint is not necessary because the OO correspondence approach is able to account for the variation.

⁸⁵ In this and following tableaux, I omit **COMPOUNDACCENT**. Candidates without an accent are eliminated by this constraint.

(44) NC: *pooku'-paN* “pork bread”

Input: {/pa'N/ _H , /po'oku/}	*FINAL/ μ '	*FINAL/ σ '	*FINAL/FT'	IDENT-IO (HA)	RIGHTMOST
a. pooku-pa'N		*!	*		
→b. pooku'-paN				*	*
c. po'oku-paN				*	**!

(45) NC: *onna-go'koro* “woman’s mind”

Input: {/koko'ro/ _H , /onna'/}	*FINAL/ μ '	*FINAL/ σ '	*FINAL/FT'	IDENT-IO (HA)	RIGHTMOST
a. onna-goko'ro			*!		*
→b. onna-go'koro				*	**
c. onna'-gokoro				*	***!

When the head stem originally has a final accent, as in (44), or a penultimate accent, as in (45), the original accent cannot be parsed in a compound because it fatally violates *FINAL/ μ ', *FINAL/ σ ', or *FINAL/FT', as in (44a) and (45a). Therefore, the compound accent falls on the antepenultimate mora, as in (44b) and (45b) to satisfy these constraints. If the head stem originally has an antepenultimate accent, it is faithfully parsed in a compound, as shown below:

(46) NC: *jasai-sa'rada* “vegetable salad”

Input: {/sa'rada/ _H , /jasai/}	*FINAL/ μ '	*FINAL/ σ '	*FINAL/FT'	IDENT-IO (HA)	RIGHT MOST
→a. jasai-sa'rada					**
b. jasai-sara'da			*!	*	*
c. jasa'i-sarada				*	**!*

As in (46a), the original accent agrees with the default compound accent. The default accentuation is also effective when the head stem does not have an original accent, as shown below:

(47) NC: *kabuto'-muʃi* “beetle”

Input: {/muʃi/H, /ka'buto/}	*FINAL/μ'	*FINAL/σ'	*FINAL/ʔ'	IDENT-IO (HA)	RIGHT MOST
a. <i>kabuto-muʃi'</i>	*!	*	*		
b. <i>kabuto-mu'ʃi</i>			*!		*
→c. <i>kabuto'-muʃi</i>					**

Candidates with the final and penultimate accent are eliminated by *FINAL constraints, as in (47a) and (47b). In this case, IDENT-IO(HA) is vacuously satisfied in all candidates because the head component does not originally have an accent.

4.3.2 Base-Accent Effect in Normal Compounding

I turn now to the base-accent effect in normal compounding. As seen in 2.2.5, a number of stems in Japanese retain their lexical accents through compounding, violating the default-accent rule. I claim that as in the rendaku-blocking effect, which was argued in 4.2, the OO correspondence between the component of a compound and its corresponding base word plays a crucial role in the base-accent effect in Japanese compounding.

I propose that the base-accent effect in Japanese compounding is derived from the following constraint:

(48) IDENT-OO(head accent: HA):⁸⁶

The location of a compound accent is identical to that in the base word which is morphologically related to the head component.

This OO correspondence constraint requires that the accent location of the base word, which shares underlying representation with the head component, is retained in a compound. Similar to IDENT-OO(voice), which blocks rendaku voicing in some contexts, this OO correspondence constraint is relativized into two classes; i.e., OO class I, which exhibits a phonologically strong OO correspondence relation, and OO class II, which exhibits a phonologically weak OO correspondence relation. A Japanese stem may have a lexical specification regarding affiliation to either of these two OO classes. As argued above, OO class I serves as the default class. The phonological difference between the two classes is explained by the fact that they are ranked

⁸⁶ Revithiadou (1999) proposed a similar head-specific faithfulness constraint to explain head/non-head asymmetry in compound accentuation.

differently from each other in Japanese constraint ranking, as follows:

- (49) *FINAL/ μ' >> IDENT-OO(HA)-I >> *FINAL/ σ' >> *FINAL/FT'
 >> IDENT-IO(HA), RIGHTMOST, IDENT-OO(HA)-II

This ranking is a revised version of (43). IDENT-OO(HA)-I dominates *FINAL/ σ' and *FINAL/FT', which motivates the default compound accentuation. However, since no compound has an accent on the final mora in Japanese, this constraint must be dominated by *FINAL/ μ' . Since OO class II lacks the base-accent effect, IDENT-OO(HA)-II has the lowest ranking. As a consequence, this constraint is never significant in Japanese compound accentuation.

In the following tableaux, I demonstrate that constraint ranking (49) correctly derives the base-accent effect in normal compounding. Let us examine Loanword stems, which show the base-accent effect. Consider the following tableau:

- (50) NC: *pooku-ha'mu* “pork ham”

Input: {/ha'mu/ _H , /po'oku/}	*FINAL	IDENT-OO	*FINAL	*FINAL	IDENT-IO	RIGHT
O-Base: [ha'mu], [po'oku]	/ μ'	(HA)-I	/ σ'	/FT'	(HA)	MOST
→a. pooku-ha'mu				*		*
b. pooku'-hamu		*!			*	**
c. po'oku-hamu		*!			*	***

The head stem *ha'mu* “ham,” which is a member of OO class I, originally has an initial accent and realizes it in the simple base word as shown in the O-base. This accent is also preserved in the compound, as in (50a), since IDENT-OO(HA)-I requires it. The violation of *FINAL/FT' is tolerated because it is necessary to satisfy IDENT-OO(HA)-I. Any other accent locations fatally violate this OO correspondence constraint, as in (50b) and (50c). The OO relation between the non-head component *po'oku* “pork” and its base-word accent is irrelevant to the output evaluation since only the accent of the head component is significant in compound accentuation. The base-accent effect is also found when a stem in OO class I has an accent in the word-final syllable, as demonstrated below:

(51) NC: *kafe-ba'a* “café bar”

Input: {/ba'a _H , /ka'fe/}	*FINAL	IDENT-OO	*FINAL	*FINAL	IDENT-IO	RIGHT
O-Base: [ba'a], [ka'fe]	/μ'	(HA)-I	/σ'	/FT'	(HA)	MOST
→a. kafe-ba'a			*	*		
b. kafe'-baa		*!			*	*
c. ka'fe-baa		*!			*	**

Similar to (50a), the violations of *FINAL/FT' and *FINAL/σ' are tolerated to satisfy IDENT-OO(HA)-I in the winning candidate (51a).

Since the OO classification is independent of the ER classification, both Loanword and Yamato stems can belong to OO class I. This relation between the two classifications accounts for the base-accent effect in a Yamato stem, as demonstrated in the following tableau:

(52) NC: *peruša-ne'ko* “Persian cat”⁸⁷

Input: {/ne'ko _H , /pe'ruša/}	*FINAL	IDENT-OO	*FINAL	*FINAL	IDENT-IO	RIGHT
O-Base: [ne'ko], [pe'ruša]	/μ'	(HA)-I	/σ'	/FT'	(HA)	MOST
→a. peruša-ne'ko				*		*
b. peruša'-neko		*!			*	**
c. peru'ša-neko		*!			*	***

This output evaluation is identical to that in (50): the base accent is preserved in the compound, as in (52a).

This approach can also account for the fact that a stem with an accent on the

⁸⁷ This compound exhibits variation in accentuation: *peruša'neko*, which receives a default compound accent, is also a grammatical form. This fact should be understood as variation in the OO class specification; the head stem /ne'ko/ can be a member of either OO class I or OO class II. If the latter class is chosen, the default compound accent applies as demonstrated below:

NC: *peruša'neko* “Persian cat”

Input: {/ne'ko _H , /pe'ruša/}	*FINAL	IDENT-OO	*FINAL	*FINAL	IDENT-IO	RIGHT
O-Base: [ne'ko], [pe'ruša]	/μ'	(HA)-I	/σ'	/FT'	(HA)	MOST
a. peruša-ne'ko		NA		*!		*
→b. peruša'-neko		NA			*	**
c. peru'ša-neko		NA			*	*!***

final mora always follows the default-accent rule; the base-accent effect never appears in such contexts. Let us tentatively assume that a Yamato stem, *onna* ‘woman,’ which holds an accent on its final mora, is a member of OO class I. The following tableau illustrates the cancellation of the base-accent effect in a compound whose head is this stem:

(53) NC: *tabi-o’onna* ‘woman traveler’

Input: {/onna’ _H , /tabi’/}	*FINAL	IDENT-OO	*FINAL	*FINAL	IDENT-IO	RIGHT
O-Base: [onna’], [tabi’]	/μ’	(HA)-I	/σ’	/FT’	(HA)	MOST
a. <i>tabi-onna’</i>	*!		*	*		
→b. <i>tabi-o’nna</i>		*			*	*
c. <i>tabi’-onna</i>		*			*	**!

The winning candidate is (53b), which abandons the original accent and receives the default compound accent, violating **IDENT-OO(HA)-I**. This violation occurs because the word-final accent in (53a) incurs a fatal violation of ***FINAL/μ’**, which crucially dominates **IDENT-OO(HA)-I**.

Let us conclude this section by examining accentuation in complex compounds. As noted in 2.5.7, the base-accent effect is also found in complex compounding in a right-branching complex compound: the accent of a right-branching complex compound always agrees with the base compound, which is morphologically related with the head component. As argued in 4.1.1.1, a derived compound is automatically specified as a member of OO class I since it does not possess a lexical specification in the OO classification. This default specification triggers the base-accent effect, as demonstrated below:

(54) CC: *oja-peruʃa-ne’ko* ‘parent Persian cat’

Input:	*FINAL	IDENT-OO	*FINAL	*FINAL	IDENT-IO	RIGHT
{/ne’ko _H , /pe’ruʃa/} _H /oja’/}	/μ’	(HA)-I	/σ’	/FT’	(HA)	MOST
O-Base: [ne’ko], [pe’ruʃa], [oja’], [peruʃa-ne’ko]						
→a. <i>oja-peruʃa-ne’ko</i>				*		*
b. <i>oja-peruʃa’-neko</i>		*!			*	**
c. <i>oja-peru’ʃa-neko</i>		*!			*	***

Similar to the base-accent effect in simple compounds shown above, **IDENT-OO(HA)-I** requires the accent of the complex compound to be identical to that in the base compound *perufa-ne'ko* as in (54a). Note that the accent locations in the other O-bases are never significant because they are not the morphological head of this complex compound. This base-accent effect in complex compounding is similar to rendaku blocking in the same context, as examined in 4.2.

As shown in 2.2.5, short compounds in Japanese tend to lack an accent and follow the flat pattern. When such an accentless compound occupies the head position in a complex compound, the base-accent effect does not emerge and follow the default compound accent rule as in 2.5.7. This fact is also explained by the constraint ranking (49). The following tableau exemplifies this situation:

(55) CC: *fio-ta'ra-ko* “salt cod roe”

Input: {/ko/ _H , /ta'ra/} _H /fio'/{ O-Base: [ko], [ta'ra], [fio'], [tara-ko]	*FINAL /μ'	IDENT-OO (HA)-I	*FINAL /σ'	*FINAL /FT'	IDENT-IO (HA)	RIGHT MOST
a. fio-tara-ko'	*!		*	*		*
b. fio-tara'-ko				*!		**
→c. fio-ta'ra-ko						***

The head compound and its corresponding base compound *tara-ko* do not have an accent. Therefore, **IDENT-OO(HA)-I** is vacuously satisfied in all candidates because this constraint is indifferent to the deletion or epenthesis of elements. The accentuation falls on the antepenultimate mora to satisfy the *FINAL constraints as in (55c). Again, the accent locations of other O-bases are never significant.

4.3.3 Accentuation in Dvandva Compounding

Accentuation in dvandva compounding is characterized by its dependency on the first component, which we have seen in 2.3.6. This accentuation pattern stands out in compound accentuation in Japanese because in any other patterns, the accent of the first component is never significant. In this section, it will be shown that the compound accent system, as discussed in the previous section, can correctly account for this peculiar behavior in dvandva compounding.

Accentuation in dvandva compounding provides important evidence for the compound accent system of Japanese. Since no more than one prominence is allowed in a Japanese prosodic word, no more than one accent is essentially realized in a

compound—even though each of the two components may independently contain a lexical accent. As argued in the previous section, whereas the accent of the head component appears, the accent of the non-head component is always ignored in Japanese normal compounding. Within the OT framework, this head-accent priority is guaranteed by **IDENT-IO(HA)**. Japanese dvandva compounding, which results in the formation of a compound with a single accent from two head stems, reveals that in addition to this correspondence constraint, another constraint that rules out a prosodic word with two accents is necessary. Note that **IDENT-IO(HA)** cannot choose which of the two head accent locations should be that of a whole dvandva compound because the two components in a dvandva compound equally have a head status.

First, let us examine a structural constraint that prohibits a prosodic word from simultaneously having two accents. Consider the following constraint for prosodic structure, which Kubozono (1997) originally proposed in his analysis of Japanese normal compounding:

- (56) **OCP(accent):**
 No more than one prominence (i.e., a word accent) is allowed in a single prosodic word.

I claim that this constraint is especially crucial in dvandva compounding. This constraint militates against **IDENT-IO(HA)** when the input of a compound contains two head stems with a lexical accent. In the constraint ranking of Japanese, these two forms have the following ranking:

- (57) **OCP(accent) >> IDENT-IO(head accent)**

The effect of this ranking in dvandva compounding is demonstrated in the following tableau:

(58) DVD: *ʃi'ro-kuro* “white and black”^{88 89}

Input: {/ʃi'ro / _H , /ku'ro/ _H }	OCP (accent)	IDENT-IO (HA)
a. ʃi'ro-ku'ro	*!	
→b. ʃi'ro-kuro		*(ku'ro)
✗ c. ʃiro-ku'ro		*(ʃi'ro)

Constraint ranking (57) correctly rules out candidate (58a), which has two accents within a single prosodic word. However, this ranking cannot distinguish the correct output (58b), in which the accent of the first component is realized, from an ungrammatical form (58c), in which the accent of the second component is preserved.

The correct output is singled out by constraints ranking (49). This ranking prevents an accent from being realized on the right edge of a prosodic word thanks to the ***FINAL** constraints. In normal compounding, this effect motivates the default compound accent pattern, as seen in the previous section. In dvandva compounding, on the other hand, this effect triggers the realization of the accent in the first stem. Consider the following tableau:

⁸⁸ It is possible to assume that either of the two input accents is deleted and therefore it does not correspond to the compound accent at the output level. In such a case, **MAX-IO** (HA), which penalizes accent deletion in the head component, is violated. The result is identical to that in tableau (58) as demonstrated below:

DVD: *ʃi'ro-kuro* “white and black”

Input: {/ʃi'ro / _H , /ku'ro/ _H }	OCP (accent)	IDENT-IO (HA)	MAX-IO (HA)
a. ʃi'ro-ku'ro	*!		
→b. ʃi'ro-kuro			*(ku'ro)
✗ c. ʃiro-ku'ro			*(ʃi'ro)

⁸⁹ The flat accent pattern is also possible in this dvandva compound. I ignore this variation.

(59) DVD: *ʃi'ro-kuro* “white and black”

Input: {/ʃi'ro / _H , /ku'ro/ _H } O-Base: [ʃi'ro], [ku'ro]	*FINAL /μ'	IDENT-OO (HA)-I	*FINAL /σ'	*FINAL /ʔ'	IDENT-IO (HA)	RIGHT MOST	IDENT-OO (HA)-II
→a. ʃi'ro-kuro		NA			*(ku'ro)	***	*(ku'ro)
b. ʃiro-ku'ro		NA	*	*	*(ʃi'ro)		*(ʃi'ro)
c. ʃiro'-kuro		NA			*(ʃi'ro) *!(ku'ro)	**	*(ʃi'ro) *(ku'ro)

Since the two stems *ʃi'ro* “white” and *ku'ro* “black” follow the default accent rule in normal compounding, as in *peruʃa'-ʃiro* “Persian white” and *peruʃa'-guro* “Persian black,” they are considered to be members of OO class II. Candidate (59a), which is identical to (58b), is singled out as an optimal output defeating (59b), which is identical to (58c); this is because the former satisfies all the three *FINAL constraints, whereas the latter incurs them. Candidate (58c), which follows the default compound accent rule, is also defeated because of the excessive violation of IDENT-IO(HA). It should be noted that this output selection motivates the hierarchy between IDENT-IO(HA) and RIGHTMOST, which is not significant in accentuation in normal compounding.

Several issues about accentuation in dvandva compounding remain unclear because of the lack of data. For example, constraint ranking (49) predicts that when the second stem in a dvandva compound is a member of OO class I, the base-accent effect emerges. However, I have no definite data to support this prediction. As examined in 2.3, dvandva compounding imposes several morphosemantic conditions on stems. Therefore, it is difficult to supply the new data that the argument requires. For the same reason, it is not clear how the accent of a long dvandva compound behaves. For example, constraint ranking (49) predicts that when the second component originally has an antepenultimate accent, it is preserved in a dvandva compound. Nevertheless, I have been unable to find an example that supports or refutes this prediction.

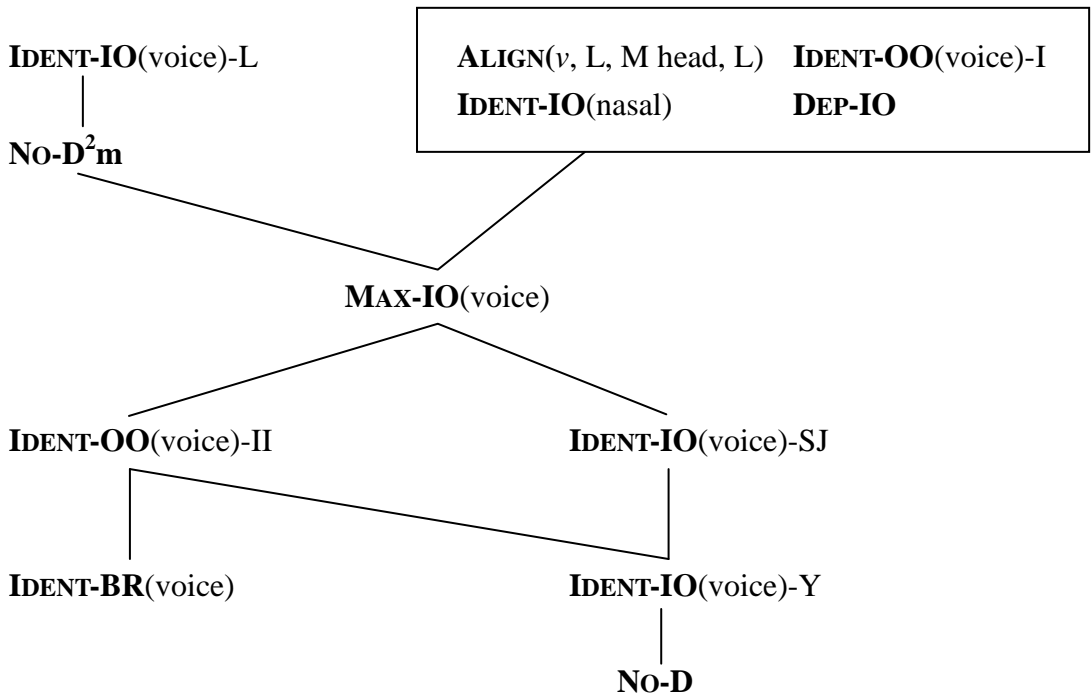
4.4 Summary

This chapter presented a mechanism that governs two morphophonological operations in Japanese compounding—rendaku application and compound accentuation—within the framework of OT. It was demonstrated that the relativized correspondence approach

accurately accounts for the variations in the two different morphophonological phenomena.

The following is an overview of the constraint hierarchy for rendaku application.

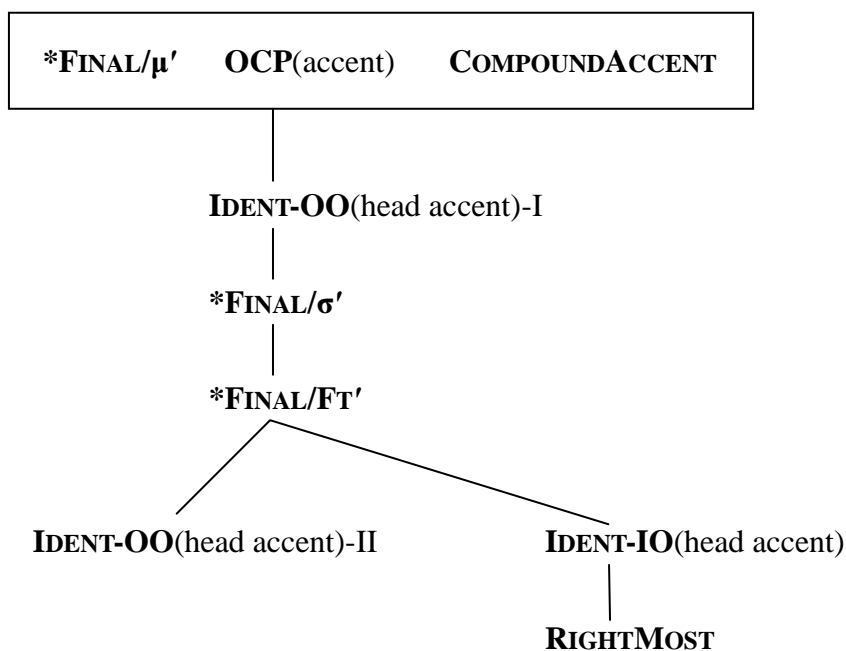
(60) Constraint hierarchy for rendaku application



I demonstrated that the interaction among these constraints provides a plausible account for the variation of the rendaku phenomenon among Japanese compounds. Application of rendaku is blocked when the violation of **MAX-IO(voice)**, which requires the realization of the linking morpheme *v*, is tolerated to satisfy higher-ranked constraints. The morphophonological operation is otherwise possible. The analysis also provides important evidence for a reduplication model: the difference between the rendaku application in normal compounding and that in intensive/plural reduplication suggests that the word faithfulness model is suitable for the morphophonology of reduplication.

The constraint hierarchy for the compound accentuation is as follows.

(61) Constraint hierarchy for compound accentuation



As in the hierarchy for the rendaku variation above, this hierarchy including the relativized OO correspondence constraints offers an account for the variation in the base-accent effect in normal compounding; when a head stem belongs to OO class I, which corresponds to **IDENT-OO(HA)-I**, the base-accent effect emerges. Compound accentuation otherwise follows the default rule. The distinctive accentuation in dvandva compounding is derived from its double-head structure and the working of **IDENT-IO(HA)**.

The approach proposed in this chapter clearly explains the phonology-morphophonology disagreement among Japanese ER classes: whereas phonological characteristics of each of the ER classes are governed by the relativized IO correspondence constraints, the morphophonological variations are derived from the relativization of OO correspondence constraints. This view provides a unified explanation of the two morphophonological operations above.

I also argue for the default value in correspondence relations: a compound, which does not have lexical specification of the word class, automatically receives the specification of the class that corresponds to the highest-ranked constraint among relativized constraints. This view correctly accounts for the morphophonological inactiveness of embedded compounds both in rendaku application and in compound accentuation; such components resist rendaku and exhibit the base-accent effect.

Chapter 5

Concluding Remarks

5.1 Introduction

As I stated in Section 1.1.1, I have tried to achieve two goals in this dissertation. The first goal was to describe morphophonological variations in Japanese compounding. It was revealed that the four major Japanese compounding patterns behave differently from one another in several morphophonological aspects. The other goal was to develop the mechanism that governs the morphophonology of Japanese compounding within the framework of Optimality Theory (OT; Prince & Smolensky 1993). I demonstrated that correspondence relations among related structures (McCarthy & Prince 1995, Benua 1997) play the crucial role in the morphophonology of this word formation process.

5.2 Descriptive Findings

In Chapter 2, I reported morphophonological features of Japanese compounding, many of which have been overlooked in previous studies of Japanese. I classified Japanese compounds into four patterns along with their morphosemantic properties: normal compounding, dvandva compounding, intensive/plural reduplication, and mimetic reduplication. It was shown that these compounding patterns exhibit morphophonological variations in several aspects. The descriptive facts reported in Chapter 2 will provide fruitful data for future investigations of phonology, morphology, and their interface in human language.

One of the important findings in that chapter was the relationship between Japanese compounding patterns and the etymological reflex (ER) classification. It is well known that the Japanese lexicon consists of several etymology-based strata that are phonologically different from one another (McCawley 1968, Vance 1987, Ito & Mester 1995ab, 1999, and many others). I reported that the ER classification is also significant in morphology: whereas normal compounding is possible in the three major ER classes, only Yamato stems can participate in dvandva compounding and intensive/plural reduplication; Yamato and Loanword stems can be a target of mimetic reduplication, although Sino-Japanese words are excluded as a possible target. From these facts, an interesting discrepancy between phonology and morphology emerges: though the Yamato class, which is phonologically the most restricted class in Japanese, can undergo all the compounding patterns, the Loanword class, which is phonologically the least restricted class, is morphologically confined. The Sino-Japanese class is heavily

restricted in compounding—probably because of its special morphological characteristics. It is not clear whether this phonology-morphology asymmetry derives from some universal characteristics of human language. This issue should be examined in future investigations on other languages.

In Chapter 2, I also reported a number of facts about *rendaku*. The applicability of this morphophonological operation varies among the four compounding patterns: *rendaku* is possible in normal compounding and intensive/plural reduplication, whereas it is impossible in *dvandva* compounding and mimetic reduplication. Interestingly enough, *rendaku* is not uniformly applied in the first two patterns: though *rendaku* in normal compounding is blocked by several linguistic aspects, such as the ER classification, phonological and morphological contexts, and the lexical immunity, *rendaku* in intensive/plural reduplication is obligatory if the phonological condition of *rendaku* is satisfied. Therefore, some particular stems that are lexically immune to *rendaku* in normal compounding are the possible target of this operation in intensive/plural reduplication.

In addition, I described the variation of accentuation in Japanese compounding, focusing on the effect of the original accent of the head component. Such a base-accent effect is found in normal compounding and *dvandva* compounding but not in the two types of reduplication. The base-accent effect in normal compounding and that in *dvandva* compounding are not uniform; whereas the former is caused by lexical specification of the head stem, the latter is derived from the double-headed structure of *dvandva* compounds.

5.3 Theoretical Development

In Chapters 3 and 4, I developed the morphophonological mechanism of compounding within the framework of OT. It was argued that the morphophonological variations among Japanese compounding patterns are derived from the interaction of the universal constraints of human language. This study provides several theoretical suggestions, which I believe will contribute to future investigations on theoretical phonology, morphology, and their interface.

The central claim of those chapters is that the majority of the morphophonological varieties in Japanese compounding, which were described in Chapter 2, are governed by several correspondence relations, i.e., input-output (IO) correspondence, output-output (OO) correspondence, and base-reduplicant (BR) correspondence. Under this model, pure phonological variations among the ER classes

and the morphophonological variations in Japanese compounding are clearly distinguished: the former are governed by IO correspondence, the latter by OO correspondence and BR correspondence. This distinction is crucial in the explanation of the phonology-morphophonology disagreement in Japanese compounding.

Another important claim of the present study concerns the relativization and default value of the correspondence relation: I claim that the default specification in relativized correspondence relations is the one that relates to the highest-ranked constraints. This view uniformly accounts for several phonological and morphophonological phenomena, i.e., the marked structure allowed in Loanwords and nonce words, the phonological inactiveness of morphologically complex structures, and the lexical immunity of some particular stems to general rules, which at first sight seem to be unconnected.

As argued in Section 4.2.3.4, Japanese reduplication provides important evidence for the theoretical analysis of reduplication. The rendaku variation between normal compounding and intensive/plural reduplication suggests that this morphophonological operation is governed by different correspondence relations in these two compounding patterns. This finding reveals that the basic model, which McCarthy & Prince (1995) proposed as the original reduplication model within Correspondence Theory, is incorrect: because the IO correspondence relation for the base component is identical in the two compounding patterns under this model, it is impossible to capture the variation in the rendaku application between normal compounding and intensive/plural reduplication. I demonstrated that the word faithfulness model (Struijke 1997, 1998, Spaelti 1997), in which the input stem is related to the whole word in reduplication, is able to explain this morphophonological variation.

In addition, the rendaku analysis in Section 4.2 provides important evidence regarding the membership of the faithfulness constraint family. Rendaku should be understood as a phonological realization of a linking morpheme that consists of a [+voice] feature (Ito & Mester 2003). As I illustrated, **MAX-IO(voice)** is necessary to correctly explain this voicing operation within the OT framework. This observation entails that not only **IDENT(F)**, which requires featural identity between two related segments on some feature specification, but also **MAX(F)**, which prohibits feature deletion, is a member of the faithfulness constraint family, as claimed in Lombardi (1995) and LaMontagne & Rice (1995).

It was also demonstrated that **REALIZE MORPHEME (RM)**, which Kurisu (2001) originally proposed to explain the phonological realization of nonconcatenative

morphemes, also plays a key role in compounding. This constraint works as one of the motivations for prosodic concatenation in compounding: as argued in Section 3.4, this constraint inhibits the head stem of a normal compound to independently form a single prosodic word. However, as I argued in Section 4.2.2, **RM** is insufficient to independently explain the application of rendaku. This constraint cannot distinguish voicing from other phonological changes, such as devoicing. This fact suggests that besides this constraint, **MAX-IO(voice)**, which requires phonological realization of a voicing feature, is necessary to explain this morphophonological operation.

In addition, I demonstrated that morphological branching structure and underlying linear order among morphemes are not essential—at least in terms of phonological analysis. Within the OT framework, the surface linear structure of a compound is determined by the headedness specification and OO correspondence relations among morphologically related words, which are independently necessary to explain various morphological and morphophonological phenomena.

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