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Dissertation

**ANTI-HOMOPHONY BLOCKING AND ITS PRODUCTIVITY IN  
TRANSPARADIGMATIC RELATIONS**

by

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TRANSPARADIGMATIC RELATIONS**

(Order No.                    )

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**ABSTRACT**

This dissertation addresses “anti-homophony blocking” in transparadigmatic relations, where an application of a particular phonological process is blocked in order to avoid homophony creation by neutralization of distinct inputs between morphologically unrelated words.

Past research was concerned with anti-homophony blocking but only within the inflectional paradigm. The possibility that this principle is also applied to transparadigmatic relations has not been pursued. In recent literature, anti-homophony constraints in paradigmatic relations have been proposed (Crosswhite 1999, 2001, among others) within the framework of Optimality Theory (Prince and Smolensky 1993). However, no attempt has been documented that proves that anti-homophony blocking is in fact a productive process. I examine these two key issues: first that anti-homophony blocking applies to transparadigmatic relations; second that it is productive, using a case of anti-homophony blocking in Japanese.

The main data comes from “contracted forms” (Kikuzawa 1935, Toki 1975) in derived environments in Japanese, created by syncope along with lenition or deletion of

the adjacent consonant. Within the framework of Optimality Theory, I will demonstrate that the contraction process and anti-homophony blocking in transparadigmatic relations are accounted for by particular constraints and ranking specific to the contraction grammar. I propose an anti-homophony constraint called CONTRAST, which is integrated into the contraction grammar. Analyses are given as to why homophony is created in inflectional morphology, as it could be counterevidence to my claim of anti-homophony blocking. I will argue that the anti-homophony principle must be phonology-internal which is embedded in the phonological grammar.

I conducted an experiment to test the extent to which anti-homophony blocking is part of the phonological grammar of Japanese, which provides some evidence in support of the claim that contraction and anti-homophony blocking are productive processes. Using a Japanese corpus, I found that there is no positive influence of word frequency and word familiarity on the occurrence and blocking of contractions.

This dissertation concludes that anti-homophony blocking is not limited to an inflectional paradigm but also occurs in transparadigmatic relations, and it is part of the productive phonological grammar.

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## LIST OF ABBREVIATIONS

ACC	accusative
AUX	auxiliary
CAUS	causative
CONJ	conjunctive
COP	copula
DAT	dative
DESI	desiderative
GEN	genitive
GER	gerundive
HYP	hypothetical
IMP	imperative
NEG	negative
NEG-IMP	negative imperative
NOM	nominative
NOMI	nominalizer
PASS	passive
PAST	past
PL	plural
POL	polite
POL-IMP	polite imperative
POL-PRES	polite present

POTEN	potential
POSS	possessive
PRES	present
SG	singular
TENT	tentative
TOP	topic
1	first person
2	second person
3	third person

## **Chapter 1: Introduction and background**

### **1.1 Introduction**

In this dissertation, I am concerned with when a certain phonological process is blocked, and particularly when this process is blocked in order to avoid homophony created by neutralization of distinct inputs, even in the cases where the alternation conditions are perfectly met.<sup>1</sup> This dissertation examines such blocking, which here I will call “anti-homophony blocking.” Previous research has shown that anti-homophony blocking occurs only within an inflectional paradigm and often it has assumed that anti-homophony blocking is productive, without concrete evidence. Anti-homophony blocking between lexical items is not usually considered strong enough to block inflectional morphology as claimed by Albright (2003). In this dissertation, I will claim that anti-homophony blocking occurs even in transparadigmatic (or nonparadigmatic) relations, that is, between words which belong to a different paradigm. To support my claim that anti-homophony blocking in transparadigmatic relations is a productive process as part of the phonological grammar of the native speakers, I will provide evidence using Japanese data and conduct an experiment.

Previous research on anti-homophony blocking concerns primarily this phenomenon within an inflectional paradigm (Kisseberth and Abasheikh 1974, Mitchell 1993, Crosswhite 1999, 2001, Kenstowicz 2002, Morrill 2002, Kawahara 2003, Itô and

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<sup>1</sup>Note that the word ‘neutralization’ is often used to refer to a situation in which two distinct sounds merge (Kenstowicz 1994 and Gussenhoven and Jacobs 1998, among others). However, “neutralization” is used here to refer to the neutralization of inputs through the creation of homophonous outputs by the phonology.

Mester 2004b, Blevins 2004, Gessner and Hansson, to appear). I, however, will claim that anti-homophony blocking can occur between, rather than within, individual inflectional paradigms, in other words, between words that are seemingly morphologically unrelated. The main data in this dissertation comes from *shukuyakukei* or “contracted forms” (Kikuzawa 1935, Toki 1975) in derived environments in Japanese, derived by syncope along with lenition or deletion of the adjacent consonant. Among several contracted forms, I will discuss three types of contracted forms, which I will refer to as “nasal assimilation,” that is, *r* in a syllable at a morpheme boundary assimilates to *n* before *n* in a suffix as a result of syncope of the vowel following *r*, “labial contraction,” i.e. the deletion of a labial and the vowel that precedes it, and “gerund /te/ contraction,” which is the syncope of one vowel in two consecutive vowels between the gerund /te/ and an auxiliary verb.

This research is set in the framework of Optimality Theory (Prince and Smolensky 1993), in which a finite set of universal but violable constraints are ranked in a specific order in a given language. I claim that the contracted forms and anti-homophony blocking are the results of synchronic grammar which consists of specific constraints, such as anti-homophony constraint and their rankings in “contraction grammar.” I will assume that the anti-homophony constraint also exists in “full-form grammar,” - in which the underlying form is realized in the full form, without contraction. However, homophony is sometimes allowed in both grammars, especially in the full-form grammar, due to a ranking in which the anti-homophony constraint is ranked lower than the phonotactic and faithfulness constraints.

Past research has not provided concrete evidence that such blocking is productive, even in paradigmatic relations. In order to gather more clear results on that matter, I carried out a production experiment, designed to test the extent to which the anti-homophony principle in transparadigmatic relations in nasal assimilation is part of synchronic grammar of Japanese, which provided certain evidence in support of my claim.

## **1.2 Relevant previous research**

In the following section, I will review previous research on blocking in general, and anti-homophony blocking in particular, and address issues and questions concerning anti-homophony blocking.

### **1.2.1 Anti-homophony blocking**

Aronoff defines *blocking* as “the nonoccurrence of one form due to the simple existence of another” (Aronoff 1976:43). Blocking is triggered by a threat of the occurrence of an “identical element” which is either an “identical meaning,” the traditional notion of blocking, or an “identical form.”

One of the well-known examples of avoidance of creation of “identical meaning” in different forms is lexical blocking. For example, although the English agentive nominal suffix *-er* applies productively, as in *swim ~ swimmer*, its application to *steal* is blocked,

\**stealer*, due to the existence of *thief*.<sup>2</sup> Similarly, \**goed*, the application of past formation rule to *go*, is blocked due to the existence of irregular form *went*. Also, it is a fairly productive process to form +*ity* derivatives from adjectives in *ous*, such as *curious* ~ *curiosity*. However, whenever there exists for a given root both an adjective of the form *Xous* and a semantically related but underived abstract noun, then it is not possible to form the +*ity* derivatives of the *Xous* adjective. The already existing noun blocks the new +*ity* derivative (Aronoff 1976:43).

(1)	<u>Xous</u>	<u>+ity</u>	<u>Nominal</u>	
	curious	curiosity	*	
	precious	preciosity	*	
	glorious	*gloriosity	glory	
	gracious	*graciousity	grace	(Aronoff 1976:44)

Aronoff argues that the lexicon avoids complete synonymy between its entries as much as possible. In other words, there cannot be more than one item in each “slot” in the dictionary for the noun corresponding to, for example *glorious*, since this slot is preempted by *glory*, there is no room for *gloriosity*. *Gloriosity* is blocked in order not to create a synonym to *glory*.

Clark and Clark (1979) demonstrate “preemption by synonymy” in denominal verbs, whereby an innovative denominal verb formation is blocked when it would create synonymy with an already established form. They identify three types of preemption by synonymy for denominal verb: suppletion, entrenchment and ancestry. In suppletion, for example, the noun/verb paradigm such as *helicopter/helicopter* and *bicycle/bicycle* is

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<sup>2</sup> *Stealer* could be grammatical in a specific context but is ungrammatical as general meaning of ‘somebody who steals something’.

created as a result of a denominal verb formation which means ‘to go by [vehicle]’ from the unadorned name of the vehicle. However, the following cases are ruled out.

- (2) \*Jack *carred* downtown.  
 \*Connie *airplaned* to London. (Clark and Clark 1979:798)

Such blocking is due to the presence of the suppletive forms *drive* and *fly*, which in context would mean precisely ‘to go by car’ and ‘to go by airplane’. Thus, \**carred* and \**airplaned* are blocked due to the potential synonymy with *drove* and *flew* respectively.

In past literature, blocking of the creation of “identical form” is also discussed. Clark (1987:2) explains “the homonymy assumption” as - “every two meanings contrast in form.” Holding to this view, two different meanings would never be carried by the same form. However, this assumption does not hold in general because as Clark points out, homonymy occurs in any language such as lexical homonymy *bank* (of a river) vs. *bank* (financial institution). Furthermore, this assumption may not play an important role in either adult language use or in child language acquisition. There is no evidence that children avoid homonyms during acquisition, moreover, they appear to understand and use them at an early age (Clark 1993). However, there are cases where the *creation* of homonymy by a phonological process is avoided. Clark and Clark (1979) argue that a case, where a potential innovative denominal verb formation is blocked when it would be homophonous with a well-established verb, exists because the innovative verb is normally preempted by the well-established verb. This notion is called “preemption by homonymy.”

- (3) a. to \*spring/\*fall in France  
 b. to summer/autumn/winter in France (Clark and Clark 1979:800)

(3a) meaning ‘to spend spring/fall in France’ is unacceptable as being preempted by the homonymous verbs *spring* and *fall* while (3b) is acceptable.<sup>3</sup>

My focus is “anti-homophony blocking,” which is a particular type of blocking, blocking in order to avoid the creation of identical forms by the application of a phonological process under a homophony threat. Recent research on anti-homophony blocking, for example Crosswhite (1999, 2001), Kenstowicz (2002) and Itô and Mester (2004b), discusses blocking in an inflectional paradigm, claiming that the application of a given phonological process is partially or completely blocked when it would create a homophonous output with another item in a paradigm. They call such blocking “intra-paradigmatic homophony blocking” (Crosswhite) or “paradigmatic contrast” (Kenstowicz). Anti-homophony blocking within a paradigm has been reported in several languages.

(4) Anti-homophony blocking in paradigmatic relations

- a. Trigrad dialect of Bulgarian (Crosswhite 1999, 2001, Kenstowicz 2002)  
Vowel *o*, for example neuter singular ending noun *-o*, in the unstressed position is reduced to *a*: *kapito* → *kapita*. This vowel reduction is blocked when it would produce an output form that is homophonous with the input form of a morphologically related item. For example, if *blágo* ‘good, blessing’ singular underwent the vowel reduction, the resulting *blága* would be homophonous with the plural form as no stress shift occurs, unlike other nouns such as *varzála* ‘mooring point, SG’ to *varzála* (PL). Thus, the vowel reduction is blocked (Crosswhite 2001).
- b. Russian (Crosswhite 1999, 2001, Kenstowicz 2002)  
Unstressed nonhigh vowels /*o*, *a*/ are reduced to high and unround after “soft” (palatalized or palatal) consonants (so-called *ikan’e*): *-of* ‘2-SG’ → *-if*, *\*-əf* but this reduction is blocked in inflectional endings when it obliterates the distinction between the singular and plural forms of the third person. In the 3<sup>rd</sup> plural nonpast

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<sup>3</sup>For some English speakers, *to autumn in France* seems questionable as well, but I will not go into details here.

verbal desinence, /-at/, does not undergo reduction to [it] when unstressed. Instead, it is reduced to [ət]: *stávʲat*, \**stávʲit* < /stávʲ-at/ ‘place’. The expected 3<sup>rd</sup> plural *stávʲit* is replaced by *stávʲət* because if the expected forms occurred, they would consequently become homophonous to the 3<sup>rd</sup> person singular form (Crosswhite 2001).

- c. Chi-Mwi:ni (Kisseberth and Abasheikh 1974, Kenstowicz 2002)  
 “Ablaut” is a morphophonemic process which avoids three successive laterals by deleting the middle one and contracting the resultant vowel sequence: *pułl:te* ‘shell corn’ < /pułł-I:l-e/. This process is blocked if a verb with applied suffix /-It/ and perfect suffix /-I:l/ did ablaut, the resultant form would be identical to the corresponding perfect: \**sul-I:l-e* < /sul-il-I:l-e/ as it is homophonous to *sul-I:l-e* ‘want, Perfect’ (Kenstowicz 2002).
- d. Modern Arabic (Mitchell 1993, Kenstowicz 2002)  
 In the Damascus dialect of Syrian Arabic, stress appears on the rightmost heavy syllable (long vowel or closed with final CVC counting as light) and otherwise on the antepenult. Schwa gets deleted from an unstressed open syllable. When the object suffix starts with a vowel (/ -et/ ‘she’ for example), a HLLL sequence should produce antepenultimate stress with syncope of the suffixal vowel: /9allam-et-o/ ‘taught, she, him’ → /9allám-et-o/ → \*9allám-t-o. But the stress shift and consequent syncope are blocked because this would otherwise merge this form of the paradigm with the 1-SG/2-SG masc. /9allam-t-o/ → 9allám-t-o (Kenstowicz 2002).
- e. Finnish (Morrill 2002)  
 In colloquial Finnish, some verbs show consonant deletion and vowel lengthening: *tulen* ‘to come’ → *tuun*. For the verb *olla* ‘to be’, for example, its colloquial version of the 3<sup>rd</sup> person singular *on* would presumably be either *oo* or *oon*, but both are blocked because the consonant deletion and vowel lengthening would lead to homophony with the colloquial 2<sup>nd</sup> person imperative *oo* or the colloquial form of the 1<sup>st</sup> person singular *oon*.
- f. Zoque (Kawahara 2003)  
 In Zoque, it is typical that root faithfulness takes precedence over affix faithfulness. For example, stem nasals resist nasal place assimilation (*man* + *ba* ‘he goes’ → *manba*) whereas affix nasals undergo nasal place assimilation (*tih* + *tam* + *pa* ‘we/you arrive’ → *tihtamba*). However, for example, when the nasal affix /N/ is attached before root /wenu/, and /N/ and /w/ are fused, the nasality of this root is not preserved: /N + wenu/ → [w̃enu] ‘my breaking’ (1<sup>st</sup> person progressive). The expected form [wenu], as a result of nasality faithfulness of the root, would be homophonous to [wenu], the output form /wen+u/ ‘it broke’ (3<sup>rd</sup>

person perfective). This nonpreservation of nasality in the root is due to the constraint \*MERGE which demands that underlyingly distinct forms within a paradigm receive different phonological exponence.

- g. Dakelh (Carrier) (Gessner and Hansson, to appear)  
 In Dakelh (Carrier), as in many other Athapaskan languages, valence prefixes (traditionally known as “identifiers”), which are a set of voice, and “inner subject” prefixes interact resulting in deletion and/or fusion and, in one case, what resembles epenthesis. From a diachronic-evolutionary point of view, Gessner and Hansson argues that this “epenthesis” of [ʌ] in [ʌ-] (</s-/ ‘1-SG’ + intransitive valence /l-/) and in [ʔʌ-] (< /h-/ ‘2Du/PL’ + /l-/) is in fact a failure of syncope in order to maintain a surface distinction from the affixation forms of the transitive valence suffix /ʔ-/ to “inner subject”: /-s-l-CV(C)/ → -ʔʌCV(C), \*-sCV(C) (because this would be homophonous with -sCV(C) (< /-s-ʔ-CV(C)/)), and /-h-l-CV(C)/ → -ʔʌCV(C), \*-ʔCV(C) (because this would be homophonous with -ʔCV(C) (< /-h-ʔCV(C)/)).
- h. Japanese (Itô and Mester, 2004b)  
 In the verbal Japanese suffix paradigm, the potential suffix after vowel-final verbs *-rare* is alternatively realized in a reduced form as *-re* by deleting the syllable *ra* (*ra-nuki*, or “ra-dropping,” *tabe-re-ru* instead of *tabe-rare-ru* ‘can eat’, for example). The passive suffix after V-stems, *-rare*, is homophonous with the potential after V-stem but there is no *ra-nuki* in the passive. This avoidance of homophony is motivated by a constraint called “ParadigmaticContrast” which assigns one mark per pair of paradigm members that are not phonologically distinct.
- i. Tonkawa (Blevins 2004)  
 Syncope in Tonkawa, for example in *notxo?* (< /notoxo-o?/ ‘he does it’), is blocked in stem-internal  $C_iVC_i$  where CV-reduplication is involved, as in *hewawo?* (< /hewawa-o?/ ‘he is dead’, base /hewa-/). Rather than interpreting this phenomenon as antigemination of the consonant, Blevins argues that this is paradigmatic homophony avoidance. Regular degemination is active in Tonkawa. Such syncope combined with degemination, which syncope feeds, would result in a merger of a reduplicated and nonreduplicated stem: /hewawa-/ > *hewwa-* > \**hewa* (cf. base /hewa-/). As a result, the syncope is blocked and the degemination does not occur.

In the next four sections, I will review in detail Crosswhite (1999, 2000), Kawahara (2003), and Itô and Mester (2004b), who analyze anti-homophony blocking within

Optimality Theory (Prince and Smolensky 1993) using an anti-homophony constraint, as well as my preliminary work on anti-homophony blocking in Japanese contracted forms (Ichimura 2001).

### **1.2.2 Crosswhite (1999, 2001)**

Crosswhite (1999, 2001) is concerned with vowel reduction in Trigrad Bulgarian and Russian and “homophony-blocking” of the vowel reduction process. She claims that homophony blocking must be intra-paradigmatic and “(i)f vowel reduction would cause two underlyingly distinct lexical items to become homophonous, and if those two items are morphologically related, vowel reduction can be blocked” (Crosswhite 2001:153). More specifically, she claims that vowel reduction in Trigrad Bulgarian is blocked if it produces an output form that is homophonous with the input form of a morphologically related item, although vowel reduction is not blocked by homophony with a morphologically unrelated item (Crosswhite 1999).

In the Trigrad dialect of Bulgarian, unstressed /o, ɔ/ reduce to *a* as this dialect disprefers unstressed mid-vowels. However, this process is completely blocked if the application of this process produces homophones in a morphologically related word. Neuter singular nouns, for example, are marked with the ending *o* and the plural is formed from neuter nouns by replacing the *o* suffix with *a*.

**Table 1**  
Homophony blocking in Trigrad Bulgarian  
(Stoikov 1963, cited from Crosswhite 2001:154)

	singular	plural	gloss
underlying singular <i>o</i> undergoes reduction to [a]	varzá <b>a</b>	varzalá	mooring point
	vlatʃí <b>a</b>	vlatʃílá	[gloss not given]
	kapí <b>a</b>	kapítá	hoof
	kló <b>a</b>	klabá	globe
	pé <b>a</b>	perá	pen
	ré <b>a</b>	rebrá	rib
underlying singular <i>o</i> does not reduce	zórno	zórna	grain
	pétalo	pétala	horseshoe
	blágo	blága	good, blessing
	tsigarílo	tsigaríla	cigarette

In the first six forms listed above, the singular forms undergo vowel reduction to *a* as well as a lexically specified stress shift. Due to this stress shift, singular and plural forms retain the distinction even after the reduction of /o/ to *a*. On the other hand, in the last four forms, there is no stress shift and the vowel reduction is blocked because if *-o* did reduce, it would cause two underlyingly distinct forms to become homophonous. Thus, the reduction is blocked.

Crosswhite proposes a constraint ANTI-IDENT based on the familiar IDENT constraints of McCarthy and Prince's Correspondence Theory (1993a, 1995). This constraint states that a correspondence  $\mathfrak{R}$  is established between  $S_1$  and  $S_2$  such that underlyingly distinct  $S_1$  and  $S_2$  must possess some segment that is a member of  $S_1$  such that  $\alpha$  is not identical to its correspondent  $S_2$ .

- (5) ANTI-IDENT:  
For two forms,  $S_1$  and  $S_2$ , where  $/S_1/ \neq /S_2/$ ,  $\exists \alpha, \alpha \in [S_1]$ , such that  $\alpha \neq \mathfrak{R}(\alpha)$ .  
(Crosswhite 2001:155)

In combination with other constraints and their ranking within the framework of Optimality Theory, Crosswhite analyzes the blocking of vowel reduction as follows.

**Tableau 1**

Use of ANTI-IDENT constraint in Trigrad Bulgarian (Crosswhite 2001:156)

/zórno/ ‘grain’	ANTI-IDENT	Dep[+high]	Lic-Nonperiph
☞ zórno			*
zórnu		*!	
zórna	*!		

cf. plural: zórna ‘grains’

Dep[+high]: No [+high] vowel should be inserted.

Lic-Nonperiph: Nonperipheral vowels are licensed only in stressed positions.

In this tableau, the third candidate output \*[zórna] violates the ANTI-IDENT constraint because it is homophonous with the morphologically related plural form. The second candidate [zórnu] makes a fatal violation of the second highest-ranking constraint Dep[+high]. As a result, the first candidate [zórno] wins out even though it violates the lowest ranked constraint Lic-Nonperiph. Crosswhite (1999) claims that the ANTI-IDENT constraint indicates that each candidate output could be compared with any number of other inputs that occur in the language, and that could determine whether there is homophony or not. However, I argue that the tableau above does not explicitly express the speaker’s knowledge of potentially completing paradigmatic items, in this case plural [zórna] ‘grains’, simply because plural [zórna] is part of tableau 1. Her analysis would encounter a problem, for example when analyzing a type of homophony creation where two distinct underlying forms undergo a phonological process simultaneously, and result in the identical forms. From this tableau, we cannot tell where the morphologically

related form fits. Crosswhite’s analysis raises an issue when analyzing cases where the interaction of two alternations needs to be evaluated because an individual analysis of each alternation does not capture such an interaction. This calls for a more complex system which would allow an output candidate to be compared with potential homophonous counterparts. In chapter 3, I will propose a “Minimal Pair Analysis” within OT analysis in order to account for such the case where a phonological process is applied to multiple inputs.

Furthermore, Crosswhite argues that in the Trigrad dialect of Bulgarian, the forms involved in homophonous blocking must be morphologically related, since vowel reduction cannot be blocked to avoid nonmorphologically-related homophones. For this argument, she provides an example that lexical homophones *blágo* ‘benefit’ and *blágo* ‘sweet’ (two words that are pronounced *blágo*) coexist without blocking each other. Both *blágo* forms are blocked in vowel reduction as the application of vowel reduction would create homophony with paradigmatic item [blága].

- (6) Lexical homophones in Trigrad Bulgarian
- |                  |                             |                       |
|------------------|-----------------------------|-----------------------|
| <u>noun</u>      | <u>adjective</u>            |                       |
| blágo ‘benefit’  | blágo ‘sweet’ (predictive)  |                       |
| blága ‘benefits’ | blága ‘sweet’ (attributive) | (Crosswhite 2001:155) |

However, this reasoning is not very convincing. ANTI-IDENT cannot compare morphologically unrelated items, however, as Crosswhite mentions, ANTI-IDENT does not apply to forms that share an underlying form such as syncretism or lexical homonym.<sup>4</sup>

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<sup>4</sup>In fact, as Jonathan Barnes (personal communication) points out, neuter adjectives in Bulgarian can be used as abstract nouns without direction affixation like *blago* (adjective) and *blago* (noun). This is another example of the problem in Crosswhite’s account. Also, in Russian, feminine dative and locative singular

Her claim that the homophony blocking only applies to morphologically-related homophones can only be proven successfully when there is evidence that the reduction of underlyingly distinct morphologically unrelated words is not blocked. Crosswhite does not provide such example.

### 1.2.3 Kawahara (2003)

Kawahara (2003) demonstrates another example of blocking of contrast neutralization using a constraint within OT. He argues that precedence of root faithfulness over affix precedence on fusion in Zoque is suspended in the case that it would result in the surface neutralization of a distinction between underlyingly distinct forms within a paradigm.

In Zoque, it is typical that root faithfulness takes precedence over affix faithfulness. In the following examples of affixation (not to be confused with fusion which I will examine later), stem-final nasals do not undergo nasal place assimilation whereas affix-final nasals do undergo this process.

- (7) a. Stem nasal resisting nasal place assimilation
- |                        |                    |                     |
|------------------------|--------------------|---------------------|
| / <u>maŋ</u> + ba/     | [ <u>maŋ</u> ba]   | ‘he goes’           |
| / <u>maŋ</u> +jah + u/ | [ <u>maŋ</u> jahu] | ‘they went’         |
| / <u>maŋ</u> + tu/ +u/ | [ <u>maŋ</u> du/u] | ‘he intended to go’ |
- (Kawahara 2003:3)
- b. Affix nasals undergoes nasal place assimilation
- |                                |                        |                               |
|--------------------------------|------------------------|-------------------------------|
| / <u>ti</u> h + tam + u/       | [ <u>ti</u> htamu]     | ‘we/you arrived’              |
| / <u>ti</u> h + tam + pa/      | [ <u>ti</u> htamba]    | ‘we/you arrive’               |
| / <u>ti</u> h + tam + tu/ +u/  | [ <u>ti</u> htandu/u]  | ‘we/you were about to arrive’ |
| / <u>ti</u> h + tam + ke/t +u/ | [ <u>ti</u> htange/tu] | ‘we/you arrived also’         |
- (Kawahara 2003:4)

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are always identical, but any anti-homophony principle in the grammar is careless because these simply share an underlying form.

Kawahara argues that this precedence of root in Zoque fusion is evidence of universal ranking of root faithfulness higher than affix faithfulness, Faith root >> Faith affix.

- (8) Agree (Place): Two adjacent segments agree in place specification  
 Faith (Place) root: Input place specifications of roots are faithfully mapped to output  
 Faith (Place) affix: Input place specifications of affixes are faithfully mapped to output

The ranking for this analysis is Faith (Place) root >> Agree (Place) >> Faith (Place) affix, where the constraint which triggers nasal assimilation Agree (Place) is sandwiched between the faithfulness constraints.

**Tableau 2**

/maŋ + ba/ → [maŋba]

/maŋ + ba/	Faith (Place) root	Agree (Place)	Faith (Place) affix
a. <sup>✗</sup> [maŋba]		*	
b. [mamba]	*!		

**Tableau 3**

/t<sup>h</sup> + tam + ke/t +u/ → [t<sup>h</sup>taŋge/tu]

/t <sup>h</sup> + tam + ke/t +u/	Faith (Place) root	Agree (Place)	Faith (Place) affix
a. [t <sup>h</sup> taŋge/tu]		*!	
b. <sup>✗</sup> [t <sup>h</sup> taŋge/tu]			*

The following is an example of root-controlledness of a fusion, where coronal and glide fuse into one segment (roots are underlined). Sonority and voice in the root are unchanged after fusion. In Kawahara's analysis, a series of IDENT constraints in sonority, vowel, nasality in the root and the affix are used, for example IDENT F is defined as satisfied just when input and output correspondents agree in the specification F.

- (9) a. /put + jah + u/ → [pu.ca.hu], \*[pu.ja.hu] ‘they emerged’  
 IDENT (Son) root >> IDENT (Son) affix  
 b. /sohs + jah + u/ → [soh.ʃa.hu], \*[soh.ʒa.hu] ‘they cooked’  
 IDENT (Voi) root >> IDENT (Voi) affix

However, there is a fusion case where root-controlledness fails and nasality of an affix takes precedence over orality of a root. For example, when the nasal affix /N/ is attached before root /wenu/, and /N/ and /w/ are fused, the nasality of this root is not preserved.

- (10) /N + wenu/ → [w̃enu] ‘my breaking’ (1<sup>st</sup> person progressive)

Such evidence goes against the universal ranking, IDENT (Nas) root >> IDENT (Nas) affix. Kawahara accounts for this by explaining that this case is due to the requirement that every distinct word within a paradigm assumes a distinct phonological shape. This requirement is the constraint \*MERGE. \*MERGE is a relativized version of \*MERGE which is proposed in Padgett (2003a,b,c) to argue contrast preservation within Dispersion Theory (Flemming 1995, Ní Chiosáin and Padgett 1997 among others).

- (11) \*MERGE: Underlyingly distinct forms within a paradigm must receive different phonological exponence. (Kawahara 2003:13)

The expected form [wenu], as a result of nasality faithfulness of the root, would be homophonous to [wenu], the output form of /wen+u/ ‘it broke’ (3<sup>rd</sup> person perfective). This is exactly the case that \*MERGE penalizes.

#### Tableau 4

Anti-homophony blocking with \*MERGE

/N + wenu/ <sub>1</sub> /wen+u/ <sub>2</sub>	*MERGE	IDENT (Nas) root	IDENT (Nas) affix
a. [wenu] <sub>12</sub>	*!		*
b. ☞ [w̃enu] <sub>1</sub> [wenu] <sub>2</sub>		*	

The candidate a) violates \*MERGE because [wenu] has two underlying correspondents. Due to the violation of \*MERGE, root-controlledness on nasality is suspended. If there had been no violation of \*MERGE, the candidate a), without any change in nasality of the root, would be optimal.<sup>5</sup>

The Zoque case is not a blocking of the application of a phonological process, but a blocking of root faithfulness precedence over the affix faithfulness. However, this is also a type of anti-homophony blocking.

#### 1.2.4 Itô and Mester (2004b)

This paper discusses *ra-nuki* (ra-dropping) in the potential form of vowel-final verbs in Japanese. The potential suffix *-rare* is alternatively realized in a reduced form as *-re* by deleting the syllable *ra*.

- (12) kinoo      -wa yoku ne-  $\left\{ \begin{array}{l} \text{rare} \\ \text{Øre} \end{array} \right\}$  -ta  
           yesterday -TOP well sleep -POTEN -PAST  
           ‘(I) was able to sleep well last night.’

The verbal suffixes have different allomorphs as shown below.

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<sup>5</sup>It appears that RM (Realize Morpheme), a constraint which requires some phonological exponence to each morpheme, can account for /N + wenu/ → \*[wenu] but Kawahara argues that \*MERGE is more appropriate to account for this fusion in Zoque. See Kawahara (2003) for a discussion of the advantage of \*MERGE over RM.

**Table 2**  
Suffix allomorphy for V-stems and C-stems<sup>6</sup>

Verbal stem	V-stem (vowel-final verb) e.g., <i>tabe-</i> ‘eat’	C-stem (consonant-final verb) e.g., <i>nom-</i> ‘drink’
a. present negative	...V-nai	...C-anai
b. plain present	...V-ru	...C-u
c. inchoative	...V-joo	...C-oo
d. conditional	...V-reba	...C-eba
e. causative	...V-sase-	...C-ase-
f. passive	...V-rare-	...C-are-
g. imperative	...V-ro	...C-e
h. potential	...V-rare-	...C-e-

The passive suffix after V-stems, *-rare*, is homophonous with the potential after V-stem, but there is no *ra-nuki* in the passive.

- (13) sensei -ni yoku home { -rare } -ta  
 teacher-DAT often praise-PASS -PAST  
 { \*Øre }  
 ‘(He) was often praised by the teacher.’

Itô and Mester take a systemic approach in OT and propose the paradigmatic constraint ParadigmaticContrast.

- (14) ParadigmaticContrast (PARCONTRAST)

The cells of a paradigm are pair-wise phonologically distinct. Assign one mark for each pair of paradigm members that are not phonologically distinct.

Adopting the position that the ranking of constraints is only partial in order to explain variation of outputs in OT, Itô and Mester propose that MAX-IO and PARCONTRAST are not ranked.

<sup>6</sup>See Appendix A for an argument on how this verbal suffix allomorphy is in fact lexical allomorphy, not synchronic deletion or epenthesis, not only for the imperative whose allomorphs have very different shape but also for other suffixes.

**Tableau 5**  
Contrast in paradigm selection

	Candidate paradigms for /tabe-/ ‘eat’	(i) MAX-IO	(ii) PARCONTRAST
☞ (i) » (ii)	potential<rare>: tabe-rare- passive<rare>: tabe-rare- causative<sase>: tabe-sase- ....		*
☞ (ii) » (i)	potential<rare>: tabe-re- passive<rare>: tabe-rare- causative<sase>: tabe-sase-....	**	

In the first output candidate, the potential and passive forms are identical and thus violate PARCONTRAST. The second candidate violates MAX-IO twice since two segments, *ra*, are dropped, but there is no violation of PARCONTRAST. The ranking of PARCONTRAST and MAX-IO are variably ranked, and the potential form is realized as either *rare* or *re*.

The question that raises is why the potential suffix, not the passive suffix, is reduced to *re* in order to satisfy PARCONTRAST. They generalize “paradigm uniformity” to include (inflectional) stem and affix allomorphy, and propose the Allomorph Correspondence Constraint.

(15) Allomorph Correspondence Constraint (ALLCORR)

Let R be an allomorph correspondence relation between the segments of  $m_1$  and those of  $m_2$ . Then one violation of ALLCORR is incurred for each segment in  $m_1$  or  $m_2$  that is not included in R, i.e., has no correspondence in the other form.

The Japanese verbal suffixes violate ALLCORR as below.

**Table 3**

ALLCORR violations in the Japanese verbal suffixes

	ALLCORR violations
present negative: <-nai, -anai>	*
Plain present: <-ru, -u>	*
inchoative: <-joo, -oo>	*
causative: <-sase-, -ase->	*
passive: <-rare-, -are->	*
potential: <-rare-, -e->	***

The potential suffix has three violations for the segments *rar*. It is now logical to delete two segments *ra* in the potential, rather than in the passive, in order to minimize the violation of ALLOCORR. An OT analysis using ALLOCORR, which is unranked relative to MAX-IO (protecting segments from being deleted) and PARCONTRAST, is shown below.

**Tableau 6**

Contrast in paradigm selection with ALLOCORR

	potential: /<-e, -rare>/ passive: /<-are, -rare>/ ....	(i) MAX-IO	(ii) PARCONT RAST	(iii) ALLOCOR R
a. faithful candidate ☞ (i) » (ii)	potential: <-e, -rare> passive: <-are, -rare> ....		*	*** *
b. <i>ra-nuki</i> (potential) ☞ (ii) » (i)	potential: <-e, -re> passive: <-are, -rare> ....	**		* *
c. <i>ra-nuki</i> (passive)	potential: <-e, -rare> passive: <-are, -re> ....	**		*** *

The candidate with the *ra-nuki* passive in c) incurs four total violations of ALLOCORR while the candidate with the *ra-nuki* potential in b) has two violations. Thus, the paradigm with *ra-nuki* in the passive in c) will never win.

Itô and Mester assume that the anti-homophony constraint PARCONTRAST only applies within the paradigm of a single lexical item, and is not applicable across paradigms, for example the homophony of *ki-re-ru* ‘wear, POTEN, PRES’ and *kir-e-ru* ‘cut, POTEN, PRES’. In Ichimura (2001), however, which will be reviewed below, I argued that the anti-homophony principle is also applicable to transparadigmatic relations.

### 1.2.5 Ichimura (2001)

The past research, as reviewed above, focuses on anti-homophony blocking within an inflectional paradigm (in other words, morphological contrast), not between morphologically unrelated words or in non-paradigmatic relations (lexical contrast). Crosswhite (1999, 2001) claims the anti-homophony ANTI-IDENT applies only to homophones in paradigmatic relations. Itô and Mester (2004b) claim that PARCONTRAST only applies within the paradigm of a single lexical item, and is not applicable across paradigms, because there are cases of homophony creation across paradigms, for example, *ki-re-ru* ‘can wear’ and *kir-eru* ‘can cut’. Albright (2003) notes in his discussion on Spanish paradigm gaps that avoidance of homophony between lexical items is not usually considered strong enough to block inflectional morphology.

Ichimura (2001), however, argues that homophony avoidance can occur between lexical items. This paper is concerned with what I call “nasal assimilation,” one of the contracted forms in Japanese.<sup>7</sup> I argue that nasal assimilation is blocked in order to avoid

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<sup>7</sup>In Ichimura (2001), the term “casual speech” is used to refer to contracted forms such as nasal assimilation. However, this term will not be used in this dissertation, as to avoid confusion with fast speech.

ambiguity by the loss of lexical distinctiveness when it is applied to two separate lexical items, in other words, in a transparadigmatic context.

In nasal assimilation, the vowel preceding the negative suffix /nai/ or /a/ in its allomorph /anai/) is syncope after /r/, and /r/ assimilates to *n*.<sup>8</sup>

- (16) **kure**      -nai → **kunnai**  
       give (me)    NEG  
       **wakar**     -anai → **wakannai**  
       understand    NEG

However, when nasal assimilation in /...r-anai/ and /...re-nai/ (or /...ri-nai/) potentially creates homophony, nasal assimilation occurs only in /...r-anai/. The nasal assimilation of /...re-nai/ (or /...ri-nai/) is blocked.

- (17) **nare**        -nai → \***nannai**  
       get used to    NEG  
       **nar**        -anai → **nannai**  
       become        NEG

In Ichimura (2001), an anti-homophony constraint called CONTRAST is introduced. CONTRAST demands that lexical contrast be maintained, and thereby prohibits the cooccurrence of nasal assimilation of distinct underlying forms if nasal assimilation causes loss of lexical contrast and creates neutralization.

- (18) CONTRAST: Maintain lexical contrast<sup>9</sup>

CONTRAST interacts with the constraint \*NUC ('Nucleus is not allowed') which drives

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<sup>8</sup>See Appendix A for a discussion of my claim that /nai/ and /anai/ are examples of lexical allomorphy.

<sup>9</sup>Although I did not explain specifically in Ichimura (2001), I used "lexical contrast" here as "contrast of lexeme."

the syncope.<sup>10</sup> In section 3.5, I will discuss the formal status of this constraint within OT. CONTRAST is ranked higher than \*NUC to encode the fact that the maintenance of lexical distinctiveness is more important than syncope.

(19) CONTRAST >> \*NUC

By differentiating the importance of vowel faithfulness at a morpheme boundary between the stem (/e/ and /i/), and the suffix (/a/), the following constraint orders are posited.

(20) MAX [m-V-stem] >> MAX [m-V-suffix]

MAX [m-V-stem]: Do not delete a vowel in a stem at a morpheme boundary.  
MAX [m-V-suffix]: Do not delete a vowel in a suffix at a morpheme boundary.

In order for CONTRAST to work in evaluating the interaction between nasal assimilation of a pair in a transparadigmatic relation, a “systemic” approach in OT analysis, called a “Minimal Pair Analysis,”<sup>11</sup> is proposed. In the Minimal Pair Analysis, a set (two or more) of inputs is evaluated simultaneously and a set of output candidates, which has fewer fatal violations, is chosen as the optimal output.

### Tableau 7

Minimal Pair Analysis: Anti-homophony blocking with CONTRAST

	CONTRA ST	*NUC	MAX [m-V-stem]	MAX [m-V-suffix]
a. <i>naranai</i> : <i>narenai</i>		***.***!		
b. <i>nannai</i> : <i>narenai</i>		**.***		*.
c. <i>naranai</i> : <i>nannai</i>		***.**	:*!	
d. <i>nannai</i> : <i>nannai</i>	*!	**.***	:*	*.

<sup>10</sup>In the analysis of nasal assimilation in section 3.2, new constraints INITIAL-C (Every suffix is consonant initial) and FINAL-C (Every stem is consonant final) will be proposed as a driving force of syncope, instead of \*NUC.

<sup>11</sup>The term “minimal pair” is not used in a strict sense in Ichimura (2001). A question is naturally raised whether or not /nar-anai/ and /nare-nai/ are truly a “minimal pair.” In this dissertation, “minimal pair” refers to a set of inputs which are evaluated for potential homophony including a pair or triplet, which is not a minimal pair in a strict sense.

In the Minimal Pair Analysis, we add the number of violations of each pair as the total number of violations. In order to show which output is responsible for the violations, asterisks are divided into the left or right side of the colon. Note that candidate d) has fewer violations of \*NUC as both inputs undergo nasal assimilation, but incurs a fatal violation of CONTRAST as the two inputs become homophonous. Between candidates b) and c) which incur the same number of violations of \*NUC, b) wins out because c) violates MAX [m-V-stem] but b) does not: /e/ in /nare-nai/ is part of the stem, while /a/ in /nar-anai/ is part of the suffix. Thus, /nar-anai/ undergoes nasal assimilation but the nasal assimilation in /nare-nai/ is blocked.

### 1.2.6 Questions and plans

Whether anti-homophony blocking is limited to application within an inflectional paradigm is an important question. If it is, apparent cases of blocking in a transparadigmatic relation must be analyzed as merely lexical exceptions for particular lexical items.

Albright (2003) discusses paradigm gaps in Spanish, for example, for the verb *abolir* ‘abolish’, speakers are typically unsatisfied with any possible 1sg form (\**abol-o*, \**abeul-o*). There are at least three logically possible foci of such failure: 1) the underlying forms of certain words may be defective, 2) the grammar itself may be indeterminate or 3) some external mechanism blocks the output being pronounced at the surface. Following Albright, we will assume that, in the discussion to anti-homophony blocking at hand, the three logically possible foci are: 1) the underlying forms of certain

words are lexically marked as simply not undergoing contraction, 2) the grammar itself incorporates some anti-homophony principle and 3) some unknown external mechanism blocks the output from being pronounced in the surface form.

Under the second possibility, there is a further question of where the anti-homophony blocking resides in the grammar. Crosswhite (1999, 2001), Kawahara (2003) and Itô and Mester (2004b) consider that the anti-homophony principle to be part of the phonological grammar, using particular constraints, ANTI-IDENT, \*MERGE and PARCONTRAST, respectively. If anti-homophony blocking is part of the synchronic/phonological grammar, it should be productive. How do we know that homophony blocking is in fact part of the grammar? What type of evidence can we provide? In the past research, productivity of anti-homophony blocking is not explicitly addressed, but presumably, it was assumed to be productive. If anti-homophony as part of grammar is not limited to the inflectional paradigm, its productivity also needs to be demonstrated. Furthermore, if there is a constraint against homophony, how can one account for the many exceptions, especially concerning inflectional morphology, for example, *kaw -ta* ‘buy, PAST’ → *katta*, *kar -ta* ‘clip, PAST’ → *katta*, despite this anti-homophony principle? How do we account for such possible counterevidence to anti-homophony blocking?

In this dissertation, I will demonstrate that contraction in Japanese is blocked due to the potential for homophony creation in transparadigmatic relations. I will also show that the anti-homophony constraint CONTRAST is not limited to applying within paradigms. I take the position that anti-homophony constraint resides within the “contraction grammar.” This thesis compares the contraction grammar to the noncontraction grammar

(called “full-form grammar”). It will be demonstrated that homophony creation is often allowed in spite of the anti-homophony constraint CONTRAST because the effect of CONTRAST does not always emerge due to the violation of constraints ranked higher than CONTRAST. I will show that the anti-homophony principle must be a phonology-internal process, deeply embedded in the phonology, and that it must be so in order to account for anti-homophony blocking and homophony creation.

Since past research has simply assumed that anti-homophony blocking is a productive process without providing clear examples for these assumptions, I will discuss a production experiment of nasal assimilation, which provides evidence that anti-homophony blocking is in fact a productive process.

### **1.3 Method of data collection and analysis**

#### **1.3.1 Data collection**

I have collected data of contracted forms in Japanese from the relevant literature, Toki (1975), Hasegawa (1979), Otsubo (1982), Makino and Tsutsui (1986), Saito (1986), Horiguchi (1989), Shibatani (1990), Toki (1990), Saito (1991), Kawase (1992), Minegishi (1999), Umemura (2003), Nakamura et al. (2003), as well as from elicitations from native speakers of Japanese. I also collected contracted forms in written form children’s books, popular music, and politicians’ speeches, in order to show that contracted forms in Japanese, which mostly appears verbally in casual setting, are also described in writing and even occur in a formal speech.

### **1.3.2 Analysis**

The collected data will be analyzed using constraints and their rankings within the framework of Optimality Theory (OT) by Prince and Smolensky (1993). In OT, it is assumed that there is a finite set of constraints which are universal among all languages, and that these constraints are ranked in a specific order in a given language. For a set of competitive outputs for the same underlying input, only the output which violates the more high ranked constraint the least wins. Thus, language universality and language specificity are captured. OT is an appropriate method to analyze contracted forms and their anti-homophony blocking.

### **1.3.3 Experiment**

To exemplify the question of whether contraction and anti-homophony blocking are productive processes as they are part of synchronic/phonological grammar, I conducted a production experiment involving nasal assimilation, one of the processes subject to anti-homophony blocking. The subjects are 15 native Japanese speakers living in Japan and the U.S. with age ranging from 19 to 45. In the production experiment, both existent and nonce verbs are used to check the occurrence of nasal assimilation. If contraction and the anti-homophony principle are applied not only to the existent verbs but also nonce verbs, this reveals that contraction and anti-homophony must be part of the phonological grammar.

Nonce words used in this experiment are a) the ones, which are not ambiguous upon nasal assimilation because there is no homophony threat, and b) the ones which

would create homophony if these words and their counterparts both undergo nasal assimilation. The former tells us whether or not the contraction really occurs, and the latter confirms anti-homophony blocking is at work. For statistical analysis, Chi-square is used of data obtained by the experiment to check statistical significance in distribution in the data.

#### **1.4 Significance of the study**

This dissertation is a part of an increasing body of literature on anti-homophony blocking, a phenomenon in natural languages which has received much attention in recent theoretical literature (Kisseberth and Abasheikh 1974, Mitchell 1993, Crosswhite 1999, 2001, Kenstowicz 2002, Morrill 2002, Kawahara 2003, Itô and Mester 2004b, Blevins 2004, Gessner and Hansson, to appear). The dissertation contributes in identifying new aspects of anti-homophony blocking. All past research in this area demonstrated only anti-homophony within an inflectional paradigm. This thesis sheds light on an expanded notion of this phenomenon by claiming that transparadigmatic contexts are also subject to anti-homophony blocking. In other words, it can occur with lexically unrelated words, if a phonological process would produce homophony. The past research simply assumes that anti-homophony blocking is a productive process by claiming an anti-homophony constraint in the grammar. I will demonstrate that contractions and anti-homophony blocking in Japanese are productive processes and that the anti-homophony principle is embedded into the phonology as a phonology-internal constraint.

The thesis also makes a significant contribution to the study of phonological aspects of Japanese contracted forms for which sufficient phonological analyses have not been provided by the researchers on Japanese in recent years (a phonological analysis on contracted forms is limited to Saito 1986). I provide a closer look at nasal assimilation, labial contraction and gerund /te/ contraction in a derived environment. I offer full-phonological analyses of nasal assimilation.

In addition, this dissertation contributes to a body of literature on variation in OT by demonstrating that the variation of the contraction and full-form grammars is a result of a relativized faithfulness constraint. In these grammars, the markedness constraints have a single ranking but the relativized faithfulness constraint can be ranked in one of two positions in the hierarchy to provide different surface results by different grammars.

### **1.5 Outline of the dissertation**

The rest of this dissertation is organized as follows. Chapter 2 introduces nasal assimilation, labial contraction and gerund /te/ contraction in derived environments in Japanese and demonstrates that there is anti-homophony blocking in the first two contracted forms.

Chapter 3 contains analyses of each contracted form and the anti-homophony blocking within the framework of Optimality Theory (Prince and Smolensky 1993) and propose the anti-homophony constraint CONTRAST in a “Minimal Pair Analysis,” a technique used to allow a set of inputs under evaluation for a homophony threat and a set

of output candidates, in order to capture the interaction between words in transparadigmatic relations.

In chapter 4, I will tackle several cases of homophony creation, which could be counterevidence to my claim that the anti-homophony principle exists in transparadigmatic relations. Proper explanations are given for such homophony cases in the full-form grammar, which the noncontracted forms (full forms) derive from, as well as in the contraction grammar, which the contracted forms derive from. It also discusses the variation of between the two grammars by created by the ranking of a relativized constraint. This chapter also demonstrates that the anti-homophony principle is a phonology-internal device, which is embedded in the phonological grammar.

Chapter 5 examines the productivity of contracted forms and the anti-homophony blocking by conducting a production experiment involving nasal assimilation. In order to eliminate a possibility that contraction is positively influenced by word frequency and word familiarity, a Japanese corpus is examined to check the word frequency and word familiarity of the words that undergo contraction, and that of the words whose contraction is blocked.

Chapter 6 offers conclusions of this dissertation.

## **Chapter 2: Contracted forms and their anti-homophony blocking in Japanese**

### **2.1 Introduction**

Certain phonological alternations are sometimes blocked even when the conditions for the application are perfectly met. One case of such blocking occurs when the application of the phonological process to multiple inputs creates homophonous outputs. Such blocking is clearly evident in contraction phenomena in Japanese. In this chapter, I will review *shukuyakukei* or Japanese “contracted forms” (Kikuzawa 1935, Toki 1975, among others) which have drawn little attention in their phonological analysis. The contracted forms I reviewed in this chapter are what I will refer to as “nasal assimilation,” “labial contraction” and “gerund /te/ contraction.” I will demonstrate that in nasal assimilation and labial contraction, contraction is blocked when the application of the contraction to a set of words in transparadigmatic relation creates homophonous outputs. I will identify this phenomenon as “anti-homophony blocking,” with a detailed analysis of the contracted forms and this blocking in the next chapter.

### **2.2 Contracted forms – syncope in a derived environment**

The main data in this dissertation comes from *shukuyakukei* or “contracted forms” (Kikuzawa 1935, Toki 1975, among others) in derived environments, which are commonly used among Japanese speakers. Kikuzawa (1935) was the first researcher who used the word *shukuyaku* or “contraction” in a phonological study of modern Japanese.

Toki's (1975) work was ground breaking work concerning contracted forms in teaching Japanese as a foreign language. The definition of "contraction forms" varies depending on the researcher. Kikuzawa (1935) originally called *shukuyaku* "a phonological phenomenon in which two syllables merge into one syllable as a result of deletion or fusion" (Kikuzawa 1935:107, translated by Ichimura). However, since then, *shukuyaku(kei)* has been used to refer to more expanded notions. Otsubo (1982:51), for example, gives a broad definition of *shukuyakukei* as "a short form which corresponds to a particular long form" (translated by Ichimura). A narrower definition is given by Minegishi as "contraction of function words which accompanies with a reduction of the number of syllables or sounds" (Minegishi 1999:30, translated by Ichimura). I follow Minegishi's definition, with slight modification that I will consider that contracted forms are not strictly limited to function words. In more recent research, contracted forms in Japanese have been primarily discussed in the context of teaching Japanese as a foreign language, in discussions of whether contracted forms should be taught at all, and if so how they should be taught (Horiguchi 1989, Minegishi 1999, among others).

As observed by Shibatani (1990:175), the contracted forms generally arise from the deletion of vowels, and some forms stop at the level of vowel deletion, but others undergo further changes of the adjacent consonants such as assimilation and palatalization. Out of several patterns of contracted forms, I focus on "nasal assimilation" (where *r* in a syllable at a morpheme boundary assimilates to *n* before *n* in a suffix as a result of syncope of the vowel following *r*), "labial contraction" (deletion of a labial and the vowel before it) and "gerund /te/ contraction" (syncope of one vowel in two

consecutive vowels between the gerund /te/ and the auxiliary verb). In the examples below, syncopated vowels are written in boldface. The following are examples of each contracted form.<sup>12</sup>

(21) Contracted forms in derived environments

a. Nasal assimilation

Contracted form: /wakar **-anai**/ → wak**annai**  
understand NEG ‘don’t understand’

(Full form: /wakar **-anai**/ → wak**aranai**)

Contracted form: /kure **-nai**/ → k**unnai**  
give (me) NEG ‘don’t give me’

(Full form: /kure**-nai**/ → kurenai)

b. Labial contraction

Contracted form: /boku **-wa**/ → bok**aa**, bok**a**  
1-SG -TOP ‘as for me’

(Full form: /boku **-wa**/ → bok**uwa**)

Contracted form: /ik **-eba**/ → ik<sup>l</sup>**aa**, ik<sup>l</sup>**a**  
go -HYP ‘if (someone) goes’

(Full form: /ik **-eba**/ → ike**ba**)

c. Gerund /te/ contraction (allomorphs [te], [de])

Contracted form: /tabe **-te -oku**/ → tabet**oku**  
eat GER put (auxiliary verb)  
‘eat in advance’

(Full form: tabe**-te-oku**/ → tabete**oku**)

Contracted form: yom **-de -ik -u** → yonde**ku**  
read, GER, go, PRES  
‘continue to read’

(Full form: /yom **-de -ik -u**/ → yonde**iku**)

Note that as will be explained in section 2.5, /a/ in /wa/ and /a/ in /eba/ in (21b) are lengthened. They all occur in a derived environment, namely at a morpheme boundary,

<sup>12</sup>I will not discuss here what I call “obstruent contraction,” that is syncope which results in creating geminates of an obstruent, such as /doko-kara/ ‘where, from’ → *dokkara* since this phenomenon does not seem to be purely phonological because its occurrence is sensitive to the speed of the speech (“fast speech”), as well as word frequency (see Okada 2004 for details). I also exclude what I call “moraiic nasal formation” such as /boku-no-da/ ‘1-SG, POSS, COP’ → *bokunda*, /nani-mo/ ‘what, also’ → *nammo*, since this phenomenon is not only involved in the morpheme boundary but also in the word boundary. Hence analysis of this contraction is beyond the scope of this dissertation.

and they fail to occur in a nonderived environment. A vowel internal to a morpheme does not undergo syncope. Such nonderived environment blocking or derived environment effects (Mascaró 1976, Kiparsky 1982; 1993, Inkelas 1998, among others) are observed in the following examples of minimal pairs or near minimal pairs.

- (22) a. kurenai → \*kunnai  
 crimson  
 kure -nai → kunnai (nasal assimilation)  
 give (me) NEG
- b. uranai → \*unnai  
 fortune telling  
 ur -anai → unnai (nasal assimilation)  
 sell NEG
- c. dokuwa → \*dokaa, \*doka  
 monologue  
 buku -wa → bokaa, boka (labial contraction)  
 1-SG (male) TOP
- d. totteoki → \*tottoki  
 thing for a special occasion  
 tabe -te -oku → tabetoku (gerund /te/ contraction)  
 eat GER put (auxiliary verb)

The contracted forms may have originated as a result of “natural tendency of the simplification of pronunciation,” (Kikuzawa 1935) or “principle of economy,” (Toki 1990) but it is crucial to clarify that the contracted forms in derived environments are not part of “fast speech” but rather, they are part of the lexical phonology of Japanese, as evidenced by the nonderived environment blocking exhibited above. Fast speech is treated as a phonetic phenomenon in which gradient sound reduction occurs when the speed of the speech is high. Therefore, it should occur in a nonderived environment as well. High vowel devoicing in Japanese, for example, is a typical phenomenon of this kind. In high vowel devoicing, /i/ and /u/ get devoiced when they occur between

voiceless consonants or before a pause: *sukoshi* ‘a little’, *yakusoku* ‘promise’ (Hasegawa 1979). As for contracted forms, Toki (1975) disagrees with the conventional view that contracted forms occur when the speed of speech is high. He observed a conversation between an announcer and three guests on an educational TV program on NHK (the Japanese national broadcasting company) and found that some speakers used contracted forms more frequently than the others even when the speed of speech was low. He, therefore, concluded that there is no definite correlation between the use of contracted forms and the speed of speech.<sup>13</sup> It is also important to point out that although contracted forms are generally considered to only be used in informal settings, they occur in formal settings as well. Toki observed that the contracted forms were used frequently in a formal situation such as educational TV program. Thus, the occurrence of the contracted forms is not only limited to informal situations. I also argue that the use of contracted forms in formal situation is not a linguistic faux pas since, as Minegishi (1999) found out in her experiment, certain contracted forms are perceived as “natural” by the native speakers, even in a formal setting (see also Saito 1991). Nakamura et al. (2003) found that male speakers tend to use nasal assimilation more than female speakers, and nasal assimilation occurs where there is a close relationship between the speaker and listener. I will briefly touch upon the relationship between the level of occurrence of nasal assimilation and sociolinguistic factors such as gender, age and closeness between the speakers in an

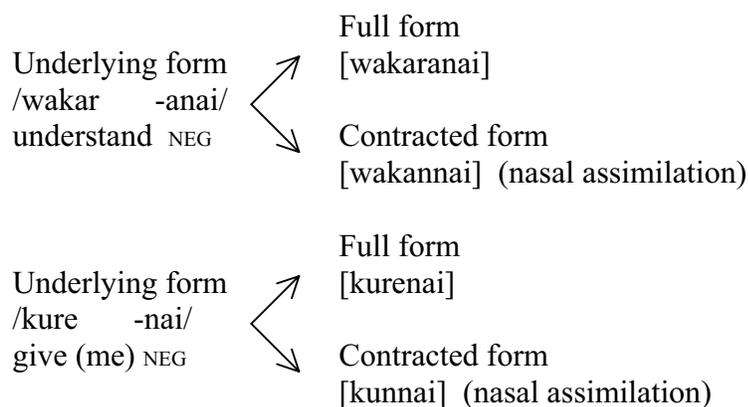
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<sup>13</sup>Hasegawa (1979) makes a distinction between “fast” speech and “casual” speech, and argues that fast speech is sensitive to the rate of the speech, whereas casual speech is more or less sensitive to sociological notions and lexical information, not to the rate of the speech. Her “casual speech” is not exactly the same as “contracted forms” used in this dissertation (although her casual speech includes some contracted forms). Hasegawa’s claim that casual speech is sensitive to lexical information could provoke a counterargument because there is a case to which her claim is not applicable (see Ichimura 2001 for details).

experiment on nasal assimilation in section 5.2.3. I will give little attention to the effects of sociolinguistic factors and although it should be noted that they do come into play.

The important thing here is the fact that contracted forms are optional. In general adult speakers use both full and contracted forms (see Horiguchi 1989).<sup>14</sup> The underlying form, which undergoes contraction, may surface without contraction, in which case I will call it the “full form.”<sup>15</sup> For example, the underlying form /wakar-anai/ in the example below is realized as a contracted form *wakannai* due to the nasal assimilation process but also it is realized as the corresponding full-form *wakaranai*.

(23) Coexistence of two forms



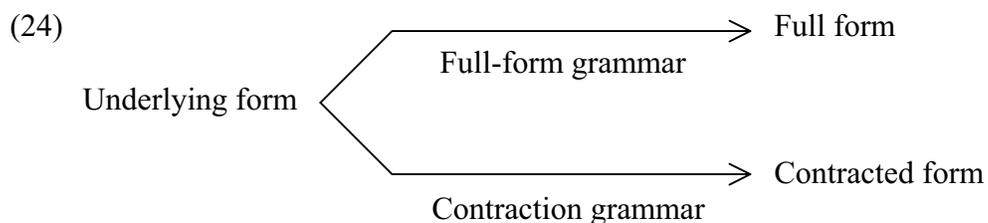
Contracted and full forms coexist not only among the speakers of the language (see Saito 1991), but also within an individual speaker. Contraction is not an obligatory

<sup>14</sup>It is important to make clear that the distinction between full and contracted forms is not the same as the distinction between polite and nonpolite forms. It is also acceptable to mix a contracted form and a polite form within a sentence. For example, in the example below, nasal assimilation (underlined) is used along with the polite copula *desu*.

(i) wakan nai desu yo  
 understand NEG COP-POL Sentence Ending  
 ‘I did not understand it, you know.’

<sup>15</sup>Horiguchi (1989), Kawase (1992) and Minegishi (1999) use either *genkei* or *genkeishiki* (original form) to refer to a noncontracted form which corresponds to a contracted form. However, I avoid this term because it gives the impression that a contracted form derives from the corresponding noncontracted form.

phonological process, and nonoccurrence of contracted forms does not jeopardize the intended meaning. I call the grammar from which a contracted form derives “contraction grammar” and the grammar from which a full form derives “full-form grammar.”



I have very little to say about the choice of full-form and contraction grammars sociolinguistically as this dissertation focuses phonological aspects of the grammars. In chapter 4, I will claim that full-form and contraction grammars consist of different orders of the same constraints within the framework of Optimality Theory. Among several approaches to the variation in grammar, I will show that a “nonfixed model” is the most suitable to explain the variation of the two grammars, the contraction and the full-form grammars in Japanese. In the “nonfixed model,” a certain constraint is rerankable within a single grammar, which in effect leads to two or more subgrammars (Anttila 1997, Anttila and Cho 1998, among others). To be more specific, in the case of nasal assimilation, one particular constraint has two possible positions within the single ranking, and which position this constraint is ranked leads to two subgrammars, the contraction and the full-form grammars.

### 2.3 Japanese verb paradigm

Before reviewing each contracted form, it is beneficial to introduce the Japanese verb paradigm, as I will use it often throughout the following discussions. Japanese conjugation classes and stem allomorphy, using examples of /kar(V)/ verbs, are shown in (25). In Appendix A, I will review the claims that two allomorphs, for example, the negative suffixes /nai/ which attaches to a vowel-final verb and /anai/ which attaches to a consonant-final verb, are derived by a phonological rule, either a deletion rule or an epenthesis rule, and argue that they are in fact both listed in the lexicon and a particular allomorph is selected by phonology. In other words, /nai/ and /anai/ are subject to lexical allomorphy (Kager 2003, among others) conditioned by phonology.

(25)	<u>Category names</u>	<u>Consonant-final verb</u>	<u>Vowel-final verb</u>	
	Negative	kar <u>-anai</u>	kare <u>-nai</u>	kari <u>-nai</u>
	Polite Present	kar <u>-imasu</u>	kare <u>-masu</u>	kari <u>-masu</u>
	Present	kar <u>-u</u>	kare <u>-ru</u>	kari <u>-ru</u>
	Hypothetical	kar <u>-eba</u>	kare <u>-reba</u>	kari <u>-reba</u>
	Potential	kar <u>-e</u>	kare <u>-rare</u>	kari <u>-rare</u>
	Passive	kar <u>-are</u>	kare <u>-rare</u>	kari <u>-rare</u>
	Imperative 1	kar <u>-e</u>	kare <u>-ro(yo)</u>	kari <u>-ro(yo)</u>
	Imperative 2	kar <u>-ina</u>	kare <u>-na</u>	kari <u>-na</u>
	Polite Imperative	kar <u>-inasai</u>	kare <u>-nasai</u>	kari <u>-nasai</u>
	Tentative	kar <u>-oo</u>	kare <u>-yoo</u>	kari <u>-yoo</u>
	Causative	kar <u>-ase</u>	kare <u>-sase</u>	kari <u>-sase</u>
	Past	kat <u>-ta</u>	kare <u>-ta</u>	kari <u>-ta</u>
	Gerund	kat <u>-te</u>	kare <u>-te</u>	kari <u>-te</u>
		'clip'	'wither'	'borrow'

Only *e* and *i* occupy the position at the end of a regular vowel-final verb.<sup>16</sup> There are several ways to describe each category name. For example, 'negative' and 'polite present' correspond to categories traditionally called 'irrealis' and 'adverbial'

<sup>16</sup>Vowels *o* and *u* can be in the final position for irregular verbs, for example, *ko-nai* 'come, NEG'.

respectively, and adverbials without *masu* such as *kar-i*, *kare*, *kari*, are called ‘infinitive’ as well. It may be argued that *-nai* should be further broken into *-na -i* ‘negative’ and ‘conclusive ending’ (Shibatani 1990) or ‘adjective indicative’ (de Chene 1985). For this reason, *-nai* is also called the ‘present negative’. However, here I will simply treat it as *-nai* because the internal structure of *-nai* is irrelevant to my discussion. ‘Present’ *-u/-ru* is also called ‘plain present’, ‘conclusive’, or ‘perfective indicative’. ‘Hypothetical’ is also called ‘conditional’ or ‘provisional’, and ‘tentative’ is also called ‘presumptive’, ‘hortative’ or ‘inchoative’. The difference between ‘imperative 1’ and ‘imperative 2’ is stylistic. In ‘imperative 1’, the difference between *-ro* and *-yo* is also stylistic: *-ro* is the spoken form and *-yo* is the written form.

## **2.4 Nasal assimilation and its anti-homophony blocking**

In this section, I will introduce and review nasal assimilation, one of the contracted forms. Several forms of nasal assimilation will be reviewed. It is demonstrated that nasal assimilation is blocked in order to avoid homophony creation even when the conditions for the application of nasal assimilation are perfectly met.

### **2.4.1 Nasal assimilation**

In this section, I further dissect nasal assimilation. In nasal assimilation, *r* in a syllable at a morpheme boundary assimilates to *n* before *n* in a suffix, as a result of syncope of the vowel following *r*. This is a purely phonological phenomenon, as it occurs independently

from the type of suffixes (/r/-/V/ combinations which undergo nasal assimilation are shown in the examples below in boldface).

(26) Nasal assimilation 1: a suffix starting with /n/ attaches to the present form /u/ or /ru/

- a. **kaer** **-u** -no → **kaenno**  
 go back PRES, Question particle  
 ‘Are you going back?’
- b. **okor** **-u** -no -wa murinai → **okonno** wa murinai  
 get upset PRES NOMI TOP reasonable  
 ‘It is reasonable to get upset.’
- c. **tabe** **-ru** no da → **tabennoda**<sup>17</sup> (Saito 1986:208)  
 eat PRES NOMI COP  
 ‘It is that (sub.) eats.’
- d. **fuzake** **-ru** -na → **fuzakenna**  
 make a fool of PRES NEG-IMP (attaches to PRES)  
 ‘Don’t fool around!’

(27) Nasal assimilation 2: a suffix starting with /(V)n/ attaches to a verb stem (consonant-final or vowel-final)

- a. **gambar** **-inasai** → **gambannasai**  
 hang on POL-IMP  
 ‘Hang on’
- b. **yar** **-ina** → **yanna**  
 do IMP  
 ‘Do it!’
- c. **kawar** **-anai** → **kawannai** (Toki 1990:231)  
 change NEG  
 ‘does not change’
- d. **tabe** -tagar **-anai** → **tabetagannai**  
 eat show signs of NEG  
 ‘does not show signs of eating’
- e. **taore** **-nai** → **taonnai**  
 fall down NEG  
 ‘does not fall down’

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<sup>17</sup>Saito (1986) gives examples of a variation of *no* which undergo nasal assimilation: *no-da* (Nominalizer, Copula), *no-ka* (Nominalizer, Question maker), *noni* (Conjunction), *noda* (Conjunction).



- (28) a. **wakar** -anai → wakannai  
 CVCVC (consonant-final verb) (Umemura 2003:133)  
 understand NEG
- b. **tari** -nai → tannai  
 CVCV (vowel-final verb) (Otsubo 1982:51)  
 suffice NEG
- c. **kure** -nai → kunnai  
 CVCV (vowel-final verb) (Toki 1990:231)  
 give (me) NEG

Thus, there are three verb patterns for nasal assimilation by negative suffixation: /r-anai/, /re-nai/ and /ri-nai/.<sup>20</sup>

Nasal assimilation only occurs to the combination of *r* and *n*. The examples below show that verbs ending in a consonant other than *r* (indicated in boldfaced letters) do not undergo nasal assimilation.

- (29) a. **sas** -anai → \*sannai (sannai < sar-anai ‘leave, NEG’)  
 sting NEG
- b. **kat** -anai → \*kannai  
 win NEG
- c. **nak** -anai → \*nannai (nannai < nar-anai ‘ring, NEG’)  
 cry NEG
- d. **yom** -anai → \*yonnai  
 read NEG
- e. **sow** -anai → \*sonnai (sonnai < sor-anai ‘shave, NEG’)  
 satisfy NEG

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NEG.’ However, I am not concerned with these verbs because they never ends with /ru/ or /ro/ before the negative suffix, and therefore they do not undergo nasal assimilation.

<sup>20</sup>There is a variation in the realization of verb + negative suffix /nai/ (and /anai/).

- (i) **wakar** -anai → wa.ka.ra.nee. (coalition of *ai*)  
 understand NEG. → \*wa.ka.ran. (truncation of *ai*)  
 → wa.ka.raN. (truncation of *ai*. N: placeless nasal)  
 → wa.kan.nee. (nasal assimilation)  
 → \*wa.kann. (nasal assimilation + truncation of *ai*)

\**wakaran* and \**wakann* are ill-formed as they violate CODACOND and NOCOMPLEXCODA respectively (See section 3.3 for these constraints). However, these surface forms are excluded in the current discussion since our focus in this dissertation is on syncope at the morpheme boundary.

Also, /r-V/ does not assimilate to *n* before coronal other than *n*. Coronals *t* and *d* in the desiderative /tai/ and suffix /dasu/ ‘to start’ do not trigger the assimilation to *n*. /r-V/ also does not assimilate to a nasal other than *n*. Nasal *m* in the ‘polite present’ /masu/ does not trigger assimilation. As shown in the parenthesis below, gemination of a consonant following the syncopated vowel, does not occur.

- (30) a.      wakar      -itai → \*wakantai, (\*wakattai)  
                  understand DESI  
                  wakar      -idasu → \*wakandasu, (\*wakaddasu)  
                  understand start  
                  wakar      -imasu → \*wakanmasu, (\*wakammasu)  
                  understand POL-PRES
- b.      araware -tai → \*arawantai, (\*arawattai)  
                  appear    DESI  
                  araware -dasu → \*arawandasu, (\*arawaddasu)  
                  appear    start  
                  araware -masu → \*arawanmasu, (\*arawammasu)  
                  appear    POL-PRES

There is evidently something about the combination of /r/ and /n/ which triggers nasal assimilation. I will give an analysis to this special status of /r/ and /n/ in section 3.4.

The accent pattern plays an important role in distinguishing meaning in nasal assimilation. For example, the difference between the following two examples is whether the word is lexically accented or not. In (31a), *nár* has a pitch drops from high to low at the accented syllable (indicated by an acute accent), whereas in (31b), *nar* is unaccented in which the pitch does not drop. Thus, the resultant forms of nasal assimilation are different and this helps a listener process the two forms.

- (31) a. **nár** -anai → **nánnai**<sup>21</sup>  
           become NEG  
       b. **nar** -**anai** → **nannai**  
           ring NEG

*nánnai* is never interpreted to be the nasal assimilation of *nar-anai*, and *nannai* is never confused with the nasal assimilation of *nar-ánai*. Another example of the role of accentuation for nasal assimilation with the negative imperative affix /-na/ (and its allomorph /-ina/) is:

- (32) a. **gambár -ina** -yo → **gambánnáyo**  
           hang on IMP Sentence Ending  
       b. **gambár -u** -na -yo → **gambánnayo**  
           hang on PRES NEG-IMP Sentence Ending

Again, the resultant forms of nasal assimilation are different and therefore, they are not homophonous.<sup>22</sup> In the following discussions, accent pattern will not be shown in the examples, but accent pattern will be taken into consideration when a pair in comparison is selected.

Nasal assimilation occurs in written forms as well. It sometimes appears in picture books and cartoon magazines for children. Note that the underlined *n*'s in *yánnai* and *wakánnai* are expressed by the Hiragana character *ん* (also underlined). Hiragana is syllabary and one letter corresponds to one syllable (C)V with exception of syllable-final /n/ which is also described by one letter.

<sup>21</sup>Note that the accented syllable of the full-form is different: *naránai*. The accented syllable shifts forward in the nasal assimilation form because moraic *n* is a special mora; there are four special moras: long vowel, nasal coda or moraic nasal, moraic obstruent and the second element of diphthong. As a special mora, *n* cannot bear an accent (See Saito 1986, Kubozono 1995, among others for detail).

<sup>22</sup>This was shown in a mini-experiment with 17 native speakers. They listened to each set of nasal assimilation in (31) and (32) and were asked what the nonnasal assimilation forms were. 15 out of 17 subjects answered the underlying forms of *nánnai* and *nannai* correctly. 2 subjects could not tell the underlying forms of *nánnai* and *nannai* without a context. All the subjects answered the underlying forms of *gambánnáyo* and *gambánnayo* correctly.

- (33) a. いっしょにあそんでやんない! (Kiyono 2001:16)  
 isshoni ason -de yannai! (< yar-anai)  
 together play GER give-NEG  
 ‘I won’t play with you!’
- b. ゲホッ、ゲホッ、わかんない (Yanase 2000:8)  
 geho, geho, wakannai (< wakar-anai)  
 ugh ugh understand-NEG  
 ‘ugh, ugh, I don’t understand.’

The nasal assimilation of /re-nai/ words also appear in written form.

- (34) 嘘! 信じらんない! 国民の70%が戦争反対だったのに (Moore 2003)  
 uso! shinji -rannai! (< shinji-rare-nai) kokumin -no 70% -ga  
 lie believe -POTEN-NEG people of the nation -GEN 70% -NOM  
 sensou hantai da -tta noni  
 war opposition COP PAST CONJ  
 ‘No way! I can’t believe it! The fact is that 70% of the people of the nation was opposing the war.’

Nasal assimilation also occurs in occasions which would usually be considered formal.

The Japanese prime minister Jun-ichiro Koizumi made the following comment at a press interview on the Iraq War of 2003 after the Peace Prayer Ceremony in Nagasaki city (quoted in the web site of Asahi Newspaper of August 9, 2003.

<http://www.asahi.com/politics/update/0809/005.html>):

- (35) イラクが国際社会の声を聞いて査察を受け入れれば、戦争は起こんなかった。  
 Iraku -ga kokusaishakai -no koe -o kii -te sasatu -o ukeire  
 Iraq -NOM international society -GEN voice -ACC listen -GER inspection -ACC accept  
 -reba sensoo -wa okonna -katta (< okor-ana-katta)  
 -HYP war -TOP occur-NEG -PAST  
 ‘If Iraq had accepted the inspection (by the United Nation) following the voices of the international society, the war would not have occurred.’

In this example, nasal assimilation occurs in a formal press interview of the prime minister.

It is important to state here that some /r-anai/ words are less susceptible to nasal assimilation.

- (36) ser -anai → ?\*sennai  
 bid, NEG  
 vs. sor -anai → sonnai (nasal assimilation occurs)  
 shave, NEG

Similarly, it is not always the case that /re-nai/ words which do not have a /r-anai/ counterpart undergo nasal assimilation.

- (37) a. sugure -nai → ?\*sugunnai  
 excel NEG  
 b. osore -nai → ?\*osonnai  
 fear of NEG

To my knowledge, a corpus of verbs that undergo nasal assimilation does not exist. Therefore, as a native speaker of Japanese, I have created a list of /CV.rV.nai/ and /CV.CV.rV.nai/ words and their nasal assimilation using my own intuition, along with the cooperation of two other Japanese native speakers (see Appendix B). I do not expect that other Japanese speakers completely agree with our judgment on the occurrence of nasal assimilation due to the individual variation on judgment. However, we can have some idea on the percentage of nasal assimilation of /r-anai/ and /re-nai/ words (excluding /re-nai/ words which have a /r-anai/ counterpart since the nasal assimilation of these /re-nai/ words is always blocked). The result is that /r-anai/ words undergo nasal assimilation at 98.7% (155/157) and /re-nai/ words at 62.2% (23/37). This may be an indication that nasal assimilation of /re-nai/ words is used more strictly (in more causal situation, for example). Nevertheless, what's crucial here is that the nasal assimilation of /re-nai/ words which have a /r-anai/ counterpart is clearly and completely blocked as shown in the next section.

### 2.4.2 Anti-homophony blocking of nasal assimilation

In this section, I will examine several cases where nasal assimilation is blocked even when the phonological conditions for nasal assimilation are met. I argue that this blocking exists in order to avoid homophony creation, that is, it is an anti-homophony blocking.

Toki (1990) points out that *kari-nai* and *ori-nai* do not undergo nasal assimilation, however, an explanation for the nonoccurrence is not given, so I will attempt to provide one here.

- (38) a. **kari** -nai → \*kannai  
       borrow NEG  
       b. **ori** -nai → \*onnai  
       get off NEG (Toki 1990: 231)

It appears that *kari-nai* and *orinai* should undergo nasal assimilation because the phonological environment for nasal assimilation is appropriate, namely, there is an *r* in a syllable at a morpheme boundary, that is directly followed by *n* in a suffix when /i/ gets deleted, just like *tari-nai* ‘suffice, NEG’ which undergoes nasal assimilation as *tannai*. Not only some /ri-nai/ words but also some /re-nai/ words are blocked in nasal assimilation.

- (39) a. **wakare** -nai → \*wakannai  
       get separated NEG'  
       b. **okure** -nai → \*okunnai  
       become late NEG  
       c. **nare** -nai → \*nannai  
       get used to NEG  
       d. **umare** -nai → \*umannai  
       be born NEG<sup>23</sup>

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<sup>23</sup>One could argue that *umare-nai* (< *umare-ru*) is a passive form, *um-are-nai* ‘bear, PASS, NEG (< *um-are-ru*). However, following Iwanami (2000), I treat it as an independent lexical item as Japanese dictionaries generally do.

Again, the phonological environment for these words does not seem to be any different from *kure-nai* ‘give (me), NEG’ which undergoes nasal assimilation *kunnai*. The examples above, however, do not point towards the generalization that only /r-anai/ words undergo the assimilation and the assimilation of /re-nai/ and /ri-nai/ words is blocked. As we saw in (28), /ri-nai/ and /re-nai/ words do undergo nasal assimilation.

Further observation reveals that these words whose negative forms do not undergo nasal assimilation have /r-anai/ counterparts. That is, if a /re-nai/ word or a /ri-nai/ word has a /r-anai/ counterpart, only nasal assimilation of the /r-anai/ word occurs. Nasal assimilation of the /re-nai/ word or the /ri-nai/ word is blocked.

(40) Blocking of the nasal assimilation of /re-nai/

- a.     **wakar**    **-anai** → **wakannai**  
           understand NEG  
           **wakare**    **-nai** → \***wakannai**  
           get separated NEG
- b.     **okur** **-anai** → **okunnai**  
           send NEG  
           **okure**     **-nai** → \***okunnai**  
           become late NEG
- c.     **nar**     **-anai** → **nannai**  
           become NEG  
           **nare**     **-nai** → \***nannai**  
           get used to NEG
- d.     **umar**    **-anai** → **umannai**  
           get buried NEG  
           **umare** **-nai** → \***umannai**  
           be born NEG

- (41) Blocking of the nasal assimilation of /ri-nai/  
 kor -anai → konnai  
 have stiffness NEG'  
 kori -nai → \*konnai  
 be sick of NEG<sup>24</sup>
- (42) Blocking of the nasal assimilation of /re-nai/ and /ri-nai/  
 a. kar -anai → kannai  
 clip NEG  
 kare -nai → \*kannai  
 wither NEG  
 kari -nai → \*kannai  
 borrow NEG
- b. or -anai → onnai  
 bend NEG  
 ore -nai → \*onnai  
 break NEG  
 ori -nai → \*onnai  
 get off NEG

I can observe from the pairs above that if the /re-nai/ and /ri-nai/ counterparts undergo nasal assimilation, the outputs would neutralize the contrast with their /r-anai/ counterparts in input. The diagram below shows that in nasal assimilation and the blocking of (40a), if contrast neutralization (or homophony) is created by distinct underlying forms, it leads to ambiguity in mapping onto the unique input.

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<sup>24</sup>It is possible to add here *kor-e-nai* ‘come, POTEN, NEG’ whose nasal assimilation is also blocked.

- (43) wakar -anai  
understand NEG
- wakare -nai  
get separated NEG
- wakannai
- karera -wa zenzen wakannai  
they TOP at all ??
- ↑  
Ambiguous
- { ‘They don’t understand at all.’  
or  
‘They don’t get separated at all.’

However, the application of the phonological process to one of the inputs, *wakare-nai*, is blocked and the ambiguity is avoided. In other words, a homophony threat drives such blocking.<sup>25</sup> In section 5.3, I will examine the possible influence of word frequency and word familiarity on this blocking, and demonstrate that there is no correlation between blocking of nasal assimilation and word frequency and that high word familiarity does not warrant the occurrence of nasal assimilation.

<sup>25</sup>Contextual or syntactical information cannot help nasal assimilation, for example, of /kari-nai/, to be realized.

- (i) a. asa hayaku siba -o kar -anai -de kudasai  
morning, early lawn -ACC clip(mow) -NEG -GER IMP-AUX  
‘Please do not mow the lawn early in the morning.’  
→ asahayaku siba-o kannai-de kudasai
- b. damatte hon -o kari -nai -de kudasai  
without saying book -ACC borrow-NEG -GER IMP-AUX  
‘Please do not borrow books without saying so.’  
→ damatte hon-o \*kannai-de kudasai

Even in the following sentence where *kari-ru* is already introduced, nasal assimilation of *kari-nai* is blocked.

- (ii) kinoo kare-wa hon -o kari -ru -yooni iw -are -ta -ga boku -wa kitto kare-wa  
Yesterday he -TOP book -ACC borrow -PRES -CONJ tell -PASS -PAST-but I -TOP sure he -TOP  
hon -o kari -nai -to omoo  
Book -ACC borrow -NEG -Comp. think  
‘yesterday, he was told to borrow a book, but I think he won’t borrow it.’  
→ kinoo kare-wa hon-o kari-ru-yooni iwa-re-ta-ga boku-wa kitto kare-wa hon-o \*kannai-to omoo.

A contextual cue does not entitle nasal assimilation to *kari-nai*.

Among several transitive-intransitive verb pairs, the negative forms of the following pairs are potentially under the threat of homophony. However, in this case, nasal assimilation in intransitive verbs, /re-nai/ words, is always blocked.

(44) Blocking of nasal assimilation in /re-nai/: transitive vs. intransitive

- a.     **kosur**            **-anai** → **kosunnai**  
           rub (transitive) NEG  
           **kosure**           **-nai** → \***kosunnai**  
           rub (intransitive) NEG
- b.     **war**               **-anai** → **wannai**  
           break (transitive) NEG  
           **ware**             **-nai** → \***wannai**  
           break (intransitive) NEG

Shibatani (1990) argues that in these transitive-intransitive verb pairs, the transitive suffix is  $\emptyset$  and the intransitive suffix is /-e/. So, if *kosur-e-nai* ‘rub (intransitive)’, for example, underwent nasal assimilation, it would wipe off the intransitive suffix /-e/. Therefore the blocking of nasal assimilation of *kosur-e-nai* is possibly due to a violation of the requirement that a morpheme must be realized.

Another example of this, as Saito (1986) examined, is when there is a pair between a /-anai/ word and its potential form, with the potential morpheme /-e/ (which attaches to a consonant-final verb), the potential form does not undergo nasal assimilation.

- (45) **tomar -anai** → **tomannai**  
       stop    NEG  
       **tomar -e**    **-nai** → \***tomannai**  
       stop    POTEN NEG

This examples of blocking is different from previous examples as one more morpheme /-e/ is involved in for /re-nai/ (/r-e-nai/, to be exact) words. If *tomar-e-nai* underwent nasal assimilation, it would eliminate the entire potential morpheme. As Saito (1986) points

out, /rare/, the other allomorph of the potential suffix which attaches to a vowel-final verb, behaves differently from /-e/, since it does not result in blocking.

- (46) tabe -rare -nai → taberannai  
eat POTEN NEG

Therefore, it is not that a potential morpheme does not undergo nasal assimilation. In section 3.5, I will discuss this nonoccurrence of nasal assimilation using a requirement that a morpheme be realized.

The /re-nai/ words which undergo nasal assimilation do not have a /r-anai/ (and /ri-nai/) counterpart.

- (47) Occurrence of nasal assimilation in /re-nai/
- a. kure -nai → kunnai  
give (me) NEG  
No counterparts  
\*kur -anai → N/A  
\*kuri -nai → N/A
  - b. taore -nai → taonnai  
fall down NEG  
No counterparts  
\*taor -anai → N/A  
\*taori -nai → N/A
  - c. araware -nai → arawannai  
appear NEG  
No counterparts  
\*arawar -anai → N/A  
\*arawari -nai → N/A

This indicates that in order for a /re-nai/ word to undergo nasal assimilation, it cannot have a /r-anai/ counterpart, because such /r-anai/ word would block nasal assimilation. As for /ri-nai/ words, similar to /re-nai/ words, the /ri-nai/ words which undergo nasal assimilation do not have /r-anai/ (and /re-nai/) counterparts.

- (48) Occurrence of nasal assimilation in /ri-nai/
- a. **tari** -nai → **tannai**  
 suffice NEG  
No counterparts  
 \*tar -anai → N/A  
 \*tare -nai → N/A<sup>26</sup>
- b. **kototari** -nai → **kototannai**  
 get enough NEG  
No counterparts  
 \*kototar -anai → N/A  
 \*kototare -nai → N/A

The /ri-nai/ words which undergo nasal assimilation are not many (see the Appendix B) and all of them are derivations of *tari-nai* such as *kototari-nai* ‘get enough, NEG’. Saito (1991) raises the question concerning whether nasal assimilation *tannai* should be treated as a contracted form of *tari-nai* (< *tari-ru* ‘suffice, PRES’) or that of *tar-anai* (< *tar-u* ‘suffice, PRES’). I follow Otsubo (1982) in analyzing *tannai* as a contracted form of *tari-nai* for the following reasons. Tanaka (1991) explains that the negative form of *tar-u* is limited to idiomatic expressions such as *shita tar-azu* ‘tongue, suffice, NEG’ (*azu* or *zu* is an old negative suffix) ‘with a lisp’ or *ichi-jikan tar-azu* ‘one-hour, suffice, NEG’ ‘nearly one hour’. *Iwanami Kobugo Jiten* by Iwanami (2000) and *Shinmeikai Kokugo Jiten* by Sanseido (1997), two popular Japanese dictionaries, explain that *tar-u* is either the written form of *tari-ru* (the former) or that it is characteristic of the dialects of Western Japan (the latter). Saito (1991), on the other hand, mentions the possibility of excluding nasal assimilation of /ri-nai/ words altogether because of the blocking of nasal assimilation of /ri-nai/ words such as *ori-nai* ‘get off, NEG’ → \**onnai* and *kari -nai* ‘borrow, NEG’ →

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<sup>26</sup>Note that *tare-nai* here is without an accent nucleus, in other words, it is level accent. This is different from the existent *taré-nai* ‘drip, NEG’. Thus, *taré-nai* does not form a minimal pair with *tari-nai* (unaccented).

\**kannai*, other than /*tari-nai*/ and its derivations. I assume that the fact that there is a very limited number of examples of nasal assimilation of a verb ending with /*ri*/ + negative suffix /*-nai*/, also contributes to Saito's hesitation to treat *tannai* as a contracted form of *tari-nai* (< *tari-ru* suffice'). Kitahara (1990) and Iwanami (1999) list only six words which take /*ri-nai*/ form, 3 of which are *tari-ru* 'suffice' and its compounds: *miti-tari-ru*, *koto-tari-ru*. However, this does not mean that there is a phonological reason to exclude /*ri-nai*/ words from nasal assimilation. There are many examples of nasal assimilation of /*ri*/ before nasals other than the negative morpheme /*-nai*/: for example the polite imperative /*-inasai*/ (for consonant-final verbs), as shown briefly earlier:

- (49) a.     **gambar** -**inasai** → **gambannasai**  
           hang on   POL-IMP  
       b.     **kaer**    -**inasai** → **kaennasai**  
           go back   POL-IMP  
       c.     **suwar** -**inasai** → **suwannasai**.  
           sit down POL-IMP

Therefore, I argue that nasal assimilation of the negative suffix is applicable to /*ri-nai*/ words without limitation, but that the nasal assimilation of all the /*ri-nai*/ words other than *tari-nai* and its derivations, are blocked by the /*r-anai*/ counterparts, for example *kari-nai* 'borrow, NEG' → \**kannai* vs. *kar-anai* 'clip, NEG' → *kannai*, due to homophony avoidance.<sup>27</sup>

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<sup>27</sup>In terms of other /*ri-nai*/ words, some adjectives take /*ri-nai*/ forms such as *kagirinai* 'unlimited', *kawarinai* 'not changed', *kumorinai* 'not cloudy' but the location of accent nucleus is different from /*ri-nai*/ verbs, for example, *kagirinái* 'unlimited' vs. *kagir-ánai* 'limit, NEG', therefore, they can not make minimal pairs with /*ri-nai*/ verbs. These adjectives do not undergo nasal assimilation. The reason, I argue, is again due to a violation of the requirement that a morpheme must be realized. *Kagirinai* 'unlimited', for example, is derived from three morphemes: *kagir -i -nai* 'limit, NOMI, NEG'. The nasal assimilation of this adjective, *kaginnai* wipes off the nominalizer *-i*.

The table below is a summary of nasal assimilation and the blocking. It clearly shows blocking of nasal assimilation of /re-nai/ and ri-nai/ words when they have a /r-anai/ counterpart.

**Table 4**  
Nasal assimilation and its blocking

	CV <b>r</b> -anai → CV <b>nn</b> ai	CV <b>re</b> -nai → CV <b>nn</b> ai	CV <b>ri</b> -nai → CV <b>nn</b> ai
No counterpart exits.	kawar -anai → kawannai change <sub>NEG</sub>	N/A	N/A
	N/A	kure -nai → kunnai give me <sub>NEG</sub>	N/A
	N/A	N/A	tari -nai → tannai suffice <sub>NEG</sub>
A counterpart exists.	wakar -anai understand <sub>NEG</sub> → wakannai	wakare -nai get separated <sub>NEG</sub> → *wakannai	N/A
	kor -anai have stiffness <sub>NEG</sub> → konnai	N/A	kori-nai → *konnai be sick of, <sub>NEG</sub>
	kar -anai → kannai clip <sub>NEG</sub>	kare -nai → *kannai wither <sub>NEG</sub>	kari -nai borrow <sub>NEG</sub> → *kannai

It is clear that only one of the multiple inputs undergoes nasal assimilation, namely anti-homophony blocking, and the nasal assimilation in the others is blocked. It would be interesting to see which undergoes nasal assimilation in a pair solely between /re-nai/ word and /ri-nai/ word, but to my knowledge, such a pair does not exist.

In chapter 3, I will give a thorough phonological analysis to nasal assimilation and its anti-homophony blocking. In the rest of this chapter, other contracted forms and their blocking will be reviewed before we move on to the analysis.

## 2.5 Labial contraction and its anti-homophony blocking

This section introduces another case of contraction caused by syncope at a morpheme boundary (between a root and an affix, or between two suffixes) and its blocking. In this contraction, the labial in the topic particle *wa* or in the hypothetical particle *eba/reba* (*eba* attaches to a consonant-final verb and its allomorph *reba* attaches to a vowel-final verb) is deleted along with a vowel preceding the labial (Toki 1975, Otsubo 1982, Horiguchi 1989, Shibatani 1990, Toki 1990, Saito 1991, Kawase 1992, Minegishi 1999, Umemura 2003, Nakamura et al. 2003).<sup>28</sup> Then, the remaining vowel *a* can be optionally lengthened (Shibatani 1990).<sup>29</sup> There are two patterns in labial contraction depending on the vowel before a labial: 1) simple deletion of nonfront vowel (*a, o, u*) and a labial, and 2) deletion of front vowel (*i, e*) and a labial along with palatalization of the consonant before the front vowel.

- (50) a. Simple deletion of a nonfront vowel  
 boku -wa → bokaa, boka  
 1-SG (male) TOP ‘it is that I’ (Shibatani 1990:176)
- b. Deletion with palatalization of a front vowel  
 ik -eba → ik<sup>j</sup>aa, ik<sup>j</sup>a<sup>30</sup>  
 go HYP ‘if (sub.) goes’ (Otsubo 1982:52)

<sup>28</sup>I do not think it is coincidental that historically /w/ has been debuccalized in Japanese. *Wi, we* and *wo* have changed to *i, e* and *o* respectively. A historical change *kwa* → *ka* (as well as *kwi* → *ki* and *kwe* → *ke*) started in the Kamakura period (A.D. 1192-1333) and completed in the Edo period (A.D. 1603-1867). *Kwa* exists in only limited numbers of dialects in Shikoku and Kyuushuu regions (Okimori 1989). Even the only surviving *w*-sound *wa* tends to be deleted as seen in this section

<sup>29</sup>In the next chapter, I argue that this is in fact shortening of the long vowel, not lengthening of the short vowel.

<sup>30</sup>Some researchers treat this as a glide formation (Poser 1986, among others). However, in the labial contraction, this phenomenon always occurs with a consonant which is palatalized. I treat it as palatalization and transcribe using C<sup>j</sup>.

The past literature on the contracted forms tends to classify these two labial contractions into separate categories due to the difference of the suffix type. Horiguchi (1989), for example, treats the following contracted forms separately but phonologically these processes are the same phenomena: *de-wa* ‘GER, TOP’ → *dʒaa* or *dʒa*, *na-k-er-eba* ‘NEG, predicate copula, dummy copula, HYP’ → *naker<sup>i</sup>aa* or *naker<sup>i</sup>a*, *na-ku-te-wa* ‘NEG, predicate copula, GER, TOP’ → *nakutʃaa* or *nakutʃa*, *kore-wa* ‘this, TOP’ → *kor<sup>i</sup>aa* or *kor<sup>i</sup>a*. For this reason, I treat these contracted forms as one phenomenon, which I call “labial contraction.”

### 2.5.1 Simple deletion of nonfront vowels

In labial contraction with a nonfront vowel, the front vowel simply syncopated along with the labial. The only labial in this pattern is *w* (The other pattern in section 2.5.2 involves labial *b* as well). As we will see in the next section, in the second pattern, both *w* and *b* are involved in syncope with palatalization.

- (51) Nonfront vowels + [+labial] + a → aa or a
- a. *ik -u -koto -wa* → *ikukotaa*, *ikukota*  
go PRES NOMI, TOP ‘it is that (sub.) goes’
  - b. *honto(o)<sup>31</sup> -wa* → *hontaa*, *honta*  
truth TOP ‘it is that the truth is’
  - c. *boku -wa* → *bokaa*, *boka*  
1-SG (male) TOP ‘it is that I’ (Shibatani 1990:176)

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<sup>31</sup>*Hontoo* ‘truth’ is often shortened to *honto*.



- e. ki **-te -wa** → kitʃaa, kitʃa  
come GER TOP ‘It is that (sub.) come’ (Umemura 2003:133)
- f. nom **-de -wa** → nondʒaa, nondʒa  
drink GER TOP ‘It is that (sub.) drinks’ (Toki 1990:229)
- g. kore **-wa** → korʲaa, korʲa  
this TOP ‘it is that this’ (Toki 1990:229)
- h. wakari **-wa -si -nai** → wakarʲaa, wakarʲa sinai  
understand TOP do NEG ‘It is not that (sub.) understand’ (Saito 1991:91)
- i. sage **-reba** → sagerʲaa, sagerʲa<sup>33</sup>  
pull down HYP ‘if (sub.) pulls down’ (Toki 1990:230)
- j. tika -k -er -eba<sup>34</sup> → tʃikakerʲaa, tʃikakerʲa<sup>35</sup>  
near Predicate copula Dummy copula HYP ‘if (sub.) is near’  
(Horiguchi 1989:113)

#### Dorsals

- k. ik **-eba** → ikʲaa, ikʲa  
go HYP ‘if (sub.) goes’ (Otsubo 1982: 52)
- l. oyog **-eba** → oyogʲaa, oyogʲa  
swim HYP ‘if (sub.) swims’

#### Labials

- a. yom **-eba** → yomʲaa, yomʲa  
read HYP ‘if (sub.) reads’ (Shibatani 1990:176)
- b. yorokob **-eba** → yorokobʲaa, yorokobʲa  
be glad HYP ‘if (sub.) is glad’

Like nasal assimilation, labial contraction sometimes appears in written form, as in the following example, taken from a picture book for children.

- (54) あたしゃ、もりへ かえって もう ひとねむり。(Iwamura 1986)  
ataʃa mori -e kaet -te mou hitonemuri (< atasi-wa)  
I-TOP forest to go back GER more one sleep  
‘I will go back to the forest and take one more nap.’

<sup>33</sup>This is the only example in which syncope does not occur at a morpheme boundary in all of contracted forms in Japanese I discuss in this dissertation, and therefore, it is potentially an exception for contraction by syncope in a derived environment. However, since /reba/ (which attaches to the vowel-final verb) and /eba/ (which attaches to consonant-final verb) are allomorphs, I assume that there is a morpheme boundary effect between /r/ and /e/ in /reba/.

<sup>34</sup>See Nishiyama (1999) for the morpheme structure of *-k*, predicate copula, and *-er*, dummy copula.

<sup>35</sup>*tʃikakerʲa{a}* is further contracted to *tʃikakʲa{a}*.

Labial contraction is very apparent in personal pronouns which undergo both simple deletion of nonfront vowel and deletion of front vowel with palatalization when the pronouns are followed by the topic *wa*.

(55) Nonfront vowels

- a. anta -wa → antaa  
2<sup>nd</sup> - SG TOP
- b. boku -wa → bokaa, boka  
1-SG (male), TOP
- c. koitsu -wa → koitsaa, koitsa  
this one TOP

Front vowels

- d. bokutati -wa → bokutatʃaa, bokutatʃa  
1-SG (male) TOP
- e. watasi -wa → wataʃaa, wataʃa  
1-SG TOP

Poser (1986) claims that this type of labial contraction is morphologically governed, and that ordinary nouns do not undergo this contraction. However, Shibatani (1990) gives an example of the ordinary noun *tori* ‘bird’ which undergoes labial contraction: *tori-wa* → *torʃaa*. Although this matter calls for further investigation, the labial contraction with a nonfront vowel, as discussed above, is at least not governed morphologically.

Labial contraction only applies to a morpheme boundary between a vowel and a labial. It does not apply to morpheme internally.

- (56)
- a. dokuwa → \*dokaa, \*doka  
monologue
  - b. niwa → \*nʃaa, \*nʃa  
garden
  - c. satewa → \*satʃaa, \*satʃa  
I wonder...

### 2.5.3 Anti-homophony blocking of labial contraction

Like nasal assimilation, we find cases where labial contraction is blocked. In the examples below, neither the nonlengthened form nor the lengthened form of the labial contraction is realized.

- (57) a. *kasoku* -wa → \**kasokaa*, \**kasoka*  
 acceleration, TOP
- b. *eigo* -wa → \**eigaa*, \**eiga*  
 English, TOP

Once again, these words seem to share the same phonological environment with *boku* -wa ‘1-SG, TOP’ which undergoes labial contraction *bokaa* or *boka*, where the nonfront vowel *u* (or *o*) gets deleted along with the labial *w*.

Similar to the blocking of nasal assimilation, these words with nonfront vowels form a pair with words with /a/ counterparts whose labial contraction is realized without blocking. If both members of the pair underwent the labial contraction, the lengthened forms of labial contraction would be homophonous.

- (58) a. *kasoku* -wa → \**kasokaa*  
 acceleration TOP  
*kasoka* -wa → *kasokaa* (\**kasoka*)  
 depopulation TOP
- b. *eigo* -wa → \**eigaa*  
 English TOP  
*eiga* -wa → *eigaa* (\**eiga*)  
 movie TOP

*Kasoku-wa* and *eigo-wa* do not contract into the nonlengthened forms \**kasoka* and \**eiga*, either. For their /a/ counterparts *kasoka-wa* and *eiga-wa*, the lengthening is mandatory as shown in (52): *kasokaa* (\**kasoka*) and *eigaa* (\**eiga*). Then, the nonlengthened forms \**kasoka* and \**eiga*, contracted from *kasoku-wa* and *eigo-wa*, would not create

homophony because their /a/ counter parts do not result in the same form. We would expect, without the threat of homophony, that the nonlengthened forms should have occurred, as they did in *boka* (< *boku-wa*). However, that is not the case. These nonlengthened forms are evidently the same realization as *kasoka* ‘depopulation’ and *eiga* ‘movie’, but without the topic *wa*.

- (59) a. *kasoku* -*wa* → \**kasoka* (homophonous with *kasoka* ‘depopulation’)  
           acceleration TOP  
       b. *eigo* -*wa* → \**eiga* (homophonous with *eiga* ‘movie’)  
           English TOP

This is an example of anti-homophony blocking in “paradigmatic” relations.

## 2.6 Gerund /te/ contraction

In this section, gerund /te/ contraction is introduced. There is no anti-homophony blocking in this phenomenon. Nevertheless, this contraction is discussed briefly in this section because gerund /te/ contraction is another good example of Japanese contracted forms which are characterized as a contraction driven by syncope at a morpheme boundary like the other two contracted forms. In Ichimura (2001:13), syncope of one vowel in two consecutive vowels between the gerund /te/ and an auxiliary verb, which I call here “/te/ contraction,” is briefly introduced in order to demonstrate the syncope ranking between the vowels. It is a common contracted form also discussed in Toki (1975), Otsubo (1982) and Toki (1990), Saito (1991), Kawase (1992), Minegishi (1999), Umemura (2003), Nakamura et al. (2003): *mitē* + *ageru* ‘see- GER, give’ → *mitageru*

(Toki 1990:228). In this section, I would like to discuss in detail this syncope at the morpheme boundary.

First, I will discuss the phenomenon of /te/ contraction in detail. /te/ contraction is a phenomenon in which the gerund /te/ and an auxiliary verb attached to it gets contracted by the deletion of one of the two vowels in the boundary. The gerund /te/ has two allomorphs, *-te* and *-de*: *-de* before nasal and *-te* before the rest. There are two types of /te/ contraction. One is when a consonant follows the gerund /te/. In the examples below, the vowel /e/ of the gerund /te/ (*te* and its allomorph *de*) gets deleted and the stranded *t* and *d* are resyllabified the following consonants, resulting in the palatalization of *s*.

- (60) a. mi -te simaw -ta → mitʃimatta<sup>36</sup>  
 see GER finish PAST  
 ‘finished seeing’
- b. yom -de simaw -ta → yondʒimatta  
 read GER finish PAST (Shibatani 1990:177)  
 ‘finished drinking’

Another type is when an auxiliary verb starting with a vowel such as *-ik*, *-ok*, or *-ar* attaches to the gerund /te/. One of the vowels in the boundary is chosen to get deleted, however, which vowel is chosen depends on the particular case/environment.

- (61) a. tabe -te -ik -u → tabeteku (/i/ deletion)  
 eat GER go PRES  
 ‘eat before going’
- b. tabe -te -ok -u → tabetoku (/e/ deletion)  
 eat GER put PRES  
 ‘eat in advance’ (Umemura 2003:133)

---

<sup>36</sup> *mitʃimatta* and *yondʒimatta* are further contracted to *mitʃatta* and *yondʒatta* respectively.

- c.     tabe **-te** **-age** -ru → tabetageru (/e/ deletion)<sup>37</sup>  
 eat GER give PRES  
 ‘eat for (somebody’s) sake’
- (62) a.   yom **-de** **-ik** -u → yondeku (/i/ deletion)  
 read GER go PRES  
 ‘read before going’ (Otsubo 1982:51)
- b.     yom **-de** **-ok** -u → yondoku (/e/ deletion)  
 read GER put PRES  
 ‘read in advance’ (Toki 1990: 229)
- c.     yom **-de** **-ager** -u → yondageru (/e/ deletion)  
 read GER give PRES  
 ‘read for (somebody’s) sake’ (Toki 1990: 229)

In the following discussion, I will focus on the allomorph *-te* because the *-te/-de* alternation is not important to my argument in this section. One thing to notice from these examples is that syncope is not conditioned by morphology because there is no morphological pattern in the syncope: *i* in the auxiliary verb (suffix) *-ik* gets deleted in (61a, 62a) while /e/ in gerund /te/ gets deleted in (61b, c, 62b, c).

/te/ contraction only applies at the morpheme boundary between /te/ and an auxiliary verb in (63a, b). It does not apply at a word boundary in (63c, d)

- (63) a.   tabe **-te** **-ok** -u → tabetoku  
 eat GER put PRES  
 ‘write in advance’
- b.     tabe **-te** **-ager** -u → tabetageru  
 eat GER give PRES  
 ‘eat for (somebody’s) sake’

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<sup>37</sup> Other examples of auxiliary verbs starting with /i/, /o/ and /a/ are:

- (i) a.   kai **-te** **-ir** -u → kaiteru  
 write, GER, exist, PRES ‘is writing’
- b.     kai **-te** **-oide** → kaitoide  
 write, GER, come ‘write and come back’
- c.     kai **-te** **-ar** -u → kaitaru  
 write, GER, exist, PRES ‘have already written’

- c.     tabe -te # uk -u → \*tabetuku, \*tabeteku  
 eat GER float PRES  
 ‘eat, then float’
- d.     tabe -te # ak -u → \*tabetaku, \*tabeteku  
 eat GER open PRES  
 ‘eat, then open’

Below is another example in which the contraction applies to an auxiliary verb (64a) but the contraction is blocked in a word boundary when *ik* is used as a verb (64b).

- (64) a.     tabe -te -ik -u → tabeteku  
 eat GER go PRES  
 ‘eat before going’
- b.     tabe -te # ik -u → \*tabeteku  
 eat GER go PRES  
 ‘eat, then go’

The syncope does not apply morpheme-internally.

- (65) a.     teika → \*teka  
 price
- b.     totteoki → \*tottoki  
 thing kept for a special occasion

Again in this contracted form, the contraction is driven by syncope at the morpheme boundary. To my knowledge, there are no cases of anti-homophony blocking identified in /te/ contraction.

## 2.7 Summary

In this chapter, I have introduced three types of contracted forms in Japanese, nasal assimilation, labial contraction and gerund /te/ contraction. The contracted forms occur as a result of syncope across a morpheme boundary. In nasal assimilation with the negative suffix, if a /re-nai/ word or a /ri-nai/ word has a /r-anai/ counterpart, only nasal

assimilation of the /r-**a**nai/ word occurs. Nasal assimilation of the /r**e**-nai/ word or the /r**i**-nai/ word is blocked, because it otherwise would create homophony. In labial contraction of a pair of words with the topic morpheme, /wa/, the word ending with a nonfront vowel undergoes labial contraction. Labial contraction of the word ending with a front vowel is blocked, because it otherwise would create homophony. This is what can be called anti-homophony blocking. /te/ contraction, though it does not have cases for anti-homophony blocking, is another example of contraction driven by syncope at the morpheme boundary.

In chapter 3, among three contracted forms, I will provide an in-depth analysis of nasal assimilation and its anti-homophony blocking within the framework of Optimality Theory.



/-nai/ and /-anai/ are allomorphs of the negative suffix. A verb stem ends with a vowel, either /e/ or /i/ (vowel-final verb), or a consonant (consonant-final verb). /-nai/ attaches to a vowel-final verb and its allomorph /-anai/ attaches to a consonant-final verb. I will argue in Appendix A that the selection of the negative suffix is lexical allomorphy conditioned by phonology, and I will provide an alternative analysis using lexical allomorphy, including combinations of a vowel-final verb + /anai/ and a consonant-final verb + /nai/.

The syncope in nasal assimilation as well as in the other contracted forms also occurs only at the morpheme boundary, in other words, nasal assimilation is blocked in nonderived environment. This blocking is clearly shown in (22a,b), repeated below.

- (67) a.     **kure**     -nai → **kunnai**  
           give (me) <sub>NEG</sub>  
           **kurenai**     → \***kunnai**  
           crimson
- b.     **ur** -anai     → **unnai**  
           sell <sub>NEG</sub>  
           **uranai**     → \***unnai**  
           fortune telling

First, we analyze the nasal assimilation of a vowel-final verb. The driving force of nasal assimilation is syncope at the morpheme boundary, either syncope of the final vowel of a base or affixation or the initial vowel of a suffix. In order to account for the former syncope, I propose a new constraint following McCarthy and Prince (1994). They propose an alignment constraint, which demands that every prosodic word be consonant-final. This constraint was first introduced in McCarthy (1993) to account for the intrusive

*r* in the Eastern Massachusetts dialect, where the *r* is limited to lexical-word-final position.

- (68) FINAL-C:      Align(PrWd, Right, Consonant, Right)  
                           “Every PrWd is consonant-final.”

This alignment constraint is one example of Generalized Alignment by McCarthy and Prince (1993b). Generalized Alignment is formulated as below.

- (69) Generalized Alignment  
       Align(Cat1, Edge1, Cat2, Edge2) =<sub>def</sub>  
            $\forall$  Cat1  $\exists$  Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide,  
       *where*  
           Cat1, Cat2  $\in$  Pcat  $\cup$  GCat (Prosodic and Grammatical categories)  
           Edge1, Edge2  $\in$  {Right, Left}

Generalized Alignment demands that a designated edge of each prosodic or morphological constituent of type Cat1 coincide with a designated edge of some other prosodic or morphological constituent Cat2.

I extend the notion of this constraint to the base of affixation. I define the “base” as ‘a form that immediately precedes a suffix morpheme’ in a similar way as McCarthy and Prince (1993a) define the base in their discussion of reduplication. The base of affixation, thus, includes not only a root such as *tabe-nai* ‘eat, NEG’ but also a root plus a suffix which precedes another suffix such as *tabe-rare-nai* ‘eat, POTEN, NEG’

- (70) FINAL-C:      Align(Base of Affixation, Right, Consonant, Right)  
                           “Every base of affixation is consonant final.”

A possible effect of FINAL-C is vowel deletion. I use MAX-IO which demands “every segment of the input has a correspondent in the output” (McCarthy and Prince 1995), specifically MAX-V which prohibits syncope.

- (71) MAX-V: Every vowel in the input has a correspondent in the output.  
 “No deletion of vowels”

We examine two ranking orders: FINAL-C >> MAX-V and MAX-V >> FINAL-C. In the analyses below, I will exclude the potential output candidate with simple syncope *kurnai* (< /kure-nai/) as I will address this issue later.

**Tableau 8**

FINAL-C >> MAX-V

	/kure-nai/	FINAL-C	MAX-V
a.	kurenai	*!	
b.	 kunnai		*
	/kurenai/		
c.	 kurenai		
d.	kunnai		*!

Between candidates a) and b), a) violates FINAL-C which is ranked higher than MAX-V. Candidate b) is the optimal candidate although it violates MAX-V. Between candidates c) and d), c) does not violate FINAL-C because the /e/ is not a vowel in base-final position and it is selected as optimal. The next tableau shows ranking MAX-V >> FINAL-C selects an undesirable output.

**Tableau 9**

MAX-V >> FINAL-C

	/kure-nai/	MAX-V	FINAL-C
a.	 kurenai		*!
b.	kunnai	*	
	/kurenai/		
c.	 kurenai		
d.	kunnai	*!	

As indicated by the bomb above, *kurenai* (< /kure-nai/) should not be chosen as optimal in the contraction grammar. FINAL-C is a driving force of the syncope of /e/. FINAL-C must rank higher than MAX-V because the opposite order MAX-V >> FINAL-C does not allow the nasal assimilation *kunnai* to occur.

- (72) Ranking of the contraction grammar  
FINAL-C >> MAX-V

I will argue in chapter 4 that MAX-V outranks FINAL-C in the full-form grammar in which nasal assimilation does not occur.

We now analyze nasal assimilation of a consonant-final verb with the negative suffix *-anai*. I propose an alignment constraint which demands that every suffix be consonant-initial.

- (73) INITIAL-C: Align(Suffix, Left, Consonant, Left)  
“Every suffix is consonant initial.”

This constraint acts as a driving force of syncope for a consonant-final verb (See section 4.2 for how a consonant-initial suffix surfaces despite a violation of this constraint in the full-form grammar, because this constraint is uniquely ranked lower than MAX-V.). In the tableau below, I exclude potential output candidates with syncope alone such as *urnai* (</ur-anai/) as these types of candidates will be discussed later.

**Tableau 10**

INITIAL-C >> MAX-V

/ur-anai/	INITIAL-C	MAX-V
a. uranai	*!	
b.  unnai		*
/uranai/		
c.  uranai		
d. unnai		*!

Between candidates a) and b), a) violates INITIAL-C which is ranked higher than MAX-V. Candidate b) is the optimal candidate, despite the fact that it violates MAX-V. Between candidates c) and d), c) does not violate INITIAL-C because the first /a/ is not suffix initial. d) violates MAX-V and therefore, c) is a winner. INITIAL-C also must outrank MAX-V because the opposite order MAX-V >> INITIAL-C does not allow the nasal assimilation *unnai* to occur.

- (74) Ranking of the contraction grammar  
 INITIAL-C >> MAX-V

FINAL-C, along with INITIAL-C, which are ranked higher than MAX-V, demand that morpheme boundaries be without a vowel. Syncope does not apply to morpheme-internal vowels. Thus, we can account for the blocking of nasal assimilation in a nonderived environment.<sup>38</sup>

In the analyses above, it is assumed that FINAL-C and INITIAL-C result in syncope, not consonant epenthesis. Why doesn't consonant epenthesis take place instead of syncope in order to satisfy FINAL-C and INITIAL-C? The constraint that prohibits consonant epenthesis is DEP-C, one form of DEP-IO which demands "every segment of the output has a correspondent in the input" (McCarthy and Prince 1995).

- (75) DEP-C: Every consonant of the output has a correspondent in the input.  
 "No epenthesis of consonants."

DEP-C must be ranked higher than MAX-V in order for syncope to be better solution to satisfy FINAL-C than epenthesizing a consonant in the case of a vowel-final verb.

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<sup>38</sup>Different researchers approach nonderived environment blocking in different ways. See Lubowicz (2002) for the local conjunction of a markedness and faithfulness constraint and Inkelas (1998) for the Structural Immunity approach, proposed by Kiparsky (1993).

(76) DEP-C >> MAX-V

There is no ranking motivation between FINAL-C and DEP-C.

**Tableau 11**

Consonant epenthesis: DEP-C >> MAX-V

/kure-nai/	FINAL-C	DEP-C	MAX-V
a. kurenai	*!		
b. karennai		*!	
c.  kunnai			*

Note that DEP-C can be replaced with DEP-Mora, which is defined as “no epenthesis of mora”: ku•re•na•i (4 moras) vs. ku•re•n•na•i (5 moras).

In the case of a consonant-final verb, ranking DEP-C >> MAX-V also accounts for nonoccurrence of consonant epenthesis.

**Tableau 12**

Consonant epenthesis: DEP-C >> MAX-V

/ur-anai/	INITIAL-C	DEP-C	MAX-V
a. uranai	*!		
b. urranai		*!	
c.  unnai			*

In this section, I have analyzed nasal assimilation of the vowel-final verb with the negative suffix /nai/ and the consonant-final verb with the allomorph /anai/ as a basic analysis. However, the opposite combinations, the vowel-final verb with the negative suffix /anai/ and the consonant-final verb with the allomorph /nai/, have not been discussed. /kure-anai/ → *kunnai* and /wakar-nai/ → *wakannai* also satisfy both INITIAL-C and FINAL-C. In other words, the possibility that both allomorphs are available for vowel-final and consonant final verbs has not been pursued. Such a possibility will be examined in Appendix A. In the remainder of this chapter and the next chapter, I will assume

combinations of a vowel-final verb + /nai/ and a consonant-final verb + /anai/ to demonstrate the basics of the analysis.

### 3.3 SYLLSTRUC: Basic syllable canons in Japanese

Recall that in the OT analyses in the previous section, we excluded a potential output candidate with simple syncope such as *wakarnai* (</wakar-anai/) and *kurnai* (< /kure-nai/). In this section, I will introduce a group of constraints which derive the basic syllable canon in Japanese. Furthermore, I will demonstrate that because of these constraints, candidates with syncope alone are disqualified.

There is a potential conflict between contraction, which is driven by syncope at a morpheme boundary, and phonotactic well-formedness constraints on the surface forms. Contraction can only apply insofar as well-formedness constraints are respected. This set of well-formedness constraints will be subsumed in a cover constraint called SYLLSTRUC (Itô 1989, Itô and Mester 1995b, among others). The SYLLSTRUC constraints are the basic syllable canon of Japanese and must be respected for all syllables. It consists of three constraints (Itô and Mester 1995b). The details of the component constraints of SYLLSTRUC are not crucial here and will not be explored further.

- (77) SYLLSTRUC: Constraints defining the basic syllable canons of Japanese, including:
- a. NOCOMPLEXONSET: Complex onset is not allowed.  $*_{\sigma}[tr]$ ,  $*_{\sigma}[pl]$
  - b. NOCOMPLEXCODA: Complex coda is not allowed.  $*_{\sigma}[nd]$ ,  $*_{\sigma}[pt]$
  - c. CODACOND: Coda cannot license place features unless it is licensed by the onset of the following syllable,  $*Place]_{\sigma}$  (Itô 1989, among others).  
 $*kat.pa$ ,  $kat.ta$

In Japanese, regardless of the stratum, /r/, /y/ and /w/ do not create gemination:  $*rr$ ,  $*yy$ ,  $*ww$  (Kawahara 2005). This means that these segments do not occur in coda position

because they are not licensed as a coda by the same segment as the onset of the following syllable:  $*r]_{\sigma}$ ,  $*y]_{\sigma}$ ,  $*w]_{\sigma}$ . Thus,  $r$ ,  $y$  and  $w$  in a coda position are a violation of SYLLSTRUC. If /a/ in /wakar-anai/ underwent syncope without /r/ assimilating to  $n$  as below, it would violate one of the three constraints, NOCOMPLEXONSET, NOCOMPLEXCODA or CODACOND, no matter what syllable structure  $r$  and  $n$  belong to.

- (78) wakar     anai → wakannai (Nasal assimilation)  
       understand<sub>NEG</sub>  
               → \*wa.ka.rnai. (violation of NOCOMPLEXONSET)  
               → \*wa.karn.ai. (violation of NOCOMPLEXCODA)  
               → \*wa.kar.nai. (violation of CODACOND)

The ranking of SYLLSTRUC in relation to INITIAL-C is motivated as shown below using a verb ending with a consonant other than /r/ which does not undergo nasal assimilation.

### Tableau 13

Syncope of /a/ of /yom-anai/ ‘read, NEG’: SYLLSTRUC >> INITIAL-C

/yom-anai/	SYLLSTRUC	INITIAL-C
a. $\text{yomanai}$		*!
b. $\text{yomnai}$	*!	

From this tableau, it is evident that SYLLSTRUC is ranked higher than INITIAL-C. Similarly, /tabe-nai/ below does not undergo nasal assimilation despite the fact it violates FINAL-C.

### Tableau 14

Syncope of /e/ of /tabe-nai/ ‘eat, NEG’: SYLLSTRUC >> FINAL-C

/tabe-nai/	SYLLSTRUC	FINAL-C
a. $\text{tabenai}$		*!
b. $\text{tabnai}$	*!	

Thus, the ranking between SYLLSTRUC and INITIAL-C/FINAL-C is as follows:

- (79) SYLLSTRUC >> INITIAL-C  
       SYLLSTRUC >> FINAL-C

At this point, the ranking between INITIAL-C and FINAL-C is not established (but it will be in tableau 50). Now, the total ranking of the major constraints in the contraction grammar is as follows:

(80) SYLLSTRUC >> INITIAL-C, FINAL-C >> MAX-V

Using this ranking, I analyze nasal assimilation of a consonant-final verb and a vowel-final verb.

### Tableau 15

Nasal assimilation of /wakar-anai/ ‘understand, NEG’: SYLLSTRUC >> INITIAL-C

/wakar-anai/	SYLLSTRUC	INITIAL-C	MAX-V
a. wakar <b>an</b> ai		*!	
b. wakar <b>na</b> i	*!		*
c.  wakar <b>ann</b> ai			*

Candidate b) violates SYLLSTRUC because *r* is not allowed in the coda position, as it is not licensed (violation of CODACOND).

### Tableau 16

Nasal assimilation of /kure-nai/ ‘give (me), NEG’: SYLLSTRUC >> FINAL-C

/kure-nai/	SYLLSTRUC	FINAL-C	MAX-V
a. kure <b>n</b> ai		*!	
b. kure <b>na</b> i	*!		*
c.  kure <b>nn</b> ai			*

Thus, SYLLSTRUC plays an important role in the analyses.

There is a question/issue we need to solve here. That is, why do syncope and assimilation occur when in Japanese vowel epenthesis usually occurs to fix syllable structure violations? For example, the English word *strike* is adopted into Japanese as *sutoraiku* with vowel epenthesis in order to avoid potential violations of SYLLSTRUC. I will examine this issue using consonant-final /r/ verb formation, a productive process in

creation of a new verb, especially by adopting a foreign word. One of the recent examples of this type (Junko Ando, personal communication) is:

- (81) sutaba-r-u > sutabar-anai  
Starbu(cks)-r, PRES ‘go to Starbucks Coffee’

Kitahara (1990) and Iwanami (1999) have 11 listings of verbs which are adopted from foreign words ((82 a-e) from Kitahara, (82 a-c, f-k) from Iwanami). All the listings are the same formation pattern: /r/-stem ending (consonant-final verbs) which takes /r-anai/ for negative.

- (82) a. azi -r -u (> azir-anai, \*azi-nai)  
agi(tation) -r PRES ‘to agitate’
- b. demo -r -u (> demor-anai, \*demo-nai)  
demo(nstration) -r PRES ‘to demonstrate’
- c. negu -r -u (> negur-anai, \*negu-nai)  
neg(lect) -r PRES ‘to neglect’
- d. dabu -r -u (> dabur-anai, \*dabu-nai)  
doub(le) -r PRES ‘to duplicate’
- e. posya -r -u (> posyar-anai, \*posya-nai)  
peaucha -r PRES (peaucha: reverse of *cha-peau* ‘hat’ in French)  
‘(a plan) to discontinue’
- f. paniku -r -u (> panikur-anai, \*paniku-nai)  
panic -r PRES ‘to become panicky’
- g. dema -r -u (> demar-anai, \*dema-nai)  
dema(gogie) -r PRES (German) ‘to start a false rumor’
- h. hamo -r -u (> hamor-anai, \*hamo-nai)  
harmo(ny) -r PRES ‘to harmonize’
- i. memo -r -u (> memor-anai, \*memo-nai)  
memo(random) -r PRES ‘to take a memo’
- j. misu -r -u (> misur-anai, \*misu-nai)  
mis (take) -r PRES ‘to make a mistake’
- k. gasu -r -u (> gasur-anai, \*gasu-nai)  
gas -r PRES ‘to get foggy’

In this verb formation, the verb-final consonant /r/ and the present suffix /u/ are attached to a truncated root adopted from a foreign word. Note that /u/ is epenthesized in the case of *paniku-r-u*, for example, because otherwise, SYLLSTRUC would be violated.

- (83) panic -r -u → panikuru  
 panic -r, PRES → \*pa.ni.kru. (violation of NoCOMPLEXONSET)  
 → \*pa.nikr.u. (violation of NoCOMPLEXCODA)  
 → \*pa.nik.ru. (violation of CODACOND)

All of these verbs can undergo nasal assimilation.

- (84) nasal assimilation  
 panic -r -anai → panikunnai  
 panic -r NEG

A conflict arises when a vowel is epenthesized in order to respect SYLLSTRUC on one hand, and on the other hand, the deletion of the initial vowel of /anai/ triggers nasal assimilation in order to respect SYLLSTRUC. I use the constraint DEP-V, one of DEP-IO constraints (McCarthy and Prince 1995).

- (85) DEP-V Do not epenthesize a vowel

The tableau below shows that DEP-V must be ranked lower than SYLLSTRUC.

**Tableau 17**

Nasal assimilation of /panic-r-anai/: SYLLSTRUC >> DEP-V

/panic-r-anai/	SYLLSTRUC	DEP-V
a. panikunnai	*!	
b.  panikunnai		*

There are two potential positions for DEP-V in relation to INITIAL-C. One is that DEP-V is unranked with INITIAL-C as in tableau 18, and the other is that DEP-V is ranked lower than INITIAL-C in tableau 19.

**Tableau 18**

Nasal assimilation of /panic-r-anai/: INITIAL-C, DEP-V

/panic-r-anai/	INITIAL-C	DEP-V
a. panikuranai	*!	*
b.  panikunnai		*

**Tableau 19**

Nasal assimilation of /panic-r-anai/: INITIAL-C &gt;&gt; DEP-V

/panic-r-anai/	INITIAL-C	DEP-V
a. panikuranai	*!	*
b. $\text{ɳ}$ panikunnai		*

In both tableaux, vowel epenthesis and vowel deletion coexist in the contraction grammar. The vowel *a* at the morpheme boundary is underlying, and it is deleted because of INITIAL-C, not by any need to fix the syllable structure. Vowel *u* is inserted to satisfy SYLLSTRUC as shown in tableau 17. Thus, epenthesis and syncope are driven by completely different types of processes. At this point, I will not go into detail on the precise ranking of DEP-V since my purpose here is to demonstrate how vowel epenthesis and syncope coexist.

What if the consonant cluster of the original word is morpheme internal? Let us create a nonce verb which means ‘eat at McDonald’s’: *makudo-r-u* (< /McDo-r-u/). In this case, *u* would be inserted morpheme-internally in order to avoid a consonant cluster. Again, DEP-V must be ranked lower than SYLLSTRUC.

**Tableau 20**

Nasal assimilation of /McDo-r-anai/: SYLLSTRUC &gt;&gt; DEP-V

/McDo-r-anai/	SYLLSTRUC	DEP-V
a. makdonnai	*!	
b. $\text{ɳ}$ makudonnai		*

Again, there are two possible rankings for DEP-V in relation to INITIAL-C and FINAL-C, which drive syncope.

**Tableau 21**

Nasal assimilation of /McDo-r-anai/: INITIAL-C, FINAL-C, DEP-V

/McDo-r-anai/	INITIAL-C	FINAL-C	DEP-V
a. makudor <b>an</b> ai	*!	*	*
b. <sup>u</sup> makudon <b>n</b> ai		*	*

Candidate a) violates INITIAL-C due to *a*. Both candidates violate FINAL-C or INITIAL-C by *o*, but there are no additional violations of FINAL-C by *u* because *u* is inserted morpheme-internally. The expected winner b) is selected as optimal. The other possible ranking of DEP-V also leads to the optimal output.

**Tableau 22**

Nasal assimilation of /McDo-r-anai/: INITIAL-C, FINAL-C &gt;&gt; DEP-V

/McDo-r-anai/	INITIAL-C	FINAL-C	DEP-V
a. makudor <b>an</b> ai	*!	*	*
c. <sup>u</sup> makudon <b>n</b> ai		*	*

Thus, again vowel epenthesis and vowel deletion coexist in the contraction grammar. Epenthesis and syncope are driven by completely different types of processes.

### 3.4 Special relation between /r/ and /n/

In this section, I will give an explanation as to why only /r/ undergoes nasal assimilation before /n/. Nasal assimilation only occurs in the *r-V-n* sequence at a morpheme boundary. Other consonants, as indicated in boldfaced letters in (29) repeated below, do not behave the same way as /r/.

- (86) a. sas -anai → \*sannai (sannai < sar-anai ‘leave, NEG’)  
           sting<sub>NEG</sub>  
       b. kat -anai → \*kannai  
           win<sub>NEG</sub>

- c.     **nak** -anai → \*nannai (nannai < nar-anai ‘ring, NEG’)  
       cry   NEG
- d.     **yom** -anai → \*yonnai  
       read  NEG
- e.     **sow**  -anai → \*sonnai (sonnai < sor-anai ‘shave, NEG’)  
       satisfy NEG

Also, *rV* does not assimilate to *n* before coronal other than *n*. Coronal *t* and *d* in the desiderative /tai/ and suffix /dasu/ ‘to start’, for example, do not trigger the change of *rV* to *n* in (30), repeated below. Another nasal *m* does not trigger nasal assimilation.

- (87) a.     wakar     -**itai** → \*wakantai  
           understand DESI
- wakar     -**imasu** → \*wakanmasu, \*wakammasu  
           understand POL-PRES
- wakar     -**idasu** → \*wakandasu  
           understand start
- b.     araware -**tai** → \*arawantai  
           appear    DESI
- araware -**masu** → \*arawanmasu, \*arawammasu  
           appear    POL-PRES
- araware -**dasu** → \*arawandasu  
           appear    start

There is something about the combination of /r/ and /n/ which triggers nasal assimilation.

I will explore the reason for this below.

In analyzing several combinations of possible nasal assimilation, the following consonant features in Japanese are used. Note that the table only shows partial feature system.

**Table 5**  
Consonant features in Japanese

	p	b	t	d	k	h	s	m	n	r	w	y
[son]								√	√	√	√	√
[cor]			√	√			√		√	√		√
[cont]							√				√	√
[nas]								√	√			
[labial]	√	√						√			√	
[dorsal]					√							

Instead of binary features, I use univalent features across the board following the claim that some features are monovalent (e.g. Ewen 1995). Treatment of flap /r/, whether it be continuant or not, is somewhat controversial. I assume that the Japanese /r/ does not have a [continuant] feature.

I will examine verbs which end with a coronal (voiceless coronal /t/), a labial (labial nasal /m/), and a glide (/w/), as to why these consonants do not undergo nasal assimilation or progressive assimilation. First, it is shown that syncope without assimilation of a vowel between different consonants is ruled out due to the ranking of SYLLSTRUC being higher than INITIAL-C.

**Tableau 23**  
Nonoccurrence of nasal assimilation of /kat-anai/ ‘win, NEG’:  
SYLLSTRUC >> INITIAL-C

	/kat-anai/	SYLLSTRUC	INITIAL-C
a.	kat <sup>h</sup> anai		*
b.	katnai	*!	

In the tableaux that follow, I will exclude candidates of such simple syncope, as it is obvious that the simple syncope, which results in the sequence of two different consonants, violates SYLLSTRUC. Nasal assimilation *kannai* (< *kat-nai*) does not occur.

Assuming the first  $n$  ( $< t$ ) is a plain geminate, it appears that a constraint, prohibiting insertion of a [son] feature to  $t$ , would account for this nonoccurrence of nasal assimilation. However, the tableau below shows that DEP [son] does not rule out candidate b).

(88) DEP [son]: Do not add a [son] feature.

“F” in the tableau below refers to any autosegmental feature.

**Tableau 24**

Nonoccurrence of nasal assimilation of /kat-anai/:

DEP [son] >> INITIAL-C

/kat-anai/	DEP [son]	INITIAL-C
a. k a t <sub>1</sub> a n <sub>2</sub> a i          F <sub>1</sub> F <sub>2</sub> [son] <sub>2</sub> [nas] <sub>2</sub>		*
b. ●* k a n <sub>1</sub> n <sub>2</sub> a i   F <sub>12</sub> [son] <sub>2</sub> [nas] <sub>2</sub>		

Undesirable candidate b) is chosen as it does not violate DEP [son] (the [son] feature as well as the [nas] feature simply spread to  $t_1$ ). There is no insertion of a [son] feature. DEPLINK [son], on the other hand, is violated by candidate b) because  $t_1$  becomes associated with [son]. I adopt the notion of DEPLINK from Morén (2001), where he discusses underlying moraicity. I expand it to feature specification.

- (89) DEPLINK [son]      Let  $\zeta_j$  be segments,  $S_k$  phonological representations,  
 $S_1 R S_2$ ,  
 $\zeta_1$  is an element of  $S_1$ ,  
 $\zeta_2$  is an element of  $S_2$ ,  
 $\zeta_1 R \zeta_2$ , and  
 $\zeta_1$  belongs to a specific segment,  
if  $\zeta_2$  is associated with [son] feature,  
then,  $\zeta_1$  is associated with [son] feature

“Do not add a [son] feature to a segment that it did not have underlyingly”

This constraint is crucially different from DEP [son]. DEP [son] prohibits a [son] feature from being added to the output but it is not violated by association of an underlying [son] feature to another segment on the surface. In other words, it does not prevent a [son] feature on one segment from spreading to the other segment as shown in tableau 24. DEPLINK [son], on the other hand, does not allow such spreading as reassociation of a [son] feature to another segment is prohibited as shown in the tableau below.

**Tableau 25**

Nonoccurrence of nasal assimilation of /kat-anai/:

DEPLINK [son] >> INITIAL-C

/kat-anai/	DEPLINK [son]	INITIAL-C
a. $\text{k a t}_1 \text{ a n}_2 \text{ a i}$        F <sub>1</sub> F <sub>2</sub> [son] <sub>2</sub> [nas] <sub>2</sub>		*
b. $\text{k a n}_1 \text{ n}_2 \text{ a i}$   F <sub>12</sub> [son] <sub>2</sub> [nas] <sub>2</sub>	*!	

The next tableau shows that MAX [son] must be ranked higher than INITIAL-C. Here I use simply MAX [son] constraint because as MAXLINK [son] is not necessary.

- (90) MAX [son]:    Do not delete [sonorancy] feature

**Tableau 26**

Nonoccurrence of nasal assimilation of /kat-anai/:

MAX [son] &gt;&gt; INITIAL-C

/kat-anai/	MAX [son]	INITIAL-C
a.  katanai		*
b. kattai	*!	

In the analyses of nonoccurrence of nasal assimilation that follow, several faithfulness constraints, including MAX [son] and DEP LINK [son] which were introduced above, will be used.

- (91) MAX [son]: Do not delete [sonorancy] feature  
 MAX [cont]: Do not delete [continuancy] feature  
 MAX [lab]: Do not delete [labial] feature  
 DEP LINK [son]: Do not add a [sonorancy] feature to a segment that it did not have underlyingly  
 DEP LINK [cont]: Do not add a [continuancy] feature to a segment that it did not have underlyingly  
 DEP LINK [lab]: Do not add a [labial] feature to a segment that it did not have underlyingly

I have demonstrated that MAX [son] and DEP LINK [son] are ranked higher than INITIAL-C and I will do the same for the other faithfulness constraints.

The /m/-final verb does not undergo nasal assimilation or *m*-gemination due to a violation of MAX [lab] and DEP LINK [lab]. These constraints should be ranked higher than INITIAL-C.

**Tableau 27**

Nonoccurrence of nasal assimilation of /yom-anai/ ‘read, NEG’:

MAX [lab], DEP LINK [lab] &gt;&gt; INITIAL-C

/yom-anai/	MAX [lab]	DEP LINK [lab]	INITIAL-C
a.  yomanai			*
b. yonnai	*!		
c. yommai		*!	

The /w/-final verb does not undergo nasal assimilation or *w*-gemination due to a violation of MAX [lab] and SYLLSTRUC.

**Tableau 28**

Nonoccurrence of nasal assimilation of /sow-anai/ ‘satisfy, NEG’:  
SYLLSTRUC, MAX [lab] >> INITIAL-C

/sow-anai/	SYLLSTRUC	MAX [lab]	INITIAL-C
a.  sowanai			*
b. sonnai		*!	
c. sowwai	*!		

As shown above, verbs ending with a consonant other than /r/ do not undergo nasal assimilation before /nai/ because the other verbs fatally violates SYLLSTRUC and several faithfulness constraints when /a/ is syncopated.

Next, we move on to an analysis of suffixes with a consonant other than /n/ after a vowel to see why these suffixes fail to trigger progressive or regressive assimilation. The first is a suffix with voiceless coronal, the desiderative /-itai/.

**Tableau 29**

Nonoccurrence of nasal assimilation of /wakar-itai/ ‘understand, DESI’:  
SYLLSTRUC, MAX [son] >> INITIAL-C

/wakar-itai/	SYLLSTRUC	MAX [son]	INITIAL-C
a.  wakaritai			*
b. wakattai		*!	
c. wakarra	*!		

/-itai/ does not trigger progressive or regressive assimilation due to violations of SYLLSTRUC and MAX [son] that would result. A suffix with labial nasal, the polite present /-imasu/, behaves in the same manner.

**Tableau 30**

Nonoccurrence of nasal assimilation of /wakar-imasu/ ‘understand, POL-PRES’:  
 SYLLSTRUC, DEP LINK [lab] >> INITIAL-C

/wakar-imasu/	SYLLSTRUC	DEP LINK [lab]	INITIAL-C
a.  wakarimasu			*
b. wakammasu		*!	
c. wakarrasu	*!		

/wakar-imasu/ does not trigger progressive or regressive assimilation. Next, two combinations of consonants other than /r/ and /n/ will be reviewed.

**Tableau 31**

Nonoccurrence of nasal assimilation of /kas-itai/ ‘lend, DESI’:  
 MAX [cont], DEP LINK [cont] >> INITIAL-C

/kas-itai/	MAX [cont]	DEP LINK [cont]	INITIAL-C
a.  kasitai			*
b. kattai	*!		
c. kassai		*!	

Syncope of /i/ does not occur. The /b-/m/ combination is the same.

**Tableau 32**

Nonoccurrence of nasal assimilation of /tob-imasu/ ‘fly, POL-PRES’:  
 MAX [son], DEP LINK [son] >> INITIAL-C

/tob-imasu/	MAX [son]	DEP LINK [son]	INITIAL-C
a.  tobimasu			*
b. tommasu		*!	
c. tobbasu	*!		

Progressive or regressive assimilation does not occur. Then, why is the /r/-/n/ combination so special? Returning to nasal assimilation of *wakar-anai* → *wakannai*, none of faithfulness constraints in (91) are violated. Neither is SYLLSTRUC violated.

**Tableau 33**

Nasal assimilation of /wakar-anai/

/wakar-anai/	SYLLS TRUC	MAX [son], DEP LINK [son], MAX [lab], DEP LINK [lab], MAX [cont], DEP LINK [cont]	INITI AL-C	MAX -V
a. wakar <sup>nas</sup> anai			*!	
b. wak <sup>nas</sup> annai				*
c. wakarra <sup>nas</sup> i	*!			*

In nasal assimilation where /r/ assimilates to *n*, the nasality is added. A faithfulness constraint, which prohibits epenthesis of nasality, needs to be added to the analysis.

- (92) DEP LINK [nas]: Do not add a [nasality] feature to a segment that it did not have underlyingly

Where is this constraint ranked? If DEP LINK [nas] outranks INITIAL-C, *wakannai* would not surface.

**Tableau 34**

Nasal assimilation of /wakar-anai/

/wakar-anai/	DEP LINK [nas]	INITIAL-C
a. wakar <sup>nas</sup> anai		*
b. wak <sup>nas</sup> annai	*!	

DEP LINK [nas] must be ranked lower than INITIAL-C.

**Tableau 35**

Nasal assimilation of /wakar-anai/: INITIAL-C &gt;&gt; DEP LINK [nas]

/wakar-anai/	INITIAL-C	DEP LINK [nas]
a. wakar <sup>nas</sup> anai	*!	
b. wak <sup>nas</sup> annai		*

DEP LINK [nas] must also be ranked lower than FINAL-C to account for nasal assimilation of a vowel-final verb because otherwise, *kunnai* would not surface as shown below.

**Tableau 36**

Nasal assimilation of /kure-nai/: FINAL-C &gt;&gt; DEP LINK [nas]

	/kure-nai/	FINAL-C	DEP LINK [nas]
a.	kurenai	*!	
b.	𑌕𑌗 kunnai		*

There is no motivation for the ranking between DEP LINK [nas] and MAX-V, which is ranked lower than INITIAL-C and FINAL-C. Thus, the total ranking of the main constraints so far is as follows:

(93) SYLLSTRUC >> INITIAL-C, FINAL-C >> MAX-V, DEP LINK [nas]

However, the discussions and analyses above are not enough to capture all of the facts. In the case where consonants before and after the vowel under possible syncope are identical, the vowel does not get syncopated.

- (94) a. sin -anai → \*sinnai  
die NEG
- b. tom -imasu → \*tommasu  
prosper POL-PRES
- c. tob -eba → \*tobba  
win HYP
- d. kat -itai → \*kattai  
win DESI
- e. kas -ase → \*kasse  
lend CAUS

In these cases, there will be no violation of the faithfulness constraints in (91) or any faithfulness constraints not mentioned here. The syncope would violate fewer constraints, compared with nasal assimilation of a verb ending with /r/ where /r/ assimilates to *n*. Why, then, can't the vowel be syncopated? The pair below clearly shows that it is preferred that the /r/ assimilates to *n* in (95b) over the simple syncope in (95a).

- (95) a.    sin -anai → \*sinnai  
           die  NEG  
       b.    sir  -anai → sinnai  
           know NEG

In order to account for this, I will show several scenarios of feature association using /kat-anai/ ‘win, NEG’ which does not undergo nasal assimilation. /t/ does not assimilate to /n/ in the contraction environment.

- (96) kat -anai → \*kannai  
       win  NEG

There would be feature “association” changes in order for /t/ to surface as *n*. I use the term “association” here because as we saw already, this is not feature addition, but rather feature reassociation where [son] and [nas] features spread from the nasal *n* which follows *t* after syncope of /a/ is syncopated.

- (97) Feature association changes from /t/ to *n*  
       t       →    n  
       ∅       →    [son]  
       ∅       →    [nas]

The ranking SYLLSTRUC >> INITIAL-C was already established. This tableau shows that simple syncope without changing any features will violate SYLLSTRUC.

**Tableau 37**

Nonoccurrence of nasal assimilation of /kat-anai/:

SYLLSTRUC >> INITIAL-C

/kat-anai/	SYLLSTRUC	INITIAL-C
a. $\text{k a t}_1 \text{ a n}_2 \text{ a i}$        F <sub>1</sub> F <sub>2</sub>		*
b.    k a t <sub>1</sub> n <sub>2</sub> a i        F <sub>1</sub> F <sub>2</sub>	*!	

Tableau 25, repeated below as tableau 38, showed that spreading [son] feature to  $t_1$  is prohibited by DEP LINK [son]. DEP LINK [nas] is not included in the tableau below but as motivated in tableau 35, it is ranked lower than INITIAL-C.

**Tableau 38**

Nonoccurrence of nasal assimilation of /kat-anai/ (reassociation of [son] and [nas]):  
DEP LINK [son] >> INITIAL-C

/kat-anai/	DEP LINK [son]	INITIAL-C
a. $\text{k a } t_1 \text{ a } n_2 \text{ a i}$ <div style="text-align: center;"> <math>\begin{array}{cc}   &amp;   \\ F_1 &amp; F_2 \end{array}</math> </div>		*
b. $\text{k a } n_1 \text{ n}_2 \text{ a i}$ <div style="text-align: center;"> <math>\begin{array}{c}   \\ F_{12} \\ [son]_2 [nas]_2 \end{array}</math> </div>	*!	

The next tableau shows that full merger of root nodes from /t/ to  $n$  also violates DEP LINK [son].

**Tableau 39**

Nonoccurrence of nasal assimilation of /kat-anai/ (full merger):  
DEP LINK [son] >> INITIAL-C

/kat-anai/	DEP LINK [son]	INITIAL-C
a. $\text{k a } t_1 \text{ a } n_2 \text{ a i}$ <div style="text-align: center;"> <math>\begin{array}{cc}   &amp;   \\ F_1 &amp; F_2 \end{array}</math> </div>		*
b. $\text{k a } n_{12} \text{ a i}$ <div style="text-align: center;"> <math>\begin{array}{c}   \\ F_{12} \\ [son]_2 [nas]_2 \end{array}</math> </div>	*!	

Next, I return to (95b), repeated below, where /r/ does assimilate to  $n$  in the contraction environment.

- (98)  $\text{sir -anai} \rightarrow \text{sinnai}$   
 know NEG

There are some features association changes in order for /r/ to surface as *n*.

(99) Feature association changes from /r/ to *n*

r → n  
 ∅ → [nas]

With the ranking already established, we get an ambiguous result.

**Tableau 40**

Nasal assimilation of /sir-anai/:

/sir-anai/	SYLLSTRUC	DEPLINK [son]	INITIAL-C	MAX-V
a. s i r <sub>1</sub> a n <sub>2</sub> a i        F <sub>1</sub> F <sub>2</sub>			*!	
b. s i r <sub>1</sub> n <sub>2</sub> a i        F <sub>1</sub> F <sub>2</sub>	*!			*
c. ● s i n <sub>12</sub> a i   F <sub>12</sub> [nas] <sub>2</sub>				*
d. ☞ s i n <sub>1</sub> n <sub>2</sub> a i        F <sub>12</sub> [nas] <sub>2</sub>				*

Candidates b) and c) violate SYLLSTRUC and they are ruled out. Candidates c) and d) do not violate DEPLINK [son] because /r/ has the [son] feature as well. We have an undesirable winner c) which is a full merger of the root nodes. To prohibit the full merger, UNIFORMITY, which prohibits coalescence, must be ranked somewhere in the grammar.

(100) UNIFORMITY: No element of the output has multiple correspondents in the input ('No coalescence') (McCarthy and Prince 1995)

Using this constraint, an analysis between candidates c) and d) above is again conducted.

There is probably evidence elsewhere in the language for a more precise ranking,

particularly since Japanese does not allow merger as a regular phonological process, however, for now, ranking between UNIFORMITY and MAX-V is not motivated.

**Tableau 41**

Nasal assimilation of /sir-anai/ using UNIFORMITY

/sir-anai/	MAX-V	UNIFORMITY
a.   s i n <sub>12</sub> a i   F <sub>12</sub> [nas] <sub>2</sub>	*	*!
b. <sup>☞</sup> s i n <sub>1</sub> n <sub>2</sub> a i   F <sub>12</sub> [nas] <sub>2</sub>	*	

Both candidates violate MAX-V but only candidate a), the full merger, violates UNIFORMITY. Finally, the winning candidate gains a nasal feature. Therefore, we know that INITIAL-C is ranked higher than DEP LINK [nas], the ranking which was also established in tableau 35.

**Tableau 42**

Nasal assimilation of /sir-anai/: INITIAL-C &gt;&gt; DEP LINK [nas]

/sir-anai/	INITIAL-C	DEP LINK [nas]
a.   s i r <sub>1</sub> a n <sub>2</sub> a i       F <sub>1</sub> F <sub>2</sub>	*!	
b. <sup>☞</sup> s i n <sub>1</sub> n <sub>2</sub> a i   F <sub>12</sub> [nas] <sub>2</sub>		*

Nasal assimilation does not occur when the verb root ends in a nasal as we saw in (95a), repeated below.

(101) sin -anai → \*sinnai  
      die   NEG

This is somewhat of a dilemma since this contraction does not involve feature association changes, but the nasal assimilation of a flap *r*, *sir-nai* → *sinnai*, involves feature association changes. One possibility is that UNIFORMITY must be relativized to features, not just root nodes. For example, if UNIFORMITY [nas] is ranked higher than INITIAL-C, the merger of [nas] feature is ruled out.

**Tableau 43**

Nonoccurrence of nasal assimilation of /sin-anai/:

UNIFORMITY [nas] >> INITIAL-C

/sin-anai/	UNIFORMITY [nas]	INITIAL-C
a. $\begin{array}{c} s \ i \ n_1 \ a \ n_2 \ a \ i \\   \quad   \\ F_1 \ F_2 \end{array}$		*
b. $\begin{array}{c} s \ i \ n_1 \ n_2 \ a \ i \\ \quad \quad \quad   \\ \quad \quad \quad F_{12} \\ \quad \quad \quad [nas]_{12} \end{array}$	*!	

This must be combined with OCP (Leben 1973, McCarthy 1986), a constraint against two adjacent identical segments, in this case nasals.

(102) OCP [nas]: No identical nasal adjacent segments

Candidate b), simple deletion of /a/ without a merger of [nas], is ruled out due to its OCP [nas] violation.

**Tableau 44**

Nonoccurrence of nasal assimilation of /sin-anai/: OCP [nas] &gt;&gt; INITIAL-C

/sin-anai/	UNIFORMITY [nas]	OCP [nas]	INITIAL-C
a. $\begin{array}{c} s \ i \ n_1 \ a \ n_2 \ a \ i \\   \quad   \\ F_1 \ F_2 \end{array}$			*
b. $\begin{array}{c} s \ i \ n_1 \ n_2 \ a \ i \\   \quad   \\ F_1 \ F_2 \\ [nas]_1 \ [nas]_2 \end{array}$		*!	

OCP [nas] must be ranked higher than INITIAL-C. Note that the UNIFORMITY [nas] does not prohibit the flap-nasal assimilation because UNIFORMITY [nas] is violated only if two input nasal features merge in the output.

**Tableau 45**

Nasal assimilation of /sir-anai/ using UNIFORMITY [nas]

/sir-anai/	UNIFORMITY [nas]	INITIAL-C	DEPLINK [nas]
a. $\begin{array}{c} s \ i \ r_1 \ a \ n_2 \ a \ i \\   \quad   \\ F_1 \ F_2 \end{array}$		*!	
b. $\begin{array}{c} s \ i \ n_1 \ n_2 \ a \ i \\ \quad \quad   \\ \quad \quad F_{12} \\ \quad \quad [nas]_2 \end{array}$			*

The other cases of nonoccurrence of syncope between identical consonants in (94b-f), repeated below, can be accounted for in the same way using UNIFORMITY [feature] and OCP [feature], for example, UNIFORMITY [cor] and OCP [cor] for *\*kattai* and *\*kasse*.

- (103) a. tom -imasu → \*tommasu  
prosper POL-PRES  
b. tob -eba → \*tobba  
win HYP  
c. kat -itai → \*kattai  
win DESI  
d. kas -ase → \*kasse  
lend CAUS

In conclusion, only /r/ assimilates to *n* by syncope and no other combinations, even the identical segments, undergo syncope. It is because the /r/-/n/ combination, upon syncope and assimilation of one consonant to the other, is the only one which does not violate the constraints ranked higher than INITIAL-C such as SYLLSTRUC, the faithfulness constraints, UNIFORMITY [feature] and OCP [feature].

In the next section, anti-homophony blocking of nasal assimilation is analyzed.

### 3.5 Blocking of nasal assimilation and the anti-homophony constraint

Now we turn to an analysis of anti-homophony blocking of nasal assimilation of /wakare-nai/ which forms a pair with /wakar-anai/.

- (104) wakar -anai → wakannai  
understand NEG  
wakare -nai → \*wakannai  
get separated NEG

The tableaux show a single analysis of /wakar-anai/ and /wakare-nai/. For the sake of simplicity, I will post only two candidates, one is completely faithful to the input, and the other is nasal assimilation (thus, SYLLSTRUC is not necessary). There is no motivation to rank INITIAL-C and FINAL-C at this point (In a later discussion, I will argue that in fact, INITIAL-C outranks FINAL-C).

**Tableau 46**

Single analysis of /wakar-anai/ and /wakare-nai/:

INITIAL-C, FINAL-C &gt;&gt; MAX-V

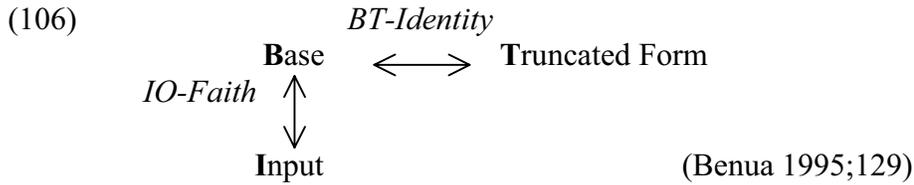
a.	/wakar-anai/	INITIAL-C	FINAL-C	MAX-V
	wakaranai	*!		
	☞ wakannai			*
b.	/wakare-nai/			
	wakarenai		*!	
	☞ wakannai			*

The problem in this analysis is that *wakare-nai* undergoes nasal assimilation (indicated by the bomb), which should be blocked due to the potential creation of homophony. I argue that blocking is motivated by avoidance of homophony creation in an inter-paradigmatic relationship, and the blocking of nasal assimilation of a word is sensitive to whether another word, which would create homophony when nasal assimilation occurs, exists. We need a monitoring system between outputs (nasal assimilation) of the two words in a transparadigmatic relation in order to avoid neutralization of the underlying forms on the surface.

(105) Input: /wakar-anai/ → Output: [wakannai]


  
 Input: /wakare-nai/ → Output: [wakannai]

This monitoring system is one type of correspondence between the two outputs, but it is different from the conventional output-output correspondence (McCarthy and Prince 1995, Benua 1995). For example, in the model of BT-Identity below (Benua 1995), the truncated form (output) is derived from the base (output), which in fact surfaces from the input.



In the model in (105), on the other hand, the two outputs are the result of independent phonological phenomena. This monitoring system only checks if one output is appropriate for the other. I propose that such a monitoring system that blocks contrast neutralization of the underlying distinct inputs is realized as a constraint to prohibit homophony and this constraint is embedded in the phonological grammar. Below, I define the anti-homophony constraint CONTRAST.

- (107) CONTRAST: *Contrastiveness* in underlying forms between words with the same *major lexical category* must be maintained in surface forms.

*Contrastiveness*: Given two strings  $S_1$  and  $S_2$ , *contrastiveness* is a relation from the elements of  $S_1$  to those of  $S_2$  whereby the relation of correspondence is less than perfect, i.e. such that evaluation finds a violation of at least one of the constraints in Correspondence Theory (McCarthy and Prince 1995), such as MAXIMALITY, DEPENDENCE, IDENTITY [F], CONTIGUITY, LINEARITY, and ANCHORING.

*Major lexical categories*: noun, verb, adjective and adverb

The brief definitions of the constraints of Correspondence Theory are below:

- (108) MAXIMALITY: No deletion  
 DEPENDENCE: No epenthesis  
 IDENTITY [F]: No feature changes  
 CONTIGUITY : No medial epenthesis or deletion of segments  
 LINEARITY : No metathesis  
 ANCHORING: No epenthesis or deletion at edges

Take minimal pair *ore-ru* ‘break, PRES’ vs. *ori-ru* ‘get off, PRES’ for example, to see how we determine these words are “contrastive.” I provide a meta-linguistic analysis of what it means to be “contrastive.” The table below evaluates if /ore-ru/ → /ori-ru/ violates any

of the constraints. Note that this table is not a tableau evaluating the phonology of the language, and that the constraints and their violations have nothing to do with a synchronic morpho-phonological “online” evaluation. It is simply a means for us to access whether two input forms contrast with one another. Therefore, there is no need to rank the constraints. If there is a violation of any of these constraints, these two words are “contrastive.”

**Table 6**

“Contrastiveness” evaluation: /ore-ru/ and /ori-ru/

/ore-ru/	MAX	DEP	IDENT	CONTIG	LINEAR	ANCHOR
/ori-ru/		*				

Comparing /e/ in /ore-ru/ which has [V-cor] feature with /i/ in /ori-ru/ which has [high] and [V-cor] features, this input pair violates DEP because the change from /e/ to /i/ is an epenthesis of [high] feature. One may argue that there are more violations, but I will not go into detail because one violation of the correspondence constraints is sufficient for this pair to be “contrastive.” If we switch the positions of the two inputs in the table, at least MAX is violated by deleting [high] feature of /i/. Thus, the position of /ore-ru/ and /ori-ru/ in the table do not have any meaning because if the result reveals that the pair is contrastive in one position, the opposite position will be also contrastive, meaning there is at least one violation. Here is another example.

- (109) kar -inasai → kannasai  
clip POL-IMP  
kari -nasai → \*kannasai  
borrow POL-IMP

**Table 7**

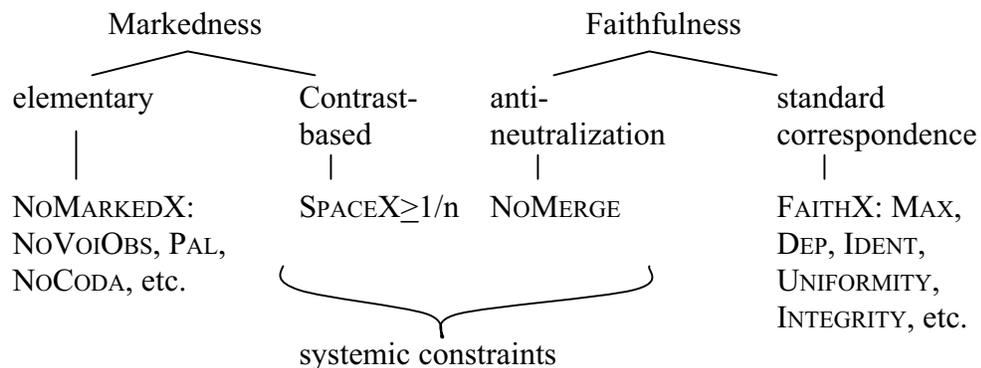
“Contrastiveness” evaluation: /kar-inasai/ and /kari-nasai/

/kar-inasai/	MAX	DEP	IDENT	CONTIG	LINEAR	ANCHOR
/kari-nasai/	*	*				*

MAX and DEP are violated because *i* is deleted and epenthesized. ANCHORING is violated because the deletion and epenthesis occur at the edge. In this case, the same result will be obtained if we switch the positions of the two inputs in the table. Again, there is at least one violation of the correspondence constraints. Thus, this pair is “contrastive.” What’s not contrastive, therefore, is a pair which has the same segmental sequences and morphological structure.

Now where does this constraint stand among other OT constraints? CONTRAST penalizes a merger of two distinct inputs to surface in the same way as ANTI-IDENT in Crosswhite (1999, 2001) and \*MERGE in Kawahara (2003), except that I do not limit CONTRAST within paradigmatic relations. Referring to Itô and Mester (2004a,b), I discuss here the formal status of CONTRAST (or any other anti-homophony constraints) within OT. Itô and Mester discuss that there are “systemic” markedness and faithfulness constraints which are new addition to conventional markedness and faithfulness.

(110) The contrast-based version of OT (Itô and Mester 2004a,b)



## (111) Systemic constraints

SPACE $X \geq 1/n$ : Potential minimal pairs differing in property X must differ in X by at least 1/nth of the available space.

NOMERGE: No output word has multiple correspondents in the input.

See Padgett (2003b) for details on SPACE $X \geq 1/n$ . In the discussion of anti-homophony blocking at hand, the primary focus is “anti-neutralization” under the faithfulness constraint group to which CONTRAST belongs in (110). It looks that “systemic constraints” are either relevant to nonphonological modules (such as phonetics and lexicon) and/or phonetics-phonology and lexicon/morphology-phonology interfaces. One may think that CONTRAST is a phonology-external device. In section 4.4, I will demonstrate that CONTRAST is not outside of the phonology proper, but in fact embedded in the phonological grammar of Japanese.

How, then, do we utilize this CONTRAST in a tableau? If we simply apply CONTRAST to tableau 46, CONTRAST does not make any contribution as shown below, no matter which of the two possible rankings of CONTRAST we use, simply because these tableaux are not suitable to evaluate an interaction between the outputs of /wakar-anai/ and /wakare-nai/.

**Tableau 47**

Single analysis of /wakar-anai/ and /wakare-nai/ with CONTRAST, ranking 1

a. /wakar-anai/	CONTRAST	INITIAL-C	FINAL-C	MAX-V
wakar <del>an</del> ai		*!		
<del>wa</del> kannai				*
b. /wakare-nai/				
wakare <del>n</del> ai			*!	
<del>w</del> kannai				*

**Tableau 48**

Single analysis of /wakar-anai/ and /wakare-nai/ with CONTRAST, ranking 2

a. /wakar-anai/	INITIAL-C	FINAL-C	MAX-V	CONTRAST
wakar <b>an</b> ai	*!			
☞ wak <b>ann</b> ai			*	
b. /wakare-nai/				
wakare <b>n</b> ai		*!		
☞ wak <b>ann</b> ai			*	

In Ichimura 2001, I proposed a “Minimal Pair Analysis” (henceforth, MPA)<sup>39</sup> within OT in order to see how two outputs interact. MPA is a technique used to allow a pair or triplet to be considered as a set of inputs and to evaluate a set of outputs in order to see the interaction of phonological process of two or more words. I will use this technique in this dissertation as well. In order to utilize an “anti-neutralization” constraint in (110), Itô and Mester (2004a) discuss that a whole group of related forms is needed to constitute an input and a candidate. This is the basic concept of MPA that I propose here and in Ichimura (2001). The important difference between Itô and Mester’s “anti-neutralization” and the anti-homophony constraint CONTRAST in MPA is that the former is limited to a “group of related forms” (in the paradigm), whereas the latter covers the entire lexicon (transparadigmatic). In the analysis of nasal assimilation at hand, how are these constraints ranked? Nasal assimilation is a process driven by syncope, which triggers the assimilation of *r* to *n*. The blocking of contraction of the /re-nai/ word indicates that the anti-homophony requirement is more important than contraction by syncope of the base-final vowel /e/.

<sup>39</sup> Again, “minimal pair” refers to a set of inputs which are evaluation for potential homophony including a pair or triplet, which is not a minimal pair in a strict sense.

(112) CONTRAST &gt;&gt; FINAL-C

In the tableau below, in order to show which output, the left or the right, is violated, asterisks are divided into the left or right side of the colon. We can see the interaction between the two outputs. A colon is not used for violation of CONTRAST because it takes a pair of the outputs to violate this constraint.

**Tableau 49**

Minimal Pair Analysis: /wakar-anai/ and /wakare-nai/ with CONTRAST

CONTRAST &gt;&gt; FINAL-C

	/wakar-anai : wakare-nai/	CONTRAST	FINAL-C
a. 	wakannai : wakarenai		:*
b.	wakannai : wakannai	*!	

The table below, with the addition of INITIAL-C and candidate *wakaranai : wakannai*, shows that INITIAL-C must also outrank FINAL-C. The ranking between INITIAL-C and CONTRAST has not yet been determined

(113) INITIAL-C &gt;&gt; FINAL-C

**Tableau 50**

Minimal Pair Analysis: INITIAL-C &gt;&gt; FINAL-C

	/wakar-anai : wakare-nai/	INITIAL-C	CONTRAST	FINAL-C
a. 	wakannai : wakarenai			:*
b.	wakaranai : wakannai	*!:		
c.	wakannai : wakannai		*!	

Thus, the total ranking is as follows:

(114) INITIAL-C, CONTRAST &gt;&gt; FINAL-C &gt;&gt; MAX-V

Below the full analysis of anti-homophony blocking between /wakar-anai/ and /wakare-nai/ is shown.

**Tableau 51**

Minimal Pair Analysis: INITIAL-C, CONTRAST &gt;&gt; FINAL-C &gt;&gt; MAX-V

	/wakar-anai : wakare-nai/	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a.	wakar <b>an</b> ai : wakare <b>n</b> ai	*!:		:*	
b.	wak <b>ann</b> ai : wakare <b>n</b> ai			:*	*:
c.	wakar <b>an</b> ai : wak <b>ann</b> ai	*!:			:*
d.	wak <b>ann</b> ai : wak <b>ann</b> ai		*!		*:*

Candidate d) is ruled out as it violates CONTRAST. Candidates a) and c) fatally violate INITIAL-C whereas candidate b) does not violate INITIAL-C. The desirable candidate b) wins. MPA is a useful technique to account for homophony avoidance, as it analyzes the interaction in application of a phonological process to two or more inputs, which could cause potential homophony if the process applies to both inputs. Conventional “single analysis” or an evaluation in “isolated” forms, which only allows one input and output at a time, cannot capture anti-homophony blocking. Crosswhite’s OT analysis, reviewed in section 1.2.2, has trouble accounting for this type of neutralization because her analysis cannot account for interaction of two or more outputs. MPA shares the similar concept with Dispersion Theory (Flemming 1995, Ní Chiosáin and Padgett 1997, 2001, Padgett 2003b) in which a “systemic” approach directly appeal to neutralization avoidance or anti-homophony.<sup>40</sup>

<sup>40</sup>Another possible approach is to divide MAX-V into MAX-V<sub>root</sub> and MAX-V<sub>affix</sub> instead of using ranking INITIAL-C >> FINAL-C. I will not take this approach in this dissertation because it will require one constraint more than the approach I have adopted here does. Nevertheless, I will show this approach also works. McCarthy and Prince’s (1995) claim that root faithfulness takes precedence over affix faithfulness: “(B)ecause roots are never unmarked relative to affixes, the ranking of Root-faithfulness and Affix-faithfulness must be fixed universally” (McCarthy and Prince 1995:364).

(i) Root-Affix Faithfulness Metaconstraint  
 Root-Faith >> Affix-Faith (McCarthy and Prince 1995)

Adopting this constraint ranking to the current discussion, I break MAX-V into two constraints and rank them as below.

The ranking in (114) also explains homophony blocking of a triplet (I will continue to use the term “Minimal Pair Analysis” since the technique itself remains the same no matter which we analyze, a pair or a triplet).

- (115) **kar -anai** → **kannai**  
clip<sub>NEG</sub>  
**kare -nai** → \***kannai**  
with<sub>NEG</sub>  
**kari -nai** → \***kannai**  
borrow<sub>NEG</sub>

**Tableau 52**

MPA: Nasal assimilation of a minimal triplet

/kar-anai/ : /kari-nai/ : /kare-nai/	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. <b>kar</b> anai : karinai : karenai	*!::		::*.*	
b. <b>kann</b> ai : karinai : karenai			::*.*	*::
c. <b>kar</b> anai : <b>kann</b> ai : karenai	*!::		::*	::*
d. <b>kar</b> anai : karinai : <b>kann</b> ai	*!::		::*	::*
e. <b>kann</b> ai : <b>kann</b> ai : karenai		*!	::*	*::*
f. <b>kar</b> anai : <b>kann</b> ai : <b>kann</b> ai	*!::	*		::*.*
g. <b>kann</b> ai : karinai : <b>kann</b> ai		*!	::*	*::*
h. <b>kann</b> ai : <b>kann</b> ai : <b>kann</b> ai		*!		*::*.*

- (ii)  $MAX-V_{root} \gg MAX-V_{affix}$   
 $MAX-V_{root}$ : Every vowel in root in input has a correspondent in output.  
 $MAX-V_{affix}$ : Every vowel in affix in input has a correspondent in output

Now, we go back to tableau 51 and conduct the analysis one more time using  $MAX-V_{root} \gg MAX-V_{affix}$ .

/wakar-anai : wakare-nai/	INITIAL-C	CONTRAST	FINAL-C	MAX-V <sub>root</sub>	MAX-V <sub>affix</sub>
a. <b>wakar</b> anai : wakare <b>n</b> ai	*:		::*!		
b. <b>wakann</b> ai : wakare <b>n</b> ai			::*		*:
c. <b>wakar</b> anai : <b>wakann</b> ai	*:			::*!	
d. <b>wakann</b> ai : <b>wakann</b> ai		*		::*!	*:

Candidate a) is ruled out due to its two violations of the three high ranked constraints. Among the rest of the candidates, c) and d) violate  $MAX-V_{root}$  fatally as  $MAX-V_{root}$  is ranked higher than  $MAX-V_{affix}$ . As a result, b) wins. Candidate d) is successfully ruled out due to its violation of CONTRAST without which d) would win.

Candidates a), c), d) and f) fatally violate INITIAL-C as /a/ in /kar-anai/ remains in the outputs. Candidates e), f), g) and h) violate CONTRAST as two or three words surface as homophones. As a result, candidate b) is optimal despite its violation of FINAL-C.

Next we return to (109), repeated below as (116), to see how CONTRAST works on this contrastive pair in which the only difference between the members of the pair is the affiliation of the segments on the edges of the morpheme.

- (116) kar -inasai → kannasai  
clip POL-IMP  
kari -nasai → \*kannasai  
borrow POL-IMP

### Tableau 53

MPA: /kar-inasai/ vs. /kari-nasai/

	/kar-inasai : kari-nasai/	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a.	karinasai : karinasai	*!:	*	.*	
b.	☞ kannasai : karinasai			.*	*:
c.	karinasai : kannasai	*!:			.*
d.	kannasai : kannasai		*!		*.*

Both candidates a) and d) violate CONTRAST because contrast between the two inputs is not maintained due to the neutralization in the output. Candidate c) violates INITIAL-C. As a result, candidate b) wins.<sup>41</sup>

<sup>41</sup> In the full-form grammar, no contraction occurs and homophony is allowed

- (i) kar -inasai → karinasai  
clip POL-IMP  
kari -nasai → karinasai  
borrow POL-IMP

I will discuss this homophony creation in the full-form grammar by different constraint ranking from the contraction grammar in chapter 4, namely MAX-V outranks CONTRAST. Also, theoretically it would be possible to get homophony in nasal assimilation between  $C_1V_1$ -rare-nai 'C<sub>1</sub>V<sub>1</sub>, PASS, NEG' and  $C_1V_1r$ -are-nai 'C<sub>1</sub>V<sub>1r</sub>, PASS, NEG'. However, to my knowledge, there is no such pair. The closet pair is the following but the accent is different. This pair cannot be considered as homophony.

Recall that CONTRAST does not apply to a pair in which the members of the pair are not contrastive. Syncretism and the homophones are such cases.

(117) Syncretism

a. tome -rare -nai → tomerannai  
stop POTEN NEG

b. tome -rare -nai → tomerannai  
stop PASS NEG

(Ichimura 2001:12)

Homophones

c. okor -anai → okonnai  
get upset NEG

d. okor -anai → okonnai  
occur NEG

(Ichimura 2001:12)

/tome-rare-nai/ ‘stop, POTEN, NEG’ and /tome-rare-nai/ ‘stop, PASS, NEG’ are not “contrastive” because the two forms are identical underlyingly and there is no violation of any of the correspondence constraints as shown below.

**Table 8**

“Contrastiveness” evaluation:

/tome-rare-nai/ ‘stop, POTEN, NEG’ and /tome-rare-nai/ ‘stop, PASS, NEG’

/tome-rare-nai/ ‘stop, POTEN, NEG’	MAX	DEP	IDENT	CONTIG	LINEAR	ANCHOR
/tome-rare-nai/ ‘stop, PASS, NEG’						

Since the two inputs are not “contrastive,” the creation of homophony in output in candidate a) (with no nasal assimilation) and candidate d) (with nasal assimilation) does not violate CONTRAST in the OT analysis below.

- 
- (ii) ki -rare -nai → kirannai  
wear, PASS, NEG  
kir -aré -nai → kiránnai  
cut, PASS, NEG

**Tableau 54**

MPA: Syncretism

/tome-rare-nai/ : /tome-rare-nai/ 'stop, POTEN, NEG' : 'stop, PASS, NEG'	CONTRAST	FINAL-C	MAX-V
a. tomerarenai : tomerarenai		**.*!*	
b. tomerannai : tomerarenai		*:**!	*.
c. tomerarenai : tomerannai		**:**!	.*
d.  tomerannai : tomerannai		*.*	*.*

Candidate d) has the smallest number of FINAL-C violations and therefore, it wins. Thus, both inputs undergo nasal assimilation. The analysis of lexical homonym is the same.

**Tableau 55**

MPA: Lexical homonym

/okor-anai/ : /okor-anai/ 'get upset, NEG' : 'occur, NEG'	INITIAL-C	CONTRAST	MAX-V
a. okoranai : okoranai	*!.*		
b. okonnai : okoranai	*!.		*.
c. okoranai : okonnai	*!:		.*
d.  okonnai : okonnai			*.*

Again, candidate d), as well as candidate a), do not violate CONTRAST. Since d) has no INITIAL-C violation, it is selected as optimal. Note that CONTRAST is crucially different from PARCONTRAST (Itô and Mester 2004b) that PARCONTRAST penalizes a case when underlyingly identical inputs surface as identical outputs, such as in the case of syncretism, including the potential /rare/ and the passive /rare/ in their discussion of /ra/-dropping, but CONTRAST does not. It is important to notice that the potential scope of CONTRAST may not cover all of the paradigm contract effects described in the literature.

I will show two more cases to which CONTRAST is not applied. In these cases, CONTRAST is not violated because two forms do not belong to the same major lexical

category and homophony is created by nasal assimilation. In the first case, verb with imperative /-ina/ undergo nasal assimilation resulting the same outputs as nouns.

- (118) a. /kar -ina/<sub>V</sub> → [kanna]<sub>V</sub>  
 clip, IMP  
 /kanna/<sub>N</sub> → [kanna]<sub>N</sub>  
 plane  
 b. /or -ina/<sub>V</sub> → [onna]<sub>V</sub>  
 bend, IMP  
 /onna/<sub>N</sub> → [onna]<sub>N</sub>  
 woman

CONTRAST does not apply to these pairs because the two forms belong to different lexical categories. In the second case, adjectives ending with /ranai/ undergo nasal assimilation and it creates homophony with their verbal counterparts.

- (119) a. /tumar-**anai**/<sub>ADJ</sub> → [tsumannai]<sub>ADJ</sub>  
 boring  
 /tumar -**anai**/<sub>V</sub> → [tsumannai]<sub>V</sub>  
 fill NEG  
 b. /tamar-**anai**/<sub>ADJ</sub> → [tamannai]<sub>ADJ</sub>  
 unbearable  
 /tamar -**anai**/<sub>V</sub> → [tamannai]<sub>V</sub>  
 accumulate NEG

Following Nishio et al. (1981), I assume that /tumar-anai/<sub>ADJ</sub>, for example, is derived from a verb *tumar-anai*. Therefore, I argue that although it is an adjective, a morpheme boundary still exists underlyingly. Then, /kudar-anai/<sub>ADJ</sub> and /kudar-anai/<sub>V</sub> are not contrastive underlyingly and CONTRAST does not apply to this pair. If we took the position that there is no morpheme boundary in the adjectives such as /tumar-anai/<sub>ADJ</sub> and

/tamaranai/<sub>ADJ</sub>, CONTRAST still does not apply to these pairs because the two forms are in different lexical categories.<sup>42</sup>

Readers might argue that there is a dilemma of using CONTRAST in MPA in transparadigmatic relations that we need to go through all possible pairs, even ones that we are not analyzing at the moment because MPA does not prevent us from picking any input pairs as a comparison set. For example, CONTRAST in MPA allows analyzing not only an input pair like (120a,b) and but also allows a pair like (120c).

- (120) a. /nar -anai/ : /nare -nai/ → ☞ nannai : narenai  
 become, NEG get used to, NEG
- b. /war -anai/ : /ware -nai/ → ☞ wannai : warenai  
 break (trans.), NEG break (intrans.), NEG
- c. /nare -nai/ : /ware -nai/ → ☛ nannai : wannai  
 get used to, NEG break (intrans.), NEG

Then, in (120c), *nannai* : *wannai* is selected because it satisfies CONTRAST. However, this selection is incorrect, indicated by the bomb, because neither *nare-nai* nor *ware-nai* should undergo nasal assimilation as shown in (120a,b). One possible explanation to account for this dilemma is a condition for MPA.

<sup>42</sup> Although the focus in this chapter has been nasal assimilation, there is a clear case that two forms do not belong in the same lexical category in labial contraction, one of the contracted forms in Japanese. Kawase (1992) points out that in the following case of labial contraction in consonant-final verbs, homophony is created.

- (i) a. /kak -i -wa/<sub>N</sub> → [kak<sup>j</sup>a]<sub>N</sub>  
 write NOMI TOP  
 /kak -eba/<sub>V</sub> → [kak<sup>j</sup>a]<sub>V</sub>  
 write HYP
- b. /asob -i -wa/<sub>N</sub> → [asob<sup>j</sup>a]<sub>N</sub>  
 play NOMI TOP  
 /asob -eba/<sub>V</sub> → [asob<sup>j</sup>a]<sub>V</sub>  
 play HYP

Note that *kak-i* and *sob-i* are not verbs because *kak* and *sob* are nominalized by the nominalizer *i*. I assume that a similar OT analysis can be applied to labial contraction, but CONTRAST is not applicable to these pairs because they do not belong to the same lexical category, and homophony is allowed.

## (121) Minimal Pair Analysis condition

Minimal Pair Analysis must be exhaustive – all possible comparison sets must be analyzed, and in order to determine the winning output set, each member of the winning output set must be the winner in all the analyses.

Since MPA has to be exhaustive, we cannot just pick an arbitrary pair for evaluation. We have to be sure that all the appropriate other forms are being considered. The full combinations of the lexicon need to be checked to make sure that none could wind up producing something homophonous. In order for *nannai* (< nare-nai) to win, it must undergo nasal assimilation with all possible comparison pairs. Failure of even one will block nasal assimilation. This condition is not met because *nare-nai* does not undergo nasal assimilation in (120a), even though it does (120c).

A challenge to the Minimal Pair Analysis condition how it is possible to exhaust MPA in transparadigmatic relations, as the number of comparison pairs may be very big. The definition of CONTRAST in (107) specifies what a comparison pair should be, to some degree, namely, the members of the comparison pair must be contrastive and belong to the same major lexical category. However, it does not reduce the number of possible comparison sets significantly as the entire set of combinatory possibilities that can be generated from the lexicon is still a huge number. If we assume that CONTRAST is a universal constraint, there is nothing, which hinders this condition to be applied to analyses of anti-homophony blocking in paradigmatic relations. If we apply the Minimal Pair Analysis condition to paradigmatic relations, anti-homophony blocking evaluation within paradigms does not seem to have such computational issue since there are fairly limited numbers of pair which can be chosen as a comparison set. How, then, do we

account for this dilemma in transparadigmatic relations? Although MPA must be exhaustive, we do not need to go through all the possible input pairs in order to exhaust. Pairing up first the options that are most closely related, we are more likely to arrive at a failure of meeting the MPA condition relatively at the early stage of the research. For example, in the evaluation of nasal assimilation of /nare-nai/, we select a comparison pair with /rV/, /nar-anai/ : /nare-nai/, rather than very different pair such as /tabe-nai/ : /nare-nai/, and test it out. As shown in (120a), nasal assimilation of /nare-nai/ is blocked. Since only one failure is needed to block nasal assimilation, we do not need to evaluate other comparison pairs and thus, the task usually ends soon. Then, how is /kure-nai/ ‘give (me), NEG’ → *kunnai* justified? *kur-anai*, which is only the potential blocking factor of nasal assimilation, does not exist simply because it is not in the lexicon of the native speaker. Thus, without analyzing other pairs such as /kure-nai/ : /fure-nai/ ‘touch, NEG’, finding out that *kunnai* is never pursued as /kur-anai/ due to the fact that the blocker of nasal assimilation of /kure-nai/ does not exist is enough to make the judgment that /kure-nai/ undergoes nasal assimilation. In some cases, a minimum triplet for example, /kar-anai/ ‘clip, NEG’: /kare-nai/ ‘wither, NEG’: /kari-nai/ ‘borrow, NEG’ in (115), exists. In this case, three pair-wise evaluations, /kar-anai/ : /kare-nai/, /kar-anai/ : /kari-nai/, and /kare-nai/ : /kari-nai/, are not enough because an evaluation between /kare-nai/ : /kari-nai/, using the constraint proposed earlier, would not be able to determine a winner since both /e/ and /i/ are a final vowel of the base of affixation (in fact, as commented in section 2.4.2, there is no pair solely between /re-nai/ and /ri-nai/ in the Japanese lexicon). We, then, need a triple pair analysis as demonstrated in tableau 52.

Thus far in this section, I have focused nasal assimilation of simply negative affixation where the negative morpheme is attached directly to a verb such as *wakar-nai*. As shown in (27), there are cases where the negative morpheme is attached to another suffix and nasal assimilation occurs: *tabe-tagar-anai* ‘eat, show signs of, NEG’ → *tabetagannai*, *ake-rare-nai* ‘open, POTEN, NEG’ → *akerannai* and *okos-are-nai* ‘wake up, PASS, NEG’ → *okosannai*. I will analyze nasal assimilation of the potential morpheme and the passive morpheme. The potential suffix has two allomorphs, /rare/ and /e/. Both are suffixes ending with /e/ (in the latter case, it is a suffix starting with /e/ as well since it consist of a single segment). However, only /rare/ undergoes nasal assimilation and nasal assimilation of /e/ is blocked.

- (122) Two potential morphemes
- a.     *tabe -rare -nai* → *taberannai*  
       eat   POTEN NEG  
       ‘cannot eat’
  - b.     *tor -e     -nai* → *\*tonnai*  
       take POTEN NEG  
       ‘cannot take’

I will analyze (122b) first. As shown below, this potential /e/ affixation to a consonant-final verb as in (123a) always has a /r-anai/ counterpart as in (123b), that is, affixation of the negative morpheme directly to the consonant-final verb.

- (123) a.     *tor -e     -nai* → *\*tonnai*  
       take POTEN NEG  
       ‘cannot take’
- b.     *tor -anai* → *tonnai*  
       take    NEG  
       ‘does not take’

In the OT analysis below, the constraints and their order we have established earlier are applied.

**Tableau 56**

MPA: /tor-e-nai/ vs. /tor-anai/

/tor-e-nai : tor-anai/	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. torenai : toranai	*.*!		*:	
b.  tonnai : toranai	.*			*:
c. torenai : tonnai	*:		*!:	.*
d. tonnai : tonnai		*		*.*!

Recall in (70), FINAL-C was defined such a way that a root plus suffix which precedes another suffix, like /tor-e/ in this case, is also considered as a base of affixation. Note that /-e-/ is considered not only the right edge of the base of affixation but also the initial vowel of a suffix. Thus, *torenai* in candidates a) and c) violates both INITIAL-C and FINAL-C. This OT analysis is a problematic as the undesirable candidate b) is selected. Candidate c) should be optimal. Note that /e/ is a whole morpheme which carries the entire meaning of ‘potential’. Deleting /e/ is very costly because once it gets deleted, the whole morpheme would disappear. Following Kurisu (2000) among others, I argue that a constraint, which requires realization of a morpheme on the output, is at work here.

(124) Realize Morpheme constraint (RM):

Every morpheme in the input must receive a phonological realization in the output.  
(Kurusu 2000)

In other words, not having any phonological exponent of a morpheme in the output is a violation of this constraint. I argue that RM is ranked higher than INITIAL-C and FINAL-C, motivated by the tableau below.

**Tableau 57**

Nasal assimilation of the potential morpheme /-e/:

RM &gt;&gt; INITIAL-C &gt;&gt; FINAL-C

/tor-e-nai/	RM	INITIAL-C	FINAL-C
a.  torenai		*	*
b. tonnai	*!		

Candidate b) violates RM fatally as /e/ is completely eliminated.<sup>43</sup> The MPA analysis with CONTRAST below shows that candidates b) and d) are ruled out by RM as /e/ is eliminated. As a result, nasal assimilation of /tor-e-nai/ is blocked.

**Tableau 58**

MPA: /tor-e-nai/ vs. /tor-anai/ with RM

/tor-e-nai : tor-anai/	RM	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. torenai : toranai		*:*!		*:	
b. tonnai : toranai	*!:	:*			*:
c.  torenai : tonnai		*:		*:	:*
d. tonnai : tonnai	*!:		*		*:*

To use RM is not an *ad hoc* fix to the problem of the violation of INITIAL-C in candidate c). In a) and c), *e* violates INITIAL-C and FINAL-C because it is a vowel-initial suffix as well as a vowel-final suffix. Its deletion violates RM in candidates b) and d).

Now we move onto the analysis of (122a). In the case of /rare/, there is no homophony threat simply because there is no potential for homophony.

<sup>43</sup>A question arises whether maintaining /e/ as a whole is the only option for its preservation in the output. In section 2.5.2, it was shown that labial contraction by syncope of front vowels *e* and *i* results in palatalization of the consonant before the vowel: *kore-wa* ‘this, TOP’ → *kor<sup>i</sup>aa, kor<sup>i</sup>a*. It is possible to posit a constraint that demands that [coronal] feature in vowel be maintained between input and output: MAX-V [cor]. However, palatalization of *r* in the case of nasal assimilation of the potential morpheme /e/ at hand is not an option as the resultant *r<sup>i</sup>n* violates SYLLSTRUC: *tor-e-nai* → \**tor<sup>i</sup>nai*.

- (125) *tabe -rare -nai* → *taberannai*  
 eat POTEN NEG  
 ‘cannot eat’  
 \**tabe -rar -anai* → N/A  
 \**taberar -anai* → N/A  
 \**tabe -rari -nai* → N/A

*/tabe-rare/* is considered as a base of affixation because the negative suffix is attached.

Thus, maintaining */e/* in */rare/* is a violation of FINAL-C.

### Tableau 59

Nasal assimilation of */tabe-rare-nai/*

<i>/tabe-rare-nai/</i>	RM	FINAL-C	MAX-V
a. <i>taberarenai</i>		**!	
b. <i>taberannai</i>		*	*

Candidate a) does not violate RM because deleted *e* in */rare/* is only one segment of the potential morpheme. Note that candidate a) violates FINAL-C twice, by *e* in *tabe* and *e* in *rare*. b) is selected as optimal. I won’t discuss the possibility of syncope of *e* in *tabe*, as this was already addressed in tableau 14 in section 3.3.

Now we move on to the analysis of nasal assimilation of the passive morpheme */are/*. In the case of *okos-are-nai* ‘wake up, PASS, NEG’ → *okosannai*, a similar analysis is applied.

### Tableau 60

Nasal assimilation of */okos-are-nai/*

<i>/okos-are-nai/</i>	RM	INITIAL-C	FINAL-C	MAX-V
a. <i>okosarenai</i>		*	*!	
b. <i>okosannai</i>		*		*

There is no violation of RM for candidate b). However, there are some cases where nasal assimilation of the passive morpheme is blocked.

- (126) a. kak **-are** -nai → \*kakan**nai**  
 write PASS NEG  
 ‘is not written’  
 kakar **-anai** → kak**annai**  
 hang (intransitive) NEG  
 ‘does not hang’
- b. sas **-are** -nai → \*sas**annai**  
 sting (transitive) PASS NEG  
 ‘is not stung’  
 sasar **-anai** → sas**annai**  
 sting (intransitive) NEG  
 ‘does not sting’

The same constraints and its ranking account for the blocking of nasal assimilation of *kak-are-nai* in (126a).

### Tableau 61

MPA: /kak-are-nai/ vs./kakar-anai/

/kak-are-nai : kakar-anai/	RM	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. kak <b>arenai</b> : kakar <b>anai</b>		*:#!		*:	
b. kak <b>annai</b> : kakar <b>anai</b>		*:#!			*:
c.  kak <b>arenai</b> : kak <b>annai</b>		*:		*:	:*
d. kak <b>annai</b> : kak <b>annai</b>		*:	*!		*:*

The rankings in (80) and (114), repeated below as (127), indicate that SYLLSTRUC is ranked higher than INITIAL-C, but the ranking between INITIAL-C and CONTRAST is not motivated.

- (127) SYLLSTRUC >> INITIAL-C, FINAL-C >> MAX-V  
 INITIAL-C, CONTRAST >> FINAL-C >> MAX-V

The total ranking, thus far, is as follows:

- (128) Ranking of main constraints in the contraction grammar  
 SYLLSTRUC >> INITIAL-C, CONTRAST >> FINAL-C >> MAX-V

In this section, I have argued that nasal assimilation is blocked when the contrast in underlying forms is neutralized, in order to maintain distinction of the underlying forms. I

have proposed a constraint *CONTRAST* that penalizes the contrast neutralization and MPA (Minimal Pair Analysis) which allows transparadigmatic words to interact in terms of the occurrence of nasal assimilation as such occurrence is a potential threat for the creation of homophony. *CONTRAST* is not applied to a pair which are identical underlyingly such as syncretism and homophones, or to a pair which belongs to different lexical categories.<sup>44</sup>

### 3.6 Summary

In this chapter, by using nasal assimilation as an example, I have presented an analysis of the contracted form and its anti-homophony blocking. I have demonstrated that nasal assimilation is accounted for by certain constraints and ranking specific to the contraction grammar: *SYLLSTRUC* >> *INITIAL-C* >> *FINAL-C* >> *MAX-V*. Nasal assimilation is driven by syncope, which is motivated by *INITIAL-C* and *FINAL-C* without a violation of *SYLLSTRUC*.

- (129) Nasal assimilation  
 $r-Vn \text{ or } rV-n \rightarrow n \langle V \rangle n$   
 $\rightarrow *r \langle V \rangle n$  (*SYLLSTRUC* violation)

In order to account for anti-homophony blocking of nasal assimilation in a pair under homophony threat, I have posited the anti-homophony constraint *CONTRAST*. It has been shown that *CONTRAST* is crucially ranked higher than *FINAL-C* and it blocks nasal assimilation of the vowel-final verb. Thus, homophony creation is avoided.

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<sup>44</sup>Pertsova (2004) claims that anti-homophony constraint is harder to learn than constraints with local dependencies due to its nonlocal, intraparadigmatic dependent nature. She arrived to this conclusion after doing a study of genitive plural allomorph choice in Russian. Although learnability of a systemic constraint, such as the anti-homophony constraint, vs. a conventional nonsystemic constraint is an interesting topic, it is out of the scope of this dissertation.

(130) SYLLSTRUC >> INITIAL-C, CONTRAST >> FINAL-C >> MAX-V

In order to utilize CONTRAST in OT analysis, I have proposed a Minimal Pair Analysis (MPA) in which multiple competing inputs are evaluated simultaneously to see how the outputs candidates interact in terms of the occurrence of the contraction. Such an analysis can easily be extended to account for other contracted forms and the anti-homophony blocking.

## **Chapter 4: Full-form grammar and transparadigmatic homophony creation**

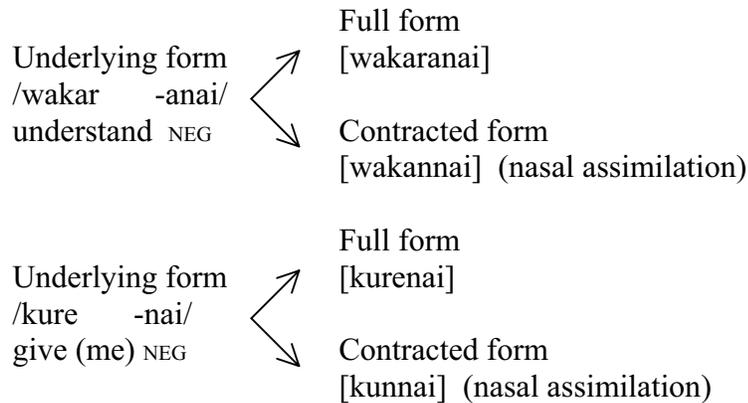
### **4.1. Introduction**

In Chapter 3, the contraction grammar and its layout has been established. In this chapter, I will introduce the full-form grammar from which an underlying form surfaces without contraction. There are cases where transparadigmatic homophony in inflectional morphology is created without blocking, for example, *katta* (< kar-ta ‘clip, PAST’) and *katta* (< kaw-ta ‘buy, PAST’). Such cases challenge the anti-homophony blocking principle presented in this dissertation as they could be counterevidence of anti-homophony blocking in full-form grammar and in some cases in the contraction grammar. I will examine each such case of transparadigmatic homophony creation. From there, I will argue that homophony is allowed despite the existence of anti-homophony constraint CONTRAST in order to respect the constraints ranked higher than CONTRAST. It will be argued that anti-homophony principle must be an outrankable and violable constraint embedded in the phonological grammar. The relationship between the contraction and full-form grammars will also be discussed. I will demonstrate that the two grammars share the same constraints and the ranking except for the position of the faithfulness constraint MAX-V. The relativized MAX-V results in different surface forms of the two grammars.

## 4.2 Full-form grammar

In this section, I will discuss the ranking of the constraints in the full-form grammar and the relation of the full-form grammar to the contraction grammar. In section 2.2, I discussed the coexistence of two forms, full-form and contraction form in (23), repeated here as (131), was discussed.

### (131) Coexistence of two forms



In the preceding chapter, I demonstrated that certain constraints and ranking specific to the contraction grammar in (128), repeated below, successfully account for the contracted forms in Japanese.

### (132) Ranking of main constraints in the contraction grammar SYLLSTRUC >> INITIAL-C, CONTRAST >> FINAL-C >> MAX-V

I will argue in the discussion below that in the full-form grammar, the vowel-faithfulness constraint MAX-V is ranked higher than the constraints which drive syncope, namely INITIAL-C and FINAL-C. These two grammars are minimally different, “minimally” meaning that the position of the faithfulness constraint MAX-V relative to the other constraints. I will demonstrate how the ranking of the constraints in the full-form grammar accounts for the nonoccurrence of nasal assimilation.

Nasal assimilation does not occur in the full-form grammar.

- (133) No nasal assimilation in the full-form grammar (a consonant-final verb)  
 wakar **-anai** → wakar**anai**  
 understand NEG

The tableau below shows that MAX-V must also outrank INITIAL-C since syncope does not occur.

**Tableau 62**

Full-form grammar: Nonoccurrence of nasal assimilation of a consonant-final verb  
 MAX-V >> INITIAL-C

/wakar-anai/	MAX-V	INITIAL-C
a.  wakar <b>anai</b>		*
b. wak <b>annai</b>	*!	

We know already that SYLLSTRUC is also ranked higher than INITIAL-C. The tableau below relays the full analysis. The ranking between SYLLSTRUC and MAX-V is not motivated.

**Tableau 63**

Full-form grammar: Nonoccurrence of nasal assimilation of a consonant-final verb  
 SYLLSTRUC, MAX-V >> INITIAL-C

/wakar-anai/	SYLLSTRUC	MAX-V	INITIAL-C
a.  wakar <b>anai</b>			*
b. wak <b>arnai</b>	*!	*	
c. wak <b>annai</b>		*!	
d. wak <b>arra</b> i	*!	*	

Candidates b) and d) are excluded because of the violation of SYLLSTRUC. Candidate c) makes a fatal violation of MAX-V which outranks INITIAL-C. Candidate a) violates INITIAL-C but it is still selected as optimal. Thus, the ranking SYLLSTRUC, MAX-V >> INITIAL-C is motivated, and nasal assimilation of a vowel-final verb does not occur.

- (134) Nonoccurrence of nasal assimilation in the full-form grammar (a vowel-final verb)

kure -nai → kurenai  
 give (me) NEG

This nonoccurrence of nasal assimilation can be similarly accounted for by using FINAL-C. First, MAX-V outranks FINAL-C.

**Tableau 64**

Full-form grammar: Nonoccurrence of nasal assimilation of a vowel-final verb  
 MAX-V >> FINAL-C

	/kure-nai/	MAX-V	FINAL-C
a.	kurenai		*
b.	kunnai	*!	

We know that SYLLSTRUC is ranked higher than FINAL-C. The tableau below shows the full analysis.

**Tableau 65**

Full-form grammar: Nonoccurrence of nasal assimilation of a vowel-final verb  
 SYLLSTRUC, MAX-V >> FINAL-C

	/kure-nai/	SYLLSTRUC	MAX-V	FINAL-C
a.	kurenai			*
b.	kurnai	*!	*	
c.	kunnai		*!	
d.	kurrai	*!	*	

Ranking SYLLSTRUC, MAX-V >> FINAL-C crucially selects a) *kurenai* as optimal. So far, I have argued that in the full-form grammar, SYLLSTRUC and MAX-V are ranked higher than INITIAL-C and FINAL-C

- (135) Full-form grammar  
 SYLLSTRUC, MAX-V >> INITIAL-C, FINAL-C

The ranking between INITIAL-C and FINAL-C is not motivated.

So far, I have not discussed whether CONTRAST exists in the full-form grammar in addition to the contraction grammar. If anti-homophony blocking principle is incorporated into the grammar as the anti-homophony constraint CONTRAST, this constraint must also exist somewhere in the full-form grammar. I base this assumption of the existence of CONTRAST in the full-form grammar on the hypothesis in Optimality Theory that a set of constraints is the same in every human language and the ranking of the constraints is unique to each individual language. Then, where is CONTRAST ranked in the full-form grammar? In full-form grammar, nasal assimilation does not occur to either member of the pair.

(136) No nasal assimilation in the full-form grammar

wakar     -anai → wakar**an**ai  
understand <sub>NEG</sub>  
wakare     -nai → wakare**n**ai  
get separated <sub>NEG</sub>

The tableau below (the full-form grammar version of the nasal assimilation in tableau 51 excluding INITIAL-C and FINAL-C) shows that MAX-V is violated by all candidate sets except for the most faithful candidate set a). The ranking of CONTRAST cannot be motivated because CONTRAST can be ranked lower or higher than MAX-V. At this point, we cannot provide evidence for the ranking of CONTRAST.

**Tableau 66**

MPA in the full-form grammar: Nonoccurrence of nasal assimilation

	/wakar-anai : wakare-nai/	MAX-V	CONTRAST
a. 	wakar <b>an</b> ai : wakare <b>n</b> ai		
b.	wak <b>ann</b> ai : wakare <b>n</b> ai	*!:	
c.	wakar <b>an</b> ai : wak <b>ann</b> ai	:*!	
d.	wak <b>ann</b> ai : wak <b>ann</b> ai	*!:*	*

The ranking of CONTRAST is established in the analysis of the following pair. Recall in (116), repeated below that homophony is blocked in the pair *kar-inasai* ‘clip, POL-IMP’ and *kari-nasai* ‘borrow, POL-IMP’.

- (137) Contraction grammar  
 kar -inasai → kannasai  
 clip POL-IMP  
 kari -nasai → \*kannasai  
 borrow POL-IMP

In the full-form grammar on the other hand, homophony is created.

- (138) Full-form grammar  
 kar -inasai → karinasai  
 clip POL-IMP  
 kari -nasai → karinasai<sup>45</sup>  
 borrow POL-IMP
- } homophony

As shown in the “contrastiveness” evaluation in table 7 in 3.5, MAX, DEP as well as ANCHORING are violated in /kar-inasai/ → /kari-nasai/, so these two inputs are contrastive. Thus, this pair is qualified for an evaluation using CONTRAST. The tableau in the full-form grammar below shows that CONTRAST must be ranked lower than MAX-V.

### Tableau 67

MPA: /kar-inasai/ vs. /kari-nasai/ in the *full-form* grammar

MAX-V >> CONTRAST

/kar-inasai : kari-nasai/	MAX-V	CONTRAST
a. ✖ karinasai : karinasai		*
b. kannasai : karinasai	*!:	
c. karinasai : kannasai	:*!	
d. kannasai : kannasai	*!.*	*

<sup>45</sup>Similarly, the affixation of the desiderative /-tai/ creates homophony.

- (i) kar-itai → karitai  
 clip, DESI  
 kari-tai → karitai  
 borrow, DESI

However, there is no ranking motivation among CONTRAST, INITIAL-C and FINAL-C.

**Tableau 68**

MPA: /kar-inasai/ vs. /kari-nasai/ in the full-form grammar

MAX-V >> INITIAL-C, CONTRAST, FINAL-C

/kar-inasai : kari-nasai/	MAX-V	INITIAL-C	CONTRAST	FINAL-C
a. $\text{karinasai} : \text{karinasai}$		*:	*	:*
b. $\text{kannasai} : \text{karinasai}$	*!:			:*
c. $\text{karinasai} : \text{kannasai}$	:*!	*:		
d. $\text{kannasai} : \text{kannasai}$	*!:*		*	

Thus, the total ranking so far is as follows:

- (139) Full-form grammar  
 SYLLSTRUC, MAX-V >> INITIAL-C, CONTRAST, FINAL-C

**Tableau 69**

MPA in the full-form grammar: Nonoccurrence of nasal assimilation

MAX-V >> INITIAL-C, FINAL-C

/wakar-anai : wakare-nai/	SYLLS TRUC	MAX-V	INITIAL -C	CONTRAST	FINAL- C
a. $\text{wakaranai} : \text{wakarenai}$			*:		:*
b. $\text{wakannai} : \text{wakarenai}$		*!:			:*
c. $\text{wakaranai} : \text{wakannai}$		:*!	*:		
d. $\text{wakannai} : \text{wakannai}$		*!:*		*	

### 4.3 Transparadigmatic homophony creation

In the previous section, I have assumed that the anti-homophony constraint CONTRAST exists even in the full-form grammar, and demonstrated its ranking among other constraints. In this section, I will review three patterns of homophony creation in the full-form grammar and account for these cases, which are possible counterevidence of anti-homophony principle. The three patterns are: 1) neither members of a pair undergo a

phonological process resulting in homophony (“neutralization without alternation”), 2) both members of a pair undergo a phonological process resulting in homophony (“neutralization of two-way alternation”), 3) only one member of a pair undergoes a phonological process resulting in homophony with the other monophonemic member (“neutralization of one-way alternation”). I will demonstrate that in all the patterns, homophony is created in inflectional morphology despite CONTRAST in the full-form grammar due to a fatal violation of SYLLSTRUC and MAX-V which are ranked higher than CONTRAST. Homophony is sometimes created even in the contraction grammar when there is a fatal violation of constraints ranked higher than CONTRAST. In short, the anti-homophony effect only emerges when there is no violation of the constraints ranked higher than CONTRAST.

#### **4.3.1 Homophony pattern 1: Neutralization without alternation and “Emergence of the Unmarked”**

To my knowledge, there is no research to this date that has presented the argument that the anti-homophony principle is applicable in transparadigmatic relations in addition to paradigmatic relations. As reviewed in section 1.2.4, Itô and Mester (2004b) propose that the anti-homophony constraint ParadigmaticContrast (PARCONTRAST) assigns one mark for each pair of paradigm members that are not phonologically distinct. They claim that this constraint only applies within the paradigm of a single lexical item, not applicable across paradigms. If the anti-homophony constraint is transparadigmatic, how are the many cases of homophony across paradigms explained?

In order to address this question, we will take a look at /kar-inasai/ and /kari-nasai/ pair one more time. This is the first of three patterns of homophony creation where neither members of a pair undergo a phonological process resulting in homophony, which I call “neutralization without alternation.” No contraction occurs and homophony is allowed in the full-form grammar in (138), repeated below as (140), but homophony creation is blocked when the contraction grammar is applied in (137), repeated below as (141).

(140) Full-form grammar  
kar -inasai → karinasai  
clip POL-IMP  
kari -nasai → karinasai  
borrow POL-IMP

} homophony

(141) Contraction grammar  
kar -inasai → kannasai  
clip POL-IMP  
kari -nasai → \*kannasai, karinasai  
borrow POL-IMP

The question is: how do the two grammars differ in such way that homophony creation is allowed in one grammar and it is blocked in another? As shown in tableau 68, repeated below as tableau 70, homophony is created in the full-form grammar due to the fatal violation of all the candidates, except for the homophonous candidate a), of MAX-V, which is ranked higher than CONTRAST.

**Tableau 70**

MPA: /kar-inasai/ vs. /kari-nasai/ in the *full-form* grammar  
 MAX-V >> INITIAL-C, CONTRAST, FINAL-C

/kar-inasai : kari-nasai/	MAX-V	INITIAL-C	CONTRAST	FINAL-C
a. $\Rightarrow$ karinasai : karinasai		*:	*	:*
b. kannasai : karinasai	*!:			:*
c. karinasai : kannasai	:*!	*:		
d. kannasai : kannasai	*!:		*	

In the contraction grammar on the other hand, as we saw in tableau 53, repeated below as tableau 71, CONTRAST exerts its force in disqualifying homophonous output d) because there is no violation of the candidate ranked higher than CONTRAST, namely SYLLSTRUC.

**Tableau 71**

MPA: /kar-inasai/ vs. /kari-nasai/: nasal assimilation in the *contraction* grammar

/kar-inasai : kari-nasai/	SYLLSTRUC	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. karinasai : karinasai		*!:	*	:*	
b. $\Rightarrow$ kannasai : karinasai				:*	*:
c. karinasai : kannasai		*!:			:*
d. kannasai : kannasai			*!		*:*

Thus, the homophony is blocked. In tableau 70, homophony is allowed and the anti-homophony effect is not in sight because of violations of MAX-V which is ranked higher than CONTRAST. The situation is the same in tableau 51, repeated below (SYLLSTRUC is added to the tableau).

**Tableau 72**

MPA: /wakar-anai/ vs. /wakare-nai/: nasal assimilation in the *contraction* grammar

/wakar-anai : wakare-nai/	SYLLSTRUC	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. wakaranai : wakarenai		*!:		:*	
b. $\Rightarrow$ wakannai : wakarenai				:*	*:
c. wakaranai : wakannai		*!:			:*
d. wakannai : wakannai			*!		*:*

Anti-homophony blocking only emerges when there is no violation of the constraints ranked higher than the anti-homophony constraint CONTRAST. The case of anti-homophony blocking in the contraction grammar is due to an emergence of CONTRAST. This is an example of “Emergence of the Unmarked” (McCarthy and Prince 1994), a circumstance in which a constraint, typically “unmarked” or “dormant” due to dominating constraint(s), unexpectedly surfaces since phonotactics does not block contraction independently and MAX-V is not ranked higher to prevent blocking of syncope. Thus, CONTRAST takes control.

#### 4.3.2 Homophony pattern 2: Neutralization by two-way alternation

In this section, I will introduce the second pattern of homophony creation despite a violation of CONTRAST., namely a transparadigmatic homophony creation in both full-form and contraction grammars in the affixation of the past morpheme /ta/ and the gerund /te/.

A historical morphophonemic sound change called *onbin* (sound euphony) began in the Heian period (A.D. 794-1192). *Onbin* is still observed in contemporary Japanese. *Soku-onbin* (or moraic obstruent), one of the *onbin* phenomena, is illustrated below:

$$(142) \quad \overline{\text{soku-onbin}} \\ \left. \begin{array}{l} \text{CVt} \\ \text{CVr} \\ \text{CVw} \end{array} \right\} -\text{ta} \rightarrow \text{CVtta}$$

There is a case in which homophony is created as a result of gemination of different verb root-final consonants.

- (143) /kaC/ + PAST (C: /t/, /w/, /r/)
- a. kát -ta → kátta  
 win PAST  
 káw -ta → kátta  
 keep an animal PAST
- b. kaw -ta → katta  
 buy PAST  
 kar -ta → katta<sup>46</sup>  
 clip PAST

In the examples above, accentuation is described in order to show that a) and b) are different in accent: *kát* and *káw* are lexically accented and *kaw* and *kar* are unaccented. *Soku-onbin* was caused by a historical loss of /i/ in the past morpheme /ita/. See Appendix C for history and patterns of *onbin*. The same homophony pattern by *soku-onbin* is observed in the suffixation of the gerund /te/ due to a loss of /i/ in /ite/.

- (144) /kaC/ + gerund /te/ (C: /t/, /w/, /r/)
- a. kát -te → kátte  
 win GER  
 káw -te → kátte  
 keep an animal GER
- b. kaw -te → katte  
 buy GER  
 kar -te → katte  
 clip GER

In *soku-onbin*, due to a violation of one of the canonical constraints in SYLLSTRUC, either CODACOND (\*CVr.ta.), NOCOMPLEXONSET (\*CV.rta.) or NOCOMPLEXCODA (\*CVrt.a.), as

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<sup>46</sup>For past formation, a polite expression exists in addition to nonpolite.

- (i) a. kaw -imasita → kaimasita  
 buy PAST (polite)  
 kaw -ta → katta  
 buy PAST (nonpolite)
- b. kar -imasita → karimasita  
 clip PAST (polite)  
 kar -ta → katta  
 clip PAST (nonpolite)

The polite past formations in a) and b) do not create homophony. The polite and nonpolite past formation have different underlying forms.

pointed out by Itô and Mester (1999), the root-final codas, *r* and *w*, assimilate to the suffix-initial *t*. I will analyze *soku-onbin kar-ta* ‘clip, PAST’ → *katta* first. Neither the most faithful candidate *karta* nor assimilation of *t* to *r*, *karra*, appears. These forms violate SYLLSTRUC. On the other hand, changing *r* to *t*, violates MAX [son] as we saw in tableau 29. This indicates that SYLLSTRUC must be ranked higher than MAX [son].

**Tableau 73**

*Soku-onbin* of /kar-ta/ ‘clip, PAST’:

SYLLSTRUC >> MAX [son]

/kar-ta/	SYLLSTRUC	MAX [son]
a.  katta		*
b. karta	*!	
c. karra	*!	

Since there is no syncope in this evaluation due to the fact that the past morpheme is underlyingly /ta/, not /ita/, MAX-V is excluded in this tableau. This tableau shows that SYLLSTRUC is ranked higher than MAX [son]. Recall in section 3.4, especially in tableau 29, the ranking between SYLLSTRUC and MAX [son] was not motivated but here we have evidence for the following ranking.

(145) SYLLSTRUC >> MAX [son]

A consonant deletion at the morpheme boundary does not occur. Since INITIAL-C and FINAL-C are ranked lower than MAX [son], motivated in tableau 26, MAX-C must be ranked higher than INITIAL-C and FINAL-C in order for neither *kara* nor *kata* to be surfaced.

(146) MAX-C: Do not delete a consonant

**Tableau 74**

*Soku-onbin* of /kar-ta/ ‘clip, PAST’:  
MAX-C >> INITIAL-C >> FINAL-C

/kar-ta/	MAX [son]	MAX-C	INITIAL-C	FINAL-C
a. 𑖅 katta	*			
b. kara		*	*!	
c. kata		*		*!

The ranking between MAX [son] and MAX-C is not motivated. In nasal assimilation, *r* assimilates to *n*. Why, then, does *r* not change to *n* in this case: *kar-ta* → *\*kanta*? In the Yamato (original Japanese) vocabulary, there are no consonant clusters such as *\*nt*, *\*mp*, *\*ŋk*. This constraint is called POSTNASVOI (Itô and Mester 1995b). This constraint is violable by the strata other than Yamato.<sup>47</sup>

(147) POSTNASVOI: Post-nasal obstruents must be voiced.

This constraint must be ranked higher than MAX [son].

**Tableau 75**

*Soku-onbin* of /kar-ta/: POSTNASVOI >> MAX [son]

/kar-ta/	POSTNASVOI	MAX [son]
a. 𑖅 katta		*
b. kanta	*!	

Voicing after a nasal is not realized in this case: *kar-ta* → *\*kanda*. This indicates that DEPLINK [voice] must be ranked higher than MAX [son] because /t/ gains nasality. *kar-ta* → *\*kanna* is also accounted for by DEPLINK [voice].

<sup>47</sup>Itô and Mester (1995a) claim that the Japanese vocabulary has several strata: Yamato (original Japanese), Sino-Japanese (Loan words of Chinese origin), Foreign, Mimetic, and the acceptability of constraints on well-formedness by each stratum varies (Itô and Mester 1995b further specify the foreign stratum into assimilated foreign called “Foreign” and unassimilated foreign called “Alien”). In their theory of the Core-Periphery structure, Japanese vocabulary has stratum-specific phonological phenomena. Yamato is the most constrained stratum as the core of the Japanese vocabulary, the violation of a set of constraints increases as “foreignness” of stratum increases (more toward the periphery) (See Itô and Mester 1995b for further details).

- (148) DEPLINK [voice]: Do not add a [voice] feature to a segment that it did not have underlyingly

**Tableau 76**

*Soku-onbin* of /kar-ta/: DEPLINK [voice] >> MAX [son]

/kar-ta/	DEPLINK [voice]	MAX [son]
a. $\text{ㄎ}$ katta		*
b. kanda	*!	
c. kanna	*!	

At this point, we do not know the exact ranking of MAX-C relative to SYLLSTRUC, POSTNASVOI and DEPLINK [voice] but in the full tableau 77, I chose the ranking is SYLLSTRUC, POSTNASVOI, DEPLINK [voice] >> MAX-C. The exact ranking MAX-C is not important because the ranking of MAX-C would not change the winner as long as it is ranked higher than INITIAL-C and FINAL-C.

**Tableau 77**

*Soku-onbin* of /kar-ta/: Full analysis

/kar-ta/	SYLLS TRUC	POSTNA sVOI	DEPLINK [voice]	MAX [son]	MAX-C	INITIAL- C	FINAL- C
a. karta	*!						
b. $\text{ㄎ}$ katta				*			
c. karra	*!		*				
d. kara					*	*!	
e. kata					*		*!
f. kanta		*!					
g. kanda			*!				
h. kanna			*!				

Recall that in (128) and (139), the main difference between the contraction grammar and the full-form grammar is the position of MAX-V.

- (149) Contraction grammar

SYLLSTRUC >> INITIAL-C, CONTRAST >> FINAL-C >> MAX-V

Full-form grammar

SYLLSTRUC, MAX-V >> INITIAL-C, CONTRAST, FINAL-C

Note that the faithfulness constraint MAX-V would not be violated by any of the candidates in tableau 77 (and thus, this constraint is not included in this tableau). The ranking between INITIAL-C and FINAL-C does not contribute to the determination of the winner, either it is INITIAL-C >> FINAL-C or INITIAL-C, FINAL-C. This means that tableau 77 would represent *soku-onbin* of /kar-ta/ in the contraction grammar in addition to the full-form grammar by simply unranking INITIAL-C and FINAL-C. Regardless of the grammar, *soku-onbin* of /kar-ta/ occurs.

The analysis of *soku-onbin* of /kaw-ta/ ‘buy, PAST’ are the same as the analysis of *soku-onbin* of /kar-ta/ ‘clip, PAST’.

### Tableau 78

*Soku-onbin* of /kaw-ta/ ‘buy, PAST’: Full analysis

/kaw-ta/	SYLLS TRUC	POSTN ASVOI	DEPLINK [voice]	MAX [son]	MAX-C	INITIAL- C	FINAL- C
a. kawta	*!						
b.  katta				*			
c. kawwa	*!		*				
d. kawa					*	*!	
e. kata					*		*!
f. kanta		*!					
g. kanda			*!				
h. kanna			*!				

Now we are able to account for *soku-onbin* of /kar-ta/ and /kaw-ta/.<sup>48</sup>

<sup>48</sup>As shown in (188) in Appendix C, verbs ending with a voiced obstruent or a nasal triggers *hatsu-onbin*, another type of *onbin*, in which these consonants become *n* along with voicing of *t* to *d*: *tob-ta* ‘fly, PAST’ → *tonda*, *yom-ta* ‘read, PAST’ → *yonda*, and *sin-ta* ‘die, PAST’ → *sinda*. By posing 1) MAX [voice] Obstruent, which prohibits the deletion of the voicing of an obstruent (Lombardi 1991), and 2) MAX [nas], which prohibits the deletion of a nasal, and ranking them, higher than DEPLINK [voice], *hatsu-onbin* can be accounted for, as below.

Now we move on to the analysis of /kar-ta/ and /kaw-ta/ in MPA in the full-form and contraction grammars. The four combinations of candidates a) and b) in tableaux 77 and 78 are used in tableau 79 below. The ranking between MAX [son] and CONTRAST is not motivated, so at this point, these two constraints are unranked. Since this tableau does not show MAX-V, INITIAL-C or FINAL-C in the tableau, it represents both grammars.

**Tableau 79**MPA: *Soku-onbin* in both grammars

	/kaw-ta : kar-ta/	SYLLSTRUC	MAX [son]	CONTRAST
a.	kawta : karta	*!:*		
b.	katta : karta	:*!	*:	
c.	kawta : katta	*!:	:*	
d.	𑄢𑄣𑄤 katta : katta		*:*	*

Candidates a)-c) all violate SYLLSTRUC. Although candidate d) violates CONTRAST, it still wins out. This tableau clearly indicates that the homophony *katta/katta* is created despite the violation of CONTRAST, due to the fact that all other candidates fatally violate SYLLSTRUC, which is ranked higher than CONTRAST. Thus, the effect of CONTRAST does not emerge and the homophony is allowed.

*Soku-onbin* is an obligatory process at the price of homophony. In the affixation of the past suffix /ta/ and the gerund /te/ to consonant-final verbs, no vowels appear at the morpheme boundary. In order to avoid a violation of SYLLSTRUC, assimilation of the

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/tob -ta/	MAX [voice] Obstruent	DEPLINK [voice]
totta	*!	
𑄢𑄣𑄤 tonda		*

/yom -ta/	MAX [nas]	DEPLINK [voice]
yotta	*!	
𑄢𑄣𑄤 yonda		*

verb-final consonants /r/ and /w/ to *t* occur. On the other hand, in the negative suffixation, there is an option to undergo contraction by syncope (nasal assimilation) or for it to remain as the full form. If contraction creates homophony, the contraction would be blocked.

### 4.3.3 Homophony pattern 3: Neutralization by one-way alternation

In this section, the third pattern of homophony creation in transparadigmatic relations will be reviewed. Regular verbs ending with a velar undergo *i-onbin*, another type of *onbin* in which a velar changes to *i* (see Appendix C for detail of *i-onbin*), by suffixation with the past morpheme /ta/ and the gerund /te/ such as *kik* ‘listen’ such as *kiita* (< *kik-ta*). *i-onbin* is observed across the verbs ending with a velar, except for *ik* ‘go’ which undergoes *soku-onbin* instead.

(150)	<u>Category names</u>	<u>ik ‘go’</u>	<u>kik ‘listen’</u>
	Negative	ik -anai	kik -anai
	Adverbial	ik -imasu	kik -imasu
	Present	ik -u	kik -u
	Hypothetical	ik -eba	kik -eba
	Potential	ik -e	kik -e
	Passive	ik -are	kik -are
	Imperative 1	ik -e	kik -e
	Imperative 2	ik -ina	kik -ina
	Polite Imperative	ik -inasai	kik -inasai
	Tentative	ik -oo	kik -oo
	Causative	ik -ase	kik -ase
	Past	<u>it</u> -ta	<u>ki</u> -ta
	Gerund	<u>it</u> -te	<u>ki</u> -te

Other than *ik*, all of the other verbs ending with a velar undergo *i-onbin*.

- (151) *ik* -te → *itte*  
 go GER  
*ak* -te → *aite*  
 open GER  
*uk* -te → *uite*  
 float GER  
*kik* -te → *kiite*  
 listen GER  
*sik* -te → *siite*  
 lay GER  
*hik* -te → *hiite*  
 pull GER

As a result, past /ta/ suffixation and gerund /te/ suffixation create homophony with *iw* ‘say’ which also undergoes *soku-onbin*.

- (152) a. *ik* -ta → *itta* (soku-onbin), \**iita* (i-onbin)  
 go PAST  
*iw* -ta → *itta* (soku-onbin)  
 say PAST  
 b. *ik* -te → *itte* (soku-onbin), \**iite* (i-onbin)  
 go GER  
*iw* -te → *itte* (soku-onbin)  
 say GER

There is nothing ill-formed about *iita* and *iite*. Yet, these are not realized for *ik*. I propose that *itta* (< *ik-ta*) and *itte* (< *ik-te*) are listed as monophonemic in the lexicon as ‘go, PAST’ and ‘go, GER’ respectively, rather than being derived from *ik* ‘go’, *ta* ‘PAST’ and *te* ‘GER’ who are listed separately in the lexicon by a phonological rule. /*iw-ta*/ ‘say, PAST’ → *itta* can be accounted for by the same constraints used for /*kaw-ta*/ ‘buy, PAST’ in tableau 77.

**Tableau 80**

/iw-ta/ ‘say, PAST’: Full analysis

/iw-ta/	SYLLS TRUC	POSTNA sVOI	DEPLINK [voice]	MAX [son]	MAX-C	INITIAL- C	FINAL- C
a. iwta	*!						
b. $\text{it}^{\text{a}}$ itta				*			
c. iwwa	*!		*				
d. iwa					*	*!	
e. ita					*		*!
f. inta		*!					
g. inda			*!				
h. inna			*!				

Like tableau 77, MAX-V would not be violated by any of the candidates above, and therefore, this tableau would represent the past formation of /iw-ta/ in the contraction grammar in addition to the full-form grammar by unranking INITIAL-C and FINAL-C.

The tableau below shows a MPA for homophony creation in the past formation of /itta/ ‘go, PAST’ and /iw-ta/ ‘say, PAST’ which represents both full-form and contraction grammars, using candidates a) and b) in tableau 80. Only *itta* is evaluated as an output of /itta/ because the other candidates are out of the question. There is no ranking motivation between MAX [son] and CONTRAST.

**Tableau 81**MPA: /itta/ ‘go, PAST’ and /iw-ta/ ‘say, PAST’ in *both* grammars

/itta/ : /iw-ta/	SYLLSTRUC	MAX [son]	CONTRAST
a. itta : iwta	:*!		
b. $\text{it}^{\text{a}}$ itta : itta		:*	*

The candidate a) fatally violates SYLLSTRUC. As a result, b) is selected despite its violation of CONTRAST since CONTRAST is ranked lower than SYLLSTRUC. Homophony creation occurs due to a violation of SYLLSTRUC. The anti-homophony effect does not

emerge here because of violation of the constraints ranked higher than CONTRAST.

It is not necessary for *itta* (< iw-ta) and *itte* (< iw-te) to be listed as ‘say, PAST’ and ‘say, GER’ respectively because these can be derived from the phonology since *iw -ta* → *itta* and *iw -te* → *itte* are productive processes. However, even if *itta* and *itte* were listed, as they have two meanings, in other words syncretism, homophony creation is not blocked. This is because CONTRAST does not apply to a pair which is not contrastive, as you may recall from the discussion in section 3.5.

There is another case for neutralization by one-way alternation. This case for homophony creation in this section is slightly different from the last three sections because the optimal output does not violate CONTRAST. This case is homophony creation between *ku* ‘come’ and *ki* ‘wear’. As you can see in the paradigms below, the adverbial, imperative 2, and polite imperative forms are identical. *ki* is a verb with regular conjugation and *ku* is an irregular verb in which I assume several allomorphs are stored.

(153)	<u>Category names</u>	<u>ku ‘come’</u>	<u>ki ‘wear’</u>
	Negative	ko -nai	ki -nai
	Adverbial	<b>ki -masu</b>	<b>ki -masu</b>
	Present	ku -ru	ki -ru
	Hypothetical	ku -reba	ki -reba
	Potential	ko -rare	ki -rare
	Passive	ko -rare	ki -rare
	Imperative 1	ko -i	ki -ro
	Imperative 2	<b>ki -na</b>	<b>ki -na</b>
	Polite Imperative	<b>ki -nasai</b>	<b>ki -nasai</b>
	Tentative	ko -yoo	ki -yoo
	Causative	ko -sase	ki -sase
	Past	ki -ta	ki -ta
	Gerund	ki -te	ki -te

I will use the adverbial form as an example. When the adverbial suffix /masu/ is attached to *ku*, the stem becomes *ki*, and it becomes homophonous with the adverbial form of *ki*

‘wear’. In the adverbial form, these two verbs create homophony in both full-form and contraction grammars. Like /itta/ ‘go, PAST’ discussed in the previous section, I assume that the adverbial form of *ku* is listed as /kimasu/ in the lexicon since /kimasu/ is not computable, unlike the adverbial form of *ki* is by simple affixation of the present suffix /masu/. It may be arguable that /ki-masu/ is in fact /k-imasu/ with an /imasu/, allomorph of /masu/, added to /k/. However, /ku/ + /imasu/ → *kimasu* is not computable because /imasu/ usually attaches to a consonant-final verb but the stem /ku/ is a vowel-final verb, not just /k/.

(154) Category names      ku ‘come’      ki ‘wear’  
 Adverbial                      kimasu                      ki -masu

(155) In the full-form and contraction grammars  
 kimasu → kimasu  
 come PRES  
 ki -masu → kimasu  
 wear PRES

} homophony

A MPA is conducted for the pair in (155).

**Tableau 82**

MPA: /kimasu/ ‘come, PRES’ and /ki-masu/ ‘wear, PRES’ in the *full-form* grammar

/kimasu/ : /ki-masu/	SYLLSTRUC	MAX-V	INITIAL-C	CONTRAST	FINAL-C
a.  kimasu : kimasu				*	:*
b. kmasu : kimasu	*!:	*:			:*
c. kimasu : kmasu	:*!	:*			
d. kmasu : kmasu	*!.*	*.*			

Candidate a) does not violate MAX-V, nor would violate any possible faithfulness constraints, for example MAX-C, IDENT-V. The other candidates b), c) and d) with a

deletion of /i/ fatally violate SYLLSTRUC. Thus, homophony in d) is allowed despite a violation of CONTRAST. An analysis in the contraction grammar is as follows.

**Tableau 83**

MPA: /kimasu/ ‘come, PRES’ and /ki-masu/ ‘wear, PRES’ in the *contraction* grammar

/kimasu/ : /ki-masu/	SYLLSTRUC	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a. ✗ kimasu : kimasu			*	:*	
b. kmasu : kimasu	*!:			:*	*:
c. kimasu : kmasu	:*!				:*
d. kmasu : kmasu	*!.*				*:*

In the contraction grammar, homophony is also created due to a fatal violation of SYLLSTRUC by candidates b), c) and d).

#### 4.4 Anti-homophony principle: phonology-internal vs. phonology-external

To the extent that anti-homophony blocking is not the sort of principle we traditionally associate with purely phonological processes as it concerns the interaction of the phonology with the lexicon, we might imagine that the right way of treating it is not with a ranked constraint within the phonology, but rather with some sort of filter on the output of the phonology. We might think that anti-homophony blocking is some sort of principle that lets the phonology do what it wants, but then comes along afterward and disallows certain results on the basis of the anti-homophony principle. In this section, I will examine whether the anti-homophony principle can be such a phonology-external device. Also, using the principle of Lexicon Optimization (Prince and Smolensky 1993), I will introduce the “extended LO (Lexicon Optimization) approach” used to determine which possible concatenation of already learned morphemes should be chosen upon parsing a

given output form in the adult grammar. However, I will demonstrate that the extended LO approach cannot account for cases of homophony creation because although it is sensitive to phonology, it is not a phonology-internal device. I will therefore argue that the anti-homophony constraint CONTRAST must be phonology-internal and it accounts for not only anti-homophony blocking but also homophony creation as a violable constraint embedded in the phonological grammar.

First, a phonology-external device will be examined. This would be a principle that lets the phonology do what it wants first, and then afterwards disallows homophony creation. Tableau 84 shows single analyses of /wakar-anai/ ‘understand, NEG’ and /wakare-nai/ ‘get separated, NEG’ using INITIAL-C >> FINAL-C along with MAX-V (without using CONTRAST). Both tableaux show that /wakare-nai/ undergoes nasal assimilation, which of course is not supposed to occur as indicated by the bombs.

**Tableau 84**

Single analysis of /wakar-anai/ and /wakare-nai/:

INITIAL-C >> FINAL-C >> MAX-V

a.	/wakar-anai/	INITIAL-C	FINAL-C	MAX-V
	wakar <b>an</b> ai	*!		
	☞ wak <b>ann</b> ai			*
b.	/wakare-nai/	INITIAL-C	FINAL-C	MAX-V
	wakare <b>n</b> ai		*!	
	☛ wak <b>ann</b> ai			*

After the optimal outputs are selected, the phonology-external anti-homophony principle prohibits the homophony in the outputs.

(156)	wakar	-anai	→	☞ wakannai	}	*
	understand	NEG				
	wakare	-nai	→	●☞ wakannai	}	↑
	get separated	NEG				

phonology-external anti-homophony principle

The phonology-external anti-homophony principle merely prohibits the realization of homophony but since it is not part of phonological grammar, it cannot see how phonology resolves homophony creation, namely only /wakar-anai/ undergoes nasal assimilation and nasal assimilation of /wakare-nai/ is blocked. CONTRAST as a phonology-internal anti-homophony principle, on the other hand, not only prohibits homophony creation but also lets the other constraints determine nasal assimilation of which inputs is blocked as a resolution as we saw in tableau 51, repeated below as tableau 85.

**Tableau 85**

Minimal Pair Analysis: INITIAL-C, CONTRAST >> FINAL-C >> MAX-V

	/wakar-anai : wakare-nai/	INITIAL-C	CONTRAST	FINAL-C	MAX-V
a.	wakaranai : wakarenai	*!:	:	*:	
b.	☞ wakannai : wakarenai		:	*:	*:
c.	wakaranai : wakannai	*!:	:		*:
d.	wakannai : wakannai		*!		*:*

A phonology-external device cannot do that because it is not part of the grammar.

Next, I will examine the “extended LO approach.” It is sensitive to phonology in terms of identifying the underlying form, however, it is not quite phonology-internal. The original proposal of Lexicon Optimization is reviewed first. Prince and Smolensky (1993:192) defines Lexicon Optimization as:

## (157) Lexicon Optimization

Suppose that several different inputs  $I_1, I_2, \dots, I_n$  when parsed by a grammar  $G$  lead to corresponding outputs  $O_1, O_2, \dots, O_n$ , all of which are realized as the same phonetic form  $\Phi$  – these inputs are all *phonetically equivalent* with respect to  $G$ . Now one of these inputs must be the most harmonic, by virtue of incurring the least significant violation marks: suppose this optimal one is labelled  $O_k$ . Then the learner should choose, as the underlying form for  $\Phi$ , the input  $I_k$ .

In other words, out of several potential inputs whose optimal outputs converge to the same phonetic realizations, the one most harmonic to the output should be chosen.

“Harmony” is defined as follows: “(H)armony is a kind of relative well-formedness, taking into account the severity of the violations of individual constraints, as determined by their hierarchical ranking. That is, violation of a higher-ranked constraint incurs a greater cost to harmony than violation of a lower-ranked constraint” (Kager 1999:8-9). In other words, an input with fewer violations of higher-ranked constraints is more harmonic.

Lexicon Optimization minimizes deep/surface disparity in its selection of underlying forms (Tesar and Smolensky 2000). This principle was introduced to argue for the learnability of the language-dependent underlying forms of morphemes, namely to address which of the universally available inputs is paired with a particular morpheme, in other words, to acquire new lexical entries. Given that phonetic form heard in the environment, the child figures out how to assign phonological and morphological structure to that form and store that structure in the lexicon. Lexicon Optimization has been utilized by other researchers to argue for the necessity of underspecification of the underlying form of a predictable and alternating surface forms (Inkelas 1995), and for the

recoverability of schwa in the underlying form from a full vowel in the surface in Coast Salish (Urbanczyk 2002), to name a few.

The Lexicon Optimization mechanism has not been used outside the acquisition domain. Once the morpheme is stored, Lexicon Optimization plays no further role in its evaluation since the “lexicon” (list of stored morphemes) has been “optimized.” I will attempt to extend this principle as a general mechanism beyond the acquisition of lexicon, not from a learnability standpoint, but for determining which possible concatenation of already learned morphemes should be chosen upon parsing a given output form in an adult grammar. The “extended LO approach” can be utilized to account for the anti-homophony blocking in the pair below, by using slightly different constraints.

- (158) **wakar**    **-anai** → **wakannai**  
           understand NEG  
       **wakare**    **-nai** → **\*wakannai**  
           get separated NEG

As introduced in footnote 40, another approach for this type of anti-homophony blocking is to divide MAX-V into MAX-V<sub>root</sub> and MAX-V<sub>affix</sub> and rank them as MAX-V<sub>root</sub> >> MAX-V<sub>affix</sub> instead of using ranking INITIAL-C >> FINAL-C.

- (159) MAX-V<sub>root</sub>: Every vowel in root in input has a correspondent in output.  
       MAX-V<sub>affix</sub>: Every vowel in affix in input has a correspondent in output.

Single analyses of each nasal assimilation using these MAX-V constraints along with unranked INITIAL-C and FINAL-C are shown in tableau 86.

**Tableau 86**

Single analysis of /wakar-anai/ and /wakare-nai/:

INITIAL-C, FINAL-C >> MAX-V<sub>root</sub> >> MAX-V<sub>affix</sub>

/wakar-anai/	INITIAL-C	FINAL-C	MAX-V <sub>root</sub>	MAX-V <sub>affix</sub>
wakar <sup>ⓐ</sup> anai	*!			
wak <sup>ⓑ</sup> annai				*
/wakare-nai/				
wakare <sup>ⓐ</sup> nai		*!		
wak <sup>ⓑ</sup> annai			*	

Compare this tableau with single analyses using INITIAL-C >> FINAL-C along with MAX-

V in tableau 84, repeated below as tableau 87.

**Tableau 87**

Single analysis of /wakar-anai/ and /wakare-nai/:

INITIAL-C &gt;&gt; FINAL-C &gt;&gt; MAX-V

a.	/wakar-anai/	INITIAL-C	FINAL-C	MAX-V
	wakar <sup>ⓐ</sup> anai	*!		
	wak <sup>ⓑ</sup> annai			*
b.	/wakare-nai/			
	wakare <sup>ⓐ</sup> nai		*!	
	wak <sup>ⓑ</sup> annai			*

The difference between the two tableaux, however, is that the harmonic levels of the winning candidates with the correspondent inputs are different in tableau 86 while the harmonic levels of the winning candidates with the correspondent inputs are the same in tableau 87. In order to apply the mechanism of Lexicon Optimization to tableau 86, I rewrite it using a technique called “tableau des tableaux,” following Itô, Mester and Padgett (1995), in which we can compare each of the optimal outputs to see its harmonic status to the corresponding input. In the tableau des tableaux, the optimal outputs of both analyses are compared to determine which output is ultimately optimal as the surface

form of the input. This tableau des tableaux below successfully demonstrates that only /wakar-anai/ undergoes nasal assimilation.

**Tableau 88**

Tableau des tableaux: /wakar-anai/ vs. /wakare-nai/

Input	Output	INITIAL-C	FINAL-C	MAX-V <sub>root</sub>	MAX-V <sub>affix</sub>
☞ /wakar-anai/	☞ wakannai				*
/wakare-nai/	☞ wakannai			*!	

So far, I have demonstrated that the extended LO approach is able to account for anti-homophony blocking by using different constraints.

Now, I will show that the extended LO approach does not work in accounting for a homophony creation, out of competing underlying forms in the lexicon, because anti-homophony principle must be a constraint ranked along with the other constraints in the phonology. One of such cases where the extended LO approach fails is the homophony creation by *soku-onbin* between /kaw-ta/ and /kar-ta/ in the full-form and contraction grammar as shown in (143b), repeated below as (160).

- (160) kaw -ta → katta  
 buy PAST  
 kar -ta → katta  
 clip PAST
- } homophony

In tableaux 77 and 78 in section 4.3.2, I showed single analyses of each *soku-onbin*, repeated below as tableau 89 by only showing the winner. MAX-V is not shown, nor MAX-V<sub>root</sub> /MAX-V<sub>affix</sub>, in the tableau because there would be no violation of these constraints. Note that I will leave the ranking between INITIAL-C and FINAL-C (INITIAL-C >> FINAL-C) as it is in the tableaux 77 and 78, rather than unranking them as it should be

if we use  $\text{MAX-V}_{\text{root}}$  nor  $\text{MAX-V}_{\text{affix}}$ , because the ranking between the two would not contribute anything to the analysis.

**Tableau 89**

*Soku-onbin* of /kar-ta/: Full analysis

/kaw-ta/	SYLLS TRUC	POSTNA sVOI	DEPLINK [voice]	MAX [son]	MAX-C	INITIAL- C	FINAL- C
☞ katta				*			
/kar-ta/							
☞ katta				*			

In order to account for this homophony creation, only using  $\text{MAX} [\text{son}]$  was sufficient in section 4.3.2. However, since the extended LO approach looks for differences in the harmonic level, it is necessary to further determine the harmonic level. there is a crucial difference between /w/ and /ɾ/ in terms of alternating to *t*, namely the former adds coronal but the latter does not. It means that using  $\text{DEPLINK} [\text{cor}]$  defined below, the former violates this constraint but the latter does not.

(161)  $\text{DEPLINK} [\text{cor}]$ : Do not add a [coronal] feature to a segment that it did not have underlyingly.

Since /kaw-ta/ → *katta* occurs, this constraint must be ranked lower than  $\text{SYLLSTRUC}$  but there is no motivation of its ranking relative to  $\text{MAX} [\text{son}]$ . The tableau below is a rewrite of tableau 89 using only the constraints which are violated, namely  $\text{MAX} [\text{son}]$  and  $\text{DEPLINK} [\text{cor}]$ .

**Tableau 90***Soku-onbin* of /kar-ta/: Analysis with DEP LINK [cor]

/kaw-ta/	MAX [son]	DEP LINK [cor]
☞ katta	*	*
/kar-ta/		
☞ katta	*	

The tableau des tableaux below shows that the extended LO approach chooses only /kar-ta/ is the input of *katta*. It fails to account for the fact that /kaw-ta/ is also the input of *katta* as homophony is created.

**Tableau 91**Tableau des tableaux: /kaw-ta/ vs./kar-ta/ in *both* grammars

Input	Output	MAX [son]	DEP LINK [cor]
/kaw-ta/	☞ katta	*	*!
☞ /kar-ta/	☞ katta	*	

Compare this with tableau 92 below, the same as tableau 79 but adding DEP LINK [cor], where the anti-homophony constraint CONTRAST is able to explain the homophony creation. All the candidate sets except for candidate d) violate the highest ranked constraint SYLLSTRUC and homophonous output set a) is selected despite its violation of CONTRAST.

**Tableau 92**MPA: *Soku-onbin* in *both* grammars

/kaw-ta : kar-ta/	SYLLSTRUC	MAX [son]	DEP LINK [cor]	CONTRAST
a. kawta : karta	*!:*			
b. katta : karta	:*!	*:	*:	
c. kawta : katta	*!:	:*		
d. ☞ katta : katta		*:*	*:	*

The problem with the extended LO approach is that it should never be able to allow homophony to arise as it always finds the difference in the harmonic levels in any given winning outputs in comparison unless they are underlyingly identical, as in the case of syncretism. The LO principle is a metagrammatical principle which is not quite internal to the constraint ranking. It merely chooses the winner by the harmonic levels of the two outputs to the inputs. CONTRAST, on the other hand, is a ranked constraint internal to the phonology, and its operation is inextricably linked with the operation of those other constraints. CONTRAST can be outranked by another constraint such as MAX-V, and as a result of a violation of MAX-V, homophony is created despite the fact the homophonous output set violates CONTRAST. The extended LO approach cannot do that because it does not see that SYLLSTRUC is more important than maintaining the contrast in the two outputs.

Another case in which the extended LO approach cannot account for homophony creation is when one input alternates but the other does not, such as a case of homophony creation of verb *ik*, discussed in (152a), repeated here as (162)

- (162) *ik* -ta → itta (soku-onbin), \*iita (i-onbin)  
           go PAST  
       *iw* -ta → itta (soku-onbin)  
           say PAST

In tableau 80, repeated below as tableau 89, *soku-onbin* of /iw-ta/ was accounted for.

**Tableau 93**

/iw-ta/ ‘say, PAST’: Full analysis

/iw-ta/	SYLLS TRUC	POSTNA sVOI	DEPLINK [voice]	MAX [son]	MAX-C	INITIAL- C	FINAL- C
a. iwta	*!						
b.  itta				*			
c. iwwa	*!		*				
d. iwa					*	*!	
e. ita					*		*!
f. inta		*!					
g. inda			*!				
h. inna			*!				

The tableaux below individual analyses, using the same constraints as above. Recall my claim in section 4.3.3 that *itta* is listed as monophonemic in the lexicon as ‘go, PAST’, rather than being derived from *ik* ‘go’ + *ta* ‘PAST’. Therefore, *itta* is the most faithful to the input /itta/, and there is no need to evaluate candidates other than *itta*.

**Tableau 94**

Soku-onbin of /itta/ ‘go, PAST’ and /iw-ta/ ‘say, PAST’

/itta/ ‘go, PAST’	SYLLSTRUC	POSTNASVOI	DEPLINK [voice]	MAX [son]
 itta				
/iw-ta/ ‘say, PAST’				
iwta	*!			
 itta				*

We use a tableau de tableaux for the extended LO approach.

**Tableau 95**

Tableau de tableaux: Soku-onbin of /itta/ ‘go, PAST’ and /iw-ta/ ‘say, PAST’

Input	Output	SYLLSTRUC	POSTNASVOI	DEPLINK [voice]	MAX [son]
 /itta/	 itta				
/iw-ta/	 itta				*!

As a result, the extended LO approach selects only /itta/ → *itta* as optimal although both /itta/ and /iw-ta/ must have been realized as *itta*. Thus, using the constraints and the ranking which were established, the extended LO approach failed to account for the fact that both /itta/ and /iw-ta/ is realized as *itta* on the surface. It is because the output *itta* is completely faithful to /itta/ without a violation of any constraints, while /iw-ta/ → *itta* always violates at least one constraint. Again, the problem with the extended LO approach arises due to the fact that the LO principle is not ranked and violable as it is not embedded in the phonological grammar. Compare tableau 95 with MPA with CONTRAST in tableau 81, repeated here as tableau 96.

**Tableau 96**

MPA: /itta/ ‘go, PAST’ and /iw-ta/ ‘say, PAST’ in *both* grammars

/itta/ : /iw-ta/	SYLLSTRUC	MAX [son]	CONTRAST
a. itta : iwta	:*!		
b. ☞ itta : itta		:*	*

Note that no violation is incurred when /itta/ surfaces as *itta* just like in tableau 95. Candidate b), the homophonous output set, is selected despite the violation of CONTRAST because CONTRAST, a violable constraint, is ranked lower than SYLLSTRUC. This is only possible because CONTRAST is a ranked constraint internal to the phonology.

In conclusion, I have demonstrated that the anti-homophony principle must be part of the phonological grammar as a constraint internal to the phonology. The anti-homophony constraint CONTRAST is able to account for the resolution of anti-homophony blocking and homophony creation because it can outrank other constraints and can be

outranked by the other constraints. In other words, the anti-homophony principle must be phonology-internal which is embedded in the grammar.

#### **4.5 Relativized faithfulness constraint and two grammars**

In earlier sections in this chapter, the constraints and their ranking as well as homophony creation in the full-form and contraction grammars have been discussed. In this section, the relationship between the two grammars will be discussed. First, I will review several researchers' treatment of variation in OT.

There are several accounts for variation in grammar within the OT framework. "Cogrammar," or "cophonology" (Inkelas et al. 1997, among others), is one of them. In this model, two (or more) grammars coexist and the ranking of the constraints within each grammar is fixed, as in traditional OT, and only one grammar is selected at a time. The different output is a result of which grammar the speaker chooses at a given time of speech production. The second account is the "nonfixed model" or "free ranking model" where constraints are rerankable within a single grammar, which in effect leads to two or more subgrammars or subhierarchies. Subgrammars differ only in constraints whose ranking is not stipulated by the grammar. This approach is similar to the "cophonology" approach but the crucial difference is that in the free ranking approach, the degree of dissimilarity between variable output forms and the number of variable outputs are positively correlated while in cophonology, the ranking of different cophonologies are intrinsically unrelated (Kagar 1999). There are two cases within this account. In one case, the ranking of two constraints is not fixed and therefore, one can outrank the other or vice

versa (Anttila 1997, Anttila and Cho 1998), which is referred to as “partial ranking.” In the other case, one constraint is not ranked categorically in a hierarchy and can float to any position within a set of constraints (Reynolds 1994, Nagy and Reynolds 1997). The third account is stochastic OT in the Gradual Learning Algorithm by Boersma (1997) and Boersma and Hayes (1999). In this model, it is presupposed that there is a linear scale of constraint strictness, in which higher values correspond to higher-ranked constraints. In the speech process, the position of each constraint is temporarily perturbed by a random positive or negative value, the constraints act as if they were associated with a range of values, instead of a single point. With such stochastic positions of the constraints at the evaluation of the candidate, the grammar can produce variable outputs if the ranges of two constraints with equal standard deviation overlap. (For a general discussion on variation in OT, except for Gradual Learning Algorithm, see Zubritskaya 1997 and Kagar 1999).

In the Japanese case at hand, contracted forms and full forms coexist not only among the speakers of the language (see Saito 1991), but also within an individual speaker. Contracted forms (labial contraction, nasal assimilation and /te/ contraction, in boldfaced below) and full forms (underlined) can appear interchangeably within a single sentence. The selection of the forms most likely has to do with sociolinguistic or individual factors of speakers who use contracted forms, and such details are beyond the scope of this dissertation (see section 5.2.3, however, for a brief discussion of the influence of sociolinguistic factors on the occurrence of nasal assimilation).

- (163) boku-wa yoku wakar -anai kedo sokoni kai-te-oku yo  
 I TOP well understand NEG although there write-GER-put sentence ending  
 ‘I don’t understand very well but I will write it there (for future purpose).’
- bokuwa yoku wakaranai kedo sokoni kaiteoku yo  
 → **bokaa** yoku wakaranai kedo sokoni **kaitoku** yo  
 → bokuwa yoku **wakannai** kedo sokoni kaiteoku yo  
 → **bokaa** yoku **wakannai** kedo sokoni **kaitoku** yo

This coexistence of the two forms is not surprising, considering that code-switching between two phonologically completely separate languages/grammars within a sentence does occur.<sup>49</sup> I will soon demonstrate that the “nonfixed model” is an appropriate model to account for the variation of two grammars in Japanese.

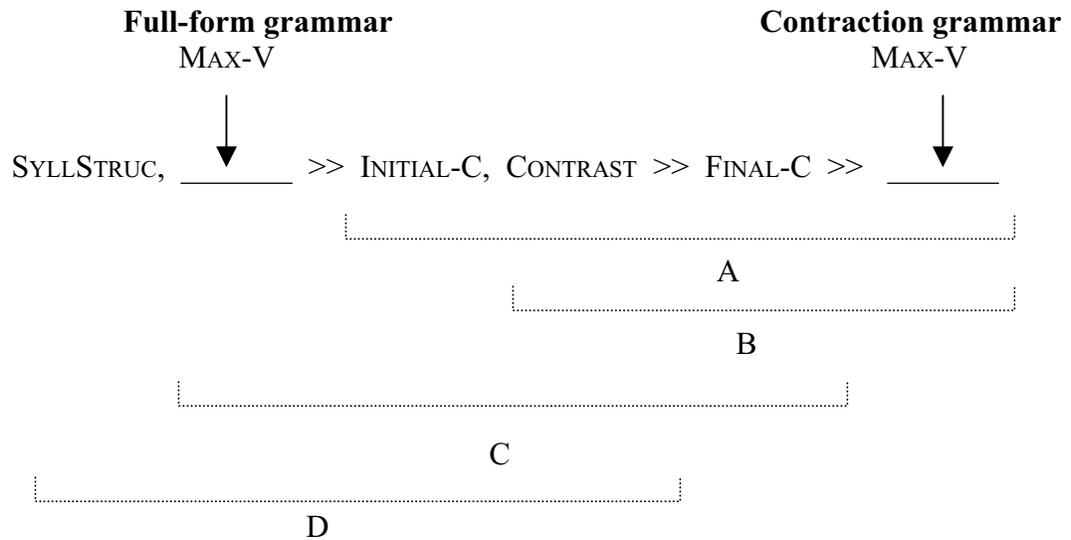
The chart demonstrates that there are two positions available for MAX-V, one for the full-form grammar and the other for the contraction grammar.

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<sup>49</sup>One example of code-switching between English and Spanish is as below.

- (i) *Anyway, yo creo que que las personas who support todos estos grupos como los Friends of the Earth son personas que are very close to nature.* (Moyer 1992, cited in Lipski 2005)

(164) Relativized faithfulness constraint MAX-V and the realization of two grammars



- A: Occurrence of contraction in the contraction grammar  
(Single analysis without CONTRAST)  
INITIAL-C >> MAX-V  
FINAL-C >> MAX-V
- B: Anti-homophony blocking in the contraction grammar (MPA)  
CONTRAST >> FINAL-C >> MAX-V
- C: No contraction in the full-form grammar  
(Single analysis without CONTRAST)  
MAX-V >> INITIAL-C  
MAX-V >> FINAL-C
- D: Homophony creation in the full-form and contraction grammars (MPA)  
SYLLSTRUC, MAX-V >> CONTRAST

In the contraction grammar, contraction occurs because INITIAL-C and FINAL-C outrank MAX-V, marked as A. The presence of contraction was demonstrated in tableaux 8, 10, 15 and 16. When there is a homophony threat by contraction, the contraction (driven by the ranking INITIAL-C and FINAL-C) on one member of a pair in question, is blocked by the anti-homophony constraint CONTRAST ranked higher than FINAL-C, one of the constraints which drives the syncope, marked as B. Anti-homophony blocking was demonstrated in tableaux 51 and 52. In the full-form grammar, no contraction occurs

because MAX-V is ranked higher than INITIAL-C and FINAL-C, marked as C.<sup>50</sup> We see the nonoccurrence of contraction in tableaux 63 and 65. In both the full-form and contraction grammars, there are some cases in which homophony is created. It is because all candidates, except for the candidate which violates CONTRAST, are ruled out due to a fatal violation of the constraints ranked higher than CONTRAST (SYLLSTRUC and MAX-V in the full-form grammar, and SYLLSTRUC in the contraction grammar), marked as D. Homophony creation was demonstrated in tableaux 68 (70), 79, 81, 82 and 83.

In the contraction and full-form grammars, the markedness constraints have a single ranking but the faithfulness constraint MAX-V can be relativized. The relativized faithfulness constraint can be ranked in one of two possible positions in the hierarchy to provide different surface results by different grammars. This relativized faithfulness constraint model is an example of the “nonfixed model” of two possible positions for MAX-V within a single constraint order, which leads to two subgrammars. However, it does not mean that the other accounts for variation in OT would not work for the case at hand.

Note that in the full-form grammar, the ranking between CONTRAST and FINAL-C is not yet established. Since these constraints are ranked relatively lower in the full-form grammar, a precise ranking is difficult to determine by an example, which motivates the exact ranking.

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<sup>50</sup> van Oostendorp (1998) claims that the more formal the register, the higher ranked faithfulness constraints. The contracted forms in Japanese can occur in formal speech but there is still a tendency that full forms occur in formal speech and contracted forms occur in informal speech. van Oostendorp’s observation reinforces my claim that MAX-V ranks higher in the full-form grammar than that in the contraction grammar.

A question arises as to whether another possible position of MAX-V is available, namely midway between the full-form grammar and contraction grammar, as shown below. If MAX-V can float to any position within this set of constraints like “floating constraint” model in Reynolds (1994), Nagy and Reynolds (1997), the position below should also be available.

(165) Another possible position of MAX-V



Is this ranking possible? This grammar predicts that vowels would be preserved even if it means that morphemes are attached to vowel-final bases, but would still drop in order to allow morphemes to be consonant-final. It means that consonant-final verbs always undergo nasal assimilation and vowel-final verbs never undergo nasal assimilation as below.

- (166) a.     wakar     -anai → wakannai  
           understand NEG  
       b.     wakar     -anai → wakarenai  
           get separated NEG  
       c.     kure     -nai → \*kunnai (⊗)  
           give (me) NEG

Nonoccurrence of nasal assimilation in (166b), then, is not due to the anti-homophony principle but due to the fact that in this grammar vowel-final verbs never undergo nasal assimilation even when there is no /r-anai/ counter part. This scenario makes false predictions as shown because /kure-nai/ in (166c) should undergo nasal assimilation when /wakar-anai/ in (166a) undergoes nasal assimilation. This grammar does not seem to exist.

Recall that it was discussed in chapter 1 that no researchers have demonstrated a case of anti-homophony blocking in transparadigmatic relations except for the Japanese case. In this chapter, it was shown that nasal assimilation in the contraction grammar is the only case that we know of that the anti-homophony constraint CONTRAST is in effect in blocking homophony creation due to the “Emergence of the Unmarked” effect in Japanese contracted forms. Such an effect is not always observed due to the fact that CONTRAST is a violable constraint and is in fact dominated by other constraints. However, it is not the reason why anti-homophony blocking is almost unattested in transparadigmatic relations. There is no reason to believe that anti-homophony blocking in transparadigmatic relations is rarer than that in paradigmatic relations. We just do not know for sure at this point. It seems to be true that CONTRAST in general is not ranked high enough to have an effect. Why CONTRAST isn’t ranked higher in many languages’ grammar is an open question. I leave it to future research.

#### **4.6 Summary**

In this chapter, I have established the ranking of the constraints in the full-form grammar. It was argued that the full-form grammar is crucially different from the contraction grammar in the position of faithfulness constraint MAX-V, namely MAX-V is ranked higher than INITIAL-C, CONTRAST and FINAL-C in the former, and lower in the latter. The relativized MAX-V provides different outputs by subgrammars by ranking in different positions in the hierarchy. Assuming that the anti-homophony constraint CONTRAST exists in the full-form, I have reviewed several cases for homophony creation which are

potentially counterevidence of anti-homophony blocking. I have argued that homophony is allowed due to violations of the constraints ranked higher than the anti-homophony constraint CONTRAST. The anti-homophony effect emerges only when CONTRAST is violated but there is no violation of constraints ranked higher than CONTRAST. In nasal assimilation, anti-homophony blocking is observed in the contraction grammar due to such “Emergence of the Unmarked” effect. I have demonstrated that the anti-homophony principle must be embedded in the phonological grammar as an outrankable and violable constraint internal to the phonology. Unless it is a phonology-internal device, the anti-homophony principle cannot account for the resolution of anti-homophony blocking and homophony creation because anti-homophony principle must be part of the phonological grammar.

## **Chapter 5: Experiment on productivity of anti-homophony blocking**

### **5.1. Introduction**

In chapter 3, I analyzed anti-homophony blocking in Japanese contracted forms using the anti-homophony constraint CONTRAST. This constraint, as well as other similar constraints such as \*MERGE (Kawahara 2003) and PARCONTRAST (Itô and Mester 2004b) within a systemic OT analysis, have only recently been developed and are still rather radical compared to conventional “nonsystemic” or “syntagmatic” constraints. My claim concerning this constraint would be more convincing if there were evidence that the anti-homophony blocking we are examining is in fact a result of a productive aspect of the synchronic grammar and not simply the result of lexically-specified exceptionality of one form or another (for example, lexical listing of nasal assimilation).

In this chapter, I will discuss a production experiment involving nasal assimilation designed to demonstrate the productivity of nasal assimilation. I will conclude that the result obtained from the experiment provides evidence that contraction and resulting anti-homophony blocking in transparadigmatic relations are productive processes generated by a contraction grammar. I will argue that the anti-homophony principle is incorporated into the grammar of native speakers as part of the speaker’s knowledge.

I will also demonstrate that word frequency and word familiarity are not contributing factors to warrant contraction. It is not the case that homophony creation in transparadigmatic relations is blocked because one (the one which undergoes contraction)

of the members of a pair ranks higher in word frequency and word familiarity, than the other (which is blocked in contraction).

## 5.2 Production experiment involving nasal assimilation

In this section, I will discuss the production experiment involving nasal assimilation, to demonstrate that nasal assimilation and anti-homophony blocking are productive processes.

### 5.2.1 Purpose

This experiment is designed to test the productivity, in native speakers of Japanese, of both nasal assimilation and anti-homophony blocking by introducing speakers to nonce verbs. In section 3.5, it was demonstrated that nasal assimilation of a /re-nai/ or /ri-nai/ word is blocked when a /r-anai/ counterpart exists in (115) among others, repeated here as (167).

- (167) kar -anai → kannai  
clip NEG  
kare -nai → \*kannai  
wither NEG  
kari -nai → \*kannai  
borrow NEG

I have proposed that the anti-homophony constraint CONTRAST is incorporated into the contraction grammar. If this claim is correct, the anti-homophony principle should be productive and should therefore be applicable to nonce verbs. The purpose of this experiment is to examine if nasal assimilation and blocking of it occurs not only with actual verbs which were introduced in the discussion, but also to nonce verbs especially

designed for this experiment in order to demonstrate the productivity of nasal assimilation.

### **5.2.2 Methods**

A conversational experiment was conducted between the subjects and a dialogue partner conducting the experiment. The subject pool consists of 15 native Japanese men and women, ages 19-45 years. The dialogue partner is a 40-year-old male Japanese native speaker. The experiment was conducted from September 2003 to April 2004. The experiment was recorded on an AIWA SLSS/Cassette recorder TP-80 VZRS (voice zoom recording system).

Closeness and age difference between the subjects and the dialogue partner may affect the occurrence of nasal assimilation. In their research on contracted forms, Nakamura et al. (2003) found that nasal assimilation is used to address to the close acquaintances (friends, close colleagues and boy/girl friends) or the people in subordinate positions, but not people they do not know or those in superior positions. They found these results in conversations in four TV dramas. In the current experiment, the dialogue partner was older than the most of the subjects and he was not an acquaintance of half of the subjects. In order to minimize the influence of the relationship of the subjects in this experiment with the dialogue partner, the subjects were told to relax and pretend that they were having a conversation with their friends. Before the experiment of subjects who met the dialogue partner for the first time, a small conversation (about 10 minutes) was held so that the subjects had a chance to relax before the experiment.

First, a practice dialogue written in Japanese orthography, dialogue sheet 1 in (168), was handed to the subjects. The orthography does not indicate whether the verbs are consonant-final or vowel-final, or whether nasal assimilation is to be applied or not. The subjects were asked to practice the dialogue with the dialogue partner by reading their part indicated by S1–S4. The subjects were told that it was not necessary to repeat the noun phrases before the verbs, in this case *taiya* ‘tire’, since it is natural to omit the noun phrases after initial introduction in Japanese. This particular verb in the Dialogue Sheet 1, *mawar* ‘spin’, is a consonant-final verb.

(168) Dialogue Sheet 1 (for females)

Verb: *taiya mawar -u*  
 tire spin -PRES  
 ‘The tire spins.’

D: Dialogue partner  
 S: Subject

D1: ねえ、タイヤ、まわった？

nee taiya mawat -ta?  
 hey tire spin PAST  
 ‘Hey, did the tire spin?’

S1: それが全然まわらないのよ。

sore -ga zenzen mawar -anai no yo.  
 that -NOM at all spin -NEG Sentence Ending Sentence Ending  
 ‘Well, it does not spin at all.’

D2: ふつうは簡単にまわっちゃうもんじゃないの？

futsuu -wa kantanni mawat -tyau mon -ja -nai no?  
 usually-TOP easily spin GER-finish NOMI COP-TOP NEG Sentence Ending  
 ‘Isn’t it usually the case that it spins without a problem?’

S2: そんなにうまくまわれればいいけどね。

sonnani umaku mawar -eba ii kedo ne  
 like that nicely spin -HYP good although Sentence Ending  
 ‘It would be great if it spins that easily.’

D3: まあ、もうちょっと待って見たら？きっとまわるって。

maa moo tyotto mat -te mi -tara? kitto mawar -u -tte.  
 well more a bit wait -GER, try -HYP for sure spin -PRES Sentence Ending  
 ‘Well, why don’t you wait a little bit more? I am sure it will spin.’

- S3: もう、あきらめたの。まわるのは。  
 moo akirame -ta no mawar -u no wa.  
 already give up -PAST Sentence Ending spin -PRES NOMI TOP  
 'I have already given up that it spins.'
- D4: でも、突然、まわり始めたらどうする？  
 demo totuzen mawar-i -hazime -tara dou suru?  
 but suddenly spin -start -HYP how do  
 'But, what would you do if it starts spinning?'
- S4: そしたらこうやってやる。もういまさら、まわらないでいいよ。  
 sositara kou it -te yaru. 'mou imasara mawar -anai -de  
 in that case this way say-GER give already at this time spin -NEG -GER  
 ii -yo  
 good Sentence Ending  
 'In that case, I would say like this. 'Don't spin now (it's too late).'

Two types of dialogue sheets 1 were prepared, one for male and the other for female subjects in order to make the dialogue more gender appropriate. The dialogue sheet above is for female subjects and it includes the sentence-ending *no* in S1 and S3, as *no* is predominantly used by female speakers. The dialogue sheet for male subjects does not have this *no* in S1 and S3 but everything else is identical. *no* does not lead to any difference in meaning.

After the subjects practiced the dialogue with the dialogue partner, dialogue sheet 2 was given to the subjects. The dialogue sheet includes the dialogue with blanks for the assigned verbs and a list of possible verbs. The subjects practiced the dialogue with the dialogue partner using the vowel-final verb, (*kaminoke*) *nure-ru* 'hair, get wet' with the dialogue partner. Subjects were then asked to go back to the consonant-final verb (*taiya*) *mawar-u* and practice using dialogue sheet 2. This practice using two verbs was repeated until the subjects became comfortable with the dialogue.

## (169) Dialogue Sheet 2

- D1: ねえ、\_\_\_\_\_た？  
nee \_\_\_\_\_-ta?  
hey \_\_\_\_\_-PAST
- S1: それが全然\_\_\_\_\_ないのよ。  
sore -ga zenzen \_\_\_\_\_-nai no yo  
that -NOM at all \_\_\_\_\_-NEG Sentence Ending Sentence Ending
- D2: ふつうは簡単に\_\_\_\_\_ちゃうもんじゃないの？  
futsuu -wa kantanni \_\_\_\_\_-tyau mon -ja -nai no  
usually -TOP easily \_\_\_\_\_-GER-finish NOMI -COP- TOP -NEG Sentence Ending
- S2: そんなにうまく\_\_\_\_\_ればいけどね。  
sonnani umaku \_\_\_\_\_-r-eba ii kedo ne  
like that nicely \_\_\_\_\_-HYP good although Sentence Ending
- D3: まあ、もうちょっと待って見たら？きっと\_\_\_\_\_るって。  
maa moo tyotto mat -te mi -tara? kitto \_\_\_\_\_-r-u -tte.  
well more a bit wait -GER try -HYP for sure \_\_\_\_\_-PRES Sentence Ending
- S3: もう、あきらめたの。\_\_\_\_\_るのは。  
moo akirame -ta no, \_\_\_\_\_-r -u no wa.  
already give up -PAST Sentence Ending \_\_\_\_\_-PRES NOMI TOP
- D4: でも、突然、\_\_\_\_\_始めたらどうする？  
demo, totuzen \_\_\_\_\_-hazime -tara dou suru?.  
but suddenly \_\_\_\_\_-start -HYP how do
- S4: そしたらこうやってやる。もういまさら、\_\_\_\_\_ないでいいよ。  
sositaru kou it -te yaru. 'mou imasara \_\_\_\_\_-nai -de ii  
in that case this way say-GER give already at this time \_\_\_\_\_-NEG-GER good  
-yo  
Sentence Ending

A

- |              |  |
|--------------|--|
| あの人、帰る       | ano hito, kaer -u<br>that person go back PRES                          |
| 風向き、変わる      | kazamuki, kawar -u<br>direction of the wind change PRES                |
| はしご、寄りかかる    | hasigo, yorikakar -u<br>ladder, lean over PRES'                        |
| ごはん、作る       | gohan, tukur -u<br>meal cook PRES'                                     |
| 子ども、学校、行きたがる | kodomo, gakkoo, ik -itagar -u<br>child school go show the sign of PRES |

友達、宿題、やってくれる	tomodachi, syukudai, yat -te -kure -ru friend homework do GER give PRES
相手、へこたれる	aite, hekotare -ru opponent get daunted PRES
朝、起きられる	asa, oki -rare -ru morning wake up PASS PRES
あの政治家、助けられる	ano seijika, tasuke -rare -ru that politician save PASS PRES
頭数、たりる	atamakazu tari -ru headcounts suffice PRES
B	
あの2人、別れる	ano futari, wakare -ru that two people get separated PRES
赤ちゃん、生まれる	akachan, umare -ru baby be born PRES
レポート期限、遅れる	reposito kigen okure -ru due date of the paper become late PRES
生徒、本、借りる	seito, hon, kari -ru student book borrow PRES
運転手、降りる	untensyu, ori -ru driver get off PRES
C	
あの男、とか'る	ano otoko, tokár -u that man (nonce) PRES
コップ、たしも'る	koppu, tasimór -u cup (nonce) PRES
コンピューター、また'る	konpuutaa, matár -u computer (nonce) PRES
花、あぐ'る	hana, agúr -u flower (nonce) PRES
左手、そわ'る	hidarite, sowár -u left hand (nonce) PRES
D	
物理、うかれ'る	buturi, ukaré -ru physics (nonce) PRES
弁護士、くもれ'る	bengosi, kumoré -ru lawyer (nonce) PRES

毛糸、わたる	keito, watari -ru woolen yarn (nonce) PRES
春、なぐり'る	haru, naguri -ru spring (nonce) PRES
天気、すわりる	tenki, suwari -ru weather (nonce) PRES

Four types of verbs were used in this experiment, type A and type B (actual verbs) and type C and type D (nonce verbs). I will explain these types of verbs in more detail below. For type C and D verbs, the dialogue partner helped the subjects to understand whether each verb is consonant-final, or verb-final since the subjects do not have a way to know whether the given nonce verb is a consonant-final or a vowel-final verb. For example, *tokaru* in type C verbs can be interpreted to be the vowel-final verb *toka-ru* (> *toka-nai*) instead of the consonant-final verb *tokar-u* (> *tokar-anai*) as intended. *Komareru* in type C verbs can be interpreted to be the consonant-final verb *komarer-u* (> *komarer-anai*) instead of the vowel-final verb *komare -ru* (> *komare-anai*) as intended. The first utterance of the dialogue partner gives the subject information as to which type of verb it is because a consonant-final verb conjugates differently (*tta* for a consonant-final verb and *ta* for a vowel-final verb). However, since it may not be adequate information for the subjects to make proper judgments on the verb type, the dialogue partner described each verb using several conjugations before the experiment. For example, in the case of *tokar-u*; “じゃ、次は「あの人、とかる」 ‘Okay, the next is *ano hito tokar-u* (that person *takars*)’, たまにとかって (tokat-te) いる人見ることない? ’Don’t you sometimes see a person who is *tokaring*?’ まあ、とかれば (tokar-eba) いいってもんじゃないけど。 ‘It is not that to *tokar* is only thing you need to do.’ とかりっぱなし (tokar-ippanasi) でも困る

けどね。‘It would be annoying if somebody keeps *tokar*-ing all the time.’ The sounds in three conjugation forms in boldface above, *t*, *e* and *i*, are indicators of consonant-final verbs. The absence of these sounds indicates that the verb is a vowel-final verb; for example, in the case of the vowel-final nonce verb *kumore*, the three conjugation forms are: *kumore-te*, *kumore-reba*, *kumore-ppanasi*. The use of the negative form was avoided here. The subjects were told to ignore the accentuation marker on the list of type C and D verbs, but when they were introduced to the subjects in the experiment, the verbs were pronounced by the dialogue partner according to the designated accents.

After practicing the two above-mentioned verbs, the actual experiment began using verbs types A-D listed on the sheet after the dialogue. The verbs in types A-D were tested in the order above as a block, for several reasons. First, it is convenient as a testing procedure to present them in a block, since, as noted before, especially nonce verbs in types C and D require special notification and instruction before testing. Second, by testing in this order where undergoers of nasal assimilation and nonundergoers are successive: A (expected as undergoing) - B (expected as being blocked) - C (expected as undergoing) - D (expected as being blocked), a carryover effect, for example by doing type A first could affect the response on type B, can be observed easily. I wanted to make sure that there would be no carryover effect. The results, which will be reviewed in the next section, indicate that there were in fact no carryover effects whatsoever. The

subjects were allowed to consult with the dialogue sheet 2 during the experiment, rather than memorizing the dialogue.<sup>51</sup>

This dialogue is designed to check the nasal assimilation in the negative affixation to the verb. However, a variety of verb categories were used in order to disguise that the real focus is only on the negative forms, and to give the subjects information about conjugation patterns, as below:

(170)	<u>Utterance</u>	<u>Category name</u>
	N1	Past
	S1	Negative
	N2	Gerundive
	S2	Hypothetical
	N3	Present
	S3	Present
	N4	Adverbial (with auxiliary verb <i>hazime-ru</i> )
	S4	Negative

The key utterances are S1 and S4, potential utterances for nasal assimilation.

The four types of verbs are designed as follows.

(171) Four types of verbs

Type A: Actual verbs which can undergo nasal assimilation if the speaker is an active user of nasal assimilation.

Examples:    **kaer**    **-nai** → **kaennai**  
                   go home    NEG

Type B: Actual verbs whose nasal assimilation should be blocked if anti-homophony blocking is at work.

Examples:    **wakare**    **-nai** → **\*wakannai**  
                   get separated    NEG,

Blocked because homophonous with:

**wakar**    **-nai** → **wakannai**  
                   understand    NEG

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<sup>51</sup>At the designing stage of this experiment, my expectation was that the subjects would memorize the dialogue by practicing with two verbs. However, the preliminary experiment revealed that it was not an easy task for the subjects to memorize the dialogue.

Type C: Nonce verbs which can undergo nasal assimilation if nasal assimilation is productive.

Examples: tokar -anai → tokannai  
(nonce) NEG

Type D: Nonce verbs whose nasal assimilation should be blocked if anti-homophony blocking is productive.

Examples: ukare -nai → \*ukannai  
(nonce) NEG

Blocked because homophonous with:

ukar -anai → ukannai  
pass NEG

As shown in the table 9, the verbs were introduced to the subjects with a noun phrase (NP), described in parentheses, which can be interpreted to be nominative, accusative or dative case. The negative form of each verb is in parentheses. I intentionally avoided using case markers in the verb phrases. There are several reasons for this. In the environments where contracted forms used, case markers are often omitted without misinterpreting the case of such NPs. In addition, by eliminating case markers, all of verbs with NPs in the four verb lists have the consistent pattern (NP + verb), except for (*kodomo gakkoo*) *ik-itagar-u* ‘(child, school), go, show the sign of, PRES’ and (*tomodachi syukudai*) *yat-te-kure-ru* ‘(friend, homework), do, GER, give, PRES’ in the table 9 and (*seito hon*) *kari-ru* ‘student, book, borrow, PRES’ in table 10 in which two NPs are involved. This consistency should make it easier for the subjects to apply each verb to the dialogue. Also, eliminating case markers gives more flexibility to possible interpretations of the nonce words. For example, in (*ano otoko*) *tokaru*, the noun *ano otoko* ‘that man’ could be interpreted to be nominative, dative or accusative.

Type A verbs are actual verbs which can undergo nasal assimilation.

**Table 9**  
Type A verbs

	Verbs	Expectations
A-1	(ano hito) kaer -u (> kaer-anai) (that person) go home PRES	These verbs can undergo nasal assimilation because there is no potential homophone upon nasal assimilation.
	(kazamuki) kawar -u (> kawar-anai) (direction of the wind) change PRES	
	(hasigo) yorikakar -u (> yorikakar-anai) (ladder) lean over PRES	
	(gohan) tukur-u (> tukur-anai) (meal) cook PRES	
	(kodomo gakkoo) ik -itagar -u (> ik-itagar-anai) (child, school) go show the sign of PRES	
A-2	(tomodachi syukudai) yat -te -kure -ru (> yat-te-kure-nai) (friend, homework) do GER give PRES	
	(aite) hekotare -ru (> hekotare-nai) (opponent) get daunted PRES	
	(asa) oki -rare -ru (> oki-rare-nai) (morning) get up POTEN PRES	
	(ano seijika) tasuke -rare -ru (> tasuke-rare-nai) (that politician) save PASS PRES	
	(atamakazu) tari -ru (> tari-nai) (headcounts) suffice PRES	

The A-1 verbs are /r-anai/ and the A-2 verbs are /re-nai/ and /ri-nai/ words. Only one /re-nai/ verb is included in A-2 because /ri-nai/ words are not so frequent, only *tari* and derivations of *tari*, as explained in 2.4.2 and Appendix B. By testing the subjects with these verbs as controls, we can verify whether they are active users of nasal assimilation and at the time of the experiment, they were in a speech environment suitable to produce nasal assimilation. In general, an adult Japanese speaker is exposed to both full forms and contracted forms (including nasal assimilation). However, whether or not the speaker is an active user of nasal assimilation depends on the person. In addition, the production of

nasal assimilation by the subjects depends on the particular speech environment.<sup>52</sup> For example, it is possible that the subject is so conscious to verb conjugation that the occurrence of nasal assimilation may be hindered, even if the experiment atmosphere is informal. The data of the subjects who do not make nasal assimilation of these verbs at all were excluded from the analysis.

Type B verbs are actual words whose nasal assimilation is blocked by anti-homophony, for example, *wakare-nai* ‘get separated, NEG’ → \**wakannai* should be blocked by *wakannai* (< *wakar-anai* ‘understand, NEG’)

**Table 10**  
Type B verbs

Verbs	Expectations
(ano futari) wakare -ru (> wakare-nai) (that two people) get separated PRES	Nasal assimilation should be blocked due to <i>wakar-anai</i> ‘understand, NEG’ → <i>wakannai</i>
(akachan) umare -ru (> umare-nai) (baby) be born PRES	Nasal assimilation should be blocked due to <i>umar-anai</i> ‘get buried, NEG’ → <i>umannai</i>
(repooto kigen) okure -ru (> okure-nai) (due date of the paper) become late, PRES	Nasal assimilation should be blocked due to <i>okur-anai</i> ‘send, NEG’ → <i>okunnai</i>
(seito hon) kari -ru (> kari-nai) (student, book) borrow PRES	Nasal assimilation should be blocked due to <i>kar-anai</i> ‘get buried, NEG’ → <i>kannai</i>
(untensyu) ori -ru (> ori-nai) (driver) get off, PRES	Nasal assimilation should be blocked due to <i>or-anai</i> ‘bend, NEG’ → <i>onnai</i>

<sup>52</sup>It is reported that contracted forms, including nasal assimilation, are preferred in informal conversation as opposed to formal conversation (Minegishi 1999). However, Toki (1975) argues that contracted forms, including nasal assimilation, are not restricted to the informal situation as they also occur in formal situations.

This experiment using type B verbs was conducted to verify that anti-homophony blocking is at work. However, blocking of nasal assimilation of these words does not indicate that anti-homophony blocking is productive. Whether or not anti-homophony blocking is productive was checked by the experiment with type D verbs.

Type C verbs are nonce /r-anai/ verbs which can undergo nasal assimilation if nasal assimilation is productive. If they produce nasal assimilation, it can be argued that nasal assimilation is a productive process. Since these words are not lexically listed, if nasal assimilation occurs, it has to come from the grammar. If the subjects are active users of nasal assimilation (checked by type A verbs) but they do not produce nasal assimilation of a nonce /r-anai/ word, it is argued that they only learn the nasal assimilation list.

**Table 11**  
Type C verbs

Verbs	Expectations
(ano otoko) tokár -u (> tokar-ánai) (that man) a nonce word PRES	These verbs can undergo nasal assimilation because there is no potential homophone upon nasal assimilation.
(koppu) tasimór -u (> tasimor-ánai) (cup) a nonce word PRES	
(konpuutaa) matár -u (> matar-ánai) (computer) a nonce word PRES	
(hana) agúr -u (> agur-ánai) (flower) a nonce word PRES	
(hidarite) sowár -u (> sowar-ánai) (left hand) a nonce word PRES	

Note that I have marked an accented syllable where tone drops using an acute accent. The designation of the accent is crucial to make complete homophones with existent words if they undergo nasal assimilation. Note that the accented syllable shifts upon affixation of the negative morpheme.

Type D verbs are nonce /re-nai/ or /ri-nai/ verbs whose nasal assimilation should be blocked if anti-homophony blocking is productive.

**Table 12**  
Type D verbs

Verbs	Expectations
(buturi) <i>ukaré</i> -ru (> <i>ukaré</i> -nai) (physics) a nonce word PRES	Nasal assimilation should be blocked by potential homophone with: <i>ukar-ánai</i> (< <i>ukár-u</i> ‘pass’)
(bengosi) <i>kumoré</i> -ru (> <i>kumoré</i> -nai) (lawyer) a nonce word PRES	Nasal assimilation should be blocked by potential homophone with: <i>kumor-ánai</i> (< <i>kumór-u</i> ‘get cloudy’)
(keito) <i>watari</i> -ru (> <i>watari</i> -nai) (woolen yarn) a nonce word PRES	Nasal assimilation should be blocked by potential homophone with: <i>watar-anai</i> (< <i>watar-u</i> ‘cross’)
(haru) <i>nagurí</i> -ru (> <i>nagurí</i> -nai) (spring) a nonce word PRES	Nasal assimilation should be blocked by potential homophone with: <i>nagur-ánai</i> (< <i>nagúr-u</i> ‘punch’)
(tenki) <i>suwari</i> -ru (> <i>suwari</i> -nai) (weather) a nonce word PRES	Nasal assimilation should be blocked by potential homophone with: <i>suwar-anai</i> (< <i>suwar-u</i> ‘sit down’)

The nonce /re-nai/ and /ri-nai/ words are created in such a way that if they undergo nasal assimilation, it would produce homophony with the already existing /r-anai/ counterparts as shown above. If they produce nasal assimilation of the nonce words without blocking, it is argued that the subjects have not acquired the anti-homophony principle, even though nasal assimilation is a productive process. In that case, it is possible that the subjects use the list of exceptions in which the nonce words are not listed. If the subjects produce nasal assimilation for type C verbs but the nasal assimilation in type D verbs is blocked, I can conclude that the subjects learned the anti-homophony principle and that it is productive. Note that the nonce words in type C and type D verbs are created in such a way that the syllable before /rV/ matches between counterparts of type C and D verbs;

/ka/, /mo/, /ta/, /gu/ and /wa/, described by the italic letters in tables 11 and 12. The intention is to minimize the phonological influences of the environment of /rV/ words.<sup>53</sup>

### 5.2.3 Results and observations

The results of the production experiment are as follows:

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<sup>53</sup>There are certain limitations on the appropriate nonce /CV.re.ru/ word in this type D. Its negative form /CV.re.nai/ should form a minimal pair with already existing /CV.ra.nai/. *Ishi doushi* or ‘intention verbs’ are such that the speaker intentionally takes an action expressed by the verbs, for example, *tor* ‘to take’ as opposed to *muishi doushi* or ‘nonintention verbs’ like *fur* ‘to rain’ in which the movement or situation these verbs express is not intentional. Both undergo nasal assimilation; *tonnai* and *funnai*. Intention verbs, either consonant-final verbs or vowel-final verbs, can take potential morphemes (/e/ for consonant-final verbs and /rare/ for vowel-final verbs), but nonintention verbs cannot (Tanaka 1991). As a consonant-final verb, an intention verb ending with /r/ takes /e/ as a potential form and therefore, a minimal pair /CV.ra.nai/-/CV.re.nai/ is generated within the paradigm.

- (i)     hasir -anai vs. hasir -e     -nai  
           run   NEG     run   POTEN NEG  
           ‘don’t run’   ‘cannot run’

In such minimal pairs, /-anai/ variation always wins out for nasal assimilation and the nasal assimilation of /re-nai/ variation is always blocked. If a nonce word is designed as a /re-nai/ verb which forms a minimal pair with a /r-anai/ intention verb, it is not a nonce verb anymore because it is an already-existing potential form. Thus, we need to exclude the intention verbs when we consider a nonce vowel-final verb. We need to create /CV.re.ru/ words whose negative form /CV.re.nai/ forms a minimal pair with the negative form of nonintention verbs ending with /r/. Such nonintention verbs are few: *fur-u* ‘rain, PRES’, *komar-u* ‘have difficulty, PRES’, *naor-u* ‘cure, PRES’, *kemur-u* ‘get smoky, PRES’ and so on. In terms of nonce /CV.ri.ru/ words, there is no such limitation. A /CV.ri.ru/ word, whose negative form would potentially be homophonous with the nasal assimilation of an intention verb /CV.ra.ru/, is a good candidate as a type D verb.

**Table 13**  
Results of the production experiment on nasal assimilation

Negative forms	1	2	3	4	5	6	7	8	9
<b>A-1</b>									
kaer-anai	Y,Y	N,N	Y,Y	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,Y
kawar-anai	Y,Y	N,N	Y,N	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,Y
yorikakar-anai	Y,Y	N,N	N,Y	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,Y
tukur-anai	Y,Y	N,N	Y,Y	Y,Y	N,Y	N,N	N,Y	Y,Y	Y,Y
iki-tagar-anai	Y,Y	N,N	Y,Y	Y,N	Y,Y	N,N	Y,Y	Y,Y	N,Y
(total)	10	0	8	9	9	0	9	10	9
<b>A-2</b>									
yatte-kure-nai	Y,Y	N,N	N,N	Y,Y	N,N	N,N	Y,N	N,N	Y,N
hekotare-nai	N,N	N,N	N,N	Y,Y	N,Y	N,N	N,N	N,N	N,N
oki-rare-nai	Y,Y	N,N	N,N	Y,N	Y,Y	N,N	Y,Y	N,N	Y,N
tasuke-rare-nai	Y,Y	N,N	N,N	Y,N	N,N	N,N	Y,Y	N,N	N,N
tari-nai	N,N	N,N	N,N	Y,N	N,N	N,N	Y,N	Y,N	Y,N
(total)	6	0	0	7	3	0	6	1	3
<b>B</b>									
wakare-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
umare-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
okure-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
kari-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
ori-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
(total)	0	0	0	0	0	0	0	0	0
<b>C</b>									
tokar-anai	Y,Y	N,N	Y,Y	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,N
tasimor-anai	Y,Y	N,N	Y,Y	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,N
matar-anai	Y,Y	N,N	Y,Y	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,Y
agur-anai	Y,Y	N,N	Y,Y	Y,Y	Y,Y	N,N	Y,Y	Y,Y	Y,Y
suwar-anai	Y,Y	N,N	Y,Y	Y,N	Y,Y	N,N	Y,Y	Y,Y	N,Y
(total)	10	0	10	9	10	0	10	10	7
<b>D</b>									
ukare-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
kumore-nai	N,N	N,N	N,N	N,Y	N,Y	N,N	N,N	N,N	N,N
watari-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
naguri-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
suwari-nai	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N	N,N
(total)	0	0	0	1	1	0	0	0	0
Total occurrence	26	0	18	26	23	0	25	21	19
Age	26	34	34	40	35	45	20	20	18
Gender	Fem.	<i>Fem.</i>	Male	Male	Fem.	<i>Male</i>	Fem.	Fem.	Fem.
Closeness	H	<i>H</i>	H	H	H	<i>H</i>	L	L	L

Negative forms	10	11	12	13	14	15	Total occurrence
<b>A-1</b>							
kaer-anai	Y,Y	Y,Y	Y,Y	Y,Y	Y,Y	<i>N,N</i>	100% (24/24)
kawar-anai	Y,Y	Y,Y	Y,Y	Y,Y	Y,Y	<i>N,N</i>	95.8% (23/24)
yorikakar-anai	Y,Y	Y,Y	Y,Y	Y,N	Y,Y	<i>N,N</i>	91.7% (22/24)
tukur-anai	Y,N	Y,Y	N,Y	Y,Y	Y,Y	<i>N,N</i>	83.2% (20/24)
iki-tagar-anai	Y,N	Y,Y	Y,Y	N,N	Y,Y	<i>N,N</i>	79.2% (19/24)
(total)	8	10	9	7	10	0	90.0% (108/120)
<b>A-2</b>							
yatte-kure-nai	Y,N	N,N	N,N	Y,N	Y,N	<i>N,N</i>	37.5% (9/24)
hekotare-nai	N,N	N,Y	N,N	N,N	Y,Y	<i>N,N</i>	25.0% (6/24)
oki-rare-nai	N,Y	Y,Y	N,N	Y,N	Y,Y	<i>N,N</i>	58.3% (14/24)
tasuke-rare-nai	Y,Y	N,N	N,N	Y,N	Y,N	<i>N,N</i>	37.5% (9/24)
tari-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	16.6% (4/24)
(total)	4	3	0	3	6	0	35.0% (42/120)
<b>B</b>							
wakare-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
umare-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
okure-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
kari-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
ori-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
(total)	0	0	0	0	0	0	0% (0/120)
<b>C</b>							
tokar-anai	Y,Y	Y,Y	N,Y	Y,Y	Y,Y	<i>N,N</i>	91.7% (22/24)
tasimor-anai	Y,N	Y,Y	Y,Y	Y,Y	Y,Y	<i>N,N</i>	91.7% (22/24)
matar-anai	Y,Y	Y,Y	N,Y	Y,Y	Y,Y	<i>N,N</i>	95.8% (23/24)
agur-anai	Y,Y	Y,Y	Y,Y	Y,Y	Y,Y	<i>N,N</i>	100% (24/24)
sowar-anai	Y,N	Y,Y	Y,Y	Y,Y	Y,Y	<i>N,N</i>	87.5 % (21/24)
(total)	8	10	8	10	10	0	93.3% (112/120)
<b>D</b>							
ukare-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
kumore-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	8.3% (2/24)
watari-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
naguri-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
suwari-nai	N,N	N,N	N,N	N,N	N,N	<i>N,N</i>	0% (0/24)
(total)	0	0	0	0	0	0	1.7% (2/120)
Total occurrence	20	23	17	20	26	0	264
Age	19	19	19	35	34	28	
Gender	Fem	Fem	Fem	Fem	Male	<i>Male</i>	
Closeness	L	L	L	H	H	<i>L</i>	

Total occurrence: Total number of the occurrence of nasal assimilation (“Y”)

Y: Nasal assimilation occurred.

N: Nasal assimilation did not occur.

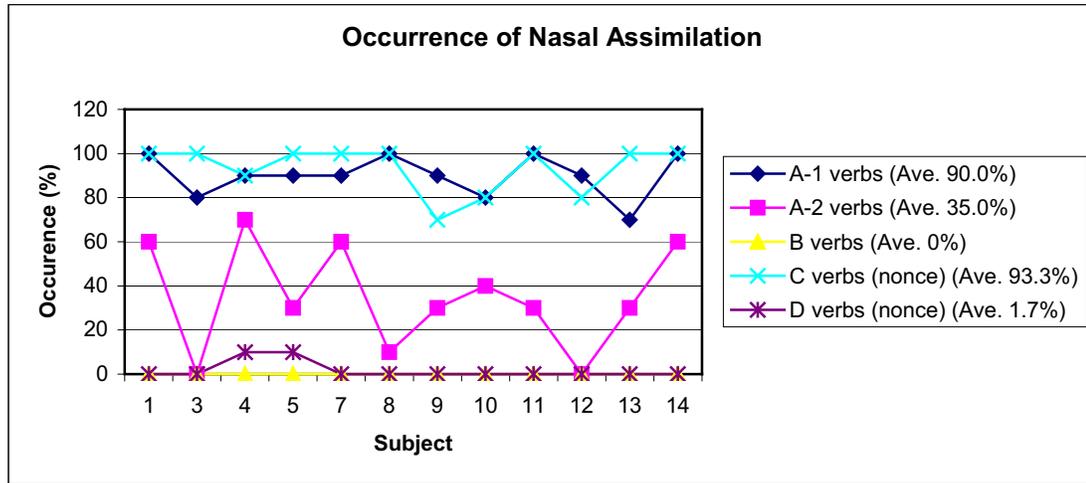
Data in *italics*: Not an active user of nasal assimilation and the data will be discarded.

The percentage of nasal assimilation is calculated by taking the total number of nasal assimilation in each type of verb (A1 and A2 separately) and dividing that number by the total number of opportunities to use the nasal assimilation in table 14. The total number of opportunities for nasal assimilation is 120 (2 per dialogue x 5 verbs x 12 subjects =120). I exclude subjects #2, 6 and 15, as they were not active users of nasal assimilation because they did not make nasal assimilation for type A verbs. In fact, they did not make any nasal assimilation for any of the types of verbs. From my personal communication with subject #2, for example, I noticed that she uses nasal assimilation in actual conversation, but it appears that she paid too much attention to the verb conjugation and she could not put herself into an environment where she would use nasal assimilation. These subjects are not active users of nasal assimilation, at least at the time and within the setting of the experiment and therefore, they are excluded from the total number. The table below shows the actual numbers of occurrence and nonoccurrence of nasal assimilation of each verb type.

**Table 14**  
Occurrence of nasal assimilation

	Occur	Not occur	Total	Occurrence %
A-1	108	12	120	90.0
A-2	42	78	120	35.0
B	0	120	120	0
C	112	8	120	93.3
D	2	118	120	1.7

The next chart shows the percentage of the occurrence of nasal assimilation for individuals.

**Figure 1.**

The average percentage of nasal assimilation in type A-1 verbs is very high (90.0%) and the occurrence is stable across subjects. As for type A-2 verbs (real /re-nai/ and /ri-nai/ words), the average percentage of the occurrence is 35%, not as high as type A verbs (90%). A chi-square test was run to check if there is a statistically significant difference in occurrence of nasal assimilation between A-1 and A-2 verbs. The result is that the occurrence is significant:  $\chi^2 = 77.44$ ,  $df = 1$ ,  $p < 0.001$ . Nasal assimilation occurs with A-2 verbs but the individual difference was as high as 70% and as low as 0%, whereas individual difference is much smaller for A-1 verbs. This may be an indication that the speech environment where nasal assimilation of the /re-nai/ and /ri-nai/ words takes place is more restricted than that of the nasal assimilation of the /r-anai/ words. In other words, the speech environment created by this experiment may not have been sufficient to reach the level where nasal assimilation can be used, in terms of appropriateness or informality. Another possibility is that nasal assimilation of /re-nai/ and /ri-nai/ words are lexically conditioned and the words which undergo nasal

assimilation depends on the list of the undergoers of each individual. As discussed earlier, the argument that nasal assimilation and anti-homophony blocking are incorporated into the grammar does not exclude the possibility that nasal assimilation is lexically conditioned, or that a list of nasal assimilation actually exists. However, further discussion about the list in the lexicon is beyond the scope of this thesis. Another issue concerning A-2 verbs is that only one /ri-nai/ word is used. It is difficult to come to a general and definite conclusion on the occurrence of nasal assimilation of /ri-nai/ words.

None of the subjects made nasal assimilation with type B verbs. These verbs are expected to be blocked in nasal assimilation due to potential homophony. The chi-square results between type A-2 verbs and type B verbs are significant: chi-square = 50.90,  $df = 1$ ,  $p < 0.001$ . This indicates that there is a specific reason for type B verbs to be blocked. I argue that it is because the anti-homophony principle is in effect.

The percentage of nasal assimilation in nonce type C verbs is very high. The average of the occurrence of nasal assimilation for type C verbs was similar to that of type A verbs, the real /r-anai/ verbs (93.3% in type C vs. 90% in type A). The chi-square results show that there is no statistical significance in the occurrence of nasal assimilation between types A-1 and C verbs: chi-square = 0.8727,  $df = 1$ ,  $p < 1$ . The high percentage of nasal assimilation in type C verbs indicates that nasal assimilation is very productive. Note that nonce /ri-nai/ and /re-nai/ verbs were not tested. All type C verbs are /r-anai/ verbs whether they undergo nasal assimilation productively. This may be a small challenge for the productivity argument of nasal assimilation across the board. Nevertheless, nasal assimilation of /r-anai/ words is productive. If we tested nonce /ri-nai/

and /re-nai/ verbs, I would assume that percentage of nasal assimilation would not be as high as /r-anai/ words but it would be close to the percentage of A-2 verbs (actual /re-nai/ and /ri-nai/ words which undergo assimilation) or at least there would be a significant difference between /re-nai/ and /ri-nai/ words in type C verbs and type B (actual /re-nai/ and /ri-nai/ words which are blocked) in nasal assimilation.

The occurrence rate of nasal assimilation in type D verbs is almost 0% except for two cases in which nasal assimilation took place. Subject #4 and #5 made nasal assimilation *kumonnai* for *kumore-nai* which should have been blocked if anti-homophony blocking is productive. However, it may have been caused by a confusion between the /ri-nai/ and /r-anai/ words. For example, after the experiment, subject #4 was asked what the noncontracted form of *kumonnai* was and he answered it was *kumor-anai*. He then commented that he confused it with the verb as *kumor-u* (> *kumor-anai*), as he was not paying attention to the verb during the experiment. In a sense, this confusion is unavoidable because the nonce verbs are created in such a way that they form a pair under a homophony threat with the actual words. Another contributing factor to this confusion is that NPs were not repeated as it is natural not to repeat the NP, and therefore, there were fewer contextual cues that /r-anai/ counterparts did not fit here. For example, in *bengosi kumori-ru* ‘lawyer, (nonce)’, if *bengosi* had been repeated in all of the utterances of the subject (S1-S4), the subject may have noticed that *kumor-anai* ‘get cloudy, NEG’, the /r-anai/ counter part, would not have fit in the context and he may have blocked the nasal assimilation of *kumore-nai*. Nevertheless, these two cases of the occurrence of nasal assimilation are used as data. A chi-square test was run between type

D verbs and the other verb. As Type C verbs and Type D verbs are designed in such a way that the syllable before /rV/ matches between counterparts of type C and D verbs, the difference between the two types is whether they have potential nasal assimilation blockers: type C verbs do not, but type D verbs do. Both types are nonce verbs but there is a dramatic difference. The subjects produced nasal assimilation for type C verbs at very high percentage but the nasal assimilation in type D verbs was almost completely blocked. The results between types C and D verbs result in the following statistical significance: chi-square = 202.17,  $df = 1$ ,  $p < 0.001$ . The results between types B and D verbs results in no statistical significance: chi-square = 2.016,  $df = 1$ ,  $p < 0.20$ . I argue that type D verbs are blocked in nasal assimilation for the same reasons that type B verbs are blocked, namely anti-homophony blocking. I conclude that the subjects learned the anti-homophony principle and that it is productive

Other than the occurrence of nasal assimilation of the negative forms, another type of nasal assimilation occurred in the dialogues of the subjects #1, 3, 6 and 12. The subject #12, for example, made nasal assimilation of /r-u/ before the nominalizer /no/ 6 times in S3 such as *tukunnowa* (< tukur-u-no-wa), *ikitagannowa* (< ik-itagar-u-no-wa). The subject #3 often used a different type of contracted form, labial contraction, in S2 for example *kawar<sup>l</sup>a* (< kawar-eba).

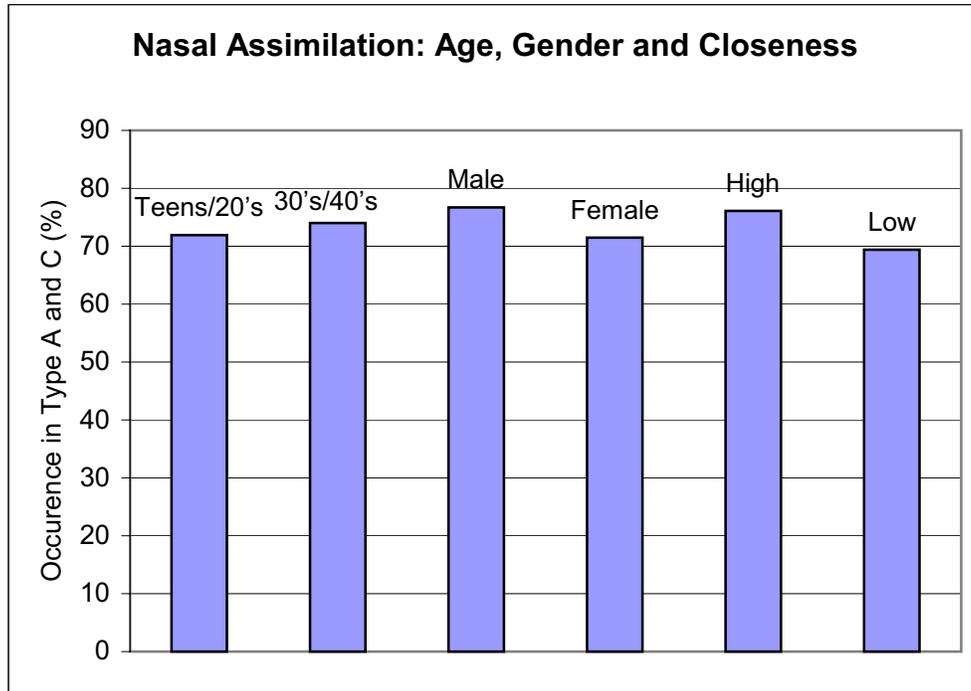
Sociolinguistic factors upon nasal assimilation are not addressed in detail in this dissertation. Nevertheless, the number and percentage of nasal assimilation by age group, gender and closeness to the dialogue partner, are shown below (excluding 3 subjects who are not active users of nasal assimilation). The numbers of nasal assimilation are only for

type A and C verbs. I excluded type B and C verbs because nasal assimilation does not occur in these verbs (except for the two special cases in D verbs discussed above). Age groups for subjects in their teens and 20's, and 30's and 40's are combined, as the data points are small if analyzed separately. "Closeness" in table 15 indicates the personal closeness between the subjects and the dialogue partner. "High" means that the closeness is high and "low" means the closeness is low. In particular, if the dialogue partner personally knows the subject, the closeness is "high," and if the dialogue partner met with the subject for the first time for this experiment, the closeness is "low." Note that the closeness does not necessarily indicate the level of formality used in the conversation between the dialogue partner and the subject. Although the relationship may be close, there is a case where the formal register (polite forms, respect forms, humble forms) is used during the small talk before the experiment.

**Table 15**

Sociolinguistic factors of the nasal assimilation of type A (A-1 and A-2) and C verbs

Sociolinguistic factors	Group	Occurrence	Nonoccurrence	Total	Occurrence (%)
Age group	Teens-20's	151	59	210	71.9
	30's-40's	111	39	150	74.0
Gender	Male	69	21	90	76.7
	Female	193	77	270	71.5
Closeness	High	137	43	180	76.1
	Low	125	55	180	69.4

**Figure 2.**

Nakamura et al. (2003) found that male speakers tend to use nasal assimilation more than female speakers, and nasal assimilation occurs in close relationship between the speaker and listener. However, the chi-square result in the combination of A-1, A-2 and C verbs does not support the gender difference as the distribution is not significant: chi-square = 0.916,  $df = 1$ ,  $p < 1$ . The age group results could also be related to closeness, as the dialogue partner is in his forties and he is in the 30's/40's age group. However, unlike the observation of Nakamura et al. that nasal assimilation may not be used towards people in socially superior positions, the subjects in the age group of teens/20's and the subjects with low closeness made nasal assimilation at very high percentages. The chi-square results show that the difference between age group is not significant (chi-square = 0.1938,  $df = 1$ ,  $p < 1$ ) nor is closeness (chi-square = 2.019,  $df = 1$ ,  $p < 0.20$ ). This result is

interesting as teen-20's (7 people) are all female (and 30's-40's are mixed, 3 males and 2 female), who, according to Nakamura et al., use nasal assimilation less than male.

Now we will take a close look at how these factors influence each type of verbs, A-1, A-2 and C.

**Table 16**  
Sociolinguistic factors in type A-1 verbs

Sociolinguistic factors	Group	Occurrence	Nonoccurrence	Total	Occurrence %
Age group	Teens-20's	65	5	70	92.8
	30's-40's	43	7	50	86.0
Gender	Male	27	3	30	90.0
	Female	81	9	90	90.0
Closeness	High	53	7	60	88.3
	Low	55	5	60	91.6

There is no significant difference in occurrence of nasal assimilation of type A-1 verbs in age group (chi-square = 1.523,  $df = 1$ ,  $p < 1$ ), gender (chi-square = 0,  $df = 1$ ,  $p < 1$ ) or closeness (chi-square = 0.3703,  $df = 1$ ,  $p < 1$ ).

**Table 17**  
Sociolinguistic factors in type A-2 verbs

Sociolinguistic factors	Group	Occurrence	Nonoccurrence	Total	Occurrence %
Age group	Teens-20's	23	47	70	32.8
	30's-40's	19	31	50	38.0
Gender	Male	13	17	30	43.3
	Female	29	61	90	32.2
Closeness	High	25	35	60	41.7
	Low	17	43	60	28.3

There is also no significant difference in occurrence of nasal assimilation of type A-2 verbs in age group (chi-square = 0.3390,  $df = 1$ ,  $p < 1$ ), gender (chi-square = 1.221  $df = 1$ ,  $p < 1$ ) or closeness (chi-square = 2.344,  $df = 1$ ,  $p < 0.20$ ).

**Table 18**  
Sociolinguistic factors in type C verbs

Sociolinguistic factors	Group	Occurrence	Nonoccurrence	Total	Occurrence %
Age group	Teens-20's	63	7	70	90.0
	30's-40's	49	1	50	98.0
Gender	Male	29	1	30	96.7
	Female	83	7	90	92.2
Closeness	High	59	1	60	98.3
	Low	53	7	60	88.3

There is no significant difference in occurrence of nasal assimilation of type C verbs in age group (chi-square = 3,  $df = 1$ ,  $p < 0.10$ ) and gender (chi-square = 0.7148,  $df = 1$ ,  $p < 1$ ), but there is a significant difference in closeness (chi-square = 4.821,  $df = 1$ ,  $p < 0.05$ ).

Although closeness is a significant factor in nasal assimilation of type C verbs, overall, the method of provoking the use of nasal assimilation from the subjects was very effective and the influence of the social factors was minimal.

In summary, the subjects applied nasal assimilation to nonce verbs on-line and they blocked nasal assimilation when the application to nonce verbs would have caused homophony with nasal assimilation of already existing verbs. The results of the experiment provide evidence that nasal assimilation in transparadigmatic relations is productive, although this conclusion may not be definite due to the lack of testing the productivity of nasal assimilation of /re-nai/ and /ri-nai/ words. The results of the experiment also provide evidence that anti-homophony blocking is productive. This productiveness of anti-homophony blocking demonstrates that the anti-homophony blocking principle is part of a phonological grammar realized as an anti-homophony constraint.

### 5.3 Influence of word frequency and word familiarity on anti-homophony blocking

Anti-homophony blocking in transparadigmatic relations differs from blocking in paradigmatic relations crucially in that the competing inputs for a given output are lexically unrelated. Due to the nature of transparadigmatic anti-homophony blocking, it is possible that the lexical status of the inputs, namely word frequency and word familiarity, influence which input undergoes nasal assimilation and which is blocked. In this section, I will examine this possibility using corpus in Japanese.

#### 5.3.1 Word frequency

Word frequency strongly influences word recognition. The higher the word frequency, the shorter the time to recognize the word and the lower the word recognition error (Segui et al. 1982). In the production experiment involving nasal assimilation, it could be argued that the subjects only made nasal assimilation from words which have a higher word frequency and blocked the words with a lower one. Word frequency potentially plays an important role to the occurrence of the contracted forms, as it is easy to imagine that more frequently used words tend to be contracted. Okada (2004), for example, points out that gemination as a result of syncope of *u* in *ku + k-gyo* (*ka, ki, ku, ke, ko*) is influenced by the high frequency of a given word. He used a corpus of utterances recorded between 1999 and 2000, and found that the gemination occurred very often in the words referring to the year 1990s, for example “1995 (*sen kyuuhyak<u> kyuujuu go nen*)” or “1999 (*sen kyuuhyak<u> kyuujuu kyuu nen*).” However, gemination is not as

prevalent in the same string of sounds referring to concepts other than the 1990s. Okada assumes that this gemination occurs due to the fact that the nongeminated form can be easily recovered from the gemination due to the high frequency of the words referring to the 1990s. Accordingly, the same argument can be applied to nasal assimilation. If the word frequency of a given word is higher, it may be easier to identify the noncontracted form from a given contracted form.

I compared the level of word frequency of the lexical items, not on the contracted forms (nasal assimilation), in a pair under a potential homophony threat including the pairs used in the production experiment in section 5.2. The Kokuritsu kokugo kenkyuujo (1997) and Amano and Kondo (1999b) corpus is used as a source of word frequency. “TV” and “NP” below indicate two sources of word frequency in Japanese.

(172) Data of word frequency

“TV” (TV program):

Kokuritsu kokugo kenkyuujo (1997). *Terebi housou no goi chousa II – goi hyou* – (Lexicon investigation in TV broadcasting II)

Data: The total number of 103,064 words were extracted from the **TV** programs of 6 broadcasting companies (7 channels) between April and June in 1989, including news, education, music, variety, drama, sports, and so on. The total hours of the programs from which these words are extracted is 30 ours 20 minutes.<sup>54</sup> The frequency of a word is calculated as percentage of appearance of the word per the total number of words.

“NP” (newspaper):

Amano and Kondo (1999b). *NTT database series. Nihongo no goitokusei. Dai 7 kan. Hindo 1*. (Lexical property of Japanese. Vol. 7 Word frequency)

Data: The total number of 457,516,403 words were extracted from all the articles in **Asahi Newspaper** published in 1985 through 1998. The frequency of a word is calculated as percentage of appearance of the word per the total number of words.

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<sup>54</sup>This corpus includes the commercials and written words in the screen but I only used auditory words in the TV programs. This is because auditory information in commercials and visual information is limited.

The table below shows the word frequency of each lexical item under a potential homophony threat in nasal assimilation. In order to compare results from the same source, the results of “TV” and “NP” are shown in the same table. However, these two databases are very different; “TV” is extracted from the spoken database and “NP” from the written database. The definition of “words” extracted from the database is much narrower in “TV” than in “NP.” For example, “TV” does not include auxiliary verbs, such as (*~te*) *iru* and (*~te*) *simau*, while “NP” includes all morphemes the computer program analyzed. The total number of words extracted for analysis in “NP” is much larger than in “TV.” There is a noticeable difference in the word frequency between “TV” and “NP.” This is because not only what is included in the database is different between the two sources, as mentioned above, but also because many words chosen for this analysis in the table below are colloquial verbs. These two factors may explain the higher word frequency in “TV.”

**Table 19**

Nasal assimilation and word frequency of lexical items

Undergoers/ r-anai			Blocked/ re-nai, ri-nai			Nasal assimilation with the negative suffix
Lexical items	Frequency		Lexical items	Frequency		
	TV	NP		TV	NP	
wakar 'understand'	<b>2.551</b>	<b>0.02207</b>	wakare 'get separated'	0.097	0.00050	wakannai
okur 'send'	<b>1.135</b>	<b>0.00693</b>	okure 'become late'	0.068	0.00377	okunnai
umar 'get buried'	0.019	0.00070	umare 'be born'	<b>0.301</b>	<b>0.00713</b>	umannai
kar* 'clip'	<b>0.058</b>	0.00009	kare 'wither'	0.049	<b>0.00025</b>	kannai
	0.058	0.00009	kari 'borrow'	<b>0.078</b>	<b>0.00239</b>	
or* 'bend'	<b>0.078</b>	0.00033	ore 'break'	N/A	<b>0.00051</b>	onnai
	0.078	0.00033	ori 'get off'	<b>0.126</b>	<b>0.00193</b>	
nar 'become'	<b>9.594</b>	<b>0.22221</b>	nare 'get used to'	0.049	0.00095	nannai
kor 'have stiffness'	N/A	<b>0.00016</b>	kori 'be sick of'	N/A	0.00005	konnai
kosur 'rub (trans.)'	<b>0.049</b>	<b>0.000007</b>	kosure 'rub (intrans.)'	N/A	N/A	kosunnai
makur 'roll up (trans.)'	N/A	N/A	makure 'roll up (intrans.)'	N/A	N/A	makunnai
war 'break (trans.)'	0.058	<b>0.00129</b>	ware 'break (intrans.)'	<b>0.107</b>	0.00081	wannai
Higher	50.0% (6/12)	50.0% (6/12)	Higher	33.3% (4/12)	41.7% (5/12)	
	50.0% (10/24)			37.5% (9/24)		
Undetermined	12.5% (3/24)					

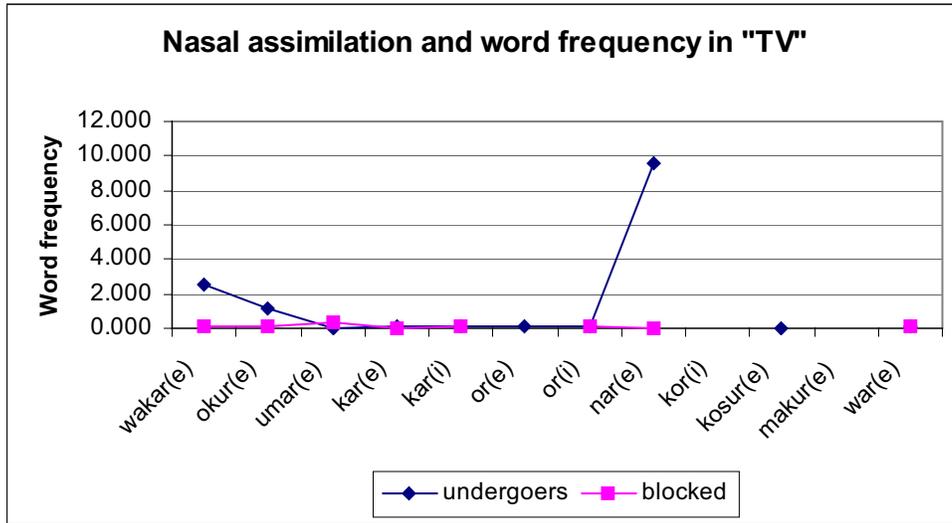
Numbers in boldface indicate that these words are higher frequency than their counter parts.

\* *kar* and *or* are counted twice as they are compared to their two counterparts.

“Undergoers” are verbs which undergo nasal assimilation, and “blocked” are nouns whose nasal assimilation is blocked. The “TV” source is auditory information and the “NP” one is visual information. The numbers in boldface indicate that these have a higher frequency compared to the other members in the pair (comparing “TV” to “TV” and “NP” to “NP”). If data is available in one member of the pair but not in the correspondent member, due to nonlisting (indicated by “N/A”), the former is considered to have a

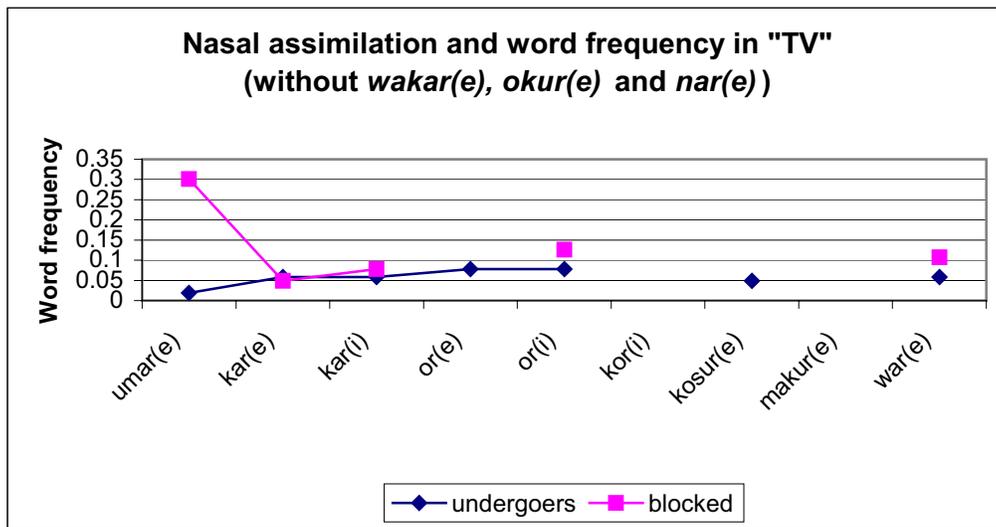
higher frequency (or familiarity) and is therefore in boldface. If both competing lexical items are N/A, those numbers are counted as “undetermined.” “Higher” indicates the total number and percentage of higher frequency including “TV” and “NP.” Note that the data points for the undergoers are 24, not 20, because *kar* ‘clip’ is competing with two lexical items, *kare* ‘wither’ and *kari* ‘borrow’, and so is *or* ‘bend’. They are therefore counted twice. The TV frequency of *kar* and *or* are higher than *kare* and *ore* so they are counted as the winner once (but lower than *kari* and *ori*). *Kare* and *kari* are both in boldface because they independently compete with *kar*, but they do not compete with each other. The results indicate that there are more of the ‘higher’ frequency words in the “undergoers” than in the “blocked” including the TV and NP frequencies: 50.0% vs. 37.5%. However, it is premature to conclude that there is a positive influence of word frequency on the occurrence of the nasal assimilation. The chart below shows word frequency in “TV” of the pairs in which one undergoes nasal assimilation and the other is blocked in nasal assimilation.

Figure 3.



The chart below is the data after excluding *wakar(e)*, *okur(e)* and *nar(e)* from the chart above so that we can see it in a smaller scale.

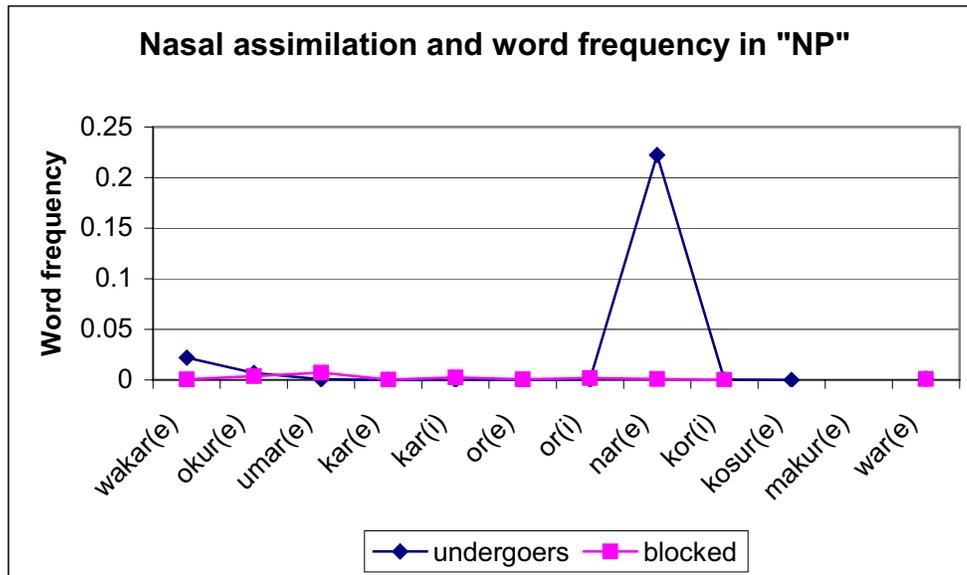
Figure 4.



From these results, we cannot see a strong favor for high frequency words to be undergoers, though there are more words with higher word frequency in undergoers than

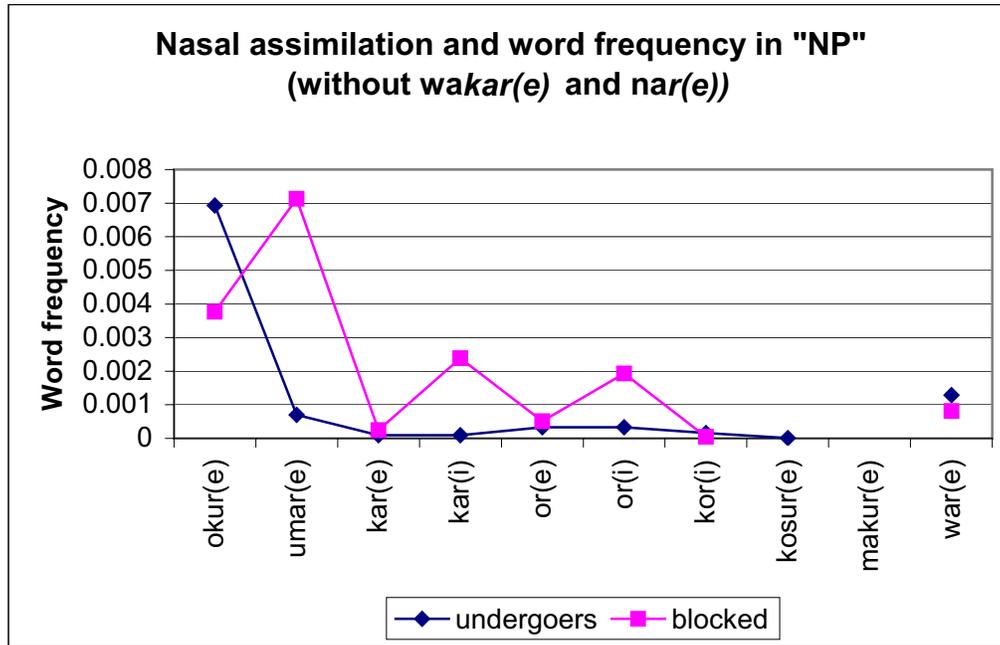
in the blocked. The chart below shows word frequency in “NP” of the pairs in which one undergoes nasal assimilation and the other is blocked in nasal assimilation.

**Figure 5.**



The chart below shows word frequency with a smaller scale after excluding *wakar(e)* and *nar(e)* which are very apparent that the undergoers have high word frequency.

Figure 6.



From the data, we cannot conclude that there is a positive influence of word frequency on the occurrence of nasal assimilation.

In conclusion, no definite correlation was found between the occurrence of nasal assimilation and word frequency. It is not the case that words with higher word frequency are predisposed as undergoers for the contractions. Contractions appear to occur or block independently from word frequency.

### 5.3.2 Word familiarity

In the previous section, we examined the influence of word frequency. A similar but different notion from word frequency is “word familiarity.” Word familiarity is the degree of how people feel familiar to certain words. In this section, I will examine the relationship between the occurrence of nasal assimilation and word familiarity.

Amano and Kondo (1999a) examine word familiarity of certain words by having several subjects determine the familiarity of a given word by 7 scales (1 is the lowest in familiarity and 7 is the highest). The word familiarity was determined by the average of the numbers. Then, they conducted three tasks, a lexical decision task, a word recognition task and a naming task to see if there is positive influence of word familiarity on word recognition in Japanese. In the lexical decision task, subjects made an immediate judgment on whether a given stimulus is a word by pushing a response key. The results show that the higher the familiarity of the words, the shorter the response time for auditory judgment of word, and the lower incorrect response rate. In the word recognition task, the subjects responded as to what word a given stimulus is. The stimuli are given with background noise, and recognition rate is calculated per several levels of word familiarity and several levels of noise. The results indicate that the higher the word familiarity, the higher the recognition rate, and the louder the background noise, the higher the dependability of the recognition rate by the level of word familiarity. In the naming task, subjects pronounce a given stimulus in writing as soon as possible. The results show that the higher the visual word familiarity, the shorter the response time for the subjects to read the words (for more detail, see Amano and Kondo 1999a). They claim that the higher familiarity of words, the shorter amount of time needed to recognize the words and the smaller the recognition error.

Then, how are these two notions, word frequency and word familiarity related? Amano and Kondo (1999b) demonstrate in their study of Japanese corpus that the words with high frequency are almost always highly familiar words. As we can imagine easily,

it is very rare to find words with high frequency but low familiarity. However, not all the words with high familiarity are highly frequent words. Could it be the case in the contracted forms in Japanese that only the words with high familiarity undergo nasal assimilation, and nasal assimilation of words with low familiarity is blocked? In this section, I will examine the relationship between the occurrence of nasal assimilation and word familiarity, using data from Amano and Kondo (1999a).

I compared the level of word familiarity of the lexical items, not on the contracted forms (nasal assimilation), in the pairs used in the experiments by using Amano and Kondo (1999a). “Aud” and “Vis” below indicate two sources of word familiarity in Japanese.

(173) Data of word familiarity

“Aud” (auditory):

Amano and Kondo (1999a). *NTT database series. Nihongo no goitokusei. Dai 1 kan. Tango shinmitsudo.* (Lexical property of Japanese. Vol. 1. Word familiarity)

Data: 9,000 words selected from Shinmeikai Japanese Dictionary 1989. 40 Japanese speakers between 18 and 30 years of age rated **auditory** familiarity on a 7-point scale (1: low – 7: high) by listening each recorded word with a headphone The experiment period is between September 1995 and July 1996.

“Vis” (visual):

The same database as above.

Data: 9,000 words were selected from Shinmeikai Japanese Dictionary 1989. 40 Japanese speakers between 18 and 30 years of age rated **visual** familiarity on a 7-point scale (1: low – 7: high) by reading each word on a computer screen. The experiment period is between September 1995 and July 1996.

Results of the word familiarity of pair words under potential homophony upon nasal assimilation including pairs used in the production experiment in section 5.2 are shown below.

**Table 20**

## Nasal assimilation and word familiarity of lexical items

Undergoers/ r-anai			Blocked/ re-nai, ri-nai			Nasal assimilation with the negative suffix
Lexical items	Familiarity		Lexical items	Familiarity		
	Aud	Vis		Aud	Vis	
wakar 'understand'	<b>6.125</b>	5.875	wakare 'get separated'	6.062	<b>6.344</b>	wakannai
okur 'send'	6.000	<b>6.188</b>	okure 'become late'	<b>6.062</b>	6.031	okunnai
umar 'get buried'	5.469	5.562	umare 'be born'	<b>6.250</b>	<b>6.219</b>	umannai
nar 'become'	5.375	5.531	nare 'get used to'	<b>5.938</b>	<b>6.031</b>	nannai
kor 'have stiffness'	<b>5.375</b>	5.156	kori 'be sick of'	5.312	<b>5.344</b>	konnai
kar 'clip'	4.438	5.438	kare 'wither'	<b>5.750</b>	<b>5.781</b>	kannai
			kari 'borrow'	<b>6.156</b>	<b>6.062</b>	
or 'bend'	5.750	5.812	ore 'break'	<b>5.781</b>	<b>5.875</b>	onnai
			ori 'get off'	<b>6.156</b>	<b>6.031</b>	
kosur 'rub (trans.)'	5.156	4.625	kosure 'rub (intrans)'	<b>5.469</b>	<b>4.844</b>	kosunnai
makur 'roll up (trans)'	<b>5.188</b>	<b>3.531</b>	makure 'roll up (intrans)'	N/A	N/A	makunnai
war 'break (trans)'	5.562	<i>5.875</i>	ware 'break (intrans)'	<b>5.969</b>	<i>5.875</i>	wannai
Higher	25.0% (3/12)	16.7% (2/12)	Higher	75.0% (9/12)	75.0% (9/12)	
	20.8% (5/24)			75.0% (18/24)		
Tie	4.2% (1/24)					
Undetermined	0% (0/24)					

Numbers in boldface indicates that these words are higher familiarity than their counter parts.

In the table above, there is one case where the corresponding numbers are equal between the members of the pair, namely *war* and *ware* in “Vis” written in italics. This is counted as “Tie.” The total familiarity (“Aud” + “Vis”) is much higher in the “blocked” than in the “undergoers”: 75.0% vs. 20.8%. As for “Aud” familiarity, the “blocked” is much

higher than the “undergoers”: 75.0% vs. 25.0%, and so is for “Vis” familiarity: 75.0% vs. 16.7%. The vowel-final verbs are blocked in nasal assimilation despite the higher familiarity. This tendency is observed in the charts below. The charts show word familiarity in “Aud” and “Vis” of the pairs in which one of the members of the pair undergoes nasal assimilation and the other is blocked.

**Figure 7.**

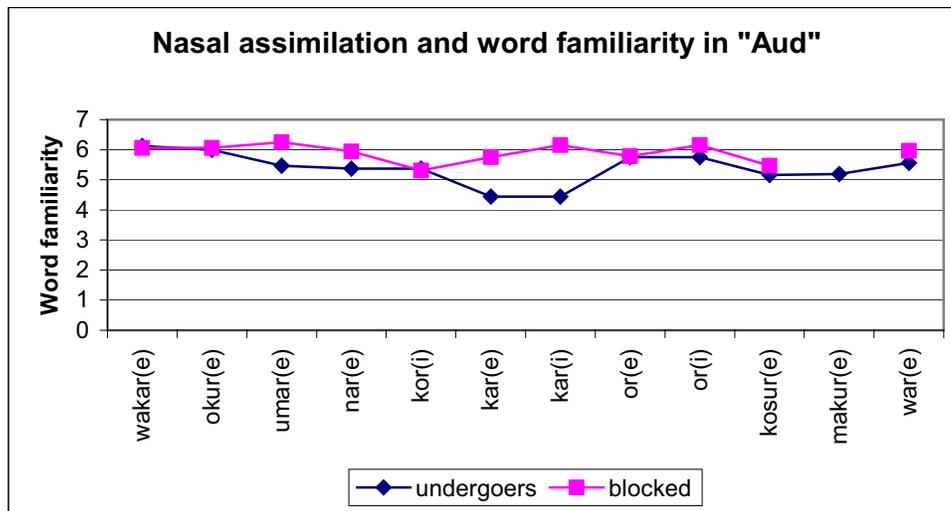
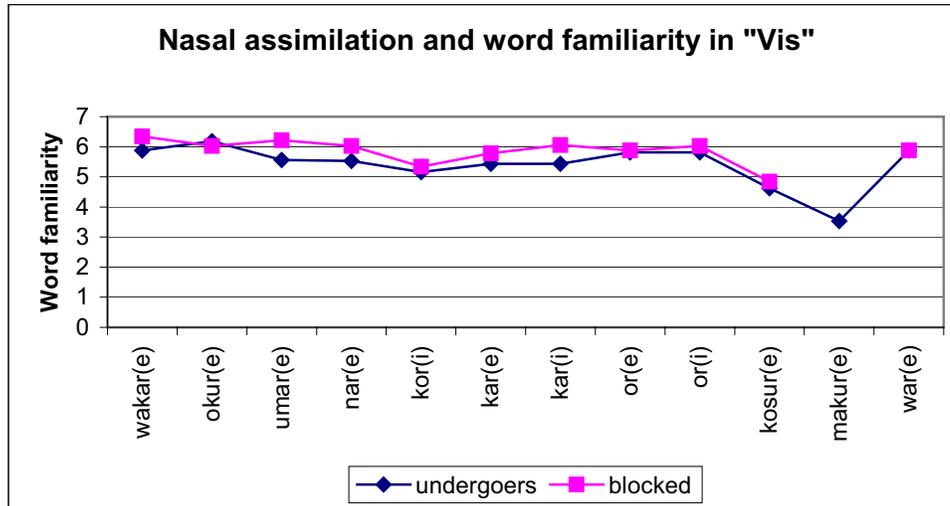


Figure 8.



The charts show that words blocked in nasal assimilation tend to have higher word familiarity than the ones which undergo nasal assimilation.

In conclusion, I cannot find a positive relationship between word familiarity of the lexical items and the occurrence of nasal assimilation. In fact, the lexical items whose nasal assimilation is blocked are higher in word familiarity than the lexical items which undergo nasal assimilation, yet the nasal assimilation of these words is blocked. Word frequency and familiarity are not a driving force in determining which words undergo contraction and which words are blocked in nasal assimilation. This result supports my claim in chapter 3 that particular constraints in a particular order in the grammar determine the occurrence or blocking of nasal assimilation.

#### **5.4 Summary**

The results of the experiment provide evidence that nasal assimilation and anti-homophony are productive processes, which are incorporated into the grammar. The occurrence or blocking of the contractions is not clearly correlated with word frequency between the members of the pair. Higher word familiarity does not warrant the occurrence of the contractions. The results provide evidence that anti-homophony blocking is part of a productive phonological grammar.

## Chapter 6: Conclusion

In this dissertation, I have examined anti-homophony blocking in transparadigmatic relations. The main questions I raised in chapter 1 are: 1) whether or not anti-homophony principle is incorporated into the grammar of native speakers, 2) whether this principle is productive, 3) whether this principle is at work between words in transparadigmatic relations in addition to paradigmatic relations, 4) how we account for cases of homophony creation in transparadigmatic relations which qualify as counterevidence to the anti-homophony blocking.. If we claim this principle exists in the grammar, then it should be productive, which calls for evidence for productivity.

Previous research on anti-homophony blocking is reviewed in chapter 1 (Kisseberth and Abasheikh 1974, Mitchell 1993, Crosswhite 1999, 2001, Kenstowicz 2002, Morrill 2002, Kawahara 2003, Itô and Mester 2004b, Blevins 2004, Gessner and Hansson, to appear). Many researchers argue that the anti-homophony principle in paradigmatic relations is incorporated into the grammar of native speakers as a specific constraint within the framework of Optimality Theory (Prince and Smolensky 1993), although the constraints are defined slightly differently by different researchers (Crosswhite 1999, 2001, Kawahara 2003, Itô and Mester 2004b). I have also used Optimality Theory as a framework for my analyses.

In chapter 2, I used “contracted forms” in Japanese (Kikuzawa 1935, Toki 1975) as examples of anti-homophony blocking in transparadigmatic relations and in chapter 3, I conducted the analyses. I have focused on “nasal assimilation” among other contracted

forms. In nasal assimilation, *r* in a syllable at a morpheme boundary assimilates to *n* before *n* in a suffix as a result of syncope of the vowel following *r* (*wakar-anai* ‘understand, NEG’ → *wakannai*, *kure-nai* ‘give (me), NEG’ → *kunnai*). However, if a /re-nai/ or /ri-nai/ word has a /r-anai/ counterpart, only nasal assimilation of the /r-anai/ word occurs and nasal assimilation of the /re-nai/ word or the /ri-nai/ word is blocked: *kar-anai* ‘clip, NEG’ → *kannai*, *kare-nai* ‘wither, NEG’ → \**kannai*, *kari-nai* ‘borrow, NEG’ → \**kannai*. I concurred with previous research done in this area that anti-homophony principle is realized as an anti-homophony constraint in the grammar. However, I have claimed that the anti-homophony principle is also available in transparadigmatic relations. I have proposed that there is a specific constraint called CONTRAST (“Contrast in underlying forms between words with the same major lexical category must be maintained in surface forms”), which prohibits two underlyingly distinct inputs from surfacing as homophonous outputs.

In chapter 3, I have argued that INITIAL-C (“Every suffix is consonant initial”) and FINAL-C (“Every base of affixation is consonant final”) outrank the faithfulness constraint, which prohibits syncope MAX-V (“Every vowel in input has a correspondent in output”), in nasal assimilation. Thus contraction occurs. CONTRAST is ranked higher than INITIAL-C and FINAL-C, two driving constraints for contraction by syncope. In order to evaluate the interaction between outputs using CONTRAST, a “Minimal Pair Analysis” within Optimality Theory has been proposed. In the Minimal Pair Analysis, inputs and outputs are evaluated as a set. Total number of violations is counted in order to choose an optimal output set. Due to the crucial ranking of CONTRAST over INITIAL-C and FINAL-C, a

homophonous candidate set as a result of nasal assimilation violates CONTRAST and it is ruled out. Thus, homophony is blocked. When there are no other words which would become homophonous upon contraction, CONTRAST does not take effect in and contraction occurs.

In chapter 4, I have argued that there are two grammars: “contraction grammar” from which contracted forms are derived and “full-form grammar” in which contraction does not occur. Contracted form and full form share the same underlying forms but the different outputs surface due to specific constraint orders. In the contraction and full-form grammars, the markedness constraints have a single ranking but the faithfulness constraint MAX-V can be relativized. There are two positions available for the faithfulness constraints: one for the contraction grammar and the other for the full-form grammar. The relativized faithfulness constraint can be ranked in one of two positions in the hierarchy to provide different surface results by different grammars. This relativized faithfulness constraint model is an example of the “nonfixed model” where a constraint is rerankable within a single grammar, which in effect leads to two subgrammars (Anttila 1997, Anttila and Cho 1998).

Several cases of homophony creation in inflectional morphology, mainly in the full-form grammar, were reviewed in chapter 4, for example *kaw -ta* ‘buy, PAST’ → *katta*, *kar -ta* ‘clip PAST’ → *katta*. These cases of inflectional morphology are potentially counterevidence to my claim that the anti-homophony principle exists in transparadigmatic relations. Assuming that CONTRAST exists in the full-form grammar in addition to in the contraction grammar, I have demonstrated that the anti-homophony

effect emerges only when CONTRAST is violated but no constraints ranked higher than CONTRAST are violated. Also in this chapter, I demonstrated that CONTRAST is in fact a phonology-internal device. A phonology-external device merely prohibits homophony creation, however, it cannot see how to resolve the homophony creation. The “extended LO approach,” which is sensitive to phonology but not quite phonology-internal, fails to account for homophony creation, for example, homophony between /itta/ ‘go, PAST’ → *itta*, /iw-ta/ ‘say, PAST’ → *itta*, because it merely chooses the winner by the harmonic levels of the two outputs to the inputs. The extended LO approach is blind to the fact that SYLLSTRUC is more important than maintaining the contrast in the two outputs. The anti-homophony constraint CONTRAST, on the other hand, is heavily embedded in the phonology and its operation is inextricably linked with the operation of those other constraints. It is an outrankable and violable constraint. Since a violation of constraints ranked higher than CONTRAST is more costly than a violation of CONTRAST, homophony is allowed despite the fact the homophonous output set violates CONTRAST. It was concluded that the anti-homophony principle must be phonology-internal which is embedded in the phonological grammar.

A production experiment of nasal assimilation, discussed in chapter 5, was specifically designed to examine the productivity of anti-homophony blocking. A chi-square test was conducted for statistical analysis. The subjects applied nasal assimilation to nonce verbs and they blocked nasal assimilation when the application to nonce verbs would cause homophony with already existent. The results of the production experiment provide evidence that nasal assimilation and anti-homophony in transparadigmatic

relations are productive. I have argued that the anti-homophony principle and nasal assimilation process are productive because they are incorporated into the grammar of the native speaker.

In order to eliminate the possibility of word frequency and word familiarity factors upon anti-homophony blocking, the influence of word frequency and familiarity on whether or not the inputs undergoes contraction and are blocked in contraction, was examined using verbal and written corpus. No definite correlation was found between the occurrence of the contractions and word frequency. Words with a higher word frequency are not predisposed as an undergoer for the contractions. As for word familiarity, it was found that there was no positive influence of word familiarity of the lexical items on the occurrence of the contractions.

In conclusion, this dissertation has given two major contributions to the research on anti-homophony blocking. One is that it was demonstrated that the anti-homophony principle, incorporated into the grammar, is applicable to morphologically unrelated words, that is, in transparadigmatic relations. The other is that an attempt was made for the first time to demonstrate that anti-homophony blocking is a productive process. The results provide evidence for the productivity of anti-homophony blocking in transparadigmatic relations.

The next step in the study of anti-homophony blocking is to find cross-linguistic evidence of such blocking in transparadigmatic relations. I leave this research as the first step in building a foundation for future researchers to further explore anti-homophony blocking.

## Appendix A: Verbal suffix allomorphy in Japanese

In the discussion of verbal suffix allomorphy in Japanese in section 2.3, I simply assumed that /anai/ and /nai/ are lexical allomorphs which are listed in the lexicon. I will defend this assumption including allomorphy with and without *r*, then conduct an analysis of homophony creation to see if lexical allomorphy would provide a more elegant account.

There is a long-standing issue in the Japanese verb paradigm. Under the traditional generative approach assumes, it has been assumed there is one underlying morpheme and the surface allomorphs are computed by a rule (McCawley 1968, Ashworth and Lincoln 1973, de Chene 1981, 1985, Poser 1986, Mester and Itô 1989). An issue arises when we assume that there is one underlying suffix for each inflectional category in Japanese verbs. As we saw in (25), repeated here as (174), it is controversial whether the boldfaced segments described below are epenthesized or deleted.

(174) <u>Category names</u>	<u>Consonant-final verb</u>	<u>Vowel-final verb</u>	
Negative	kar <b>-anai</b>	kare <b>-nai</b>	kari <b>-nai</b>
Polite Present	kar <b>-imasu</b>	kare <b>-masu</b>	kari <b>-masu</b>
Present	kar <b>-u</b>	kare <b>-ru</b>	kari <b>-ru</b>
Hypothetical	kar <b>-eba</b>	kare <b>-reba</b>	kari <b>-reba</b>
Potential	kar <b>-e</b>	kare <b>-rare</b>	kari <b>-rare</b>
Passive	kar <b>-are</b>	kare <b>-rare</b>	kari <b>-rare</b>
Imperative 1	kar <b>-e</b>	kare <b>-ro(yo)</b>	kari <b>-ro(yo)</b>
Imperative 2	kar <b>-ina</b>	kare <b>-na</b>	kari <b>-na</b>
Polite Imperative	kar <b>-inasai</b>	kare <b>-nasai</b>	kari <b>-nasai</b>
Tentative	kar <b>-oo</b>	kare <b>-yoo</b>	kari <b>-yoo</b>
Causative	kar <b>-ase</b>	kare <b>-sase</b>	kari <b>-sase</b>
Past	kat <b>-ta</b>	kare <b>-ta</b>	kari <b>-ta</b>
Gerund	kat <b>-te</b>	kare <b>-te</b>	kari <b>-te</b>
	‘clip’	‘wither’	‘borrow’

I will call the suffixes for consonant-final verbs the “vowel-initial suffix” and the suffixes for vowel-final verbs the “consonant-initial suffix.” First, I will review past research on this controversy. The table below is a summary of the claims on verbal suffix allomorphy, whether the boldfaced vowels are epenthesized or deleted.

**Table 21**  
Controversy of Japanese verbal suffix allomorphy

	nai/anai 'negative'	masu/imasu 'polite present'	ru/u 'present' reba/eba 'hypothetical' rare/are 'passive'	yoo/oo 'tentative'	sase/ase 'causative'
McCawley (1968)	epenthesis	epenthesis	deletion	deletion	deletion
Ashworth and Lincoln (1973)	deletion (<ra>nai/ <r>anai)	deletion (<ri>masu/ <r>imasu)	deletion	(/roo/ → yoo)	
de Chene (1981)			not deletion		
de Chene (1985)			epenthesis		
Poser (1986)			deletion	epenthesis	deletion
Mester and Itô (1989)			epenthesis	(epenthesis , referral to Poser 1986)	(need further investigation)

As for the negative and polite present, McCawley (1968), who assumes consonant-initial suffixes such as /nai/ and /ru/ are basic, argues that /a/ and /i/ are inserted for consonant-final verbs whereas Ashworth and Lincoln (1973) claim that the underlying form of the negative is /ranai/ and /r/ is deleted when it is attached to consonant-final verbs and /ra/ is

deleted when it is attached to vowel-final verbs. They imply the same analysis for the polite present /masu/ and /imasu/.<sup>55</sup>

As for /r/, McCawley, Ashworth and Lincoln and Poser (1986) argue that there is a deletion rule for /r/. de Chene (1981) questions the *r*-deletion rule because it is highly unnatural to delete a syllable-initial consonant while leaving a syllable-final consonant untouched. de Chene (1985), who claims that vowel-initial suffixes such as /u/ and /eba/ are basic, argues that the allomorphy of the Japanese verbal paradigm with or without *r* (such as the present *ru/u* and the hypothetical *reba/eba*) is a result of *r*-epenthesis (Mester and Itô 1989 simply assume it is *r*-epenthesis without further explanation). de Chene (1985) claims that the *r*-epenthesis rule is motivated by two arguments. One is that *r*-epenthesis is a “natural” outcome of the system of morphological rules that results from the selection of consonant-stem suffixes, such as the present *u* and the hypothetical *eba*, as basic, using a general stem-boundary epenthesis rule of /r/:  $\emptyset \rightarrow r / V]_{\text{vs}} \_ [V$  (for example,  $\emptyset \rightarrow r / \text{tabe} \_ \text{eba}$ , but no *r*-epenthesis for a consonant-final verb *yom -eba*). It is “natural” as *r*-initial vowel-stem suffix alternates in five out of nine cases de Chene introduces. The other is, de Chene claims, that stem-boundary *r*-epenthesis is a natural rule on universal grounds. He provides cross-linguistic support for the idea of a Japanese *r*-epenthesis rule, with some examples where there is an insertion of hiatus-breaking consonants; Sanskrit (*madhunas* /madhu-as/ GEN, SG ‘honey’), Ancient Greek (*onomatos* /onoma-os/ GEN, SG ‘name’), and Modern Greek (*pansedes* /panse-es/ NOM, PL ‘pansy’), to name a few. There is a language-independent tendency to choose coronal consonants as

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<sup>55</sup>de Chene (1985) takes a position that vowel-initial suffixes are basic but he is not clear about the status of /nai/ and /masu/ whether these are derived by deletion of /a/ and /i/ respectively.

hiatus breakers. In Japanese, it is /r/ (but see McCarthy 1993 for an argument against insertion of *r* to break hiatus in his discussion on the Eastern Massachusetts dialect).

As for /y/ in the tentative, Poser (1986) argues convincingly that historically /y/ is an insertion, although the synchronic status of this alternation requires further investigation. McCawley claims that /y/ is deleted by a rule. Ashworth and Lincoln (1973) claim that the tentative suffix is underlyingly /roo/ and surfaces as *yoo*, but no rule is articulated.

As for /s/ in the causative, McCawley and Poser assumes that /s/ is deleted.

There are some issues to account for the Japanese verbal suffix allomorphy by epenthesis rules or deletion rules. The issue of the epenthesis rules is that if consonant-initial suffixes are basic, why are two different vowels, *a* and *i*, epenthesized as shown in (175)? We cannot argue that a suffix initializing with /m/ takes *i* and a suffix initializing with /n/ takes *a* as an epenthetic vowel because as shown in (174), *i* is selected before /n/ in Imperative 2 *kar-ina* and Polite Imperative *kar-inasai*. Similarly, if vowel-initial suffixes are basic, why are three different consonants, *r*, *y* and *s*, epenthesized, as pointed out by Mester and Itô (1989)?

(175) Phonologically derived allomorphy: Epenthesis rules

Consonant-initial suffixes as basic

- a.     *tabe -nai* → *tabenai*  
           eat    NEG  
           *tob -nai* → *tobanai*  
           fly    NEG
- b.     *tabe -masu* → *tabemasu*  
           eat    POL-PRES  
           *tob -masu* → *tobimasu*  
           fly    POL-PRES

Vowel-initial suffixes as basic

- c.     tabe -u → taberu  
        eat    PRES  
        tob -u → tobu  
        fly    PRES
- d.     tabe -oo → tabeyoo  
        eat    TENT  
        tob -oo → toboo  
        fly    TENT
- e.     tabe -ase → tabesase  
        eat    CAUS  
        tob -ase → tobase  
        fly    CAUS

In addition, another issue for deletion rules, as well as epenthesis rules, is how to account for the alternation of the imperative suffix /-e/ for a consonant-final verb and /-ro/ (or /yo/) for a vowel-final verb. A phonological rule cannot derive /ro/ to /e/ or vice versa unless we posit an ad-hoc rule.<sup>56</sup>

The deletion rules, on the other hand, seem to work if we delete *a* or *i* if the alternative is a VV sequence and delete *r*, *y* and *s*, if the alternative would be a CC sequence.

## (176) Phonologically derived allomorphy: Deletion rules

Deletion in a VV sequence

- a.     tabe -anai → tabenai  
        eat    NEG  
        tob -anai → tobanai  
        fly    NEG
- b.     tabe -imasu → tabemasu  
        eat    POL-PRES  
        tob -imasu → tobimasu  
        fly    POL-PRES

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<sup>56</sup>Ashworth and Lincoln (1973) claim that the imperative suffix is underlyingly /re/ and it surfaces as *yo* when it is attached a vowel-final verb but no explanation is given.

Deletion in a CC sequence

- c.     tabe -ru → taberu  
        eat    PRES  
        tob -ru → tobu  
        fly    PRES
- d.     tabe -yoo → tabeyoo  
        eat    TENT  
        tob -yoo → toboo  
        fly    TENT
- e.     tabe -sase → tabesase  
        eat    CAUS  
        tob -sase → tobase  
        fly    CAUS

It is possible to choose deletion of suffix material rather than root material using positional faithfulness, namely, the material in the suffix gets deleted in all the cases. However, deletion of only the material in suffix is rather lexically idiosyncratic in hiatus resolution in the Japanese phonology, as some vowels in a vowel-initial suffix are never deleted even when such affixation results in hiatus. In the following compound verbs, for example, /a/ and /i/ in the suffix are not deleted in the same environments as (176a,b).

- (177) a.     tabe -aruk -u → tabearuku  
           eat   walk   PRES  
           ‘eat around’
- b.     nage -ire        -ru → nageireru  
           throw put into   PRES  
           ‘throw in’

In gerund /te/ affixation to /ok/ and /age/ in (178), hiatus is created in the full-form grammar. /o/ in /ok/ and /a/ in /age/ are not deleted.

- (178) a.     tabe -te -ok -u → tabeteoku  
           eat   GER put   PRES  
           ‘eat in advance’
- b.     tabe -te -age -ru → tabeteageru  
           eat   GER give   PRES  
           ‘eat for (somebody’s) sake’

In the contraction grammar, /te/ contraction occurs as a resolution of hiatus but /e/ in /te/ is deleted, not /o/ in /ok/ and /a/ in /age/.

- (179) a.      tabe -te -ok -u → tabetoku (/e/ deletion)  
               eat   GER put   PRES  
               ‘eat in advance’
- b.      tabe -te -age -ru → tabetageru (/e/ deletion)  
               eat   GER give PRES  
               ‘eat for (somebody’s) sake’<sup>57</sup>

Thus, the deletion rules (176) are lexical idiosyncrasy.<sup>58</sup> In addition, an issue for epenthesis rules again is how to account for the alternation of the imperative suffix /-e/ for a consonant-final verb and /-ro/ (or /yo/) for a vowel-final verb.

I hold the view that the negative suffixes /nai/ ~ /anai/ are listed in lexicon, in other words, they are lexical allomorphy, as opposed to allomorphy by phonological deletion or epenthesis rules. I make use of lexical allomorphy to account for this controversial treatment of verbal suffix allomorphy. The selection of the one or another allomorph is accomplished with reference to the phonological context in which the suffix appears.<sup>59</sup> I follow Kager’s (2003) discussion on Dutch open syllable lengthening, alternation of a short vowel ~ a long vowel, for example, *slo[ɔ]t* ~ *sl[o:]ten* ‘lock(s)’ and *w[ɛ]g* ~ *w[e:]gen* ‘read(s)’. The distribution of short and long vowels is phonologically

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<sup>57</sup> /i/ in /ik/ ‘go’, on the other hand, is deleted in /te/ contraction as shown in (61a).

- (i)      tabe -te -ik -u → tabeteku (/i/ deletion)  
               eat   GER go   PRES  
               ‘eat before going’

The mechanism of which vowel gets deleted in hiatus in /te/ contraction is a whole different discussion.

<sup>58</sup> I cannot find a counterexample of the deletion rules of a CC sequence in (176); an example consonant initial suffix, which attaches to a consonant final verb, resulting in a consonant cluster where the consonant is never deleted. It is because a CC sequence is a violation of SYLLSTRUC.

<sup>59</sup> Incidentally, the same approach has been proposed by Itô and Mester (2004b), however, using slightly different constraints.

predictable. A short vowel occurs in a closed syllable and a long vowel occurs in an open syllable. The alternation, however, is exceptional (or a “minor rule,” as it occurs in only a few stems) because in Dutch, short vowels and long vowels occur freely in open and closed syllable contexts in many stems:  $p[\text{ɔ}]t \sim p[\text{ɔ}]ten$  ‘pot(s)’,  $p[\text{o:}]t \sim p[\text{o:}]ten$  ‘paw(s)’. Kager assumes that lexically unpredictable allomorphs, such as minor rules, are encoded in the lexicon by listed allomorphs. As for the alternation in Japanese at hand, the distribution of /masu/ ~ /imasu/ and /nai/ ~ /anai/, for example, is also phonologically predictable. Vowel-final verbs take consonant-initial suffixes, /masu/ and /nai/, and consonant-final verbs take vowel-initial suffixes, /imasu/ and /anai/. This situation resembles the /a/ ~ /an/ alternation in English where /a/ is chosen before a consonant-initial noun and /an/ is chosen before a vowel-initial noun. This alternation in English is 100% phonologically predictable, however, it is generally accepted that this alternation is not based on a phonological rule of *n*-insertion or deletion since such a rule would be rather ad-hoc to only apply to this indefinite article. Similarly, I argue that in the verbal suffix allomorphy, it is a result of phonologically-driven distribution of lexical allomorphy.

Following Kager’s (2003) analysis, the tableau below shows analyses of lexical allomorphy of /masu/ ~ /imasu/ and /nai/ ~ /anai/ in the full-form grammar. Each allomorph in the lexicon is independently available as an input to mapping. One of its properties is that it can freely generate any conceivable output candidate for a given input, and therefore, a full set of candidate outputs for each individual lexical allomorph can be generated. There are four output combinations.

**Tableau 97**Lexical allomorphy approach: /imasu/ ~ /masu/ in the *full-form* grammar

{/C/ ~ /V/} {/masu/ <sub>1</sub> ~ /imasu/ <sub>2</sub> }	SYLLSTRUC	MAX-V	INITIAL-C	FINAL-C
a. Cmasu <sub>1</sub> ~ Vmasu <sub>1</sub>	*! ~			~ *
b. Cmasu <sub>1</sub> ~ Vimasu <sub>2</sub>	*! ~		~ *	~ *
c. ☞ Cimasu <sub>2</sub> ~ Vmasu <sub>1</sub>			* ~	~ *
d. Cimasu <sub>2</sub> ~ Vimasu <sub>2</sub>			* ~ *!	~ *

**Tableau 98**Lexical allomorphy approach: /anai/ ~ /nai/ in the *full-form* grammar

{/V/ ~ /C/} {/nai/ <sub>1</sub> ~ /anai/ <sub>2</sub> }	SYLLSTRUC	MAX-V	INITIAL-C	FINAL-C
a. Cnai <sub>1</sub> ~ Vanai <sub>1</sub>	*! ~			~ *
b. Cnai <sub>1</sub> ~ Vanai <sub>2</sub>	*! ~		~ *	~ *
c. ☞ Canai <sub>2</sub> ~ Vnai <sub>1</sub>			* ~	~ *
d. Canai <sub>2</sub> ~ Vanai <sub>2</sub>			* ~ *!	~ *

/masu/ and /imasu/, as well as /nai/ and /anai/, are both listed in the lexicon. {/C/ ~ /V/} in the input indicate that two types of verbs, one ending with a vowel and the other ending with a consonant, are available in the lexicon. Note that in both tableaux, there is no violation of MAX-V. As argued by Kager (2003:28), availability of lexical allomorphy allows each member of the output candidate, *anai* or *nai*, to derive from a lexical counterpart of a matching member of underlying form, either /nai/ or /anai/, as indicated by the index. *nai* in output, for example, is not a result of the deletion of /a/ in /anai/ (see Kager for his argument on this). Lexical allomorphy is invisible to faithfulness constraints and it implies that phonological distribution of allomorphs uniquely depends on markedness constraints (Kager 2003: 26). This invisibility to faithfulness is crucially different from the single underlying morpheme scenario in which the faithfulness

constraint is violated, due to deletion or epenthesis of the vowels *i* or *a*.<sup>60</sup> Nonviolation of MAX-V in these tableaux means that the same results will be obtained by the contraction grammar because the difference between the two grammars is the position of MAX-V (whether INITIAL-C and FINAL-C are ranked – in contraction grammar –, or unranked – in the full-form grammar –, is inconsequential in the tableaux 97 and 98 to determine the optimal candidates). This lexical allomorphy approach adequately accounts for the alternations.

The lexical allomorphy approach can be used to account for the controversial *r*-deletion/epenthesis argument of verbal suffixes, such as the present suffix /ru/ ~ /u/, the hypothetical suffix /reba/ ~ /eba/, the passive suffix /rare/ ~ /are/, and *s*-deletion/epenthesis issue the causative suffix /sase/ ~ /ase/.

**Tableau 99**

Lexical allomorphy approach: /ru/ ~ /u/ in the *full-form* grammar

	{/C/ ~ /V/} {/ru/ <sub>1</sub> ~ /u/ <sub>2</sub> }	SYLLSTRUC	MAX-V	INITIAL-C	FINAL-C
a.	Cru <sub>1</sub> ~ Vru <sub>1</sub>	*! ~			~ *
b.	Cru <sub>1</sub> ~ Vu <sub>2</sub>	*! ~		~ *	~ *
c.	Cu <sub>2</sub> ~ Vru <sub>1</sub>			* ~	~ *
d.	Cu <sub>2</sub> ~ Vu <sub>2</sub>			* ~ *!	~ *

The pattern of the violations of this tableau is identical to tableaux 97 and 98. The lexical allomorphy approach adequately accounts for the allomorphy of *ru/u* as well.

There is another advantage for the lexical allomorphy approach over the phonological rule approach. *r*-epenthesis (de Chene 1985) can only account for a mere alternation of *r* ~ ∅, such as *ru* ~ *u* and *reba* ~ *eba*. The lexical allomorphy approach, on

<sup>60</sup>In the case that C is *n*, for example *sin* ‘die’, the sequence *nm* in *mai* does not violate SYLLSTRUC as *sin.nai* does. However, it violates UNIFORMITY [nas] as we discussed in section 3.4.

the other hand, can also account for the potential suffix allomorphy *rare ~ e* and the imperative suffix allomorphy *ro ~ e*. Those two cases of allomorphy cannot be explained by phonological rules, as pointed out by Shibatani (1990:232). We must assume that the allomorphs of each morpheme are listed separately in the lexicon. The distribution of the attached allomorph is determined by the type of the verb stem. /ro/ is chosen for a vowel-initial verb and /e/ is chosen for a consonant-initial verb. It is obvious that these cases are examples of lexical allomorphy. Therefore, I conclude that it would be straightforward to treat all the allomorphy in the Japanese verb paradigm as lexical allomorphy.<sup>61</sup>

Although I do not expect to come to a final conclusion regarding this controversy on the allomorphy of Japanese verbal paradigm, I have presented several advantages of the lexical allomorphy approach, which gives a more elegant account of this issue.<sup>62</sup>

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<sup>61</sup>See Booij (2002) for a similar discussion that the Dutch nominal suffix allomorphs, *-er* and *-aar* ‘-er’, are listed separately in the lexicon rather than being derived from one underlying form.

<sup>62</sup>Paul Hagstrom (personal communication) has suggested another account for this allomorphy. That is, the non-deleting vowel /a/, for example /a/ in (177a), is prelinked to a V slot, while /a/ in the negative /anai/ is either unlinked or is floating, something that would be left unrealized if it is not needed, but it nevertheless has the vowel quality recorded in the lexical item. Deleting /a/ in the negative to satisfy ONSET constraint would violate MAX-V but not, for example, MAXLINKMORA, or something similar, making it cheaper to get rid of.

### Appendix B: /rVnai/ verb patterns and blocking of nasal assimilation

Since neither comprehensive data nor a corpus of nasal assimilation in Japanese is available, I created this list based on my own native speaker intuitions along with the cooperation of two other Japanese native speakers. It is possible that other Japanese speakers, who speak a different dialect, or for other individual reasons, may not agree with our judgment on the occurrence of nasal assimilation.<sup>63</sup> Nevertheless, we were still able to capture the tendency of this particular contracted form.

In this appendix, I show several patterns of /rVnai/ verb formation and a comprehensive list of /rVnai/ verbs and their nasal assimilation. The list includes two sets of words and the corresponding nasal assimilation.

- (180) a. /CV.rV.nai/  
 b. /CV.CV.rV.-nai/

C in each syllable is optional since Japanese syllables do not always require onsets and /C<sup>j</sup>V/ syllables are excluded from this list since verbs with /C<sup>j</sup>V/ are extremely rare. There are 60 combinations of the CV syllable in Japanese. This means that there are 180 potential patterns for /CV.rV.-nai/ words (60 syllable pattern for /CV/ and three vowels -

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<sup>63</sup>One of the useful methods used to judge whether nasal assimilation occurs is to put verbs in a context. For example, occurrence of nasal assimilation of three variation of /karVnai/ can be tested with arguments.

- (i) a. kaminoke kar -anai → kaminoke kannai  
 hair cut NEG  
 ‘does not get a hair-cut’  
 b. hon kari -nai → hon \*kannai  
 book borrow NEG  
 ‘does not borrow a book’  
 c. hana kare -nai → hana \*kannai  
 flower wither NEG  
 ‘the flower does not wither.’

In these examples, case particles, the nominative *ga* and the accusative *o*, are deleted since the omission is more natural with nasal assimilation.

*a, e, i* -, for /V/ in /rV/, 60 x 3 = 180) and 10, 800 potential patterns in /CV.CV.rV.-nai/ words (60 syllable pattern for the first /CV/ and the second /CV/ and, three vowels for /V/ in /rV/, 60 x 60 x 3 = 10,800). Obviously, this does not cover the entire /rV/ formation of Japanese verbs. If we add one more syllable, there would be 648,000 potential patterns and it is too much to handle. However, I believe that this list is representative of the tendency in /rVnai/ patterns and nasal assimilation.<sup>64</sup>

First of all, I need to explain several formation patterns for /rVnai/verbs.

(181) Formation patterns

- a. /r-anai/ formation – a verb ending with /r/ + negative /-anai/

Simple NEG -C

nur -anai → **nuranai**

paint, NEG

- b. /ri-nai/ formation – vowel-final verb + negative /-nai/

Simple NEG -V

ori- -nai → **orinai**

get off NEG

- c. /re-nai/ formation

Simple NEG -V

kure -nai → **kurenai**

give NEG

/e/- NEG (POTEN)

tor -e -nai → **torenai**

take POTEN NEG

/are/- NEG (PASS)

tor -are -nai → **torarenai**

take PASS NEG

<sup>64</sup>In Japanese, there is a form known as the indirect passive (or adversative passive) (Tsujimura 1996:238-241). In the indirect passive form, intransitive verbs also take passive forms. For example,

(i) a. Taroo -ga kodomo -ni sin -are -ta (Tsujimura 1996:238)

Taro -NOM child -by die -PASS -PAST

‘Taro is adversely affected by his child’s death.’

b. Ziroo -ga ame -ni fur -are -ta (Tsujimura 1996:238)

Ziro -NOM rain -by fall -PASS -PAST

‘Ziro was rained on.’

I also included indirect passives in the list as long as they were considered to be commonly used forms.

/rare/-NEG (POTEN or PASS)

tome -rare -nai → tomerarenai

stop POTEN NEG

tome -rare -nai → tomerarenai

stop PASS NEG

The allomorphs are listed below.

(182) Allomorphs

- a. /-anai/ and /-nai/ are allomorphs of the negative morpheme which attach to consonant-final verbs/suffixes and vowel-final verb/suffixes respectively.
- b. /-e/ and /-rare/ are allomorphs of the potential morpheme which attach to consonant-final verbs/suffixes and vowel-final verbs/suffixes respectively.
- c. /-are/ and /-rare/ are allomorphs of the passive morpheme which attach to consonant-final verbs/suffixes and vowel-final verbs/suffixes respectively.

Table 22 below shows the summary of /CV.rV.-nai/ words. The second column “Formation pattern” shows /rVnai/ formation patterns explained in (181). The “Number of verbs” column shows how many verbs of each formation pattern were found. “Counterparts” shows the number of counterparts to a specific formulation pattern in a given row. For example, in the second row, there are three /ri-nai/ counterparts (for example, *kari-nai* vs. *kar-anai*) and 20 /re-nai/ counterparts to /CVr-anai/ (for example, *kare-nai* vs. *kar-anai*). Counterparts potentially create homophony if they all underwent nasal assimilation because only the difference is a vowel following *r* besides the difference in the morpheme boundary.

**Table 22**  
/CV.rV.nai/ words and counterparts

/rVnai/	Formation patterns	Number of verbs	Counterparts		
			/r-anai/	/ri-nai/	/re-nai/
/r-anai/	Simple <sup>NEG</sup> CVr-anai	29	N/A	3	20
/ri-nai/	Simple <sup>NEG</sup> CVri-nai	4	<b>3</b>	N/A	2
/re-nai/	Simple <sup>NEG</sup> CVre-nai	12	<b>4</b>	2	N/A
	/e/- NEG (POTEN) CVr-e-nai	21	<b>21</b>	1	N/A
	/are/- NEG (PASS) C-are-nai	0	<b>0</b>	0	N/A
	/rare/- NEG (POTEN/ PASS) rare-nai	0	<b>0</b>	0	N/A

Table 23 shows nasal assimilation of all of the patterns in table 22. The first three columns from the left are the same as table 22. “Nasal assimilation” indicates how many of each formation pattern of /CV.rV.nai/ undergoes nasal assimilation. For example, in the fourth row, out of 12 Simple<sup>NEG</sup> /CVr-e-nai/ words, five words are considered to undergo nasal assimilation, and four words are considered not to, because their /r-anai/ counterparts are considered as a full form of nasal assimilation (indicated as “4 /r-anai/” in the boldface). “Questionable” indicates the number of words which we found difficult to judge whether these words clearly undergo nasal assimilation.

**Table 23**  
/CV.rV.nai/ words and nasal assimilation

/rVnai/	Formation patterns	Number of verbs	Nasal assimilation		
			Yes	No	Questionable
/r-anai/	Simple NEG CV <sub>r</sub> -anai	29	27	0	2
/ri-nai/	Simple NEG CV <sub>ri</sub> -nai	4	1	<b>3</b> /r-anai/	0
/re-nai/	Simple NEG CV <sub>re</sub> -nai	12	5	<b>4</b> /r-anai/	3
	/e/- NEG (POTEN) CV <sub>r</sub> -e-nai	21	0	<b>21</b> /r-anai/	0
	/are/- NEG (PASS) C-are-nai	0	0	<b>0</b>	0
	/rare/- NEG (POTEN/ PASS) rare-nai	0	0	<b>0</b>	0

Notice that the numbers in the boldface in tables 22 and 23 match. This means that whenever /r-anai/ counterparts to /re-nai/ or /ri-nai/ words exist, nasal assimilation of /ri-nai/ or /re-nai/ is blocked. Notice also that none of /e/-NEG (POTEN) words undergo nasal assimilation. As introduced in section 2.4.2, especially in (45), a /CV<sub>r</sub>-e-nai/ word always has its non-potential simple negative /CV<sub>r</sub>-anai/ counterpart, for example, *tor-e-nai* ‘take, POT, NEG’ vs. *tor-anai* ‘take, NEG’, and the deletion of /-e/ means a loss of the entire morpheme as discussed in section 3.5, especially in tableau 58. Thus, nasal assimilation of the /CV<sub>r</sub>-e-nai/ words is blocked.

The proportions of words undergoing nasal assimilation (excluding words which are blocked in nasal assimilation by a counterpart due to anti-homophony) are as follows:

- (183) Nasal assimilation of /CV. rV.nai/ words  
 /r-anai/: 93.1% (27/29)  
 /ri-nai/: 100% (1/1)  
 /re-nai/: 62.5% (5/8)

Obviously, the data point for /ri-nai/ is too small a sample to allow any meaningful conclusion to be drawn. Note that not all words undergo nasal assimilation even without the risk of homophony (see section 2.4.1 for this discussion). The result indicates that /CV.rV.nai/ words undergo nasal assimilation but the percentage of undergoing nasal assimilation varies depending of the deleted vowel. Nasal assimilation in /re-nai/ and /ri-nai/ words is blocked completely when it becomes homophonous to the nasal assimilation of the counterpart /r-anai/ word. Tables 24 and 25 show the results of /CV.CV.rV.nai/ words.

**Table 24**

/CV.CV.rV.nai/ words and counterparts

/rVnai/	Formation patterns	Number of verbs	Counterparts		
			/r-anai/	/ri-nai/	/re-nai/
/r-anai/	Simple <sup>NEG</sup> CVCVr-anai	128	N/A	0	107
/ri-nai/	Simple <sup>NEG</sup> CVCVri-nai	4	<b>0</b>	N/A	1
/re-nai/	Simple <sup>NEG</sup> CVCVre-nai	31	<b>2</b>	0	N/A
	/e/- <sup>NEG</sup> (POTEN) CVCVr-e-nai	96	<b>96</b>	1	N/A
	/are/- <sup>NEG</sup> (PASS) CVC-are-nai	24	<b>3</b>	0	N/A
	/rare/- <sup>NEG</sup> (POTEN/ PASS) CV-rare-nai	7	<b>0</b>	0	N/A

**Table 25**

/CV.CV.rV.nai/ words and nasal assimilation

/rVnai/	Formation patterns	Number of verbs	Nasal assimilation		
			Yes	No	Questionable
/r-anai/	Simple NEG	128	128	0	0
/ri-nai/	Simple NEG	4	4	<b>0</b> /r-anai/	0
/re-nai/	Simple NEG	31	18	<b>2</b> /r-anai/	11
	/e/- NEG (POTEN)	96	0	<b>96</b> /r-anai/	0
	/are/- NEG (PASS)	24	19	<b>3</b> /r-anai/	2
	/rare/- NEG (POTEN/ PASS)	7	7	<b>0</b>	0

The proportions of the words undergoing nasal assimilation (excluding words which are blocked in nasal assimilation by a counterpart due to anti-homophony blocking) are as follows:

(184) Nasal assimilation of /CV.CV.rV.nai/ words

/r-anai/: 100% (128/128)

/ri-nai/: 100% (4/4)

/re-nai/: 77.2% (44/57)

Again, nasal assimilation of /ri-nai/ and /re-nai/ words is blocked completely when their counterparts exists. The total percentages of undergoing nasal assimilation of both /CV.rV.nai/ words and /CV.CV.rV.nai/ words are below.

(185) Nasal assimilation of /CV.rV.nai/ and CV.CV.rV.nai/ words

/r-anai/: 98.7% (155/157)

/ri-nai/: 100% (5/5)

/re-nai/: 75.4% (49/65) } Combination of /ri-nai/ and /re-nai/: 77.1%

Compare this result with the occurrence of nasal assimilation of /r-anai/ words (A-1 type verbs: 90.0%) and /ri-nai/ and /re-nai/ words (A-2 type verbs: 35.0%) in the production

experiment in section 5.2.3. The percentage of the occurrence of nasal assimilation in the production experiment is lower than the result in (185). There are several factors causing this difference. First and the most importantly, the result in (185) is potential occurrence of nasal assimilation, in other words, percentage of the words that could undergo nasal assimilation, but the results in the experiment is actual production of nasal assimilation. Second, the people who made judgment of nasal assimilation in the list and the subjects on the experiment are not the same. The individual differences in the acceptance of nasal assimilation may be an influential factor. Third, the length of the words is also different. The list includes words with /CV.CV.rV.nai/ or less, while 1 out of 5 A-1 type verbs and 4 out of 5 A-2 type verbs are longer than /CV.CV.rV.nai/. Examining the relationship between these factors and the occurrence of nasal assimilation is beyond the scope of this dissertation. Conclusions we can draw from the list and the experiment are that nasal assimilation of /ri-nai/ and /re-nai/ words is blocked completely when their counterparts exists (anti-homophony blocking) and that /r-anai/ words are more susceptible to nasal assimilation than /ri-nai/ and /re-nai/ words under no threat of homophony.

### Appendix C: Onbin

*Onbin* (sound euphony) is a historical sound change, which began in the Heian period (A.D. 794-1192) (Okimori 1989). Several patterns of *onbin* are observed when four morphemes, 1) the past morpheme /ta/, 2) the gerund /te/, 3) the conditional morpheme /tara/ and 4) the representative/alternative morpheme /tari/, attached to a verb root, except when the root ends in a vowel or the sibilant *s* (Poser 1986, Itô and Mester 1986). Shibatani (1990) explains this phenomenon using the adverbial ending of the verb root where *i* is attached to consonant-final verbs and no attachment is made to vowel-final verbs. I will review Shibatani's (1990) description of *onbin*.

When the root ends with a vowel or sibilants, *onbin* does not occur.

(186) No onbin (root ending with a vowel and sibilants)

- a. mi+Ø -ta [mita]  
look PAST
  - b. kas+i -ta [kasita]  
lend PAST
- (+ : root inflection boundary, - : morpheme boundary)

When the root ends in a velar, the velar elides due to the historical sound change known as *i-onbin*. The root-final voiced velar *g* has a voicing spread effect to the initial consonant of the past suffix: *t* → *d* (see Itô and Mester 1986).

(187) *i-onbin* (root ending with a velar)

- a. kak+i -ta [kaita]  
write PAST
- b. kag+i -ta [kaida]  
smell PAST

The roots ending in *b*, *m* and *n* elide the inflectional ending, and then assimilate to the suffix-initial consonant, resulting nasal *n*. This is called *hatsu-onbin* or moraic

nasalization (*hatsu-on* is a moraic nasal as in *s.in.do.i.* ‘tired’, *to.m.bo.* ‘dragonfly’). Again, the root-final voiced consonants have a voicing effect on the initial consonant of the past suffix.

(188) *hatsu-onbin* (root ending with /b/, /m/, /n/)

- a. tob+i -ta [tonda]  
fly PAST
- b. nom+i -ta [nonda]  
drink PAST
- c. sin+i -ta [sinda]  
die PAST

The last *onbin* pattern is the one introduced in section 4.3.2. The roots endings in *t*, *r*, and *w* elide the inflectional ending, and then assimilate the final consonants to the suffix-initial consonant, resulting geminates *tt*. This process is known as *soku-onbin* (*soku-on* is a moraic obstruent as in *ba•t•ta•ri•* ‘come across with someone’).

(189) *soku-onbin* (root ending with /t/, /w/ or /r/)

- a. tat+i -ta [tatta]  
stand PAST
- b. kaw+i -ta [katta]  
buy PAST
- c. kir+i -ta [kitta]  
cut PAST

I agree with Shibatani’s classification of the *onbin* phenomena but not with the treatment of /i/ as adverbial ending of the verb. /i/ does not attach to the root ending with a vowel. There is another verb ending, according to Shibatani, which is the negative ending /a/ such as *wakar-a*. Thus, his position is root allomorphy. I take the position of the suffix allomorphy, over root allomorphy, in which /i/ and /a/ are not root-final vowels, but rather a part of suffix.

- (190) a. Root allomorphy:  
 wakar +i -masu wakar +a -nai  
 understand adv. ending POL-PRES understand negative ending NEG
- mi + Ø -masu mi + Ø -nai  
 look POL-PRES understand NEG
- b. Suffix allomorphy:  
 wakar -imasu wakar -anai  
 understand POL-PRES understand NEG
- mi -masu mi -nai  
 look POL-PRES understand NEG

In suffix allomorphy, there are several verbal suffixes which begin with /i/ when they attach to all of the consonant-final verbs, for example the polite present morpheme /imasu/ and the desiderative morpheme /itai/. However, it is generally accepted among researchers in this area that the past morpheme /ta/ (and the other three suffixes) is unique compared to other suffixes. That is, /i/ is unavailable before /ta/ and /te/ for most of the suffixes, if not all (Itô and Mester 1986 and Poser 1986 among others). Researchers, however, do not unanimously agree on which root-final consonants /i/ cannot follow. Poser (1986) argues that /ta/ is chosen for roots ending in a vowel, sibilant /s/, voiced obstruents and nasals /b, m, n/ and others /t, r, w/, and /ita/ is chosen for roots ending in velars. Itô and Mester (1986) argue that /i/ is also absent for roots ending with a velar. I take the position that /ita/ is not available for any root ending.

- (191) a. Vowel: mi -ta → mita  
 look PAST
- b. Sibilant /s/: kaş -ta → kasita  
 lend PAST

b.	Voiced obstruents and nasals /b, m, n/:		
		to <u>b</u> -ta → tonda	( <i>hatsu-onbin</i> )
		fly PAST	
		yom <u>m</u> -ta → yonda	( <i>hatsu-onbin</i> )
		read PAST	
		sin <u>n</u> -ta → sinda	( <i>hatsu-onbin</i> )
		die PAST	
d.	Other /r, w, t/:	kar <u>r</u> -ta → katta	( <i>soku-onbin</i> )
		clip PAST	
		kaw <u>w</u> -ta → katta	( <i>soku-onbin</i> )
		buy PAST	
e.	Velar /k, g/:	kak <u>k</u> -ta → kaita	( <i>i-onbin</i> )
		write PAST	
		kag <u>g</u> -ta → kaida <sup>65</sup>	( <i>i-onbin</i> )
		smell PAST	

Historically, however, /i/ was present for /ta/ and /te/ after all the consonants like other suffixes as below (Poser 1986, Okimori 1989), but there was loss of /i/ over the centuries.

- (192) a. kak -ita → kakita  
write PAST
- b. tob -ita → tobita  
fly PAST

Wenck (1959), cited by Poser (1986), states that the loss of /i/ after each consonant occurred over a period of centuries: the loss of /i/ after /r/ in the late 9<sup>th</sup> century), the loss of /i/ after /w/ in the first half of 11<sup>th</sup> century, and the loss of /i/ after /t/ was at first sporadic from the first half of 11<sup>th</sup> century and became regular at the end of 16<sup>th</sup> century. As for root-final /s/, Poser claims that there is a rule to insert /i/ after /s/ as *kas-ta* → *kasita*.<sup>66</sup> As for velars, Poser states that /i/ was not lost after velars, but rather, there was a morphologically-governed rule to delete an intervocalic velar before /i/ which was

<sup>65</sup>There is a lexical exception for this pattern. Unlike regular verbs ending in /k/, such as *kak* ‘write’ which undergo *i-onbin*, verb *ik* ‘go’ undergoes *soku-onbin* instead, as reviewed in 4.3.3.

<sup>66</sup>This claim concurs with Itô and Mester’s view (see Smolensky 2005 for his communication with Itô and Mester).

applied only to a velar before the tense/aspect suffixes /ta/ and /te/ (and /tari/ and /tara/ as well), beginning in the early 9<sup>th</sup> century as a sporadic loss. Itô and Mester (1986) assume that there is a velar vocalization process which converts the velar to *i*. Itô and Mester's claims appear to be more straightforward than the special treatment of velars as the loss of /i/ is a unified process for all root-final consonants. This is the position I adopt here.<sup>67</sup>

Thus, /ta/ differs crucially from other suffixes beginning with coronal obstruents, which do not undergoes *onbin* such as the desiderative /tai-/itai/, or the compound verbs /tasu-/itasu/ 'add' and /dasu-/idasu/ 'begin'. In the suffixation of the desiderative /tai/, for example, /itai/ is selected for a verb ending with *r* and *soku-onbin* is not triggered, as opposed to the occurrence of *soku-onbin* in the suffixation of /ta/ and /te/.

- (193) kar -itai → kaitai (no *soku-onbin*)  
 clip DESI  
 kar -ta → katta (*soku-onbin*)  
 clip PAST

Synchronically, the alternation between /tai/ and /itai/ is in fact lexical idiosyncrasy, that is, phonologically-conditioned suppletive allomorphy, not by phonology. In other words, the alternation of allomorphs /itai/ and /tai/ is not the result of a phonological rule, but rather there are two lexically listed allomorphs {/itai/ ~ /tai/} (lexical allomorphy, Kager 2003). On the other hand, there was a historical loss of lexical allomorphy, {\*/ita/ ~ /ta/}. Only one morpheme /ta/ is listed in the lexicon. As a result, *soku-onbin* occurs in order to

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<sup>67</sup>Several researchers offer alternative views in which /i/ is also absent after velars. McCawley (1968) posits a rule to convert velar stop to /h/ before /ta/, then /h/ is converted to /?/. /i/ is then inserted between the spirant and /ta/, and /?/ is deleted. Anderson and de Chene (1979) assume that there is a phonological rule to convert velar stops to glides before dental stops (velar gliding). Poser (1986) argues velars were lost before /i/. See Poser for a dispute on the views of McCawley and Anderson and de Chene.

avoid a violation of SYLLSTRUC constraint, which is ranked the highest (see section 4.3.2).

(194) kar -ta (\*-ita) → katta, \*ka.rta., \*kart.a, \*kar.ta.  
clip PAST

This also explains the discrepancy in resolving consonant cluster in the following, pointed out by Mester and Itô (1989):

(195) kar -ta → \*karta, katta, \*karra  
clip PAST  
kar -sase → karase, \*kassase, \*karsase  
clip CAUS

The potential creation of consonant clusters by /ta/ affixation is resolved by *soku-onbin*: *katta*. However, *soku-onbin* does not apply to the causative affix /sase/, \**kassase*, despite the fact that /ss/ is phonotactically well-formed in Japanese, for example when the first /s/ is a coda and the second /s/ is an onset as in *is.sai*. ‘nothing at all’. Instead, it looks that /ase/ is derived from /sase/ by a deletion rule. *s*-deletion (McCawley 1968, Poser 1986), however, is not without controversy. As discussed in Appendix A, I argue that this is lexical allomorphy /sase/ ~ /ase/ and one of the listed allomorphs, /sase/ or /ase/, is chosen conditioned by phonology, namely whether the verb-final item is a vowel (/sase/ is chosen) or a consonant (/ase/ is chosen).

(196) kar -ase → karase  
clip CAUS

Thus, neither *s*-deletion nor *s*-gemination occurs. As for /ta/, *soku-onbin* occurs as only /ta/ is listed.

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