

# Structural Restrictions on Sequential Voicing in Japanese N-V Compounds

YUTA TATSUMI  
*Meikai University*

## 1 N-V Compounds and Sequential Voicing

This paper focuses mainly on N-V compounds in Japanese. Examples of Japanese N-V compounds are given in (1).

- (1) a. *Taro-ga mado-huki-o sita.*  
Taro-NOM window-wipe-ACC did  
'Taro did a window wiping.' [N<sub>argument</sub>-V]
- b. *Taro-ga mizu-buki-o sita.*  
Taro-NOM water-wipe-ACC did  
'Taro did wiping with a damp cloth.' [N<sub>adjunct</sub>-V]

As shown in (1), Japanese N-V compounds consist of a dependent noun stem (*mado*, *mizu*) and a verb stem that appears in its conjunctive form (*huki*, *buki*).

### 1.1 The Argument-adjunct Asymmetry in N-V Compounds

It has been observed that Japanese N-V compounds behave differently depending on types of noun stems (Okumura 1955, Kindaichi 1976, Sugioka 2002). In (1a) above, the noun stem is interpreted as an internal argument of the verb stem. In (1b), the noun stem is interpreted as an adjunct of the verb stem. What is important is that only in (1b), the first consonant of the verb

stem (*huki*) is voiced, as a result of sequential voicing (a.k.a *Rendaku*).

In (1a), the N-V compound containing an argument noun stem does not exhibit sequential voicing. However, this does not mean that  $N_{\text{argument}}\text{-V}$  compounds always resist sequential voicing. As shown in (2), some  $N_{\text{argument}}\text{-V}$  compounds allow sequence voicing (Kindaichi 1976).

(2)  $N_{\text{argument}}\text{-V}$  compounds with sequential voicing

- a. *atena-gaki* ‘address-write’ (*kaki - gaki*)
- b. *inochi-goï* ‘life-ask’ (*koi - goï*)
- c. *garasu-bari* ‘glass-cover’ (*hari - bari*)
- d. *kuzi-biki* ‘lot-pull’ (*hiki - biki*)

Recently, Sato & Yokozawa (2018) report that they do not find any significant bias in  $N_{\text{argument}}\text{-V}$  compounds regarding sequential voicing. The result of their survey is summarized in (3).

(3) Sato & Yokozawa (2018): *Rendaku*-database

- a. N-V (N = Obj, Y = Voiced): 246/511 (48%)  
X = kango:61, wago:180, gairaigo:2, wago/kango:3
- b. N-V (N = Obj, Y = Voiceless): 261/511 (51%)  
X = kango:58, wago:201, gairaigo:1, wago/kango:1
- c. N-V (N = Obj, Y = Voiced or Voiceless): 4/511 (1%)  
X = wago:2, kango:2

In contrast,  $N_{\text{adjunct}}\text{-V}$  compounds generally show sequential voicing, with some few exceptions.<sup>1</sup> Following the previous studies, I assume that the pattern I in (4) is a property of Japanese N-V compounds.

---

<sup>1</sup> At first glance, it appears that there is a certain amount of  $N_{\text{adjunct}}\text{-V}$  compounds without sequential voicing in Sato & Yokozawa’s database. The relevant data are given in (i).

(i) Sato & Yokozawa (2018): *Rendaku*-database

- a. X+Y (X = non-Obj, Y = Voiced): 727/1067 (68%)
- b. X+Y (X = non-Obj, Y = Voiceless): 326/1067 (31%)
- c. X+Y (X = non-Obj, Voiced or Voiceless): 14/1067 (1%)

However, careful examination of the data shows that  $N_{\text{adjunct}}\text{-V}$  compounds in (ib) include a significant number of *rendaku* immune elements like the numeral ‘one’. The fact that numerals generally block sequential voicing is observed by Nakagawa (1966). See Irwin (2012) for a recent study of these elements. Moreover, the database only distinguishes object noun stems from non-object ones. This means that (ib) contains N-V compounds where a noun stem functions as an argument of ergative/unaccusative verbs (e.g. *ame-huri* ‘rain-fall = raining’). Given these considerations, I assume (4) is still a correct description of N-V compounds.

(4) Property I

$N_{\text{adjunct-V}}$  compounds generally allow sequential voicing, whereas  $N_{\text{argument-V}}$  compounds disallow sequence voicing in some cases.

There are several attempts to explain the property in (4). For example, Sugioka (1984) assumes that sequential voicing is a way of marking the head of a complex word. When a given N-V compound does not have an argument-predicate relation (e.g.  $N_{\text{adjunct-compound}}$ ), it is not clear which is the head of the compound. In this case, sequential voicing is required to mark the head. Sugioka's analysis may be on the right track descriptively. However, we still need another analysis because  $N_{\text{argument-V}}$  compounds do allow sequential voicing in a significant number of cases. Sugioka's headedness approach does not predict the property in (4).

### 1.2 The Verbal Use of N-V Compounds

We have seen that the argument-adjunct distinction affects the availability of sequential voicing in N-V compounds. Importantly, the availability of sequential voicing is an indicator of another property of N-V compounds. As shown in (5b) and (6b), some N-V compounds can be used as a verb followed by a tense morpheme.

- (5) a. *ne-biki*                      b. *ne-bik-u*  
price-pull                      price-pull-PRES  
'a discount'                      'to discount'                      [ $N_{\text{argument-V}}$ ]
- (6) a. *kara-buri*                      b. *kara-bur-u*  
empty-swing                      empty-swing-PRES  
'a swing and a miss'                      'to get struck out swinging'                      [ $N_{\text{adjunct-V}}$ ]

What is important is that there is a strong connection between the availability of sequential voicing and the verbal use of N-V compounds. My observation is given in (7).

(7) Property II

N-V compounds without sequential voicing cannot be used as a verb.

I found that all the N-V compounds without sequential voicing in Sato & Yokozawa's database disallow the verbal use.<sup>2</sup> This indicates that (7) is strikingly robust. There is another piece of evidence for the property in (7). As shown in (8), the N-V compound containing *toru* 'take' optionality shows sequential voicing. However, only the compound with sequential voicing can be used as a verb, as in (9b). The contrast in (9) supports the property in (7).

---

<sup>2</sup>Note that there are 587 N-V compounds lacking sequential voicing in their database.

- (8) a. *zin-dori* ‘spot + take= encamping’  
 b. *zin-tori* ‘spot + take = encamping’
- (9) a. *zin-dor-u* ‘spot + take-PRES = to encamp’  
 b. \**zin-tor-u* ‘spot + take-PRES = to encamp’

There are caveats about the property in (7). Firstly, it should be noted that the property in (7) only holds for N-V compounds. Other compounds in Japanese can be used as a verb even when they do not exhibit sequential voicing. For instance, there are V-V compounds that function as a verb but do not show sequential voicing, as shown in (10).

- (10) a. *si-harai* ‘do-pay = payment’  
*si-harau* ‘do-pay = to pay’
- b. *mi-hari* ‘see-spread = a watch’  
*mi-haru* ‘see-spread = to watch’
- c. *tobi-tati* ‘fly-stand = flying away’  
*tobi-tatsu* ‘fly-stand = to fly away’

The contrast between N-V and V-V compounds in this respect does not depend on types of verb stems. As shown in (11), the same verb stem behaves differently in N-V and V-V compounds.<sup>3</sup>

- (11) a. V-V compounds as V  
*ikiri-tatu* ‘get angry’, *uki-tatu* ‘cheer up’, *omoi-tatu* ‘come to mind’,  
*ori-tatu* ‘get down’, *kiri-tatu* ‘precipitous’, *sosori-tatu* ‘rise’, *ture-  
 datu* ‘go together’, *nari-tatu* ‘hold up’, *moe-tatu* ‘flare up’, *waki-  
 tatu* ‘boil up’
- b. N-V compounds as V  
*awa-datu* ‘foam’, *ukiasi-datu* ‘be upset’, *omote-datu* ‘become  
 known’, *kiwa-datu* ‘stand out’, *keba-datu* ‘become fluffy’, *saki-  
 datu* ‘precede’, *sakki-datu* ‘seethe’, *su-datu* ‘leave the nest’, *tabi-  
 datu* ‘leave on a trip’ *tsumasaki-datu* ‘stand on tiptoe’

In (11a), the verb stem *tat-* ‘stand’ occurs in V-V compounds. In this case, the compounds do not exhibit sequential voicing. On the other hand, when the same verb stem occurs in N-V compounds, the verbal use generally involves sequential voicing as in (11b). The contrast in (11) indicates that (7) only holds for N-V compounds.

Secondly, I found two exceptions to (7); *koshi-kake* → *koshi-kakeru* ‘waist-sit = sit down’ and *azi-tuke* → *azi-tsukeru* ‘taste-add = season’. How-

<sup>3</sup>The examples here are taken from Sugioka (1984).

ever, as discussed by Kageyama (1982) and Sugioka (1984), these exceptions may not count as N-V compounds. In this paper, I assume that the exceptional cases are derived by pseudo noun incorporation observed in some languages such as Hindi, and Niuean. An example from Hindi is given in (12).<sup>4</sup>

- (12) Hindi: Dayal (2011: 134)  
*anu-ne kitaab<sub>1</sub> paRhii. #vo<sub>1</sub> bahut acchii thii.*  
 Anu book read-PFV it very good be-PST  
 ‘Anu book-read (read a book). It was very good.’

In (12), the bare noun *kitaab* ‘book’ undergoes pseudo noun incorporation, and hence cannot be an antecedent of the pronoun *vo* ‘it’ in the second sentence. Following the previous researchers, I suggest that the exceptional N-V verbs are derived by pseudo noun incorporation, as shown in (13).

- (13) *isu-ni koshi-o kakeru. ⇒ isu-ni [koshi kakeru].*  
 chair-to waist sit chair-to waist sit

The N-V verb in (13) then undergoes backformation, yielding the N-V noun *koshi-kake*. So far, I am implicitly assuming that N-V verbs are derived from corresponding N-V nouns, as in (14a). On this view, the property in (7) can be seen as a ban on a particular word formation process; N-V nouns without sequential voicing cannot become N-V verbs. The attested exceptions do not ruin (7) because they are derived in the opposite way as in (14b).

- (14) a. N-V nouns  $\Rightarrow$ verbalization N-V verbs  
 b. N-V verbs  $\Rightarrow$ backformation N-V nouns

Yo Matsumoto (p.c.) has informed me that some N-V verbs do not have corresponding N-V nouns; *tema-doru* ‘take time’ vs. *\*tema-dori*, *te-gakeru* ‘deal with’ vs. *\*te-gake*. This indicates that the backformation process is not so productive in present-day Japanese. Notice that a similar backformation process has been assumed in English N-V compounds (e.g. *baby-sit*, *trouble-shoot*). English N-V compounds are not formed productively, and new ones often sound unnatural. The fact that there are only few exceptions to (7) can be seen as a piece of supporting evidence for the present analysis that they are derived by backformation.<sup>5</sup>

Lastly, it should be noted here that some researchers have assumed that

<sup>4</sup> See Massam (2001) for a similar construction in Niuean.

<sup>5</sup> One potential issue is how to determine whether a given N-V noun is derived by backformation or compounding. Given that there is a significant amount of N-V verbs that do not have corresponding N-V nouns, I assume here that (14a) is more productive than (14b). It would be desirable to investigate whether these two derivational patterns yield different properties of N-V compounds. I am indebted to Yo Matsumoto for bringing this issue to my attention.

N-V compounds are lexical words and syntactically opaque. Kageyama (2016) provides the example in (15) to show the lexical integrity of N-V compounds.<sup>6</sup>

- (15) Q. *ki-wa iro-zuki masi-ta ka?*  
 tree-TOP color-attach POL-PAST Q  
 ‘Have the tree leaves changes colors?’
- A. *hai, iro-zuki masi-ta.*      A’ \**hai, Δ-tuki masi-ta.*  
 yes color-attach POL-PAST      yes -attach POL-PAST  
 ‘Yes, they have.’      ‘Yes, they have.’

(15A) can be used as an answer to the question in (15Q), whereas (15A’), in which the first stem of the compound is missing, is infelicitous in the context. Kageyama (2016) attributes the unacceptability of (15A’) to the Lexical Integrity Hypothesis. He argues that syntactic deletion cannot take place in (15A’) because N-V compounds are lexical words.

The present paper does not argue against the assumption that N-V compounds are lexical words. I will argue instead that N-V compounds still have internal hierarchical structures that can affect their morphophonological properties. Specifically, I will propose in the next section that sequential voicing is blocked when a noun stem is generated in a position remote from a verb stem. Moreover, I will show that the proposed structural constraint on sequential voicing has other consequences for morphophonological behaviors of N-V compounds.

## 2 Proposal

In the previous section, I pointed out the following two peculiarities of Japanese N-V compounds in connection to sequential voicing.

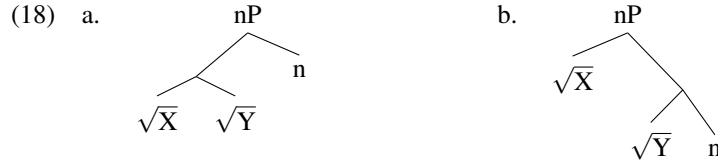
- (16) Property I  
 N<sub>adjunct</sub>-V compounds generally allow sequential voicing, whereas  
 N<sub>argument</sub>-V compounds disallow sequence voicing in some cases.

- (17) Property II  
 N-V compounds without sequential voicing cannot be used as a verb.

I argue that (16) and (17) can be explained by different internal structures of N-V compounds. I propose that there are two positions for a noun stem in N-V compounds, as shown in (18). (See Tatsumi (2016), Hasegawa & Oseki (2020), Nishiyama & Nagano (2020) for similar analysis of N-V compounds.)

---

<sup>6</sup>In (15), Δ stands for the deleted part of the compound.



Adopting the framework of Distributed Morphology (Halle & Marantz 1993 and subsequent work), I take roots as bare lexical elements. In (18a), the root X occurs in the local position of the root Y, yielding a root compound. I propose that N-V compounds with sequential voicing have the structure in (18a). In (18b), on the other hand, the root Y combines with a nominalizer, and the dependent root X occurs in the non-local position of Y.

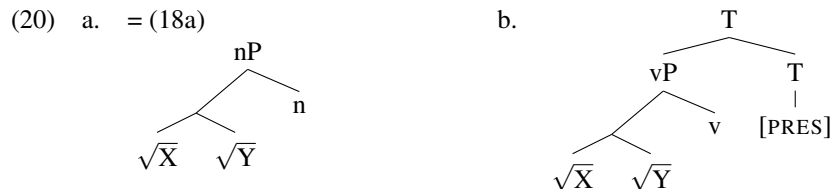
I assume that N-V compounds without sequential voicing have the structure in (18a) or (18b). However, when N-V compounds have the non-local structure in (18b), they cannot exhibit sequential voicing. Following Arad (2003), I assume that the nominalizer is a phase head. In (18b), X and Y are separated by an intervening phase head. Because of the intervening phase head, there is no local compound that can be a target of sequence voicing in (18b), and hence sequential voicing cannot take place.

The pattern in (16) can be captured by assuming that adjuncts are base-generated in the local position of the verb stem, while arguments can appear either in the local position or in the non-local position. The (im)possible patterns are summarized in (19).

- (19) a. N<sub>adjunct</sub>-V compounds: <sup>OK</sup>(18a), \*(18b)  
 b. N<sub>argument</sub>-V compounds: <sup>OK</sup>(18a), <sup>OK</sup>(18b)

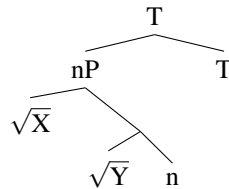
The proposed analysis is in accordance with the recent development of the constructivist approach to argument structure (Hake & Keyser 1993, Pylkkänen 2008, Marantz 2013). Under the constructivist approach, arguments are introduced by particular syntactic heads, and not always appear structurally close to a root. Given the constructivist tradition, it is not unreasonable to assume that N<sub>argument</sub>-V compounds have the structure in (18b).

The proposed analysis can also account for the pattern in (17). Under the current analysis, there are two structural sources of N-V compounds as in (18). The root compound in (18a) can be verbalized as shown in (20b).



On the other hand, the nominalizer head is indispensable in (18b) because it provides a position for the noun stem. (18b) thus yields the impossible structure given in (21), in which the T head combines directly with a nominalized phrase. (I assume that Japanese does not have a null verbalizer that triggers conversion from noun to verb.)

(21) Impossible structure



This problem does not arise for N-V compounds in which a noun stem occurs in the local position of a verb stem, as shown in (20).

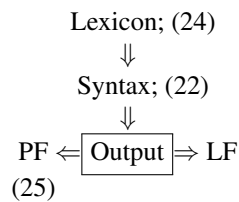
Before concluding this section, there are some points that need to be addressed. Notice that the present analysis summarized in (22) is a structural restriction on sequential voicing.

(22) Proposal: A structural restriction

- a. There are two types of N-V compounds; local compounds and non-local compounds.
- b. Sequential voicing is disallowed in non-local N-V compounds.

Sequential voicing of local N-V compounds may be blocked when some other non-structural restrictions are involved. In this paper, I adopt the single output model, as illustrated in (23).

(23) Single Output Syntax (Bobaljik 1995, 2002)



In this model, the proposed structural restriction on sequential voicing is at work only in the syntactic component. It has been argued that sequential voicing is subject to other constraints too. For instance, Rosen (2001) observes that some elements lexically hate sequential voicing (Rendaku-haters), while some others often exhibit sequential voicing (Rendaku-lovers). The availability of sequential voicing is also regulated by the vocabulary strata, as in (24) (Irwin 2005, 2011).



- (24) Lexical restriction
- Native Japanese words (*wago*): *Rendaku*-lovers
  - Sino Japanese words (*kango*): *Rendaku*-haters
  - Foreign Japanese words (*gairaigo*): *Rendaku*-haters

These lexical restrictions may independently block sequential voicing of N-V compounds. Moreover, there is a well-known phonological restriction on sequential voicing as in (25) (Motoori-Lyman's Law).

- (25) Phonological restriction: Motoori (1822), Lyman (1894)
- $[[m_1 \dots] [m_2 \dots [-son, +voi] \dots]]$
  - Motoori-Lyman's Law effect: SV is blocked in m2 in (25a).

The properties in (16) and (17) hold only when independent phonological constraints like Motoori-Lyman's Law are respected.<sup>7</sup>

Let me illustrate the idea by using an example of word-part ellipsis. In (26), two V-V compounds are coordinated by the disjunctive particle *ka* 'or'. As shown in (26), the first member of a V-V compound can be elided, without changing the meaning. In (26),  $\Delta$ -*dasa-nai* is interpreted as *omoi-dasa-nai* 'think-extract-NEG'.<sup>8</sup>

- (26) *kare-ga watasi-no tanzyoobi-o*  
 he-NOM I-GEN birthday-ACC  
 [[*omoi-dasu*] *ka* [ $\Delta$ -*dasa-nai*] *ka*]-*ga mondai da*.  
 think-extract or -extract-NEG or -NOM problem COP  
 'The problem is whether he remembers my birthday or not.'

<sup>7</sup> One may consider Motoori-Lyman's Law is an instance of the OCP effect (Ito & Mester 2003). In fact, Sugito (1965) observed the pattern similar to the Lyman's Law, regarding to the alternation between /ta/ and /da/ in Japanese surnames, as shown in (i).

(i) When the first element ends with a mora containing a voiced obstruent, /da/ is not used in surname compounds. (e.g. *huku-da* vs. *hugu-ta* (#*hugu-da*))

If we assume that /da/ is derived from /ta/ via sequential voicing, Sugito's observation supports the claim that voiced obstruents block sequential voicing across a morpheme boundary. However, Sugito's observation does not hold for sequential voicing in N-V compounds. N-V compounds which contain a mora with a voiced obstruents can undergo sequential voicing, as in (ii).

(ii) *kuzi-biki* 'lot-pull' (*hiki* → *biki*), *nido-zuke* 'twice-soak' (*tuke* → *zuke*), *kazyou-gaki* 'item-write' (*kaki* → *gaki*), *siraga-zome* 'white.hair-dye' (*some* → *zome*), *sabi-dome* 'rust-stop' (*tome* → *dome*), *yado-gae* 'inn-change' (*kae* → *gae*), *suzi-gaki* 'plot-write' (*kaki* → *gaki*), *kooden-gaesu* 'funeral.gift-return' (*kaesi* → *gaesi*), *ude-damesi* 'arm-try' (*tamesi* → *damesi*),

Given the contrast between surnames and N-V compounds, I assume that different phonological constraints on sequential voicing are imposed, depending on the type of a given compound.

<sup>8</sup> See Yatabe (2001) and Tatsumi (2019) for an analysis of this type of ellipsis.

As shown in (27), the noun stem in a N-V verb can be elided in the same construction.

- (27) *Akira-wa sekken-ga* [[*awa-datsu*] *ka*  
 Akira-TOP soap-NOM bubble-stand or  
 [ $\Delta$ -*tata-nai*] *ka*]-*de uranai-o suru.*  
 -stand-NEG or -by fortune.telling do.PRES  
 ‘Akira do fortunetelling by seeing whether a soap bubbles or not.’

In (27), the elided compound  $\Delta$ -*tata-nai* is interpreted as *awa-data-nai*. It should be noted that when the bare verb *tatsu* ‘stand’ takes the noun *sekken* as its argument, the resulting sentence receives a different reading from (27), as shown in (28).

- (28) *Akira-wa sekken-ga tata-nai.*  
 Akira-TOP soap-NOM stand-NEG  
 ‘Akira cannot make a soap stand.’

The difference between (27) and (28) can be captured by assuming that the elided part of (27) underlyingly contains the N-V compound *awa-data-nai*.

Since the N-V verb *awa-datsu* exhibits sequential voicing, the current analysis predicts that it has the structure in (18a). However, the elided N-V compound in the second conjunct in (27) does not show sequential voicing. The absence of sequential voicing in (27) is consistent with the current analysis, which adopts the single output model given in (23). Although the N-V compound structurally allows sequential voicing, it is blocked in (27) because of the phonological absence of the noun stem.

To recapitulate, I have argued in this section that the two properties in (16) and (17) can be explained by the two different structural sources of N-V compounds, as in (18). In the next section, I will argue that the proposed structural restriction has another consequence in light verb voicing.

### 3 Light Verb Voicing

The current analysis can be extended to another property of sequential voicing in s-irregular verbs (*sahen*-verbs). Some examples of s-irregular verbs are given in (29). The s-irregular verbs in (29) consist of a noun stem and the light verb *su* ‘do’.

- (29) a. *yuu-suru* = existence-do.PRES  
 b. *huu-zuru* = seal-do.PRES

Tanomura (2001, 2009) observes that s-irregular verbs are in the process of being other verbal classes. His observation is summarized in (30)

(30) Morphological changes of N-*suru* compounds (Tanomura 2001, 2009)

- a. s-irregular:  
*bikkuri-suru* ‘surprise-do = be surprised’,  
*zikkoo-suru* ‘action-do = carry out’
- b. s-irregular → regular conjugation:  
*ai-suru* ‘love-do = love’, *yuu-suru* ‘exist-do = possess’
- c. s-irregular → upper monograde conjugation:  
*ron-zuru* ‘argument-do = argue’, *huu-zuru* ‘seal-do = seal’
- d. s-irregular → lower monograde conjugation:  
*sin-zuru* ‘precede-do = give’, *mi-suru* ‘attract-do = attract’  
 (only two examples in his sample)

As shown in (30b), some s-irregular verbs are acquiring the regular conjugation pattern. This morphological change is exemplified in the third row of Table 1. This kind of s-irregular verb can have the *sa* form with negation. Some other s-irregular verbs are changing into the upper monograde conjugation as in (30c). As shown in the fourth row of Table 1, these s-irregular verbs have the *zi* form in negative and conditional environments, unlike the typical s-irregular verbs.

	Present	Negation	Conditional
(30a)	su-ru	si-nai	su-reba
(30b)	yuu-su-ru	yuu- <b>{si sa}</b> -nai	yuu-su-reba
(30c)	huu- <b>{zu zi}</b> -ru	huu-zi-nai	huu- <b>{zu zi}</b> -reba

Table 1

What is important for the purposes of the present discussion is that the light verb *su* ‘do’ in the s-irregular verbs with the upper monograde conjugation generally exhibits sequential voicing. The observation is summarized in (31).

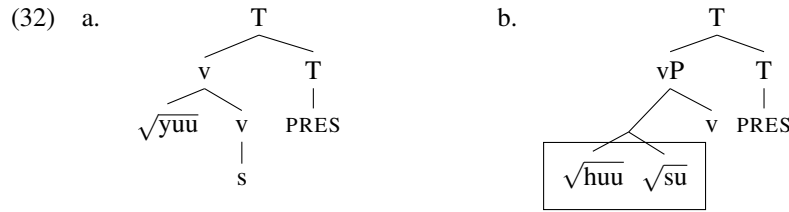
(31) Property III

Only s-irregular verbs containing the voiced *do*-verb can be changed into verbs with the upper monograde conjugation.

Tanomura (2001) reports that only two s-irregular verbs that have the upper monograde conjugation remain unvoiced. He further notices that those exceptional s-irregular verbs are on the verge of being lost. These data indicate that the property in (31) is robustly attested.

Following Kishimoto & Yu (2019), I assume that s-irregular verbs with the regular conjugation (e.g. *yuu-suru*) contain the verbalizer suffix *-s*, which is a grammaticalized form of the light verb *su*, as shown in (32a). In this structure, the verbalized root can be interpreted as a single verb, showing the

regular conjugation pattern. Regarding the *s*-irregular verbs with the upper monograde conjugation, I propose that they have the structure in (32b). Here, the light verb *su* is a root, and it forms a root compound together with a noun stem. The root compound then combines with a null verbalizer, yielding the N-V verb. Here, I hypothesize that *s*-irregular verbs appearing in the structure in (32b) show the upper monograde conjugation pattern.



Recall that I proposed that N-V compounds can exhibit sequential voicing only when they have the local structure given in (18a). The proposed analysis expects that the root compound in (32b) undergoes sequential voicing if other restrictions on sequential voicing are respected. (Compare (32b) with (20b) in the previous section.) The property in (31) can thus be handled in the present analysis without any further stipulation.

#### 4 Summary

In this paper, I have argued that the following properties of N-V compounds can be accounted for by assuming the two different structures of N-V compounds; the local structure and the non-local structure.

- (33) Property I  
 $N_{\text{adjunct}}$ -V compounds generally allow sequential voicing, whereas  
 $N_{\text{argument}}$ -V compounds disallow sequence voicing in some cases.
- (34) Property II  
 N-V compounds without sequential voicing cannot be used as a verb.
- (35) Property III  
 Only *s*-irregular verbs containing the voiced *do*-verb can be changed into verbs with the upper monograde conjugation.

Adopting the single output model, I proposed that sequential voicing is structurally possible when a given N-V compound contains a root compound. As discussed in section 2, sequential voicing is subject to other restrictions like Motoori-Lyman's Law, in addition to the structural restriction proposed in the present paper. It is thus important to properly distinguish different types of restrictions, in order to investigate the nature of sequential voicing.

## Acknowledgments

I would like to thank the audience at the 29th conference on Japanese/Korean linguistics for helpful discussion. Parts of this work were presented in a talk at Handai-Shindai linguistics group. I would like to thank the participants for their comments.

## References

- Arad, M. 2003. Locality Constraints on the Interpretation of Roots: The Case of Hebrew Denominal Verbs. *Natural Language and Linguistic Theory* 21:737–778.
- Bobaljik, J. D. 1995. *Morphosyntax: The Syntax of Verbal Inflection*. Ph.D. dissertation, MIT, Cambridge, MA.
- Bobaljik, J. D. 2002. A-chains at the PF-interface: Copies and “Covert” Movement. *Natural Language and Linguistic Theory* 20:197–267.
- Dayal, V. 2011. Hindi Pseudo-incorporation. *Natural Language and Linguistic Theory* 29.1:123–167.
- Halle, M. and Marantz, A. 1993. Distributed Morphology and the Pieces of Inflection. In Ken Hale and Samuel J. Keyser (eds.), *The View from Building 20*, MIT Press Cambridge, MA, 111–176.
- Hasegawa, T. and Oseki Y. 2020. Bunsankeetairon-to Nihongo-no Doosiyurai-hukugoogo [Distributed morphology and Japanese deverbal compounds]. A handout presented at the 161st Meeting of the Linguistic Society of Japan.
- Irwin, M. 2005. Rendaku-based Lexical Hierarchies in Japanese: The Behaviour of Sino-Japanese Mononoms in Hybrid Noun Compounds. *Journal of East Asian Linguistics* 14:121–153.
- Irwin, M. 2011. *Loanwords in Japanese*. Amsterdam and Philadelphia: John Benjamins.
- Irwin, M. 2012. Rendaku Dampening and Prefixes. *NINJAL Research Papers* 4:27–36.
- Kageyama, T. 1982. Word Formation In Japanese. *Lingua* 57:215–258.
- Kageyama, T. 2016. Noun-compounding and Noun-incorporation. In Taro Kageyama and Hideki Kishimoto (eds.) *Handbook of Japanese Lexicon and Word Formation*, 237-272. Berlin: De Gruyter Mouton.
- Kindaichi, H. 1976. Rendaku-no Kai (On Explaining Rendaku). *Sophia Linguistica* 2:1–22.
- Kishimoto, H. and Yu Y. 2019. (Kango-Wago) Ichizi-keitaiso Suru-no Gokeesei-to Keitaikoozoo ((Sino-Japanese and Native-Japanese words) Morphemes and Word Formation in a Single Morpheme Plus Do). In *Rekisikon-kenkyuu-no aratana apuroochi* (New Approaches to Lexicon Research), 55-80. Tokyo: Kuroshio Publishers.
- Lyman, B. S. 1894. Change from Surd to Sonant in Japanese Compounds. Oriental Club of Philadelphia, 1–17.
- Marantz, A. 2013. Verbal Argument Structure: Events and Participants. *Lingua* 130:152–168.

- Massam, D. 2001. Pseudo Noun Incorporation in Niuean. *Natural Language and Linguistic Theory* 19.1:153–197.
- Motoori, N. 1822. *Kojiki den*. Edo: Maegawa Rokuzaemon; Osaka: Matsumura Kyubei; Kyoto: Imai Kihei; Owari: Katano Toshiro.
- Nakagawa, Y. 1966. Rendaku, Rensei (Kashoo)-no Keifu. *Kokugo Kokubun* 35:302–314.
- Nishiyama, K. and Nagano A. 2020. *Keetairon to Rekisikon* (Morphology and the Lexicon). Tokyo: Kaitakusha.
- Okumura, M. 1955. Rendaku. In Kokugo Gakkai (ed.) *Kokugogaku Jiten* (Glossary of Japanese Linguistics), 961–962. Tokyo: Tokyodo Shuppan.
- Pylkkänen, L. 2008. *Introducing Arguments*. Cambridge, MA: MIT Press.
- Rosen, E. R. 2001. *Phonological Processes Interacting with the Lexicon: Variable and Non-Regular Effects in Japanese Phonology*, PhD dissertation, University of British Columbia.
- Sato, T. and Yokosawa K. 2018. *Rendaku-no Soogooteiki-kenkyuu* (A Comprehensive Study of Rendaku). Tokyo: Bensei Publishers.
- Sugioka, Y. 1984. *Interaction of Derivational Morphology and Syntax in Japanese and English*. PhD dissertation, University of Chicago.
- Sugioka, Y. 2002. Incorporation vs. Modification in Deverbal Compounds. In *Japanese/Korean Linguistics* 10, 495–508. Stanford: CSLI.
- Sugito, M. 1965. Shibata-san to Imada-san: Tango no Chookakuteki Benbetsu-nitsuite-no Ichi Koosatsu (Mr. Shiba-ta and Mr. Ima-da: A Study in the Auditory Differentiation of Words). *Gengo Seikatsu* 165:64–72. (Reproduced in Sugito M. 1998. *Nihongo Onsei-no Kenkyuu* (Studies on Japanese Sounds). Vol. 6: 3–15. Osaka: Izumi-shoin.)
- Tanomura, T. 2001. An Analysis of the Morphological Alternations of *Sahen* Verbs. *Japanese Linguistics* 9:9–32.
- Tanomura, T. 2009. Morphological Changes of *Sahen*-verbs Revisited. *Japanese Linguistics* 25:91–103.
- Tatsumi, Y. 2016. Deverbal Compounds in Japanese: A Distributed Morphology Approach. *Proceedings of Formal Approaches to Japanese Linguistics* 8:177–187.
- Tatsumi, Y. 2019. Excorporation and V-V Compound Ellipsis in Japanese. *Proceedings of the Fifty-Fourth Annual Meeting of the Chicago Linguistic Society*, 503–518. CLS.
- Yatabe, S. 2001. The Syntax and Semantics of Left-node Raising in Japanese. *The Proceedings of the 7th International Conference on HPSG*, 325–344. Stanford: CSLI Publications.