Boundary Effects in Lexical Accent Variation and Vowel Devoicing in Japanese
Category: (1) Phonetics/phonology

It has been observed in the Japanese literature that morphological boundaries affect vowel devoicing. For example, McCawley (1968) shows that stems are the domain of accent shift triggered by vowel devoicing in verb and adjective alternations. Vance (1992), looking at compounds, finds that the presence of word-internal morpheme boundaries prevent vowels from undergoing devoicing in some environments. This visibility of word-internal information is unexpected, since vowel devoicing, being non–structure-preserving and non-categorial, occurs at the postlexical level (e.g., Hirayama 2009), and it has been argued that although phonological information is available, morphological information is not available at this level (e.g., Pulleyblank 1986:7-9).

In this paper, we explore boundary effects in variation in the location of lexical accent involving vowel devoicing. If there is an effect, the variation would be skewed depending on the location of the boundary. We show that the boundary does play a role in explaining the variation. However, contrary to the literature, the boundaries are phonological, not necessarily morphological. We also show that higher-level boundaries (PrWd) have a stronger effect than lower-level ones (foot). This supports the claim that different levels of prosody have different strengths in phonetic realizations (e.g., Fougeron 2001).

Using a pronunciation dictionary (NHK Hoso Bunka Kenkyujo 2009), we extract words with accented devoiced vowels and record whether they have variants with respect to accent, and, if so, where the accent falls. In most cases of variation, the variant is either accentless or takes its accent one syllable to the left (L) or one syllable to the right (R) of the syllable containing a devoiced vowel. Focusing on nouns, the accent variation seems to depend on the presence or absence of a boundary adjacent to the syllable with a devoiced vowel. We discuss both Sino-Japanese words and native words. (We do not discuss loanwords, as the original morphological information is arguably lost in the adaptation.)

Table 1 shows the variation. We follow Itô & Mester's (1996) analysis of Sino-Japanese words in recognizing stem boundaries (S) and word boundaries (W); N indicates that there is no boundary.

	Boundary			Variation (N (%))					
	R	L	Examples	L	R	Unaccented	No variation	Other	Totals
1	N/S	#*	[失意], [幾何]	0 (0)	84 (87)	3 (3)	10 (10)	0 (0)	97 (100)
2	N	W	[法[秩序], [[社会][福祉]]	0 (0)	10 (77)	0 (0)	3 (23)	0 (0)	13 (100)
3	S	W	[大[至急]], [[中立][地帯]]	0 (0)	79 (71)	2 (2)	30 (27)	0 (0)	111 (100)
4	W	N	[[体育]祭]	214 (75)	1 (0)	25 (9)	47 (16)	0 (0)	287 (100)
5	W	S	[[一致]点]	0 (0)	7 (10)	16 (22)	49 (67)	1 (1)	73 (100)
6	S	N	[半[濁点]], [益金]	6 (67)	0 (0)	3 (33)	0 (0)	0 (0)	9 (100)
7	N	S	[[三幅]対]	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)	2 (100)
8	W	W	[[都][道][府][県]]	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2 (100)
			Totals	221	184	49	139	1	594

Table 1 Variation of accentuation in Sino-Japanese (* # to the left means word-initial position)

Columns L and R for lines 2 and 3 compared with lines 4 and 5 indicate that word boundaries have a strong effect. When there is a word boundary to the left (lines 2 and 3), there are no words with variants whose accent is one syllable to the left of the devoiced vowel (we call these L variants), whereas there are many words with variants whose accent is one syllable to the right of them (R variants) (77%, 71%). Likewise, when there is a word boundary to the right (lines 4 and 5, particularly 4), there are hardly any items with R variants, while there are abundant items that have L variants. This indicates that word boundaries block accent shift, preventing variants on the same side as the boundary.

We can also see stem boundaries in effect, although the effect is weaker than that of word boundaries. When there is a word boundary to the right, as in lines 4 and 5, if there is no boundary to the left (line 4), there are many items with L variants (75%), whereas if there is a stem boundary to the left (line 5), there are no such items; instead, most words do not have variation (67%). This can be interpreted to mean that stem boundaries also affect accent variation: when there is a boundary on both sides (line 5), we see either accent deletion (22%) or a lack of variants rather than accent shift. However, the effect of stem boundaries is weaker than that of word boundaries. Compare line 3 with line 5, where the boundary positions are reversed. Unlike line 5, in line 3, when there is a word boundary to the left, items with R variants (71%) outnumber items with no variation (27%), whereas in line 5, there are no items with L variants. This asymmetry shows that the effect of stem boundaries is limited to certain environments (i.e., when there is

a word boundary to the right (line 3)), while the effect of word boundaries is not. Thus, the effect of stem boundaries is weaker than that of word boundaries. The weaker effect of stem boundaries may explain lines 6 and 7 as well, where there are no word boundaries: the accents on the variants do not cross stem boundaries.

We claim that these boundaries are not morphological but phonological, following Itô & Mester's (1996) analysis that the word and stem boundaries in Sino-Japanese coincide with phonological ones, PrWd and Foot boundaries respectively. Thus, the above results can be reinterpreted in phonological terms: PrWd boundaries have an effect on the lexical variation of accent and Foot boundaries have a smaller effect. The accent variation in native vocabulary in Table 2 confirms that the boundary effects are phonological rather than morphological.

	Boundary			Variation (N (%))					
	R	L	Examples	L	R	Unacc.	No variation	Other	Totals
1	N	#	ひそか, 鱚	0 (0)	4 (100)	0 (0)	0 (0)	0 (0)	4 (100)
2	N	W	上唇, 笛吹き, 罪作り	3 (8)	19 (48)	5 (13)	13 (32)	0 (0)	40 (100)
3	W	N	秋風, 揚げ足取り	2 (6)	18 (58)	6 (19)	4 (13)	1 (3)	31 (100)
4	S	N	"Adjective -さ"	15 (100)	0 (0)	0 (0)	0 (0)	0 (0)	15 (100)
5	N	S	お妃, お作り	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	2 (100)
6	W	W	末つ方	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1 (100)
			Totals	20	41	12	19	1	93

Table 2 Variation of accentuation in native vocabulary

Compare lines 2 and 3, focusing on columns L and R. At first glance, the word boundary seems to have no effect, as the pattern is the same whether there is a word boundary to the left (line 2) or to the right (line 3); words have mostly R variants in both cases. However, although these boundaries are word boundaries morphologically, they are arguably mostly foot boundaries phonogically rather than PrWd boundaries, as many of them are simple compounds like stem+stem compounds in Sino-Japanese (parallel argument to Sino-Japanese compounds as discussed in Itô & Mester 1996). Given the results of the Sino-Japanese words above, this pattern makes sense framed in phonological terms: since the boundaries in lines 2 and 3 are Foot boundaries, not PrWd, they do not have a strong effect in determining the distribution of L and R variants. This further suggests that R variants are the default when there is no PrWd boundary involved.

Nominal compounds are the primary focus of our study; however, in line 4, we see that in adjectives with the derivational suffix /-sa/, the stem boundary before the suffix prohibits R variants. This suggests that stem boundaries may affect nouns differently than they do adjectives and verbs, which were the topic of McCawley's (1968) study.

In summary, we find that boundaries have an effect on the variation of lexical accent in nominal compounds involving devoiced vowels, and that these boundaries are phonological (PrWd and Foot boundaries) rather than morphological (word and stem boundaries). Moreover, we observed that PrWd has a stronger boundary effect than Foot. This supports the observation in the literature that different levels in the prosodic hierarchy have different degrees of effect in phonetic realization (e.g., Fougeron 2001).

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