

# The Adaptation of Contemporary Japanese Loanwords in Korean

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In this paper we report some of the results of a study of the adaptation of Japanese loanwords into Korean by Korean speakers living in Japan, focusing on the treatment of the laryngeal features in stops and affricates. Our goal is to first document and then explain the differences between the contemporary adaptation patterns and those found in loans that entered the language in the first half of the last century, a period we refer to as Classical Loans.

Japanese has a binary contrast of voiced vs. voiceless obstruents in both word-initial and intervocalic position. It also distinguishes between an alveolar and alveo-palatal affricate. Korean has the ternary lax-tense-aspirated contrast in its stops and affricates in both initial and medial inter-sonorant positions and a single affricate series whose place of articulation as alveolar vs. alveo-palatal has been a matter of some controversy (H-S. Kim 1999, Kang 2006). Finally, Japanese has a medial singleton-geminate opposition, which Korean lacks. Our discussion proceeds as follows. We first review the laryngeal adaptations in the Classical period and then provide an overview of the correspondences we have found in our Contemporary speakers.

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Section 3 examines the phonetic basis of the laryngeal adaptations in both periods. Section 4 treats the behavior of affricates. Section 5 looks at the correspondences for word-medial position for singletons and section 6 for geminates. Section 7 summarizes our findings.

### 1. Classical Adaptations

Ito et al. (2006) discuss the correspondences between Japanese and Korean in c. 1,300 loans found in an etymological dictionary (Kim 1997). (1) illustrates the onset adaptation patterns for obstruents in Classical loanwords.

(1)

Word-initial					
Japanese	Korean	example			gloss
b	p	baketsu	→	pak*es*ɨ	'bucket'
d	t	daNgo	→	taŋko	'dumpling'
g	k	gaku	→	kak*u	'frame'
t	t	tamago	→	tamako	'egg'
k	k	kagami	→	kakami	'mirror'

Word-medial					
Japanese	Korean	example			gloss
b	p	nabe udoN	→	nape utoŋ	'udon type'
d	t	sodenasi	→	sotenasi	'sleeveless shirt'
g	k	maguro	→	makuro	'tuna'
t	t	sita	→	sita	'subordinate'
k	k*	mikaN	→	mik*an	'tangerine'

Transcription: p, t, k = lax, p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup> = aspirated, p\*, t\*, k\* = tense

Several puzzling asymmetries were identified in how the Japanese binary voiced vs. voiceless contrast in stops and affricates aligns with the Korean ternary lax-tense-aspirated distinction. The finding that is most relevant here was that Japanese voiced and voiceless plosives were both adapted as Korean lax consonants in word-initial position but were distinguished word-medially. Ito et al. (2006) speculated as to the phonetic bases responsible for this difference. The word-initial merger of voiced and voiceless plosives is particularly puzzling since English and French loans into Korean do distinguish these laryngeal categories, albeit differently as primarily lax vs. aspirated and lax vs. tense, respectively.

Shinohara et al. (2011) investigated the Japanese-Korean correspondences experimentally and showed that young Seoul speakers readily distinguish word-initial Japanese voiced vs. voiceless plosives in stimuli of the

form [data] vs. [tata], [gata] vs. [kata], etc. as lax vs. aspirated. They also collected a set of c. 150 loanwords taken from restaurant menus, fashion magazines, and tourist maps in which the word-initial voiced and voiceless > lax correspondences persist. Given the discrepancy between the experimental results and the loanword correspondences, Shinohara et al. (2011) conclude that loanword adaptations, at least in this case, are not based on acoustic/perceptual similarity but rather have been “phonologized” or “conventionalized.”

These conflicting results raise a number of questions. Granted that the classical correspondence is no longer based on perception and has become conventionalized, what was it based on originally? Why is there a difference among Japanese, English, and French, which phonologically all have a voiced vs. voiceless contrast? It is now well known that for contemporary younger Seoul speakers F0 in the following vowel is the primary cue for the lax vs. aspirated distinction in word-initial position while for earlier generations VOT was the major discriminant (Kim et al. 2004, Silva 2006). Also, Japanese voiceless stops now occupy an intermediate position on the VOT dimension between the short lag stops of French and Spanish and the longer lag stops of English and Korean (Riney et al. 2007). Moreover, Japanese initial voiced stops with closure voicing (negative VOT) now have alternative realizations with a short voicing lag for many speakers (Kong et al. 2012, Takada 2012). What role, if any, do these diachronic changes in the phonetic implementation of the voicing contrast in both languages play in the loanword adaptations?

In order to address these (and other) questions, we collected a corpus of data from Korean speakers residing in Japan who use Korean in their daily lives with family and friends but are also fluent in Japanese. For these speakers there is thus extensive Japanese-Korean language contact, which may better replicate the kind of contact situation found in the Classical period (1890-1945) when Japanese words first entered Korean in significant numbers compared to present-day Korea, where the language contact is more remote, sporadic, and conventionalized.

## **2. Contemporary Japanese > Korean Loans**

We assembled a corpus of 628 Japanese words that we knew to be frequently used by Korean people living in Japan and polled 23 native speakers for the form of these words in their everyday Korean. Our speakers include 8 from Yanbian in China while the remaining 15 come from South Korea: Seoul (5), Kyungsang (8), Ceolla (1), and Ceju (1). They range in age from their 20's to 40's with most 20-35. Some speakers are recently arrived students studying in Japan while others are married to Japanese spouses and/or

work in Japan and hence reside permanently (although most make periodic visits back to their Korean homeland).

The loanwords in our corpus include 178 western-origin words (primarily from English) as well as 450 native Japanese items: e.g. koN.bi.ni > k<sup>h</sup>om.pi.ni ‘convenience store’ vs. koNbu > k<sup>h</sup>ompu ‘sea tangle’. In many cases a Japanese word is adapted into Korean in multiple ways, resulting in considerable variation. For example, Japanese ikebukuro ‘Ikebukuro’ is adapted variously as ik<sup>h</sup>epuk<sup>h</sup>uro, ik<sup>h</sup>epuk\*uro, ik<sup>h</sup>epuk\*iro, ik\*epuk\*uro, and ik\*epuk\*iro. Thus the total number of distinct loanword forms in our data are 2,140 items. The words (almost all nouns) comprise a variety of lexical fields that reflect contemporary culture: cuisine, place-names, personal names, transportation, fashion, technology/products, health, commerce/trends.

In word-initial position, Japanese voiced stops and affricates continue to be mapped to the Korean lax category. However, voiceless stops are now split between lax and aspirated, with a bias in favor of aspirated. Moreover, Japanese voiceless affricates have a substantial number of Korean tense adaptations, while this mapping is essentially never found for stops. The overall proportions are shown below along with some examples.

## (2)

## Word-initial

Japanese	Korean	example			gloss
b	p	bjooiN	→	pjo:in	‘hospital’
d	t	deNsja	→	tensja	‘train’
g	k	gomi	→	komi	‘garbage’
p	p <sup>h</sup>	pasokoN	→	p <sup>h</sup> asok <sup>h</sup> on	‘p.c.’
t	t <sup>h</sup> , t	tako	→	t <sup>h</sup> ak*o, tak*o	‘octopus’
k	k <sup>h</sup> , k	kinoko	→	k <sup>h</sup> inok*o, kinok*o	‘mushroom’
ts	c*, c <sup>h</sup>	tsubaki	→	c*ipak*i, c <sup>h</sup> ipak*i	‘Tsubaki’
tʃ	c*, c <sup>h</sup>	tʃiNtai	→	c*int*ai, c <sup>h</sup> int*ai	‘rental’

## Word-medial

Japanese	Korean	example			gloss
b	p	waribiki	→	waribik*i	‘discount’
d	t	Noda	→	nota	personal name
g	k	onigiri	→	onikiri	‘riceball’
p	p*, p <sup>h</sup>	suupaa	→	si:p*a:, si:p <sup>h</sup> a:	‘supermarket’
t	t*, t <sup>h</sup>	keetai	→	k <sup>h</sup> e:t*ai, k <sup>h</sup> e:t <sup>h</sup> ai	‘cell phone’
k	k*, k <sup>h</sup>	eki	→	ek*i, ek <sup>h</sup> i	‘station’
ts	c*, c <sup>h</sup>	netsu	→	nec*i, nec <sup>h</sup> i	‘fever’
tʃ	c*, c <sup>h</sup>	yatʃiN	→	jac*iŋ, jac <sup>h</sup> iŋ	‘rent’

(3)

Korean/Japanese	Voiceless stop		Voiceless affricate	
Lax	813	(.27)	22	(.08)
Aspirate	2,174	(.73)	134	(.51)
Tense	1	(.00)	106	(.40)
Totals	2,987		262	

There are some refinements we can make in the data for voiceless adaptations. First, there is a statistically significant ( $p < .0001$ ) difference between native Japanese and Western loans. The aspiration adaptation rate for the latter is 90% and approaches the 100% found for loans transmitted directly from English to Korean. This contrasting behavior implies that speakers can distinguish the source of the loan.

(4)

	Native		Western	
Lax	745	(.32)	68	(.10)
Aspirate	1,555	(.68)	619	(.90)

Second, in native Japanese words the aspiration rate is higher for /t/ than for /k/ ( $p < .0001$ ).

(5)

	Native		Western	
t > Lax	244	(.27)	15	(.09)
t > Aspirate	649	(.73)	156	(.91)
k > Lax	501	(.36)	53	(.10)
k > Aspirate	906	(.64)	463	(.90)

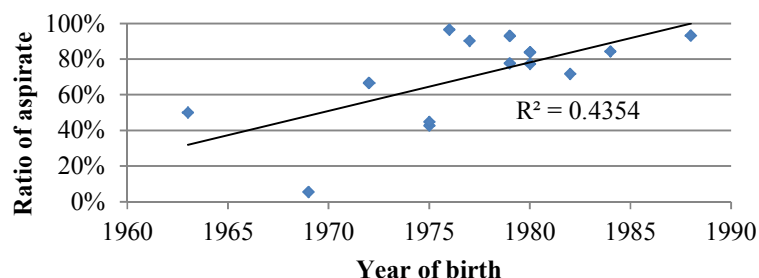
Third, Japanese /ts/ is adapted primarily as Korean tense /c\*/ while /tʃ/ is adapted primarily as aspirated /c<sup>h</sup>/ in native loans.

(6)

	Native		Western	
ts > Lax	2	(.00)	0	(.00)
ts > Aspirate	95	(.38)	37	(.63)
ts > Tense	151	(.62)	22	(.37)
tʃ > Lax	22	(.12)	1	(.01)
tʃ > Aspirate	128	(.69)	120	(.99)
tʃ > Tense	36	(.19)	0	(.00)

Finally, there is a fairly good correlation between the aspiration rate and the age (year of birth) of the speakers, with a higher rate for younger speakers.

(7)



### 3. Phonetic Correlates: Stops

We believe that the different adaptation strategies for voiceless plosives between the Classical and Contemporary loans are elucidated by taking into account the phonetic correlates of the laryngeal contrasts that are likely to be/have been in play in the two periods. There is good reason to believe that VOT was the primary correlate distinguishing the Korean lax vs. aspirated stops in the Classical period. A survey of publications dated until c. 1980 consistently finds long voicing lags for the aspirated stops, while more recent studies, particularly with Seoul speakers, report substantial overlap between these two categories, with an increase in the VOT values for lax stops and a decrease for aspirated ones, as compared to the earlier period. This diachronic trend has also been noted by Nagato (2003), Utsugi (2009), and M-R. Kim (2012).

(8)

VOT (ms)	Lax	Aspirate	Tense
Lisker & Abramson (1964)	30	103	12
Kim, C-W. (1964)	35	93	12
Han & Weitzman (1970)	30	107	7
Hardcastle (1973)	37	113	10
Kagaya (1974)	60	160	15
Park (1982) (k only)	58	116	26
Lee (2000)	53	64	15
Silva (2006) Seoul	70	75	10
Kang & Guion (2008) young	68	72	17
Kang & Guion (2008) older	70	90	16

Particularly relevant here is Kang and Han's (2012) analysis of a 1935 recording of a teacher and his students from an elite Seoul elementary

school reciting short passages from a school reader. They find that VOT is the primary discriminant; and while small F0 differences exist, they are confined to the vocalic region adjacent to the stop release, unlike in contemporary Seoul speech, where F0 differences persist well into the vowel (Jun 1996).

(9)

	VOT (ms)	F0 (Hz, V onset)	F0 (Hz, V mid)
Lax	37	128	123
Aspirate	84	134	126

In sum, the available evidence indicates that during the Classical period the Korean lax vs. aspirated stops were distinguished primarily by VOT and that F0 played a minimal role.

What were the correlates of the Japanese voiced vs. voiceless distinction in the Classical period? The table below shows our measures of a re-cording made prior to 1938 of speakers reading the syllabary and some elementary vocabulary from a Japanese textbook for foreigners (The Society for Teaching Japanese as a Foreign Language 2003). The data indicate a closure voicing (negative VOT) vs. short lag contrast comparable to Spanish or Dutch. There is also an F0 difference at vowel onset as well as breathy voice after voiceless stops.

(10) Mean and St.Dev.

Stop	VOT (ms)	F0 (Hz, V onset)	H1-H2 (dB, V onset)
Voiced	-93 (17.6)	162 (2.7)	
Voiceless	17 (5.2)	184 (3.9)	3.3 (2.4)

In the contemporary period the Japanese voicing contrast in stops has shifted along the VOT dimension with an increased lag for voiceless stops while the closure voicing of voiced stops has either decreased in magnitude or developed a short lag variant.

(11)

VOT (ms)	Voiced	Voiceless
Homma (1981)	-35	25
Sugito (1996)	-58	45
Shimizu (1996)	-80	46
Lee (2000)	-20	38
Riney et al. (2007)		38 (t=20, p=30, k=55)
Takada (2012)	-90 ≈ -60; 0 ≈ 20	
Ogasawara (2011)	-70 ≈ 20	30 ≈ 40
Kong et al. (2012)	10 ≈ 20	10 ≈ 90

We conclude from this survey that during the Classical period the Japanese short-lag voiceless stop was too distant from the Korean long-lag aspirated category to make an aspirated stop an appropriate adaptation. But in the Contemporary period the Japanese intermediate-lag voiceless stop now approaches the overlapping (Seoul dialect) lax and aspirated categories allowing for a dual adaptation. Viewed in this light, the correlation between speaker age and aspiration rate noted in (7) above now makes sense. The higher aspiration rate reflects the decreased VOT value for /p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup>/ in younger speakers. This diachronic perspective also sheds light on the sample of adaptations of Japanese /k/ seen in (12) below. Words higher in the table are ones that are more likely to have come into common usage more recently and tend to show a higher aspiration rate, while loans such as ‘kimono’ and ‘kabuki’ presumably entered Korean in the Classical period (if not earlier) and hence are more likely to retain the original lax adaptation.

(12) Aspiration adaptation rate

彼氏 karesi ‘boyfriend’	.87
婚活 koNkatsu ‘activity to get married’	.79
クロネコ kuroneko ‘delivery service’	.73
携帯 keetai ‘cell phone’	.71
神戸 Kobe	.58
キリン kiriN ‘Kirin beer’	.46
着物 kimono	.40
歌舞伎 kabuki	.28

Another point worth making is that the nature of the Korean speaker’s initial contact with Japanese seems to influence their adaptation strategy. The table below shows the treatment of initial voiceless stops for words in our corpus for two Yanbian speakers.

(13)

Native	YB1	YB2	Western	YB1	YB2
Lax	54	11	Lax	8	5
Tense	0	0	Tense	1	0
Aspirate	4	81	Aspirate	17	45

YB1 received formal classroom instruction in Japanese before coming to Japan while YB2 acquired her Japanese via immersion in Japan. The first speaker follows the conventionalized Classical adaptation style that largely merges voiceless stops as lax while the second speaker has a strong preference for the aspirated adaptation that more likely indicates a phonetically



based mapping. It is notable that both speakers adapt voiceless stops in Western loans primarily as aspirated.

In the Classical period the Japanese short lag voiceless stops would have matched the Korean tense series in VOT, which has consistently maintained a low value throughout both periods. Why wasn't a Japanese voiceless stop adapted as tense? Here we must be more speculative. Voice quality data such as spectral tilt are not provided in the earliest studies of Korean. To try to get a sense of whether this factor extended back into the Classical period, we made an analysis of a sample of the lax vs. tense stops in the tapes accompanying Park (1968). Our results show that voice quality at the onset of the following vowel (H1-H2) effectively distinguishes this contrast, with lax stops being quite breathy and tense stops creaky. Moreover, the analysis of the Japanese voiceless stops in (10) found them to be relatively breathy. We therefore tentatively conclude that voice quality made the Korean tense series a poor choice for the adaptation of Japanese initial voiceless stops. More study of this question is clearly warranted, however.

In sum, during the Classical period neither the Korean aspirated nor the tense series were phonetically similar enough to match the Japanese word-initial voiceless stops, leaving the lax series as the best alternative. But during the Contemporary period the VOT shifts in both languages have brought the aspirated stops close enough to the Japanese voiceless stops to serve as an alternative to the traditional lax adaptation. More conservative speakers continue with the lax adaptation, which has become conventionalized for them and more likely to apply in entrenched vocabulary. (14) summarizes this point.

(14)

	Classical Period			Contemporary Period	
/t <sub>jap</sub> /	Ident-VOT	Ident-VQ	/t <sub>jap</sub> /	Ident-VOT	Ident-VQ
→ t			→ t	√	
t*		*	t*		*
t <sup>h</sup>	*		→ t <sup>h</sup>	√	

#### 4. Phonetic Correlates: Affricates

We recall from section 2 that affricates have a substantial number of tense adaptations while stops have none. Another puzzling finding was that Japanese /ts/ exhibits a 62% vs. 38% bias to the Korean tense adaptation while Japanese /tʃ/ shows an inverse 19% vs. 69% tense-aspirate ratio in native loans. These findings raise two questions. First, why are affricates different from stops and second, why does the alveolar vs. alveo-palatal difference in Japanese translate into a tense vs. aspirate difference in Korean?

A clue to what we believe underlies the tense adaptation of Japanese /ts/ is the finding of Cho et al. (2002) that Korean tense /s\*/ has a higher center of gravity (median energy in the frequency spectrum) than lax /s/. (No data on affricates is provided.) The authors speculate that “the channel between the palate and the tongue necessary for the frication of s\* may be smaller and thus produce a higher velocity jet of air, which, on striking the incisors, would produce higher frequency,” p. 215. Due to its more anterior point of articulation, Japanese /ts/ can be expected to have a higher center of gravity than /tʃ/. As a check, four repetitions each of /tsu/ and /tʃi/ by a male Japanese speaker yielded a mean center of gravity difference of 5683 Hz vs. 4202 Hz when analyzed in Praat.

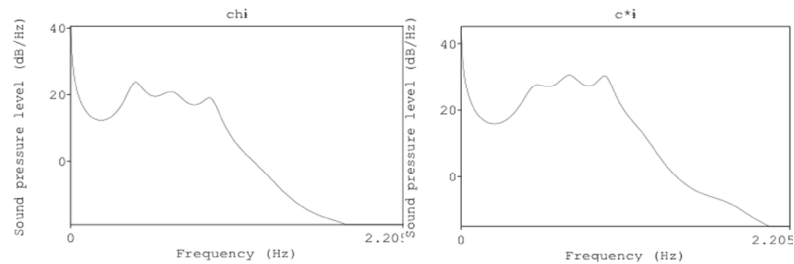
Several other researchers have observed differences in the articulation of tense vs. lax stops and affricates that could produce a difference in the average frequency of frication. Shin’s (1997) EPG study found that Korean tense stops and affricates have the largest contact area among the three laryngeal types as well as the highest convex tongue shape. An MRI investigation by Kim et al. (2005) reports that the tense stop /t\*/ and affricate /c\*/ have maximal tongue blade raising compared to the other two laryngeal categories. Both studies thus suggest that the tense affricates have a more narrow constriction channel that could lead to the higher velocity posited by Cho et al. (2002).

The table (15) below indicates our results from a small pilot study of one female Seoul speaker. The data are based on four repetitions of fifteen words containing the five Korean stops and affricates in three word-initial prevocalic contexts: /a, i, ɨ/. The center of gravity measures were made across the entire VOT period (frication plus aspiration) in Praat with LPC smoothing (16 peaks). Figures in parentheses are standard deviations. The data show a consistently higher center of gravity for the tense segments. Sample spectra of the aspirated vs. tense affricates are also shown in (16).

(15)

cons	fric dur (ms)	center of gr.	t-test (one tail)	prob.
c	89 (19)	4008 (1919)	c vs. c*	.0007
c <sup>h</sup>	100 (9)	4070 (1635)	c <sup>h</sup> vs. c*	.0019
c*	40 (14)	6142 (723)	c vs. c <sup>h</sup>	.7436
s	118 (27)	3722 (1511)	s vs. s*	< .0001
s*	124 (13)	8199 (539)		

(16)



If these data are representative, they suggest that Korean speakers are sensitive to the auditory effects of different frequency distributions in frication and can take this into account when deciding on the appropriate loanword adaptation of an affricate. This hypothesis was anticipated by K-S. Kang (2006), who observed that Korean tense /c\*/ may be substituted for the otherwise expected aspirated /c<sup>h</sup>/ in the adaptation of the alveolar affricates in the loanwords *Mozart* and *Mitsubishi* while a tense adaptation for the alveo-palatal /tʃ/ would be unnatural. She speculates “the informal use of tense affricates for alveolar affricates of L2 could be interpreted as an interesting way of distinguishing the alveolar input from the palato-alveolar that the lax and aspirate affricates of Korean normally stand for,” p. 447.

As a final point, we note that since stops lack any substantial frication, the center of gravity effect is not in play and hence there is no motivation for a tense adaptation for stops.

### 5. Word-Medial Position: Singletons

For the Classical loans Ito et al. (2006) found that in intervocalic position Japanese singleton voiced stops mapped to Korean lax while /t/ and /k/ were adapted as Korean lax /t/ and tense /k\*/, respectively. The former adaptation makes sense in terms of closure duration and voicing. Relativized to the length of the preceding vowel, Japanese voiced stops (.31) match best to Korean lax (.37) rather than aspirated (.65) and tense (.70). As for the singleton voiceless stops, the relatively long VOT measures reported by Lisker and Abramson (1964) and Kagaya (1974) explain why aspiration is not chosen, just as in word-initial position. The former finds VOT's of 75 ~ 93 ms and the latter 70 ~ 140 ms. However, the lax adaptation of /t/ in the face of the tense adaptation of /k/ remains mysterious. Ito et al. (2006) consider various possible explanations; we have nothing to add to their speculations here.

For the Contemporary loans we find that Japanese voiced stops continue to be adapted as lax but singleton voiceless stops now vary primarily be-

tween tense and aspirated. There is moreover a dialect difference, with more aspirated adaptations for the South Korean speakers compared to our Yanbian consultants. Finally, in both dialects /t/ has a higher aspiration rate than /k/ as well as a greater proportion of lax adaptations. The table below summarizes the medial correspondences in our data.

(17)

	Japanese	Lax	Tense	Aspirate
South Korean	t	52 (.09)	169 (.28)	387 (.63)
	k	47 (.02)	1,210 (.54)	1,002 (.44)
Yanbian	t	78 (.25)	132 (.43)	97 (.32)
	k	47 (.04)	845 (.78)	197 (.18)

Phonetic investigations that provide VOT data for both initial and medial position are limited. The table below shows VOT measures for Japanese based on Homma (1981) and Ogasawara (2011). In both studies the medial values are about one-half the initial ones.

(18)

Homma	initial	medial	Ogasawara	initial	medial
p	27	7	p	30	11
t	32	16	t	29	13
k	53	24	k	42	23

We are not aware of any recent investigations of the phonetic properties of word-medial Korean stops. The table below shows our VOT measures for two female South Korean speakers based on two repetitions of six different words for each stop consonant.

(19)

	p*	t*	k*	p <sup>h</sup>	t <sup>h</sup>	k <sup>h</sup>
Seoul	10	9	10	16	15	31
Kyungsang	8	11	16	29	27	27

They indicate a much shorter VOT for the aspirated series compared to that reported by Lisker and Abramson (1964) and Kagaya (1974) and suggest the aspirated category has reduced its VOT for younger speakers, just as in word-initial position. There is, however, no merger with the lax series, which is typically voiced in intervocalic position. The shorter medial VOT brings the Korean aspirated category within the range of the Japanese voiceless stops and is presumably responsible for the increased aspiration adaptations compared to the Classical loans. Also, it is well known that velars tend to have longer voicing lags compared to labial and alveolars cross-

linguistically. If this asymmetry also holds for word-medial position in Korean then it could help to explain why velars have a smaller rate of aspiration adaptation in both dialects.

Finally, we collected VOT data from six of our Yanbian consultants. The values for medial position are shown below. They clearly indicate higher values than those of our two South Korean speakers. If this represents a true dialect difference, it could help to explain why the word-medial aspiration adaptation rate for Japanese voiceless stops is lower for our Yanbian speakers. Their aspirated stops are more far-removed from the short-lag Japanese compared to the South Korean and hence make poorer correspondents.

(20)

	p <sup>h</sup>	t <sup>h</sup>	k <sup>h</sup>
Yanbian	62	54	69

Also worthy of note in this regard is the finding of Jin (2012) that Yanbian subjects reliably label Japanese word-initial voiced vs. voiceless stops but in word-medial position Japanese /t/ had a significantly higher error rate (38%) compared to /k/ (13%).

**6. Word-Medial Position: Gemimates**

Ito et al. (2006) find only 32 examples of Japanese voiceless gemimates in their corpus of Classical loanwords and all are adapted as Korean tense singletons. The table below summarizes our findings for the adaptation of Japanese voiceless geminate stops in the Contemporary loans.

(21)

		C*	C <sup>h</sup>	CC*	t-C*	CC <sup>h</sup>	t-C <sup>h</sup>	Totals
Native	kk	14	3	43	23	9	9	101
	pp	2	0	5	28	0	1	36
	tt	0	0	23	0	9	0	32
	Totals	16	3	71	51	18	10	169
Western	kk	18	37	24	7	60	9	155
	pp	4	22	3	3	18	6	56
	tt	25	14	63	0	23	0	125
	Totals	47	73	90	10	101	15	336

They evidence greater faithfulness to the Japanese source in that they are overwhelmingly realized as gemimates (90%) in native loans as either identical coda-onset sequences (CC) or as a coda alveolar stop-onset (t-C), in which the former often assimilates in place to the following. In Western loans the geminate rate is lower (65%) and presumably indicates competi-

tion with a direct adaptation from English, which would lack a geminate in the input source. Conversely, the Western loans show a greater percentage of aspirated adaptations compared to native loans: 56% vs. 18%. On the assumption that the Japanese phonetic realization of a geminate does not differ between a native Japanese word and a Western loan, these striking differences must be explained as competition with the direct mapping of English words into Korean, giving rise to hybrid formations (Kang et al. 2009): cf. native  $\text{nat.t}^*\text{o} \approx \text{nat.t}^*\text{o}$ : < Japanese *nattoo* ‘fermented soybeans’ vs.  $\text{k}^{\text{h}}\text{at.t}^*\text{o} \approx \text{k}^{\text{h}}\text{at.t}^{\text{h}}\text{o} \approx \text{k}^{\text{h}}\text{a.t}^*\text{o}$  < Japanese *katto* ‘cut’ (cf. direct English > Korean  $\text{k}^{\text{h}}\text{a.t}^{\text{h}}\text{i}$ ).

Among the three Korean laryngeal categories, why are tense adaptations favored for Japanese geminates? The primary phonetic correlate of the Japanese geminate stop is closure duration. We reproduce some key references below. While there is considerable variation in the geminate duration across studies, the ratio to the singleton is on average well above twice as long.

(22)

duration (ms)	singleton	geminate	ratio
Homma (1981)	55	160	2.90
Kawahara (2006)	60	129	2.15
Idemaru & Guion (2008)	69	206	2.99

The closure duration of the Korean ternary laryngeal contrast in word-medial stops is surveyed below. The tense consonants are between two and three times as long as the lax ones and fall within the range of the Japanese geminates. Thus, the tense series is the best match for Japanese geminates in terms of the segment-internal cue of closure duration.

(23)

duration (ms)	Lax	Aspirate	Tense
Silva (1992) (p)	48	84	123
Han (1996) (p,t)	56		140
Kim et al. (2011)	74	139	169

One other finding worthy of note is that Idemaru and Guion (2008) report that for one of their voice quality measures (H1–A1), Japanese vowels are significantly more creaky after geminates than after singletons. This property could also independently encourage the Korean tense adaptation of Japanese geminates and help to explain why this laryngeal state is favored even when the consonant is realized as a coda-onset geminate in the Korean loans and thus a matching for the constriction duration is obtained.

### 7. Summary and Conclusions

In this paper we compared the loanword adaptation of Japanese voiced vs. voiceless stops and affricates in initial and medial position with regard to the Korean lax-tense-aspirated distinction across two time periods referred to as Classic and Contemporary. Our study was prompted by the discrepancy observed by Shinohara et al. (2011) between productive loanword correspondences, where Japanese initial voiced and voiceless plosives are merged as Korean lax, and speech perception experiments in which Korean speakers readily distinguished the Japanese sounds as lax vs. aspirated. We hypothesized that Korean speakers whose contact with Japanese is more direct and sustained would distinguish these categories in loanwords based on their phonetic correlates. Our hypothesis was supported through the collection and analysis of a corpus of Japanese loanwords used by Korean speakers residing in Japan who use both languages on a daily basis. Our major result is that for many such speakers voiced vs. voiceless stops in loanwords are now distinguished as lax vs. aspirated word initially and as lax vs. aspirated/tense word-medially. We attributed this difference to a change in the VOT correlates of the contrasts in both languages. In the Classical period Korean long lag aspirates were too disparate from the Japanese short lag voiceless stops, blocking an aspiration adaptation. We suggested that a tense adaptation was inhibited because of a mismatch in voice quality (relatively breathy voiced Japanese vs. creaky voiced Korean). The voiceless > lax correspondence was conventionalized and persists for speakers whose contact with Japanese is minimal or based initially on written sources. But for speakers with more intimate contact with Japanese, a difference emerges based on presumed judgments of phonetic similarity. A second finding was that unlike stops, affricates have a significant number of tense adaptations but they are largely confined to Japanese /ts/. We attributed this result to the higher frequency of frication for /ts/ vs. /tʃ/ and tied it to articulatory differences reported in the literature on Korean phonetics where tense affricates and fricatives have a narrower oral constriction that increases the velocity of airflow. Third, for medial position we observed a substantial number of aspirate adaptations that were absent during Classical period. This is also attributed to a shift in VOT that has brought the Korean aspirated category closer to Japanese voiceless stops. This hypothesis was supported by dialect differences and differences in place of articulation with respect to VOT. Finally, Japanese geminate stops are more faithfully realized with coda-onset closure sequences in the Contemporary period compared to singleton geminates in the Classical period. In both periods the tense laryngeal category predominates. We connected this to the longer clo-

sure duration of tense stops and more speculatively to creakiness in the vowel following a Japanese geminate.

Tasks for future research include substantiating the phonetic correlates for the laryngeal contrasts with a larger number of speakers. This is particularly critical for the H1-H2 difference proposed to explain why Japanese short lag voiceless stops were not adapted as tense in the Classical period. For the subjects in Shinohara et al.'s (2011) study, French short lag voiceless stops were identified as tense. Our speculation was that Japanese voiceless stops were relatively breathy and thus were better matched by the Korean lax than the creaky tense stops. But do French and Japanese really differ in this way?

The more general interest of this research is based on the observation that the same phonological contrast may have different phonetic correlates depending on language or even dialect. Which correlates are primary and which play secondary, enhancing roles? Can these roles change over time? Our results support a typology in which the internal cues of VOT and closure duration are the most important while the external cues of F0 and Voice Quality in the following vowel come into play when the internal cues are not decisive. In this regard it is interesting that although F0 has become the primary difference for younger Seoul speakers due to the merger of VOT for the lax and aspirated stops, this development has not so far led to a reorganization of the phonological contrast. When placed in medial position in a compound or phrase, the lax and aspirated stops remain distinct, even for the youngest speakers. Will the contrast eventually turn into a tonal distinction, as has happened so many times elsewhere in Asia?

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