

Analogy and Lexical Restructuring in the Development of Nominal Stem Inflection from Middle to Contemporary Korean

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Abstract This paper tries to elucidate the asymmetric distribution of stem-final coronal obstruent codas (stem-final coronal, SFC) in the nouns of Contemporary Korean (CK) by documenting their historical development from Middle Korean (15-16th C, MK). Examination of historical data suggests that there was an intermediate stage in Korean in which [s] was far and away the most prevalent phonetic value, and thus triggered analogical extension to other SFC's through a stage of free variation between [s] and [t]. Subsequent developments involving the completion of the occlusivization of [s] obscure this state of affairs. Two other factors which resulted in the biased distribution of SFC's in CK are also pointed out: (1) the simplification of SFC's oppositions in polysyllabic words based on their near-complementary distribution, (2) the type-frequency of MK SFC's which takes into account compound words as well as simplex (= non-compound) words.

Keywords Analogy, Frequency, Compound-productivity, Middle Korean

1 Introduction

In Standard Contemporary Korean (CK) nouns, five stem-final coronal obstruent codas (cf. 'jong-seong') are distinguished: /-t/, /-t^h/, /-tʃ/, /-tʃ^h/, and /-s/. As a rule, these stem-final coronals (SFC) are realized faithfully by being parsed as a syllable onset when followed by a vowel-initial suffix, whereas they are all neutralized to an unreleased stop [t̚] before consonants or in word-final position. (In Korean, nouns may occur in unaffixed form.)

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(1) Korean coronal coda alternations

$/-t/, /-t^h/, /-tʃ/, /-tʃ^h/, /-s/ \rightarrow [t], [t^h], [tʃ], [tʃ^h], [s] / __ V$
 $/-t/, /-t^h/, /-tʃ/, /-tʃ^h/, /-s/ \rightarrow [t^{\text{̚}}] / __ C, \#$

However in actuality, many suffixed forms before a vowel show different realizations from the underlying codas. Although the SFC's are realized faithfully in conservative pronunciation, they appear with innovated realizations in more casual pronunciations. (2) shows this tendency (Albright 2008). In innovative forms, the original SFC's distinctions tend to be replaced, mainly by $/-s/$.

(2) Conservative and innovated forms in CK SFC's

	Isolation	Conservative, acc.	Innovated, acc.
<i>nat</i> 'grains'	$nat^{\text{̚}}$	$nat\text{-}il$	$nat\text{-}il \sim nas\text{-}il$
<i>nat^h</i> 'piece'	$nat^{\text{̚}}$	$nat^h\text{-}il$	$nat^h\text{-}il \sim natʃ^h\text{-}il \sim nas\text{-}il$
<i>natʃ</i> 'daytime'	$nat^{\text{̚}}$	$natʃ\text{-}il$	$natʃ\text{-}il \sim nas\text{-}il$
<i>natʃ^h</i> 'face'	$nat^{\text{̚}}$	$natʃ^h\text{-}il$	$natʃ^h\text{-}il \sim nas\text{-}il$
<i>nas</i> 'sickle'	$nat^{\text{̚}}$	$nas\text{-}il$	$nas\text{-}il$

The fact that the SFC's change to $/-s/$ only takes place in nouns and that verbal stems are never involved suggests that the change is not a purely phonetic process but an analogically motivated one (Ko 1989).¹ This phenomenon, including a peculiar loanword adaptation pattern which maps English $/-t/$ and $/-d/$ to Korean $/-s/$ (e.g. $t^h i . k^h e t^{\text{̚}}$, $t^h i . k^h e . s \text{-} il$ 'ticket') have been discussed from various perspectives in the recent literature, such as anti-correspondence constraints (Kang 2005, Davis and Kang 2006), markedness (Kenstowicz and Sohn 2001), type/token frequency (Albright 2002, 2008, Kang 2003, 2005, 2007, Jun 2007, Jun and Lee 2007), confidence/informativeness (Albright 2002, 2008), phonetic naturalness (Kang 2005, 2007), and homophony/functional load (Silverman to appear). The most striking fact that emerges from these discussions is the distribution (type-frequency) of the SFC's. As pointed out by Albright 2008, the SFC's in CK nouns show extremely biased distribution. (3) is the data from Albright 2008, which is based on the Sejong project corpus (<http://www.sejong.or.kr>).

¹ An alternative view is that the change to $/-s/$ originated from the palatalization of $/-t/$ to $[tʃ]$ in the nominative, which became fricativized to $[s]$ and spread to other forms in the same paradigm by leveling (Kwak 1984, Choi 1986, Paek 1992, Kim 2001, and others). However this analysis can be problematic in that Middle Korean $/-t/$ and $/-ts/$ do not necessarily show the same historical development, as discussed below.

(3) The SFC's distribution in conservative pronunciations (Albright 2008)

/-t/ : 1

/-t^h/ : 113

/-tʃ/ : 17

/-tʃ^h/ : 160

/-s/ : 375

/-s/ is the dominant coda (375), followed by /tʃ^h/ (160) and /-t^h/ (113). Compared with these three codas, /-t/ and /-tʃ/, which are traditionally assumed to be more 'unmarked' consonants than /-t^h/ and /-tʃ^h/, are highly underrepresented (1 and 17 respectively). This fact can support the idea that an analogical process is involved rather than a contextual sound change.

The correlation between analogical change and type-frequency is discussed in previous literature (Bybee 1995 and references cited, Albright to appear, Ito 2008b). A generalization emerging from the literature is that higher type-frequency classes tend to attract words from lower type-frequency classes. Thus the discussion about the variation of SFC's in the recent literature has focused on the correlation between the Korean analogical changes (mainly to /-s/) and the frequency distribution, which is largely biased to /-s/.

Given this peculiar distribution, the following questions arise: did Middle Korean (15-16th C, MK²) have this biased distribution as well? If not, how was this distribution in CK established? The present paper tries to answer these questions by documenting the historical development of nominal stem-final codas from MK. Examination of historical data suggests that the following three factors resulted in the biased distribution of SFC's in CK.

- a. There was an intermediate stage in Korean in which [s] was far and away the most prevalent phonetic value, and thus triggered analogical extension to other SFC's through a stage of free variation between [s] and [t]. Subsequent developments involving the completion of the occlusivization of [s] obscure this state of affairs.
- b. MK SFC's had an asymmetric distribution in polysyllabic words in that only /-ts/ and /-s/ could appear and that /-ts/ and /-s/ were in near-complementary distribution based on the preceding nucleus. Since no contrasts were lost upon the merger and no homophones were created, the change from /-ts/ to /-s/

² Strictly speaking, this corresponds to Late Middle Korean, the language of the first two hundred years of the Joseon dynasty. Early Middle Korean, on the other hand, is the language of the Koryeo dynasty (Lee 1972, Lee and Ramsey 2000).

(simplification of SFC's opposition) could easily happen. This fact can support the analysis of Silverman (to appear).

- c. If we take into account the SFC's distribution of compound words as well as simplex (= non-compound) words, it turns out that /-t/ was in fact the smallest class due to its low productivity in compounds, which could potentially lower the type-frequency of /-t/. This may explain the dispreference for /-t/ in analogical/historical change in Korean.

This paper is organized as follows. In 2 we first review the SFC's distribution in CK and show the default status of /-s/. In 3 we track the historical development of the SFC's and show tendencies in their evolution. In 4 we examine the factors that motivated the historical changes. 5 is a summary and conclusion.

2 The SFC's distribution in CK

As mentioned above, the SFC's in CK have a peculiar asymmetric distribution. For the purpose of comparison with Albright 2008,³ we show the data of our count of native nouns from *Pyojun kugeo taesajeon* [Standard Korean dictionary, PKT] (Kungnip kugeo yeonguwon (Ed.), 1999, Seoul: Tusandong'a) in (4), which excludes dialectal/historical data. Although the total number of words is much larger in PKT, the overall distributional patterns are basically the same as the Sejong data reported in the Albright (2008) study.

³ These data have some problems. First, they contain Western loans (Jun 2007). Most of them have been introduced into Korean quite recently and hence should be excluded, at least when examining the historical evolution. Second, the count of /-s/ seems to include /-ps/, /-ls/, etc. which are distinct stem-final codas from /-s/. Third, some words with /-s/ are the combination of open syllable noun + genitive *s* (e.g. *pa.tas* < *pa.ta* 'sea' + *s*), which are used neither in isolation forms nor in inflectional forms.

(4) The SFC's distribution in CK nouns

SFC's	Albright (2008)		PKT	
t	1	(0 %)	1	(0 %)
t ^h	113	(17 %)	412	(16 %)
tʃ	17	(3 %)	97	(4 %)
tʃ ^h	160	(24 %)	690	(26 %)
s	375	(56 %)	1,424	(54 %)
Totals	666		2,624	

Both data sets contain compound as well as simplex words. In Korean, the percentage of compound words occupying the lexicon is quite high.⁴ (5) shows the difference between simplex words and compound words, based on PKT.⁵

(5) The SFC's distribution of simplex and compound words in CK

SFC's	Simplex		Compound		Totals	
t	1	(1 %)	0	(0 %)	1	(0 %)
t ^h	17	(12 %)	395	(16 %)	412	(16 %)
tʃ	8	(6 %)	89	(4 %)	97	(4 %)
tʃ ^h	14	(10 %)	676	(27 %)	690	(26 %)
s	103	(72 %)	1,321	(53 %)	1,424	(54 %)
Totals	143		2,481		2,624	

As shown in (5), 2,481 out of 2,624 entries are compound words. The number of compound words compared with simplex words is especially high in /-t^h/ and /-tʃ^h/, which is due to several compound-productive nouns such as *k*otʃ^h* 'flower', *pitʃ^h* 'color/light', *pat^h* 'field', which occupy the second (head) position in many compound

⁴ In Korean, it is relatively easy to distinguish compound words from simplex words. First, compounds often have clear semantic similarities with the corresponding simplex words. E.g.) *na.p^hal-k*otʃ^h* 'morning glory' < *na.p^hal* 'trumpet' + *k*otʃ^h* 'flower', *na.ra-k*otʃ^h* 'national flower' < *na.ra* 'country' + *k*otʃ^h* 'flower', *tal-pitʃ^h* 'moonlight' < *tal* 'moon' + *pitʃ^h* 'color/light', *mul + pitʃ^h* 'sky-blue' < *mul* 'water' + *pitʃ^h* 'color/light'. Second, the orthography of compounds basically follows the spelling of the simplex words which constitute them. E.g.) *kəʔ^h-os* 'overalls' < *kəʔ^h* 'surface, outer' + *os* 'clothing', although its actual pronunciation is [kə.doʔ] due to the neutralization in word boundary and the subsequent liaison.

⁵ Semi-compound words, which contain a bound form as the second member, are treated as compound words in my study. In many cases these bound forms in semi-compound words were free forms in MK. E.g.) *tʃuŋ.kis* 'a kind of pillar' < *tʃuŋ* 'middle' + *kis* 'pillar'. (*kis* is a CK bound form which was a free form *kit* in MK.) Similarly classifiers/counters, which are bound forms as well, are counted as constituting compound words here. E.g.) *-kas* 'ten dry foods', *-t^hos* 'a hundred sheets of dried laver'.

words. In any case, if we restrict attention to only the distribution of simplex words, the percentage of /-s/ goes up to 72 %, which may indicate the default status of /-s/ in this context. (As to the distribution of all stem-final codas in CK monosyllabic words, see Ito 2007.)

Another striking distributional feature in CK is that the ratios of each SFC are quite different between monosyllabic and disyllabic nouns, as shown in (6). (As far as the data in PKT is concerned, simplex words of more than two syllables seem not to exist.)

(6) Ratios of each CK SFC based on syllable numbers in simplex words

SFC's	Monosyllabic		Disyllabic	
t	1	(1 %)		(0 %)
t ^h	15	(16 %)	2	(4 %)
tʃ	6	(6 %)	2	(4 %)
tʃ ^h	14	(15 %)		(0 %)
s	60	(63 %)	43	(91 %)
Totals	96		47	

In monosyllabic nouns all five SFC's can appear, whereas in disyllabic words only three SFC's are available, and 91 % of them appear with /-s/. Given that the disyllabic words which appear with SFC's other than /-s/ are lexically idiosyncratic,⁶ we can say that /-s/ is the only permissible coda in CK disyllabic nouns.⁷ The fact that semi-compound words and classifiers/counters, which we treat as compound words in this study (see footnote 5), show a higher percentage of /-s/ (82 %) than monosyllabic simplex words (63 %) may be interpreted as part of the same tendency, since they always make polysyllabic words and the second member (a bound form) does not have an independent free form that could prevent the coda from changing to /-s/.

Thus, the SFC's distribution as well as the analogical changes to /-s/ in CK suggest the default status of /-s/, whatever the reason for it is. It may even be safe to say that virtually all words with a SFC appear with /-s/, and the words with underlying

⁶ The CK disyllabic nouns which appear with other than /-s/ are: *ka.ratʃ* 'bristle-grass', *to.ratʃ* 'balloon-flower', *ko.pu^h* 'outside fold of a bolt of cloth', *pa.k*at^h* 'outside'; *pa.k*at^h* 'outside' was probably a compound in MK: *pa.k*at^h* < *pask* 'outside' + *kjə^h* 'side'; *ka.ratʃ*, *to.ratʃ*, and *ko.pu^h* are the truncations of *ka.ra.tʃi*, *to.ra.tʃi*, and *ko.pu.t^haj.i*.

⁷ Similar restrictions due to syllable number are observed in contemporary Korean dialects: in stems of four or more syllables of the North Kyungsang dialect, accent ceases to play a distinctive role and a default penultimate accent is assigned as a rule (Kenstowicz and Sohn 2001). Similarly in Yanbian Korean dialect, which is spoken in north-eastern China, longer nouns tend to be restricted to either penultimate or final accent classes (Ito 2008 a).

codas other than /-s/ are lexical exceptions which are listed in CK grammar (Kang 2006).

Given this state of affairs for the contemporary language, the question arises as to what was the SFC's distribution in MK. Was /-s/ the most prevalent default coda as in CK? In the next section we examine the MK data and its historical development to CK.

3 Historical development

First we examine the SFC's distribution in MK. (7) shows the SFC's distributions in simplex words in MK, along with the CK data. The MK data was collected by the author from more than 20 MK original book-length texts as well as Yu, Changdon (1964), *Ijoeo sajeon* [Lee dynasty language dictionary], Hangeul hakhoe (1992), *Urimal keunsajeon* [Korean language dictionary] and various indexes (Fukui 1985, Shibu 1990, Cho 2005). The words whose codas are not clearly attested due to the syllable-final neutralization (see below) are not included here. Note that CK [tʃ] and [tʃʰ] are reconstructed as [ts] and [tsʰ] in MK respectively. The palatalization in these affricates is assumed to have happened in the transitional period between the 17th and the 18th C (Lee 1972).

(7) The SFC's distributions in MK and CK

SFC's	MK	CK
t	14 (14 %)	1 (1 %)
t ^h	12 (12 %)	17 (12 %)
ts / tʃ	21 (21 %)	8 (6 %)
ts ^h / tʃ ^h	19 (19 %)	14 (10 %)
s	34 (34 %)	103 (72 %)
Totals	100	143

Unlike CK, which shows a large asymmetry in the SFC's distribution, MK did not show such an extreme distribution, although /-s/ was still the predominant class (34 %), as in CK. Also, /-t/ and /-ts/ were not much smaller classes than other SFC's in MK, which occupied 14 % and 21 % of the SFC's, respectively. In fact, /-ts/ was the second largest class in MK. In spite of the fact that the attested MK words comprise only 70 % of the inventory of CK words (= 100/143), it is odd that the

number of /-t/ and /-ts/, which were not clearly weaker classes in MK, have dramatically decreased in CK (/t/: 14 → 1, /ts/: 21 → 8), compared to /t^h/ and /ts^h/.

What are the origins of each SFC in CK? In (8) I present the correspondences of SFC's between MK and CK in all CK words which have MK cognates. The words which have become obsolete in CK are not included in (8). 'Stability' is calculated by the number of regular correspondences/total number. For example, the stability of MK /-t/ is 8 % (= 1/12).

(8) Correspondences of SFC's between MK and CK

MK/CK	t	t ^h	tʃ	tʃ ^h	s	Totals	Stability
t	1		2		9	12	8 %
t ^h		13		1	3	17	76 %
ts		1	3	2	13	19	16 %
ts ^h		5		5	5	15	33 %
s				1	27	28	96 %
Totals	1	19	5	9	57	91	

(9) Examples

- a. MK /-t/: *nat* 'grain' > *nat*, *put* 'writing brush' > *pus*, *kat* 'hat' > *kas*, *mot* 'nail' > *mos*, *pit* 'debt' > *pitʃ*
- b. MK /-t^h/: *pat^h* 'field' > *pat^h*, *mit^h* 'bottom' > *mit^h*, *sat^h* 'mat made of reed' > *sas*
- c. MK /-ts/: *nats* 'daytime' > *natʃ*, *tsjəts* 'milk' > *tʃəʃ*, *kots* 'flower' > *k*otʃ^h*, *i.uts* 'neighbor' > *i.us*, *hΛ.ots* 'unpaired thing' > *hot^h*
- d. MK /-ts^h/: *pits^h* 'color/light' > *pitʃ^h*, *nΛts^h* 'face' > *natʃ^h*, *kəts^h* 'surface, outer' > *kəʃ^h*, *tsits^h* 'feather' > *kis*
- e. MK /-s/: *os* 'clothing' > *os*, *mos* 'pond' > *mos*, *pə.sʌs* 'mushroom' > *pə.səs*, *os* 'lacquer' > *otʃ^h*

The tendencies in the historical development that can be observed in (8) are summarized in (10).

(10) Tendencies in historical development

- a. MK /-t/ mostly changed to CK /-s/.
- b. MK /-ts/ either remained as CK /-tʃ/ or tended to change to /-s/. (There was an independent diachronic of palatalization /-ts/ > /-tʃ/.)
- c. MK /-ts^h/ either remained as CK /-tʃ^h/ or changed to /-s/ or /-t^h/. (Also there was an independent diachronic of palatalization /-ts^h/ > /-tʃ^h/.)

- d. MK /-t^h/ is relatively stable.
- e. MK /-s/ is the most stable, but CK /-s/ contains many examples which derived from other SFC's.
- f. In general, the relative stability of MK SFC's is: /-s/ > /-t^h/ > /-ts^h/ > /-ts/ > /-t/. In fact, most of the historical changes follow this ranking: there is virtually no case of a reverse change, such as MK /-t^h/ → CK /-tʃ/, MK /-ts^h/ → CK /-tʃ/, etc.

The stability in historical development from MK to CK is not straightforwardly a mirror image of the frequency distribution in (7). In particular, the fact that MK /-t/ almost completely changed to CK /-s/ in spite of the fact that it was not a markedly smaller class than other SFC's in MK is contrary to our expectation, based on the general tendency for analogical changes to affect words drawn from the lower type-frequency class first. Also we may say that /-s/, which occupied 34 % in MK simplex words, is not obviously large enough to attract the words from other classes. In order to explain these apparent problems, we have to take into account the following factors. First, the existence of the two neutralized codas [t] and [s] which merged later in the historical development, second, the simplification of SFC's distribution in polysyllabic words, and third, the SFC's distribution of both simplex and compound words. These factors are discussed in the next section.

4 Causes of historical change

4.1 Merger of the two neutralized codas

In Old Korean (the language of Silla), /-t/, /-s/ and /-ts/ were clearly distinguished in syllable-final position (before pause). On the other hand in the 15th C, there were only two neutralization outcomes [t] and [s]. (It is unclear whether [t] was released or not in MK.) The former is the result of neutralization of /-t/, /-t^h/, whereas the latter is the neutralization of /-ts/, /-ts^h/, /-s/. The loss of the distinction between [-ts] and [-s] represented a change that had taken place after the 13th C (Lee 1972, Lee and Ramsey 2000).

(11) MK SFC's neutralizations

$$\begin{aligned} & /-t/, /-t^h/ \rightarrow [t] / __C, \# \\ & /-ts/, /-ts^h/, /-s/ \rightarrow [s] / __C, \# \end{aligned}$$

(12) Examples

	Isolation	Inflection
<i>mot</i> ‘nail’	mot	mot-i ‘nail + nominative’
<i>mit^h</i> ‘bottom’	mit	mit^h-ij ‘bottom + locative’
<i>kots</i> ‘flower’	kos	kots-ʌl ‘flower + accusative’
<i>pits^h</i> ‘light’	pis	pits^h-ʌn ‘light + topic’
<i>mos</i> ‘pond’	mos	mos-ʌl ‘pond + accusative’

The distinction between coda [t] and [s] began to be confused in the later 16th C, and the choice of [t] or [s] in syllable-final position was quite arbitrary in the texts of the 17th C (i.e. the same word could appear with either [t] or [s]). In the 18th C, the neutralized coda was almost uniformly written as -s, although it is assumed that the actual pronunciation of the merged coda was [t] (Lee 1972). (13) shows the neutralized codas in each of three stages. The situation from the later 16th C to the 17th C probably indicates free variation.

(13) Merger of [t] and [s]

	/-t/, /-t ^h /	/-ts/, /-ts ^h /, /-s/
15 th -16 th C	[t]	[s]
later 16 th -17 th C	[t] ~ [s]	
18 th C	[t]	

In the analogical changes affecting CK nouns, the base is assumed to be the isolation form, which neutralizes the relevant underlying codas and whose frequency is much higher than other inflectional forms (Ko 1989, Kenstowicz 1996, Hayes 1998, Albright 2002, 2005, 2008, Kang 2003, 2005, and others). Historical changes of the SFC’s can be explained the same way: through the merger/confusion of [t] and [s] which started in the later 16th C, it became theoretically possible for any of the five coronal codas to restructure as any SFC. (Until the merger/confusion started, the analogical change from /-t/, /-t^h/ to /-ts/, /-ts^h/, /-s/ or the reverse was impossible because stops and sibilants had distinct codas [t] and [s].)

Based on this development, Ko (1989) analyzes the (historical) change from /-t/ (and /-t^h/, /-ts/, /-ts^h/) to /-s/ as follows (slightly modified by the author):

(14) Analysis by Ko (1989)

- a. Merger: As a result of merger [s] > [t] in syllable-final position, an alternation

between [t] (as a coda) and [s] (as an onset) started to appear.

- b. Lexical restructuring: Because of the strong independence of isolation forms for nouns, original /-s/ was reinterpreted as underlyingly /-t/.
- c. Rule inversion: The phonological rule (/s/ → [t] / ____ {C, #}) was reinterpreted as the inflectional rule (/t/ → [s] / ____ {particle V}).
- d. Extension: Based on the same neutralized coda [t], the inflectional rule (14c) was extended to the original /-t/, which thus started to appear with [s] before a vowel-initial particle. The same is true for /-t^h/, /-ts/, /-ts^h/.

There is no doubt that the merger [s] > [t] is involved in the historical/analogical change of the SFC's in some way, but how the merger could motivate the analogical changes has to be explained. As mentioned above, given that the neutralized coda of all SFC's appeared with the same phonetic value [t] after the [s] to [t] merger which started in the later 16th C and was probably completed by the 18th C, original underlying codas could have changed to any coronal coda obstruent, not just to /-s/. As to the fact that the actual historical change in the SFC's is not from /-s/ to /-t/ but from /-t/ to /-s/, Ko (1989) conjectures that this is because nominal stem-final /-s/ was more frequent than /-t/, but he does not provide any actual data counts to support this idea.

Based on our data, the ratio of /-s/ was relatively higher in MK simplex words (34 %), which may have resulted in the restructuring to /-s/, as Ko (1989) expected. However, the fact that /-s/ was an extremely strong attractor in the lexical restructuring can be explained by other factors as well.

We start by examining the situation before the merger ([s] > [t]) took place. Until that merger happened, /-s/ and /-t/ were the only codas which could faithfully appear in syllable-final position. That is, people had more opportunities to hear [s] and [t] than [t^h], [ts], [ts^h], which could appear only before a vowel-initial suffix.

On the other hand, the neutralized codas [s] and [t] themselves had quite different type-frequency. In MK texts, some morphemes are attested only as an isolation form. Their morphophonemic codas are unknown in this case: 'T' and 'S' indicate the codas of these words: 'T' represents /-t/, /-t^h/, and 'S' represents /-ts/, /-ts^h/, /-s/. (15) shows the SFC's distribution in MK words including /-T/ and /-S/ from our data.

(15) The SFC's distribution in MK including /-T/ and /-S/ (simplex words)

SFC's	MK		
t	14	}	[t]: 33 (24 %)
t ^h	12		
T	7		
ts	21	}	[s]: 107 (76 %)
ts ^h	19		
s	34		
S	33		
Totals	140		

Based on the distribution in (15), it turns out that among the two neutralization patterns, [s] appeared in much higher ratio than [t]: 76 % vs. 24 %. (In actuality MK stem-final codas /-sk/ and /-z/ appeared with [s] in syllable-final position, and hence the ratio of [s] was actually higher than 76 %.) Thus as a whole, /-s/ ([s]) was the coronal coda which Korean people heard most frequently in two senses:

- a. Underlying /-s/ was the most frequent SFC.
- b. The surface neutralized coda (syllable-final phonetic value) [s] was more frequent than [t] by a factor of three to one.

Given this, we assume the reason why /-s/ attracted other SFC's the most historically was as follows. There was an intermediate stage in Korean in which [s] was far and away the most prevalent phonetic value, and thus triggered analogical extension to other SFC's through a stage of free variation between [s] and [t]. Subsequent developments involving the completion of the occlusivization of [s] obscure this state of affairs. Also by the time the merger ([s] > [t]) was completed, /-s/ ([s]) had probably acquired default status as the "canonical coronal coda". As to this analogical change to /-s/, the following stages can be postulated (based on the general model in Bermúdez-Otero 2007).

(16) Merger and the extension of underlying /-s/

Stage A «15th-16th C»

- : [t] and [s] were distinguished in syllable-final position. [s] appeared more frequently than [t]. Also the type-frequency of underlying /-s/ was most frequent among the five SFC's.

Stage B «later 16th -17th C»

: The merger [s] > [t] started to happen due to phonetic conditionings, such as reduction (cf. the decrease of audible frication/turbulence in a fricative at the end of the word or before pause, Cho and Giavazzi 2009), which made [s] closer to [t], especially if the latter was unreleased. Alternatively, generalization of Kim's (1971) principle of close articulation might have played a role in forcing [s] to be pronounced as an unreleased coda, by which [s] was no longer distinguishable from [t]. In any case, once the merger ([s] > [t]) started to happen, the path to analogical changes among all five SFC's was open. Given the fact that the choice of [s] or [t] in syllable-final position was quite confused and arbitrary in the texts of this stage in that the same word could appear with either [s] or [t] (Lee 1972), it is assumed that [s] and [t] were essentially in free variation at this stage and thus the change was gradual/gradient, not a sudden merger from [s] to [t]. This gradual change with a stage of free variation between [s] and [t] involved the restructuring of the phonological representation of the SFC's, which took into account the overall higher type-frequency of /-s/ or [s], and hence went mainly toward /-s/.

Stage C «18thC»

: After the confusion in stage B, the merger [s] > [t] was completed, by favoring [t] in this position for the reasons mentioned above. By this stage /-s/ had already acquired default status as the "canonical coronal coda" to the extent that a new phonological generalization emerged: words with a SFC as a rule appear with /-s/. In other words, the neutralized coda was phonologically categorized as /-s/ in this stage, although it was phonetically realized as [t]. This retained some lexical exceptions with other SFC's.

Orthographic convention can support this hypothesis. As mentioned above, in the 18th C the neutralized coda was uniformly written as -s, in spite of the fact that the actual pronunciation is assumed to be [t]. This convention itself suggests that Korean speakers at this stage recognized that the neutralized coronal coda should be categorized as /-s/. While this orthography probably reflected a kind of phonological representation of the neutralized coda, the lexical restructuring to /-s/ may even have been partially influenced by this orthographic convention: by finding that the isolation forms of unknown words are written with -s in texts, people could easily guess that the underlying codas of these words are /-s/.

Thus the extension of /-s/ is not only because /-s/ was the largest class among the

SFC's in MK but also because /-s/ [s] had the overall highest frequency in all the contexts, which eventually made /-s/ the canonical coronal coda through the restructuring process after the [s] ~ [t] merger/confusion.

However this cannot explain why the stability is different among /-t^h/, /-ts^h/, /-ts/, and /-t/. Ko (1989) points out that the change from /-t^h/, /-tʰ/ to /-s/ took place much later than the change of /-t/ to /-s/ (after mid 19th C, cf. Kwak 1984) and attributes this delay or relatively stronger resistance to analogical change to the feature [+tense]/[+aspiration], although he admits that Korean /s/ is rather closer to aspirated consonants /t^h/, /tʰ/ than to /t/, /tʃ/. In 4.2 we explain why the stability rate of /-ts/ is very low (cf. (8)) in spite of the fact that /-ts/ was the second largest class in MK. In 4.3 we discuss the motivation for relative instability of /-t/ compared to /-s/, /-t^h/, and /-ts^h/.

4.2 Near-complementary distribution in polysyllabic words

As mentioned above, in MK /-ts/ was the second largest class which occupied 21 % of the SFC's. In spite of this fact, the stability rate of historical development or transmission for /-ts/ is quite low (16 %), and most words with /-ts/ (13 out of 19) changed to /-s/. How did these irregular changes take place?

This is due to the asymmetric distribution of the SFC's between monosyllabic and polysyllabic words in MK. (17) shows the distribution of MK SFC's, classified as monosyllabic, disyllabic, and trisyllabic words (based on our corpus).

(17) MK SFC's in monosyllabic, disyllabic, and trisyllabic words

SFC's	Monosyllabic	Disyllabic	Trisyllabic	Totals
t	14			14
t ^h	12			12
ts	9	10	2	21
ts ^h	18	1		19
s	23	9	2	34
Totals	76	20	4	100

As in CK, the SFC's distribution in MK was more restricted in longer words. Still in MK, both /-ts/ and /-s/ could appear as a rule, whereas /-s/ is the only permissible SFC in CK.

However in actuality, the distribution of /-ts/ and /-s/ was almost entirely predictable in polysyllables. /-ts/ and /-s/ were in near-complementary distribution, depending on the nucleus before the SFC: when the nucleus was /a/, /o/, /u/, the SFC was /-ts/, whereas when the nucleus was /ʌ/ or /i/, the SFC was /-s/. (/ə/ was an exception: when the nucleus was /ə/, both /-ts/ and /-s/ could appear.) (18) shows some examples.

(18) Nucleus and the SFC's /-ts/ and /-s/ in polysyllabic words

Nucleus	SFC's	Examples
/a/	/-ts/	<i>oj.jats</i> 'plum'
/o/	/-ts/	<i>ta.pots</i> 'mugwort'
/u/	/-ts/	<i>i.uts</i> 'neighbor'
/ʌ/	/-s/	<i>ta.sʌs</i> 'five'
/i/	/-s/	<i>jə.sis</i> 'six'
/ə/	/-ts/ and /-s/	<i>nun.pi.jəts</i> ~ <i>nun.pi.jəs</i> 'Leonurus sibiricus'

Thus the opposition between /-ts/ and /-s/ in polysyllabic words was essentially redundant, which probably promoted the merger and simplification of underlying opposition between /-ts/ and /-s/, since no contrasts are lost upon the merger. The historical change was unidirectional (/-ts/ → /-s/, not vice versa), based on the default status of /-s/ as the canonical coronal coda, as mentioned above. This can support the analysis by Silverman (to appear), who suggests that the collapse into [s] in polysyllabic words was tolerated because it was less likely to result in homophony, which is due to their near-complementary distribution.

In this way, many longer words with /-ts/ changed the underlying coda to /-s/ historically, thus the SFC's distribution in polysyllabic words became more simplified with only /-s/, as in CK. In other words, this change simplified the grammar by eliminating the rules such as SFC (polysyllabic words) → ts / a, o, u __, SFC (polysyllabic words) → s / ʌ, i __. This simplification as a result decreased the lexical number of /-ts/ itself and made /-ts/ more susceptible to analogical changes in the SFC's; likewise /-s/ became a further strengthened SFC, by gaining more lexical items.

4.3 Type frequency in the whole lexicon

The final question is why MK /-t/ almost completely changed to CK /-s/, in spite of the fact that it was not a markedly smaller class than other SFC's in MK, as shown in (7). A possible answer to this question is available, if we take compound words into account. The SFC's distribution in MK which we have examined in the discussion so far is restricted to simplex words. If we include compound words into the data, the frequency distribution changes. (19) shows the SFC's distribution in simplex and compound words in MK. Compound data includes the words whose underlying codas are reconstructed based on the attested data of the SFC of the second member.

(19) The SFC's distribution of simplex and compound words in MK.

SFC's	Simplex	Compound	Totals
t	14 (14 %)	12 (7 %)	26 (10 %)
t ^h	12 (12 %)	29 (17 %)	41 (15 %)
ts	21 (21 %)	32 (19 %)	53 (19 %)
ts ^h	19 (19 %)	30 (17 %)	49 (18 %)
s	34 (34 %)	69 (40 %)	103 (38 %)
Totals	100	172	272

(20) Examples

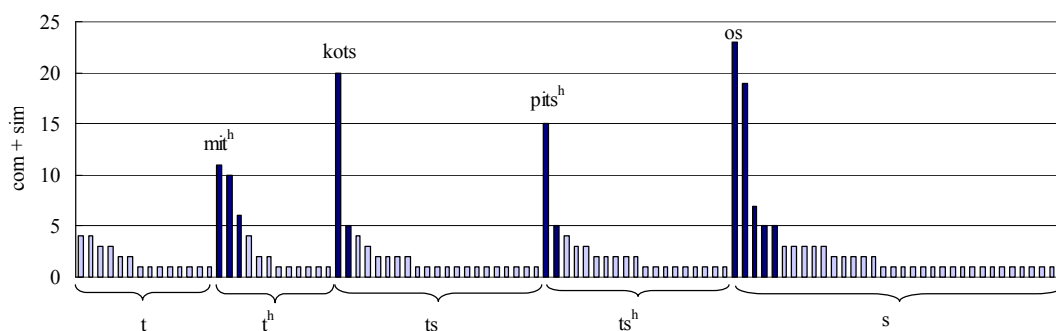
kot 'place' *mit.kot* 'the home, the best place'
mit^h 'bottom' *kuj.mit^h* 'under one's ears'
nats 'daytime' *pam.nats* 'day and night'
pits^h 'color' *nas.pits^h* 'complexion'
os 'clothing' *kas.os* 'leather clothes'

Importantly, when the compound data is included, the ratio of /-t/ decreases to 10 %, which is lowest among all SFC's. Thus we assume that the dispreference for /-t/ in analogical/historical change (and hence its earlier replacement compared to /-t^h/ and /-ts^h/) is based on its lower type-frequency in the entire lexicon, not just in simplex words.⁸

⁸ Given the high stability of /-t^h/ (76 %) in SFC historical change (cf. (8)), the relatively lower percentage of /-t^h/ in (19) (as a whole 15 %) may be problematic. Still as pointed out by the previous literature (Choi 1986, Ko 1989, Kang 2003, 2005, 2007, and others), most of the morphemes with /-t^h/ are words for a place. They often occur in locative constructions. Unlike the nominative suffix *-i*, the locative suffix *-e* (MK *-aj/-əj* as a rule) does not cause palatalization in Standard Korean phonology, and faithfully realizes the underlying coda. E.g.) *pat^h* 'field' + *-e* → [pat^h-e], *pat^h* 'field' + *-i* → [pat^h-i]. Thus the stability of the nouns with /-t^h/ can be explained by the high-frequency use of locative constructions, which do not involve palatalization.

Why was the type-frequency of /-t/ in the entire lexicon so low? This is probably due to the accidental lack of compound-productive simplex words with /-t/, which could lead to the low type-frequency of /-t/ as a whole. (21) shows how many compound words each simplex word in MK could head. Each bar corresponds to an individual simplex word. Numbers on the left (‘com + sim’) indicate the total of compound words and simplex words. For example, *mit^h* ‘bottom’ appeared as the head in 10 compound words and so ‘com + sim’ is 11 (= 10 + 1). When a simplex word did not head any compound words, ‘com + sim’ is 1 (= 0 + 1). We call the degree of productiveness in making compound words “compound-productivity” in this paper.

- (21) Compound productivity of MK simplex words. Bars are filled when ‘com + sim’ is 5 or more.



As seen in (21), no word with /-t/ showed high compound-productivity. On the other hand, some words with /-t^h/, /-ts/, /-ts^h/, /-s/ were quite productive in forming compound words, which could increase the type-frequency of each SFC as a result.⁹

In 4.2 we discussed why the stability rate of historical development of /-ts/ is very low in spite of the fact that in MK /-ts/ was the second largest class, and mentioned the biased/complementary distribution in MK polysyllabic words, which promoted the merger of /-ts/ with /-s/. The compound-productivity may explain the instability of /-ts/ as well: a highly compound-productive morpheme *kots* ‘flower’ changed its underlying coda to /-ts^h/ irregularly in historical evolution (as far as I know, the earliest example of ‘flower’ with /-ts^h/ appeared in *Sohakeonhae* (vol.6, 102b2)

⁹ In (19), the ratio of /-t/ (10 %) may not be small enough to assume the correlation with the dispreference for /-t/ in analogical/historical change. However if we compare the numbers of attested simplex/compound words in MK (cf. (19)) with those in CK (cf. (5)), it turns out that the numbers of (attested) compound words in both MK and CK are quite different (172 vs. 2,481), compared to the numbers of simplex words in both MK and CK (100 vs. 143). Given the fact that no word with /-t/ showed high compound-productivity whereas some words with /-t^h/, /-ts/, /-ts^h/, /-s/ were quite productive in forming compound words, it is assumed that if unattested data is taken into account then the ratios in (19) can be magnified so that the ratio of /-t/ goes down further.

published in 1588), contributing to lowering the type-frequency of /-ts/ and raising the type-frequency of /-ts^h/.

The fact that in CK analogical changes there is an order of usage preference among SFC's (/s/ > /tʃ^h/ > /t^h/ > /tʃ/, /-t/, Jun 2007) can also be explained better by the distribution of the whole lexicon than that of just simplex words, as shown in (5): in simplex words the numbers of /-t^h/ and /-tʃ^h/ are 17 (12 %) vs. 14 (10 %), whereas including compound words, the numbers of /-t^h/ and /-tʃ^h/ are 412 (16 %) vs. 690 (26 %). The ratio of /-tʃ^h/ thus goes up dramatically.

This suggests the possibility that in counting type-frequency, speakers pay attention to the entire lexicon, not just counting the number of simplex words only, even though the compound words are theoretically only the repetition of simplex morphemes that make them up. That is, each compound word contributes to the assessment of stem-final coda distribution AS IF they are separate lexical items.¹⁰ This is probably because in estimating the type-frequency of stem-final codas in order to determine the pronunciation in inflection, speakers look at the final segment (= stem-final coda) only, treating other segments as the variable X for every word uniformly, regardless of whether they are simplex words or compound words. (22) shows this idea. As in (22), speakers compute that as a whole 412 words (not 17 words) inflect as -t^hi (nominative), -t^hil (accusative), -t^he (locative)...., and hence the type-frequency of /-t^h/ (= X) is 412.

(22) Counting the type-frequency of stem-final codas (examples are from CK)

Simplex	Complex	Totals	
<i>pat^h</i> 'field'	<i>til.pat^h, t[*]i.pat^h, mo.pat^h, p[*]oŋ.pat^h, ki.rim.pat^h, po.ri.pat^h, sa.rjo.pat^h, s[*]uk.tɛ.pat^h, can.ti.pat^h, ...</i>	163	} /Xt ^h /
<i>pjət^h</i> 'sunlight'	<i>pom.pjət^h, hɛs.pjət^h, ka.il.pjət^h, jə.u.pjət^h, ha.rus.pjət^h, ...</i>	14	
<i>kət^h</i> 'surface'	<i>t[*]aŋ.kət^h, na.mu.kət^h</i>	3	
<i>mut^h</i> 'land'	<i>mul.mut^h</i>	2	
....			
Totals	17	395	412 ← Total of /Xt ^h /

¹⁰ This does not mean that compound words are completely different lexical items from simplex words, since in general the second member (head) of compounds shows the same historical development as simplex words. (E.g. MK *kots* 'flower' changed to CK *k^{*}otʃ^h*. Complex words appear with *k^{*}otʃ^h* as well, such as *jən.k^{*}otʃ^h*, *san.k^{*}otʃ^h*, *hal.mi.k^{*}otʃ^h*, etc.) On the other hand, derivatives are treated as different lexical items and do not follow the general analogical changes which happened in Korean. (E.g. MK *kut* 'hole' restructured the SFC from /-t/ to /-s/ (*kus*) but preserved the SFC /-t/ as an onset in a derivative *ku.təŋ.i.*)

It is assumed that when the analogy was made in Korean, the choice was based on the frequency of items in the overall lexicon, not just restricted to simplex words. And the great increase of type-frequency in the entire lexicon is owing to only a few simplex words which are highly productive in heading compound words. (For example in CK, among 676 compound words with /-tʰ/, 439 words are from *k*otʰ* ‘flower’.) That is, the type-frequency of each SFC (and the stability of the historical development) is largely contingent on the fact that the popular choice as a head of compounds happened to end with /-s/, /-tʰ/, /-tsʰ/, not with /-t/ or /-ts/. Thus I conjecture that the productivity of compound words, which can affect the type-frequency as a whole, seems to play a crucial role in the development of biased SFC’s distribution in CK.

5 Summary and conclusion

In this paper we documented the SFC’s distribution of both CK and MK nouns, and examined how historical changes took place. The SFC’s distribution in CK shows an large asymmetry: /-s/ is the predominant (default) coda whereas /-t/ is virtually zero. This outcome is not necessarily true of MK simplex words, which do not show such an extreme distributional imbalance. Nevertheless, MK /-t/ mostly changed to /-s/ whereas MK /-s/ was retained faithfully in CK. It is assumed that this resulted from three factors:

- a. There was an intermediate stage in Korean in which [s] was far and away the most prevalent phonetic value, and thus triggered analogical extension to other SFC’s through a stage of free variation between [s] and [t]. Subsequent developments involving the completion of the occlusivization of [s] obscure this state of affairs. Thus the lexical restructuring went mainly toward /-s/, and by the time the merger ([s] > [t]) was completed, /-s/ ([s]) had probably acquired default status as the “canonical coronal coda”.
- b. MK SFC’s also had an asymmetric distribution in polysyllabic words in that only /-ts/ and /-s/ could appear and that /-ts/ and /-s/ were in near-complementary distribution based on the preceding nucleus. Since no contrasts were lost upon the merger and no homophones were created, the change from /-ts/ to /-s/ (simplification of SFC’s opposition) could easily happen. This fact can support the analysis of Silverman (to appear). Most of the words with /-ts/ thus changed the underlying coda to /-s/, and as a result /-ts/, which was the second largest class in

MK, became a much smaller class whereas /-s/ became strengthened by increasing the number of lexical items.

- c. If we take into account the SFC's distribution of compound words as well as simplex words, it turns out that /-t/ was in fact the smallest class due to its low productivity in compounds, which could potentially lower the type-frequency of /-t/. The dispreference for /-t/ in analogical/historical change in Korean (and hence its earlier replacement by /-s/ compared to /-t^h/ and /-ts^h/) may be explained this way. This suggests a possibility that in the assessment of type-frequency, speakers are sensitive to compound-productivity, which can affect the total type-frequency.

In sum, the Korean historical changes discussed in this paper provide supporting evidence for analogical changes based on type-frequency, which counts both morphophonemic and neutralized codas on the one hand, and both simplex and compound words on the other.

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Appendix: Korean nouns with the SFC's

This list contains all the simplex words and bound forms with the SFC's in CK (from *Pyojun kugeo taesajeon*). Bound forms are indicated with “-”. When a bound form appears in semi-compound words, the semi-compound words are shown in a curled parenthesis. E.g.) -mat^h {mə.ri.mat^h, pe.ke.mat^h, tʃa.ri.mat^h}. MK forms are also listed. “—” indicates that corresponding MK forms are not attested.

CK	CK coda	MK	MK coda	Gloss
nat	t	nat	t	grains
at ^h	t ^h	pat ^h	t ^h	field
hot ^h	t ^h	hʌ.ots	ts	unpaired things
kət ^h	t ^h	kəts ^h	ts ^h	surface, outer
kjət ^h	t ^h	kjət ^h	t ^h	side
ko.put ^h	t ^h	—	—	outside fold of a bolt of cloth
k*it ^h	t ^h	kit ^h	t ^h	edge
-k*it ^h	t ^h	—	—	word for counting points in card games
-mat ^h	t ^h	mat ^h	t ^h	the moment when something is about to end
-mat ^h {mə.ri.mat ^h , pe.ke.mat ^h , tʃa.ri.ma t ^h }	t ^h	mat ^h	t ^h	beside (one's pillow, bed)
mit ^h	t ^h	mit ^h	t ^h	bottom
mut ^h	t ^h	mut ^h	t ^h	land
nat ^h	t ^h	nats ^h /nat ^h	ts ^h /t ^h	piece
pa.k*at ^h	t ^h	kjət ^h	t ^h	outside
pat ^h	t ^h	pat ^h	t ^h	field
pjət ^h	t ^h	pjət ^h	t ^h	sunlight
p ^h at ^h	t ^h	p ^h ʌts ^h /p ^h ʌsk	ts ^h /sk	red bean
sat ^h	t ^h	sats ^h	ts ^h	crotch
-sat ^h {ko.sat ^h }	t ^h	sats ^h	ts ^h	rope used when roofing a house
sot ^h	t ^h	sot ^h	t ^h	pot
sut ^h	t ^h	—	—	thickness of a hair
tot ^h	t ^h	tot ^h	t ^h	pig
ka.ratʃ	tʃ	kʌ.raS	S	bristle-grass
kotʃ	tʃ	—	—	cape
-kotʃ {pon.kotʃ, tʃe. kotʃ}	tʃ	kot	t	headquarters; the place where one was born
natʃ	tʃ	nats	ts	daytime
pətʃ	tʃ	məts	ts	cherry
pitʃ	tʃ	pit	t	debt
to.ratʃ	tʃ	to.raS/tol.ʏa S	S	balloon-flower
tʃətʃ	tʃ	tsjəts	ts	milk
tʃotʃ	tʃ	—	—	penis

CK	CK coda	MK	MK coda	Gloss
jut ^h	t ^h	z(j)uS	S	Korean traditional game
kat ^h	t ^h	kats ^h	ts ^h	skin
k*ot ^h	t ^h	—	—	fire [jargon]
k*ot ^h	t ^h	kots (kots ^h)	ts (ts ^h)	flower
-mit ^h {səl.mit ^h }	t ^h	miS	S	a kind of oar
mjət ^h	t ^h	mjəts ^h	ts ^h	how many
nat ^h	t ^h	nʌts ^h	ts ^h	face
nɪt ^h	t ^h	—	—	cadelle
nɪt ^h	t ^h	nɪts	ts	symptom
ot ^h	t ^h	os	s	lacquer
pit ^h	t ^h	pits ^h	ts ^h	color, light
sut ^h	t ^h	susk	sk	charcoal
tat ^h	t ^h	taT	T	anchor
tət ^h	t ^h	—	—	trap
tot ^h	t ^h	tosk	sk	sail
-tot ^h {ko.sim.tot ^h }	t ^h	ko.som.tot ^h	t ^h	hedgehog
-a.us	s	—	—	remained half
-as {s*i.as}	s	—	—	seed
ə.səs	s	—	—	only a part
əs	s	—	—	one of traditional Korean songs
əs	s	—	—	adjective [Neo-Confucianism word]
-əs {tu.əs}	s	tu.zəh	h	around two
i.us	s	i.uts (i.oS)	ts (S)	neighbor
is	s	—	—	cover
is	s	—	—	conjunction [Neo-Confucianism word]
is	s	ni.zi	—	safflower
jə.rəs	s	jə.rəh	h	many
jə.səs	s	jə.sis/jə.sʌS	s/S	six
jəs	s	jəs	s	candy
-jəs {tɛ.jəs}	s	taj.jəS	S	five or six
ka.ras	s	—	—	papaveraceous biennial plant
ka.ras	s	kʌ.raS	S	bristle-grass
-ka.us {mal.ka.us, na.tʃəl.ka.us, tō.ka.u s, tʃa.ka.us}	s	—	—	remained half
kas	s	—	—	mountain or land under the protection
kas	s	kas	s	leaf mustard
kas	s	kat	t	crown
-kas	s	—	—	ten dry foods
kə.tʃis	s	kə.tsiS/kə.tsʌ S	S	lie
kə.us	s	—	—	ridge
kə.us	s	—	—	hay
kə.us	s	kə.uts	ts	pubic hair
-kəs	s	kas/kəs	s	things
kis	s	—	—	starch for cotton
kis	s	tsits ^h	ts ^h	feather
kis	s	kits/kis	ts/s	collar
kis	s	kits	ts	share
kis	s	kiS	S	litter for farm animals
-kis {tʃuŋ.kis}	s	kit	t	narrow pillar

CK	CK coda	MK	MK coda	Gloss
-kis {mal.kis}	s	—	—	interference
-kis {s*al.kis}	s	kis	s	diaper
ki.ris	s	ki.ris	s	container
-kis {sok.kis}	s	kis	s	preliminary sketch
kjəs	s	—	—	woman
kjəs	s	kjəts/kjəts ^h	ts/ts ^h	particle [Neo-Confucianism word]
-kjəs {han.kjəs}	s	—	—	one fourth of a day
-kjəs {mal.kjəs, twi s.kjəs}	s	kjət ^h	t ^h	interference; backyard
ko.pus	s	—	—	outside fold of a bolt of cloth
kos	s	kot	t	place
-kos {sok.kos}	s	—	—	trouser-like underwear
-kos {soŋ.kos, toŋ.kos}	s	kots	ts	skewer
ku.pus	s	—	—	a bunch of leaf tobacco
kus	s	kuS	S	traditional Korean religious festival
kus	s	kut	t	hole
k*is	s	kit ^h	t ^h	ending [Neo-Confucianism word]
-k*is	s	—	—	word for counting points in card games
-k*is {i.k*is}	s	—	—	clue for getting profit
-k*is {sa.tʃi.k*is}	s	—	—	meat [jargon]
maŋ.os	s	—	—	white feather attached to the foot of hawks
mas	s	mas	s	taste
mas	s	maT	T	razor clam
məs	s	—	—	being stylish
-mis {tʃaŋ.mis}	s	miS	S	a kind of oar
mos	s	—	—	callus
mos	s	mos	s	pond
mos	s	mot	t	nail
mu.əs	s	mi.səs/mi.əs/ mi.sik	s/k	what
mu.ris	s	mul.ʏots/mu l.ʏuS	ts/S	scilla
mus	s	—	—	harpoon
-mus	s	mus	s	unit for counting firewood
mwəs	s	mi.səs/mi.əs/ mi.sik	s/k	what
na.ros	s	nal.ʏots	ts	beard
na.ris	s	na.ras	S	shafts
na.rus	s	nal.ʏots	ts	beard
-nam.tʃis	s	nam.tsak	k	the rest
nas	s	—	—	millet
nas	s	naT	T	sickle
nes	s	nəjh	h	four
-nəs {sə.nəs}	s	—	—	three or four
no.kus	s	—	—	flower of beans
no.ris	s	no.ras/no.ris	s	duty, job
nos	s	—	—	brass

CK	CK coda	MK	MK coda	Gloss
-nun.pi.as {am.nun.pi.as}	s	nun.pi.jəts/ nun.pi.jəs/ nun.pi.jaS	ts/s/S	Leonurus sibiricus
o.jas	s	oj.jats/o.jats/ oj.jəS/	ts/S	plum
os	s	os	s	clothing
pa.kos	s	—	—	long, narrow drill with handle
-pa.kos {kwi.ta.ri.pa.kos, s*ak.nun.pa.kos, tful.pa.kos}	s	pa.koS	S	aconite
pə.ris	s	pə.riS	S	habit
pə.səs	s	—	—	black spots on the skin of old people
pə.səs	s	pə.sis	s	mushroom
pəs	s	—	—	furnace for burning salt
pəs	s	—	—	charcoal receiving fire from a banked coal
pəs	s	pət	t	friend
pi.us	s	pi.uT	T	herring
pis	s	pits ^h	ts ^h	a kind of post/position
pis	s	pis	s	comb
-pis {tʃaŋ.pis}	s	miS	S	a kind of oar
pjəs	s	pjəts ^h /pjəs	ts ^h /s	cockscorn
pjəs	s	pjəT	T	edge of a plow
-po.tʃəs {tos.po.tʃəs}	s	—	—	mat
po.kos	s	—	—	skewer
po.kos	s	—	—	plow
po.kus	s	—	—	thick bark
pos	s	—	—	cherry
pos	s	poS	S	bark of white birch
pu.rus	s	—	—	bulk
pus	s	—	—	a flat place higher than surrounding place
pus	s	put	t	writing brush
sas	s	sat ^h	t ^h	mat made of reed
-sas {ko.sas}	s	sats ^h	ts ^h	rope used when roofing a house
səl.k*is	s	—	—	rump of beef
ses	s	səjh	h	three
si.as	s	—	— ¹¹	mistress of a husband
si.os	s	—	—	the name of Hangul s
si.is	s	—	—	the name of Hangul s
ta.səs	s	ta.sas/ta.siS	s/S	five
təs	s	—	—	about five
təs	s	təs	s	cause for troubles
təs	s	tət	t	short time
-təs {nə.təs}	s	—	—	about four
-təs {sul.təs}	s	—	—	steamed rice with malted rice
ti.kis	s	—	—	the name of Hangul t
tol.k*jəs	s	—	—	instrument for reeling thread

¹¹ The MK origin may be *kas* ‘woman, wife’.

CK	CK coda	MK	MK coda	Gloss
tos	s	tosk	sk	sail
tos	s	tosk	sk	mat
twəs	s	tu.zəh	h	around two
t [*] i.as	s	stij.jəS	S	sibling affection
t [*] is	s	ptit	t	will
t ^h as	s	tas/t ^h as	s	cause
t ^h i.is	s	—	—	the name of Hangul t ^h
t ^h os	s	—	—	a kind of seaweed
-t ^h os	s	—	—	a hundred sheets of dried laver
-t ^h os {ka.re.t ^h os}	s	ka.ras.t ^h os	s	bubo
-t ^h os {sil.t ^h os}	s	—	—	spindle-shaped thread
tʃal.mos	s	tsal.mot.hʌ-	T	mistakes
tʃas	s	tsas	s	seed of Korean pine
tʃəs	s	tsəS	S	salted fish guts
tʃəs	s	tsjəts	ts	milk
tʃi.is	s	—	—	the name of Hangul tʃ
tʃis	s	tsiz	z	behavior
tʃos	s	—	—	penis
tʃ ^h i.is	s	—	—	the name of Hangul tʃ ^h

The following list shows cases of either MK words with SFC's that do not have directly corresponding cognate words in CK or MK words with SFC's that correspond with CK non-SFC codas. In the former case, related words are listed for reference.

CK	CK coda	MK	MK coda	Gloss
—	—	kot	t	things
mat- [prefix]	—	mat	t	the head
si.tak.na.mu	—	sit	t	maple
—	—	əjŋ.əts	ts	surroundings
so.ru.tʃeŋ.i	—	sol.γots/sʌl.γoS	ts/S	Curly dock, Rumex crispus
—	—	i.si.rats/i.sʌ.raS	ts/S	cherry
ta.puk.s*uk	—	ta.pots/ta.puS	ts/S	mugwort
—	—	ats ^h	ts ^h	reason
—	—	kjəts ^h	ts ^h	the tone of color
—	—	nʌ.mats ^h	ts ^h	bag
—	—	pʌjts ^h	ts ^h	scull
pal.tʃ ^h i	—	pats ^h	ts ^h	toward which one's feet ordinarily lie when one sleeps
—	—	sits ^h	ts ^h	interval, distance
ka.si- [prefix]	—	kas	s	woman
—	—	kis	s	nest
—	—	pʌj.hʌs	s	habit
—	—	tsas	s	castle
i.k*i	—	is/isk	s/sk	moss
—	—	jəT	T	now
—	—	haŋ.kəS	S	master

CK	CK coda	MK	MK coda	Gloss
ka.mus.əps-	—	kΛ.mΛS	S	model, pattern
ku.sək	—	kuS	S	corner
pi.ros.ha-	—	pi.riS	S	beginning
p*jo.ru.tʃi	—	po.to.roS	S	pimple
—	—	to.t ^h Λ.raS/to. t ^h Λj.Λ.raS	S	wild spinach
puk	k	puS	S	soil packed around a plant
-ul {sin.ul}	l	uT	T	the outer rim of shoes
mjən	n	mjəs	s	earth dug out by rats, crabs, or ants
ka.wi.t ^h op/ka.hö.t ^h o p	p	ka.hΛj.t ^h oS	S	Magnolia
həŋ.kəp ^h	p ^h	həŋ.kəS	S	a piece of cloth