Adoption of Aspiration Feature in Sino-Korean Phonology

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Abstract

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This dissertation examines the adoption of aspiration feature in Sino-Korean character readings. In broad usage, the term Sino-Korean refers to Chinese loanwords in Korean, but in this dissertation, it is used for a phonological system of Chinese-character readings (or pronunciation) derived from Middle Chinese. Although most sound correspondences between Sino-Korean and Middle Chinese are quite regular, some phonological features of Middle Chinese have been adopted irregularly into Sino-Korean, and Sino-Korean (SK) readings with aspiration discrepancy are part of this broader phenomenon of irregular SK readings.

It is generally assumed that both the Chinese and Korean languages had voiceless aspirated stops and voiceless unaspirated stops at the time Chinese characters were adopted in the Korean peninsula. If that is indeed the case, a regular correspondence between Middle Chinese (MC) and SK is expected between the two languages. However, there are many cases where the aspiration feature shows irregular correspondence. Some SK readings with an unaspirated initial in their MC counterpart have an aspirated initial, while other SK readings with an aspirated initial in their MC counterpart have an unaspirated initial.

Based on data from Korean annotations of Chinese texts and Korean Chinese-character rhyme books, previous researchers (Kōno 1968, Itō, 2007) have identified analogy and syllabic inclination as two possible factors influencing the aspiration feature in SK. The analogy

hypothesis is that the reading of the phonetic component of certain "frequent" characters is applied by analogy to other characters that share the same component. The syllabic inclination hypothesis is concerned with the tendency that irregular aspiration appears only in certain syllable shapes.

In this dissertation, I discuss problems with the previous research and suggest an improved account of aspiration mismatch. After a thorough quantitative analysis of data, I propose hyperforeignization as an important cause for the aspiration mismatch in SK borrowings. Hyperforeignization is a process in which speakers create a form by adding a feature they perceive as foreign to a borrowed foreign word, even when that feature is not present in the original pronunciation. In my examination, I focus on what role hyperforeignization played in creating irregular SK pronunciations and its possible connections to the phenomenon of syllabic inclination. Because of the special historical context in which the written characters were main medium of borrowing in the case of SK loanwords, orthographic interference had a more significant influence compared to most other scenarios of loanword adaptation. It is probably not a single factor that is responsible for irregular SK readings, and any serious linguistic analysis must be complemented by social and cultural factors. This dissertation contributes to the field by showing how such factors may have played a role in the creation and transmission of irregular loanword readings.

DEDICATED

To my beloved parents,

to my supportive and encouraging husband

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LIST OF ABBREVIATIONS

EMC: Early Middle Chinese
EMK: Early Middle Korean
EOSK: Early Old Sino-Korean
LMC: Late Middle Chinese
LMK: Late Middle Korean
LOSK: Late Old Sino-Korean
MC: Middle Chinese
MK: Middle Korean
MSK: Middle Sino-Korean
OC: Old Chinese
OK: Old Korean (=Sinla language)
OSK: Old Sino-Korean
Pre-OK: Pre-Old Korean
SKo: Sino-Kokwulye
SK: Sino-Korean
SP: Sino-Paykcey
SS: Sino-Sinla

LIST OF ABBREVIATIONS FOR TITLES

(Chinese sources in pīnyīn, Korean sources in Yale romanization)

Cangswu: annotation of *Cangswukyeng* 장수경언해 長壽經諺解
Chopal: *Chopalsimcakyeng* 초발심자경 初發心自警
Cinen: annotation of *Cinenkwenkong* 진언권공언해 真言勸供諺解
Hwunmong: Hwunmong cahoy 훈몽자회 訓蒙字會
Hyangyak: *Hyangyak kwukuppang* 향약구급방 鄕藥救急方
Kyeylim: *Kyeylim Yusa* 계림유사 雞林類事 *Jīlínlèishì*
Mongsan: annotation of *Mongsanpepe* 몽산법어언해 蒙山法語諺解
Pephwa: amended annotation of *Pephwakyeng* 개간 법화경언해 改刊 法華經諺解
Samtan: annotation of *Samtansisikmwun* 삼단시식문언해 三壇施食文諺解
Sapep: annotation of *Sapepe* 사법어언해 四法語諺解
Sincung: *Sincungyuhap* 신증유합 新增類合
SKSK: *Samkwuk Saki* 삼국사기 三國史記
Tongkwuk: *Tongkwuk cengwun* 동국정운 東國正韻
Yukco: annotation of *Yukcopeppotankyeng* 육조법보단언해 六祖法寶壇經諺解

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1. Introduction

Approximately 70% of Modern Korean vocabulary is composed of Sino-Korean (SK) words. Chinese characters and their pronunciations have been borrowed through different stages in Korean history since the establishment of the Han commanderies in the northern Korean Peninsula in early 2nd century BC. Therefore, there are several layers in SK phonology (Kōno 1968, Yi 1995, Eom 2015). Among these layers, I will discuss the SK readings that are based on the Middle Chinese (MC) pronunciations of Chinese characters, which is also the most widely accepted definition of Sino-Korean.[1] This layer of borrowing contains a large scale of adoption of Chinese loanwords, and their SK readings correspond with phonological features of Middle Chinese. These SK readings mainly appear in the materials compiled after the native Korean alphabet *Hankul* was invented in the Cosen dynasty (1392-1897).

Regular patterns of correspondence between the source language and the target language are expected with extensive lexical borrowings due to intense contact. On the whole, the phonological systems of MC and SK do show a high degree of regularity of correspondence. Because the phonological systems of MC and SK both contain voiceless aspirated stops and voiceless unaspirated stops, we would expect to see a high degree of agreement in aspiration between MC initials and SK initials. However, this is not the case.

The purpose of this study is to resolve a long-standing puzzle in the relationship between the Chinese and Korean languages: the pronunciation mismatch in aspiration between MC and SK pronunciations of Chinese characters. Although there are a number of earlier studies of this phenomenon, some of which are of high quality, they have not comprehensively resolved all

[1] Pronunciation of Chinese characters is defined as reading in the field of Chinese linguistics. I will use pronunciation and reading interchangeably.

aspects of the problem (Kōno 1968, Chang 1981, Yi 1995, Itō 2007). I investigate this phenomenon from multiple perspectives, bringing new theoretical insights to the existing literature on the subject, and propose a comprehensive explanation that attempts to account for both linguistic and socio-historical facts.

1.1 Periodization of Korean and Chinese

Most language periodizations are based on divisions that correlate with major changes in linguistic features. This is the basis for most periodizations of Chinese and Korean. The main emphasis of periodization in this dissertation, however, is to align each period of the development in Korean, Sino-Korean, and Chinese. Based on this periodization, chronologically accurate comparisons can be made in order to clarify the relationships among these languages and their linguistic materials.

The table below shows a periodization of Korean and Sino-Korean with the relevant source materials that will be introduced in my dissertation. The periodization of Korean in this table is based on K. Lee (1998). I follow Changkyun Yu 1980 (with modification) for Sino-Korean. In Yu's SK periodization, Old SK (OSK) covers the time after Chinese characters were adopted to the Korean Peninsula, and lasts until Sinla's unification in 668. I modified Yu's SK periodization for both Middle Korean (MK) and Middle SK (MSK) to begin at the time of the foundation of Kolye in 918. OSK is extended backward in time (as Early OSK) to cover the time before the adoption of Chinese characters. The periods of Chinese language included on Table 1.1 are Old Chinese (OC), Early Middle Chinese (EMC), and Late Middle Chinese (LMC).[2]

[2] Pulleyblank (1984) created the terms Early Middle Chinese and Late Middle Chinese to clarify that Middle Chinese is not defined by a single phonological system. He explains that EMC and

Periodization of Korean			Periodization of Sino-Korean		
Source Materials	**Kingdoms/ Dynasties**	**Stage of Korean**	**Stage of Sino-Korean**	**Chinese Origins**	**Source Materials**
	Before Sinla	Pre-Old Korean	Early Old SK	From Old Chinese or later	Korean lexical items identified as early Chinese borrowings
Samkwuk Saki 삼국사기 三國史記	Sinla 57 BC-935, Kokwulye 37 BC-668, Paykcey 18 BC-660	Old Korean, Old Kokwulye, Old Paykcey	Late Old SK	From Early Middle Chinese	Sino-Kokwulye, Sino-Paykcey, Sino-Sinla (stele inscriptions, personal names and local place names recorded in *Samkwuk Saki*)
Kyeylim yusa 계림유사 雞林類事 *Jīlínlèishì* (1103-4, Song), *Hyangyak kwukuppang* 향약구급방 鄕藥救急方	Kolye (918-1392)	Early Middle K	Middle SK	From Late Middle Chinese and/or contemporary Chinese dialects	*Kyeylim yusa* 계림유사 雞林類事 *Jīlínlèishì* (1103-4, Song), *Hyangyak kwukuppang* 향약구급방 鄕藥救急方
Cosen kwanyeke 조선관역어 朝鮮官譯語, Korean annotations of Chinese Classics (*Enhay* 諺解), *Hwunmong cahoy*	Cosen until right after the Imcin War[3] (15-16 C)	Late Middle K	Middle SK	From Late Middle Chinese	*Cosen kwanyeke* 조선관역어 朝鮮官譯語, *Enhay*, *Hwunmong cahoy* 훈몽자회 訓蒙字會, etc.

LMC are codified in the rhyme book *Qièyùn* 切韻 and the rhyme table *Yùnjìng* 韻鏡 respectively.

[3] The Imcin 壬辰 War is another name of the Japanese Invasions of Korea (1592-1598).

훈몽자회 訓蒙字會, etc.					
Rime books, *Enhay*	17-19 C	E Modern K		From Late Middle Chinese	Rime books, *Enhay*

<Table 1.1 Periodization of Korean and Sino-Korean>

Scholars have proposed many different periodizations of the history of the Chinese language, but these differences are not crucial for this study.

I will give a synopsis of how Chinese during each period was adopted to Korean:

a. Before Sinla: Some Korean lexical items have been identified as early Chinese borrowings from the period of OC or between OC and MC. Oh (2005) defines a linguistic contact that occurred and influenced the Korean language before the adoption of Chinese characters as 'Old Sino-Korean.' He speculates that some MK forms were inherited from OSK words that were borrowed from OC, and uses the Middle Korean data to find the traces of Old Sino-Korean. In my dissertation, Oh's Old Sino-Korean is termed as Early Old Sino-Korean (EOSK) to distinguish it from the Late Old Sino-Korean (LOSK). EOSK will be discussed in more detail in Section 2.3.1.

b. The phonological systems of the reading pronunciations of Chinese characters in the languages of the Three Kingdoms (Kokwulye, Paykcey, and Sinla) are referred as Sino-Kokwulye (SKo), Sino-Paykcey (SP), and Sino-Sinla (SS), which together form LOSK.[4] The materials of these phonological systems are mainly personal names and place names in historical documents such as *Samkwuk Saki* 삼국사기 三國史記 (SKSK) and stele inscriptions. There are

[4] K. Lee (1998) suggests that these three states in the Korean peninsula had three distinctive languages. Since the Sinla language was the direct ancestor of Middle Korean, it is considered as Old Korean. It still remains as a question whether the Kokwulye and Paykcey languages were varieties of Old Korean. However, I will discuss SKo, SP, and SS in one category, LOSK, because there has been no discusstion to distinguish their phonological systems. Section 2.3.2 will discuss the LOSK phonological system more detail.

studies of the phonological system of consonants in SKo, SP, and SS, which have been reconstructed based on these materials (Changkyun Yu 1980, To 1987, Eom 1991, Noh 2003). The SKo, SP, and SS materials also provide valuable information regarding linguistic features of Old Korean. The Chinese origins of SK readings in this period are EMC.

c. Early Middle Korean (EMK) is Korean language during the Kolye dynasty (918-1392). Very few materials were available to examine SK readings reflecting LMC phonological system before the invention of *Hankul*. *Kyeylim yusa* (*Kyeylim*) 계림유사 雞林類事 *Jīlínlèishì* (1103) and *Hyangyak kwukuppang* (*Hyangyak*) 향약구급방 鄕藥救急方 have been examined to get a better understanding of the phonological system of EMK and MSK. *Kyeylim* is a vocabulary list with a transcription of the Korean words in Chinese characters as phonograms. Sūn Mù 孫穆 visited Kolye in the early 12th C as a secretary of the Song imperial legation, and compiled *Kyeylim*. *Kyeylim* comprises three chapters including local customs, system of government, and language. The language section with a list of 355 words and phrases takes a form of "A *yuē* 曰 B (A is called B)." In this form, 'A' is a Chinese character. Korean words or phrases in each entry, 'B,' are transliterated using phonograms that reflect Chinese readings of the characters from the late Song period (S. Kang 1980).

It is challenging to reconstruct the Chinese readings of the phonograms in each entry of *Kyeylim*, because the Chinese readings are compared with what can be reconstructed by projecting back Korean phonological values known from 15th C *Hankul* texts. Many scholars including S. Kang (1980) have tried to reconstruct the Korean phonological system of this period based on reconstructed Chinese pronunciation of the Song dynasty.

d. It was not until the invention of *Hankul* in 1443 that SK materials with relatively accurate sound information became available. The materials compiled in 15th C and 16th C, such as

enhay (Korean annotations of Chinese Classics) and *Hwunmong cahoy* (*Hwunmong*) 훈몽자회 訓蒙字會 will be introduced in section 1.3.

The main period that is examined in this dissertation is Late Middle Korean and Middle Sino-Korean oulined in (d). The Chinese origins of SK readings in this period are LMC. The reconstructed forms of LMC provided in this dissertation are from Pulleyblank (1984).

1.2 Definitions of Sino-Korean and irregular Sino-Korean readings

Sino-Korean is defined broadly as Chinese loanwords in Korean. In its narrower sense, Sino-Korean refers to the Korean reading of Chinese characters based on the Chinese reading of Chinese characters of the MC period (Hashimoto 1977). Along with Sino-Japanese and Sino-Vietnamese, Sino-Korean is regarded as a phonological system derived from MC and plays an important role in reconstruction of MC (Kōno 1968, Itō 2007). By the broader definition of Sino-Korean above, some Korean words such as *kom* 곰 'bear' that are commonly thought to be native Korean might in fact be Sino-Korean. Wancin Kim (1971) suggests that *kom* 곰 is a Chinese loan word from OC 熊 *gi̯um. This purported older borrowing contrasts with the modern standard SK reading *wung* 웅 for the character 熊 MC *iwŋ*. The word *kom* 곰 and the character reading *wung* 웅 can both be considered Sino-Korean. They are explained by the two different time periods when the same Chinese character 熊 was adopted by Korean. Oh (2005) examines 154 examples of MK vernacular forms and compares them with OC reconstruction to discuss an earlier SK layer, which he defines as Old Sino-Korean. Adoption of these pronunciations in Oh occurred during the time period roughly corresponding to our reconstructions of OC. They are relatively few in number and many aspects of their history

remain uncertain or subject to debate. Unlike MC, which has a standardized set of categories reflected in rhyme books and other published texts, there is no equivalent standard OC. Although these SK readings from OC are also significant in the Chinese historical phonology and Korean historical phonology, SK readings were adopted more systematically during the MC stage. Furthermore, modern SK readings generally correspond with the MC system. Therefore, in this dissertation, I will discuss Middle Sino-Korean pronunciation of Chinese characters that reflect the MC phonological system.

There are divergent views regarding the time period for this systematic borrowing of the SK layer(s).[5] It is now widely accepted that SK readings are based primarily on the phonological system of Late Middle Chinese (Kōno 1968, Pulleyblank 1984). Phonological categories of LMC are represented in medieval rhyme tables such as *Yùnjìng* 韻鏡. In *Yùnjìng*, initials of five different categories are listed according to the place of articulation: labials, linguals, velars, dentals, and gutturals. Each category is further subdivided into the following four types according to the aspiration/ voicing feature:

清 *qīng*, voiceless unaspirated
次清 *cìqīng*, voiceless aspirated
濁 *zhuó*, voiced
次濁 *cìzhuó*, sonorants

As seen above, there is a three-way distinction in the MC oral stops and affricates.[6] By comparison, the SK consonant system in the MK period, when *Hankul* was first used to record

[5] The table below summarizes hypotheses on the origin of SK reading:

Maspero (1920)	Karlgren (1954)	Arisaka (1936)	Kōno (1968)
5th C. Wu dialect area	600 AD Northern China	10th C. Kāifēng	Tang dynasty (618-907) Cháng'ān

[6] There is two-way distinction in the MC fricatives.

SK reading, shows only a two-way distinction.[7] Both MC and SK have voiceless aspirated stops and voiceless unaspirated stops. A regular correspondence between MC and SK is observed with both of these two types of stops with greater than chance frequency. For example, 國 MC *kuǎk*, whose MC initial is /k/, also has a voiceless unaspirated velar initial /k/ in Sino-Korean (SK [kuk]). However, the aspiration feature of MC and SK initials shows irregular correspondence in many cases. Some SK readings whose MC counterpart has an unaspirated initial have an aspirated initial, while some SK readings with an aspirated initial in their MC counterpart have an unaspirated initial. For example, 八 MC *pa:t* with /p/ has an aspirated labial initial in its SK reading [p^{h}al] 팔.

Another interesting piece of data comes from historical developments of MC initials. While MC had phonemic voiced stops in initial position, they did not exist in SK. In various Chinese dialects, MC voiced stops had lost their voicing and were divided into two categories, voiceless aspirated and unaspirated, depending on the tone category. Since SK did not have voiced initials, MC voiced initials were adopted as either voiceless unaspirated or voiceless aspirated. However, adoption of MC voiced initials into SK does not correspond to the aspiration pattern that developed in any variety of modern Chinese dialects. Unlike Chinese, tone does not appear influential to the change of initial in SK. More readings with MC voiced initials are reflected as unaspirated in SK. Therefore, aspirated reading in SK is considered the irregular correspondent for MC voiced initials.

[7] The "artificial" or "transcriptional" SK systems that are attested in *hwunmin cengum* 훈민정음 and in *Tongkwuk cengwun* (*Tongkwuk*) 동국정운 東國正韻 record a three-way distinction correlating with the MC three-way distinction. The current research examines the data in sources that are believed to reflect actual SK pronunciations, not the artificial dictionary-based ones that do not seem to have played a factor in the actual Korean language. See section 1.3 for more information regarding *Tongkwuk cengwun*.

The irregular correspondence of aspiration features is diversely represented depending on the place of articulation. Itō (2007), consulting with SK materials in early Cosen Dynasty period (15-16th C), provides a different ratio of place asymmetry in adoption of aspiration feature as seen in Table 1.2 below.

Place of articulation in MC	Aspiration/ voicing features in MC	Percentage of irregular SK readings
Labials	-asp	23.9% +asp (60/251)
	+asp	43.2% -asp (29/67)
	voiced	30.1% +asp (73/242)
Dentals	-asp	21% +asp (41/195)
	+asp	31.8% -asp (43/135)
	voiced	27.9% +asp (95/340)
Velars	-asp	4% +asp (20/488)
	+asp	91.2% -asp (175/192)
	voiced	0% +asp

<Table 1.2 Ratio of place asymmetry in adoption of aspiration feature based on the data in Itō (2007)>

Labials include both MC labial stops and labiodental fricatives: /f/and /v/. MC labiodental fricatives were adopted as SK bilabials due to lack of labiodentals in Korean. Only 12 readings with MC labiodentals have an aspirated initial in SK, and the rest are pronounced as unaspirated. Dentals include MC dental stops and affricates. While dentals have the highest degree of correspondence, velars have the lowest degree of correspondence. The mismatch ratio with labials is similar, but still greater than dentals, regardless of the aspiration/ voicing feature.

Velars are more complicated than what is shown in the table. An aspiration feature is manifested in only a few SK readings with velars, and most cases of aspirated SK pronunciation begin with /h/, not /k^h/. /k^h/ is in fact very rare. It is noticeable that [$k^hwɛ$] 쾌 is the only syllable

shape with an aspirated velar initial in SK. Velar-initial xamples are 夬, 獪, 澮, 儈 MC *kuaj* and 快, 駃, 噲 MC $k^{h}wa:j$ in *qù* 去 tone with *jué* 夬 rhyme.

1.3 Sino-Korean Source Materials in the Data

Middle Sino-Korean (MSK) materials are available through two types of resources. One type is material compiled before the invention of *Hankul*, and the other after. Although the first type of compilations such as *Kyeylim yusa* (*Kyeylim*) (1103) and *Cosen kwanyeke* 조선관역어 朝鮮官譯語 (around 1400) offer the earliest materials available to examine Sino-Korean reflecting the LMC phonological system, reliable research on SK reading cannot be expected without the reconstruction of the MSK forms. The invention of *Hankul* allowed more SK materials to be compiled in *Hankul*, which offer relatively accurate sound information. With the aid of *Hankul*, the SK phonological system was also first established.

One potentially valuable resource compiled after the invention of *Hankul* is *Tongkwuk cengwun* (*Tongkwuk*) 동국정운 東國正韻, a rhyme book modeled after the Ming Dynasty's *Hóngwǔ zhèngyùn* 洪武正韻 1375. *Tongkwuk* was compiled by *Sin Swukcwu* and eight other scholars in 1447 at King *Seycong*'s special order with the goal of standardizing the SK reading. Rather unfortunately for modern day scholars, however, the standardization process was based on MC sources. In modeling contemporary SK pronunciation, the compilers of *Tongkwuk* included all the Chinese features, even features not actually in use in contemporary SK pronunciation. *Tongkwuk* thus reflects artificial SK pronunciation of the time, which in turn made research on the SK phonological system based on *Tongkwuk*, not truly reliable.

More meaningful would be research done on a phonological system that reliably reflects the SK pronunciation of the general population during the Cosen Dynasty. Such data became

available in the form of various *enhay* and Korean Chinese-character rhyme books, compiled later during the Cosen Dynasty. Kōno (1968) and Itō (2007) based their research on these later compilations, thus their research provides us with more valuable information.

I draw mainly on Itō's (2007) SK data as a main source to discuss irregular SK readings in my dissertation. In her work, Itō uses the SK data materials collected from various SK materials in the Cosen Dynasty[8]. I classify these materials into four categories below with brief descriptions.

1.3.1 Buddhist Materials

The following is a list of Buddhist materials that Itō (2007) examined in her work:

Title of material	Abbreviation	Number of different versions
annotation of *Yukcopeppotankyeng* 六祖法寶壇經諺解	*Yukco*	1
annotation of *Cinenkwenkong* and *Samtansisikmwun* 真言勸供, 三壇施食文諺解	*Cinen* / *Samtan*	1
Chopalsimcakyeng 初發心自警	*Chopal*	2
annotation of *Mongsanpepe* 蒙山法語諺解	*Mongsan*	2
annotation of *Sapepe* 四法語諺解	*Sapep*	2
amended annotation of *Pephwakyeng* 改刊 法華經諺解	*Pephwa*	1
annotation of *Cangswukyeng* 長壽經諺解	*Cangswu*	1

<Table 1.3 Buddhist materials examined in Itō (2007)>

High Priest Hakco 學祖 of the Cosen dynasty translated quotations from Great Master Hùinéng 惠能 of the Tang dynasty (638-714) in 1496, and compiled *Yukco*. This translation consists of three volumes and was published in a wooden type. In the same year, *Cinen* and *Samtan* about daily Buddhist practice were also published in a wooden type, bound together as a single book.

[8] See An (1992), Itō (2007), and K. Lee & Ramsey (2011) for more detailed information regarding these materials.

All these three materials record transmitted SK readings rather than the pronunciation recorded in *Tongkwuk*. According to the epilogue of *Cinen* and *Samtan*, *Yukco*, *Cinen*, and *Samtan* were all translated by Hakco. However, discrepancies in some pronunciations indicate that they were not recorded by the same person. Furthermore, only *Yukco* provides intonation markers (句音調) to indicate ending or conjunction of a phrase.

Chopal is a bound volume of *Kyeychosimhakinmwun* 誡初心學人文, *Palsimswuhayngcang* 發心修行章, and *Yawuncakyengse* 野雲自警序. There are two versions of *Chopal*. One was published at the Songkwang temple 松廣寺 located in Cenla Province (1577), and the other was published at the Sepong temple 瑞峰寺 located in Kyengki Province (1583). Both versions are discussed in Itō (2007).

Pephwa in Itō's research was printed in 1500 as the second edition of the original annotation of *Pephwakyeng* 法華經. The original edition was printed in 1463, and published in *Kankyengtokam* 刊經都監 (General Directorate of for the Publishing of Sūtras) established by King Seyco 世祖.[9] It is speculated that printing this second edition was at the royal family's request.

1.3.2 Medical Books

These two medical materials, *Pwunmwun onyek ihaypang* 分門瘟疫易解方 (Late 16th C) and *Kanipyekonpang* 簡易辟瘟方 (1578) have very similar contents. Both were compiled to teach people how to cure epidemic diseases.

[9] Translation of this government office is from K. Lee and Ramsey (2011).

1.3.3 *Enhay* 諺解 (Korean annotations of Chinese Classics)

Enhay is a primary *Hankul* record of the LMK period, and is understood as vernacular exegeses of Chinese texts including translation. Itō examines *enhay* of the Lesser Learning 小學, Four Books 四書, and the Filial Piety 孝經. They were all published in the government office known as *Kyocengcheng* 校正廳 in 1588-1590 by a royal command (King Seonco). There are three different versions of *enhay* of the Lesser Learning.

1.3.4 Others

Translation of the Lesser Learning *penyek sohak* 翻譯小學 (10 volumns) is a translation of Dàwén 大文 part in the Lesser Learning. The first edition published in 1518 does not exist, and the second edition only has volumn 6-10. Each volumn shows a different tendency regarding intonation markers. Itō analyzes discrepancies found in each volumn in terms of how MC /n/, /l/, /r/ initials are recorded. Characters with different initials and finals through each volumn are compared. It is still controversial to decide when the second edition was printed. According to Itō, the time for the reprint of volumn 6-10 can be assumed to be after mid-16th C.

Hwunmong cahoy (*Hwunmong*) is a teaching material for children to learn Chinese characters. It was compiled in 1527 by Choy Seycin 최세진. Providing gloss for 3,360 characters in Korean, it has been a valuable material for understanding MK phonology and morphology. There are six different versions of *Hwunmong*, and each version is examined and compared in Itō.

1.4 Overview of Structure of Dissertation

The purpose of this research is to examine how the aspiration feature in Chinese pronunciation of Chinese characters has been adopted in Korean. I will discuss the possible factors that motivated the discrepancy between an initial consonant of a Chinese pronunciation and the conventional SK reading of the same character. Previous research on SK readings has largely relied on a single explanatory mechanism, analogy based on phonetic components, to account for irregular SK readings. Instead, I will provide a broader frame of SK reading adaptation to propose additional factors to understand aspiration mismatch in SK reading. By recognizing that no single factor is primarily responsible, I complement the existing linguistic analysis via exploring social and cultural factors that have played a role in the creation and transmission of irregular readings.

Chapter 1 has provided a summary of the issue to be investigated, and laid out the language periodizations and major textual sources that will be relied on for the current study.

Chapter 2 will provide background information to help readers understand the phonological characteristics of the aspiration feature in Chinese, Korean, and Sino-Korean through different periods. I will review previous research and hypotheses that attempt to explain the causes of irregular correspondences between Chinese and SK aspiration features. In this chapter, I will discuss two hypotheses regarding development of aspiration feature in Korean. The first hypothesis is that aspiration feature existed in OK. The second hypothesis is that there were no phonemically distinct aspirated consonants in OK and EMK. After examining both hypotheses, I will conclude that OK speakers were not able to make a phonemic distinction between aspirated and unaspirated initials in MC. It will be shown that the differences in the phonetic nature of Chinese and Korean aspiration caused mismatches in the borrowing process.

In Chapter 3, I will discuss analogy in historical linguistics and its application in the analysis of SK phonology. Following this discussion, I will examine the relationship between frequency effect and analogy in SK phonology. Kōno (1968) and Itō (2007) only used an impressionistic evaluation of the data to explain the analogy hypothesis. To improve the accuracy and reliability of the analogy hypothesis, I will analyze quantitative data in Kwen (2005) to develop a robust conclusion for the analogy hypothesis. This analysis will determine which characters can serve as analogical models, and reveal that analogy plays a smaller role in SK phonology than was previously believed. With the aid of this analysis, Chapter 3 will show that only about 20% of irregular SK readings are explainable by analogy. In Chapter 4, I utilize the concept of syllabic inclination of Kōno, and categorize syllables in SK data into those with aspirated initials only and those with unaspirated initials only. Syllabic inclination refers to the tendency for irregular aspiration to appear only a certain syllable shapes. Based on the analysis of these syllable types, I will determine that no phonological feature of certain syllable shapes has regularly caused SK initials to be aspirated. I will claim that the apparent phenomenon of syllabic inclination in SK phonology is better understood as a secondary effect of hyperforeignization. I will propose that these syllable types with an on-glide [j] or *rù* tone ending, cited as examples of syllabic inclination in Itō, were relatively rare in native Korean words. Aspiration feature was added to these syllables to make them even more foreign-sounding, because these syllable types sounded unfamiliar and non-native Korean.

Chapter 5 will consider the language adaptation issue from the perspective of loanword phonology. Recent theoretical advances in loanword phonology and loan processes should be considered as possible factors that cause discrepancy in SK borrowing. Korea and China have had language contact in different cultural contexts as adjacent countries, and understanding the

role of both orthographic and auditory inputs is critical in SK loanword phonology. I will propose possible scenarios using theories in loanword phonology and link them to the unique path and background of language adaptation from China to Korea. This relies greatly on orthography and systematic adaptation.

Finally, chapter 6 will examine traditional education environments in Korea as a social factor that created SK irregular readings. Based on materials written in the Cosen dynasty, I will explore how Chinese characters were taught and learned in Korea among Korean teachers and students using the materials written in Chinese characters. The meaning of a character, not the pronunciation of a character, was the main concern in the learning process during the Cosen dynasty. Therefore, students were not strongly encouraged to acquire a regular reading of Chinese characters. This phenomenon played a major role to cause irregular SK readings.

I will conclude this dissertation in chapter 7 with a brief summary.

2. Aspiration Feature Discrepancies between Sino-Korean and Middle Chinese

Understanding the phonetics and phonological system of both the borrowing language and the input language is a necessary prerequisite for the analysis of loanword adaptation. This chapter aims to provide a basic understanding of the phonological characteristics of the aspiration feature in both Chinese and Korean. The main language contact between China and Korea that led to Sino-Korean (SK) pronunciation occurred during the Late Middle Chinese (LMC) period. There is a time gap between this period of language contact and the time when SK pronunciations could be accurately recorded in *Hankul*. Therefore, to obtain a clear picture of phonological change in terms of aspiration features in both Chinese and Korean, we need to consider the development of aspiration features through the intervening time periods. In sections 2.1 and 2.2 below, I examine Chinese and Korean aspiration features in different periods. In section 2.3, I discuss aspiration features in the SK phonological system and catalogs differences in development of aspirates between native Korean and SK of the same time period. Based on the discussion of Chinese and Korean aspiration features, I summarize in section 2.4 previous research and hypotheses that attempt to explain the causes of irregular correspondences between Chinese and SK aspiration features.

2.1 Aspiration in Korean Phonology

The Modern Korean phonological system includes aspirated and unaspirated consonants. The table below demonstrates the Korean consonant inventory (Sohn 1999).

			bilabial	Alveo-dental	palatal	velar	glottal
stop	lax	voiceless or voiced	p	t	c	k	
	aspirated	voiceless	ph	th	ch	kh	
	tensed	voiceless	p’	t’	c’	k’	
fricative	aspirated	voiceless		s			h
	tensed	voiceless		s’			
nasal		voiced	m	n		ŋ	
liquid		voiced		l			

<Table 2.1 Korean consonant inventory (Sohn 1999)>

As shown in the table above, Modern Korean has a three-way phonemic distinction among stops and affricates at each place of articulation, although aspirated consonants appear with less frequency.

The consonant system of Late Middle Korean (LMK) also had a distinction between aspirates and unaspirates, but in LMK aspirated consonants appeared with much less frequency than in Modern Korean. It appears that the aspiration feature was less prominent in earlier stages of Korean history. K. Lee and Ramsey (2011) show that some words with an aspirated consonant in LMK had an unaspirated consonant in Early Middle Korean (EMK). They explain that some aspirates in LMK arose through a number of different phonological processes, such as influence of syllable-final /h/ and vowel syncope. As examples of syllable-final /h/ influence, we have *kwoh* 곻 ‘nose’ and *kalh* 갌 ‘knife’ in EMK, which developed into *khwo* 코 and *khal* 칼 in LMK.[10] And, the fifteenth-century verb *tha* ‘to ride’ is an example of aspirates developed by syncope of a vowel in the first syllable and subsequent metathesis of the two adjacent consonants. *Tha* appears to have gone through the following phonological process: **hota* > **hta* > *tha* [t^{h}a]. This is supported by the transcription of ‘to ride’ found in the *Kyeylim yusa* 계림유사 *Jīlínlèishì*: 轄打 [*xɦja:t-ta(jŋ)].

[10] The EMK and LMK examples presented in this chapter are from K. Lee & Ramsey (2011).

Based on internal reconstruction from Middle Korean and the characteristics of the system recovered through philological work, some scholars believe that the Old Korean (OK) phonological system also had plain consonants and aspirated consonants (K. Lee 1987, I. Lee & Ramsey 2000, K. Lee & Ramsey 2011). However, due to the scarcity of OK and EMK materials, there is not yet a scholarly consensus on whether aspirated consonants existed in these earlier stages of Korean history. These two possibilities will be discussed in 2.4.4.

2.2 Aspiration in Chinese Phonology

The main language contact between China and Korea that led to Modern Sino-Korean pronunciation occurred during the Late Middle Chinese (LMC) period. The thirty-six initials of LMC are presented in the table below:

	Stop/ Affricate				Fricative		Other
	vl.-asp	vl. +asp	vd.	nasal	vl.	vd.	
Labial	幫 p *bāng*	滂 p^h *pāng*	並 b *bìng*	明 m *míng*			
Labiodental	非 f *fēi*	敷 f *fū*	奉 v *fèng*	微 ʋ *wēi*			
Dental/lateral	端 t *duān*	透 t^h *tòu*	定 d *dìng*	泥 n *ní*			來 l *lái*
Retroflex stop	知 ʈ *zhī*	徹 $ʈ^h$ *chè*	澄 ɖ *chéng*	娘 ɳ *niáng*			
Dental sibilant	精 ts *jīng*	清 ts^h *qīng*	從 dz *cóng*		心 s *xīn*	邪 z *xié*	
Retroflex sibilant	照 tʂ *zhào*	穿 $tʂ^h$ *chuān*	床 dʐ *chuáng*	日 r *rì*	審 ʂ *shěn*	禪 ʐ *shàn*	喻 ø(j) *yù*
Velar	見 k *jiàn*	溪 k^h *xī*	群 g *qún*	疑 ŋ *yí*			
Laryngeal	影 ʔ *yǐng*				曉 h (x) *xiǎo*	匣 ɦ (ɣ) *xiá*	

< Table 2.2 Late Middle Chinese initials and their phonetic values >[11]

Phonological categories of LMC are represented in medieval rhyme tables such as *Yùnjìng* 韻鏡. In *Yùnjìng*, initials of five different categories are listed according to the place of articulation: labials (labial, labiodental), linguals (dental/lateral, retroflex stop), velars, dentals (dental sibilant, retroflex sibilant), and gutturals (laryngeal). Each category is further subdivided into the following four types according to the aspiration/ voicing feature:

清 *qīng*, voiceless unaspirated
次清 *cìqīng*, voiceless aspirated
濁 *zhuó*, voiced
次濁 *cìzhuó*, sonorant

[11] Traditional names of the initials are given in characters and pīnyīn. Reconstructions of the initials vary, and the phonetic values given in the table is one possible reconstruction. See Pulleyblank (1984) and Norman (1998) for terminology and concepts of the MC phonological system.

This categorization clearly indicates that unaspirated and aspirated initials were contrastive in LMC.

Chinese historical linguists believe that this distinction between unaspirated and aspirated initials existed as early as Old Chinese (OC) (Li 1980, Wang 1985, Norman 1988). The table below shows Li's inventory of OC initials, illustrating the aspiration contrast. Li's OC reconstruction is one of the most widely used and influential system, so I am presenting it here.

p	ph	b	hm	m		
t	th	d	hn	n	hl	l,r
ts	tsh	dz			s	
k	kh	g	hng	ng		
kw	khw	gw	hngw	ngw		
ʔ					h	
ʔw					hw	

<Table 2.3 Inventory of Old Chinese initials (Li 1980)>

2.3 Aspiration in Sino-Korean Phonology

In general, we would expect that the reconstructed phonological system of Sino-Korean (SK) in each period would more or less correspond to the reconstructed native Korean phonological system of the same period. This is because, in the earlier period of Korean history, evidence for SK phonology is found in the same textual materials that provide information on the native Korean phonology, including transcription of personal and place names in Old Korean. However, SK phonology may not be exactly the same as native Korean phonology. By definition, SK phonology is based on Chinese loans in Korean. To extend this understanding, Oh

(2005) defines SK research as "the study of the history and the nature of Chinese loans in the Korean language throughout various periods of time, from which Chinese strata the words are borrowed, and how those sounds transformed in Korean." He asserts that SK research should be "established separately from the studies of Old Korean and Middle Korean," which can be done more concisely based on the proper understanding of SK. Although the two phonological systems are found in the same periods, SK phonology reflects the Chinese source and Chinese phonological system, while native Korean phonology does not. Traditional views treat SK as part of the phonological system of Korean proper, but I adopt Oh's view regarding the discrepancy between SK phonology and Korean phonology and discuss aspirates in SK and native Korean separately. In 2.3, development of aspirated consonants in SK in various periods will be discussed and compared with each corresponding period of native Korean. (On periodization, refer back to Table 1.1 in Chapter 1.)

2.3.1 Early Old Sino-Korean

The period of Early Old Sino-Korean (EOSK) corresponds to pre-Old Korean, which is before Sinla (57 BC). The phonological system of pre-Old Korean was not discussed in 2.1, due to a lack of evidence. However, we can approach an understanding of the Korean consonant system of the earlier period by examining EOSK phonology. Due to the limited number of borrowings from Chinese into Korean and the unsystematic process of borrowing during this time, it is unlikely that EOSK phonology differed significantly, if at all, from pre-OK phonology.

Early borrowings from Chinese were nativized in Korean, and are not considered part of the SK system by speakers of Modern Korean; nor are they included in modern dictionaries of

SK.[12] Oh's (2005) attempts to discover early Chinese borrowings within the Korean lexicon are based on comparing Middle Korean (MK) forms with reconstructed ancient Chinese. Oh (2005) speculates that these MK forms were inherited from EOSK words that were borrowed from OC. He examines 154 examples of MK vernacular forms and compares them with OC reconstructions to discuss an earlier SK layer, which is EOSK.[13] Oh explains that the EOSK phonology is based on borrowing at the level of the individual word, unlike later layers of SK phonology, which were borrowed as part of a larger phonological system.

Three tables are presented below, reproduced from Oh (2005), to show correspondence between OC and MK initials. In each table, OC initials are arranged to correspond to their reflexes in MK based on the place of articulation. The data presented are all from MK, but Oh's discussion is regarding EOSK. In the following first table, which shows correspondence of labial initials, we see that OC *p-, *ph-, and *b- are mostly reflected as MK /p/. Among the four examples of OC *ph-, three of them are reflected as MK /p/, and one of them as MK /ph/. This one example is not strong enough to indicate the regular reflex of OC *ph- as an aspirated labial in MK. Therefore, it is possible to suggest that /ph/ was not fully developed in EOSK:

OC \ MK	*p*	*ph*	*sp*	*m*	*W*	*t*	*th*	*st*	*n*	*l*	*c*	*ch*	*sc*	*ss*	*s*	*z*	*k*	*kh*	*sk*	*ng*	*h*	*G*	*q*	*y*	*ø*
p	10																								
ph	3	1																							
b	4			1																					
m				7																					
hm	2																				2				

<Table 2.4 OC labial initials and corresponding MK sounds (Oh 2005)>[14]

[12] See 1.2 for the example *kom* 곰 'bear.'
[13] Changton Yu (1964) and Nam (1997) are the sources of MK words in Oh (2005).
[14] *hn*=[n̥]; *W*=[β]; *G*= an underspecified uvular; *ø*=zero See Oh (2005: 73, 77) for details of OC phonemic consonants and MK phonetic consonants.

The folowing table shows correspondence of dental initials. As seen in syllables with labial initials, phonemically distinct voiced and aspirated stops in OC mostly correspond to unaspirated in reflexes of OC in MK. OC *t-, *th-, and *d- are mostly reflected as MK /t/, which again supports the conclusion that the distinction between aspirates and unaspirates was not fully developed in EOSK:

MK / OC	*p*	*ph*	*sp*	*m*	*W*	*t*	*th*	*st*	*n*	*l*	*c*	*ch*	*sc*	*ss*	*s*	*z*	*k*	*kh*	*sk*	*ng*	*h*	*G*	*q*	*y*	*ø*
t						1	2	2			2				1						1				
th						2	1	1			1				2										
d						9	1	2	3		1						1								
n									8																
hn									1																

<Table 2.5 OC dental initials and corresponding MK sounds (Oh 2005)>

While there were a few syllables with labial and dental aspirates, there is no syllable with a velar aspirate in Oh's data. This is consistent with the current status of Korean phonology, in which velar aspirates are the least frequently used compared to aspirates in other places of articulation. The following table shows correspondence of velar initials:

MK / OC	*p*	*ph*	*sp*	*m*	*W*	*t*	*th*	*st*	*n*	*l*	*c*	*ch*	*sc*	*ss*	*s*	*z*	*k*	*kh*	*sk*	*ng*	*h*	*G*	*q*	*y*	*ø*
k																	9		1		1				
kh																	5								
g																	5								1
ng																	2		1						1
hng																									
ʔ																	1							1	4
h																									
kw															1		2								
khw																									
gw																	4				1				
ngw																									1
hngw																	1								
ʔw																									
hw																									

<Table 2.6 OC velar initials and corresponding MK sounds (Oh, 2005)>

If a stage earlier than MK had an aspiration distinction, we would expect that the OC aspiration distinction would have been reflected in OK and then inherited by MK. Oh's study supports the hypothesis that the aspiration feature is later innovation in MSK and cannot be reconstructed back to EOSK; he shows that the MK pronunciations with aspirated consonants are rare and only irregularly correspond to OC aspirates. Based on the fact that there are only a few cases of aspirated consonants, I deduce that their occurrences are random and sporadic, and conclude that aspiration was not a phonemic feature of EOSK.

2.3.2 Late Old Sino-Korean (Sino-Paykcey, Sino-Sinla, Sino-Kokwulye)

All available studies on Sino-Paykcey, Sino-Sinla, Sino-Kokwulye languages from the Late Old Sino-Korean period point to absence of aspiration as a phonemic feature. Examples in Eom's (1991) research, conducted based on personal and place names in historical documents such as *Samkwuk Saki* (SKSK), show that both Sino-Paykcey (SP) and Sino-Sinla (SS) lacked aspirates in their phonological system. Reconstructions of SP by To (1987) and Changkyun Yu (1980) do not include aspirates, either. The nine initials of SP that have been reconstructed in Eom (1991) are *p-, t-, k-, ts-, s-, m-, n-, l-*, and *Ø-*.

Based on the comparison of Kokwulye transcriptions and Chinese reconstructions, Noh (2003) also claims that there is no aspiration distinction in Sino-Kokwulye (SKo). The table below shows MC initials and corresponding SKo initials:

Middle Chinese	Sino-Kokwulye
p-, p^h-, b-	*p-*
m-	*m-*
t-, t^h-, d-; tr-, tr^h-, dr- before non-high front vowels	*t-*
n-, nr-, ɲ-	*n-*
l-	*l-*
ts-, ts^h-, dz-; tʂ-, tʂ^h-, dʐ-; tɕ-, tɕ^h-, dʑ- *t-, t^h-, d-; tr-, tr^h-, dr-* before high front vowels	*ts-*
s-, z-; ʂ-, ʐ-; ɕ-, ʑ-	*s-*
k-, k^h-, g-, x-, ɣ-	*k-*
j-, ŋ-, ʔ-	*ø-*

<Table 2.7 MC initials and corresponding SKo initials>

It is noticeable that the same consonants were reconstructed in SP and SKo with the absence of aspirates. Previous research (Changkyun Yu 1980, Chang 1981, To 1987, Eom 1991) consistently argues that aspirates were not phonemically distinct in the phonological system of Late Old Sino-Korean. Chang and Eom acknowledge that aspiration was in the process of developing up until Middle Sino-Korean, based on the evidence of different phonemicization process of aspirates at different places of articulation in the 7th – 8th C.

2.3.3 Middle Sino-Korean

Some Middle Sino-Korean data come from materials from the pre-*Hankul* stage, and others from after the invention of *Hankul*. It cannot be determined with certitude whether the phonological systems reflected in these pre-*Hankul* materials such as *Kyeylim yusa Jīlínlèishì* (1103) and *Cosen kwanyeke* 조선관역어 (around 1400) contain aspirated consonants because of the scarcity of data and inconsistent patterns of correspondence between aspirates in Chinese and their SK reflexes (S. Kang 1980, K. Lee & Ramsey 2011).

After the invention of *Hankul*, SK readings were recorded in *Hankul* on various *enhay* 諺解 (Korean annotations of Chinese Classics) and Korean Chinese-character rhyme books compiled during the Coson dynasty. The distinction between aspirates and unaspirates is clearly indicated in these materials, giving us more reliable data to investigate the nature of aspiration in SK and native Korean. Therefore, I will use the data from these *enhay* and rhyme books.

2.4 Previous Research and Hypotheses

The sections above described aspiration features in Korean, Chinese, and SK phonology systems to demonstrate that possibly the discrepancy in aspiration features in these phonological systems triggered irregular correspondence between consonants in Chinese and Korean. However, the lack of a phonemic aspiration distinction in early SK phonology is not enough by itself to explain the aspiration discrepancy between MC and SK. The degree of correspondence is much higher than would occur by chance if there were truly no aspiration distinction in the history of SK phonology before 1400. In addition to this phonological trait, previous researchers (Kōno 1968, Itō 2007) have proposed two other factors as the main determiners of the pronunciation of the initial consonant of SK readings, namely, *analogy* based on the Chinese characters' phonetic component and *syllabic inclination*. Itō summarizes the causes of irregular correspondence between aspirated and unaspirated initials as below:

a. analogy and contamination caused by the same phonetic component
b. syllabic inclination (including tone)
c. influence from modern Chinese dialects
d. influence from medial -i-

I begin this section by exploring the analogy and syllabic inclination hypotheses in more detail. Afterwards, I discuss more hypotheses such as influence from modern Chinese dialects and influence from medial -i- presented in Itō and other studies.

2.4.1 Analogy Based on Phonetic Component

Analogy of the phonetic component has been discussed in the literature as one of the main factors that triggered irregular SK readings. When a great number of new characters were imported in a short amount of time, it was probably not easy for learners to acquire the correct pronunciation of each character. Since a large portion of Chinese characters are phono-semantic compound characters (*xíngshēngzì* 形聲字), which is a compound of a phonetic component and a semantic component, it is possible that Korean elites who faced a new character tried to guess the pronunciation (or features of the pronunciation) based on the character's phonetic component without consulting a reliable source each time.

The concepts of analogy (*yuchwu* in Korean, *ruisui* in Japanese) 類推 and, more specifically, the hypothesis of reading by analogy (*yuchwuum* in Korean, *ruisuion* in Japanese) 類推音, play a significant role in previous research of SK phonology such as Kōno (1968), Yi (1995), and Itō (2007). However, these researchers have not explicitly discussed the definition of analogy in the context of SK phonology.

The analogy hypothesis of the previous research can be summarized as follows. When learners do not know an exact reading of a character, they tend to rely on evidence that is easily accessible, instead of taking the time to make a more deliberate determination of proper reading pronunciation. A common phonetic component shared by an unknown character and a known character produces interference in the selection of a normative reading. In SK phonology, this

kind of phonetic component shared by two characters plays a significant role. Suppose that character A and character B share a phonetic element but have different pronunciations in their MC source. This is a common occurrence.[15] These two characters are expected to end up being adapted into Korean with the same SK reading, but that is not the case. Let's take "波" *bō*, which has two different SK readings, as an example. When it is used for transliteration in Buddhist texts, its pronunciation is [pa] 바, but in its ordinary meaning 'wave,' it is read as [p^{h}a] 파, although their MC counterparts are both read with the identical MC /p/ initial. What then is the source of the SK reading [p^{h}a]파? The answer might be found in 皮 'skin,' which is a phonetic component of 波 *bō*, and has MC /p^{h}/ initial.

According to this scenario, a single character or multiple characters function as a model character for the analogical process. In this context of analogy, I define a "model character" as a character or character set whose familiarity to users influences the pronunciation of other characters that share the same phonetic component. I am defining this term in order to more clearly explain the analogy hypothesis, because the concept of a model character was not discussed explicitly in the previous studies of this hypothesis. In the example above, the model character is 皮 'skin.' The hypothesis that irregular readings are caused by analogy to the pronunciation of a model character is persuasive when the model character is indeed influential. However, how to define "influential" or which character or a character set is truly influential is controversial. For example, characters with a phonetic component 舀 such as 滔 'flood,' 韜

[15] The same phonetic component was not necessarily used for the exactly same sound in the Chinese characters even during the OC period when these characters were created. When one character was used as a phonetic component in another character, or two characters shared the same phonetic component, it is because pronunciations of these two characters were related to each other: two characters normally have identical OC main vowels and codas, and their initial consonants must have the same position of articulation, in order to be written with the same phonetic element. See section 3.2 for details. See Boltz (1994: 90-126) for related discussion.

'cover,' 慆 'negligent,' and 瑵 'jade' are all read as *to* in SK.[16] Since these characters have MC /t^{h}/ initial, their SK reading *to* is irregular. Itō claims that these readings are influenced by 蹈 'tread' and 稻 'rice' with MC /d/ initial. According to Itō, 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑵 'jade' are less frequent, whereas 稻 'rice' is one of the most frequently used characters. Therefore, Itō maintains that 稻 'rice' could have influenced the readings of other characters as a model character.

On the other hand, Kōno contends that 蹈 'tread' and 稻 'rice' are not influential enough. While Itō argues that frequency determines how influential a model character is, Kōno does not explain what determines the degree of influence. In fact, recourse to frequency seems more problematic than it first appears, because it is necessary to define and measure frequency in order to examine the frequency effect on analogy. I will revisit this issue in Chapter 3.

Itō (2007) also claims that analogy by phonetic component can occur even if pronunciations of characters differ significantly. This phenomenon is termed "contamination" in Kōno (1968), and is treated as a phenomenon distinct from analogy. According to Kōno, even if two characters sharing the same phonetic component do not have the same final, they can still be influenced by each other. Kōno claims that 菠 'spinach' and 簸 'winnow' (SK [p^{h}a] 파) with MC /p/ initial are examples of contamination. SK aspirated initials of these characters are influenced by the SK reading of their phonetic component 皮 'skin' (SK [p^{h}i] 피), even though the vowels are different in both MC and SK. Compared to a set of characters in the case of analogy, these two characters in the case of contamination show a greater degree of dissimilarity in their SK readings. Because cases of contamination are, like analogy, the result of shared phonetic

[16] Chinese words with English gloss, for convenience, will be a single word that is not a fully arranged meaning.

components, and because they are apparently not very common, I do not think it is justified to treat them as distinct. I consider this phenomenon to be a type of analogy and discuss it in the same category.

Analogy is common to learning processes. It has also been appealed to as an explanation for irregular readings of other Sinoxenic systems. In Sino-Japanese (SJ), 洗 'to wash' MC *siaj* is read as /sai/ in *go-on* 呉音 and as /sei/ in *kan-on* 漢音. These readings accurately reflect the MC phonological categories. In Modern Japanese, it has an irregular reading /sen/. Yi (1995) applies analogy to argue that this irregular reading might have been influenced by the reading of 先 /sen/. Analogy is an important concept to explain irregular readings in SJ, as in SK, due to the similar situation of importing an abundant number of Chinese characters and pronunciations. Similar to Korean learners, Japanese leaners could have relied on analogy to guess a proper pronunciation instead of consulting an authentic source for the correct reading.

2.4.2 Syllabic Inclination (*onsetsu henkō* 音節偏向)

Kōno's (1968) *Cosen Kanjion-no Kenkyu* '*A Study of Sino-Korean Pronunciations*' is regarded as the earliest and the most comprehensive research on SK phonology. He discusses SK readings according to the different places of articulation, because each of them shows a different ratio of discrepancy. He argues that there are certain syllable types that are combined only with aspirated initials or only with unaspirated initials. For example, there are characters whose SK reading is /pin/, but the final /-in/ is never found with an aspirated labial initial /p^h/. That is, /p^hin/ does not exist as an SK reading. There are also characters whose SK reading is /p^hil/, but the final /-il/ does not combine with unaspirated labial initial /p/. Thus, /pil/ does not exist as a SK

reading. The term Kōno uses to label this phenomenon is *onsetsu henkō* 音節偏向, which we translate here as "syllabic inclination."

Based on Kōno's explanation of syllabic inclination, Itō (2007: 47-48) summarizes the cases where particular SK finals are combined with only aspirated or only unaspirated initial, and develop irregular SK readings:

a. SK pronunciation is based on MC pronunciation. Therefore, when there is a tendency that a certain final is combined with only aspirated or only unaspirated initial in MC, this is reflected in SK.
b. Aspirated initials in MC are adopted as unaspirated in SK due to analogy of the same phonetic component, if most characters with the phonetic component have an unaspirated initial in MC. Besides analogy, contamination also occurs.
c. When most syllables with a certain final in MC have either an aspirated or unaspirated initial, this tendency is reflected in SK.
d. If a character with a certain final occurs frequently, other characters tend to be pronounced as this character.

It is apparent from (b) that Itō does not differentiate syllabic inclination from analogy as a mechanism that de-aspirates aspirated MC initials in SK. However, I will examine the sets of irregular readings that are explained by each mechanism.

Chang (1981) engages Kōno's observation that aspirated consonants are restricted in their distribution: certain finals tend to combine with an aspirated consonant, but others do not. He examines MC finals that are combined with /p/ and /p^h/ initials to investigate the most promising factors of what he calls 'the new realignment' in SK, by which he means a shift in correspondence pattern between both initials and finals. This examination attempts to determine which features in MC finals are manifested as aspirated labial initials in SK other than MC aspiration. Based on the examination of syllables with labial initials, he argues that voicing, tone, and medial glides appear to influence aspiration in SK. According to Chang, there are twenty-three MC syllabic types where only unaspirated initials occur and seven types only occurring with aspirated initials.

One can also interpret syllabic inclination as a phonotactic tendency within a syllable. Itō (2007) in fact suggests that this phonotactic tendency is rule-based to a degree. I will revist this in 2.4.3 below as part of aspiration-inducing phonological features in SK.

2.4.3 Aspiration-inducing Phonological Features in Sino-Korean

Itō (2007) expands the usage of textual sources by adding documents to Kōno's materials list. Discussing syllabic inclination, Itō argues that due to a special characteristic of aspiration in SK, both aspirated and unaspirated initials in MC are adopted as aspirated in SK with certain finals. Itō hypothesizes that certain phonological features in syllables with aspirated initials in SK caused unaspirated initials in MC to be realized as aspirated in Korean. She lists a few of these phonological features that purportedly cause aspiration. According to Itō, in most cases MC unaspirated initials are reflected as aspirated in SK when they are followed by an SK medial -i- (i.e. on-glide [j], romanized as *j* in the examples below). The mechanism that Itō proposes for this phonological process is that medial -i- could cause stops and affricates to be perceived as fricatives. A medial -i-, which is phonologically weak, might have become devoiced, ultimately causing the preceding consonant to be perceived as aspirated.[17] For example, there is no character with SK pronunciation [pje] 볘. Characters that are expected to be pronounced [pje] 볘 are all pronounced [p^{h}je] 폐 as illustrated in the table below:

[17] I provide a paragraph from the original article and its Korean translation from Itō (2007) and Yi (2011) for the reader's convenience: ただしこのことを音声学的に説明することは難しい。i 介音をもっていることにより、無気破裂音、破擦音が摩擦音のように聞き取られる傾向があったか、もしくは i 介音が音声学的に弱いものであったために無声化する傾向があり、その結果「子音+ i 介音」全体が有気音的に聞き取られていたのかもしれない。(Itō 2007: 48) 이런 사실을 음성학적으로 설명하기란 어렵다. 개음 'i'를 가졌다는 점으로 인해 무기파열음이나 무기파찰음을 마찰음처럼 알아듣는 경향이 있었거나, 아니면 개음 'i'가 음성적으로 약했기 때문에 무성화하는 경향이 있었고 그 결과 '자음+개음 i' 전체를 유기음적으로 알아들었을지도 모른다. (Yi 2011: 96)

MC initial	幫 *p-*			並 *b-*		非 *f-*	敷 *f-*	奉 *fɦ-*
Character	閉	嬖	蔽	弊	陛	廢	肺	吠
pīnyīn	bì			bì		fèi		
LMC	pjiaj			pɦjiaj		fjyaj/ fji	fjyaj/ fji	fɦjyaj/ fɦji

<Table 2.8 Characters that are pronounced as [p^{h}je] 폐 in Sino-Korean>[18]

Itō also observes that *rù* 入 tone endings (i.e. codas -p, -l, -k in SK, from MC -p, -t, -k) are another condition that causes aspiration. In syllables with labial initials, aspiration occurs predominantly in the structure of 'consonant+ -i- + *rù* tone ending' such as [p^{h}ip] 핍 and [p^{h}il] 필.

Itō attempts to systematize possible phonological rules that cause aspiration in SK by explaining contributing phonological features. Although her research has contributed to a more nuanced understanding of the concept of syllabic inclination, it has not provided a fully developed argument regarding aspiration-inducing effects of phonological features in SK. To determine whether her explanation is valid, we need to examine how well these phonological features discussed by Itō in irregular readings with labial initials can explain those with dental initials. Itō's data above supports her proposal, but it cannot explain why certain syllables in the proposed mechanism with a medial -i- or a *rù* tone ending, such as [pjʌl] 별, [pjʌk] 벽, [pjʌn] 변, and [pjʌŋ] 병, still exist. We would have to identify (i) a common phonological feature or combination of features in the syllables that have aspiration, and only in those syllables; and (ii)

[18] Developments from Middle Chinese to Mandarin are complicated. For details, see Pulleyblank (1984). In terms of voicing and aspiration of stops and affricates, which is our main concern, the developments are relatively straightforward and can be generalized as follows:
MC voiceless unaspirated > Mandarin voiceless unaspirated (e.g. MC p- > Mandarin p-, *b-* in pīnyīn)
MC voiceless aspirated > Mandarin voiceless aspirated (e.g. MC p^{h}- > Mandarin p^{h}-, *p-* in pīnyīn)
MC voiced > LMC voiceless breath > Mandarin voiceless unaspirated in non-píng tones (e.g. MC b- > LMC pɦ- > Mandarin p-, *b-* in pīnyīn)
MC voiced > LMC voiceless breath > Mandarin voiceless aspirated in píng tone (e.g. MC b- > LMC pɦ- > Mandarin p^{h}-, *p-* in pīnyīn)
It is also worth noting that MC bilabial stops developed into Mandarin labiodental fricatives under some conditions.

a plausible motivation (i.e. articulatory or perceptual) that accounts for the sound change. Until then, the problems that arise from Itō's hypothesis will remain unresolved.

2.4.4 Lack of Aspiration in Korean Phonology

The presence or lack of contrastive aspiration in earlier stages of the Korean language is one of the most outstanding questions to be answered in historical Korean phonology. The LMC period, when the main layer of SK pronunciation was developed in Korea, corresponds to the period of OK. Understanding the phonemic and phonetic status of aspiration in OK would help to explain the irregularity of SK aspiration. Therefore, it is important to evaluate the different hypotheses about aspiration in the history of Korean phonology and to consider their ramifications on hypotheses about the causes of the SK aspiration mismatch.

There are two contentions on the presence of aspiration in OK. K. Lee (1987) and I. Lee and Ramsey (2000) hypothesize that the aspirated consonant series existed in the Sinla language, which they consider to be equivalent to OK. K. Lee (1987) provides a few examples in personal and place names from transcriptions of Sinla as evidence that there were aspirated consonants in OK. For example, 居柒 SK [kʌ.tɕ^{h}il] in SKSK is a phonogrammic form of the Sinla word for 'uncultivated, fallow,' which is glossed as 荒 MC *xuaŋ* 'wilderness, wastelands' or 萊 MC *laj* 'goosefoot.[19]' Comparing this phonogrammic form with *kechul* 거츨 in Middle Korean, Lee argues that the second syllable of the OK word 'uncultivated, fallow' is pronounced with an aspirated initial, which is why it was transcribed as 柒 that had an aspirated initial in SK.

[19] I speculate that 'goosefoot' could serve as a semantic gloss for 'uncultivated, fallow,' because it is a type of weed.

However, not all scholars agree that OK had a distinct aspiration feature. Tongso Kim (1998) believes that aspirates were still in the process of development until the MK stage.[20] Kim claims that /h/ began to develop in 11th C; in some cases it developed from a weakened *k-, and in others from an *s-. Kim presents examples showing that velar fricatives in OC and MC were reflected as a velar stop in OK, which is evidence of no distinction between a velar fricative and a velar stop in OK:

a. 居瑟<u>邯</u> (MC *xɦam*) 或作居西<u>干</u> (MC *kan*) <SKSK 1>
Jūsèhán is also written as Jūxīgān.

b. <u>咸</u> (MC *xɦja:m*) 悅縣 本百濟<u>甘</u> (MC *kam*) 勿阿縣 <SKSK 36>
Xiányuè County was originally Gānwù'ā County of Paykcey.

Kim argues that truly contrastive aspiration did not appear until the 13th C when the development of /h/ was completed and productive as a phoneme. There are a number of examples in SKSK where Chinese characters of both MC aspirated and unaspirated initials were used as a phonogrammic form of the same OK word. For example, Chinese characters with both MC /t/ (旦, 頓) and /t^h/ (呑) initials were used to as a phonetic transcription of 谷 'valley' in SKSK, and Kim presents this as evidence of no aspiration distinction in OK. According to Kim, when MC pronunciation was systematically adopted into Korean on a large scale, MC's aspirated, unaspirated, and voiced consonants were all reflected as voiceless, unaspirated consonants, i.e. merging into one consonant series in OK. He posits that the SK phonology system that was established during this period remained for several centuries until /h/ appeared in Korean phonology, which contributed to the development of aspirated consonants in Korean. Kim speculates that this whole situation caused mismatching between MC and SK.

[20] In Kim's periodization, MK period begins in 13th C, which is the end of EMK period in the current study.

The conflicting views of these two hypotheses are understandable. Reconstruction of SK in the OK stage relies on extremely limited personal and place names in historical documents. Because the SK materials prior the invention of *Hankul* are sporadic and scarce, both hypotheses are still being evaluated.

Let us now return to the earlier discussion in 2.3.2 and compare it with these two hypotheses on aspiration features in OK. Based on the analysis of personal and place names in SKSK, previous research (Changkyun Yu 1980, To 1987, Eom 1991, and Noh 2003) explains that there was no distinct aspiration feature in the phonology of Late Old Sino-Korean (LOSK), which is compatible with the hypothesis that there was no distinction between aspirated and unaspirated initials in OK. The evidence for lack of aspiration feature in LOSK contradicts the hypothesis that aspirated initials existed in OK. These hypotheses on aspiration features in OK and LOSK are mostly based on SKSK. Different results from the analysis of the data in the same material can be explained in terms of several possible factors: Are multiple transcription systems, perhaps corresponding to differences in language or dialect, reflected in the data? Are different subsets of data focused on? Or, are there different interpretations of the same data? With limited evidence of the languages in Kokwulye, Paykcey, and Sinla, discussion regarding the relationship among these three languages is itself as controversial as the topic of aspiration feature in OK. Although lexical differences are recognized among these three languages, there is not sufficient evidence to prove that their phonological systems, especially consonants, are significantly different. Among the three possible reasons listed above, different interpretations of the same data appear to explain different results coming from the same document. Let us look at one example that is interpreted differently in the two hypotheses regarding OK.

a. 東萊郡本居柒山郡 <SKSK 34>
Dōnglái Prefecture was originally 'Rugged Mountain' Prefecture.

b. 居柒夫或云荒宗 <SKSK 44>
Master Uncultivated is also called as Huāngzōng.

We have two Chinese-character representations of the same place name and the same personal name, with some characters used phonetically and some used semantically. As discussed earlier, K. Lee (1987) argues that 柒 was read as aspirated in OK and used as a phonogrammic form of the second syllable of a Sinla word 居柒 for 'uncultivated, fallow,' which is glossed as 荒 huāng (MC *xuaŋ*) 'wilderness, wastelands' or 萊 lái (MC *laj*) 'goosefoot, wildland.' Because 거츨 *kechul* is a Middle Korean word meaning 'uncultivated, fallow' in 15th C, Lee finds a correspondence between the aspirated initials of 츨 *chul* in 15th C Korean and 칠 *chil*, the SK pronunciation of 柒. But according to Pak (1971, 1990) and Tongso Kim (1998), there is no evidence that MC aspirated initials are reflexes of aspirates in OK. 거츨 *kechul* is a MK word, not an OK word. Based on 꺼실꺼실 *kkesil kkesil* and 까실까실 *kkasil kkasil* 'rough,' dialectal forms in Modern Korean, they find a possibility that 柒 in the SKSK examples might have been read as *s*, instead of *ch*.[21]

If there were a distinction between OK aspirated and unaspirated consonants, the irregular correspondences between Middle Chinese and Sino-Korean, what we have called the SK aspiration mismatch, would have to be explained by later phonological developments within Korean, or by different pathways of borrowing, which caused some aspirated initials to change to unaspirated and *vice versa*. In this case, possible explanations for the irregular correspondences would include different layers of Chinese character adoption, dialect differences in Chinese and/or Korean, and phonetic differences in the nature of Chinese and Korean aspiration. If there

[21] These dialect forms for 'rough' are cognate with a MK word 거츨 *kechul* 'uncultivated, fallow'.

were no distinction between aspirates and unaspirates in OK, as many scholars have hypothesized, then the aspiration mismatches are only to be expected. But this leads to a different problem: we instead need to explain why the ratio of correspondence of aspiration features between MC and SK is significantly higher than that of mismatches. The table below presents the ratio of correspondence of aspiration features between MC and SK.[22] While the degree of correspondence varies depending on the place of articulation and the aspiration/ voicing feature in MC, all these categories show more than 50% of correspondences. If aspiration features had developed after the time of adopting Chinese characters and pronunciation on a large scale, as Pak (1971, 1990) and Tongso Kim (1998) speculate, then we need to consider what later phonological and historical factors contributed to the increase in the ratio of correspondences.

Place of articulation in MC	Aspiration/ voicing features in MC	SK percentage of regular readings
Labials	-asp	76.1% -asp (191/251)
	+asp	56.8% +asp (38/67)
	voiced	69.9% -asp (169/242)
Dentals	-asp	79% -asp (154/195)
	+asp	68.2% +asp (92/135)
	voiced	72.1% -asp (245/340)

<Table 2.9 Ratio of correspondence in adoption of aspiration feature>

As a tentative conclusion regarding aspiration features in OK, I propose that there could have been phonetic aspiration in OK. There might have been alternate pronunciations for few lexical items. It appears that these rare cases, such as the example 柒 *chil,* show the existence of aspiration features in OK and EMK. It does not mean all [p^h], [k^h], and [t^h] were phonemic in OK

[22] Refer to Table 1.2 in Chapter 1 to find a complete table including velars. Velars are not included in this table, because most of the charactrs with MC velar initials have been reflected as an unaspirated initial in SK, except for only a small number of characters.

phonology and EMK phonology. Aspirated consonants with a very low functional load in the beginning could have developed into phonemically distinct aspirates later.

The Korean aspirated series developed over many centuries. I have presented two hypotheses regarding aspiration features in OK, which appear to be two opposing positions. Regardless, both hypotheses support the idea that the OK period is when the potential for aspirated consonants was generated.

2.4.5 Gradual Phonemicization Process Introduced by Loanwords

Chang (1981) supports the lack of aspirated consonants in OK. He hypothesizes that the development of aspiration in Korean was affected by the adoption of a large scale of Chinese characters along with their pronunciations.[23] Chang claims that the aspiration contrast was developed in an asymmetrical manner due to a gradual phonemicization process resulting from this large-scale adoption. The process began with dental stops and labial stops. Velar stops were affected last. According to Chang, this order is consistent with some universal phonetic tendencies, which is the intrinsic association of the velar stops and the longer duration of aspiration. Chang uses acoustic data across languages in the world to argue that velars have the least benefit from the contrast of aspiration, as opposed to dentals benefit the most. He observes that in data from Ruhlen's (1975) study of various types of aspiration systems of the world languages, of the twelve languages with aspiration in two places of articluation, only one language lacks aspiration in dentals, and of the seven languages with aspiration in only one place of articulation, six languages have aspiration feature in dentals.

[23] Chang's research is based on the data from DOC complied at UC Berkeley, which uses SK pronunciation recorded in Karlgren (1957).

Chang contends that there is a significant difference between the grave series of initials (labials and velars) and the non-grave series (coronals). Compared to the non-grave series, the grave series show a lower degree of aspiration correspondence between SK and MC. Chang concludes that OK speakers were not phonemically distinguishing the contrast of labial aspiration in MC. Instead, they categorized SK syllables with aspirated labial initial and those with unaspirated initial based on features of the MC finals. The labial aspiration was presumably, according to Chang, subphonemic in OK and later it became phonemicized. This phonemicization is due to vowel shifts that produced minimal pairs contrasting only in aspiration. Chang's study is innovative in that it accommodates universal phonetic tendencies and phonological features found in Modern Korean. His research has not received scholarly attention in the field, partly because his theory is not supported by his data. Furthermore, the claim that there was a major vowel shift in the development from OK to MK, which he uses to argue for his theory, still remains controversial.

Chang's approach to the aspiration mismatch also raises a critical question: Why would the introduction of Chinese loanwords only play a role in developing aspiration, but not in developing a voicing feature in Korean initial stops? Many scholars (Konō 1968, Pak 1971) support the hypothesis that aspiration features did not exist in native Korean until they were developed in SK morphemes. However, this rhetorical question suggests that aspiration features, unlike voicing features, may already have existed in Korean at that stage and that Chinese loanwords expedited rather than created the development of aspiration features.

2.4.6 Other Explanations: Influence from Chinese Dialects, Semantic Category of Characters

Besides the five factors listed above, it is worth exploring two more factors that might have caused the irregular correspondence between MC and SK initials: influence from Chinese dialects and semantic category of characters. As for the characters whose aspiration feature shows irregular correspondence between MC and SK, Itō compares them with their pronunciation in modern Chinese dialects. When "波" *bō* with MC /p/ initial is used for transliteration in Buddhist texts, its SK pronunciation is [pa] 바, but in its ordinary meaning 'wave' it is read as [p^{h}a] 파. As discussed in 2.4.1, the irregular reading [p^{h}a] 파 with an aspirated initial can be explained in terms of analogy. Another factor we can consider besides analogy is influence from Chinese dialects. 波 *bō* is pronounced with /p^{h}/ in many Chinese dialects. It is possible to argue that 波 *bō* had pronunciations with both /p/ and /p^{h}/ initials in MC and that both initials have been reflected in SK readings (as well as in modern Chinese dialects), even though the reading with /p^{h}/ initial is not reflected in the standard medieval Chinese textual sources.

Previous researchers have also addressed SK readings of Buddhist vocabulary relating the degree of discrepancy in SK readings and their semantic category. Readings of Buddhist terms can be different from standard readings. Based on the examples found in her research, Itō (2007) hypothesizes that many aspirated initials tend to become unaspirated in Buddhist terminology. For example, besides the example of 波 *bō* above, 便 'convenient, cheap' with MC

/b/ initial is read with SK /p^{h}/ as in [p^{h}jʌ.nan]便安 편안 ‘comfortable, safe,’ while read with /p/ in the Buddhist term as in [paŋ.bjʌn] 方便 방변 ‘expedient, means.’[24]

Since Buddhist terms was probably imported into Korea along different paths from the main layer, a close examination of Buddhist terms can reveal important information about the phonological system of OK. Chang (1981) uses examples of Buddhist terms to argue that Korean of this stage lacked an aspiration feature. He points out that the terms below include syllables that would be expected with an aspirated initial based on their MC phonological categories, but they are read with an unaspirated initial in SK:

	SK	Sanskrit source	English gloss[25]
裟婆	*sapa*	*sahā*	the secular world
布施	*posi*	*dāna*	almsgiving
婆羅門	*palamwun*	*Brāhman*	Brahmin. The clerical caste among the four castes in India
陀羅尼	*talani*	*dhāranī*	incarnation
茶毘	*tapi*	*jhāpita*	cremation
波羅蜜	*palamil*	*pāramitā*	perfection

<Table 2.10 Examples of Buddhist terms>

Each example needs to be carefully examined to determine if there is any other factor than the semantic category that caused the reading with an unaspirated initial. For example, for an unknown reason, 布 'cloth' is read with /p^{h}/ initial in most cases except for in the Buddhist terms. However, 布 'cloth' has MC /p/ initial and is expected to be read with /p/ in SK. Therefore, the SK reading with /p/ initial is a regular correspondence, and 布施 *posi* is a weak example to

[24] This reading with /p/ initial is found in 六祖法寶壇經諺解 (1496), 真言勸供諺解 (1496), and 三壇施食文諺解 (1496), but is read as *ph-* in 長壽經諺解 (early~mid 16th C). In Modern Korean, 方便 is read as 방편 [paŋ.p^{h}jʌn] and used in a broader boundary, not just as a Buddhist term.

[25] Muller, A. Charles, and Okpay Cen. 2014. *Hanyeng pwulkyo taysacen = A Korean-English dictionary of Buddhism*.

support Chang's argument. 陀 'hill' with MC /d/ initial is pronounced with two different MC tones, rising (*shǎng* 上) and level (*píng* 平). Perhaps tonal difference could have influenced the SK reading. These examples show how certain words in a different context can be adopted with different readings. More characters chosen to transliterate Buddhist texts in MC require careful investigation before we can gain a stronger understanding of the phonology of Buddhist terminology within the broader SK system. It is reasonable to assume that in comparison to Buddhist terminology, character readings associated with governance or Confucianism would have a tendency to match the standard medieval Chinese textual sources more closely. Scholars who had more knowledge of MC categories and valued "correct" pronunciations would have used these character readings. It will be ideal to categorize the characters that have aspiration discrepancy in their SK reading in future studies according to the semantic and cultural spheres they belong to.

2.5 Conclusion

Previous researchers attributed the irregular correspondence between MC sources and SK reflexes to various factors, including analogy off of phonetic components, syllabic inclination, phonological features in SK, lack of aspiration features in OK, gradual phonemicization process introduced by loanwords, influence from Chinese dialects, and semantic category of characters. Each factor certainly aided from various perspectives a fuller understanding of the SK readings that have a mismatch with their MC sources. In Chapter 2, I evaluated these factors in light of the phonological systems in Chinese, Korean, and Sino-Korean through different periods. Taking into account the data from transcriptions in this period, I drew a tentative conclusion that

aspirated consonants in OK and EMK were distinct only phonetically, but not phonemically. I base my argumentation in following chapters on this assumption.

In the following chapters, I revisit and examine in detail two important factors introduced in this chapter. I explore their possible shortcomings and make suggestions on how to improve the theories to better fit the data. I take up analogy based on phonetic components in Chapter 3 and syllabic inclination in Chapter 4.

3. Analogy, frequency effect, and Their issues

As the ability to copy is a powerful tool in language learning, linguistic signs can be "copied and modified out of their original contexts" (Anttila 2003). Analogy is an important concept to understand language change in general and explains a big portion of Sino-Korean (SK) irregular readings. In this chapter, I discuss how analogy is understood in historical linguistics and how the concept has been applied in the analysis of SK phonology. Following this discussion, frequency effect will be examined to deepen understanding of analogy in SK phonology.

3.1 Analogy in Historical Linguistics

Analogy is understood as one of the major forces for linguistic change. In historical linguistics, analogy traditionally refers to the process by which morphologically, syntactically, and/ or semantically related forms become more similar to each other in their phonetic and morphological structure (Hock 1991). As one of the most important types of triggers for linguistic change, analogy has been defined by Trask (2007:15), for example, as "a type of language change in which some forms are deliberately changed merely to make them look more like other forms." Generally, it seems that irregular forms result from regular sound change and regular forms result from irregular analogic change (Anttila 1989:94). *Wrought*, the past tense of *work*, has been changed to *worked* by analogy; *Catched*, the past tense of *catch*, has been changed to *caught* by a different kind of analogy. The first process eliminates an irregularity and the second creates it.[26] In both cases, the change results in a form that is similar to another existing form.

[26] These examples of two types of analogy are provided in Trask (2007).

Listing various definitions of analogy, Campbell (2004:103) points out that analogical change involves a relation of similarity, which is an essential element in all the definitions. Campbell describes two kinds of analogy in historical linguistics. Proportional analogical changes such as leveling and extension tend to be more regular and systematic. Proportional analogical changes can be represented in an equation of the form A:B::C:D, which reflects a proportional relationship and an expression of similarity. This form covers any kind of material where we have similarity and contiguity (Anttila 2003). Non-proportional analogical changes are mostly irregular and sporadic. According to Anttila (1989), contamination is a type of non-proportional analogy by explaining it using a diagram 'yax, zbx > yax, zax or ybx, zbx.'

The cases of irregular readings in Sino-Korean phonology discussed in my dissertation are not identical to the common examples of analogy in historical linguistics, because they are based on graphic elements, not spoken linguistic elements, as models for analogical change. However, as Campbell explains, the main characteristic of analogy is 'change made by similarity,' which can explain the relationship between characters and their SK pronunciation. It is for this reason that the main factor of SK irregular readings that have been influenced by *xiéshēng* 諧聲 relationship is also termed "analogy" (*yuchwu* in Korean, *ruisui* in Japanese) 類推 by previous researchers (Kōno 1968, Yi 1995, Itō 2007).

3.2 Analogy in the Context of Irregular Sino-Korean Reading

The cases of irregular readings in SK phonology are based on orthographic forms, as models for analogical change. In order to understand how orthographic forms can serve as analogical models, it is necessary to understand the structure of *xiéshēng* characters. The *xiéshēng* characters, which are one of the main types of evidence in reconstructing Old Chinese

(OC) phonology along with the *Shījīng* rhymes, are based on a relation of phonological similarity. If two characters share the same phonetic component, it is because pronunciations of these two characters are related to each other (or, to be more precise, were related to each other at the time of character creation). This phonological relation is defined as *xiéshēng* similarity. Explaining the principle of *xiéshēng* similarity, Baxter (1992) states that words must normally have identical OC main vowels and codas, and their initial consonants must have the same position of articulation, in order to be written with the same phonetic element. Pre-initial, medial, post-coda elements, and the manner of articulation of the initial, can be different (Baxter 1992: 348). For example, 內 **nups* 'inside' and 納 **nup* 'send in, bring in' are in this *xiéshēng* relationship by sharing the same phonetic component 內. OC pronunciation of these two characters shows similarity. As discussed by Baxter, pronunciation of the characters in the *xiéshēng* relationship reflects the phonology of the time and place of the characters created. By the Middle Chinese (MC) period, the pronunciations of older characters within a *xiéshēng* series were much more divergent, and Chinese speakers did not expect them to have the same vowels or same initial consonants. The MC pronunciations of 內 'inside' and 納 'send in, bring in' are *nuaj* and *nap* respectively. Discrepancy in the pronunciation of these characters exists in modern Mandarin as well (*nèi* and *nà* respectively). Although sound change has happened continuously since the OC period, phonological analogies found in the *xiéshēng* series still affect people who learn Chinese characters as a writing system of a modern language. Approximately 80% of Chinese characters in common use consist of a semantic component and a phonetic component (Zhou 1978, Perfetti et al. 1991). Experimental studies have shown that phonological analogy effects are found in reading Chinese characters for both adults and children (Chen and Allport 1995, Ho and Bryant 1997, Shu et al. 2003).

The same concept of *xiéshēng* relationship is used to explain irregular readings in SK phonology. However, while OC reconstruction relies on *xiéshēng* similarity, it is an assumption of *xiéshēng* uniformity, not similarity, that explains irregularity in SK readings. Analogy in SK readings explains why two characters in the same *xiéshēng* series end up with an identical initial, even though their MC readings are different. For example, 怠 'idle' is read as [$t^h\varepsilon$] in SK. Because this character has MC /d/ initial in *shǎng* tone, its expected regular reading would be [tɛ]. The irregular form [$t^h\varepsilon$] can be explained in terms of analogy, because 怠 'idle' has 台 'platform' as its phonetic component, which has MC /t^h/ initial. 殆 'danger' with MC /d/ initial and *shǎng* tone is also pronounced as [$t^h\varepsilon$] 태. These characters share the same phonetic component. Although they have different Middle Chinese initials, the SK aspirated reading of both 怠 'idle' and 殆 'danger' has been influenced by the SK pronunciation of 台 'platform' and 胎 'embryo' MC *t^haj*, SK [$t^h\varepsilon$] in the same *xiéshēng* series.

The role of graphic element as an analogical model in the above example is notably different from the examples of analogy seen in textbooks on historical linguistics, as discussed in 3.1. There we see that the similarity relations in proportional analogy involve form (i.e. pronunciation) and meaning, with little attention paid to orthographic form. Thus, *teach/taught* can serve as a model for *catch* (leading to the change of past-tense form *catched* to *caught*) because both *teach* and *catch* end with the same consonant sound. The fact that the sound is spelled *tch* in one word and *ch* in the other is not relevant. In explaining how the past-tense form *dived* changes to *dove*, Campbell (2004:104) presents the equation '*ride*:*rode*::*dive*:*x*,' where *x* is solved with *dove*, and we are meant to understand that it is the pronunciations of these words, not their written form, that is relevant. In the case of Sino-Korean, however, orthographic form plays a central role. Applying an equation of the form A:B::C:D, the Chinese characters in the 台 *tái*

series and their SK pronunciation can be presented as “台 'platform,' 胎 'embryo' ”: t^h :: “怠 'idle,' 殆 'danger' ”: *x*, where *x* is solved with t^h. Therefore, this phenomenon can be understood as proportional analogical change involving graphic forms that share a phonetic element and SK pronunciations.

Although the example of irregular SK reading above is explained in the equation form of proportional analogical change, the concept of analogy in SK is more irregular and sporadic than this example might imply. This irregular and sporadic feature of analogical change is presented among English examples that were discussed previously. While regular or irregular English verb forms have been provided as an example of analogy, there has been no discussion about why some verb pairs cause other pairs to change by analogy. It is usually assumed that frequency of usage is a factor in determining which words serve as analogical models. Itō (2007) also proposes frequency of usage as one possible factor causing analogy effect in SK readings and determining which word becomes a model. Salience of a character, which can be measured by frequency, as well as significance of the text where the character appears, and where in the text the character appears, can be the other factors. I will examine how frequency has been explained in acquisition of Chinese characters in Section 3.3 below and discuss the possible role of frequency in irregular SK readings in the following section.

3.3 Orthography in Acquisition of Pronouncing Chinese Characters

Approximately 80% to 90% of Chinese characters consist of two major components, semantic and phonetic.[27] These characters are categorized as semantic-phonetic compounds (termed as ideophonetic compounds in Ho and Bryant 1997). There are approximately 200

[27] The percentage of semantic-phonetic compounds can vary depending on the data. This number is provided in Shu et al. (2003).

semantic components and 800 phonetic components in the modern script (Hoosain 1991). Several psycholinguistic studies have been conducted on how pronunciation of Chinese characters is acquired. By evaluating factors like frequency of use, semantic transparency, and phonetic regularity of the characters, many of these studies examine the role of each component in literacy attainment by native speaking children and adults. (Ho and Bryant 1997, Leong 2002, Shu et al. 2003) In this section, I will apply some of the factors used in these studies to the case of irregular readings in SK. While these studies are in the field of first language acquisition, acquisition of Chinese characters among Korean learners needs to be discussed in the context of second language acquisition. Although the research subjects are not identical, it is very likely that both native Chinese learners and Korean learners make use of similar strategies in requiring the pronunciation of new Chinese characters.

Ho and Bryant (1997) performed a Chinese ideophonetic compound reading experiment to examine how frequency and phonological regularity impact children's strategies for using phonetic components to pronounce novel characters with the same phonetic components. First- and second-graders in a Hong Kong elementary school were asked to read 60 sample characters in Cantonese. Each character was marked with its frequency of use and phonological regularity. Frequency was counted based on token frequencies, and either a high- or low-frequency was assigned for each character. Phonological regularity was determined based on how similar the pronunciation of the ideophonetic compound was to that of its phonetic component. If a character and its phonetic component were homophonous, the character was classified as high in phonological regularity. If a character and its phonetic component were partially homophonous (i.e., same in initial and final, but different in tone), the character was classified as medium in regularity. If a character had a different pronunciation from its phonetic component, the

regularity was marked as low. The table below is presented in Ho and Bryant to provide exemplar characters in each category:

Phonological regularity			
Frequency	Low	Medium	High
Low	36[28]	37	36
Target character	撞 [dzong]6	扶 [fu]4	廈 [ha]6
Its phonetic	童 [tung]4	夫 [fu]1	夏 [ha]6
High	256	255	257
Target character	守 [sau]2	河 [ho]4	燈 [dang]1
Its phonetic	寸 [tsyn]3	可 [ho]4	登 [dang]1

<Table 3.1 Mean frequency counts and sample characters in each cell of the Chinese ideophonetic compound reading task (Ho and Bryant 1997: 282)>

The results showed that children rely on a phonetic component for phonological cues in reading Chinese characters. As children develop their phonological awareness, they discover the regular pattern existing between the phonetic component of Chinese characters and their pronunciation. This strategy of using phonetic regularity is encouraged when encountering new characters with a familiar phonetic component, because most phonetic components are high-frequency characters that children learn in their earlier years. Chen (1993) terms the script-sound regularities in Chinese, OPC, *orthography-phonology correspondence.* As Ho and Bryant emphasize, their subjects were not explicitly taught the role of phonetics in reading Chinese.

[28] These numbers are the mean frequency counts, and indicate token frequencies per 785,907 Chinese character-times. The numbers are based on the Chinese Word Research for the Junior Secondary School Students in Hong Kong in 1986 (Ho and Bryant 1997: 281).

When enough characters are exposed to children, they naturally grasp regular correspondence between orthography and sound. It is another natural phenomenon that children make over-generalizations until they are exposed to more characters with the weaker regularity and more exceptions to the OPC rules. Therefore, they make pronunciation errors of new characters, reading them identically to their phonetic components. This strategy is exactly the same kind of over-generalization that drives analogical readings I discussed in 3.2.

Ho and Bryant's experiments prove that the OPC rules influence children's reading skills negatively and positively. Despite a great number of characters to learn, children can easily acquire new characters aided by knowledge of phonetic components. However, exclusively relying on phonetic components also results in mistaken readings. Ho and Bryant explain the mistakes made by their subjects as "phonetic-related" errors. For example, 擴 [kwong]3 was read as its phonetic component 廣 [gwong]2[29]. 怕[pa]3 was read as 伯[baak]8, because 白[baak]9 is their common phonetic component.

The negative influence of using a phonetic component to teach Chinese characters is also discussed in Shu et al. (2003). By analyzing 2,570 characters listed in the *Elementary School Textbooks* (1996), Shu et al. (2003) suggest that children can utilize a certain logic found in the structure of Chinese characters. Based on several previous analyses and their own comprehensive statistics, they discuss the degree of phonetic regularity of Chinese characters based on Standard Mandarin pronunciation. In their data, only 39% of the total characters are listed as a "regular" compound, which are pronounced the same as their phonetic components or the same but with a different tone. This implies that relying on the pronunciation of the phonetic component will not always yield accurate results. Information from the phonetic component of

[29] These provided pronunciations are Cantonese pronunciations.

“irregular” compounds whose pronunciation is completely different from its phonetic is not useful.

These previous studies suggest that understanding and applying the OPC rules work as a helpful guide to learners of beginning level of language learning but only to a degree because the correspondence rate is merely around 39%. This over-generalization of the OPC rules serves as a useful empirical model for explaining irregular SK readings by analogy based on phonetic components.

3.4 Frequency Effect

Previous research has largely relied on analogy to discuss the cause of irregular SK readings (Kōno 1968, Yi 1995, Itō 2007), but it has failed to discover any specific patterns or explicit rules to via which analogy plays a role in influencing SK readings. Nor does it explain the exact mechanism by which one of the characters that share the same phonetic element becomes the model character.[30] Itō argues that a model character is determined by its higher frequency. If frequency has a significant impact on character learning, when Korean speakers learn a new character ‘A’ with a familiar character ‘B’ as its phonetic component, they will be more likely to predict the SK pronunciation of this character to be the same as the SK pronunciation of the character ‘B.’ For example, characters with a phonetic component 舀 such as 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑫 'jade' are read as *to* in SK. Since these characters have MC /t^{h}/ initial, their SK reading *to* is considered as an irregular reading. According to Itō, 蹈 'tread' and 稻 'rice' with MC /d/ initial influenced the reading of these characters. 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑫 'jade' are less frequently used, whereas 稻 'rice' is one of the most

[30] Model character can be a single character or multiple characters.

frequently used characters. Therefore, as a model character, 稻 'rice' could have influenced the readings of other characters. However, Itō simply makes this observation without quantifying these frequencies.

In various linguistics data, frequent use of certain linguistic forms has been observed to reinforce language users' memory storage, which can encourage analogy. According to Anttila (1989), there is a strong correlation between analogy and frequency: "High frequency presses forms into memory. Therefore, it becomes a factor in analogic changes. Infrequent forms are replaced more easily, or they merge more easily with others (p. 187)." Typically, irregular forms that do not conform to general rules need to be learned with more effort on the memory. When the memory is not manifested, analogy can be used.

When a pattern is experienced more often, it becomes easier to access and use (Bybee and Hopper 2001, Bod et al. 2003, Bybee 2006). The field of the Chinese acquisition has also paid attention to how frequency effect influences acquisition of Chinese characters. Both Ho and Bryant (1997) and Shu et al. (2003) report that the effect of frequency is robust.

This section aims to examine if an initial of characters with lower frequency is generally affected by an initial of characters with higher frequency in SK reading, when the characters are in the same *xiéshēng* series.

3.4.1 Frequency Effect and Irregular Sino-Korean Reading

It is not clear when speakers use analogy as a strategy to assign an aspirated or unaspirated consonant in SK pronunciation, ultiately bringing about irregular Sino-Korean readings. According to Caldwell-Harris and Edelman (2012), speakers who are more experienced with specific linguistic stimuli process those stimuli more efficiently. When learners

acquire SK readings, their linguistic experience strengthens the tendency to establish form-sound pairs. If there are multiple characters with a higher frequency in the same *xiéshēng* series, there should be a higher chance that these characters will affect the pronunciation of other characters in the same *xiéshēng* series with a lower frequency.

How to test the relationship between frequency and analogy empirically is a key issue for investigating irregularity in SK phonology. In order to determine whether frequency is responsible for investing certain characters with a model character status, I will use Kwen's (2005) *Collection of Sound and Meaning of Chinese Characters in Middle Korean* 中世韓國漢字音訓集成, which provides the frequency information. The frequency counts of the Chinese characters used in Kwen are the number of appearances in the 15-16 C Sino-Korean materials including ten *enhay* 諺解 materials (Korean annotations of Chinese Classics) and three Korean teaching materials of Chinese characters. Kwen lists 5,300 Chinese characters based on Korean alphabetical order. Each character is followed by the source where the character appears.

Kwen (2005) provides the exact number of frequencies, I utilized this information and examined if frequency impacts character learning by Korean learners. As discussed earlier, Korean learners might have tried to predict the SK pronunciation of 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑤 'jade' based on the pronunciation of 蹈 'tread' and 稻 'rice.' Itō explains these irregular readings in terms of frequency, because 稻 'rice' is one of the most frequently used characters, while 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑤 'jade' are less frequently used. Kōno states that 稻 'rice' and 蹈 'tread' are not salient enough to be model characters, but does not elaborate with any further explanation. In Kwen's dictionary, 滔 'flood,' 慆 'negligent,' and 瑤 'jade' appear only once, and 韜 'cover' appears twice. Compared to these low frequency

characters, 稻 'rice' appears four times, and 蹈 'tread' ten times. Therefore, considering their frequency, 稻 'rice' and 蹈 'tread' would be good candidates to influence the readings of the other characters. Likewise, explaining how [tɛ], SK reading of 貸 'borrow' with MC /t^h/ initial, has been influenced by the reading of 代 'substitute' with MC /d/ initial is clear and simple. 貸 'borrow' appears 7 times in Kwen, and 代 'substitute' appears 47 times.

The tables below list a number of characters that can be explained by analogy and characters that are not explained by analogy in each *xiéshēng* series. The first two tables show characters with a dental initial, and the next two tables with a labial initial. The two tables with the same initials show different numbers depending on whether a tonal distinction for the aspiration reflex of MC voiced initials is reflected in SK reading.

Table 3.2 and 3.4 assume no aspiration distinction is present, that is MC voiced initials are pronounced as unaspirated in all tones. Table 3.3 and 3.5 assume the type of split seen in the development of northern Chinese, still present in modern Mandarin: MC voiced initials develop into voiceless aspirated initials in *píng* tone and into voiceless unaspirated initials in all other tones. These two models of development of MC voiced initials are abbreviated to VD-ASP (MC voiced initials are pronounced as unaspirated in all tones) and VD+ASP (MC voiced initials develop into voiceless aspirated initials in *píng* tone and into voiceless unaspirated initials in all other three tones, *shǎng*, *qù*, and *rù*).

The first column in each table lists characters whose SK reading initial reflects the MC source. Therefore, these characters can potentially serve as models for analogical change. The higher their frequency, the more reasonable it is to hypothesize that they are models.[31] The

[31] The numbers in parentheses next to characters on the first and second columns indicate the frequency in the SK texts.

characters on the second column are irregular because the initial of these characters does not reflect their MC source. Comparing their frequencies to those of the regular characters, we can determine if it is likely that they became irregular under analogical influence from a model character. The number of irregular characters that can be explained this way is given in the third column, and the number that cannot is given in the fourth column.

For example, there are a total of 179 characters with dental initials that have irregular SK readings in terms of aspiration (if we consider that characters with MC /d/ initial should have unaspirated SK readings in all tones, as in Table 3.2). Of those 179 characters, 42 are in *xiéshēng* series with characters that have regular SK readings in the table. The other 137 irregular characters either lack a phonetic component, or are in *xiéshēng* series that lack regular SK readings entirely. When the characters in left-most column are taken as model characters based on the regularity of their aspiration correspondence, the frequency ratio between the "regular" and "irregular" characters can account for 35 irregular characters in Table 3.2, This leaves seven unexplained. This means that 35 out of 179 can be explained as the result of analogy according to the analogy model. The irregular readings of the other 144 must be due to factors other than analogy.

A. Dental initials

a. VD-ASP: Without tonal distinction for MC voiced initial (# of characters with an irregular SK reading: 179; number shown in table: 42)[32]

Regular Character (potential model character for analogical influence)	Irregular Character (potentially influenced by analogy to model character)	# of irregular characters that can be explained by analogy to a regular character	# of irregular characters that are not explained by analogy
唾(4) 涎(1) t^ha	耳＋埵 (1) *t^ha	1	0
代(38) təi	貸(5) *təi	1	0
胎(2) 台(3) $t^həi$	怠(15) 殆(8) 苔(1) 炱(1) * $t^həi$	2	2
弟(224) 第(103) 悌(20) tje	梯(1) 涕(8) *tje	2	0
著(13) tjʌ	楮(1) *tjʌ	1	0
蹈(8) 稻(2) to	滔(2) 韜(3) 慆(1) 瑵(1) *to	4	0
超(3) t^hjo	齠(1) 貂(1) *t^hjo	2	0
兆(5) 銚(1) 晁(2) 跳(1) tjo	眺(1) *tjo	1	0
豆(6) tu	頭(27) *tu	0	1
偸(8) t^hu	牏(2) 鍮(1) *t^hu	2	0
淡(8) 談(10) 痰(1) tam	毯(1) 菼(1) *tam	2	0
店(2) 坫(2) 點(17) tjʌm	覘(1) *tjʌm	1	0
舔(1) $t^hjʌm$	錟(5) *$t^hjʌm$	0	1
珍(15) tin	趁(1) *tin	1	0
達(32) 薘(1) tal	撻(6) 獺(2) 闥(3) 韃(1) *tal	4	0
端(38) tan	湍(1) 猏(1) *tan	2	0
丹(7) tan	坍(1) *tan	1	0
坦(4) *t^han	袒(1) *t^han	1	0
敦(17) 墩(1) 驐(1)	暾(1) *ton	1	0

[32] The symbol * on the second column indicates that the pronunciation given is an irregular reading.

燉(1) ton			
黨(29) taŋ	儻(1) *taŋ	1	0
堂(46) 螳(1) 膛(1) taŋ	瞠(1)*taŋ	1	0
湯(6) $t^haŋ$	蕩(9) 盪(1) *$t^haŋ$	1	1
飣(1) 丁(5) 釘(1) 疔(1) tjʌŋ	汀(2) *tjʌŋ	1	0
呈(17) 程(7) 裎(1) 鋞(1) tjʌŋ	鞮(1) *tjʌŋ	1	0
貞(10) tjʌŋ	赬(1) *tjʌŋ	1	0
韔(1) $t^hjaŋ$	脹(1) 漲(1) *$t^hjaŋ$	0	2
Total:		35/179 (20%)	7/179 (4%)

<Table 3.2 Irregular characters and analogy: Dental initials, VD-ASP>

If we assume the aspiration split for MC, as shown in Table 3.3, the number of irregular SK readings explainable by analogy increases to 54, but the percentage in the third column does not change significantly from that of Table 3.2. Table 3.3 shows that with tonal distinction for MC voiced initial, 21% of irregular readings with dental initials can be explained by analogy to a regular character. 8% are not explained even if they are in *xiéshēng* series with characters that have regular SK readings in the table. The remaining irregular readings occupy 71%, and are not included in the table, because they either are in *xiéshēng* series that lack regular SK readings, or lack a phonetic component.

b. VD+ASP: With tonal distinction for MC voiced initial (# of characters with an irregular SK reading: 261; number shown in table: 75)

Regular Character (potential model character for analogical influence)	Irregular Character (potentially influenced by analogy to model character)	# of irregular characters that can be explained by analogy to a regular character	# of irregular characters that are not explained by analogy
陀(11) 鮀(2) 駝(2) 跎(1) 酡(1) t^ha	舵(1) *t^ha	1	0
唾(4) 涶(1) t^ha	耳＋垂 (1) *t^ha	1	0
代(38) təi	貸(5) *təi	1	0

胎(2) 台(3) 苔(1) 臾(1) t^həi	怠(15) 殆(8) *t^həi	0	2
地(87) ti	池(3) *ti	1	0
帝(59) tje	蹄(3) 啼(3) 草蹄(1) *tje	3	0
弟(224) 第(103) 悌(20) tje	梯(1) 涕(8) 鵜(1) 稊(1) 綈(1) *tje	5	0
遞(1) t^hje	禘(2) 諦(2) *t^hje	0	2
著(13) 豬(3) 瀦(1) *tjʌ	楮(1) 儲(3) *tjʌ	2	0
蹈(8) 稻(2) to	滔(2) 韜(3) 慆(1) 瑵(1) *to	4	0
鵰(1) 凋(2) 彫(1) 雕(2) tjo	調(3) 蜩(1) *tjo	1	1
超(3) 齠(1) t^hjo	貂(1) *t^hjo	1	0
兆(5) 銚(1) tjo	眺(1) 跳(1) 晁(2) *tjo	3	0
蓧(1) tjo	條(9) 鰷(1) *tjo	0	2
豆(6) tu	頭(27) *tu	0	1
宙(1) 冑(2) tju	紬(1) *tju	1	0
禫(4) tam	潭(1) 潭(2) 蟫(1) *tam	3	0
淡(8) tam	談(10) 痰(1) 毯(1) 菼(1) *tam	3	1
膽(5) 擔(3) tam	澹(6) *tam	0	1
店(2) 坫(2) 點(17) tjʌm	覘(1) *tjʌm	1	0
轉(8) tjʌn	傳(98) *tjʌn	0	1
珍(15) tin	趁(1) *tin	1	0
達(32) 薘(1) tal	撻(6) 獺(2) 闥(3) 韃(1) *tal	4	0
端(38) tan	湍(1) 猏(1) *tan	2	0
丹(7) tan	坍(1) *tan	1	0
弹(2) t^han	憚(9) *t^han	0	1
坦(4) *t^han	袒(1) *t^han	1	0
頓(30) 沌(1) 囤(1) don 鈍(3) tun	魨(1) *don 飩(1) 屯(3) *tun	3	0
遯(1) ton	豚(5) *ton	0	1
敦(17) 墩(1) 驐(1) ton	暾(1) 燉(1) *ton	2	0

黨(29) taŋ	儻(1) *taŋ	1	0
湯(6) t^haŋ	蕩(9) 盪(1) *t^haŋ	1	1
飣(1) 丁(5) 釘(1) 疔(1) tjʌŋ	汀(2) *tjʌŋ	1	0
鋌(1) tjʌŋ	呈(17) 程(7) 裎(1) 鞮(1) *tjʌŋ	0	4
貞(10) tjʌŋ	赬(1) *tjʌŋ	1	0
張(58) tjaŋ	棖(2) *tjʌŋ	1	0
韔(1) t^hjaŋ	脹(1) 漲(1) *t^hjaŋ	0	2
峒(1) 洞(6) 衕(1) toŋ	桐(3) 筒(2) 同(75) 銅(1) *toŋ	3	1
冬(10) toŋ	疼(1) *toŋ	1	0
Total:		54/261 (21%)	21/261 (8%)

<Table 3.3 Irregular characters and analogy: Dental initials, VD+ASP>

Table 3.4 and 3.5 show characters with a labial initial.

B. Labial initials

a. VD-ASP: Without tonal distinction for MC voiced initial (# of characters with an irregular SK reading: 162; number shown in table: 80)

Regular Character (potential model character for analogical influence)	Irregular Character (potentially influenced by analogy to model character)	# of irregular characters that can be explained by analogy to a regular character	# of irregular characters that are not explained by analogy
皮(3) p^hi	波(9) 簸(1) 菠(1) 婆(1) 蔆(1) *p^ha	4	1
葩(1) 舥(1) 蚆(1) p^ha	把(2) 弝(1) 靶(1) 芭(1) 笆(1) 疤(1) 琶(1) 杷(1) 爬(1) *p^ha	0	9
補(8) 捕(1) 哺(5) 甫(3) 脯(2) 輔(14) po	浦(1) 溥(1) *po	2	0
杯(6) pəi	坏(1) *pəi	1	0
焙(1) 倍(6) 培(3) 陪(2) pəi	醅(1) *pəi	1	0
臂(1) pi	辟(4) 譬(29) *pi	0	2
費(7) pi	糦(1) *pi	1	0
披(2) 鈹(1) p^hi	彼(29) 陂(1) 被(26) 鞁(1) 疲(1) 皮(3) 髮(1) *p^hi	4	3

批(1) 屁(1) p^hi	鈚(1) 秠(1) *p^hi	0	2
怖 (2) p^ho	布 (14) *p^ho	0	1
砲(1) 泡(1) 皰(1) p^ho	抱(5) 菢(1) 袍(3) 鮑(16) 苞(1) 包(10) 庖(2) 匏(4) 咆(1) 炮(1) 鉋(1) 跑(1) 麅(1) 齙(1) *p^ho/ 鮑(2) *p^hjo	0	15
鋪 (1) p^hu	酺(1) 哺(1) 圃(3) 逋(2) 晡(1) 蒲(3) 葡(1) 蒱(4) *p^ho	0	8
剽(2) 漂(1) 飄(2) p^hjo	標(1) 瓢(3) 薸(1) 鰾(1) *p^hjo	3	1
部(14) pu	剖(2) *pu	1	0
半(7) 伴(1) 畔(12) 叛(3) 胖(1) pan	泮(1) *pan	1	0
襻(3) pan	攀(4) *pan	0	1
翻(14) 旛(1) 幡(1) 幡(5) 燔(1) pʌn	潘(1) *pʌn	1	0
發(46) 撥(2) pal	醱(1) *pal	1	0
分 (76) pun	盼 (1) *pjʌn	1	0
騙(1) 偏(6) 篇(30) $p^hjʌn$	徧(4) 遍(3) 蝙(1) 艑(1) *$p^hjʌn$	4	0
賁(2) 僨(1) 饙(1) 憤(2) 墳(2) 濆(1) 豶(1) pun	噴(1) *pun	1	0
博(26) 餺(1) 慱(3) 煿(1) 薄(30) 簙(1) 縛(4) pak	膊(1) *pak	1	0
鏷 (1) pak	樸 (3) *pak	0	1
白 (33) pəik	魄 (1) *b@ig 珀(1) 拍(3) 泊(6) 粕(1) *pak	5	0
檗(1) 薜(2) 躃(1) 壁(4) 襞(1) 辟(23) 闢(3) 擗(1) 壁(6) 甓(3) pjʌk	僻(2) 霹(1) *pjʌk	2	0
卜(4) pok	扑(1) *pok	1	0
僕(14) pok	醭(1) *pok	1	0
Total:		36/162 (22%)	44/162 (27%)

<Table 3.4 Irregular characters and analogy: Labial initials, VD-ASP>

b. VD+ASP: With tonal distinction for MC voiced initial (# of characters with an irregular SK reading: 176; number shown in table: 93)

Regular Character (potential model character for analogical influence)	Irregular Character (potentially influenced by analogy to model character)	# of irregular characters that can be explained by analogy to a regular character	# of irregular characters that are not explained by analogy
皮(3) p^hi	波(9) 簸(1) 菠(1) 蓼(1) *p^ha	3	1
葩(1) 舥(1) 虵(1) 琶(1) 杷(1) 爬(1) p^ha	把(2) 弝(1) 靶(1) 芭(1) 笆(1) 疤(1) *p^ha	0	6
怖 (2) p^ho	布 (14) *p^ho	0	1
補(8) 捕(1) 哺(5) 甫(3) 脯(2) 輔(14) po	浦(1) 溥(1) *po	2	0
蒲(3) 葡(1) 蒱(4) p^ho	酺(1) 哺(1) 圃(3) 逋(2) 晡(1) *p^ho	5	0
杯(6) pəi	坏(1) *pəi	1	0
焙(1) 倍(6) pəi	醅(1) 培(3) 陪(2) *pəi	3	0
輩(23) 緋(1) pəi	裴(2) 排(1) *pəi	2	0
漼(1) 牌(1) $p^hɛ$	稗(1) *$p^hɛ$	0	1
篦(1) 蓖(1) 蜌(1) 鎞(1) pi	膍(1) *pi	0	1
比(17) 妣(3) pi	琵(2) 毘(11) *pi	2	0
俾(3) 髀(1) 箄(1) 卑(16) 裨(1) 碑(6) 婢(14) pi	鞞(1) 鼙(1) 脾(1) *pi	3	0
臂(1) pi	辟(4) 譬(29) *pi	0	2
費(7) pi	糦(1) *pi	1	0
披(2) 鈹(1) 疲(1) 皮(3) p^hi	彼(29) 陂(1) 被(26) 鞁(1) 髮(1) *p^hi	3	2
批(1) 屁(1) 鈚(1) p^hi	秠(1) *p^hi	0	1
砲(1) 泡(1) 皰(1) 袍(3) 庖(2) 匏(4) 咆(1) 炮(1) 鉋(1) 跑(1) 麭(1) 齙(1) p^ho	菢(1) 抱(5) 飽(16) 苞(1) 包(10) *p^ho/ 鮑 (2) *p^hjo	3	3
剽(2) 漂(1) 飄(2) 瓢(3) 薸(1) p^hjo	標(1) 鰾(1) *p^hjo	2	0
否(10) pu	抔(1) *pu	1	0

部(14) pu	剖(2) *pu	1	0
半(7) 伴(1) 畔(12) 叛(3) pan	泮(1) 胖(1) *pan	2	0
襻(3) pan	攀(4) *pan	0	1
般(47) 盤(1) pan	盤(4) 槃(22) 瘢(1) *pan	3	0
翻(14) 旙(1) 幡(1) 幡(5) 燔(1) pʌn	潘(1) *ben 蟠(1) *pan	2	0
發(46) 撥(2) pal	醱(1) *pal	1	0
便(17) 媥(1) $p^hjʌn$	鞭(4) *$p^hjʌn$	1	0
騙(1) 偏(6) 篇(30) $p^hjʌn$	徧(4) 遍(3) 蝙(1) 艑(1) *$p^hjʌn$	4	0
賓(39) pin (3) piŋ	嬪(1) *piŋ 狗賓(1) *pin	2	0
賁(2) 僨(1) 饙(1) 憤(2) 墳(2) 濆(1) 豶(1) pun	噴(1) *pun	1	0
分(76) pun	盆(5) *pun 貧(42) *pin	2	0
博(26) 餺(1) 慱(3) pak	膊(1) *pak	1	0
榜(1) 謗(11) 蒡(1) paŋ	傍(5) 膀(1) 螃(1) *paŋ	3	0
白 (33) pəik	魄 (1) *b@ig 珀(1) 拍(3) 泊(6) 粕(1) *pak	5	0
放(27) 方(173) 坊(4) 昉(2) 舫(1) 訪(2) 芳(1) 紡(3) 房(7) 防(3) 魴(1) paŋ	彷(2) *paŋ	1	0
崩(5) 繃(1) 棚(1) pɯŋ	鵬(2) 朋(44) 堋(1) 棚(1) *pɯŋ	3	1
迸(1) 併(1) 餅(1) 屏(幫 7) 并(7) 並(22) pjʌŋ	駢(1) 瓶(3) 屏(並 in *píng* tone 2) 軿(1) *pjʌŋ	4	0
檗(1) 薜(2) 躃(1) 擗(4) 襞(1) 辟(23) 闢(3) 擗(1) 壁(6) 甓(3) pjʌk	僻(2) 霹(1) *pjʌk	2	0
卜(4) pok	扑(1) *pok	1	0
僕(14) pok	醭(1) *pok	1	0

逢(4) 縫(1) poŋ	蓬(1) 篷(1) *poŋ	2	0
Total:		73/176 (41%)	20/176 (11%)

<Table 3.5 Irregular characters and analogy: Labial initials, VD+ASP>

The result of the extracted comparison on the tables shows that the percentage of irregular readings explainable by analogy is consistently around 20% in the first three tables, with a notable difference in Table 3.5 (the last table), where the percentage is the highest as 41%. Quite a few irregular readings are not explained by analogy, even though the characters with these readings do belong to *xiéshēng* series. The ratio of these irregular readings varies across the tables. Table 3.4 lists more irregular readings that are not explained by analogy than those explainable by analogy.

We can also compare two models VD-ASP and VD+ASP by the difference on the numbers in each table. There are two separate questions: one is which model leads to more regularity overall, and the other is which model is compatible with analogy as a more significant factor. With the irregular readings of characters with dental initials, there is no noteworthy variation depending on whether a tonal distinction for MC voiced initial is reflected in SK reading. Table 3.2 and Table 3.3 show that 20% of irregular readings are explained by analogy. Some characters on the second column share the same phonetic component with the characters on the first column, but cannot be explained by analogy. In both tables, these characters are less than 10% of the entire characters with an irregular reading. On the contrary, there is noticeable difference with respect to the characters with labial initials. Among the characters on the second column of Table 3.4, there are more irregular readings not explained by analogy than the irregular readings explainable by analogy. Table 3.5 indicates that number of irregular readings explainable by analogy increases, while the number of irregular readings not explainable by analogy decreases with a tonal distinction for MC voiced initial reflected in SK reading. There

are almost four times more irregular readings explained by analogy than the irregular readings not explainable by analogy. Simply considering the different ratios between irregular readings and their potential for being explained by analogy, analogy is a better explanation for irregular readings the analysis with a tonal distinction for MC voiced initial. However, the assumption of a tonal split also increases the total number of irregular readings.

The arguments of previous scholars imply that the analogy hypothesis can explain significant number of irregular SK readings. However, our empirical data shows that analogy can be a good explanation for only about 20% of irregular SK readings; and no more than 40% even under the assumptions underlying Table 3.5.

Granted, our model for what the source for analogical change is is based on the data in the SK materials of 15-16 C. The potential model character for analogical influence was determined by the characters' frequency. If we used different data including more comprehensive dictionaries and rhyme books compiled later in late Cosen dynasty, the number of incorrect readings explainable by analogy would increase. However, the higher ratio we can possibly obtain through these materials would not necessarily reflect how analogy influenced Korean learners on the process of learning SK readings when SK pronunciations were first adopted in an earlier historical period.

In sum, the results of analysis in 3.4.1 demonstrate that the role of analogy in the history of irregular SK readings has only a limited ability to explain most irregular readings.

3.4.2 Problems in Frequency Effect

In previous SK research, analogy of a phonetic component has been attributed to as one of the main factors of irregularity in SK phonology. However, analysis of the SK data in terms of frequency indicates that the significance of analogy is not as strong as what we might expect.

Discussing the role of frequency effect during the processing of linguistic structures, Snider and Arnon (2012) argues as below:

> "Frequency effects were found across the continuum. Using a frequency threshold as a determiner of storage is problematic because speakers cannot know a priori which phrases will become frequent enough to merit storage. Whatever information is maintained for very frequent phrases must have once been registered for all phrases. This information could be discarded at later stages of learning, but this seems improbable." (Snider and Arnon 2012)

In 3.4.1, I used the quantified frequencies to analyze the SK data. These quantified frequencies are relative: a character that appears only twice in Kwen's collection can still be a potential model character of analogical influence if the irregular character appears just once. In contrast, a character that appears only twice is not considered a potential model character if the irregular character appears three times. This method is convenient and clear for comparing the frequency of thousands characters in our empirical analysis. Nevertheless, it is important to understand the frequency continuum and to examine how significant different numbers of appearances of characters with higher frequency and lower frequency are in evaluating how frequency effect plays its role in linguistic phenomena.

In addition to how to interpret the notion of frequency continuum in terms of its significance on analyzing linguistic phenomena, it is important to consider different types of frequency and how they interpret the same data. Discussing an influence of occurrence frequency on phonological patterns, Frisch (2011) explains two types of frequency. Token frequency is the frequency of occurrence in the corpus: "In English, for example, the token frequency of the

phonemes /ð/ and /v/ is relatively high, due to their presence in frequently used words like *the* and *that*, and *of* and *very*." Frisch (2011) The number of times the phonological pattern is used across different words is type frequency: "The type frequency of the phonemes /ð/ and /v/ in English is relatively low, as they are used in relatively few words. An example of a consonant with a high type frequency is /b/, which is the most common word onset in English. Some consonants, such as /s/ and /t/, have both high token frequency and high type frequency, being used in many words, many of which are common. Other consonants, such as /θ/ and particularly /ʒ/, have both low token frequency and low type frequency, as they are used in few words, most of which are not common." (Frisch 2011: 2138-9) In order to apply the concept of token and type frequencies to analyze the SK data, frequencies of a character and a phonetic component need to be discussed. In other words, we can examine these irregular SK readings in terms of the possible role of token frequency and type frequency effects. If 10 of 11 characters within a *xiéshēng* series all have the same pronunciation, then this might have a strong tendency to change the pronunciation of the 11th even if some of those characters do not occur frequently in texts -- that would be a "type frequency" effect. Or, if only 2 of the 11 have a certain pronunciation, but those two are the most common characters, they could tend to change the pronunciation of the 9 others. That would be a "token frequency" effect. The analysis in 3.4.1 is based on the token frequency. There are several characters with a certain phonetic component whose irregular SK pronunciations are not explained by a token frequency effect, but can be explained by a type frequency effect. For example, 9 characters in the 巴 *bā* series are read as [p^{h}a] in the table below.

Regular Character (potential model character for analogical influence)	Irregular Character (potentially influenced by analogy to model character)	# of irregular characters that can be explained by analogy to a regular character	# of irregular characters that are not explained by analogy
葩(1) 舥(1) 蚆(1) p^ha	把(1) 弝(1) 靶(1) 芭(1) 笆(1) 疤(1) 琶(1) 杷(1) 爬(1) *p^ha	0	9

<Table 3.6 Characters in the 巴 *bā* series with SK reading [p^ha]>

If we only consider the frequency of each character, none of these characters are explained by analogy to a regular character. However, if we consider the possibility that the majority of these characters were already read as [pa], the rest could have changed to [pa], influenced by a type frequency effect. With this possibility, the characters in the 皮 *pí*, 包 *bāo*, and 甫 *fǔ* series in Table 3.5 can be reanalyzed.

The last problem regarding frequency effect comes from the data. Littlemore and McArthur (2012) explain that the corpus data and the intuitive data show different results. Discussing analogy hypothesis, previous SK research appear to rely on the intuitive data by listing a few examples of potential model characters for analogical influence with their high frequency and characters with an irregular reading, potentially influenced by analogy to model characters. As mentioned earlier, this intuitive data does not stand up to more rigorous analysis as evidence for analogy as the primary factor to cause irregular SK readings. Compared to analyzing the data merely by intuition, the corpus data in empirical analysis can improve our degree of accuracy in the research of irregular readings. Previously discussed experimental studies (Ho and Bryant 1997, Shu et al. 2003) and my research on the SK readings both analyze corpus data. However, frequency effect in these two research can be interpreted from two different aspects. The data provided in Ho and Bryant (1997) and Shu et al. (2003) are based on

the introduction of characters in children's textbooks. While the frequencies from these data are related to the order of students' learning, the frequencies of the SK data are based on the number of appearances of the Chinese characters in the chosen SK materials. It is difficult to speculate on the order of learning or exposure to each character in the early stages of Korean history. Due to lack of documentary evidence that shows how Chinese characters and their pronunciations were taught in the early history in Korea, we cannot find the same type of frequency data as Ho and Bryant 1997 and Shu et al. 2003. In fact, we lack materials used to teach pronunciation of Chinese characters, whereas materials that emphasize the content are dominant. In chapter 6, this will be discussed in detail by examining more historical materials.

3.5 Conclusion

In Chapter 3, I have examined the role of analogy in the history of irregular SK readings. Analyzing frequencies of regular characters and irregular characters, the corpus data presented in Chapter 3 demonstrate that about 20% of irregular SK readings are explainable by analogy. This relatively low ratio does not explain most irregular readings. They will be investigated further in the following chapters.

In the following chapter, I will explore the topic of syllabic inclination, which is a concept invented in the context of SK phonology. It has been proposed as another main factor for irregular SK readings. I will then explore and propose the concept of 'hyperforeignzation' as an additional force that can explain irregular SK readings.

4. Syllabic Inclination and Hyperforeignization: Attitudinal Factors

In Sino-Korean (SK) phonology, certain syllable types are combined with aspirated initials only or with unaspirated initials only. For example, both Middle Chinese (MC) /p^h/ and /p/ are reflected as /p^h/ in SK in syllables with a final [je]. In other words, there are characters with SK reading [p^hje], but none with SK reading [pje]. Since Kōno coined the term *onsetsu henkō* 音節偏向 "syllabic inclination" to describe this observed pattern, it has been discussed as one of the main concepts that explain the mismatch between SK readings and their corresponding MC readings. By analyzing syllable types that co-occur with aspirated initials only or with unaspirated initials only, we can determine whether this phenomenon is accidental or rule-based, or the result of certain tendencies distinct from phonological rules.

If aspiration mismatch tend to occur in one-way (that is, for SK to be aspirated when MC is not, but not *vice versa*), then just by chance it may happen that some SK syllable shapes will end up only with aspirated initials. If there is a tendency for aspiration mismatch to occur in both ways, then it may happen that some SK syllable shapes will end up only with aspirated initials, some with a mix of both, and some with only unaspirated initials. In section 4.1, I analyze SK data and claim that most irregular SK readings are caused by aspiration of MC unaspirated consonants. As I have discussed analogy in Chapter 3, I do not include the cases of irregular readings that can be explained by analogy in this chapter.

Some previous research on syllabic inclination attempts to formulate rules for the occurrence of aspirated and unaspirated consonants in terms of syllabic features. These features include medial glide, main vowel, ending and tone (Chang 1981, Itō 2007). Section 4.1 also examines whether phonological conditioning has regularly caused SK initials to be aspirated.

We can also consider certain tendencies that are distinct from phonological rules. In section 4.2, I examine hyperadaptation as a non-rule-based tendency that might be involved in creating the phenomenon of syllabic inclination. In hyperadaptation, including hyperforeignization and hypercorrection, speakers of one speech form extend a pattern or structural element based on what they perceive as appropriate for the other speech form. Their perceived forms are not necessarily justified historically or etymologically (Trudgill 1986). Hyperforeignization and hypercorrection are often at work in language contact situations (Janda et al. 1994, Boberg 1999, Joseph 2009). I will examine how hyperforeignization could play a role in creating irregular SK pronunciations, and explore possible connections with the phenomenon of syllabic inclination.

4.1 Syllabic Inclination in Sino-Korean Reading

Below is a table from Itō (2007) that displays the syllable types with different finals and two labial initials, /p/ and /p^h/.

Initials	ㅂ p	ㅍ p^h	p	p^h	p	p^h	p	p^h	p	p^h	p	p^h	p	p^h
Codas	ø		ㅁ -m		ㄴ -n		ㅇ -ŋ		ㅂ -p		ㄹ -l		ㄱ -k	
ㆍㅅ											ㅂ・ㄹ			
ㆍㅣ ʌi	ㅂㆍㅣ							ㅍㆍㅣㅇ					ㅂㆍㅣㄱ	
ㅏ a	바	파			반	판	방	팡			발	팔	박	
ㅐ ai		패												
ㅓ ə			범		번				법		벌			
ㅣ i	비	피			빈		빙			핍		필		
ㅕ iə				폄	변	편	병	평			별		벽	펵
ㅖ iəi		폐												
ㅛ io		표												
ㅗ o	보	포			본		봉						복	
ㅜ u	부	푸		품	분			풍			불			
ㅡ ɨ							븡				블		븍	
ㅢ ɨi	븨													

<Table 4.1 Sino-Korean syllables with a labial initial (Itō 2007: 49)>

The following is a summary of Table 4.1: among 49 finals that co-occur with labial initials in SK syllables, ten finals are combined with both aspirated labial and unaspirated labial initials: *a, an, aŋ, al, i, iən, iəŋ, iək, o, u*. Including these ten finals, /p/ is combined with 30 finals, and /p^h/ is combined with 19 finals. The following 20 finals are only combined with /p/: *ʌl, ʌi, ʌik, ak, əm, ən, əp, əl, in, iŋ, iəl, on, oŋ, ok, un, ul, ɨŋ, ɨl, ɨk*, and *ɨi*. The following nine finals are only combined with /p^h/: *ʌing, ai, ip, il, iəm, iəi, io, um*, and *uŋ*. Kōno points out that more than half of the finals combined with /p^h/ have a vowel 'i' or '-i-' medial.

The table below displays the syllable types with different finals and two dental initials, /t/ and /t^h/.

Initials	ㄷ t	ㅌ t^h	t	t^h	t	t^h	t	t^h	t	t^h	t	t^h	t	t^h
Codas	ø		ㅁ -m		ㄴ -n		ㅇ -ng		ㅂ -p		ㄹ -l		ㄱ -k	
·ㅅ						ㅌ·ㄴ								
·ㅣ ʌi	ㄷ·ㅣ	ㅌ·ㅣ						ㅌ·ㅣㅇ						
ㅏ a	다	타	담	탐	단	탄	당	탕	답	탑	달	탈		탁
ㅐ ai	대	태												
ㅓ ə													덕	
ㅣ i	디			팀	딘		딩				딜			
ㅕ iə	뎌		뎜	텸	뎐	텬	뎡	텽	뎝	텹		텰	뎍	텩
ㅖ iəi	뎨	톄												
ㅛ io	됴	툐												
ㅠ iu	듀													
ㅗ o	도	토			돈		동	통			돌		독	
ㅚ oi		퇴												
ㅜ u	두	투			둔									
ㅡ ɨ							등						득	특

<Table 4.2 Sino-Korean syllables with a dental initial (Itō 2007: 62)>

The following is a summary of Table 4.2: among 56 finals that co-occur with dental initials in SK syllables, 19 finals are combined with both aspirated dental and unaspirated dental initials: *ʌi,*

a, am, an, aŋ, ap, al, ai, iəm, iən, iəŋ, iəp, iək, iəi, io, o, oŋ, u, and *ɨk*. Including these 19 finals, /t/ is combined with 31 finals, and /t^h/ is combined with 25 finals. The following 12 finals are only combined with /t/: *ək, i, in, iŋ, il, iə, iu, on, ol, ok, un*, and *ɨŋ*. The following six finals are only combined with /t^h/: *ʌn, ʌiŋ, ak, im, iəl*, and *oi*. Unlike syllables with a labial initial, a vowel 'i-' or '-i-' medial does not appear directly involed with aspiration of an initial.

Kōno recognizes the phenomenon of syllabic inclination, but states that there is no systematicity in this phenomenon. He explains syllabic inclination in terms of convenience when memorizing. According to him, to select and memorize fewer syllables is easier than memorizing all pronounceable syllables. However, Kōno argues that these syllables are chosen randomly in many cases. Therefore, sometimes /p/ is selected and other times /p^h/ is selected to be combined with a certain final. Kōno also attributes syllabic inclination to the lack of aspiration distinction in OK phonology. He suggests that MC pronunciations were adopted into Korea only as unaspirated during OK period. Later when an aspirated consonant /p^h/ developed in Korean, this newly developed sound began to be used in SK. However, according to Kōno, either /p/ or /p^h/ was assigned based on analogy of each character's phonetic component, which did not reflect the MC source. This mismatch led to confusion. To reduce this confusion, in the next stage in Kōno's scenario, either /p/ or /p^h/ was randomly chosen to be combined with a different set of finals, and the number of distinct syllables in SK decreased (Kōno 1968: 110-111).

While Kōno finds the cause of irregular reflection of the MC aspiration feature in SK internal to Old Korean (OK) phonology, Chang (1981) attempts to find the cause in the MC phonological features. Like Kōno, Chang argues that OK speakers could not distinguish the contrast of MC labial aspiration. According to Chang, "the most mysterious is the MK labial aspiration which appears to have split both aspirated and unaspirated categories of MC evenly

into newly realigned groups in MK." Because of the higher ratio of deviation with labial initials compare to dental and velar initials, he only discussed labials. Below is the ratio of place asymmetry in adoption of aspiration feature presented in Itō (2007) and Chang (1981):

Place of articulation in MC	Aspiration/ voicing features in MC	SK (Itō 2007)	SK (Chang 1981)
Labials	-asp	23.9% +asp (60/251)	41.5% +asp
	+asp	43.2% -asp (29/67)	40% -asp
	voiced	30.1% +asp (73/242)	45.4% +asp
Dental	-asp	21% +asp (41/195)	12% +asp
	+asp	31.8% -asp (43/135)	15.5% -asp
	voiced	27.9% +asp (95/340)	16% +asp

<Table 4.3 Ratio of place asymmetry in adoption of aspiration feature>

The gap between Chang and Itō comes from the difference in the data they use. Chang's research is based on the data from DOC complied at UC Berkeley, which uses SK pronunciation recorded in Karlgren (1957). Itō's data comes fro various *enhay* 諺解 (Korean annotations of Chinese Classics) and *Hwunmong cahoy* compiled during the Cosen dynasty.

Discussing syllabic inclination, Itō claims that both aspirated and unaspirated initials in MC are adopted as aspirated in SK when combined with certain finals. She speculates that certain phonological features in these SK finals such as a medial -i- (i.e. on-glide [j]) and *rù* 入 tone endings (i.e. codas -p -l -k in SK, from MC -p -t -k) caused unaspirated initials in MC to be realized as aspirated in Korean[33].

The hypothesis of syllabic inclination is an attempt to understand irregular SK readings which cannot be explained by analogy of a phonetic component. Chang and Itō attempt to systematize possible phonological rules that cause aspiration in SK. For example, Chang observes that the aspirated stop in SK occurs predominantly in MC *qù* tone. He speculates that

[33] For a detailed discussion, please refer to 2.4.3.

some perceptual cues in *qù* tone led OK speakers to interpret it as tense. Chang attributes aspiration to this tense feature. According to Itō, aspiration occurs predominantly in the structure of 'labial initial + -i- + *rù* tone ending' such as [p^{h}ip] 핍 and [p^{h}il] 필. These claims by Chang and Itō remain to be verified by careful analysis of the data. To determine if explanation of each phonological feature is valid, we need to examine how well these phonological features discussed in these research studies to explain irregular readings of syllables with labial initials can explain irregular readings with dental initials. For example, Itō's conditioning factors for labial-initial syllables do not explain the patterns seen with dental initials. [til] 딜 with an unaspirated dental initial is the only syllable in the structure of 'dental initial + -i- + *rù* tone ending,' and it is not enough to support that '-i- + *rù* tone ending' causes aspiration.

Chang and Itō both attribute the syllabic inclination phenomenon to certain phonological conditioning features, but interestingly they select completely different sets of features to explain the SK data. The main reason is because Chang attempts to find the phonological features from the MC finals, while Itō finds them from the SK finals. It could in theory be something about the Chinese pronunciation, not the Korean, that affected the perception of initial aspiration. And that feature might have been obscured by the SK pronunciation of the final. However, among 61 MC rhymes, only 10 rhymes do not have any irregular readings. Almost all MC rhymes include irregular readings, and no specific phonological feature in MC rhymes is observed as a conditioning factor to regularly cause aspiration. In my analysis of the SK data below, I will use the phonological features in SK finals to understand the syllabic inclination phenomenon.

To examine the examples of syllabic inclination phenomenon in different categories of syllabic types, I will categorize SK syllables into two types: syllables with aspirated initials whose MC source is an unaspirated initial and syllables with unaspirated initials whose MC

source is an aspirated initial. The purpose of this categorization is to examine different phonological features found in each category. Following the analysis of syllables with both labial and dental initials, I will compare the syllabic conditions that possibly added aspiration features to dental initials to the syllabic conditions relevant to labial initials.

The tables below list the number of characters with irregular readings in terms of aspiration, grouped by final. After listing the total number of Chinese characters appearing with each SK reading, the first four columns show the total number of characters, including those with irregular readings that can be explained by analogy according to the methodology discussed in Chapter 3. The next four columns exclude the characters whose irregular readings can be explained by analogy. By comparing these two sets of numbers, I will examine whether syllabic inclination can serve as a phonological rule-based explanation for the residue of irregular readings once those attributed to analogy are excluded.

As in Chapter 3, each set will show different numbers depending on whether a tonal distinction for the aspiration reflex of MC voiced initials is reflected in SK reading. By comparing these two different numbers, I will determine which set gives better results of the data analysis. These two models of development of MC voiced initials have an abbreviation VD-ASP (MC voiced initials are pronounced as unaspirated in all tones) and VD+ASP (MC voiced initials develop into voiceless aspirated initials in *píng* tone and into voiceless unaspirated initials in all other three tones, *shăng*, *qù*, and *rù*). When irregular SK readings have an unaspirated initial, but their MC source is pronounced as aspirated, they are listed under p^h➔p or t^h➔t. When irregular readings have an aspirated initial, but their MC source is pronounced as unaspirated, they are listed under p➔p^h or t➔t^h.

	Total # of syllables		Including irregular readings that are explainable by analogy				Excluding irregular readings that are explainable by analogy			
			Model A:VD-ASP		Model B:VD+ASP		Model C:VD-ASP		Model D:VD+ASP	
Initials	p	p^h	p^h➔p	p➔p^h	p^h➔p	p➔p^h	p^h➔p	p➔p_h	p^h➔p	p➔p_h
ㅇㅣㅅik	14		3		7		1		1	
아 a	4	27		17	2	13		13	2	10
애 ai		16		14		12		14		13
이 i	52	16	3	12	10	9	2	8	4	5
예 iəi		10		10		10		10		10
요 io		13		10		8		7		5
오 o	23	32	3	27	4	13	1	27	2	7
우 u	56	1	1		3				1	
의 ɨi	2									
엄 əm	6									
염 iəm		1		1		1		1		1
움 um		2		1		1		1		1
안 an	22	8	3	7	8	7	1	7	1	7
언 ən	15									
인 in	11				5				3	
연 iən	12	11	1	7	3	5		3	2	1
온 on	2									
운 un	27		1		2					
ㅇㅣㅇ ʌiŋ		2		1				1		
앙 aŋ	23	1			5				1	
잉 iŋ	6		1		4		1		3	
영 iəŋ	16	5		5	4			5		
옹 oŋ	14				2					
웅 uŋ		7		7		7		7		7
응 ɨŋ	7				4				1	
업 əp										
입 ip		3		3		3		3		3
	4									
알 al	8	1	1	1	1	1		1		1
얼 əl	5									
일 il		9		7		7		7		7
열 iəl	4									
울 ul										
을 ɨl	7									

ㅇ ㅟ ㄱ ʌik	9		3		3					
악 ak	20		6		6		3		2	
역 iək	15	1	3	1	3	1	1	1	1	1
옥 ok	20		2		2					
윽 ɨk	2									
# of syllable types			13	17	19	15	7	17	13	15
Excluding syllables only appearing once			8	12	18	11	2	12	7	10
# of irregular readings			31	131 (162)	78	98 (176)	10	116 (126)	24	79 (103)
			19%	81%	44%	56%	8%	92%	23%	77%

<Table 4.4 SK characters with aspiration-mismatch irregular readings with labial initials >

			Including irregular readings that are explainable by analogy				Excluding irregular readings that are explainable by analogy			
			Model A: VD-ASP		Model B:VD+ASP		Model C: VD-ASP		Model D: VD+ASP	
Initials	t	t^h	t^h➔t	t➔t^h	t^h➔t	t➔t^h	t^h➔t	t➔t^h	t^h➔t	t➔t^h
ㅇ ㅟ ʌi	13	7	1	4	3	2		2	2	2
아 a	4	20		17	2	9		16	2	7
애 ai	2	5		2		2		2		2
이 i	9	15		12	4	10		12	3	10
여 iə	12		3		5		2		3	
예 iəi	30	15	3	11	15	10	1	11	7	10
요 io	25	2	2	2	10	1	1		7	
유 iu	19	5	1	5	8	4	1	5	7	4
오 o	44	7	5		17		1		13	
외 oi		9		5		1		5		1
우 u	14	9		7	1	2		5	1	2
암 am	23	3	3	2	11	2	1	2	5	2
임 im	1	4		4		2		4		2
염 iəm	6	6	1	2	1	1		2		1
		1								
안 an	23	12	3	6	6	5		5	3	4
인 in	7		1		3				2	
연 iən	23	1	1		5		1		5	

온 on	12		2		5		1		3	
운 un	5				3				1	
ㅇㅢㅇ ʌiŋ		1								
앙 aŋ	20	6	2	2	13	2		1	12	1
잉 iŋ	2				1				1	
양 iaŋ	10	3		2	3	2		2	3	2
영 iə	30	3	7		17		4		14	
용 ioŋ		2		1		1		1		1
융 iuŋ	7	5		5	1	2		5	1	2
옹 oŋ	21	7		2	9	2		2	5	2
응 ɨŋ	12				5				5	
압 ap	4	4	2		2		2		2	
입 ip		1		1		1		1		1
엽 iəp	3	4		2		2		2		2
알 al	6	3	4	2	4	2		2		2
일 il	9									
열 iəl		9		5		5		5		5
율 iul		3		2		2		2		2
올 ol	4									
ㅇㅢㄱ ʌik	1	5		4		4		4		4
악 ak		17		9		9		9		9
억 ək	1									
익 ik	1	4		1		1		1		1
약 iak		4		4		4		4		4
역 iək	17	7		5		5		5		5
욕 iok		1		1		1		1		1
육 iuk	1	10		8		8		8		8
옥 ok	17		2		2		2		2	
윽 eɨk	1	3		1		1		1		1
# of syllable types			17	31	26	31	11	30	24	30
Excluding syllables only appearing once			12	26	22	23	4	24	20	22
# of irregular readings			43	136 (179)	156	105 (261)	17	127 (144)	109	100 (209)
			24%	76%	60%	40%	12%	88%	52%	48%

<Table 4.5 SK characters with aspiration-mismatch irregular readings with dental initials >

Among four models given in Table 4.4 and Table 4.5, Model C is the most appropriate to examine whether or not syllabic inclination is rule-based based on analysis of four models:

a. Both Table 4.4 and 4.5 show that there are less irregular readings by excluding irregular readings that are explainable by analogy than including them.

b. Model C shows the least number of syllable types that have irregular readings. Excluding syllables only appearing once, there are 14 syllable types with labial initials and 28 types with dental initials. For comparison, Model B lists the most number of syllable types that have irregular readings. Excluding syllables only appearing once, there are 29 syllable types with labial initials and 45 types with dental initials.

c. In Model C, only around 10% of irregular readings are pronounced with an unaspirated initial, which means that most irregular readings occurred by aspiration feature added to their MC source. This is consistent with the hypothesis in previous studies that explained phonological features in certain finals caused both aspirated and unaspirated initials in MC adopted as aspirated in SK.

Table 4.6 lists the number of characters with irregular readings in Model C. In Table 4.6, syllable types with occurrence of four or below are considered as outliers and excluded from the analysis, unless their occurrence as irregular readings make up more than 50% of the total occurrences of the syllable type. With labial initials, these syllables include [pi] 비, [pak] 박, and [p^{h}iən] 편. Their occurrences as an irregular reading are 50% or below of the total occurrence of each syllable ([pi] 비 2 out of 52 =2/52, [pak] 박 3/20, and [p^{h}iən] 편 3/11). I include [p^{h}ip] 핍, which occurs only three times, in the analysis, because these occurrences are all irregular readings. There is no [pip] 빕 reading in SK. With the same reason, [tiə] 더 (2/12), [tap] 답 (2/4), [tok] 독 (2/17), [t^{h}ʌi] 틔 (2/7), [t^{h}ai] 태 (2/5), [t^{h}iəm] 텸 (2/6), [t^{h}oŋ] 통 (2/7), [t^{h}iəp] 텹 (2/4) are not included, but [t^{h}am] 탐 (2/3), [t^{h}iaŋ] 탱 (2/3), [t^{h}al] 탈 (2/3)[34], [t^{h}iul] 튤 (2/3) are included in the

[34]奪 'seize' and 脫 'take off' are the two characters with an irregular reading [t^{h}al]. In her data, Itō lists 脫 'take off' (SK [t^{h}al]) twice: one with MC /t^{h}/ initial and the other with MC /d/ initial. I

analysis.

		Excluding irregular readings that are explainable by analogy			
		Model C: VD-ASP			
		p^h->p	p->p^h	t^h->t	t->t^h
	아 a		13		16
	애 ai		14		
	이 i		8		12
	예 iəi		10		11
	요 io		7		
	유 iu				5
	오 o		27		
	외 oi				5
	우 u				5
	암 am				2
	임 im				4
	염 iəm		1		
	안 an		7		5
	양 iaŋ				2
	영 iəŋ		5		
	융 iuŋ				5
	웅 uŋ		7		
	입 ip		3		1
	알 al		1		2
	일 il		7		
	열 iəl				5
	율 iul				2
	ㅇ ㅣ ㄱ ʌik				4
	악 ak				9
	약 iak				4
	역 iək		1		5
	욕 iok				1
	육 iuk				8

<Table 4.6 Irregular Sino-Korean syllables under Model C>

include [t^hal] with MC /d/ initial as an irregular reading. However, several dictionaries (such as Wang Li, 王力古漢語字典) only list MC /t^h/ initial for 脫 'take off.' It is possible that the reading with MC /d/ initial is incorrect, or that Itō has another source for this reading that I am unaware of.

After excluding syllable types with a lower number of occurrences, it can be seen that irregular readings all have an aspirated initial. The following 14 finals, Set A, are correlated with an MC unaspirated labial initial adopted as an SK aspirated labial initial: -a 아, -ai 애, -i 이, -iəi 예, -io 요, -o 오, -iəm 염, -an 안, -iəŋ 영, -uŋ 웅, -ip 입, -al 알, -il 일, -iək 역. The following 21 finals, Set B, are correlated with an MC unaspirated dental initial adopted as an SK aspirated dental initial: -a 아, -i 이, -iəi 예, -iu 유, -oi 외, -u 우, -am 암, -im 임, -an 안, -iaŋ 양, -iuŋ융, -ip 입, -al 알, -iəl 열, -iul 율, -ʌik ㅇ ㅣ ㄱ, -ak 악, -iak 약, -iək 역, -iok 욕, -iuk 육. Although there is a far greater than chance distribution of irrugular aspiration with certain syllable types, as we can see in Table 4.7, it is difficult to identify any common phonological features among the finals in Set A or those in Set B.

Labial initial	Dental initial
-a 아	-a 아
-ai 애	
-i 이	-i 이
-iəi 예	-iəi 예
-io 요	
	-iu 유
	-oi 외
-o 오	
	-u 우
-iəm 염	
	-am 암
-an 안	-an 안
	-iaŋ 양
-iəŋ 영	
-uŋ 웅	
	-iuŋ 융
-ip 입	-ip 입
-al 알	-al 알
	-im 임
-il 일	
	-iəl 열
	-iul 율
	-ʌik ㅇ ㅣ ㄱ
	-ak 악
	-iak 약
-iək 역	-iək 역
	-iok 욕
	-iuk 육

<Table 4.7 finals correlated with an MC unaspirated initial adopted as an SK aspirated initial>

The following 7 finals, Set C, appear in both Set A and Set B: -a 아, -i 이, -iəi 예, -an 안, -ip 입, -al 알, -iək 역. There are no common phonological features among the finals in Set C, either. Itō and Chang attribute aspiration in SK to certain phonological conditioning features. My analysis shows that their hypothesis that a feature of the final caused the aspiration has only limited

explanatory power at best. For example, Itō speculates that a medial -i- and *rù* 入 tone endings (i.e. codas -p, -l, -k in SK, from MC -p, -t, -k) possibly caused unaspirated initials in MC to be realized as aspirated in Korean. And it is true that many of the finals that co-occur with an aspirated labial initial and an aspirated dental initial do have a medial -i- and *rù* tone endings. But some finals such as /ung/ in [p^huŋ] do not have these features. Furthermore, some finals with these features co-occur with an unaspirated initial in regular readings. Among 111 irregular readings with a labial initial in Table 4.5, 43 cases (39%) have either a medial -i- or *rù* tone endings. Out of 113 irregular readings with a dental initial, 80 cases (71%) have either a medial -i- or *rù* tone endings. Irregular readings with the finals -a 아, -ai 애, -o 오, -an 안, -uŋ 웅 with a labial initial and the finals -a 아, -oi 외, -u 우, -am 암, -an 안 with a dental initial still remain unexplained by applying these phonological rules.

Analysis of the SK data above shows that more than half of irregular readings (39% in syllables with a labial initial and 71% in syllables with a dental initial) not explainable by analogy can be explained by the phonological conditions proposed by Itō. The other half is still not explainable by the same phonological conditions. Moreover, the validity of the hypothesis also depends on whether we can explain the phonological rules that caused aspiration in terms of plausible phonetic processes. For example, Itō speculates that medial -i- could cause stops and affricates to be perceived as fricatives. According to her, a medial -i- is phonologically weak. Therefore, it gradually becomes voiceless, and this voiceless segment after the consonant is perceived as aspiration. However, Itō does not explain how a fricative is related to the claim of perceived aspiration. The plausibility of an on-glide becoming voiceless before a voiced vowel also needs to be discussed. This process is not supported by universal phonetic principles. Itō does not provide any experimental or historical evidence for this process in any other language.

We need to examine two questions about Itō's hypothesis: (1) Does the phonological rule account for the data? (2) Is the phonological rule plausible based on what we know about phonetics and sound change? My analysis of the SK data shows that Itō's hypothesis account for some irregular readings. But, not all of the irregular readings not explained by analogy can be explained by the hypothesis. In the following sections, I will explore another explanation that might account for some of the irregular readings that are not explained by analogy: hyperforeignization. As a non-rule-based tendency, hyperforeignization has been used to explain several linguistic examples that are the result of certain tendencies distinct from phonological rules. I will discuss the similarity between these linguistic examples and irregular SK pronunciations, and explore possible connections of hyperforeignization and the phenomenon of syllabic inclination.

4.2 Hypercorrection and Hyperforeignization

In most cases of loanword adaptation, sounds that do not exist in the borrowing language are replaced by the nearest equivalent sounds in the borrowing language. However, the length and intensity of the contact, and the amount of bilingualism in the populations can make a different outcome of borrowing (Thomason & Kaufman 1988). As Heath 1978 claims, extensive and intimate contact can introduce new phonemes into the borrowing language. For example, English phonemes /v/ and /ʒ/ resulted from intensive contact with French. French words such as *vrai* 'true' and *rouge* 'red' are well-known examples that were borrowed into English and introduced the new phonemes /v/ and /ʒ/ to the English phonology inventory[35]. Even as an English phoneme, [ʒ] is still conceived as more foreign compared to [dʒ].

[35] This example is from Campbell (2004).

In some cases of loanword adaptation, a more exotic and foreign-sounding pronunciation is chosen in the borrowing language. The commonly heard pronunciation of *Beijing* Běijīng in American English with [ʒ] instead of [dʒ] is probably an example of this phenomenon (Janda et al. 1994, Campbell 2004). While English speakers can easily pronounce [beɪdʒɪŋ], which is closer in pronunciation to the Mandarin pronunciation, [beɪʒɪŋ] is frequently used in news media. Adoption of [ʒ] instead of [dʒ] cannot be explained in terms of a regular phonological rule, but is attributed to hyperforeignization in Janda et al. 1994 and Campbell 2004.

Examining speaker agentivity in language contact situations, Joseph (2009) discusses two types of hyperadaptation: hypercorrection and hyperforeignization. In hypercorrection, speakers perceive the dialect with relative prestige as correct and replace their original form with what they assume to be the correct prestige-dialect form. Because of their imperfect command of the prestige dialect, this can lead to a form that is not correct. One of the best-known examples of hypercorrection is the situation where speakers from the lower middle class in New York City pronounce *god* as [gaɹd] by overextending r-insertion (Labov 1966). In hyperforeignization, speakers create a form by adding a feature they perceive as foreign to a borrowed foreign word, even when that feature was not present in the original pronunciation. Joseph lists one French word and one Spanish word as pronounced by English speakers as examples of this phenomenon. The French word *lingerie* [lɛ̃ʒʀi] is pronounced as [|lɑ:ndʒəˈreɪ] by American English speakers rather than as [|lɑ:ndʒəˈri:], who perceive that French words end in stressed [e] (realized in English as [eɪ]).[36] Some English speakers perceive that Spanish words tend to end in /o/ and create a mock-Spanish word *problemo* (as in "*no problemo*!"), even though the actual Spanish form is *problema*. As these examples show, hyperforeignization is the result of

[36] The English pronunciation of *lingerie* [|lɑ:ndʒəˈreɪ] is from the Oxford dictionary. The pronunciation provided by Joseph is [lãZərej].

borrowers' perception, and phonological rules are not involved. In addition, as Janda et al. (1994) points out, these examples are not randomly created by a single speaker. Indeed many monolingual speakers tend to follow these phonological patterns in loanwords. The motivation causing hyperforeignization among these speakers can be explained in terms of attitudinal factors.

Comparing two English phonemes /æ/ and /a:/ which are both possible realizations of the letter 'a' in the spelled form of foreign words, Boberg (1999) argues that attitudinal factors encourage American speakers to evaluate /a:/ as more "correct, educated, and sophisticated" than /æ/ as a nativization of foreign 'a'.[37] He reached this conclusion based on an attitudinal survey that asked four issues:

1. The possibility of a discrepancy between the self-reported use of /a:/ and its evaluation as a correct nativization
2. The comparative evaluation of /æ/ and /a:/ nativizations as "more educated or sophisticated"
3. The envelope of acceptable variation and the evaluation of non-American nativizations
4. The treatment of new loanwords where no prior cues to pronunciation exist

His study confirms the hypothesis that attitudinal factors, not phonological factors, account for modern American English speakers' preference for /a:/, in some cases even where /æ/ is a standard pronunciation indicated in a dictionary.

4.3 Hyperforeignization in Sino-Korean Reading

Syllables with an irregular SK pronunciation in Table 4.6 have an aspirated initial in their SK pronunciation, whereas their MC source has an unaspirated initial. Considering the internal development of the aspiration feature in Korean and its reflection in SK readings, these SK irregular readings with an aspirated initial might plausibly be viewed as the result of

[37] Boberg provides examples such as /æ/ in *tobacco* and /a:/ in llama, spa, Mazda, and pasta.

hyperforeignization. In this section I will pursue this hypothesis.

Section 2.4.4 has discussed that the Korean aspirated consonants developed over several centuries, with the possibility that aspirated consonants first appeared in OK. OK-MC contact and adoption of a large scale of Chinese characters led to the introduction of aspirated consonants from Chinese into the Korean phonological system (Chang 1981). According to Joseph (2009), speakers use the relevant knowledge of standard forms as a model. He explains that this model provides a basis for speakers' "mistaken reconstruction, which is a type of "hyper-" action on speakers' part. Explaining the motivation for hyperforeignization, Boberg (1999) predicts that the use of /a:/ in nativization of foreign 'a' will be found more frequently among the social group with upward social mobility, especially in more formal styles of speech. Since written Chinese and the associated pronunciations of Chinese characters were of high prestige in medieval Korea, it is not surprising that they would be subject to hyperforeignization, especially by Korean learners with upward social mobility. Since aspirated consonants were far more frequent in Middle Chinese than in Old Korean (where they were likely not phonemically distinct), it would be natural for Korean speakers to perceive aspirated consonants as a salient Chinese feature. Korean speakers could therefore have added an aspiration feature even to SK readings of characters that are read with an unaspirated MC initial.

Joseph claims that when speakers are exposed to foreign forms in contact situations, they can become proactive in dealing with the forms and adapting them in their own speech. After speakers become familiar with these new phonemes from a foreign language, they gradually recognize these originally foreign sounds as less foreign. By proactively using these sounds in contexts of native lexicon, speakers establish these sounds as phonemes in their own native language. This process of adopting new phonemes from a foreign language can be applied to the

development of aspiration features in Korean.

We can draw an analogy between aspirated consonants in Korean and the sound [ʒ] in English. Both of these sounds existed as allophones before extensive contact with the high-prestige languages Chinese and French, respectively. These sounds could have become phonemicized by extension and generalization of foreign phonemes. At the same time, they might have been over-extended to the pronunciation of borrowed words (as we see in the English pronunciation [beɪʒɪŋ].) For either case, we do not have possible phonological rules to account for the appearance of the phonemes in a certain context. There are sporadic and isolated types of hyperforeignization and more systematic types. One of the examples of more systematic hyperforeignization with high-frequency in Janda et al. 1994 is adding [h] before English vowel-initial words by French speakers, which produces *Holiday* [h]*Inn*, [h]*Ohio*, etc. But even the more systematic types are far from regular. According to Janda et al. 1994, French h-insertion occurs 15% of the time only, and the set of words in which it occurs cannot be explained by phonological rules.

In previous research, syllabic inclination was cited as one of the main concepts that explain the mismatch between SK readings and their corresponding MC readings. There have been attempts to formulate phonological rules causing aspiration in certain syllable types. Kōno explains syllabic inclination in terms of convenience when memorizing. Examining proposed phonological rules in previous studies of syllabic inclination and the similarity between the linguistics examples of hyperforeignization and irregular SK pronunciations, I claim that the apparent phenomenon of syllabic inclination in SK phonology is better understood as a secondary effect of hyperforeignization, not as a rule-based development directly causing irregular SK readings.

Consider a scenario that Old Korean had incipient aspiration that was not phonemic (or perhaps only marginally phonemic). Contact with Chinese and the importation of SK pronunciations could have led to the phonemicization of aspiration-feature contrasts. Because the aspirated phonemes were far more frequent in SK pronunciations than in native Korean vocabulary, they would have been perceived as salient features of high-prestige Chinese pronunciations. Borrowing in some cases happens when a foreign upper class actively adopts another culture that is considered "superior" in terms of various aspects of social and economic life such as government, religion, and legal system (Anttila 1989:62). This situation can be observed in SK materials that are mostly connected to the culture, philosophy and religion of China. Sino-Korean is based on a systematically organized body of characters and their pronunciation as found in these SK materials.

Korean learners of Chinese characters and SK readings were equivalent to the upwardly-mobile social groups talked about by Boberg. Consider 辦 *bàn* with MC /b/ initial, which is an example of aspiration mismatch. When it was adopted to Korea, we would expect it to be pronounced as [pan], but the SK pronunciation of this character is actually [p^{h}an]. When 苞 *bāo* with MC /p/ initial was adopted to Korea, we would expect it to be pronounced as [po], but the SK pronunciation of this character is [p^{h}o]. According to the hyperforeignization hypothesis, the initial [p^{h}] was not the result of a sound change conditioned by the syllable shape; rather, it was chosen to pronounce these characters because Korean speakers evaluated an aspirated initial as more "correct, educated, and sophisticated" than an unaspirated initial, analogous to the comparison of English phonemes /æ/ and /a:/ described by Boberg (1999). Hyperforeignization is a powerful idea that can account for irregular SK readings, especially in those cases where the syllabic inclination hypothesis could not adequately explain it. However, as seen in Table 4.6,

hyperforeignization involves a limited set of syllabic shapes. Syllabic inclination shows that certain finals, but not all, co-occur with an aspirated initial in SK readings. Itō proposed that some phonological conditions, an on-glide [j] or *rù* tone ending, possibly cause syllabic inclination. But the data that can be explained by these phonological rules is limited, so syllabic inclination does not work as a rule-based explanation. Therefore, we cannot claim that an on-glide [j] or *rù* tone ending is a factor of aspiration or a condition of syllabic inclination. Nevertheless, because more than half of irregular readings (39% in syllables with a labial initial and 71% in syllables with a dental initial) do co-occur with an on-glide [j] or *rù* tone ending, it is worth to consider how these phonological features can occur with an aspirated consonant.

There is a possible connection between these phonological features and hyperforeignization. Some syllables could have been more susceptible to hyperforeignization because of their syllable shape. In other words, perhaps the presence of [j] or a *rù*-tone made syllables sound more typically Korean, so that -h- was added to make them seem more foreign. Or the opposite scenario is possible: the presence of [j] or a *rù* tone made the syllables sound very un-Korean, so it seems like they should also have an additional foreign sound. It is difficult to find definitive ways of testing these two contradictory and completely hypothetical scenarios, because available evidence from the LMK data seems insufficient to test them adequately.

Based on the analysis of occurrence frequencies of Modern Korean phonemes and syllable units in Shin (2010), I propose that the syllable types above were rare than common in native Korean words. First, there are less closed syllables (46.63%) than open syllables in Korean phonology. There are seven consonant endings in Korean /m, n, ŋ, l, p, t, k/, and syllables with a *rù* tone ending, /p, l, k/, occupy 36.2% (4.7% in /p/, 16.2% in /l/, and 15.3% in

/k/) of closed syllables.[38] Second, syllables with a simple vowel /i, ʌ, o, u, ɛ, ɯ/ occupy 85% of the entire syllables, and syllables with an on-glide [j] are less than 10%. This data is based on Modern Korean data, but still provide suggestive evidence regarding syllable patterns in LMK. In sum, Korean speakers could have perceived the syllables with an on-glide [j] or *rù* tone ending as more foreign, and added -h- to make them sound more foreign.

This kind of phonological pattern, a syllabic condition that makes hyperforeignization of aspiration more likely, would make "phonotactic tendency" of syllabic inclination appear to be rule-based. The difference is causality. A phonological rule implies some sort of phonetic (articulatory or perceptual) motivation for the sound change; while the hyperforeignization hypothesis implies a cultural rule: some syllables “sound” more or less foreign to speakers. A set of data could be explained by either hypotheses, but we must decide which one is more plausible. If the phonological rules are plausible from a phonetic perspective, then we can say a rule-based syllabic inclination is a better solution. If they are plausible from a “sounds foreign” or “sounds native” perspective, then we choose hyperforeignization. As discussed above, the phonological conditions proposed by Itō, even the phonological rules that explain as much as more than half of irregular readings, cannot consistently explain the SK data, and are not plausible from a phonetic perspective.

Comparing the advantages and disadvantages of a phonological rule-based hypothesis and the hyperforeignization hypotheses, hyperforeignization hypothesis is more consistent in explain the SK irregular readings that are manifested in the phenomenon of syllabic inclination.

[38] MC /t/ ending is reflected as /l/ in Sino-Korean.

5. Loanword Adaptation and Sino-Korean Reading

All languages experience adopting and adapting of loanwords. Loanwords are lexical items that originated in the source language (SL) and are used in the borrowing language (BL) context in order to fill some semantic void that previously existed in the borrowing language (Paradis 1996, Kenstowicz 2001, Smith 2006). In this chapter, I summarize the main issues in the field of loanword adaptation and discuss Sino-Korean readings in terms of loanword adaptation. Depending on the nature of the language contact situation, the BL speakers are exposed to the SL through either acoustic input or orthographic input of the SL. I discuss these two different types of inputs, because linguistic borrowing to Korea during the Middle Chinese period was significantly done through the medium of orthography as well as oral transmission.

During the process of borrowing, loanwords are adapted through phonological adjustment in order to be incorporated into the borrowing language. I will demonstrate two examples. Loanwords into Mandarin provide an example of phonological adjustment, as seen in the borrowed form of 'Frankfurt' and 'Hamburg' below. These loanwords are composed of Mandarin syllables, which conform to the Mandarin syllable structure, (C1)-(M)-V-(C2)[39]. No final consonants are permitted other than *n*, *ŋ*, and *r*. Consonant clusters do not exist in Mandarin syllables. If loanwords in the source language have consonant clusters or final consonants other than *n*, *ŋ*, and *r*, they are adapted by one or more of these three strategies: omitting some of the consonants, distributing consonant clusters over several syllables, or appending a final vowel:

Frankfurt > fǎ-láng-kè-fú 法郎克服/ fǎ-lán-kè-fú 法蘭克福
Hamburg > hàn-bǎo 漢堡

Another example can be found in adaption of Japanese /u/ in Korean which occurs through Korean adapters' auditory perception and reflects phonetic approximation. Japanese /u/

[39] See Haspelmath and Tadmor (2009: 584) for the details.

is adapted as the Korean central vowel /ɨ/ after the coronal sibilants [t^s], [s], and [$(d)^z$], and as /u/ elsewhere (Y. Kang et al. 2006).

	Japanese	Korean	English meaning
after the coronal sibilants	s**u**si	s**ɨ**si	'sushi'
	miz**u**age	mic**ɨ**ake	'unloading catch of fish'
elsewhere	**u**nagi	**u**naki	'eel'
	baNg**u**mi	paŋk**u**mi	'program'

<Table 5.1 Adaptation of Japanese /u/ in Korean>

Homma 1973 explains this phenomenon by the fact that /u/, frequently transcribed as the unrounded high back vowel [ɯ], is realized as centralized after [t^s], [s], and [z] in Japanese.

In 5.1, I will discuss how different theories in loanword adaptation have been applied to explain loanword adaptation processes.

5.1 Theories in Loanword Adaptation- Phonology, Phonetics, Other Factors

Which factor accounts for the process of loanword adaptation in a consistent and systematic way has been a controversial topic in the field of loanword phonology. During the process of borrowing, loanwords are adapted through phonological adjustment in order to be incorporated into the borrowing language, while preserving features of the source language as much as possible. To explain how the patterns of loanword adaptation should be interpreted, there are two extreme points of view positing that processes of loanword adaptation are either purely phonetic or purely phonological. Peperkamp and her collaborators (Peperkamp and Dupoux 2003, Vendelin and Peperkamp 2004, Peperkamp 2005, Peperkamp et al. 2008) advocate the phonetic view. The researchers who share this view claim that loanword adaptation

is mostly based on perceptual assimilation on the level of sounds and that the phonology of the source language is not accessed during the process of adaptation. Different outcomes of adapting phonologically identical, but phonetically distinct English and French word-final /n/ in Japanese support the perception approach (Peperkamp, Vendelin & Nakamura 2008). Since Japanese speakers perceive English /n/ as having no release and French /n/ as of longer duration with a release, English /n/ is adapted as Japanese moraic nasal /N/, while French /n/ is adapted as a nasal geminate by appending a vowel as shown below:

Loanwords from English		Loanwords from French	
pe**n**	< pen	ka**nnu**	< Cannes [kan]
wōkuma**n**	< walkman	parije**nnu**	< parisienne [paʁizjɛn] 'Parisian-FEM'

However, adaptation of English /l/ in the coda position in Mandarin loanwords shows the limitations of the perception approach (Tae Eun Kim 2013:197). It is difficult to account for different adaptations of the /l/ ending in an identical syllabic environment. In the first two examples, the /l/ is omitted, and the next two, it is borrowed as [əɹ].

English	Mandarin (Pinyin)	IPA (tones omitted)
waffle /wɑfəl/	→ huá-fū	[xwa-fu]
arsenal /ɑrsənəl/	→ ā-sēn-nà (duì)	[a-sən-na]
angel /endʒəl/	→ ān-qí-ér	[an-tɕ^{h}i-əɹ]
staples /stepəlz/	→ sī-tè-pǔ-ěr-sī	[sɨ-t^{h}ɤ-p^{h}u-əɹ-sɨ]

Kim bases her analysis on the assumption that "syllabic position" is the only thing that affects the perception of English /l/, and in these four words the syllabic position is the same: syllabic nucleus. Her conclusion is not entirely convincing, because she does not attempt to explain this pattern further. Nevertheless, her examples show that the perception approach is insufficient.

The phonological approach (e.g. LaCharité and Paradis 2005) claims that it is the

phonology of the borrowing language and/ or the source language that determines adaptation patterns. Some English loanwords in Korean support their argument. English /t/ has allophones depending on its syllabic position. For example, /t/ after /s/ in 'street' is more similar to Korean fortis [t] phonetically. However, English /t/ is always adapted as Korean [t^h], because Korean [t^h], not [t], belongs to the same phonological category as English /t/. Therefore, 'street' is borrowed as 스트리트 [sɨt^{h}ɨɾɨt^{h}ɨ] not as 스뜨리트 [sɨtɨɾɨt^{h}ɨ].

Like the phonetic approach, the phonological approach cannot explain all loanword adaptation cases. Unlike how Korean speakers adapt English stops, Cantonese speakers rely on phonetic characteristics rather than on the phonemic membership of these sounds in English. The English word ***p****ie* is adapted as /p^{h}aj/, with an aspirated stop /p^h/, but the English word *bum****p****er* is adapted as /pɐmpa/, with a plain stop /p/ (Silverman 1992).

Loanword adaptation is a complex process. By examining the loanword examples above, it can be concluded that neither a purely phonetic nor a purely phonological account of the adaptation process can be adequate to provide a comprehensive analysis for loanword adaptation. Recent studies (Silverman 1992, Kenstowicz 2001, Y. Kang 2003, Heffernan 2007) have attempted to resolve the weakness of each theory by integrating the two approaches and other theories.

Based on a systematic survey of a loanword list compiled by the National Academy of the Korean Language[40], Y. Kang (2003) proposes that a complex interplay of phonetic, phonemic, and morphophonemic factors is involved in vowel insertion after a postvocalic word-final stop in English loanwords in Korean. According to her, the perceptual similarity between the English input and the Korean, along with morphophonemic restriction in Korean, stimulates

[40] Y. Kang (2003) investigates 447 English words with a final postvocalic stop in this list.

vowel insertion. Kang summarizes that three phonological factors determine the pattern of vowel insertion: tenseness of the pre-final vowel, the voicing and place of articulation of the final stop. When there is either a pre-final tense vowel, or a voiced final stop, or a coronal final stop, frequency of vowel insertion tends to become higher. Among these three factors, the first two factors are related to phonetic details of the source language. Another cause of vowel insertion is a morphophonemic restriction against underlying /t/-final nouns in Korean that is not explained by phonetic similarity. Kang points out that coronal stops are released less frequently than dorsal or labial stops in English. If phonetic similarity were the only factor, vowel insertion could have occurred less often after coronal stops than after dorsal or labial stops.

The nasal endings in Sino-Japanese loanwords discussed in Heffernan (2007) illustrate the influence of non-phonetic aspects in loan word phonology. Heffernan provides a case of loanword adaptation where social factors such as the degree of bilingualism can encourage sound changes. He compares the social relationship between Japan and China with the contrasts retained in coda position in the loanwords borrowed from Chinese at various stages in the history of cultural contact. The discrepancies of maintained contrast in each stratum are explained in terms of the different contact settings (Loveday 1996). Heffernan explains that speakers of the community use L2 in an extremely limited way, and learning L2 is not regarded as socially prestigious in the distant and non-bilingual setting. On the contrary, in the diglossic setting, speaking L2 is associated with social prestige.

The table below shows that the Nara and early Heian periods preserve the most contrast:

Period	Setting	Nasal ending in Chinese	Nasal ending in Sino-Japanese
Yamato (400-700)	Distant, non-bilingual	m n ŋ	mu nu gu
Nara, early Heian (700-1000)	Diglossic, bilingual	m n ŋ	mu N v[41]
Late Heian through Tokugawa (1000-1850)	Diglossic, non-bilingual	m n ŋ	N
Meiji to modern day (1850-present)	Distant, non-bilingual	n ŋ	N

<Table 5.2 Preservation of phonemic contrast in Chinese loanwords in different contact settings>

Heffernan proposes that the higher the level of bilingualism in the community, the more likely the borrowing language maintains the non-native phonemic contrasts in adapting loanwords. That is, there is a pressure to maintain a distinction in the BL among distinct phonemes in the SL. Heffernan concludes that under the following two conditions, the pressure becomes significant: 1) The speakers of the BL are fluent in SL, and SL is prestigious in the BL community, 2) There are not enough phonemic contrasts in BL to maintain all of the SL phonemic contrasts in loanwords. Irregular readings in SK can be also explained by different degrees of familiarity leading to different adaptation strategies at different times or by different groups. This will be discussed in 5.3.

5.2 Loanword Adaptation Based on Input Types

The orthographic input and the acoustic input of a source language have been examined in previous studies of loanword adaptation. In one scenario of word adaptation, the process occurs by being exposed to the orthographic input of the target word. In another scenario, adaptation can occur by considering the acoustic input of the target word. Orthography has been discussed as playing only a limited role and has not received much attention. However, some

[41] See Takata (2004) for discussion of missing the final /ŋ/ in the *zeng* rime-group (*zengshe* 曾攝) in Kan-on due to derivation from a different dialect.

loanword adaptation processes can be explained with a greater degree of regularity by considering the influence of orthography. Take the example of the French adaptation of Afrikaans *boer* 'Boer' [bur], which is [boɛr]. Peperkamp and Dupoux (2005) explain that although the phonetic form of the source word, [bur], has a higher phonotactic probability than [boɛr] in French, [boɛr] was adapted due to the influence of orthography.

Some English loanwords in Japanese are found with two different forms (Arakawa 1977, Ichikawa 1929, Miura 1993). One of the adapted forms results from coda deletion, and the other is derived from vowel epenthesis. For example, English *jitterbug* is realized with the doublet *jiruba* [dʒi.ɾɯ.ba] from coda deletion and *jittaabaggu* [dʒit.ta:.bag.gɯ] from vowel epenthesis in Japanese. Comparing *jiruba* and *jittaabaggu,* Smith (2005) argues that these doublets are explained by different input types. [dʒi.ɾɯ.ba] is a true phonological loan from American English [dʒɪɾəbʌg], which entered through direct contact between Americans and Japanese in post-war Japan (Tranter 2009). Because the final coda is not perceived by the adapter, it is deleted ([g] → Ø). The other loanword [dʒit.ta:.bag.gɯ] is a form borrowed through written materials. Previous research suggests that Japanese loanwords are usually borrowed through written materials, not spoken English (Lovins 1975, Miura 1993). Loanwords of this type are easily affected by orthography. When the spelling is provided for *jitterbug*, the adapter knows the existence of the coda [g]. However, only a nasal moraic phoneme /ɴ/ or geminate consonant /Q/ is allowed in the final consonant position of a Japanese CVC syllable (Tanno, 2004). Therefore, the coda [g] needs to be repaired by inserting a vowel (Ø → [ɯ]).

While some examples show the influence of orthography during phonological borrowing, there are cases of adaptation that heavily rely on orthographic borrowing as a more systematic process. Loanword adaptation through orthography can happen among languages with the same,

partly overlapping, or different writing systems. Examining how the English orthography influences the adaptation of English loanwords in Modern Chinese, Dong (2012) presents different examples of the loanword adaption process that are worth consideration in terms of orthographic input influence. Adaptation between English and French is an instance of sharing the same writing system. Adaptation between Chinese and Japanese is an instance of partly overlapping writing systems. Adaptation between English and Chinese is an instance of different writing systems. The adaptation methods can also differ considerably among these cases.

With respect to adaptation between languages with a similar writing system, adapters will often adopt the written form directly into their native language without any orthographic modification. For example, French *restaurant* [ʀɛstɔʀɑ̃] is adapted into English as *restaurant* [res.tər.ənt]. The spelling of the French word *restaurant* remains the same in English, whereas the pronunciation has been changed. The main stress is on the last syllable in French, but in English, the first syllable has the main stress (Dong 2012: 34). Besides a change on the main stress, the nasal vowel [ɑ̃] in French is reflected as a vowel plus a nasal consonant in English, and the final [t] is pronounced in English unlike in French to reflect the spelling.

Focusing on the regularity and predictability of East Asian character-based loans, Tranter (2009) examines the characteristics of these graphic loans. Tranter distinguishes graphic loans from orthographic influence in the phonological process in that with graphic loans there is no direct phonological input. Following contact with the West and modern Western concepts, there was a deliberate policy beginning in the Meiji era (1868-1962) to translate Western terminology and concepts in various fields (science, philosophy, political science, literature, etc.) into Japanese. As a result, a large number of new lexical items were created by the Japanese, and adapted to Chinese and Korean in the form of graphic loans. The process of creation and

transmission can be summarized in somewhat oversimplified form as the following: first, Japanese speakers created words for Western concepts through novel combinations of Sino-Japanese morphemes written with Chinese characters; second, these words were transmitted to China and Korea by students or scholars studying in Japan. The new character combinations were directly imported to each country, and the words were pronounced using the ordinary Chinese or Korean pronunciations of the written characters. For example, the Japanese coined the word *kagaku* 科學 as an equivalent of English *science* by combining the Sino-Japanese morphemes *ka* 科 'category, section' and *gaku* 學 'study, -ology'. The word was borrowed into Chinese and Korean in the written form 科學. In Mandarin Chinese this was pronounced *kēxué* and in Korean *kwahak*. The result is that the Japanese, Chinese, and Korean words have the same meaning but very distinct pronunciations. It is only because they share the same writing system with a regular pronunciation for each character that this kind of graphic borrowing phenomenon can occur. Furthermore, regular pronunciations of each character exists in Chinese, Japanese, and Korean based on systematic borrowing of Chinese characters on a significant scale and accompanying phonological system, which established 'pre-existing reading rules' (Tranter 2009).

This modern phenomenon of graphic borrowing in East Asian countries is related to the phenomenon of linguistic borrowing in the Middle Chinese period. It is important to examine the adaptation process of this period. The historical circumstances provide evidence that this earlier borrowing was through the medium of orthography in significant part.

The term Sinoxenic (SX) was created by Samuel Martin to refer to the systems of pronouncing Chinese characters in Japan, Korea and Vietnam (Norman 1988: 34), under the Chinese cultural sphere of a long history. The systems are named Sino-Japanese, Sino-Korean,

and Sino-Vietnamese, respectively. Defining the systems as a special class of borrowed language forms from Chinese into non-Chinese languages, Miyake (2003: 99) uses scale and consistent accuracy as two characteristics of Sinoxenic. Along with importing Chinese culture and civilization, Chinese characters were adopted to Korean, Japanese, and Vietnamese, which lacked their own writing systems. The tradition of reading classical Chinese texts in Japan, Korea and Vietnam allowed nearly the entire Chinese lexicon to be imported through the medium of orthography. Furthermore, SX borrowings consistently correspond with phonological features of Middle Chinese as a result of conscious attempts to imitate the Chinese sources as much as possible. Instead of sporadic borrowings of a few words using acoustic input, the borrowing of a systematically organized body of characters and their pronunciation as found in various imported texts can explain the two characteristics of Sinoxenic mentioned above [42]. For example, the Japanese emissaries who came to Chang'an in the early seventh century continued to be sent to China until the late ninth century when the Japanese court cut ties with Tang. The Chinese readings adopted by them were the main source of Sino-Japanese readings of different periods. In most cases, this borrowing was through the medium of orthography by means of classical Chinese texts and classical Chinese translations of Buddhist texts, which became the basis of elite literature in the neighboring countries. After going through phonological adaptation to each language at the time of borrowing and subsequent sound changes, these countries established their reading tradition based on Chinese pronunciation of different time periods and various dialects. The whole MC phonological system was borrowed during the borrowing process, and each Chinese character was indicated with its MC phonological features in the MC

[42] As Miyake points out, borrowing of the entire body of Chinese characters is seen more evidently in Sino-Japanese. Each Chinese character preserves both readings of EMC-based (Go-on) and LMC–based (Kan-on) stratum along with readings from other layers of borrowing.

sources. As a result, any Chinese character, based on the character's MC phonological features and the phonological system of Sino-Japanese, Sino-Korean, and Sino-Vietnamese, could at any time be assigned a proper pronunciation in each language, regardless of whether that character had ever actually historically been introduced to these languages.[43] If an educated Korean in the 14th century wanted to know a proper pronunciation of a relatively obscure Chinese character 蠹 LMC *tuǎ*, he could look it up in various reference works. which would indicate that its pronunciation had an initial consonant identical to 當 (LMC *taŋ*, SK [taŋ] 당), and a final identical to 故 (LMC *kuǎ*, SK [ko] 고). Since the SK pronunciations of 當 and 故 are known, the scholar could simply combine their pronunciations to arrive at a "correct" SK reading of 蠹, which is [to] 도.

Analysis of Sino-Korean data needs to be based on understanding its historical background with consideration to both orthographic and acoustic inputs. These topics will be discussed in detail in the following section to which now I turn.

5.3 The Role of Orthographic Input and Acoustic Input in Sino-Korean

As I have noted above, previous studies of loanword phonology suggest that loanword adaptation can be analyzed thoroughly only in examination from various perspectives including the phonetic approach (Peperkamp and Dupoux 2003, Vendelin and Peperkamp 2004, Peperkamp 2005, Peperkamp et al. 2008), the phonological approach (LaCharité and Paradis 2005), and a metalinguistic approach such as orthography (Smith 2005). As Tae Eun Kim (2013) points out, the question of why an identical phoneme in a source language is adapted as different phonemes in a borrowing language can be explained by looking at the interaction between

[43] Miller (1967) named this phenomenon as a "principle of total availability."

language-specific perception and the role of phonological features in the borrowing language that are reflected in loanwords. Furthermore, the sociolinguistic setting is important: borrowing at different chronological stages by borrowers of different levels of bilingualism also needs be taken into consideration. We can attempt to apply these methodologies to explain the aspiration mismatch in SK. Some characters with an MC /p^h/ initial are pronounced with SK /p^h/ initial, while other characters with an MC /p^h/ initial are pronounced with SK /p/ initial.

The table below reproduces part of Table 1.2 in Chapter 1. Based on Itō's (2007) data, it shows that different MC phonemes /p^h/ and /p/ were adapted as the same phoneme in SK[44]:

Place of articulation in MC	Aspiration/ voicing features in MC	SK percentage of irregular readings
Labials	-asp	23.9% +asp (60/251)
	+asp	43.2% -asp (29/67)
	voiced	30.1% +asp (73/242)

<Table 5.3 Ratio of irregular SK readings with labials>

This irregularity could be explained by examining how the Chinese inputs were perceived by Korean borrowers during the adaptation process. Cross-linguistically, there are many cases where two contrastive categories in the source language become assimilated to the same phonological or phonetic category in the borrowing language. For example, Korean speakers perceive English sounds /r/ and /l/ as /l~ɾ/, which is phonetically closest to the sounds in English. Native and non-native listeners also may use different phonetic cues in the perception of contrastive sounds. Citing Flege and Hillenbrand (1986), Cho and McQueen (2006) contrast how native and non-native Swedish and Finnish English listeners use different phonetic cues to identify English /s/ and /z/. While English speakers used fricative duration and preceding vowel

[44] Chapter 1 shows a complete table including phonemes of other places of articulation.

duration, Swedish and Finnish speakers, who do not have a phonemically contrastive /s/-/z/ pair in their language, used only vowel length differences. This is done by reinterpreting the role of phonologically contrastive vowel duration in their native language as a cue to the voicing contrast in listening for non-native phonemes (Flege and Hillenbrand 1986).

One of the hypotheses regarding aspiration feature in Korean claims that aspirated initials were not yet fully developed in Korean during the time of adopting Chinese characters.[45] According to K. Lee and Ramsey (2011), although a few initial aspirates are believed to have existed in Old Korean, they were rare and perhaps not fully phonologized, and the series as a whole is believed to be a secondary, historical development in the phonological system. Even in Late Middle Korean, aspirated consonants occur far less often than unaspirated consonants. If that were true, under the circumstance where aspiration was not phonemic and was ignored during adaptation, adaptation results could have varied depending on the phonological or phonetic feature of both source and borrowing languages.

Consider how modern Korean words are borrowed into Japanese, which has ramifications for our understanding of the origin of the mismatch between MC and SK initials and suggests the partial existence of aspiration in Korean at the time Chinese characters are adopted there. Modern Korean has an aspiration distinction, but does not have a voicing distinction. Modern Japanese has a voicing distinction, but does not have an aspiration distinction. How Korean consonants are adopted in Japanese can be explained by the phonetic approach. When Japanese borrows Korean loanwords, both aspirated and unaspirated stops in Korean are adapted as unaspirated voiceless stops in Japanese. Only when unaspirated stops occur between two voiced phones and are allophonically voiced, are they adapted as voiced stops in Japanese, as shown

[45] See chapter 2 for the detailed discussion regarding existence of aspirated consonants in Old Korean.

below:[46]

Korean phonetic value of bolded segment		Korean source word	Korean loanword in Japanese	English gloss
+asp	/p^h/	***p'***yŏngyang 평양	**p**yonyan	'Pyongyang'
	/t^h/	***t'***aekwŏndo 태권도	**t**ekondoo[47]	'taekwondo'
-asp	/p/ → [p]	***p***ap 밥	**p**apu	'rice, meal'
	/t/ → [t]	***t***aegu 대구	**t**egu	'Daegu'
	/k/ → [k]	***k***imch'i 김치	**k**imuči	'pickled cabbage'
voiced	/k/ → [g]	han'***g***ŭl 한글	ha**ng**uru	'Korean alphabet, language'
	/p/ → [b]	kal***b***i 갈비	karu**b**i	'thinly sliced rib meat'

<Table 5.4 Korean loanwords in Japanese (Irwin 2011)>

The correspondence between MC and SK, however, does not display a consistent pattern like the correspondence between Korean and Japanese shows. This fact supports the hypothesis that aspirated consonants were still being developed in OK. If there were no aspirated consonants at all, or if aspirated consonants existed as a distinct phoneme in OK, we could expect that the correspondence between MC and SK would be more consistent.

Another hypothesis (K. Lee 1987, I. Lee and Ramsey 2000), different from that offered by K. Lee and Ramsey, is that both MC and OK distinguished aspirated and unaspirated

[46] The examples of Korean loanwords in Japanese are adopted from Irwin (2011: 67, 84).
[47] Because the Korean tensing keeps the /g/ from voicing to [g] medially, it instead is realized as [k̬] which is borrowed regularly into Japanese as /k/.

consonants as fully developed phonemes. Then, to explain the aspiration mismatch in SK, we could propose that the MC and Korean aspiration features might have been differently perceived by Korean speakers. There is no record that can offer the precise phonetic value of the aspirated phonemes such as voice onset time (VOT) in Chinese and Korean before modern times.[48] We cannot assume that phonemes of a pre-modern language and its descendant language, a modern language, have the same or similar VOT values. However, the data from contemporary languages and second language acquisition is suggestive. For example, in a classroom of English-speaking learners of Korean language, students experience difficulty in distinguishing Korean aspirated and lax initials in word-initial position. By comparing the phonetic difference in aspiration features in both English and Korean, we can understand what causes the students' difficulty with this Korean distinction. Modern Korean lax consonants are slightly aspirated in initial position (K. Lee and Ramsey 2011: 293). The VOT of Korean lax stops is clearly longer than that of the English unaspirated stops. The VOT of Korean aspirated stops is also longer than that of the English aspirated stops. The gap varies depending on the place of articulation. For example, the VOT of the English aspirated labial stop, with the shortest VOT among aspirates from three places of articulation, is almost the same as that of the Korean lax labial stop, as shown in Table 5.5 below. Therefore, an English speaker can easily perceive a lax labial stop in Korean as an aspirated labial stop. When English speakers hear the Korean word /pata/ 바다 'ocean,' the initial /p/ with 55 msec VOT might be perceived as similar to English /p/ with 58 msec VOT. They will easily interpret the word as equivalent to the English sound sequence [p^{h}ada] with an aspirated initial. Given the larger VOT gap between the confusable sounds in the two languages, the possibility of confusion is not expected to be as great at other places of

[48] Aspirated consonants are distinguished from unaspirated consonants by having a distinctively longer VOT after release of the consonant.

articulation.

Korean			English	
Tense stops	Lax stops	Aspirated stops	Unaspirated	Aspirated
p* 19 (7.9)	p 55 (21.8)	p^h 82(23.0)	b 1/-101	p [p^h] 58
t* 16 (7.5)	t 51 (18.1)	t^h 78 (26.2)	d 5/-102	t [t^h] 70
k* 33(11.3)	k 63 (20.2)	k^h 81(14.5)	g 21/-88	k [k^h] 80
F(2,6)=62.89, p<.01				

<Table 5.5 Mean VOT values of Korean stops (ms) (N=24) (Standard deviation in parentheses) and English> [49]

English speakers' difficulty to discern the difference between the two phonemes in Korean can also be attributed to the difference of phonological categories between Korean and English. While the aspirated and unaspirated stops belong to separate phonemes in Korean, unaspirated stops in English are allophones of aspirated stops. Although [p^h] and [p] both exist in English as allophones, because English speakers do not distinguish them as separate phonemes, it is difficult for them to perceive Korean aspirated and unaspirated stops as different sounds.

The data set below is another example showing cross-language variation in how phonetic categories are divided up.

[49] The data provided on the left side and the right side are from Shimizu (2011) and Lisker et al. (1964) respectively. See Lisker et al. (1964) to understand the significance of two sets of values for /b d g/ on the table of the right side.

English				Spanish			
b	1/-101	p	58	b	-138	p	4
d	5/-102	t	70	d	-110	t	9
g	21/-88	k	80	g	-108	k	29

<Table 5.6 Voice Onset Time in Msec: English and Spanish>[50]

Elman et al. 1977 explain that the language of the experimental setting influences bilinguals' perception of isolated syllables. Their experiment shows that Spanish/ English bilingual subjects tend to perceive bilabial stop and vowel sequences with various VOTs as /ba/ in an English language experimental setting and as /pa/ in a Spanish language experimental setting. Elman et al. hypothesize that the difference in the location of the phoneme boundary between /b/ and /p/ is the cause. English speakers and Spanish speakers tend to place the phoneme boundary at a different VOT value, at +25 msec VOT and between +14 to -4 msec VOT respectively. Elman et al. claim that due to this discrepancy, bilinguals tend to set the discriminatory threshold at its English level when speaking English, which leads them to perceive a labial consonant with VOT between 4 and 58 as /b/. When speaking Spanish, they set the threshold at its Spanish level and perceive the same input as /p/. It was Korean/Chinese bilinguals who first borrowed Chinese characters and SK readings. If an aspirated/unaspirated distinction existed in both OK and MC, the result seen from Elman et al.'s experiment could also explain the aspiration mismatch between OK and MC.

The precise phonetic value of the aspirated phonemes in OK and MC is not known. The phonemes of a pre-modern language and its descendant language, a modern language, do not necessarily have the same or similar VOT values. However, the data from the contemporary

[50] The data provided in Table 5.6 are from Lisker et al. (1964).

languages are worth investigating, as they could indicate the possibility that aspiration feature might have been differently perceived in MC and SK. If, for example, MC had a small difference in VOT between the aspirated and unaspirated categories while OK had a large difference, it might explain why OK speakers sometimes perceived MC unaspirated as aspirated and MC aspirated as unaspirated. Below are the modern VOT values of Mandarin Chinese and Korean.[51]

Chinese		Korean[52]	
Unaspirated	Aspirated	Lax	Aspirated
p 11 (4.7)	p^h 83 (15.4)	p 55 (21.8)	p^h 82 (15.4)
t 17 (8.8)	t^h 88 (20.0)	t 51 (18.1)	t^h 78 (20.0)
k 19 (3.6)	k^h 80 (16.5)	k 63 (20.2)	k^h 81 (16.5)

<Table 5.7 Mean VOT values of Chinese Stops (N=12) and Korean (N=24) (Standard deviation in parenthesis)>[53]

Aspirated consonants of both Mandarin and Korean are similarly highly aspirated. The difference between Mandarin and Korean is shown in the short VOT of Mandarin unaspirated consonants. The Korean entries in the table show that the difference in VOT between the lax and aspirated categories is smaller than in Chinese because even the lax ones in Korean have significant VOT lag. Thus it is unlikely that MC and OK had the same VOT values as this table presents if we believe that VOT differentials were responsible for the fact that 32.9% of MC

[51] Since the Wu dialect preserves the three-way distinction in its consonant system like Middle Chinese, it might be instructive to to use the VOT data of Wu dialect such as Shanghainese. I use the Mandarin data due to unavailability of the Wu data.
[52] The data provided in Table 5.7 are from Shimizu (2011).
[53] The VOT of tense obstruents in Korean is not mentioned here, because Korean tense consonants did not exist in the early MC period and so were not a factor in SK formation. Tense stops developed later in Korean, mostly through the reduction of consonant clusters.

unaspirated consonants were adopted as aspirated in SK. However, we lack any concrete evidence for this scenario.

The comparison of the phonetic and phonological gap between various source languages and borrowing languages and their loan patterns explains how VOT differences in the target and the source languages may end up in mismatch situations. This does not necessarily support either the hypothesis that OK distinguished aspirated and unaspirated consonants as fully developed phonemes or the hypothesis that aspirated initials existed, but were not yet fully developed. However, the hypothesis supporting the existence of OK aspiration feature is more robust than the hypothesis supporting nonexistence of OK aspiration feature, as I have already shown in discussing the historical documents in Chapter 2.

Considering that we have very little data on the precise sound values of pre-modern languages, knowledge regarding the socio-linguistic environment when loanwords are imported can provide supplementary explanation about these languages. BL speakers adapt loanwords with some degree of exposure to SL. The amount of exposure to SL varies widely depending on the relevant knowledge of the BL speakers. Auditory perception, orthography, and explicit knowledge of SL grammar such as phonology and morphology are the sources of this knowledge. The amount of exposure also enhances the BL speaker's knowledge about the SL. The output, which is the borrowing language representation of the loanword form, is determined by the amount of exposure and the BL speaker's degree of knowledge about the SL form. For example, Korean has two loanwords 남포 *nampho* (with initial /n/) and 램프 *laymphu* (with initial /l/) both meaning 'lamp.' 남포 *nampho* was borrowed in the early 20th C from Japanese

raNpu, which was in turn borrowed from the Dutch word for 'lamp.'[54] /n/ was placed as an initial, because the liquid /l/, which is the closest equivalent to Japanese /r/, is not permitted at the beginning of native Korean words. In initial position, /l/ is deleted before /i/ and /j/, and is pronounced /n/ otherwise.[55] This is also applicable to Sino-Korean vocabulary. Chinese characters with MC /l/ such as 老 *lǎo* 'old' are pronounced with /n/ initial as in the Korean word 老人 노인 *noin*.[56] However, due to the influence of Western loanwords over the course of the 20th century, Korean speakers have had more opportunity to be exposed to foreign words with /l/ initial. These opportunities encouraged Korean speakers to apply different reading rules to newly borrowed loanwords. This enhanced knowledge of SL grammar led to a change in BL pronunciations. In modern Korean, word-initial /l/, which is mostly found in English loanwords, is pronounced in free variation as either [ɾ] or [l]. Therefore, 남포 *nampho*, a Japanese loanword from the earlier stage, has been replaced by 램프 *laymphu*, a direct English loanword with /l/ initial.

I apply this concept to the context of borrowing SK readings, where some irregular features in SK readings can be explained by different degree of exposure to Chinese language among Korean speakers. Monks who preached Chinese Buddhist texts during the Three Kingdoms period (57-668)[57] were a significant group who traveled to China for study.[58]

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[54] The first written attestation of *raNpu* with a Dutch source 'lamp' is from 1831 (Irwin 2011:41). However, it is often difficult to determine which language is the source, since there are many words with a lexical similarity among Dutch, German, and English, all donor languages of loanwords in Japanese.

[55] This phenomenon of prohibiting /l/ in the word-initial position is called the 'initial law' 두음법칙 *twuum pepchik* in Korean phonology.

[56] Word-initial /l/ is retained in North Korea. For example, 歷史 'history' is pronounced as 력사 *lyeksa* in North Korea, while it is pronounced as 역사 *yeksa* in South Korea.

[57] See Chapter 1 for outline of the history of Korea and names of the kingdoms.

[58] This phenomenon is known as "study in the West 西學." (Ki-baik Lee 1984: 61.)

Presumably, they had originally learned Chinese reading directly from the Chinese source. Buddhism was transmitted to the Three Kingdoms between 4 C and 6 C. In Kokwulye, King Soswulim adopted Buddhism and established a National Confucian Academy 太學 *Thayhak* in 372. Buddhism was adopted by Paykcey in 384 during the reign of King Chimlyu and became the new value system of the state. Sinla adopted Buddhism last among the Three Kingdoms during King Pephung's reign sometime between 527 and 535.[59] Tales of several monks of the Three Kingdoms are contained in *Lives of Eminent Korean Monks* 海東高僧傳.[60] Many of them are said to have studied in China. According to the record, the Kokwulye royal house sent the monk Uyyen 義淵 to the Former Qǐ to find an answer to several questions regarding the origin and development of Buddhism. It is known that Uyyen received the answer orally from the Former Qǐ monk Fǎshàng 法上 of the Dìngguó monastery 定國寺. In Sinla, the monk Kaktek 覺德 returned from Liang dynasty after studying Buddhism in 549. He returned to Sinla with an emissary sent by the Liáng court who brought a Buddhist relic (McBride 2008). Another Sinla monk Wenkang 圓光 is known to have traveled to Chén in 590. He mastered the essence of the **Tattvasiddhi* 成實, the *Nirvanā* 涅槃, and several treatises from the *Tripitaka* 三藏.

Due to exposure to the original Chinese reading from Chinese native speakers and consistent reading practice, these monks and Korean scholars who studied Confucian texts could have acquired some Chinese linguistic features that did not exist in Korean phonology as a distinct phoneme, and made use of these features in Sino-Korean readings. Irregular readings in terms of the aspiration feature, the main subject of the current study, could be one example of

[59] For details , see Ki-baik Lee, 1984. *New History of Korea*. Cambridge: Harvard University Press.

[60] *Lives of Eminent Korean Monks* 海東高僧傳 was compiled in 1215 by Kakhwun 覺訓, abbot of Yengthong Buddhist monastery in Kolye. I use P. Lee (1969) for its translation.

this phenomenon. We can speculate that Korean speakers who learned SK readings from their teachers, who introduced the readings directly from China, could not articulate the aspirated consonants that rarely existed in native Korean phonology. At first, they may have used an unaspirated consonant to substitute for the original aspirated consonant. But just as modern Korean speakers became more familiar with word-initial /l/ and adapted 램프 *laymphu* instead of the earlier loanword 남포 *nampho*, it is possible that aspirated consonants became more widespread among Korean speakers over time[61]. Therefore, different adjustment of aspirated feature in Sino-Korean can be discussed in terms of the degree of adaptation and the amount of exposure.

The process of language adaptation from the beginning stage of borrowing to the later stage, and the medium of the borrowing process also need to be discussed as part of the socio-linguistic environment. SK readings have been borrowed through different stages in Korean history since the establishment of the Han commanderies in northern Korean Peninsula in early 2nd century BC. Although the borrowing relied on the Chinese orthographic system, the types of inputs might have been either orthographic or acoustic. Between Korea and China, language contact through acoustic input may have occurred before the stage of borrowing Chinese characters. Oh (2005) examines 154 examples of Middle Korean vernacular forms and compares them with OC reconstruction to propose an earlier Sino-Korean layer. For example, 風 *fēng* (OC *pjəm, SK p^{h}uŋ) 'wind' is compared with Middle Korean *polom* 'wind.' In contrast with the Chinese loanwords borrowed in an earlier period, more systematic adoption of the Chinese lexicon during the MC period is considered to rely on heavy lexical borrowing through the

[61] Chang (1981) hypothesizes that the development of the aspiration in Korean was affected by adoption of Chinese characters on a large scale, and explains that the aspiration contrast was developed in an asymmetrical manner due to a gradual phonemicization process introduced by loanwords from Chinese.

medium of the orthographic system.

Since first contact with Chinese, the Korean upper class was the main population adopting and learning the Chinese writing system in Korea. Because Korea borrowed Chinese characters before a native Korean writing system was established, Korean intellectuals greatly relied on Chinese characters. Considering that this group was highly literate, we can assume that there was a huge influence of orthography in Sino-Korean reading. During the borrowing process of large number of Chinese characters with accompanying readings based on the acoustic input, orthographic interference on pronunciation could have occurred based on phonetic elements in the Chinese characters. This situation caused sporadic and unpredictable irregular readings. Analogy of characters' phonetic component has been used as a main factor that determines an initial of irregular readings in Sino-Korean. Characters 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑵 'jade' are read as *to* in SK. Since these characters have MC /t^h/, their SK reading [to] is considered as an irregular reading. Itō explains that these readings are influenced by 蹈 'tread' and 稻 'rice' with MC /d/. These characters all share the phonetic component 舀, which appears on the right side of each characters. As discussed in Chapter 3, frequency effect plays a role in how analogy causes irregular reading. 滔 'flood,' 韜 'cover,' 慆 'negligent,' and 瑵 'jade' are less frequently used, whereas 稻 'rice' is listed as one of the most frequently used characters. Therefore, 稻 'rice' could have influenced the readings of other characters. A set of characters whose irregular readings are explained by analogy in Chapter 3 demonstrates that the more frequent character's usage the more regular its reading. In Chapter 3, irregular readings of around 20% of characters were explained in terms of analogy.

There is, however, a hypothesis that would suggest that higher-frequency characters would have a greater chance of irregularity and lower-frequency characters would have a lesser

chance of regularity. The Chinese characters that appeared in various Confucian or Buddhist texts most likely were introduced to Koreans through orally transmitted pronunciations. When Korean students learned Chinese texts from their Chinese teachers, it would be presumably through a method of recitation. Chinese teachers may have recited each sentence in a standard pronunciation, or possibly a pronunciation of the teachers' dialects, followed by lecturing the meaning of the sentence. Therefore, until *Hankul* was invented and used to record SK pronunciation of Chinese characters in various dictionaries and annotations, the process of transmission of SK pronunciation mostly had to rely on teachers' recitation and students' memorization. Due to the oral transmission, the pronunciation of characters appearing in the texts with higher frequency could have remained in a state received based on these orally transmitted readings. On the other hand, characters that did not appear or rarely appeared on the text might have been assigned with their SK pronunciation with a different pattern. Koreans adapted not only the pronunciation of individual characters, but also the MC phonological systems which the character pronunciations were embedded. As discussed above in section 5.2, the characters without available acoustic input could have established their SK pronunciations based on reference works giving their standard MC pronunciation. If so, their SK readings would more likely match the Chinese source and have less chance of having an irregular reading. This hypothesis can be applied to some characters with one or a low number as their occurrence in section 3.4.1. For example, 譬 'exemplify' with MC /p^h/ and 臂 'arm' with MC /p/ are both read as [pi] in SK. 譬 [pi] occurs 29 times in the SK data and its SK reading is an irregular reading, while 臂 [pi] occurs only once and its SK reading is regular. This hypothesis proposed here can explain that the SK reading of 譬 [pi], which occurred more frequently, is based on an available acoustic input, which could be a Chinese pronunciation other than standard one. And the SK

reading of 臂 [pi], which occurred only once, is based on reference works giving their standard MC pronunciation. A potential problem of this explanation is that we still need to account for the acoustic input of 譬 [pi] with an unaspirated initial. Although this hypothesis does not explain many cases of irregular SK readings, it is worth examining the adaptation of SK readings through different borrowing mechanisms.

5.4 Conclusion

In Chapter 5, I examined the role of loanword phonology and the various mechanisms by which loanwords are adapted to the local phonology or by which they modify local phonology. Phonological, phonetic, and metalinguistic approaches offer a more cohesive account for the loanword adaptation analysis.

Several sets of modern language data provided in this chapter account for how Korean speakers might have perceived an aspiration feature in MC, which subsequently resulted in the creation of irregular SK readings. An aspiration feature was still being developed in OK. Therefore, OK speakers were probably not able to adopt the distinction between aspirated and unaspirated initials in MC precisely, and the differences in the phonetic nature of Chinese and Korean aspiration led to category mismatches in borrowing.

As a metalinguistic factor, difference of input types was discussed. In order to account for SK readings systematically, I argued that orthographic influence should be considered in conjunction with acoustic input. Adoption occurred at a large scale with simultaneous borrowing of the whole MC phonological system, but not all of the characters are borrowed through an identical borrowing mechanism. A large number of characters were introduced to Koreans with their MC pronunciations as a form of acoustic input. If certain characters were introduced only

with a textual device as a form of orthographic input, there are two kinds of text-based input. One is explicit textual information about pronunciation from Chinese lexicographic or annotational sources: *fǎnqiè* spellings, rhyme book and rhyme table positioning, etc. The characters' MC phonological feature found in these MC sources would have assigned a proper pronunciation. The other is the orthographic form of the character itself: its phonetic element and its relationship with other characters in the same phonetic series. This type of orthographic form contributed to analogy of the characters' phonetic component, one of the main factors that determined an initial of SK reading and caused irregularity.

Taking all this into account, and building on the conclusions of earlier chapters, I proposed two hypotheses regarding frequency of character usage and chance of irregularity. The first hypothesis is that lower-frequency characters would have a greater chance of irregularity, because they rely on the more frequently used characters with the same phonetic component. In the second hypothesis, SK readings of the characters with low frequency would more likely match the Chinese source and have less chance of having an irregular reading.

6. Social Influence: Education Traditions in Korea

In the previous chapters, Sino-Korean (SK) irregular readings were discussed in terms of analogy of the characters' phonetic components, syllabic inclination and hyperforeignization, and loanword phonology theories. This chapter will examine another social factor that created SK irregular readings: traditional education environments in Korea. Section 5.3 discussed how monks who preached Chinese Buddhist texts and Korean scholars who studied Confucian texts adopted Chinese characters and readings through transmission of Buddhism and introduction of Confucianism during the Three Kingdoms period (57-668). Exposed to the original Chinese pronunciation from Chinese native speakers and consistent reading practice, it is possible that these monks and Korean scholars acquired some Chinese linguistic features, and established SK readings. The focus of this chapter is to explore how Chinese characters were taught and learned in Korea among Korean teachers and students. There is a shortage of both primary sources and related studies that elaborate how SK readings were introduced to the Korean peninsula and handed down to each following period. Most materials available for our review in this chapter were written in the Cosen dynasty.

6.1 Emphasis in Learning Sino-Korean Readings in Korea

Learning Chinese characters involves learning three components: the shape *xíng* 形, sound *shēng* 聲, and meaning *yì* 義 of each character. Literary tradition and the method of teaching Chinese characters have been discussed with an emphasis on the shape and meaning of a character in Korea (Wangkyu Kim 1999, P. Kim 2010). In reading Confucian Classics, which was one of the significant materials to practice reading Chinese characters, teaching moral lessons in Confucianism was the main emphasis. The teachings embodied in the Classics provide

advice that could be applied to various situations in daily life. As we will see below, historical materials suggest that most cases of exposition of Confucian Classics mainly delivered these moral lessons. The lack of discussion in pronunciation of characters indirectly provides evidence for the phenomenon that being strict to the original reading of Chinese characters was not the main concern to Korean learners and their teachers.

6.2 Learning Sino-Korean Reading in the Cosen Dynasty

There are a few studies that describe the reading methods employed in the Cosen dynasty (Wangkyu Kim 1999, P. Kim 2010). These studies examine different subjects of teaching including children and scholars. *Chencamwun* 千字文, *Yuhap* 類合, *Hwunmong cahoy* (*Hwunmong*) 訓蒙字會, and *Sincungyuhap* (*Sincung*) 新增類合 were commonly used texts for teaching the sound and meaning of Chinese characters to children and introduce them to reading texts written in Chinese characters. Based on the knowledge they learned from these introductory materials, children were able to develop reading skills to learn more advanced materials that teach how to cultivate their moral virtues. These next level materials include the First Reader 童蒙先習, *Kyekmongyokyel* 擊蒙要訣, and the Precious Mirror of the Pure Heart 明心寶鑑 . Upon mastering these basic materials, students were encouraged to read the Lesser Learning 小學, Epitome of Eighteen Histories 十八史略, and Universal Mirror 通鑑, followed by the Confucian Four Books and Three Classics 四書三經 (the Greater Learning 大學, the Analects 論語, the Mencius 孟子, the Doctrine of the Mean 中庸, the Poetry Classic 詩傳, the Book of Documents 書傳, and finally the Book of Changes 周易) (Wangkyu Kim 1999).

When the materials such as *Hwunmong* and *Sincung* were compiled to teach Chinese characters, the compilers' motivation to develop these new materials was not to correct the pronunciation of characters. In the preface of *Hwunmong* (1527), the compiler Choy Seycin explains that children need to learn *Chencamun* and *Yuhap* before reading any other books. However, *Chencamwun* only lists characters, and *Yuhap* does not have enough substantive words to name concrete objects. Therefore, Choy recommended that children learn these two materials, but supplemented them by compiling *Hwunmong*, that introduces names of real objects to children. In the preface of *Sincung* (1576), Yu Huychwun explains that he compiled *Sincung* to supplement *Yuhap*, since *Yuhap* lacks many important characters. *Sincung* lists 3,000 characters, while *Yuhap* only has 1,512 characters.

An examination of the contents and structure of these materials' main texts clearly reveals that correct pronunciation was not emphasized in the teaching/learning process. Students must have known the pronunciation of characters to recite texts. However, the emphasis was on learning the content. As seen in Chapter 3, semantic and phonetic components function as sound and meaning cues in learning Chinese characters. Incorrect assumptions of semantic information would not have led to mistakes on the meaning of characters, because the teaching process emphasized meaning. On the contrary, pronouncing characters in an incorrect way does not affect understanding materials. Therefore, when learners adapt a wrong pronunciation due to the influence of a phonetic component, this mistake would be less noticeable. This particular learning environment probably contributed to irregular readings.

To understand how scholars were taught to read the Confucian Classics in the Cosen dynasty, let us take a look at I Tekmwu 李德懋 (1741-1793)'s essay, describing four instructions to follow when studying the Classics: "First, one should be familiar with reciting the Classics.

Second, one should take various theories [explaining the text] into consideration, clarify similarities and differences [of different theories], and compare merits and demerits among them. Third, one should think thoroughly to solve doubtful points. One should not be overly confident [in one's own interpretation]. Fourth, one should clearly make a distinction [between right and wrong] to get rid of wrong. One should not simply regard oneself right. As for the Classics, if one can find a door [to them] and enter, other books all have the same room with different doors. Therefore, we can understand them by analogy."[62] I Tekmwu also highlighted the aspect of reciting texts. However, the main focus in reciting texts lies in the proper voice and manner, not the precise pronunciation. In the same essay, I says: "As for sound of reading books, it should be soft, but not weak. It should be clear, but urgent. Reading should not be repeated, should not come to a pause. One's voice should not be too loud, should not falter…"[63] Describing the reading method of his master Toykyey 退溪, Kim Sengil 金誠一 (1538-93) wrote "When reading books, the master sat up square and read in a sonorous voice. He searched for the meaning of each character, and studied the meaning of each phrase. He has never read in a half-hearted way or thoughtlessly. Dealing with errors, he did not overlook anything as small as one character or one stroke. Mistakes such as writing 魚 for 魯, 豕 for 亥, he definitely distinguished."[64] Kim also points out the importance of acquiring a correct meaning of characters.

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[62] This essay, Integrity of Scholars, *sasocel* 士小節 is found in *Kyucang cenwun* 圭章全韻. My translation is based on the following original text: "一曰熟誦經文也. 二曰盡參眾說. 而別其同異. 較其長短也. 三曰精思以釋所疑. 而猶未敢自信也. 四曰明辨以去所非. 而猶未敢自是也. 能於一經上. 得其門而入. 則諸書皆同室. 而異戶者. 可以類推而通." I Tekmwu wrote this essay as a guide to encourage Confucius scholars to preserve their high principle in various aspects of their life including language, learning, clothing, etc.

[63] The following is the original text in *Kyucang cenwun* 圭章全韻: "讀書之聲溫而無濡. 清而無促. 勿復也. 勿絕也. 勿聒也. 勿吶也. 勿倒讀. 勿訛讀. 勿落字讀. 勿越行讀."

[64] This passage is from *Thoykyey sensayng enhaynglok* 退溪先生言行錄 in *Hakpong sokcip* 鶴峯續集 (vol.5) compiled by Kim. My translation is based on the following original text: "先生讀

I I 李珥 also emphasized moral lessons over learning each character in terms of its reading: “How does the significance of reading the Greater Learning lie in understanding its language? [The significance] lies in nothing but to want to experience it through one’s mind.”[65] I I asserts that one should read the Lesser Learning to embody the elaborated lesson and put it into practice in their daily life: “the Lesser Learning by Zhū Xī has the best code of conduct. It is the most appropriate to apply to daily life. Understanding the Greater Learning does not go beyond understanding the Lesser Learning.”[66]

6.3 Learning Sino-Korean readings in *setang* 書堂, the Old Fashioned Cottage School, in Rutt (1960)

Due to the lack of documentary evidence, it is difficult to learn how Chinese characters and character pronunciations were learned in a much earlier period. Rutt (1960), an Anglican missionary priest, provides useful information based on his observation of the old-fashioned cottage school where children learned the Classics by rote during the early 20th C. To the extent that the learning environment he observed upholds much older traditions, which seems likely, his descriptions can strengthen the argument that the pronunciation was not the main focus of learning Chinese characters.

書，正坐莊誦．字求其訓，句尋其義．未嘗以麤心大膽之．雖一字一畫之微，不為放過．魚魯豕亥之訛，必辨乃已."

[65] 李珥. *Yulkok cense* 栗谷全書 권 20, 성학집요 2: "又曰， 讀大學豈在看他言語，正欲驗之於心如何."

[66] 李珥. *Yulkok cense* 栗谷全書 권 20, 수기 修己: "朱子小學書，綱領甚好．最切於日用．雖至大學之成，亦不外是."

Rutt describes the old tradition of Chinese studies at the end of the Cosen dynasty.[67] There were various institutions during this period in Korea, but his main interest is the old-fashioned cottage school, *kulpang* or *setang* (書堂), where a country scholar began his learning of Chinese characters and literature. The educational method in *setang* was mainly to memorize the passage by rote. According to Rutt, children, mostly boys, "absorb Chinese rather than learn it." Recognizing the characters and understanding the meaning were the main goal for these students.

Rutt also describes the materials used in *setang*. The order of presented materials in the curriculum is almost the same as described in section 6.2, during mid-Cosen, further supporting the claim that the cottage school methods were quite conservative. A boy who began his formal schooling was exposed to learning Chinese characters through *Chencamwun* before studying *Yuhap* and *Hwunmong*. Based on the knowledge gained from these introductory materials, he proceeded to master a series of primers such as the Child's Guide to Knowledgen and the First Reader. The next step of learning went as follows:

> "His learning of grammar (文理) was then done through the memorization of the Universal Mirror or *Tonggam* (通鑑). The grammar was not taught analytically. As he read more and more the boy gradually came to understand the structure of the Chinese sentences. ...
>
> At the age of about thirteen he should have completed the study of the Lesser Learning (小學) and be ready to tackle the Classics. These were done in this order: the Greater Learning (大學), the Analects (論語), the Mencius (孟子), the Doctrine of the Mean (中庸), the Poetry Classic (詩傳), the Book of Documents (書傳), and finally the Book of Changes (周易). Towards the end of the course only the brighter boys would still be studying—the gentlemen's sons and those who were to become professional scholars. The senior students worked with the teacher on a seminar system, having discussion with him instead of merely learning by rote." (Rutt 1960: 28)

[67] Rutt's descriptions are from after the Cosen dynasty, but he claims that they probably are essentially unchanged from the end of the Cosen dynasty. He also explains that "I use the past tense, because although a large number of such schools are still in existence, in the district of which I am speaking they have been disappearing rapidly during the last few years. Two years ago there were more than there are now."

Rutt's explanation provides a more vivid image of the method of teaching Chinese characters in the Cosen dynasty. There is no knowing as to how pronunciation was taught in these cottage schools, but by observing the course materials and their educational method in *setang*, we can more or less safely assume that focusing on correct pronunciation was not part of the core curriculum. Pupils learned character readings by imitating their teacher, and historical documents do not discuss which reading tradition the teacher followed.

6.4 Conclusion

In this chapter, I have discussed how the adopted SK pronunciation had been handed down through the educational method to children and scholars. Acquiring the meaning of Chinese characters and moral values in the texts written in Chinese characters was the main focus of education. The education method of *setang* is consistent with the surmise that teaching SK pronunciation was not systematic.

The cultural and political exchange between Korea and China was thriving during the Cosen dynasty. Even for the purpose of communication with Chinese, knowing the SK pronunciation does not seem to have appeared useful, because the phonological system of contemporary Chinese had significantly diverged from Middle Chinese and Sino-Korean. It can be deduced then that the goal of teaching Chinese characters was improving interpretation and composition skills. Literary scholarship in the Cosen dynasty was regarded important for composing diplomatic documents and hosting Chinese envoys (*Thaycong sillok* 13: 14a-15b.). Therefore, maintaining credibility with the Chinese encouraged Korean scholars to sustain a literary tradition (Duncan 1994: 81), but retaining correct SK pronunciation might not have been considered one of the most significant goals. There is no specific material showing the norm and

different traditions of standard SK readings. It is most likely that students who imitated their teachers also had to rely on analogy of the phonetic element to pronounce a character, when they did not remember the correct pronunciation. In sum, placing more emphasis on the meaning rather than the sound of characters in Korea is another factor of irregular SK readings.

7. Conclusion

The topic of this study has been salient characteristics and significant factors related to irregularities in Sino-Korean (SK) readings in terms of aspiration feature. I have explored a number of factors contributing to irregular SK readings: phonological developments from Old Korean to Middle Korean, analogy of the phonetic components, the hypotheses of syllabic inclination and hyperforeignization, and loanword phonology theories including input types. I have also looked at social and cultural factors that have played a role in the creation and transmission of irregular readings.

Previous research on SK readings (Kōno 1968, Yi 1995, Itō 2007) has largely relied on a single explanatory mechanism, analogy of the phonetic components, to account for irregular SK readings. However, no pattern or explicit rule has been advanced to explain how analogy plays its role in influencing SK readings. Previous research lacks rigorous examination of which characters, as model characters, affect the readings of other characters that share the same phonetic component. Approximately 80% of Chinese characters in common use consist of a semantic component and a phonetic component, and experimental studies have shown that both adults and children are exposed to analogical influence when they read Chinese characters (Chen and Allport 1995, Ho and Bryant 1997, Shu et al. 2003). These studies served as an empirical model for the current study's examination of the role of analogy in the history of irregular SK readings.

In discussions of the analogy hypothesis, previous SK research relied only on intuitive data by listing a few examples of potential model characters for analogical influence and of characters with irregular readings that were potentially influenced by analogy to model characters. Frequency or saliency has been mentioned, but neither one was supported by concrete

data. By analying the corpus data in Itō (2007), this dissertation has improved the accuracy and reliability of the analogy hypothesis. Recognizing a strong correlation between analogy and frequency, I employed quantified frequencies using Kwen (2005) to determine which characters could potentially serve as analogical models. In Chapter 3, I provided tables (Table 3.2, 3.3, 3.4, 3.5) listing the number of characters that can be explained by analogy and characters that are not explained by analogy in each *xiéshēng* series.

Analysis of the SK data in terms of frequency revealed that the significance of analogy is not as strong as what we might expect from casual observation. The corpus data presented in Chapter 3 demonstrated that analogy can be a good explanation for only about 20% of irregular SK readings.

Syllabic inclination has been presented as another major factor causing mismatch between SK readings and their corresponding MC readings (Kōno 1968, Chang 1981, Itō 2007). Kōno, who coined the term *onsetsu henkō* 音節偏向 "syllabic inclination," recognized certain patterns between finals and initials in SK readings, but stated that there was no systematicity to this phenomenon. While Kōno explained syllabic inclination in terms of convenience in memorizing SK pronunciations, other scholars attempted to formulate rules for the occurrence of aspirated and unaspirated consonants in terms of phonological features of finals in MC (Chang 1981) or SK (Itō 2007) finals. To investigate if any phonological feature of certain syllable shapes has regularly caused SK initials to be aspirated, I categorized SK syllable data into two types: syllables with aspirated initials whose MC source is an unaspirated initial and syllables with unaspirated initials whose MC source is an aspirated initial. The following 14 finals are correlated with an MC unaspirated labial initial adopted as an SK aspirated labial initial: -a 아, -ai 애, -i 이, -iəi 예, -io 요, -o 오, -iəm 염, -an 안, -iəŋ 영, -uŋ 웅, -ip 입, -al 알, -il 일, -iək 역.

The following 21 finals are correlated with an MC unaspirated dental initial adopted as an SK aspirated dental initial: -a 아, -i 이, -iəi 예, -iu 유, -oi 외, -u 우, -am 암, -im 임, -an 안, -iaŋ 양, -iuŋ 융, -ip 입, -al 알, -iəl 열, -iul 율, -ʌik ㅇ ㅣ ㄱ, -ak 악, -iak 약, -iək 역, -iok 욕, -iuk 육. Itō proposed that some phonological conditions, an on-glide [j] or *rù* tone ending, possibly caused syllabic inclination. But the data that these phonological rules can explain is limited, so syllabic inclination does not work as a rule-based explanation. Furthermore, it was not proven that the phonological rule in Itō's hypothesis is not plausible in terms of phonetic rules and sound change. Therefore, we cannot claim that an on-glide [j] or *rù* tone ending is a factor of aspiration or a condition of syllabic inclination, and I asserted that syllabic inclination is not rule-based in Chapter 4.

Because the syllable types subject to "syllabic inclination" exhibit a non-rule-based tendency, I explored a possible connection between phonological features of these syllable types and hyperforeignization, which is another non-rule-based tendency. Hyperforeignization has occurred in various language contact situations where speakers create a form by adding a feature they perceive as foreign to a borrowed foreign word, even when that feature was not present in the original pronunciation. I presented supporting evidence from other languages, and examined the similarity between these linguistics examples that were explained by hyperforeignization and irregular SK readings. For instance, according to Boberg (1999), the use of /a:/ in English nativization of foreign 'a' tends to be found more frequently among the social groups with upward social mobility, especially in more formal styles of speech. Similarly, written Chinese and the associated pronunciations of Chinese characters were of high prestige in medieval Korea. Thus, one may speculate that they would be subject to hyperforeignization, especially by Korean learners with upward social mobility. Since aspirated consonants were far more frequent in

Middle Chinese than in Old Korean, it would be natural for Korean speakers to perceive aspirated consonants as a salient Chinese feature. Korean speakers could therefore have added an aspiration feature even to SK readings of characters that are read with an unaspirated MC initial.

Examining proposed phonological rules in previous studies of syllabic inclination and the similarity between the linguistic examples of hyperforeignization and irregular SK readings, I rejected the explanation of syllabic inclination as a rule-based development directly causing irregular SK readings. Instead, I claimed that the apparent phenomenon of syllabic inclination in SK phonology is better understood as a secondary effect of hyperforeignization. Based upon the analysis of occurrence frequencies of Korean phonemes and syllable units in Shin (2010), I proposed that these syllable types with an on-glide [j] or *rù* tone ending, cited as examples of "syllabic inclination," were relatively rare in native Korean words. Because these finals sound foreign and un-Korean already, they are made even more foreign-sounding by addition of -h-. The frequencies shown in Shin support my hypothesis of hyperforeignization as a cause of aspiration mismatch in Sino-Korean.

Other than these two major factors, analogy and hyperforeignization, I examined SK readings in terms of loanword adaptation. An aspiration feature was still being developed in OK. Therefore, OK speakers were probably not able to discern the distinction between aspirated and unaspirated initials in MC precisely, and the differences in the phonetic nature of Chinese and Korean aspiration led to category mismatches in borrowing. By providing several sets of modern language data, I discussed how Korean speakers might have perceived an aspiration feature in MC. As a metalinguistic factor, I examined two different input types: how orthographic input can play a role as well as acoustic input. Chinese character pronunciations were transmitted to Korea, by various routes, spoken and written, in various socio-linguistic situations. Considering this

historical situation, I proposed two hypotheses: in borrowing based on orthographic input, lower-frequency characters would have a greater chance of irregularity, because they rely on the more frequently used characters with the same phonetic component. My analysis presented in Chapter 3 showed that about 20% of irregular SK readings are explained by this hypothesis. The second hypothesis is supported by SK readings that were adopted by acoustic input. The pronunciation of characters appearing in the texts with higher frequency could have remained in a state received based on the orally transmitted readings. Characters that did not appear or rarely appeared on the text might have been assigned with their SK pronunciation with a different pattern. These characters could have established their SK pronunciations based on reference works giving their standard MC pronunciation. If so, their SK readings would more likely match the Chinese source and have less chance of having an irregular reading.

Finally, in chapter 6, I examined historical materials that show how traditional education environments in Korea played their roles as a social factor that created irregular SK reading. By reviewing materials written in the Cosen dynasty, I explored how Chinese characters were taught and learned among Korean teachers and students using the materials written in Chinese characters. I also argued that placing more emphasis on the meaning rather than the sound of characters is another factor of irregular SK readings.

In this study, I have provided a broader frame of SK reading adaptation and proposed additional factors to understand aspiration mismatch in SK reading. The linguistic and sociological factors related to the adoption of Chinese pronunciations in the formation of SK pronunciations were complex and multi-faceted. It is therefore not surprising that irregularities in SK readings (as compared to their MC sources) should have multiple complex causes. My approach has been based on the recognition that no single factor is primarily responsible, and so

various causes must be carefully investigated to determine the degree to which they have played a role. This means that linguistic analysis must be complemented by socio-linguistic and metalinguistic approaches.

A second key aspect of my approach has been to bring quantitative analysis to bear on the data. Previous proposals to explain aspiration mismatches have often been plausible but have relied on only a few examples or on an impressionistic overview of the data. I attempted to improve on these proposals through corpus analysis, analyzing corpus data in terms of quantified frequency to increase the accuracy of the results delivered by the data. One result of this analysis has been the revelation that analogy plays a smaller role in SK phonology than was previously believed. To examine syllabic inclination and hyperforeignization, I excluded the characters whose irregular readings can be explained by analogy. Because the way of organizing and sorting out data can make a different result, it is important to consider which data sets can provide more accurate results. In Chapters 3 and 4, I analyzed data using two models of development of MC voiced initials (VD-ASP: MC voiced initials are pronounced as unaspirated in all tones, VD+ASP: MC voiced initials develop into voiceless aspirated initials in *píng* tone and into voiceless unaspirated initials in all other three tones, *shǎng*, *qù*, and *rù*) without prejudging which model should apply. Based on whether a tonal distinction for the aspiration reflex of MC voiced initials is reflected in SK reading, each set showed different numbers of irregular readings. This method of comparison contributed to determining which one can be explained in terms of analogy or hyperforeignization.

While there remain many unanswered questions, I hope that this study has made a valuable contribution to our understanding of the history of the development of Sino-Korean phonology.

Appendix

Chart of syllables in pīnyīn (Chinese) and Yale romanization (Korean) with their phonetic values

Pīnyīn and Yale romanization can be easily distinguished in the text by the presence of tone marks on pīnyīn forms. Tones are marked with a diacritic over the vowel: ¯ high level, ´ high rising, ˇ low dipping, and ` falling. As a general rule, for pīnyīn, Mandarin voiceless unaspirates are written with Roman "voiced" letters b, d, g, z, etc.; while Mandarin voiceless aspirates are written with Roman "voiceless" letters p, t, k, c etc.

bàn [pan]
bàng [paŋ]
bāo [pɑʊ̯]
bì [pi]
bìng [piŋ]
bō [pwɔ]

Cangswukyeng [tɕaŋ.su.gjʌŋ]
Cenla [tɕʌl.la]
Cháng'ān [ʈʂʰaŋ an]
chè [ʈʂʰə]
Chencamwun [tɕʰʌn.dʑa.mun]
chéng [ʈʂʰəŋ]
Chimlyu [tɕʰim.nju]
Chopalsimcakyeng [tɕʰo.bal.sim.dʑa.gjʌŋ]
chuān [ʈʂʰwan]
chuáng [ʈʂʰwɑŋ]
Choy Seycin [tɕʰø.se.dʑin]
Cinenkwenkong [tɕi.nʌn.gwʌn.goŋ]
cìqīng [tsʰɨ tɕʰiŋ]
cìzhuó [tsʰɨ ʈʂwɔ]
cóng [tsʰʊŋ]
Cosen [tɕo.sʌn]
Cosen Kwanyeke [tɕo.sʌn.gwa.njʌ.gʌ]

Dàwén [ta wən]
Dìngguó [tiŋ kwɔ]
Dōnglái [tʊŋ laɪ̯]
duān [twan]

Enhay [ʌ.nɛ]

fǎnqiè [fan tɕʰjɛ]
Fǎshàng [fa ʂaŋ]
fèi [feɪ̯]
fēng [fəŋ]
fǔ [fu]

Gānwù'ā [kan wä]

Hakco [hak̚.ʈɕo]
Hakpong sokcip [hak̚.poŋ]
Hankul [haŋ.gɯl]
Hóngwǔ zhèngyùn [xʊŋ u ʈʂəŋ yn]
Huāngzōng [xwän tsʊŋ]
Hùinéng [xwɪ̯ nəŋ]
Hwunmin cengum [hun.min.dʑʌŋ.ɯm]
Hwunmong cahoy [hun.moŋ.dʑa.ɦø]
Hyangyak Kwukuppang [hjaŋ.jak̚.ɡu.gɯp̚.paŋ]

Imcin [im.dʑin]
I Tekmwu [i.dʌŋ.mu]

jiàn [tɕjæn]
Jīlínlèishì [tɕi lin leɪ̯ ʂɨ]
jīng [tɕiŋ]
jué [tɕɥœ]
Jūsèhán [tɕy sə xan]
Jūxīgān [tɕy ɕi kan]

Kāifēng [kaɪ̯ fəŋ]
Kakhwun [k̚a.kʰun]
Kaktek [kak̚.ʈʌk̚]
Kanipyekonpang [ka.ni.bjʌ.gon.baŋ]
Kankyengtokam [kan.gjʌŋ.do.gam]
kechul [kʌ.tɕʰɯl]
Kim Sengil [kim sɯŋ.il]
kkasil kkasil/ kkesil kkesil [k̚ːasil k̚ːasil/ k̚ːʌsil k̚ːʌsil]
Kokwulye [ko.gu.ɾjʌ]
Kolye [ko.ɾjʌ]
kom [kom]
kulpang [kɯl.baŋ]
Kyekmongyokyel [kjʌŋ.moŋ.jo.gjʌl]
Kyengki [kjʌŋ.gi]
Kyeychosimhakinmwun [kje.tɕʰo.si.ma.gin.mun]
Kyeylim Yusa [kje.lim ju.sa]
Kyocengcheng [kjo.dʑʌŋ.tɕʰʌŋ]

Kyucang cenwun [kju.dʑaŋ tɕʌ.nun]

lái [laɪ̯]]
*laymphu*b[l̪ɛm.pʰɯ]
lyeksa [ljʌk.s̪a]

míng [miŋ]
Mongsanpepe [moŋ.san.bʌ.bʌ]

nà [na]
nampho [nam.pʰo]
nèi [neɪ̯]
niáng [njɑŋ]
noin [no.in]

palamil [pa.ɾa.mil]
palamwun [pa.ɾa.mun]
Palsimswuhayngcang [pal.sim.su.ɦɛŋ.dʑaŋ]
pāng [pʰaŋ]
Paykcey [pɛk̚.tɕe]
Penyek sohak [pʌ.njʌk so.ɦak]
Pephung [pʌ.pʰɯŋ]
Pephwakyeng [pʌ.pʰwɐ.gjʌŋ]
pí [pi]
píng [pʰiŋ]
posi [po.si]
Pwunmwun onyek ihaypang [pun.mun o.njʌk]

Qièyùn [tɕʰjɛ yn]
qīng [tɕʰiŋ]
qù [tɕʰjy]
qún [tɕʰjyn]

rì [ʐɻ̩]
rù [ʐu]

Samkwuk Saki [sam.guk sa.gi]
Samtansisikmwun [sam.dan.si.siŋ.mun]
sapa [sa.ba]
Sapepe [sa.bʌ.bʌ]
Sasocel [sa.so.dʑʌl]
Seonco [sʌn.dʑo]
Sepong [sʌ.boŋ]
setang [sʌ.daŋ]
Seyco [se.dʑo]
Seycong [se.dʑoŋ]

shăng [ʂaŋ]
shēng [ʂəŋ]
Shījīng [ʂi tɕiŋ]
Sincung yuhap [sin.dʑɯŋ ju.hap̚]
Sinla [sil.la]
Sin Swukcwu [sin.suk.tɕʉ]
Songkwang [soŋ.gaŋ]
Soswulim [so.su.ɾim]
Sūn Mù [sun mu]

tái [tʰaɪ̯]
talani [ta.ɾa.ni]
tapi [ta.bi]
Thaycong sillok [tʰɛ.dʑoŋ sil.lok̚]
Thayhak [tʰɛ.ɦak̚] Gradn Academy
Thoykyey sensayng enhaynglok [thø.gje sʌn.sɛŋ ʌ.nɛŋ.nok̚]
Tongkwuk cengwun [toŋ.guk̚ tɕʌŋ.un]
tòu [tʰoʊ̯]
twuum pepchik [tu.ɯm.bʌp̚.tɕʰik̚]

Uyyen [ɯi.jʌn]

wēi [weɪ̯]]
Wenkang [wʌn.gaŋ]
wung [uŋ]

xī [ɕi]
Xiányuè [ɕjæn ɥœ]
xiǎo [ɕjɑʊ̯]
xié [ɕjɛ]
xíngshēngzì [ɕiŋ ʂəŋ tsɯ]

Yawuncakyengse [ja.un.dʑa.gjʌŋ.sʌ]
yeksa [jʌk.ʂa]
Yengthong [jʌŋ.tʰoŋ]
yí [i]
yǐng [iŋ]
yù [y]
yuchwu(um) [ju.tɕʰu(ɯm)]
yuē [ɥœ]
Yuhap [ju.hap̚]
Yu Huychwun [ju.ɦɯi.tɕʰun]
Yukcopeppotankyeng [juk̚.tɕo.bʌp̚.po.dan.gjʌŋ]
Yùnjìng [yn tɕiŋ]

zhào [tʂɑʊ̯]

zhuó [ʈʂwɔ]
Zhū Xī [ʈʂu ɕi]

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