

LIQUIDS AND LOANWORDS: THE VARIANT BEHAVIOR OF THE KOREAN /L/

by

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## **DEDICATION**

This is dedicated to my loving partner, Mohammad, and my cat, Jasper.

## **ACKNOWLEDGEMENTS**

I would like to thank all my friends and family who supported me and encouraged me to keep going even when I felt like giving up. My partner, Mohammad, pushed me the most, making sure that I stayed focused and did the best of my ability. Though destructive as he is, my cat, Jasper, showed his support by knocking stuff over onto my computer and breaking glasses in the kitchen as I tried to focus. A special thanks goes out to my friends Aragsan, Lul, Mayron, and Victoria for understanding my lack of social interaction during this time and standing by me in support nonetheless. Finally, I would like to thank Dr. Weinberger, Dr. Kwon, and Dr. Wulf for guiding me through this journey and providing me with the knowledge and constructive criticism I needed in order to complete my research.

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## ABSTRACT

LIQUIDS AND LOANWORDS: THE VARIANT BEHAVIOR OF THE KOREAN /L/

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This study examines the phonetic variation of the Korean liquid, which can surface as [r], [n], [l], [ll], or  $\emptyset$  in overlapping environments. Previous studies on this topic have not analyzed the full range of the alternations and/or have not explicitly acknowledged that the Korean lexicon may be divided into distinct lexical strata. Since environment alone cannot predict how the liquid may appear on the surface, I propose that there are two sublexical systems (“Native/Sino” and “Loanword”) within the Korean language based on the etymology of a given word that affect a speaker’s production of the liquid. I develop an optimality-theoretic (OT) analysis in which markedness constraints are more highly ranked in words belonging to the “Native/Sino” sublexicon and faithfulness constraints are more highly ranked in words belonging to the “Loanword” sublexicon. In analyzing the Korean lexicon as being split into two distinct lexical strata, this study finds that in loanwords with two surface forms in free variation, one has become more nativized and is less marked while the other is more faithful to the input pronunciation.

## CHAPTER ONE

### Background Study

The Korean liquid has multiple alternations that have made analyzing it unexpectedly complex. At first glance, it seems like a simple case of complementary distribution of a single liquid: [r] in the onset and [l] in the coda (Heo & Lee 2005), as shown in (1) (Lee 2001, Kang 2012).

(1)	/tal/ <sup>1</sup>	[tal]	‘moon’
	/mul/	[mul]	‘water’
	/tal-i/	[tari]	‘moon-NOM’
	/mul-i/	[muri]	‘water-NOM’
	/tali/	[tari]	‘leg’
	/muli/	[muri]	‘group, unreasonableness’

The word /tal/ ‘moon’ and /mul/ ‘water’ contain the liquid in coda position, which surfaces as [l]. When adding the nominative suffix [-i] to /tal/ ‘moon’ and /mul/ ‘water’, the liquid then surfaces as [r], resulting in [tari] and [muri], respectively. In accordance with the Maximal Onset Principle, which states that consonants at syllable boundaries prefer to be placed in onset position as long as they do not interfere with any universal or

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<sup>1</sup> Studies differ considerably in how Korean is transcribed, so for the sake of uniformity within this study, I have conformed to one format that may not match exactly with the transcription in the original studies.

language-specific principles, adding the nominative suffix [-i] causes the liquid that was originally in the coda to position itself in the onset of the following syllable, resulting in a flap rather than a lateral. We see that the phonotactics of Korean do indeed allow this by looking at base forms of words in the language that have the liquid already in onset position, as in the words /tali/ ‘leg’ and /muli/ ‘group’; as expected, these surface as [tari] and [muri], respectively, with a flap, which acts as precedence for the surface forms of ‘moon-NOM’ and ‘water-NOM’.

The liquid can additionally appear as a geminate that is distinctive from its singleton counterpart. When considering the structure of geminates, “the moraic portion in a syllable coda determines the articulation of both parts” (Heo & Lee 2005, Iverson & Sohn 1994). Given that codas are moraic in Korean (Jun 1993) and that the liquid appears as a lateral in this position, it allows the geminate form to surface as [ll] rather than \*[rr], which does not exist in the language, as seen in (2) (Lee 2001, Kang 2012). This also gives insight into what the underlying form of the liquid may be; the existence of a lateral geminate compared to the nonexistence of a rhotic geminate shows that lateralness, in terms of how the liquid is viewed, is unmarked while rhoticness may be more marked, pushing towards the argument that the underlying form of the Korean liquid is actually /l/.

(2)	/talli/	[talli]	‘differently’	(cf. [tari] ‘leg’)
	/mulli/	[mulli]	‘physics’	(cf. [muri] ‘group’)
	/sallaŋ/	[sallaŋ]	‘chilliness’	(cf. [saraŋ] ‘love’)
	/mollɛ/	[mollɛ]	‘secretly’	(cf. [morɛ] ‘sand’)
	/ɻllita/	[ɻllida]	‘to freeze’	(cf. [ɻrida] ‘to be young’)

The words /sallaŋ/ ‘chilliness’ and /mollɛ/ ‘secretly’ contain the geminate liquid, which only appears in word-medial position (Heo & Lee 2005). The way that the geminate liquid surfaces is determined by the left-most or moraic portion that exists within the syllable coda. We know that the liquid appears as a lateral in the coda (i.e., in moraic positions), so we expect the geminate to appear as a lateral as well. This is correct, with /sallaŋ/ ‘chilliness’ and /mollɛ/ ‘secretly’ surfacing as [sallaŋ] and [mollɛ] (*\*[sarraŋ]*, *\*[morre]*), respectively. If we compare these words to /saraŋ/ ‘love’ and /mole/ ‘sand’, which surface as [saraŋ] and [morɛ], respectively, we see that [ll] and [r] are distinctive in Korean.

There is additional evidence to this claim in loanwords that have rhotics and laterals in the original language; in word-medial intervocalic positions, rhotics surface as [r] and laterals surface as geminate [l] (e.g., [pairɻsu] ‘virus’, [k<sup>h</sup>olla] ‘cola’). This shows that Korean does distinguish between these two sounds, even when borrowing words into the language. However, there are some loanwords that contain the lateral in the original language that have free variation in the pronunciation in Korean (e.g., [k<sup>h</sup>iro]~[k<sup>h</sup>illo] ‘kilo’).

Now, if we look at how the liquid behaves in word-initial position, we might face a problem: there are no words that start with a liquid. This is the case, at least, in words that are native to the Korean language (Um 2003). However, upon digging deeper below the surface level of words, we find that underlying liquids in word-initial position do exist within the language, but they act strangely in regards to the seemingly simple complementary distribution rule. Sino-Korean words, words that have been adopted into the language from Chinese thousands of years ago (Martin 1992), have underlying liquids that surface as [n] or  $\emptyset$  at the beginning of a word as opposed to [r], which would be expected in onset position, as in (1). In (3) (Um 2003, Kang 2012, Yun & Kang 2019), we can see that these monosyllabic Sino-Korean morphemes do indeed have an underlying liquid when comparing how the morpheme surfaces depending on its position.

- (3) /lu-kak/      [nugak]      ‘pavilion’      (cf. /po-lu/ > [poru] ‘fort’)  
 /lak-wɔŋ/      [nagwɔŋ]      ‘paradise’      (cf. /k<sup>h</sup>wɛ-lak/ > [k<sup>h</sup>wɛrak] ‘joy’)  
 /li-tɕa/      [idza]      ‘interest’      (cf. /ko-li/ > [kɔri] ‘high interest’)  
 /ljɔk-sa/      [jɔkɕa<sup>2</sup>]      ‘history’      (cf. /li-ljɔk/ > [iɾjɔk] ‘resume’)

The morphemes /lu/ and /lak/ expectedly surface with [r] in word-medial positions, as seen in [poru] ‘fort’ and [k<sup>h</sup>wɛrak] ‘joy’, respectively. However, in word-initial positions, the liquid undergoes nasalization, as seen in the words [nugak] ‘pavilion’ and [nagwɔŋ] ‘paradise’, respectively. In addition to nasalization, deletion of the liquid also occurs. The morphemes /li/ and /ljɔk/ again surface with [r] in word-medial positions, as seen in

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<sup>2</sup> For the tense/fortis consonants in Korean, this study will use the diacritic ͡, which denotes strong articulation in the extended IPA.

[kɔri] ‘high interest’ and [iɾjɯk] ‘resume’, respectively, but in word-initial positions, the liquid in these words will delete instead of undergoing nasalization, as seen in [idza] ‘interest’ and [jɯksa] ‘history’, respectively. This alternation between [n]~∅ is evidently based on environment; the liquid surfaces as [n] unless it comes before a high front vowel<sup>3</sup>, in which case it deletes. This is actually a process that affects [n] rather than liquids as this happens with words that have an underlying /n/ in word-initial position as well (i.e., /njɯtɕa/ > [jɯdza] ‘woman’) (Martin 1992). Taking this into account, the deletion seems to occur after the initial nasalization happens to the liquid, but this process is still important to understanding the alternations of the liquid in Korean.

The liquid in words that have been borrowed into Korean from other languages, such as English, behaves a bit differently in word-initial position when compared to those of Chinese origin. In these cases, the liquid surfaces as [r] word-initially regardless of whether the liquid is lateral or rhotic in the original language, as seen in (4) (Um 2003). This is expected when considering the complementary distribution rule that was exemplified in (1).

(4)	/lɛntɕu/	[ɾɛndzɯ]	‘lens’
	/lat <sup>h</sup> in/	[rat <sup>h</sup> in]	‘Latin’
	/lopot <sup>h</sup> u/	[robot <sup>h</sup> u]	‘robot’
	/latio/	[radio]	‘radio’

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<sup>3</sup> By high front vowel, I am referring to both [i] and [j] under the assumption that [j] is non-consonantal and is actually appearing as the first vowel in a diphthong.

In English, ‘lens’ and ‘Latin’ both start with a lateral and ‘robot’ and ‘radio’ both start with a rhotic. Given that Korean only has one liquid that is underlyingly /l/, from what we can assume based on the evidence presented in (1) and (2), the underlying forms of these words once transferred into Korean and adhering to its phonotactic rules start with /l/. However, the surface forms all appear with [ɾ], as seen in [ɾɛndzɯ] ‘lens’, [ɾatʰin] ‘Latin’, [ɾobotʰɯ] ‘robot’, and [ɾadio] ‘radio’, respectively.

### **List of Alternations**

There are multiple ways in which the Korean liquid can surface depending on its positioning in a word, as discussed in the previous section. This study focuses on the alternations that occur in the word-initial onset, word-medial onset in intervocalic positions, and the coda. While the liquid and other consonants in Korean do vary at syllable boundaries (Davis & Shin 1999), the majority of the causes of those alternations are beyond the scope of this study. Table 1 provides an easy to read list of the alternations of the Korean liquid that this study analyzes.

**Table 1 List of Alternations**

/l/	Alternations	Examples
<b>Word-Initial Onset</b>	[r], [n], ∅	[rɛndzɯ] ‘lens’ [robot <sup>h</sup> ɯ] ‘robot’ [nugak] ‘pavilion’ [jɤksa] ‘history’
<b>Word-Medial Onset/Intervocalically</b>	[r], [l], [r]~[l]	[tari] ‘leg’ [mollɛ] ‘secretly’ [k <sup>h</sup> iro]~[k <sup>h</sup> illo] ‘kilo’
<b>Coda</b>	[l]	[mul] ‘water’

### Research Question and Hypothesis

The main issue in this study lies in how some of the alternations of the liquid can surface without environment (aside from the instances of deletion) playing a factor. This creates a problem – *why* do such alternations take place? This study hopes to answer three main questions in regards to the Korean liquid. First, what are all of the alternations of the liquid? Second, what drives these disparate alternations and how can we make sense of them? Finally, is distinguishing between Native Korean words, Sino-Korean words, and loanwords from other languages useful in terms of how the liquid behaves in the language?

Based on these preliminary data, it appears that the etymological background of a word may give clues as to how the liquid may actually surface in speech, but it also creates some confusion in answering why these alternations occur this way. Considering



that the liquid surfaces differently in word-initial positions depending on whether it entered Korean via Chinese or another language such as English, this study hypothesizes that the origin of a given word does indeed dictate how it surfaces in Korean. Moreover, evidence of loanwords that have two pronunciations in free variation alludes to the possibility that there are two phonological processes that can affect the surface form of a given word.

### **Proposal**

In this study, I propose that there are two sublexical systems within the Korean language that affect a speaker's production of the liquid sound. While Native Korean words and Sino-Korean words are etymologically different, they do not act differently enough in regards to how the liquid in Korean behaves to justify separating them. Loanwords from other languages, however, do show differences in how the liquid behaves and serves as a second sublexicon in this study. Going forward, the former group is referred to as the "Native/Sino" sublexicon and the latter is referred to as the "Loanword" lexicon.

This study utilizes an optimality-theoretic (OT) analysis in order to make sense of the various alternations in Korean. An OT analysis allows us to compare how the liquid behaves when splitting the lexicon into two sublexicons due to the fact that environment alone does not give us insight as to why these alternations occur.

According to Davis & Shin (1999), there are a few general advantages to using an OT analysis in this type of work. "(One) advantage is that unlike analyses within nonlinear phonology, the optimality-theoretic analysis is not crucially reliant on a

particular view of feature geometry and/or feature specification. ... (Another) advantage is that the optimality-theoretic analysis requires no intermediate stages in accounting for the correct output. Even the analyses within nonlinear phonology posit some ordering of the processes involved in obtaining the correct output” (Davis & Shin 1999).

Additionally, OT analyses are wholly surface-based; with this study focusing on how the liquid appears on the surface, an OT analysis is the best way to handle these data.

Considering these advantages and in terms of how the liquid surfaces in Korean, I propose that there is a list of constraints that are ranked differently depending on which of the two sublexicons a given word belongs to and that markedness constraints are more highly ranked in words belonging to the Native/Sino sublexicon whereas faithfulness constraints are more highly ranked in words belonging to the Loanword sublexicon.

### **Thesis Structure**

In Chapter 2, I present a review of the literature, both in terms of whether the lexicon should or should not be separated into subcategories in Korean and how (and why) the Korean liquid alternates the way that it does. In Chapter 3, I propose a set of constraints and rank them differently based on the lexical membership, providing an answer as to why the liquid alternates the way that it does. In this section, I provide evidence for this claim by showing how words that have free variation in the way that they surface can be explained in terms of the constraint rankings. Finally, in Chapter 4, I discuss the outcome of my research, conclude the study, and suggest ideas for future research on this topic.

## CHAPTER TWO

### **Sublexicons of Korean**

Native Korean words are words that originate from the Korean language, which include so-called “basic vocabulary” (food, clothing, shelter, basic activities, numerals, etc.) and affixes (Martin 1992, Sohn 2001). Sino-Korean words refer to those that come from Chinese, specifically Han Chinese, as opposed to any number of languages spoken by the fifty-three ethnic groups in China (Ceong 2011). These words have been well integrated into the Korean language over the past thousand years (Martin 1992), and up to the past few decades due to a rise in nationalism in Korea, they were seen as “first-class” words or more scholarly in comparison with Native Korean words (Taylor & Taylor 2014).

Interestingly, Sino-Korean words make up approximately 60% of the Korean vocabulary while those of Native Korean origin only make up around 35% (Ceong 2011, Sohn 2001). The other 5% of the vocabulary consists of words that have entered the Korean language from other languages (Sohn 2001), which should not be confused with words borrowed from Chinese. Many of these words have entered the language through Japanese and have become well established as part of common vocabulary. However, words coming directly from its source (namely English and other European languages) have become more common in recent years (Martin 1992). Itô & Mester (1993) analyzed

the sublexicons of Japanese, arguing that words may undergo different phonological processes depending on if they are native to the language or if they were borrowed into the language. If this is the case, it is necessary to treat these sublexicons separately in order account for these differences. Considering this information, this section discusses the varying opinions of whether splitting the lexicon of Korean into two or three parts is worthwhile or if words act the same regardless of their etymological history.

### ***Three Sublexicons***

Many scholars argue that the Korean language contains three distinct sublexicons with regard to how Korean grammar, specifically its phonological processes, behave. Ceong (2011) inquires as to how Korean vocabulary should be split up, especially given that Sino-Korean words, which she refers to as “Hannate” words, behave in a way that is not completely like words of Native Korean origin and not completely like loanwords. She compares this to English vocabulary, where words native to the English language/of Germanic origin, words coming from Romance languages, and loanwords from other languages behave differently enough to create the question of how to analyze them within the language (Ceong 2011, Bauer 1998).

Based on Bauer’s (1998) study of English, which proposes a three-dimensional space for English word formation through three specific categories, Ceong (2011) proposes a similar three-dimensional framework in which Korean vocabulary should be organized with the following categories: Native, Hannate, and Foreign. She claims that words belonging to the Hannate category are set in the middle of the framework, meaning they can overlap and interact with both Native words and Foreign words, while words

belonging to the Native and Foreign categories are set at the edges, meaning they do not interact with each other; compounding that crosses over boundaries, allowing Native and Hannate words, Foreign and Hannate words, and Hannate and other Hannate words to compound together to create new words, is evident within the language and supports this claim (Ceong 2011).

For example, Native words like /kɯɾul/ 'winter' and Hannate words like /nɯɾtea/ 'woman' can compound to make [kɯɾullɯɾdza] 'winter woman' (Um 2003). In the same respect, Foreign words like 'radio' and Hannate words like /kokuɱp/ 'high-quality' can compound to create [koguɱnadio] 'high-quality radio' (Um 2003). With Hannate words sitting in the middle of the framework, we can also expect two Hannate words to be able to combine, such as with the words /loɱɯn/ 'roadside' and /teute<sup>ha</sup>/ 'parking', creating [nɔɱɯndzute<sup>ha</sup>] 'roadside/curbside parking' (Um 2003).

In addition to studies that argue for three distinct sublexicons within one language, others focus on phonological processes that occur in Korean that implicitly state that there are three lexicons. For example, Jun (1999) analyzes the nasalization of obstruents before liquids, and in doing so, he separates his data into three lexicons: Native Korean, Sino-Korean, and Loanwords. There have even been entire grammars of the language written under the assumption that there are three functional sublexicons in Korean (Martin 1992).

### ***Two Sublexicons***

Nonetheless, others argue that this trilateral distinction is not necessary and can be simplified. Lee's (2001) study of the alternations of the Korean liquid only takes two

sublexicons into account: Native Korean and Loanwords. The study analyzes its data with an OT analysis, proposing that there are two orderings of specific constraints that speakers have innate knowledge of, and the pronunciation of the liquid depends on which set of constraints the speaker uses to process a word prior to its utterance; the two sets were determined by whether a word was native to the Korean language or if it was a loanword (Lee 2001). This entire study is done under the premise that there are only two distinct sublexicons in Korean and that they do function differently within the grammar.

Heo & Lee (2005) focus their study on comparing Native Korean words with loanwords, both directly from English and also via Japanese. Similarly to Lee's (2001) study, they do not consider words that have entered the Korean language through Chinese in their data as being distinct. For example, their study includes the word /mulli/ 'physics' in with the Native Korean words that are being directly compared to loanwords from other languages such as English (Heo & Lee 2005). However, the word /mulli/ 'physics' is comprised of two morphemes that come from Chinese. This alludes to the idea that their study believes that there are only two lexicons within the language and that words that are etymologically from Chinese should be grouped with those native to Korean.

### ***One Lexicon***

Still other studies simply treat the Korean lexicon as a unified whole without dividing it into two or three sublexicons. For example, Smith's (1997) study discusses the Korean liquid and states that it has three alternations ([n] in the onset, [l] in the coda, and [r] intervocalically). Her entire study makes no mention of functionally separate lexicons

within the language and makes a claim under the assumption that all words containing a liquid in the language will behave in this way.

Additionally, Davis & Shin (1999) discuss the alternations of all consonants in Korean and how they behave when they come in contact with other consonants. Their study does not mention differences based on the etymology of a word and works under the assumption that all words in Korean function based on one set of OT constraints. However, they mention that their ranking is not perfect and cannot account for certain [l]~[n] alternations. Additionally, they do not account for alternations that happen between the underlying form and surface form word-initially – they only focus on syllable boundaries. This is too narrow and does not account for why a liquid may surface as a nasal word-initially.

### **Alternations of the Korean /l/**

While there are many studies that discuss the Korean liquid, how it alternates, and what drives these alternations, the majority of them do not account for all of the possible alternations. In Table 1 from Chapter 1 of this study, we see the various ways in which the liquid can surface in Korean. In word-initial onset, it may appear as [r], [n], or  $\emptyset$ , whereas in word-medial onset, specifically in an intervocalic position, it appears as [r] or [ll]. In the coda position of a syllable, it always appears as [l]. Despite the evidence of these varying alternations, current literature on the Korean liquid fails to account for all of them; Lee (2001) does an extensive analysis on how the liquid alternates in different syllabic positions but does not address some relevant data in her analysis. She argues that [l] appears in moraic positions (i.e., the coda and in geminate structures) while [r] appears

in non-moraic positions (i.e., the onset). While her study does make a good argument, she does not acknowledge evidence of underlying liquids undergoing nasalization or deletion in word-initial onsets. This process is referred to as the “Word-Initial Rule” in Korean, which states that liquids are illegal in word-initial onsets (Kang 2012). Other linguists have proposed other variations of this rule, such as word initial l-avoidance (Smith 2012), which states that Korean words avoid having [l] appear in onset position.

However, studies such as Lee (2001) work under the premise that liquids, specifically a flap, can appear in onset position as shown with words that have been borrowed into the language from languages like English. Jun (2000, 1999) mention that there is evidence of laterals appearing in onset positions, though not as frequently as flaps and nasals. Similarly, Seo (2004) suggests suggests that there is indeed lateral avoidance in the onset and that nasalization of an underlying liquid is preferred in Korean, but in the same regards, there is still evidence of laterals in the onset in loanwords that are preceded by a word that ends in a non-coronal consonant, which may hinder some linguists’ arguments on this case. This, however, is a small percentage of their sampling and may be due to the increase of the knowledge of English and familiarity of the lateral and rhotic distinction in a loanword’s native language.

Additionally, while studies such as Heo & Lee (2005) and Kang (2012) focus on how foreign liquids surface and are perceived by Korean speakers, Smith (1997) does not mention how liquids surface when the word is not from the native lexicon and Iverson & Kim (1987) disregards how they surface, claiming they are exceptional due to their recent entry into the language, which allows them to go against the phonological system within



the language. Thus, studies differ as to how to analyze these alternations, creating a confusing picture in the field.

### **Other Ideas**

A significant amount of research discussing the alternations of the Korean liquid follows OT analyses. However, they disagree on what the highest-ranking constraint is in the language that drives the alternations. Davis & Shin (1999) propose the constraint SyllCon, which states that syllable contact is the highest-ranking constraint in the language in terms of how consonants alternate. Kang (2002) also employs an OT analysis, basing his study on Davis & Shin's (1999). However, he states that Davis & Shin (1999) fail to account for the various alternations during [n]/[l] contact and proposes Faith-OO, a faithfulness constraint that signifies "output-to-output correspondence" (Kang 2002) and states that "word nodes in a paradigm are required to be phonologically identical" (Kang 2002). Lee (2001) proposes \*Non-moraic-l as the highest-ranking constraint among Native Korean words. Smith (1997) proposes a moraic-based analysis as well, arguing that \*SharedMora is lowly ranked in Korean and that [ɾ] is the underlying liquid. While these authors all believe an OT analysis works well in analyzing the problems that exist within the language concerning the liquid, they still lack an analysis that accounts for all the alternations as listed in Table 1.

Some research suggests the possibility of ambisyllabicity as a factor in the alternation of the liquid in Korean. Smith (1997) argues that the rhotic-lateral allophony of the Korean liquid is due to the ambisyllabic nature of intervocalic positions. She argues that [ɾ] is the underlying form of the liquid and that it occurs in ambisyllabic

positions and contains a mora. However, other studies argue against this, stating that singleton consonants in onsets are not moraic (Lee 2001). Additionally, Um (2003) argues against the concept of ambisyllabicity in Korean due to the lack of evidence of it existing elsewhere in the language. She mentions that if this were a phonological process that is active in Korean, it would then affect more than just the liquid.

### **Summary**

This chapter has discussed the varying ideas for how to handle the alternations of the Korean liquid. First, we discussed whether a stratified lexicon within Korean is necessary (Itô & Mester 1993). Some studies have argued for the three-way split (Ceong 2011, Jun 1999, Martin 1992), whereas others have implicitly argued for a two-way split (Heo & Lee 2005, Lee 2001). Other studies did not find making this split necessary at all (Davis & Shin 1999, Smith 1997).

Next, we discussed the alternations of the Korean liquid. While some studies have noted the liquid nasalizes or deletes in word-initial onset for a variety of reasons (Kang 2012, Smith 2012), others have not mentioned this process at all or have argued against it (Seo 2004, Lee 2001, Jun 2000, Jun 1999).

Finally, we discussed other ideas within the literature that may account for the alternations of the liquid. Some have argued that ambisyllabicity is the cause of the flapping of the liquid in intervocalic positions (Smith 1997), but others have not found enough evidence to support this (Um 2003). Other studies that employ OT analyses have argued that a specific constraint in their system is the highest-ranking constraint within the language (Davis & Shin 1999) whereas others have proposed other ideas (Kang 2002,

Lee 2001). Given these varying opinions, it is obvious that there is a lot of confusion in terms of how and why the Korean liquid alternates.

## CHAPTER THREE

### Research Question and Proposal

As stated in Chapter 1, the purpose of this study is to account for all the alternations of the liquid in Korean and find an answer to what drives these disparate alternations. Moreover, this study addresses whether dividing the lexicon into different sublexicons is worthwhile in analyzing the alternations.

In this chapter, I employ an OT analysis to answer these questions. First, I propose that there are two sublexical systems within the Korean language that affect a speaker's production of the liquid. Though etymologically speaking, there are three sublexicons, Native Korean words and Sino-Korean words do not act differently enough to argue for their separation with regard to how the liquid behaves. However, liquids in loanwords do function differently in comparison to how they function in both Native Korean and Sino-Korean words. As stated in Chapter 1, the first group is referred to as the "Native/Sino" sublexicon while the second is referred to as the "Loanword" sublexicon. In terms of how the liquid surfaces in word-initial onsets, word-medial onsets in intervocalic positions, and in codas in Korean within my OT analysis, I propose that markedness constraints are more dominant in words belonging to the Native/Sino sublexicon whereas faithfulness constraints are more dominant in the Loanword sublexicon.

## List of Constraints

This study employs an OT analysis with a list of constraints that govern how the liquid surfaces. Though I argue for two different rankings of the constraints, the constraints listed in Table 2 are the same in both systems.

Table 2 List of Constraints

Markedness Constraints	Faithfulness Constraints
*SonOnset- $\sigma$ 1	Ident-IO[lateral]
*n+i- $\sigma$ 1	Ident-IO[liquid]
	DEP- $\mu$
	MAX
	*Non-moraic-l

There are only two markedness constraints that this study employs: \*SonOnset- $\sigma$ 1 and \*n+i- $\sigma$ 1. \*SonOnset- $\sigma$ 1 states that an onset in the first syllable of a word should not be too sonorous. To argue for this new constraint, consider Prince & Smolensky's (1993) analysis of onset segments. They propose the ONSET constraint, which states that onsets are preferred in a syllable over not having an onset. Additionally, they propose the Margin Hierarchy, which states that onsets with low sonority are preferred over those with high sonority. This can be seen in (5) (Baertsch & Davis 2008).

(5) Syllable margins (onsets)

a. ONSET encourages syllables with onsets

ONSET >> FAITH onsets are required

FAITH >> ONSET onsets are optional

b. Margin Hierarchy ( $M_1$ ) incorporates the preference for low sonority onsets.

$*M_1/[+lo] \gg *M_1/[+hi] \gg *M_1/[r] \gg *M_1/[l] \gg *M_1/Nas \gg *M_1/Obs$

In constraint rankings where ONSET is ranked higher than FAITH, onsets will be required whereas if FAITH is ranked higher than ONSET, then onsets are optional.

“The preference for low sonority onsets results from the inherent ranking of the  $M_1$  hierarchy. Low-sonority obstruents violate the lowest-ranking constraint in this hierarchy. Very high-sonority segments like liquids and glides violate the highest-ranking constraints in the hierarchy (while nasals act as the most sonorous sound the language will allow in this position). A relevant Faithfulness constraint may be located anywhere along this hierarchy, influencing the segments that can occur in onset position” (Baertsch & Davis 2008).

(6) The  $M_1$  ranking in Korean

$*M_1/[+lo] \gg FAITH \gg *M_1/[+hi] \gg *M_1/Liq^4 \gg *M_1/Nas \gg *M_1/Obs$

Considering that liquids are more sonorous than nasals, this may account for why liquids do not surface in word-initial positions in words that belong to the Native/Sino group. In

(6) (Baertsch & Davis 2008), we see the  $M_1$  ranking of Korean; with a liquid being too

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<sup>4</sup> This study refers to liquids in general rather than just [r] as done in Baertsch & Davis (2008) in order to better connect this ranking with how the study discusses liquids in Korean.

sonorous for word-initial onsets, a nasal then takes its place. This allows us to propose \*SonOnset-σ1 under the assumption that in Korean, liquids, which are coronal, are too sonorous for a word-initial onset and must downgrade one ranking to the coronal nasal, [n]. The second markedness constraint I propose is \*n+i-σ1. This simply states that [n] cannot occur before a high front vowel<sup>5</sup>. These markedness constraints will be the highest-ranking constraints in the Native/Sino sublexicon, showing why nasalization or deletion of the liquid in word-initial onsets takes place.

With regard to the faithfulness constraints, the first we have is Ident-IO[lateral]. This states that the input must match the output in terms of being a lateral. This constraint accounts for the surface and underlying forms of the liquid in Korean. Another similar constraint we use is Ident-IO[liquid]. This constraint states that the input must match the output in terms of being a liquid. This is less specific when compared with Ident-IO[lateral] but is necessary in distinguishing various outputs when looking at words that belong to the Loanword sublexicon. The next constraint is DEP-μ, which states not to add a mora to a syllable. Considering that the liquid geminate exists within the language and is distinctive in comparison with its singleton counterpart, this constraint is important. The next constraint is MAX, which disallows deletion. This constraint potentially conflicts with \*n+i-σ1, which allows deletion of [n] before a high front vowel in word-initial onset position. Finally, we have \*Non-moraic-l, which was proposed by Lee (2001) and states that [l] may only occur in moraic positions. The constraint works under the assumption that codas and geminates are underlyingly moraic; given that [l] occurs

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<sup>5</sup> This includes [j], which is considered part of a diphthong rather than a consonant.

only in the coda or as a geminate, this constraint argues that [l] will only surface in those positions. With this constraint in place, it allows another sound that is not [l], namely [r], to appear in non-moraic positions, such as the onset.

### **OT Analysis**

In this section, I propose an updated ranking of the constraints in Korean to account for the alternations of the liquid. The ranking of constraints differ in each of the two sublexicons. We also explore the idea that one particular word that has multiple pronunciations that are seemingly in free variation does not necessarily belong to one of the given sublexicons and may either crossover or surface differently depending on which constraint ranking a speaker processes the word through. In addition to the updated ranking, I propose two new markedness constraints, mentioned in the previous section, that aid in making sense of the liquid alternation in the Native/Sino group.

#### ***Native/Sino Sublexicon***

Starting with the Native/Sino sublexicon, we must take a look at the basic positional alternations of the liquid. According to McCarthy & Prince (1995), allophonic variation occurs when markedness constraints and faithfulness constraints interact. We know that the liquid surfaces as [l] in the coda and as a geminate whereas [r] appears in an intervocalic onset and never as a geminate. Based on this evidence of the lateral showing up as a geminate whereas the rhotic only appears in singleton form, we can conclude that [l] is the less marked alternate of the liquid and [r] is more marked. This thus introduces Ident-IO[lateral], a faithfulness constraint that accounts for the underlying



form of the liquid. This constraint states that the input and output must match in terms of being a lateral consonant.

**Table 3 Native/Sino /tal/ ‘moon’**

	/tal/ ‘moon’	Ident-IO[lateral]
→ a.	[tal]	
b.	[tar]	*!

In Table<sup>6</sup> 3, candidate (b) is ruled out due to the fact that it does not surface as a lateral. Thus, candidate (a) is deemed the winner and gives us the correct output.

Though only with one constraint, this current system would give us the wrong output if we consider a word that does have a non-lateral output. Lee (2001) proposes \*Non-moraic-l, which states that [l] may only ever occur in moraic positions.

Considering that codas are moraic in Korean (Jun 1993) and that all geminates hold one mora regardless of their positioning (Davis 2011), Lee’s (2001) approach works. Due to the fact that the liquid can surface as a non-lateral, \*Non-moraic-l is ranked higher than Ident-IO[lateral].

**Table 4 Native/Sino /tali/ ‘leg’ 1**

	/tali/ ‘leg’	*Non-moraic-l	Ident-IO[lateral]
a.	[tali]	*!	
→ b.	[tari]		*

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<sup>6</sup> This is actually an OT tableau but is labeled as “table” for the sake of congruence.

In Table 4, candidate (a) is immediately ruled out by violating the highly ranked \*Non-moraic-l. The [l] is occupying the onset in word-medial position, which \*Non-moraic-l prohibits given that the onset position is not moraic. Despite the fact that candidate (b) violates Ident-IO[lateral] for not surfacing as a lateral, in the current ranking system, it is deemed as the most optimal output. If Ident-IO[lateral] were more highly ranked, then [r] would never surface, as seen in Table 5.

**Table 5 Native/Sino /tali/ ‘leg’ – Wrong Prediction 1**

*	/tali/ ‘leg’	Ident-IO[lateral]	*Non-moraic-l
→ a.	[tali]		*
!! <sup>7</sup> b.	[tari]	*!	

This leaves us with the following ranking: \*Non-moraic-l >> Ident-IO[lateral]. “Given that geminate [l] and singleton [r] are contrastive ..., both gemination and degemination should be blocked in order to preserve the underlying contrast” (Lee 2001). If we consider geminate [l] (as well as geminate [r] for comparison’s sake), this current ranking system gives us the wrong output.

**Table 6 Native/Sino /tali/ ‘leg’ – Wrong Prediction 2**

*	/tali/ ‘leg’	*Non-moraic-l	Ident-IO[lateral]
a.	[tali]	*!	
!! b.	[tari]		*
→ c.	[talli]		
d.	[tarri]		*

<sup>7</sup> !! represents the intended winner.

In Table 6, candidate (a) fatally violates \*Non-moraic-l for having [l] appear in the onset, a non-moraic position, and is thus eliminated. Candidates (b) and (d) violate Ident-IO[lateral], considering that both forms contain a rhotic consonant rather than lateral one. Candidate (c) does not violate any of the current constraints, and is thus deemed as the winner. However, the correct output is actually candidate (b), which means there is something wrong with the current ranking.

McCarthy (1997) proposes a faithfulness constraint, DEP- $\mu$ , that fixes this situation. DEP- $\mu$  states that adding an additional mora is prohibited. This constraint in addition to \*Non-moraic-l are undominated, showing that in the current system, mora faithfulness constraints are undominated, as is the case in Lee's (2001) study. This leaves us with this current ranking system: \*Non-moraic-l , DEP- $\mu$  >> Ident-IO[lateral].

**Table 7 Native/Sino /tali/ 'leg' 2**

	/tali/ 'leg'	*Non-moraic-l	DEP- $\mu$	Ident-IO[lateral]
a.	[tali]	*!		
→ b.	[tari]			*
c.	[talli]		*!	
d.	[tarri]		*!	*

In Table 7, candidate (a) fatally violates \*Non-moraic-l for allowing [l] to appear in a non-moraic position. Candidates (c) and (d) both contain geminate consonants that carry their own mora, which fatally violate DEP- $\mu$ . Though candidate (b) violates Ident-

IO[lateral] for surfacing as [r] rather than [l], it does not fatally violate any constraint and is thus deemed the most optimal output.

This current ranking system functions correctly as well if the input contains a geminate rather than a singleton consonant. In Table 8, candidate (a) fatally violates \*Non-moraic-l once again for allowing [l] in a non-moraic position and is the first eliminated. Both candidates (b) and (c) contain the liquid surfacing as [r], which violates Ident-IO[lateral]. Though these two do not fatally violate any constraints, candidate (c) comes out as the winner as it does not violate any constraints at all.

**Table 8** Native/Sino /talli/ ‘differently’

	/talli/ ‘differently’	*Non-moraic-l	DEP-μ	Ident-IO[lateral]
a.	[tali]	*!		
b.	[tari]			*
→ c.	[talli]			
d.	[tari]			*

The ranking system as it stands is very similar to Lee’s (2001) work, where she deems the mora faithfulness constraints as undominated in computing the outputs of Native Korean words. However, if we consider some Sino-Korean words, we quickly see that this current ranking falls apart. As seen in (2), liquids in word-initial onset position in Sino-Korean words surface as [n] or ∅. As previously stated, the deletion rule seems to happen after the nasalization of the liquid. However, for the sake of processing through all possibilities that contain an underlying liquid, I take this process into consideration in

the following constraint system. First, in Table 9, we see a failed attempt to account for the variation of the liquid when it appears in word-initial position. Candidate (a) is eliminated due to allowing [l] in the non-moraic onset position, fatally violating \*Non-moraic-l, and then candidates (b), (c), and (d) violate Ident-IO[lateral] for not containing a lateral in their outputs; this leaves us with three possible outputs despite the only correct output being candidate (c).

**Table 9 Native/Sino /lukak/ ‘pavilion’ – Wrong Prediction 1**

*	/lukak/ ‘pavilion’	*Non-moraic-l	DEP-μ	Ident-IO[lateral]
a.	[lugak]	*!		
→ b.	[rugak]			*
!! → c.	[nugak]			*
→ d.	[ugak]			*

To account for the nasalization and deletion possibilities, we introduce two new constraints to the system: \*SonOnset-σ1 and \*n+i-σ1. The first constraint, \*SonOnset-σ1, is a markedness constraint that states that onsets in the first syllable of a word cannot be too sonorous. With liquids being very sonorous, they are not allowed in word-initial onset position and move down in sonority hierarchy, which leads to the coronal nasal in Korean, [n]; this constraint can be compared to another markedness constraint, which is also sensitive to moraic structure (Smith 2002), as seen in (7) (Smith 2010, Smith 2002).

(7) \*ONSET/X-σ1 ‘Onsets in initial syllables do not have sonority level X’

This constraint is more specific to a given manner of articulation rather than relying on how sonorous something is as \*SonOnset-σ1 does. If we list \*ONSET/Liquid-σ1 as a

constraint in this system, for example, it would account for not allowing liquids specifically in the onset, but does not state why this is the case.

Sonority levels at syllable boundaries are very strict in Korean, which serves as evidence why \*SonOnset-σ1 works better as a constraint in the list of constraints within the system of this study. At syllable boundaries in the middle of words and often between morphemes, consonants move up or down a rank in the sonority scale in order to meet the strict requirements that Korean places on its consonants and how they can surface (Davis & Shin 1999). This is in accordance with the Syllable Contact Law, which states that “a syllable contact A\$B is the more preferred, the less the consonantal strength of the offset A and the greater the consonantal strength of the onset B” (Vennemann 1988). Davis & Shin (1999) restate this in terms of sonority, stating that “a syllable contact A\$B is the more preferred, the greater the sonority of the offset A and the less the sonority of the onset B” (Davis & Shin 1999). This law states that when two consonants come in contact at a syllable boundary, the first consonant that exists within the coda of the first syllable should not be less sonorous than the second consonant that exists within the onset of the second syllable. In other words, it prevents a rising sonority across syllable boundaries (Davis & Shin 1999).

(8)	/sip-njɔn/	[ɛimnjɔn]	'ten years'	(cf. /sip-ul/ > [ɛibul] 'ten-ACC')
	/kuk-min/	[kuɲmin]	'the nation'	(cf. /kuk-ɾ/ > [kuɡɾ] 'Korean language')
	/non-li/	[nolli]	'logic'	(cf. /non-mun/ > [nonmun] 'research paper')
	/jɔŋ-lak/	[jɔŋnak]	'downfall'	(cf. /teo-lak/ > [teorak] 'decline')
	/toŋ-tuŋ/	[toŋduŋ]	'equality'	
	/kam-ki/	[kamgi]	'flu'	
	/kalpi/	[kalbi]	'ribs'	
	/kal-maŋ/	[kalmaŋ]	'desire'	

In (8) (Davis & Shin 1999), we can see how Korean attends to this sonority issue when consonants come in contact. In the words /sip-njɔn/ 'ten years' and /kuk-min/ 'the nation', the consonant in the coda of the first syllable is an obstruent and the consonant in the onset of the second syllable is a nasal. This would create a rising sonority across the syllable boundary. The obstruent then nasalizes in order to account for this, resulting in [ɛimnjɔn] and [kuɲmin], respectively. We see a similar process with the words /non-li/ 'logic' and /jɔŋ-lak/ 'downfall', with the first syllable containing a nasal consonant in the coda and the second syllable containing a liquid in the onset. When the nasal is coronal, it will assimilate to the liquid, which is also coronal. This will result in the geminate [l], as seen in [nolli]<sup>8</sup>, which is in accordance with Vennemann's (1988)

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<sup>8</sup> There is evidence of the liquid assimilating to the coronal nasal [n] instead (Um 2003), but the reasoning behind that is beyond the scope of this study.

argument that the second consonant in a syllable contact situation is stronger (i.e., less sonorant).

However, if the nasal does not match the liquid in terms of place of articulation (i.e., coronal, given that there is no labial, velar, etc. liquid in Korean), the liquid will actually move down in sonority to avoid rising sonority, as seen in [jɤŋnak]. In the words /kam-ki/ ‘flu’ and /kalpi/ ‘ribs’, we see that the sonority of the consonant in the coda of the first syllable is higher than that in the onset of the second syllable; this creates no issues, as it is a falling sonority rather than a rising one, and results in [kamgi] and [kalbi], respectively.

- (9) /tɕap-lok/ [tɕamnok] ‘miscellany’ (cf. /tɕap-sɤ/ [tɕapɕɤ] ‘sundry writings’  
 /ki-lok/ [kirok] ‘write down’)
- /kɤɤk-li/ [kɤɤŋni] ‘separation’ (cf. /kan-kɤɤk/ > [kanŋɤɤk] ‘gap’  
 /kɤ-li/ > [kɤri] ‘street’)
- /pak-lam/ [paŋnam] ‘exhibition’ (cf. /pak-sik/ > [pakɕik]  
 ‘knowledgeable’  
 /ju-lam/ > [juram] ‘cruise’)

In (9) (Davis & Shin 1999), we see that when there is a bigger gap in sonority, both consonants must adjust in order to adhere to the Syllable Contact Law. The obstruents in the words /tɕap-lok/ ‘miscellany’, /kɤɤk-li/ ‘separation’, and /pak-lam/ ‘exhibition’ increase in sonority while the liquid decreases in sonority, both resulting in nasals, as seen in [tɕamnok], [kɤɤŋni], and [paŋnam], respectively.



In addition to \*SonOnset- $\sigma$ 1, I propose \*n+i- $\sigma$ 1<sup>9</sup>, another markedness constraint, which states that [n] is not allowed before a high front vowel. As stated above, this rule is more structured towards a process that happens to [n] itself rather than the liquid, but I consider it alongside \*SonOnset- $\sigma$ 1 to thoroughly display the different outputs of words with an underlying liquid.

In reference to each other, the ordering of these constraints does not matter. However, in order to account for the nasalization and deletion phenomena, they do need to dominate \*Non-moraic-l and DEP- $\mu$ . Additionally, we add another faithfulness constraint, Ident-IO[liquid], which is at the same ranking as Ident-IO[lateral]. This constraint, which states that the input and output must match in terms of liquidness, is more general than Ident-IO[lateral], but we must account for this due to non-liquid sounds being allowed in surface forms.

Additionally, this constraint becomes important later when accounting for how the liquid surfaces in words belonging to the Loanword sublexicon. However, this is not enough. In Table 10, we can see that adding these three new constraints into the ranking does indeed get rid of the possibility of a liquid surfacing with both candidate (a) and (b) fatally violating \*SonOnset- $\sigma$ 1, but it does not account for deletion. This then gives us candidate (c) and (d) as two possible outputs, which is incorrect.

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<sup>9</sup> i here represents a high front vowel or a glide, given that [j] in Korean is realized as part of a diphthong rather than a consonant in itself.

**Table 10 Native/Sino /lukak/ ‘pavilion’ – Wrong Prediction 2**

*	/lukak/ ‘pavilion’	*SonOnset- $\sigma 1$	*n+i- $\sigma 1$	*Non- moraic-l	DEP- $\mu$	Ident- IO[lateral]	Ident- IO[liquid]
a.	[lugak]	*!		*			
b.	[rugak]	*!				*	
!! → c.	[nugak]					*	*
→ d.	[ugak]					*	*

In order to arrive at the correct output, we must introduce MAX, a constraint that prevents deletion, into the ranking. This constraint is ranked higher than Ident-IO[lateral] but lower than  $\{ * \text{SonOnset-}\sigma 1, * \text{n+i-}\sigma 1 \}$ ; its order in reference to \*Non-moraic-l and DEP- $\mu$  does not affect the possible output.

**Table 11 Native/Sino /lukak/ ‘pavilion’**

	/lukak/ ‘pavilion’	*SonOnset- σ1	*n+i- σ1	*Non- moraic- l	DEP- μ	MAX	Ident- IO[lateral]	Ident- IO[liquid]
a.	[lugak]	*!		*				
b.	[ɾugak]	*!					*	
→ c.	[nugak]						*	*
d.	[ugak]					*!	*	*

In Table 11, candidate (a) and candidate (b) both have a liquid in the word-initial onset, fatally violating the newly high-ranking constraint \*SonOnset-σ1 due to liquids being too sonorous for that position. Candidate (d) deletes the liquid completely, which fatally violates MAX. This allows candidate (c) to emerge as the winner despite it violating Ident-IO[lateral] and Ident-IO[liquid] by having the liquid surface as a nasal.

**Table 12 Native/Sino /liju/ ‘reason’**

	/liju/ ‘reason’	*SonOnset- σ1	*n+i- σ1	*Non- moraic- l	DEP- μ	MAX	Ident- IO[lateral]	Ident- IO[liquid]
a.	[liju]	*!		*				
b.	[riju]	*!					*	
c.	[niju]		*!				*	*
→ d.	[iju]					*	*	*

This current system also works for instances where the liquid is deleted (albeit via the n-deletion rule). As seen in Table 12, both candidates (a) and (b) are eliminated due to fatally violating \*SonOnset-σ1 and candidate (c) is eliminated due to fatally violating \*n+i-σ1. Although candidate (d) violates MAX, Ident-IO[lateral], and Ident-IO[liquid], it is the most optimal output based on this current ranking system.

This gives us our final ranking for the Native/Sino sublexicon: { \*SonOnset-σ1 , \*n+i-σ1 } >> \*Non-moraic-l , DEP-μ , MAX >> Ident-IO[lateral] , Ident-IO[liquid]. This shows that the markedness constraints are the highest ranked constraints compared to the faithfulness constraints in the Native/Sino sublexicon.

### ***Loanword Sublexicon***

Now, if we take a look at words in the Loanword sublexicon, we can see how modifying the ranking of constraints can solve any issues in terms of how words that

belong to the loanword sublexicon surface. To start off, let us take a look at how liquids appear in the onset.

Regardless of whether the word starts with a lateral or rhotic in its original language, the surface form is [r] in the onset. If we take a loanword like ‘radio’ and place it in through the current ranking of constraints, we get a wrong prediction, as seen in Table 13. Candidate (a) and (b) contain a liquid in the word-initial onset and are immediately eliminated due to fatally violating \*SonOnset-σ1. Candidate (d) deletes the word-initial onset completely and is then eliminated next due to violating MAX, which leaves candidate (c) as the most optimal output, despite its output not matching the lateralness or even the liquidness of the input. This gives us a wrong predication, as candidate (b) should actually be the correct output.

**Table 13 Loanword ‘radio’ – Wrong Prediction 1**

*	‘radio’	*SonOnset- σ1	*n+i- σ1	*Non- moraic-l	DEP- μ	MAX	Ident- IO[lateral]	Ident- IO[liquid]
a.	[ladio]	*!		*			*	
!! b.	[radio]	*!						
→ c.	[nadio]						*	*
d.	[adio]					*!	*	*

However, as stated above, this ordering is not correct. In order to account for a liquid appearing in the onset,  $\{*\text{SonOnset-}\sigma_1, *\text{n+i-}\sigma_1\}$  needs to be demoted since, in these cases, liquids can in fact appear in the onset of the first syllable of a word, showing that they are not too sonorous for words in the Loanword sublexicon. In doing so, the new ranking has  $*\text{Non-moraic-l}$ ,  $\text{DEP-}\mu$ , and  $\text{MAX}$  as the new list of undominated constraints in the system.

In Table 14, we see that doing this alone does not fix the issue. Candidate (a) and candidate (d) are the first eliminated due to fatally violating the  $*\text{Non-moraic-l}$  and  $\text{MAX}$  by having [l] in a non-moraic position and deleting the underlying liquid, respectively. However, candidate (b), which has a liquid in the word-initial onset, is quickly taken out as well due to violating  $*\text{SonOnset-}\sigma_1$ , leaving us with candidate (c) again as the winner.

**Table 14 Loanword ‘radio’ – Wrong Prediction 2**

*	‘radio’	*Non-moraic-l	DEP- $\mu$	MAX	*SonOnset- $\sigma_1$	*n+i- $\sigma_1$	Ident-IO[lateral]	Ident-IO[liquid]
a.	[ladio]	*!			*		*	
!!	[radio]				*!			
b.								
→	[nadio]						*	*
c.								
d.	[adio]			*!			*	*

This shows us that the markedness constraints  $\{*\text{SonOnset-}\sigma_1, *\text{n+i-}\sigma_1\}$  should actually be ranked even lower, making it the lowest ranked set of constraints in the system.

However, now with this new ranking in place, we can see that Ident-IO[liquid] and Ident-IO[lateral] are no longer at the same level, as their ranking changes the outcome in some situations.

In order to account for the actual surface form matching in liquidness but not lateralness, we promote Ident-IO[liquid] as higher-ranking than Ident-IO[lateral]. In Table 15, candidate (a) contains [l] in a non-moraic position and fatally violates \*Non-moraic-l. Next, candidate (d) deletes the liquid entirely, which causes it to fatally violate MAX. Following behind them is candidate (c), which contains [n] as in the surface form instead of a liquid; this violates Ident-IO[liquid] based on the new ranking. In this case, if Ident-IO[lateral] were more highly ranked, the output would be the same. However, in Table 16, we see that this ranking matters. Though candidate (b) violates Ident-IO[lateral] and \*SonOnset-σ1, it is chosen as the most optimal output.

**Table 15** Loanword ‘radio’

	‘radio’	*Non-moraic-l	DEP- μ	MAX	Ident-IO[liquid]	Ident-IO[lateral]	*SonOnset-σ1	*n+i-σ1
a.	[ladio]	*!				*	*	
→	[radio]						*	
b.								
c.	[nadio]				*!	*		
d.	[adio]			*!	*	*		

If we test this system with a loanword that originally begins with a lateral opposed to a rhotic, we get the same results, as seen in Table 16. Candidate (a) fatally violates \*Non-moraic-l for having [l] in a non-moraic position, despite it being faithful to the original pronunciation of the loanword. Candidate (d) also fatally violates MAX by deleting the liquid entirely. This time, due to the new ordering restrictions between Ident-IO[liquid] and Ident-IO[lateral], candidate (c) is then eliminated; it has [n] in the output, which violates Ident-IO[liquid]. Though candidate (b) does not match the input in terms of lateralness, violating Ident-IO[lateral], it still comes out as the projected winner.

**Table 16 Loanword ‘lens’**

	‘lens’	*Non-moraic-l	DEP- $\mu$	MAX	Ident-IO[liquid]	Ident-IO[lateral]	*SonOnset- $\sigma$ 1	*n+i- $\sigma$ 1
a.	[lɛndzɯ]	*!					*	
→	[rɛndzɯ]					*	*	
b.								
c.	[nɛndzɯ]				*!	*		
d.	[ɛndzɯ]			*!	*	*		

Now that we can account for how liquids in words from the loanword group surface in the onset, we must examine how the liquid behaves word-medially. Loanwords that have laterals in the original language usually surface as a geminate lateral in the Korean pronunciation while rhotics appear as the flap. This evidence of how they treat these two



sounds in loanword adaptation serves as further evidence that the singleton and geminate liquid sound in Korean are indeed distinctive. If we consider the singleton and geminate outputs (including \*[rr] just for comparison) and put them in our current system, we find that there is an issue; in Table 17, with DEP- $\mu$ , we see that candidates (c) and (d) are eliminated due to adding a mora in the output. Prior to their elimination, candidate (a) is eliminated for having [l] in a non-moraic position, fatally violating \*Non-moraic-l. This leaves us with the wrong prediction, candidate (b).

**Table 17 Loanword ‘cola’ – Wrong Prediction**

*	‘cola’	*Non-moraic-l	DEP- $\mu$	MAX	Ident-IO[liquid]	Ident-IO[lateral]	*SonOnset- $\sigma$ l	*n+i- $\sigma$ l
a.	[k <sup>h</sup> ola]	*!						
→ b.	[k <sup>h</sup> ora]					*		
!! c.	[k <sup>h</sup> olla]		*!					
d.	[k <sup>h</sup> orra]		*!			*		

However, if we demote DEP- $\mu$  down two slots in order to account for the fact that Korean does actually allow the addition of morae in the output when trying to be faithful to a word-medial lateral sound, it allows the correct output to surface, as seen in Table 18. This new ranking still immediately eliminates candidate (a) for fatally violating \*Non-moraic-l but then eliminates candidates (b) and (d) for violating Ident-IO[lateral].

**Table 18 Loanword ‘cola’**

	‘cola’	*Non-moraic-l	MAX	Ident-IO[liquid]	Ident-IO[lateral]	DEP- $\mu$	*SonOnset- $\sigma_1$	*n+i- $\sigma_1$
a.	[k <sup>h</sup> ola]	*!						
b.	[k <sup>h</sup> ora]				*!			
→ c.	[k <sup>h</sup> olla]					*		
d.	[k <sup>h</sup> orra]				*!	*		

If we test this current ranking system on a word that has a rhotic in word-medial onset position, the output comes out correctly.

In Table 19, candidate (a) contains [l] in the onset (i.e., a non-moraic position), which violates \*Non-moraic-l and is eliminated. Second, candidate (c) is eliminated due to it not matching its input and output in terms of being lateral, violating Ident-IO[lateral]. Finally, candidate (d) adds a mora and is eliminated for violating DEP- $\mu$ . This leaves candidate (b) as the most optimal output.

**Table 19 Loanword ‘orange’**

	‘orange’	*Non-moraic-l	MAX	Ident-IO[liquid]	Ident-IO[lateral]	DEP-μ	*SonOnset-σl	*n+i-σl
a.	[olendzi]	*!			*			
→ b.	[orendzi]							
c.	[ollendzi]				*!	*		
d.	[orrendzi]					*!		

Now, let us take a look at how liquids are treated in the coda of words that belong to the Loanword sublexicon. Laterals in the input are adapted expectedly as [l] in the output, but rhotics in the input instead seem to delete.

- (10) [hot<sup>h</sup>ɛl]                      ‘hotel’  
       [sendal]                      ‘sandal’  
       [kugul]                      ‘google’  
       [p<sup>h</sup>ɛp<sup>h</sup>ɻ]                    ‘pepper’  
       [hadu]                        ‘hard’  
       [p<sup>h</sup>at<sup>h</sup>uɳɻ]                  ‘partner’

In (10) (Heo & Lee 2005), we see that in the words ‘hotel’, ‘sandal’, and ‘google’, the lateral is faithfully adapted into Korean in the coda position, resulting in [hot<sup>h</sup>ɛl], [sendal], and [kugul], respectively. However, with the word ‘pepper’, ‘hard’, and

‘partner’, the rhotic is possibly deleted, resulting in [p<sup>h</sup>ɛp<sup>h</sup>ʌ], [hadu], and [p<sup>h</sup>at<sup>h</sup>uɳɳ], respectively.

This, however, does not happen everywhere. Lee (2001) points out that a vowel and rhotic sequence is realized as a back vowel when preceded by a front vowel, as in [t<sup>h</sup>aɪɳ] ‘tire’. She states that it is not clear whether the rhotic sound deletes or if it is simply not present in the input. The vocalic nature of the rhotic in coda position in English, especially in British English, may point to the rhotic not being there to begin with. Due to the uncertainty of this, the rhotic in coda position and how it surfaces in Korean seems to be beyond the scope of this study and will not be considered in the analysis.

**Table 20 Loanword ‘hotel’**

	‘hotel’	*Non-moraic-l	MAX	Ident-IO[liquid]	Ident-IO[lateral]	DEP-μ	*SonOnset-σ1	*n+i-σ1
→								
a.	[hot <sup>h</sup> ɛl]							
b.	[hot <sup>h</sup> ɛɾ]				*!			

In Table 20, we see that candidate (b) is eliminated due to it not staying faithful to the lateral in the input, fatally violating Ident-IO[lateral]. This leaves candidate (a) as the winner.

This gives us the final ranking for the Loanword group: \*Non-moraic-l , MAX >> Ident-IO[liquid] >> Ident-IO[lateral] >> DEP-μ >> { \*SonOnset-σ1 , \*n+i-σ1 }. This

shows that faithfulness constraints are ranked higher in comparison to markedness constraints in words from the Loanword sublexicon.

***Loanwords with Multiple Outputs in Free Variation***

Now that we have established that there are two sets of rankings based on the etymology of a given word, we must look at outliers within the system. There are a group of loanwords in Korean that seemingly have two possible pronunciations that are in free variation and have been attested within the same speaker (Lee 2001). These words have optionally adapted intervocalic [l] as [ɾ].

(11) Intervocalic [l] Adaptation in Free Variation (Lee 2001)

	(I)	(II)
‘kilo’	[k <sup>h</sup> illo]	[k <sup>h</sup> iro]
‘jelly’	[tɕɛlli]	[tɕɛri]
‘melon’	[mɛllon]	[mɛron]
‘blouse’	[puɽlausu]	[puɽausu]
‘chocolate’	[tɕ <sup>h</sup> ok <sup>h</sup> olɽet]	[tɕ <sup>h</sup> ok <sup>h</sup> oɽet]

In (11), we see how the words ‘kilo’, ‘jelly’, and ‘melon’ have two ways to pronounce them each.

In the first group, we have [k<sup>h</sup>illo], [tɕɛlli], and [mɛllon], respectively, which undergo gemination in order to stay faithful to the lateral in the word from English. In the second group, we have the intervocalic lateral surfacing as a singleton flap, as in [k<sup>h</sup>iro], [tɕɛri], and [mɛron], respectively. Though these words have two pronunciations that are in free variation, there are other cases where this is not allowed. For example, the word

‘cola’ and ‘dollar’ may only surface as [k<sup>h</sup>olla] and [tallɿ], respectively, and not \*[k<sup>h</sup>ora] and \*[tarɿ], respectively. “This contrast suggests a division within loanwords, whereby one group has one coherent ranking of constraints, and the other is subject to two co-existing ranking systems” (Lee 2001).

As Lee (2001) found in her study, the two possible outputs in (11) can be predicted given that the input is the same; the surface forms in (I) are governed by constraint rankings in the Loanword sublexicon whereas the surface forms in (II) are governed by the constraint rankings in the Native/Sino sublexicon. If we take the word ‘kilo’ and put it through these systems, we can see this happen.

**Table 21 Native/Sino ‘kilo’**

	‘kilo’	*SonOnset- σ1	*n+i- σ1	*Non- moraiic-l	DEP- μ	MAX	Ident- IO[lateral]	Ident- IO[liquid]
a.	[k <sup>h</sup> ilo]			*!				
→ b.	[k <sup>h</sup> iro]						*	
c.	[k <sup>h</sup> illo]				*!			
d.	[k <sup>h</sup> irro]				*!		*	

In Table 21, candidate (a) is the first eliminated by allowing [l] to appear in a non-moraic position, fatally violating \*Non-moraic-l. Candidates (c) and (d) both add an additional mora to the output in making them geminates, which fatally violates DEP-μ. Despite it not being faithful to the lateral feature in the input, the most optimal output based on this ranking is candidate (b).

**Table 22 Loanword 'kilo'**

	'kilo'	*Non-moraic-l	MAX	Ident-IO[liquid]	Ident-IO[lateral]	DEP- $\mu$	*SonOnset- $\sigma_1$	*n+i- $\sigma_1$
a.	[k <sup>h</sup> ilo]	*!						
b.	[k <sup>h</sup> iro]				*!			
→ c.	[k <sup>h</sup> illo]					*		
d.	[k <sup>h</sup> irro]				*!	*		

In Table 22, the same violations happen as in Table 21 since the input is the same, but due to the ranking of the constraints, the output is different. Candidate (a) is the first eliminated by allowing [l] in onset position, violating \*Non-moraic-l. Candidates (b) and (d) fatally violate Ident-IO[lateral] by not being faithful to the lateral in the input. This leaves candidate (c) as the most optimal output.

## CHAPTER FOUR

### Discussion

I have employed an OT analysis to look at how words that contain a liquid in Korean can surface in different ways. In the Native/Sino sublexicon, we found that the markedness constraints  $\{*\text{SonOnset-}\sigma 1, *\text{n+i-}\sigma 1\}$  were the undominated constraints in the system. However, in the Loanword sublexicon, we found that these two constraints were demoted and became the lowest ranked constraints in the system. This showed that in the Loanword group, faithfulness constraints were undominated.

(12) Native/Sino vs. Loanword

a. Native/Sino:  $\{*\text{SonOnset-}\sigma 1, *\text{n+i-}\sigma 1\} \gg * \text{Non-moraic-l}, \text{DEP-}\mu, \text{MAX} \gg \text{Ident-IO[lateral]}, \text{Ident-IO[liquid]}$ .

b. Loanword:  $* \text{Non-moraic-l}, \text{MAX} \gg \text{Ident-IO[liquid]} \gg \text{Ident-IO[lateral]} \gg \text{DEP-}\mu \gg \{*\text{SonOnset-}\sigma 1, *\text{n+i-}\sigma 1\}$ .

Summarized above in (12), we see the final constraint rankings for the Native/Sino sublexicon and Loanword sublexicon. Other than the markedness constraints  $\{*\text{SonOnset-}\sigma 1, *\text{n+i-}\sigma 1\}$  being the highest ranked constraints in the Native/Sino sublexicon and the lowest ranked constraints in the Loanword sublexicon, we also find other differences among the faithfulness constraints.



In accordance with loanwords staying faithful to their liquid status in word-initial onset and to their lateral status in intervocalic positions, Ident-IO[liquid] and Ident-IO[lateral] get promoted in that order within the ranking system of the Loanword sublexicon. Additionally, to account for the additional mora that the geminate [l] in Korean adds when trying to stay faithful to intervocalic laterals from the input in loanwords, DEP- $\mu$  is downgraded in the ranking of the Loanword sublexicon.

This study has also explored some data that shows a given loanword may have two variations in pronunciation, which can be explained through showing how a speaker may process a word, arguing for two strata within the language (Lee 2001). This division is not clear-cut, however; words that are less nativized follow the ranking in the Loanword sublexicon and show no possibility of variation whereas words like ‘kilo’ and ‘melon’ that have become more nativized are able to overlap and can become subject to the Native/Sino ranking.

### **Conclusion**

In this study, I have examined the various alternations of the Korean liquid. We found that in word-initial onset position, an underlying liquid could appear as [n], [r], or  $\emptyset$ . In word-medial onset position/intervocalically, it could appear as [ll] and [r]. In coda position, it could only appear as [l]. Through looking at the etymological background of words in the Korean language and the fact that certain loanwords have two possible forms in free variation, I found it necessary to split the lexicon into two sublexicons in order to analyze this problem.

The first sublexicon, Native/Sino, included words that were native to the Korean language and word that were borrowed in from Chinese. The second sublexicon, Loanword, included words that were borrowed in from other languages, such as English. To account for the alternations, I employed an OT analysis with a list of constraints that are ranked different depending on which sublexicon a given word belongs to. The results were that the Native/Sino sublexicon has markedness constraints as the highest ranked constraints in the ranking whereas the Loanword sublexicon favors faithfulness constraints.

This study also noted that some words have two possible pronunciations that are in free variation and that this can be accounted for by putting the same input into the varying constraint rankings in each sublexicon, resulting in the two forms; this suggests that in these words where two variations are possible, one is more nativized and less marked whereas the other is more faithful to the input pronunciation. Furthermore, this evidence argues that there are indeed two distinct lexical strata in the Korean lexicon that function separately in the phonology.

### **Final Comments and Suggestions for Future Research**

In the future, researchers may want to see how this possible distribution and ranking of constraints fits in with the rest of the language and the alternations of other consonants. Additionally, one may inquire further about how the English [ɹ] can be analyzed when transferred over to Korean, whether it should be analyzed as non-consonantal in congruency with the realization after adaption into Korean or if we should treat it as deleting.

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