

Neutralization and Consonant Cluster Simplification as Coda Licensing in Korean

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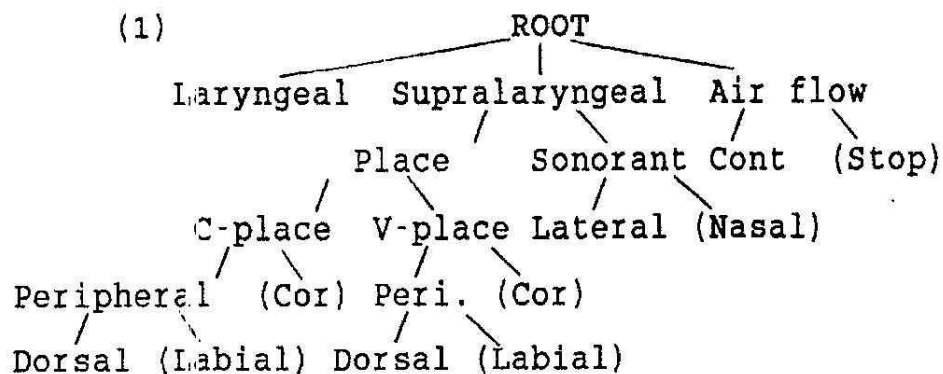
1. Introduction

I, in this paper, examine sonority and place of articulation licensing on the syllabification of the coda in Korean. I argue that (i) Neutralization and Consonant Cluster Simplification in Korean now can be accounted for by the coda syllabification, which is determined structurally, as opposed to a set of phonological rules, (ii) both sonority and place of articulation licensing are important in determining the syllabification of the coda, (iii) the priority among licensing features can be parameterized to explain some dialectal variation.

I begin by presenting background and then turn to an examination of coda condition in terms of sonorant and place of articulation.

2. Theoretical Background

It is necessary to define a segment in terms of its internal structure in order to make the argument that Coda Licensing is structurally determined. The arrangement of features that I assume grows out of work on the geometry of phonological features, following Clements (1985, 1990), Sagey (1986), and Rice (1992). The particular representation of segment structure is given in (1).



Comments on several aspects of this structure are in order. Major constituents such as Laryngeal, Air flow, Supralaryngeal, Place and Sonorant define sets of features that function together as units with respect to phonological processes such as assimilation and

delinking. The most important aspect of the organization of the segment for this paper is, as argued by Rice (1992), that it contains the major constituents of Place and Sonorant. Sonorant, as a major constituent, dominated Lateral and Nasal. In order to account for the interaction between consonants and vowels, I adopted Clements's unified feature system. As for Palatalization, consonants assimilate to adjacent V-place [cor] feature. Hume (1991) argues that a palatal consonant in Korean is specified for V-place [cor] to account for the fact that an anterior consonant is transparent to Umlaut whereas a palatal consonant is opaque. Korean loanword phonology also supports such a unified feature system (Oh 1992a).

I further assume that representations are not fully specified, but that unmarked content features are absent from underlying representation. Many researchers claim that coronal consonants lack a coronal node in underlying representation (Iverson and Kim (1987), Avery and Rice (1989), Davis (1990)). A segment with a bare C-place node will be interpreted as a coronal. A lateral consonant has the feature Lateral present under the Sonorant node, with Nasal being absent. A segment with a bare Sonorant node will be interpreted as a nasal. See also Iverson and Sohn (1992) for a similar perspective. The unmarked features are filled in by later default rules.

I explore, in this paper, in some detail how sonorant licensing and place licensing are important in determining the coda syllabification. By doing so, the independently motivated unspecified hierarchical structure will also be employed to account for the coda syllabification.

3. Coda Licensing

3.1 Neutralization in Korean as Coda Licensing

Many researchers observed that the coda system is typically a subset of the onset system (Ito 1986, Prince 1984, Goldsmith 1990); the coda has only a subset of the possibilities of contrast of the onset. For example, in Korean three series of obstruents: i) lax; ii) aspirated and iii) tense contrast in the onset. However, their contrast is lost in the phonetic coda position as shown in (2).

(2)	/ip+to/	[ipt'o]	'mouth also'
	/ip ^h +to/	[ipt'o]	'leaf also'
	/pak+to/	[pakt'o]	'gourd also'

/pak'+to/ [pakt'ol] 'outside also'

Three way contrasted obstruents are neutralized into their homorganic lax stops in the coda. Interestingly enough, the coronal obstruents are turned into [t] regardless of their manner as exemplified in (3).

- (3) a. nat --> [nat] 'a grain'
 b. nas --> [nat] 'a scythe'
 c. nac --> [nat] 'day'
 d. nat^h --> [nat] 'a piece'
 e. nah --> [nat] 'to give birth to'
 f. nac^h --> [nat] 'a face'
 g. nas' --> [nat] 'was born'

This coda neutralization has been treated as two separate processes within the framework of standard generative phonology.

(4) Chung (1980:70)

a. T-rule

C +ant
 [+cor] --> [-cont] / _____ \$
 (Coronal obstruents become l syllable-finally.)

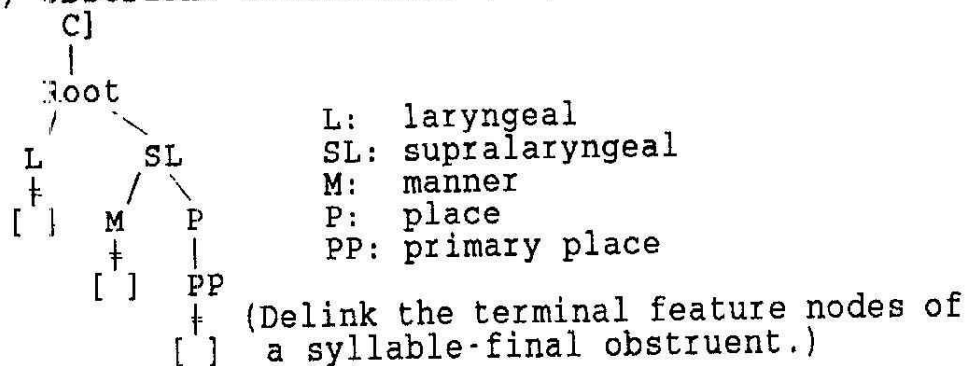
b. Final C-laxing

C
 [+tns] }
 C } --> [+lax] / _____ \$
 [+asp] }

('Tense and aspirated obstruents become lax syllable-finally.)

However, as noticed by Kim (1987), this analysis does not capture the fact that they are in fact a single process. It provides no explanation for why coronal obstruents, regardless of anteriority or continuity, are neutralized into [t]. It also fails to account for the reason why tense and aspirated obstruents are merged with lax obstruents instead of merging into either tense or aspirated counterparts. Furthermore, the segment /h/ in this analysis should be analyzed as a coronal segment somehow, since the syllable-final /h/ is realized as [t]. Employing the theory of underspecified, hierarchical feature representation, Kim (1987) proposes a single phonological rule in (5), which interprets the obstruent neutralization as delinking all terminal features of the syllable-final obstruent.

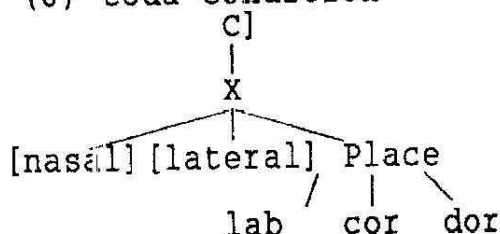
(5) Obstruent Neutralization (Kim 1987:136)



The rule in (5) will delink not only the laryngeal features, but also all the manner and place features except for the primary place nodes. As a result, the lax stops [p], [t], and [k] surface in the coda after redundancy rules supply the relevant default features.¹

However, the rule in (5) is not compatible with the basic tenet of hierarchical feature geometry that rules operate on constituents (Clements 1985). The deleted terminal features do not form a unit in phonological representation on their own. Kim (1992), thus, proposed a coda condition (6) from which she argues the obstruent neutralization is derived.

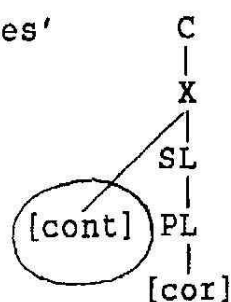
(6) Coda Condition



The coda condition (6) functions as a template and the unmatched features are deleted by the Stray Erasure. For instance, /os/ is realized as [ot] after deleting the [cont] node in /s/, since the [cont] node is not allowed by the coda condition (6).

¹Following Kim (1987), I assume that /h/ will be represented only with the laryngeal node specified, without supralaryngeal node. On the other hand, the aspirated alveolar stop /t^h/ will have the supralaryngeal node as well as the manner and place nodes whose features are maximally underspecified, in addition to the laryngeal node.

(7) /os/ --> [ot] 'clothes'



Notice that the representation of (7) assumes the specification of coronal node in underlying representation.

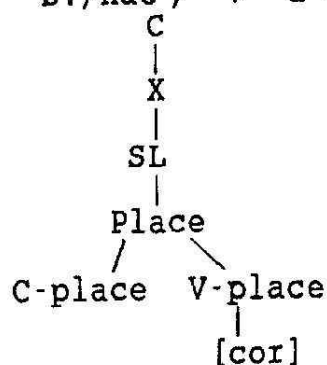
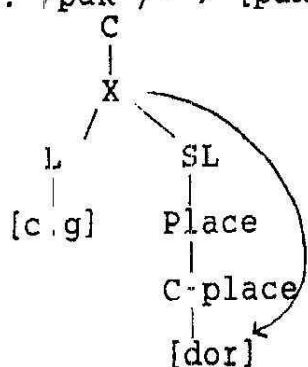
I propose to analyze coda neutralization in terms of the reduced licensing possibilities of the coda position

(8) Coda Condition in Korean (Oh 1992b)

The coda in Korean licenses sonorant and C-place specification.

That is to say, the coda, as a secondary licenser, licenses only the specification of sonorant and C-place nodes, which accounts for why only [p, t, k, m, n, ŋ, l] among 19 consonants appear in the coda. Given the phonological representation of the segment structure in (1) coupled with the assumption that coronals lack a specified daughter of the place node, the asymmetric distribution of coronals as shown in (2) and (3) can be explained. For example, the examples in (2) and (3) are explained by the coda licensing by which only sonorant and place node specifications are licensed and unlicensed features do not surface.

(9) a. /pak/ --> [pak] 'outside' b. /nac^h/ --> 'a face'



According to the coda licensing in (8), the [constricted glottis] feature in (9a) is not licensed. The syllable

coda consonant in (9b) has no feature to be licensed by (8). Thus, [k] and [t] surface, respectively, after the later redundancy rules.² This analysis is preferred to the generative rule analysis given in (4) which has failed to deal with /h/ in the coda since /h/ is neither a coronal sound nor has its lax counterpart. The segment /h/ in the coda in (3e) has no feature to be licensed by the coda licensing (8) and is realized as [t] after the redundancy rules fill in all the unspecified features. This approach is also more descriptively adequate than any other analyses proposed so far (e.g., (5)) in that it correctly predicts that as long as the coda shares some features prohibited by themselves by coda-licensing with the onset, i.e., as a geminate, the coda can be licensed. The following example illustrates this point.

(10) /mit + so/ --> [misso] 'believe + ending'

According to any traditional neutralization rule, [s] can never appear in the coda. On the other hand, according to autosegmental licensing proposed by Goldsmith (1990), a given autosegment may associate to a position without being licensed by that position, just in case that the autosegment is licensed by some other licenser (e.g., onset). Thus, the coda licensing in (8) correctly predicts that the form in (10) is well-formed: the [continuant] feature in the coda after continuant assimilation rule is not licensed by the coda but by the onset in (10). In other words, coda licensing analysis is preferred to the previous rule analyses on Neutralization in that the former provides a more adequate explanation as well as an adequate description.

Given that a consonant can be syllabified into a rhyme so long as it is licensed either in terms of place or sonority, a question arises concerning how different is the coda licensing in (8) from the coda condition (6) proposed by Kim (1992). The advantage of this approach over the coda condition in (6) proposed by Kim (1992) will be discussed with regard to consonant cluster simplification in next section.

3.2 Consonant Cluster Simplification as Coda Licensing

This section aims to show that unspecification of

²Palatal consonants maintain their unmarked status along with other coronal consonants in that they lack primary place specification underlyingly.

place of articulation for coronals and autosegmental licensing illuminate the complex phenomenon of consonant cluster simplification (henceforth CCS) in Korean. The data in (11) illustrate the so-called CCS phenomenon.

(11) Standard/Kyengsang	Standard	Kyengsang	Optional	
example	p(s)	(l)k	l(k)	lk
	k(s)	(l)p	l(p)	lp
	n(c)	(l)p ^h	l(p ^h)	lp ^h
	l(t ^h)	(l)m	(l)m	lm
	l(h)			
	n(h)			

The segments without parentheses in (11) surface. A number of previous analyses have been focused on how to formulate a rule, stipulating which segment is deleted.

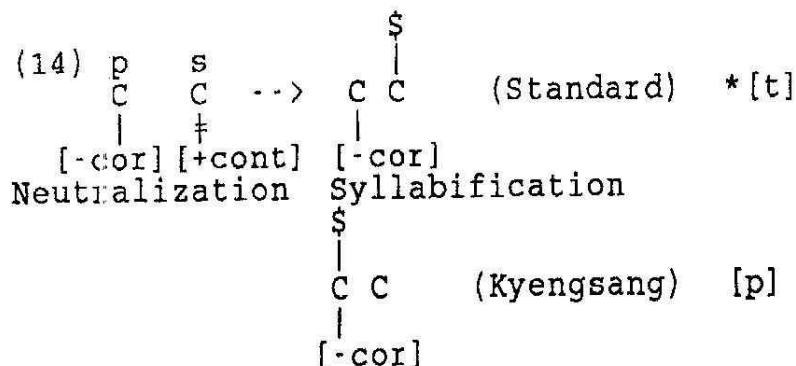
- (12) a. $[+cons] \rightarrow \emptyset / \left\{ \begin{array}{l} [+cons] \quad ([+cor]) \\ \text{_____} \quad [+cons] \end{array} \right\} \left\{ \begin{array}{l} [+cons] \\ l_w \end{array} \right\}$
Lee (1976)
- b. i. $[-cont] > [+lateral]$
-cor
- ii. $C_1 > C_2$ Ahn (1985)
- c. i. $\left\{ \begin{array}{l} [+nas] \\ ([-cont, -cor]) \end{array} \right\} > [+lateral]$
- ii. Elsewhere $C_1 > C_2$ Ahn (1989)

The rules (12a) does not capture the fact that CCS takes place in the coda since it stipulates {C,#} without any prosodic motivation (cf. Kahn 1976). The rule in (12b) says that if a coda consonant cluster consists of [-cont, -cor] and [lateral], [-cont, -cor] is retained; elsewhere, the first consonant is retained. However, this rule only deals with the Standard dialect but fails to account for the data in the Kyengsang dialect. To remedy this defect, Ahn (1989) proposes the rule in (12c). It expresses that if a consonant cluster contains an l and the other segment is a nasal, the nasal is realized but if the other segment is [-cont, -cor], such as /p, p^h, k/, it is optionally realized; otherwise, the first segment survives. That analysis, though seemingly descriptively sufficient, is not at all explanatory. Those rules in (12) try to capture the fact that coronal obstruents are deleted regardless of their position. However, as noticed by Cho (1990), these rules in (12) do not illuminate the reason why non-coronal consonants should take precedence over coronal consonants or why laterals should exhibit a different behavior from other consonants. Whitman (1985), on the other hand, is on the

right track associating the phenomenon with syllabification. Furthermore, he observes that those clusters where the second member gets reduced are exactly those cases where it undergoes Neutralization independently. Then he accounts for dialectal variations of CCS by two rules, Neutralization and different directionality of Syllabification as in (13).

- (13) Syllabification (Whitman 1985)
 a. from right to left (Standard)
 b. from left to right (Kyengsang)

However, the different directionality setting of syllabification would predict the wrong surface realization as illustrated in (14).



Thus, he restates Stray Erasure Convention to ensure that the features of the first segment always link to the second after Neutralization.

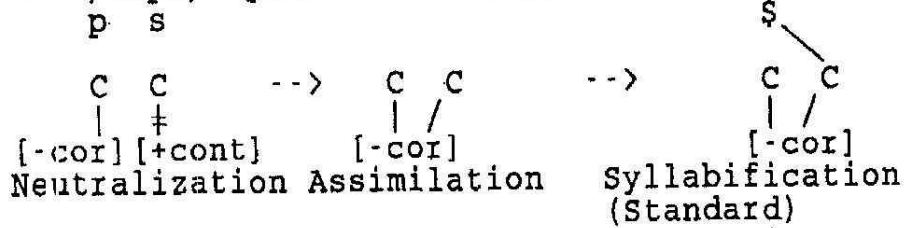
On the other hand, Cho (1990) basically adopts Whitman's (1985) analysis but she replaces his stipulation to link the features of the first segment to the second by parameters for Korean Assimilation as in (15).

- (15) Parameters for Korean Assimilation
 (Cho 1990:109-10)
 Site: any node
 Target Specifications: target<trigger/ coda-target
 Locality Conditions: skeletal adjacency
 Rule Order: spread before default
 Directionality: 0

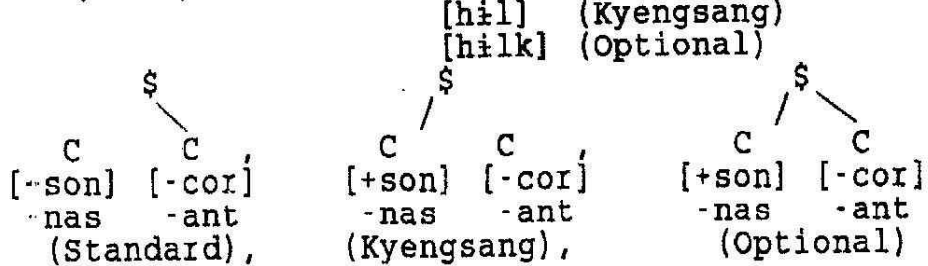
The derivations in (16) illustrate how her analysis goes.

(16) (Cho 1990:111)

a /kaps/ 'price' --> [kap]

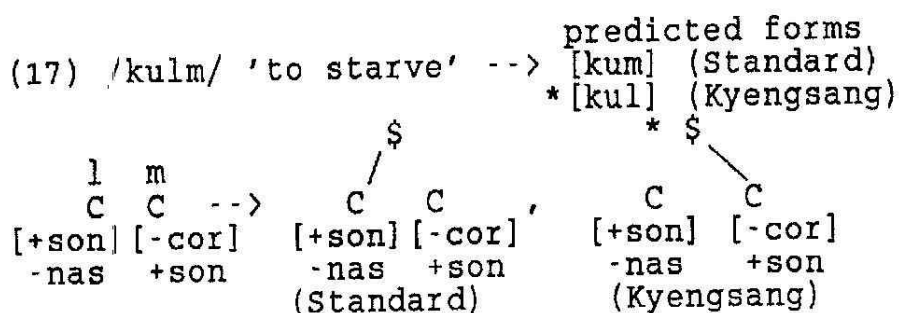


b. /hilk/ 'soil' --> [hik]



In (16a), the triggering segment spreads its [-cor] place feature onto the coda target segment since null place specification of the neutralized coda segment is the subset of any place specification of the triggering segment. On the other hand, assimilation cannot take place in (16b) since a set of features of the target segment is not a subset of the triggering segment. Then the different directional syllabification gives rise to dialectal variation.

However, I reject both the directionality setting for syllabification and assimilation altogether, since the different setting of syllabification in directionality makes no difference between the phonology of the Standard and Kyengsang dialects and assimilation only functions to get rid of any difficulties which the different directionality of syllabification may cause. Furthermore, both Whitman and Cho fail to account for the surface form of the sequence /lm/. According to them, we would predict the forms in (17), since the sequence /lm/ is predicted to be dealt with in the same way as the sequence /lk/.



But /m/ in fact survives in both dialects.

On the other hand, Kim (1992) accounts for CCS employing the same mechanisms that were used in coda neutralization: the Coda Condition (6) and the Stray Erasure. In the cases of /ps/ and /ks/, the coda condition cannot allow the fricative sounds and [p] and [k] surface, respectively. In addition to the coda condition (6), she is forced to resort to the Sonority Hierarchy Principle to get the less sonorant sounds, [k] and [m] from /lk/ and /lm/, respectively, since both consonants of each cluster are allowed as a coda according to her coda condition. However, her coda condition, in fact, functions as a template and the unallowed features are pruned by the Stray Erasure. Then, in such clusters as /ps, ks, nc, lt^h/, her coda condition predicts that [t] could surface in the same way that /s, c, t^h/ surface as [t] in the coda. Thus I suggest that place licensing as well as sonorant licensing is needed to derive the correct output. In light of previous discussions on CCS analyses, the shortcomings of Kim's (1992) analysis are clear. First, she does not deal with the complete set of consonant clusters, confining her data to the noun stems. Second, she analyzes the cluster /lp/ in /yætəlp/ as lexical idiosyncrasy, but the cluster, in fact, has been restructured as /l/ in the noun stem as opposed to in verb stems.³ Third, it cannot account for the dialectal variations attested. Fourth, her coda condition cannot look at segment structure relationally and is forced to define CCS in non-structural terms (e.g., Sonority Hierarchy Principle).

³One argument in favor of /l/ instead of /lp/ in /y t lp/ comes from tensification which tensifies obstruents after an obstruent.

i. /t^hop + to/ [t^hopt'o] 'saw also'
 /palp + tolok/ [palt'orok] or [papt'rok] 'to tread on'
 ii. /yætəp + to/ [yætəldo] * [yædəlt'o] 'eight also'

That is to say, despite the correct observation that Neutralization and CCS result from the same output condition, Kim's (1992) coda condition (6) fails to deal with the complete set of CCS.

Oh (1992b) argues that constraints on codas can account for CCS in a simple way by reference to the structure that is independently motivated: sonorant and place coda licensing. I claimed, in previous section, that coda syllabification is responsible for so-called Coda Neutralization by way of sonorant and place licensing following Goldsmith's (1990) idea that prosodic structure is related to segmental structure in terms of autosegmental licensing. With the help of Oh's (1992b) analysis of CCS in terms of autosegmental licensing, I propose that CCS can be accounted for by the same mechanism that was used in the account for Coda Neutralization. In other words, CCS and Neutralization do not result from separate phonological rules but from the same coda syllabification. That explains why these apparently different processes share the same environment: the coda. However, the analysis taken here is different from Oh's (1992b) analysis. That is, given that Coda Neutralization is taken care of by the coda licensing (8), CCS is the direct consequence of coda syllabification instead of being ordered after Coda Neutralization. The point will be clarified in the following discussion.

There are two different kinds of syllabification in Korean: Underlying Syllabification and Phonetic Syllabification. A most prominent difference lies in the constraints imposed on the coda. The phonetic coda allows at most one consonant and licenses sonorants or unreleased obstruents, while underlying syllabification allows up to two consonants and has no restriction on feature combination. As discussed above, the Korean phonetic coda licenses the presence of place and sonorant specification. This Korean phonetic coda licensing is made possible by underspecification. This explains why non-coronal consonants should take precedence over coronal segments regardless of their position. I reordered the data in (11) according to the application of the coda licensing in (18).

(18) Standard	Standard	Kyengsang	Kyengsang
p(s)	n(c)	p(s)	l(k)
k(s)	l(t ^h)	k(s)	l(p)
(l)k	l(h)	(l)m	l(p ^h)
(l)p	n(h)		n(c)
(l)p ^h			l(t ^h)

(l)m

l(h)
n(h)

The first column in (18) is accounted for by the coda condition which licenses the place feature, while the second column by the coda condition licensing the sonorant feature.

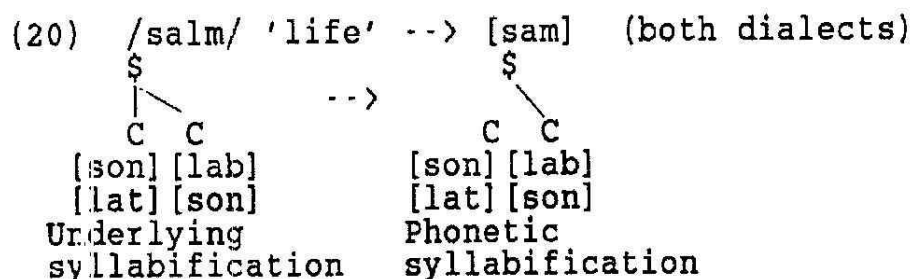
Then how can we account for the difference between two dialects? I assume that a different preference is assigned between the licensing features of the coda condition: in the Standard dialect, the place licensing takes precedence over the sonorant licensing, while in the Kyengsang dialect, the sonorant licensing takes precedence over the place licensing. The derivations in (19) will illustrate these points.

- (19) a. /kaps/ 'price' --> [kap]
- | | |
|--|--|
| $\begin{array}{c} \$ \\ \swarrow \quad \searrow \\ C \quad C \\ \quad \\ [lab] [cont] \\ \text{Underlying} \\ \text{syllabification} \end{array}$ | $\begin{array}{c} \$ \\ \\ C \quad C \\ \quad \\ [lab] [cont] \\ \text{Phonetic} \\ \text{syllabification:} \\ \text{Coda condition} \end{array}$ |
| <p>b. /hilk/ 'soil' --></p> $\begin{array}{c} \$ \\ \swarrow \quad \searrow \\ C \quad C \\ \quad \\ [son] [dor] \\ [lat] \\ \text{Underlying} \\ \text{syllabification} \end{array}$ | $\begin{array}{c} \$ \\ \swarrow \quad \searrow \\ C \quad C \\ \quad \\ [son] [dor] \\ [lat] \\ \text{Phonetic syllabification:} \\ \text{Coda licensing puts a} \\ \text{priority on the place} \\ \text{licensing} \end{array}$ |
| <p>(Standard)</p> | <p>(Standard)</p> |
| <p>(Kyengsang)</p> | $\begin{array}{c} \$ \\ \\ C \quad C \\ \quad \\ [son] [dor] \\ [lat] \\ \text{Phonetic syllabification:} \\ \text{Coda licensing puts a} \\ \text{priority on the sonorant} \\ \text{licensing} \end{array}$ |

The final /s/ in (19a) is specified for the continuant feature but the feature cannot be licensed by the coda. Thus coda licensing alone, to the exclusion of Coda

Neutralization, is enough for syllabifying /p/ as a coda. As for (19b), the final two consonants are both specified for the features which can be licensed. In the Standard dialect, Coda condition puts a priority on the place feature and /k/ in (19b) is syllabified as a coda. On the other hand, in the Kyongsang dialect the priority is given to the sonorant feature and /l/ is syllabified as a coda.

This analysis, furthermore, derives the right surface form in the sequence /lm/, which Cho (1990) and Whitman (1985) have failed to deal with.



Both dialects get the same surface form by a different reason. In the Standard dialect, the coda licensing chooses the second consonants as the coda since it has the place specification. On the other hand, in the Kyongsang dialect, both consonants have the sonorant specification and both can be syllabified as a coda but the phonetic syllabification only allows a single coda consonant. Then next preference is given to the place specification and [m] is chosen as a coda.

This account furthermore provides a systematic explanation concerning why the optional syllabification is not available when the apparent Coda Neutralization is involved. Optional syllabification is possible when the phonetic coda constraint that allows at most one coda consonant is loosened. Then the coda licensing can have a chance to license both consonants as long as they have either the place or the sonorant feature. However, the clusters containing final /s, c, t^h, h/ (i.e. the first column of (11)) which lack both the place and sonorant specification, never get syllabified since the final consonants have no feature to be licensed.

To summarize, the phonetic coda licensing is enough to guarantee the surface realization of the coda consonant cluster. This account fully makes use of syllabification and directly captures the fact that CCS is eventually motivated by phonetic syllabification as opposed to previous rule analyses.

4. Conclusion

Many phonological phenomena gained their due explanation with the development of the internal hierarchical structure of a segment and underspecification theory. For instance, the asymmetric behavior with respect to assimilation between coronal consonants and the other placed consonants can be explained by the underspecified hierarchical phonological representation: a coronal obstruent totally assimilates to the following place of articulation, while a labial or dorsal consonant never assimilates to the following coronal place of articulation due to the lack of place specification in a coronal consonant.

In this paper I made a claim that syllabification also cannot be truly understood independently of the hierarchical structure of the segment. Both Neutralization and Consonant Cluster Simplification in Korean take place in the coda and they have been dealt with by separate phonological rules. However, I argued that coda syllabification underlies these processes in Korean by the coda licensing that licenses the place and sonorant specification but nothing else. Furthermore, the dialectal variation is also accounted for by parameterizing the licensing features. By doing so, it has been shown that the sonorant as well as the place node is needed as a major constituent in the structure of the segment. The more study needs to be done whether the sonorant and place specifications also play a key role in rhymal syllabification in any other languages.

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