Suffix-centered allomorphy in Korean[*]

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Kim, Gyung-Ran. 2006. Suffix-centered allomorphy in Korean. *Studies in Phonetics, Phonology and Morphology*. 12.2. 265-281. This paper is to show that problems related with suffix allomorph selection cannot be solved at one swoop and to suggest that the job be divided between morphology and phonology in sequential steps. Drawing on the fact that neither rule-based analyses positing suffix-initial /ɨ/ for alternating suffixes in the underlying representation nor OT-based ones positing both allomorphs in the input in adherence to Richness of the Base cannot describe suffix allomorph selection adequately, the study allows only one morph in the input. The inconsistent behavior of /l/-final stems in taking C- and V-initial suffixes and the existence of non-alternating suffixes composed of similar segments lead to the argument that allomorph selection is suffix-centered, not stem-centered. It is proposed that each allomorph of alternating suffixes is subcategorized with respect to the features of its preceding stem-final segment. Particularly, the revival of the [vocalic] feature is instrumental to the explanation of the inconsistent behavior of the stem-final /l/, which forms a natural class of [+vocalic] with vowels and liquid /l/ and forms another one of [+consonantal] with all consonants. **(Yeungnam University)**

1. Introduction

The purpose of the present study is to show that problems related with suffix allomorph selection cannot be solved at one swoop and to suggest that the job be divided between morphology and phonology in sequential steps. There is neither an insertion nor a deletion of the suffix-initial vowel /ɨ/ in Korean. Rather, the selection of allomorphs showing a C/V alternation (including an /ɨ/ ~ Ø alternation) is decided by the information each suffix has with regard to its input. Allomorphs of each suffix are supposed to be stored in the mind of the speaker and retrieved in proper environments. The argument is based on the inconsistent behavior of /l/-final stems on the one hand and on the non-alternating suffixes on the other hand. First, when taking suffixes, /l/-final stems behave like vowel-final stems, while other times they behave like consonant-final stems. For instance, Purposive of *sa-* 'to buy' and *sal-* 'to live' is [sa.*rə*] and [sal.*lə*], respectively, while that of *mək-* 'to eat' is [mə.g*ɨ.rə*]. The allomorphs of Purposive show an alternation of *-lə* and *-ɨlə*. On the other hand, /l/-final noun stems behave just like consonant-final noun stems except before Goal/Instrumental marker *-(ɨ)lo*. Just like *san* 'mountain,' *mul* 'water' takes *-i*, *-il*, *-in*, and *-kwa* for

Nominative, Accusative, Topic, and Conjunctive marker, respectively. However, *san* takes -*ilo* for Goal/Instrumental marker, leading to [sa.n*i*.ro], while *mul* chooses -*lo* and results in [mul.*lo*] like a vowel-final noun stem *pata* 'sea' in [pa.da.*ro*]. Goal/Instrumental marker shows an alternation of -*ilo* and -*lo,* the latter appearing after vowel- and /l/-final stems and the former appearing elsewhere.

Secondly, some suffixes have no allomorphs, constantly appearing in the same form regardless of the phonological environment of the stems. For instance, Interrogative -*ni* appears after all kinds of stems: [sa.*ni*] from /sa-ni/ 'to buy,' [sa.*ni*] from /sal-ni/ 'to live,' and [mək.*ni*] from /mək-ni/ 'to eat.' Compared with Effective [mə.g*i*.*ni*] whose input has been argued to be /mək-ni/ or /mək-*i*ni/, depending on the viewpoint of analysis, Interrogative has no phonologically particular reason for not having the suffix-initial /*i*/: [mək.*ni*], *[mə.g*i*.*ni*].

Regarding this kind of alternation in suffixes, there has been much discussion about the status of the suffix-initial vowel /*i*/. That is, whether /*i*/ is in the underlying representation or it is inserted. Most of the previous analyses have adopted a solution of deleting suffix-initial vowel /*i*/ (Kim-Renaud 1974, Cho & Sells 1995, and Kim 2003 to name a few), while an insertion of /*i*/ has been asserted in a few studies (Kim, Y-S. 1984). Recently Hong (2001) and Lee (2003) have posited input forms with no initial vowel /*i*/ for /*i*/ ~ Ø alternating verbal suffixes, with /*i*/ in the output resulting from constraint interaction in OT (Optimality Theory, Prince & Smolensky 1993). However, whether in a C/V alternation or not, nominal suffixes are not mentioned in their analyses.

The organization of this paper is as follows. In section 2, the relevant data are presented, where examples of suffixes in an /*i*/ ~ Ø alternation, no alternation, and other C/V alternation are arranged. Section 3 reviews the previous analyses based on either /*i*/-deletion in a rule-based analysis or allomorph selection in a constraint-based analysis, pointing out some of their problems. Section 4 suggests that each allomorph of suffixes is stored in the mind of the speaker and retrieved in a proper environment. In giving an explanation to the phenomenon, the revival of the [vocalic] feature is shown to be instrumental to the selection of suffix allomorphs. A discussion and conclusion of the present study is given in section 5.

2. Data

Shown in (1a) are the data of verb stems *sa-* 'to buy,' *sal-* 'to live,' and *mək-* 'to eat' combined with suffixes in an /*i*/ ~ Ø alternation. Noun stems such as *pata* 'sea,' *mul* 'water,' and *san* 'mountain' with Goal/Instrumental marker are illustrated in (1b):

(1) suffixes in /ɨ/ ~ Ø alternation

	I	II	III
a.verbal suffixes			
stem	sa-'to buy'	sal-'to live'	mək-'to eat'
Conditional	sa*myən*	sal*myən*	məg*ɨmyən*[1]
Purposive	sa*rə*[2]	sal*lə*	məg*ɨrə*
Intentional	sa*ryə*	sal*lyə*	məg*ɨryə*
Perfective	sa*n*	sa*n*	məg*ɨn*
Effective	sa*ni*	sa*ni*	məg*ɨni*
b. nominal suffixes			
stem	pata'sea'	mul'water'	san'mountain'
Goal/Instrumental	pada*ro*	mul*lo*	san*ɨro*

It can be noticed that as far as the shape of the following suffixes is concerned, stems ending in /l/ in column II behave just like those ending in a vowel in column I: consonant-initial suffixes follow both vowel- and /l/-final stems. However, /ɨ/-initial suffixes follow elsewhere as in column III.

On the other hand, there are some suffixes with no alternations at all.

(2) verbal suffixes in no alternation

Interrogative	sa*ni*	sa*ni*	məŋ*ni*
Propositive(inf.1)	sa*ja*	sal*ja*	mək*c'a*
Propositive(inf.2)	sa*se*	sa*se*	mək*s'e*
Connective	sa*go*	sal*go*	mək*k'o*
Resultant	sa*sə*[3]	sar*asə*	məg*əsə*

In terms of an initial segment /ɨ/ vs. Ø, there is no alternation in the shape of each suffix, *-ni*, *-ca*, *-se*, *-ko*, and *-əsə* or *-asə*.

However, the following nominal markers show another kind of C/V alternation, depending on whether the preceding sound is a consonant or a vowel.

(3) nominal suffixes in C/V alternation

	I	II	III
Nominative	pada*ga*	mur*i*	san*i*
Accusative	pada*rɨl*	mur*il*	san*ɨl*
Topic	pada*nɨn*	mur*in*	san*ɨn*
Conjunctive	pada*wa*	mul*gwa*	saŋ*gwa*

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[1]   In Korean, obstruents are voiced between sonorants, while they become tense after another obstruent as in (2).
[2]   Liquid /l/ becomes [r] in the onset, while it surfaces as [l] in the coda.
[3]   Resultant form [sasə] comes from /sa-asə/, where one of the two /a/'s is deleted.

Here, noun stems ending in /l/ in column II behave just like those ending in a consonant in column III. Thus, *mul* 'water' takes the exactly same markers as *san* 'mountain' does in (3).

The problems to be solved are as follows. First, there needs to be an explanation to the allomorphs of suffixes with a C/V alternation. Second, it is necessary to explain why /l/-final stems take consonant-initial allomorphs of suffixes just like vowel-final stems in (1) and why they take vowel-initial allomorphs just like consonant-final stems in (3). Finally, it needs to be explained why the stem-final /l/ is deleted in front of some particular suffixes in (1a) and (2). Next section is going to show how the previous analyses have dealt with these problems.

3. Previous Analyses

3.1 Deletion in rule-based analyses

It has been assumed that all verbal suffixes showing an /ɨ/ ~ Ø alternation start with vowel /ɨ/ in their underlying representations. Thus, Conditional, Purposive, Intentional, Prefective, and Effective are represented as *-imyən*, *-ilə*, *-ilyə*, *-in*, and *-ini*, respectively. When these suffixes follow vowel- and /l/-final stems in (1a), suffix-initial /ɨ/ needs to be deleted. On the other hand, those in no alternations such as Interrogative, Propositive(inf. 1 & 2), and Connective in (2) are represented as beginning with a consonant: *-ni*, *-ca*, *-se*, and *-ko*, respectively, while Resultant is represented as either *-asə* or *-əsə* with no consonant-initial counterpart.

Comparing a rule-based analysis with a constraint-based one, Kim (2003: 22) posits rules in (4) and (5) to deal with the deletion of /l/ and /ɨ/ in verbs and nouns by using a morphological boundary. As always in rule-based approaches, rule ordering is very important and *l*-deletion takes place before *ɨ*-deletion.

(4) *l*-deletion
    a. $l \rightarrow Ø /$ ___]$_{VerbStem}$ + ɨ
    b. $l \rightarrow Ø /$ ___]$_{VerbStem}$ + {n, s}

Rule (4a) treats the deletion of verb stem-final /l/ in front of /ɨ/-initial suffixes, while rule (4b) takes care of that in front of suffixes such as Interrogative *-ni* and Propositive *-se*.

Although the description of /l/ is provided, there is no explanation to why /l/ is deleted particularly in front of /ɨ/ and consonants /n/ and /s/. Compare this case with that in which /l/ of *sal-* 'to live' remains in front of the suffix-initial /a/ in Resultant form [sa.ra.sə] in (2). As for rule (4b), it may be guessed that there is a tendency to avoid a sequence of alveolar consonants consisting of *ln* and *ls* across a verb stem boundary.

After the application of *l*-deletion, vowel /ɨ/ is deleted, which is taken care of by rules in (5). These rules are adapted from Kim (2003) for the purpose of the present paper.

(5) *ɨ*-deletion
    a. $ɨ \rightarrow Ø$ / V]$_{VerbStem}$ + __
    b. $ɨ \rightarrow Ø$ / .. *l*]$_{NounStem}$ + __)$_σ$

Rule (5b) is posited for Goal/Instrumental form of /l/-final nouns: /mul-ɨlo/ $\rightarrow$ [mullo] 'to/with water,' where /ɨ/ in an open syllable [lɨ]$_σ$ is deleted in the course of derivation.
    A sample derivation is illustrated in the following:

(6)   /sa-ɨmyən/   /sal-ɨmyən/   /sal-ni/   /mul-ɨlo/
      l-del.   ----------   sa-ɨmyən   sa-ni   --------
      ɨ-del.   sa-myən   sa-myən   · ------   mul-lo
                  [sa.myən]   *[sa.myən]   [sani]   [mul.lo]

However, we are in a dilemma. An unattested form *[sa.myən] is derived for Conditional of *sal-* 'to live,' whose attested form is [sal.myən]. The rest of the output forms are grammatical, though. Rule (4a) leads to an inadequate description of the data.
    In another rule-based analysis, Cho & Sells (1995) posit the following *ɨ*-deletion rule, applying between sonorants across a morpheme boundary, that is, in the derived environment (Derived Environment Condition, DEC)

(7) Intersonorant *ɨ*-deletion
    $ɨ \rightarrow Ø$ / *l* + __ *m, l* (DEC)

As pointed out in Sung (2005: 50), however, this rule is not descriptively adequate. For the application of the rule results in wrong forms in /l/-final noun stems: /mul-ɨl/ $\rightarrow$ *[mull] 'water'(acc.) and /mul-ɨn/ $\rightarrow$ *[muln] 'water'(nom.). In addition, it says nothing about the deletion of /ɨ/ in front of /n/ or /s/ as in Perfective, Effective, Propositive(inf. 2) forms of *sal-* 'to live' in (1a): /sal-ɨn/ $\rightarrow$ [san], /sal-ɨni/ $\rightarrow$ [sani], and /sal-se/ $\rightarrow$ [sase], respectively. Though her revised rule (9) derives a correct Accusative [murɨl] from /mul-ɨl/, it cannot deal with *ɨ*-deletion in verb stem-final /l/ in the above mentioned suffixes, due to no mention of /n/ in the environment. The adoption of her rules (8) and (9) does not bring us any improvement of situations. Both rules are from Sung (2005: 50-51).

(8) *C*-deletion
    $C \rightarrow Ø$ / C + __ (DEC)

(9) *ɨ*-deletion (revised)
    $ɨ \rightarrow Ø$ / *l* + __)$_σ$ *m, l* (DEC)

A sample derivation can be assumed as below:

(10)   /sal-ɨni/   /sal-se/   /sal-ɨmyən/
        C-deletion   -------   sal-e   ------------
        syllabification   sa.lɨ.ni   sa.le   sa.lɨ.myən
        i-deletion   -------   -----   sal.myən
                              *[sa.rɨ.ni]   *[sa.re]   [sal.myən]

A grammatical form is derived only for Conditional [sal.myən], with other forms being ungrammatical.

To sum up, rule-based analyses where the suffix-initial /ɨ/ is posited in the underlying representation are found to be far short of attaining any descriptive adequacy, not to mention explanatory adequacy. On top of this, the second problem among the three mentioned at the end of section 2 still remains unanswered: why /l/-final verb stems behave like vowel-final stems in that they take consonant-initial allomorphs of suffixes and why /l/-final noun stems behave like consonant-final stems in taking vowel-initial allomorphs of suffixes except for Goal/Instrumental marker.

3.2 Allomorph selection in constraint-based analyses

The adherence to Richness of the Base (Tesar & Smolensky 1998) in OT posits both allomorphs in the input and the selection of a proper allomorph is left to the constraint interaction. However, this will prove to be inadequate in describing the relevant data in this subsection.

As for the C/V alternating suffixes of the data in section 2, there have been three groups of analyses in the framework of OT: one where /ɨ/-initial suffixes are posited in the input (Kim 2003), another where the input has only C-initial suffixes (Hong 2001, Lee 2003), and the third group where both /ɨ/-initial and C-initial allomorphs are posited in the input (Sung 2005). Based on the optional appearance of /ɨ/ in suffixes, both Hong (2001) and Lee (2003) try to argue for the analysis with no vowel /ɨ/ posited in the underlying representation of suffixes. However, Lee's data do not include /l/-final stems, while Hong's data do not deal with nominal suffixes.

On the other hand, Kim (2003) and Sung (2005) have shown that an OT-based analysis is not adequate to the description of the data. Since the latter study follows Richness of the Base and includes examples of both verbal and nominal suffixes, we are going to review her analysis here.

Let's take /l/-final stems as sample cases: *salmyən*, Conditional of *sal-* 'to live' and *murɨl*, Accusative of *mul* 'water.' The following constraints have been proposed:

(11) *r]ɨ)$_\sigma$: A stem-final *l* and suffix-initial *i* should not be combined in an open syllable.[4]

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[4]   It is assumed to be developed from Kim (2003)'s constraint No *r)$_{VS}$i* whereby the same sequence is prevented across a verb stem boundary.

(12) ONS: Every syllable must have an onset.

(13) NO CODA: No syllable may have a coda.

(14) *COMPLEX: Complex onsets and codas are not allowed.

(15) IDENT(lateral): Correspondent segments must agree in the feature [lateral].

Except for (15), the above constraints are all of markedness. Constraint (11) prevents a sequence of *ri* comprising an open syllable across a morpheme boundary. However, the sequence is allowed stem-internally as in *orini*, Effective of *ori-* 'to climb.'

From a descriptive point of view, constraint (11) is working. However, it does not provide any explanation to why the sequence is not allowed in the surface. There is no particular reason for preventing the sequence *ri* in terms of production or perception. With this unsatisfactory situation on hand, let's turn our attention to how the sample words come to get by. Tableaux (16) and (17) show the situations of *salmyən* and *muril*, respectively.

(16) /sal-ɨmyən/ → [sal.myən] 'if (sb.) lives'

sal -ɨmyən or myən	*r]ɨ)$_\sigma$	ID(lat)	ONS	NOCODA	*COMP
☞ a. sal.myən				**	*
b. salm.yən				**	*
c. sal.ɨ.myən			*!	**	*
d. sa.rɨ.myən	*!	*		*	*
e. sa.rɨm.yən		*!		**	

Sung chooses (16a) as an optimal output, which is also the attested one. However, her constraint ranking as it is makes no distinction between (16a) and (16b) in terms of constraint violation.[5]

In the case of nouns, there is no way to get optimal forms from her constraint hierarchy posited for verbs. The next tableau illustrates the situation of *muril*, Accusative of *mul* 'water.'

(17) /mul-ɨl/ → [mu.rɨl] 'water'(acc.)

mul -ɨl or -lɨl	*r]ɨ)$_\sigma$	ID(lat)	ONS	NOCODA	*COMP
☞ a. mu.rɨl		*!		*	
b. mul.ɨl			*!	**	
☞ c. mul.lɨl				**	
d. mul.rɨl		*!		**	

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5   Confer her tableau (28) in her article (Sung 2005: 55). However, SYLLCON in (18) placed higher than ONS can decide candidate (16a) as optimal. In (16b) the onset /y/ is more sonorous than its preceding coda, violating SYLLCON. The ranking between SYLLCON and ONS can be seen from tableaux (20) and (21).

According to the tableau, candidate (17c) is chosen as optimal. However, the attested form is (17a).

To bring a thing home to the inadequacy of analyses in OT, the data in (3) with other nominal markers are added. Two more constraints are introduced, with no ranking between them. SYLLABLE CONTACT disallows an onset to be more sonorous than its preceding coda (Bat-El 1996, Davis 1998, David & Shin 1999), while ANCHOR aligns the right edge of a stem with the right edge of a syllable.

(18) SYLLCON: Avoid rising sonority over a syllable boundary.

(19) ANCHOR(Stem, σ, R): The right edge of a stem coincides with the right edge of a syllable.

Let's look at Conjunctive of *pata* 'sea' and *mul* 'water.' Vowel-final stems choose *-wa* as a proper allomorph, while consonant-final stems including /l/-final stems choose *-kwa*.

(20) /pata-wa/ → [pada.wa] 'sea and'

pata -kwa or -wa	SYLCON	ANCHOR	ONS	NOCODA	*COMP
a. pa.da.gwa					*!
b. pa.dak.wa	*!	*		*	
☞ c. pa.da.wa					

(21) /mul-kwa/ → [mul.gwa] 'water and'

mul -kwa or -wa	SYLCON	ANCHOR	ONS	NOCODA	*COMP
☞ a. mul.gwa				*	*
b. mul.wa	*!			*	
c. mu.lwa		*!			*

Correct allomorphs are selected, as far as Conjunctive suffix is concerned.

However, things get worse when it comes to other nominal suffixes, whose allomorphs are phonologically conditioned such as Nominative *-ka* or *-i*, Accusative *-lil* or *-il*, and Topic *-nin* or *-in*. Although (22a) should be chosen as optimal, the hierarchy selects an unattested form (22c) as optimal.

(22) /mul-i/ → [mu.ri] 'water (nom.)'

mul -i or -ka	SYLCON	ANCHOR	ONS	NOCODA	*COMP
☞ a. mu.ri		*!			
b. mul.i	*!		*	*	
☞ c. mul.ga				*	
d. mu.lga		*!			*

In sum, an OT-based analysis following Richness of the Base and positing both allomorphs is confirmed here again to be unsatisfactory (Sung 2005). The deletion of the stem-final /l/ in (1) and (2) is handled with constraint $^{*}r]i)_{\sigma}$, preventing an occurrence of *ri* across a morpheme boundary. However, there is no explanation to the inconsistent behavior of /l/-final stems in selecting suffix allomorphs; sometimes they take consonant-initial allomorphs like vowel-final stems and other times they take vowel-initial allomorphs like consonant-final stems.

4. Suffix-centered allomorphy

The problems raised at the end of section 2 are to be solved from two perspectives. The one is provided by the inconsistent behavior of stem-final /l/ in (1) and (3) and the other by non-alternating suffixes in (2).

First, the peculiar behavior of /l/-final stems can be looked at from the features that consonant /l/ consists of. Although feature [vocalic] has long been replaced with feature [syllabic], it is very crucial in the present study. For the similar behavior of vowel- and /l/-final stems of Korean can be easily explained by this feature. The major class features including [vocalic] define speech sounds as follows.[6]

(23) major class features (Chomsky & Halle 1991: 303)

	sonorant	consonantal	vocalic
voiced vowels	+	-	+
voiceless vowels	+	-	-
glides(I):*w, y*	+	-	-
glides(II):*h, ʔ*	+	-	-
liquids	+	+	+
nasal consonants	+	+	-
nonnasal consonants	-	+	-

According to tableau (23), both vowels and /l/ make a natural class of the [+vocalic] feature, while all other segments are classified as [-vocalic]. On the other hand, feature [+consonantal] captures a natural class of /l/ and other consonants, contrasting with a class of vowels and glides defined by [-consonantal].[7]

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[6]   The "vocalicness" is defined as follows (Chomsky & Halle 1991: 302):
    Vocalic sounds are produced with an oral cavity in which the most radical constriction does not exceed that found in the high vowels [i] and [u] and with vocal cords that are positioned so as to allow spontaneous voicing; in producing nonvocalic sounds one or both of these conditions are not satisfied.
    Vocalic sounds, therefore, are the voiced vowels and liquids, whereas glides, nasal consonants, and obstruents, as well as voiceless vowels and liquids, are nonvocalic.
[7]   With [syllabic] replacing [vocalic], there is no way to capture a natural class consisting of vowels and nonsyllabic liquids only, as can be seen in the following tableau (Chomsky & Halle 1991: 354):

To take an example from the stem-final /l/ in *mul* 'water,' its feature matrix is represented as [+consonantal, +vocalic]. It is the following suffix that decides which of these features is to be employed. The stem-final segment feeds the phonological information to the suffix and the latter employs its necessary feature, selecting a proper allomorph. In short, allomorph selection is suffix-centered, not stem-centered.

By using these two features, all suffixes in section 2 can be arranged as in (24).

(24)   a.   suffixes in /ɨ/~Ø alternation (= 1)

stem-final segment	[+vocalic]	[-vocalic]
Conditional	-myən	-ɨmyən
Purposive	-lə	-ɨlə
Intentional	-lyə	-ɨlyə
Perfective	-n	-ɨn
Effective	-ni	-ɨni
Goal/Instr.	-lo	-ɨlo

   b.   suffixes in no alternation (= 2)

Interrogative	-ni
Propositive(inf.1)	-ca
Propositive(inf.2)	-se
Connective	-ko
Resultant	-əsə/-asə

   c.   suffixes in C/V alternation (= 3)

stem-final segment	[-consonantal]	[+consonantal]
Nominative	-ka	-i
Accusative	-lɨl	-ɨl
Toic	-nɨn	-ɨn
Conjunctive	-wa	-kwa

The selection of affixes in (24a) and (24c) is decided by the phonological property of their preceding segment: whether it is [±vocalic] or [±consonantal], respectively. However, affixes in (24b) show no alternation at all, appearing consistently in the same shape regardless of their preceding sounds. Here comes the second perspective of the problem solution.

Phonologically speaking, there is no reason for the C-initial affixes in (2) not having vowel /ɨ/ after [-voc, +cons] stem-final segments. For instance,

	sonorant	syllabic	consonantal
vowels	+	+	-
syllabic liquids	+	+	+
syllabic nasals	+	+	+
nonsyllabic liquids	+	-	+
nonsyllabic nasals	+	-	+
glides: *w,y,h,ʔ*	+	-	-
obstruents	-	-	+

Interrogative in (2) has only one morph *-ni* after all kinds of stems, while Effective in (1) has two allomorphs *-ni* and *-ini*, the one after /l/- and vowel-final stems and the other elsewhere: Interrogative *sa-ni* [sa.<u>ni</u>] 'to buy/live' and *mək-ni* [məŋ.<u>ni</u>] 'to eat.' If the sequence *ŋn* in Interrogative [məŋ.ni] is allowed, what prevents the same sequence in Effective: *mək-ini* [mə.gɨ.ni], *[məŋ.ni] 'to eat'? In the same vein, why does Propositve(inf. 1), for example, have only morph *-ca* even when preceded by C-final stems: *mək-ca* [mək.<u>c'a</u>], *[mə.<u>gɨ.ja</u>]?

   The answer cannot be given purely phonologically, but may be provided morphologically. It can be assumed that each allomorph of suffixes is subcategorized in terms of the [±vocalic, ±consonantal] features of the stem-final segment and stored in the mind of speakers (See Lubowicz 2006 for a similar argument for the Polish locative). For instance, Interrogative has only one morph and thus there is no need of mentioning its preceding stems. However, the allomorphs of Effective as well as those of other suffixes in an alternation need specification with regards to the [vocalic] or [consonantal] feature of their preceding stem-final segments. Some of the examples are illustrated in the following.

(25) a. suffixes in alternation

Effective	Goal	Conjunctive
-ni: [+voc]+_	-lo: [+voc]+_	-wa: [-cons]+_
-ɨni: [-voc]+_	-ɨlo: [-voc]+_	-kwa: [+cons]+_
Conditional	Purposive	Nominative
-myən: [+voc]+ _	-lə: [+voc]+_	-i: [+cons]+_
-ɨmyən: [-voc]+ _	-ɨlə: [-voc]+_	-ka: [-cons]+_

   b. suffixes in no alternation:

Interrogative	-ni	Connective	-ko
Propositive(inf.1)	-ca	Resultant	-əsə/-asə
Propositive(inf.2)	-se		

Once the selection of allomorphs is done, there is no need of deleting vowel /ɨ/ or positing both allomorphs in the input as seen in the previous section 3. The rest is taken care of in the ordinary manners of phonology. As a result, the burden of allomorph selection is divided between morphology and phonology. In the previous analyses, phonology alone has borne the burden, leaving some residual problems and thus lacking descriptive adequacy, not to mention explanatory adequacy.

4.1 A rule-based analysis

Only one allomorph of suffixes is posited in the input with its proper stem. With this in mind, let's see a few forms of verb stem *sal-* 'to live' such as Conditional *sal-myən* /sal-myən/, Effective *sa-ni* /sal-ni/, and Propositive(inf. 2) *sa-se* /sal-se/. Since the stem-final segment /l/ is [+vocalic, +consonantal],

C-initial allomorphs of these suffixes are chosen and there is no *i*-deletion at all. Instead, all that is needed is *l*-deletion (4b), repeated here in (26). A sample procedure is given in (27).

(26) *l*-deletion
     $l \rightarrow \emptyset /$ __]$_{Stem}$ + {n, s}

(27) Step 1. stem identification: *sal-* 'to live,' stem-final:[+cons, +voc]
     Step 2. allomorph selection:
          Conditional: *-myən*, Effective: *-ni*, Propositive: *-se*
     Step 3. derivation:

	Conditional	Effective	Propositive
UR:	/sal-myən/	/sal-ni/	/sal-se/
l-deletion:	------------	sa-ni	sa-se
PR:	[sal.myən]	[sa.ni]	[sa.se]

In Step I, the features of stem-final segment are identified. In the above case, liquid /l/ is defined as [+consonantal, +vocalic]. In Step 2, each suffix looks for the relevant feature. Both Conditional and Effective look to the [±vocalic] feature of the stem-final segment. The [+vocalic] feature of /l/ leads to the selection of a C-initial allomorph of these suffixes: *-myən* and *-ni*, instead of /i/-initial counterparts *-imyən* and *-ini*. Propositve has no need of doing this, choosing its only morph *-se*. In Step 3, phonological rules apply, deleting /l/ before /n/ or /s/ across a stem boundary.

   For noun forms, let's look at *mul* 'water' in Topic, Conjunctive, Accusative, and Instrumental forms.

(28) Step 1. stem identification: *mul* 'water,' stem-final: [+cons, +voc]
     Step 2. allomorph selection:
          Topic: *-in*, Conjunctive: *-kwa*, Goal: *-lo*, Accusative: *-il*
     Step 3. derivation:

	Topic	Conjunctive	Accusative	Instrumental
UR:	/mul-in/	/mul-kwa/	/mul-il/	/mul-lo/
/l/ to [r]:	mu.rin	----------	mu.ril	--------
voicing:	-------	mul.gwa	-------	--------
PR:	[mu.rin]	[mul.gwa]	[mu.ril]	[mul.lo]

As in the case of verbs, the feature identification of the stem-final segment is done in Step 1: [+consonantal, +vocalic]. In Step 2, Topic, Conjunctive, and Accusative look for the relevant feature [+cons], which leads to the selection of *-in*, *-kwa*, and *-il*, respectively. In the case of Goal/Instrumental, it looks to the [+vocalic] feature, instead of [+consonantal], for its appropriate allomorph: *-lo* is chosen, instead of *-ilo*. In Step 3, phonology does what needs to be done, changing /l/ to [r] in the onset and /k/ to [g] between sonorants.

Thus, the job of allomorph selection is divided between morphology and phonology, getting rid of somewhat unnatural and arbitrary phonological rules such as *l*-deletion (4a), *C*-deletion (8) and *i*-deletion (5) or (9) in subsection 3.1. Phonology does what is necessary, providing the value of the [vocalic] and [consonantal] features of the stem-final segment in Step 1 and applying phonological rules in Step 3. Phonological information of Step 1 feeds Step 2, where an appropriate allomorph is selected from the allomorph stock of each suffix.

4.2 A constraint-based analysis

In a constraint-based analysis, Steps 1 and 2 are exactly the same as in a rule-based analysis. The only difference consists in Step 3, where instead of phonological rules, properly ranked constraints do the job of what is the counterpart of derivation.

The constraints needed are illustrated below.

(29)   a. DEP-IO: A segment in the output has a correspondent in the input.
       b. MAX-IO: A segment in the input has a correspondent in the output.
       c. MAX-IO$_{ST}$: A segment of the stem in the input has a correspondent in the output.
       d. REALIZE MORPHEME(RM): Morphemes should be realized phonetically in the output.
       e. POST-LATERAL PHONOTACTIC CONSTRAINT(PLPC): *ln, *ls[8]
       f. *COMPLEX: Complex onsets and codas are not allowed.
       g. IDENT(lateral): Correspondent segments have identical values for feature [lateral].

RM prevents a total deletion of a morpheme, ensuring a phonetic realization of each morpheme, while PLPC disallows the sequence *ln* or *ls* in the surface. In Korean a sequence of /ln/ or /nl/ change into [ll]. On the other hand, the sequence /ls/ becomes [s] across a stem boundary.

The situation of Effective *sa-ni* from /sal-ni/ is like tableau (30).

(30) stem: [+vocalic], Effective: -ni, /sal-ni/ → [sani]

sal-ni	DEP	PLPC	IDENT(lat)	MAX-IO$_{ST}$	MAX-IO
a. sal.ni		*!			
☞ b. sa.ni				*	*
c. sa.ri			*!		*
d. sa.ri.ni	*!		*		

---

[8]   Constraint PLPC comes from Hong (2001: 226). As pointed out by one of the reviewers, the deletion of /l/ in a sequence of /ls/ or /ln/ across a verb stem boundary is not phonologically motivated. The /l/ in the same sequence survives across a noun stem boundary. Let's regard this constraint as a temporary solution, since its adoption does not change the main point of the present study.

Sequence *ln* in the coda of (30a) violates PLPC. Candidate (30c) violates
IDENT(lateral) since /l/ becomes [r], changing the value of [lateral]. It also
violates MAX-IO, since the suffix-initial /n/ is deleted. In candidate (30d),
/ɨ/ is inserted and /l/ changes into [r], violating DEP-IO and IDENT(lateral).
The optimal output is candidate (30b), where the stem-final /l/ is deleted,
violating low-ranking MAX-IO$_{ST}$ and MAX-IO.

Now, informal Propositive *sase* of *sal-* is under consideration in (31).
Since the suffix has only one morph, there is no need of selecting an
allomorph.

(31) Propositive(inf.): -se, /sal-se/ → [sase] 'let's live'

sal-se	DEP	PLPC	IDENT(lat)	MAX-IO$_{ST}$	MAX-IO
a. sal.se		*!			
☞ b. sa.se				*	*
c. sa.re			*!		*
d. sa.rɨ.se	*!		*		

Constraint IDENT(lateral) is crucial in the selection of (31b) against (31c)
as optimal.

So far verb forms have been looked at. It is time to see what it is like with
nominal suffixes. The suffixes in a C/V alternation in (24c) look to the
[consonantal] feature of the stem-final segment, while Goal in (24a) looks to
the [vocalic] feature for its allomorph selection. To take Nominative and
Connective for example, *-i* and *-kwa* are chosen, respectively, when the
stem-final segment is [+consonantal]: *mul-i* and *mul-kwa*. In the opposite
case as in *pata* 'sea,' *-ka* and *-wa* are chosen, respectively: *pata-ka* and *pata-wa*. In the case of Goal, *-lo* is selected when the preceding segment is
[+vocalic] such as /l/ and vowels, while *-ilo* is chosen elsewhere.

To look at noun forms, three more constraints are needed in (32).
Constraints (32a) and (32b) are repeated from (18) and (19), while (32c) is
from (13) in the previous section.

(32)   a. SYLLCON: Avoid rising sonority over a syllable boundary.
       b. ANCHOR(Stem, σ, R): The right edge of a stem coincides with the
          right edge of a syllable.
       c. ONS: Every syllable must have an onset.

Equipped with these constraints, the situations with noun forms can be
seen in the following tableaux.

(33) stem: [+consonantal], Nominative: -i, /mul-i/ → [mu.ri]

mul-i	DEP	SYLLCONT	ONS	ANCHOR	IDENT(lat)
a. mul.i			*!		
☞ b. mu.ri				*	*
c. mul.ga	*!				

(34) stem: [+consonantal], Conjunctive: -kwa, /mul-kwa/ → [mul.gwa]

mul-kwa	DEP	SyCo	*COM	ANCH	ID(lat)	MAX-IO
☞ a. mul.gwa			*			
b. mul.wa		*				*!
c. mu.lwa			*	*!		
d. mu.rɨ.gwa	*		*!	*	*	

(35) stem: [+vocalic], Goal: -lo, /mul-lo/ → [mul.lo]

mul-lo	DEP	ANCHOR	IDENT(lat)	MAX-IO
☞ a. mul.lo				
b. mu.rɨ.ro	*!	*	**	

Positing only one suffix allomorph in the input raises no problem in describing the data and explains the deletion of /l/ especially by POST-LATERAL PHONOTACTIC CONSTRAINT. The constraints and their hierarchy used so far are given in (36).

(36)   constraint ranking
DEP, *COMP, RM, SYLLCON ≫ PLPC, ONS ≫ ANCHOR ≫
IDENT(lateral) ≫ MAX-IO_ST ≫ MAX-IO

5. Discussion and conclusion

An OT-based analysis adhering to Richness of the Base and positing both C- and V-initial allomorphs of suffixes in 3.2 is found to be descriptively inadequate, making no satisfactory description of the data. On the other hand, a rule-based analysis positing /ɨ/-initial verbal suffixes and other C-initial nominal suffixes in the underlying representation is also found to fail to describe the data in 3.1.

The present study has suggested another way of solving the problems raised at the end of section 2. Since phonology alone cannot explain why suffixes composed of phonologically similar segments behave differently in that some have allomorphs and some do not, morphology intervenes, taking a portion of responsibility in the allomorph selection. Each suffix is sensitive to either [vocalic] or [consonantal] of the stem-final segment. Allomorph selection depends on the value of the relevant feature. For example, Effective is sensitive to the stem-final segment's [vocalic] feature, while Topic is to the [consonantal] feature. Once the value of the relevant feature is identified, a proper allomorph is chosen from the allomorph stock, where each allomorph is subcategorized with respect to the value of the relevant feature. After allomorph selection is done, phonological rules apply when necessary. The process can be summarized roughly as follows, taking *sal-* 'to live' and Effective for example.

(37) Step 1: stem-final segment identification
           stem: *sal*-, /l/: [+vocalic, +consonantal]
      Step 2: suffix identification and allomorph selection
           Effective → [±vocalic]: *-ni*: [+vocalic] + __
                                    -ini: [-vocalic] + __
           <Due to [+vocalic of /l/, *-ni* is chosen as the proper allomorph>
      Step 3: (i) rule-based analysis: derivation
             (ii) OT-based analysis: candidate evaluation

Whether an analysis is rule-based or constraint-based, Steps 1 and 2 are the same. The only difference between the two analyses lies in Step 3, which consists of either derivation in the former analysis or candidate evaluation against a constraint hierarchy in the latter. This study has no intention of choosing between the two analyses, although a rule-based analysis looks simple. For now, let's suffice to leave the choice as a further study.

One thing particularly noticeable in the present study is the revival of the [vocalic] feature. Even though it has long been replaced with [syllabic], the [vocalic] feature is resorted to in this study. Without it, there would be no way to capture the inconsistent behavior of /l/, sometimes forming a natural class of the [+vocalic] feature with vowels and sometimes forming a class of the [+consonantal] feature with consonants. This is how the inconsistent behavior of /l/-final stems is explained.

Another thing to notice in this study is the abandonment of Richness of the Base, since it brings forth descriptive inadequacy. Thus, Richness of the Base, one of many attractive and strong principles of OT, might be in need of change or rejection.

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