

## Epenthetic-s in Korean

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This paper provides a comprehensive analysis of the phonological and morphological aspects of the Epenthetic-s phenomenon in Korean. It argues for the current theoretical claim of lexical phonology in that the rules of Epenthetic-s must apply to the lexicon.

Compound nouns in Korean often surface with an inserted consonant which is not present in either of the constituent nouns in isolation. This is a highly unusual language specific phenomenon in that epenthesis takes place although the input sequence is phonologically well-formed. The emergence of the consonant is conditioned by the semantic relationship between the constituents of a compound. This phenomenon has been traditionally called sai sios, translated by Martin (1954;55) as 'Epenthetic-s' or 'Bindungs-s.' It has been the center of attention in Korean phonology for the past 30 years (C-W Kim 1970a, Kim-Renaud 1974;145-170, Cheun 1978, Pae 1969, B-G Lee 1982, Y-S Kim 1984, S-C Ahn 1985, J-M Kim 1986, H-S Sohn 1987, J-R Oh 1988), and yet some important theoretical points are still needed.

This paper is an attempt to provide a comprehensive analysis of the morphology and phonology of Epenthetic-s.<sup>1)</sup> The relevant theory for the present paper is that of Lexical Phonology proposed by Mohanan(1982) and Kiparsky (1982) and extended by Pullyblank(1983), Kiparsky(1985), Halle and Mohanan (1985), Mohanan(1986), etc. The heart of this theory is the claim that the lexicon must allow some morpho-phonological rules. This paper will support this claim, by arguing that the morpho-phonology of Epenthetic-s must take place within the lexicon. For the purpose of presentation, I shall provide first the phonological analysis of this phenomenon, second, its morphological analysis, then third,

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1) This article was presented on August 1989 at Kyunghee International Conference on Linguistic Studies where I earned valuable comments from K.P.Mohanan. The basic observations remain consistent with my doctoral dissertation (1986) and I was further benefitted by Sohn(1987). I appreciate the insight of these two people, and, of course, the responsibility rests on myself.

its lexical status.

### 1. Phonology of Epenthetic-s Phenomenon

The following table (1) illustrates this phenomenon. The surface representations of compound nouns are in brackets [ ], and those of constituent nouns are on the left and right side of the symbol #. The inserted segments in question are underlined, and are sorted according to their phonological environments written in the uppermost column and the left-most row.

#### (1) Data on the "epenthetic-s"

	V#_____	C#_____	C#_____
		[+son]	[-son]
____#{i, y}	I. tü#il [t <u>ü</u> nnil] tä#ip [t <u>ä</u> nnip] nala#il [nar <u>an</u> nil] tü#yölcha [t <u>ü</u> nniyölcha]	II. s'al#yös [s'al yöt] säNG#ipyöl [säNGnibyöl] salaNG#i [saraNGni] phan#yuli [phannyuri]	III. k'och#ip [k'onnip] t'ök#ip [t'öNGnip] mulip#yöp [murimnyöp] säk#yuli [säNGnyuri]
____# V other than {i, y}	IV. iypu#adil [iybuɖadi] yo#iy [yoɖiy] ü#os [üɖot]	V.	VI.

<p>—# C [+son]</p>	<p>VI. kho#nal [khonnal] nä#mul [nänmu] i#mom [inmom] pä#nom [pännom]</p>	<p>VII.</p>	<p>IX.</p>
<p>—# C [-son]</p>	<p>X. kho#kumöNG [khotk'umöNG] nä#ka [nätk'a] namu#pul [namup'ul] kalpi#tä [kalbitt'ä] kaci#su [kacits'u]</p>	<p>XI. kil#ka [kilk'a] an#paNG [anp'aNG] [mult'ok] pom#palam [pomp'aram] khoNG#karu [khoNGk'aru]</p>	<p>XII. TENSING WITHOUT EXCEPTION eg.)pok#töNGi [pokt'öNGi]</p>

glosses of the data in(1)

<p>I. back#work (the rest) bamboo#leaves nation#work (affairs of country) back#train (next train)</p>	<p>II. rice#taffy raw#separation (separation by circumstance) love#teeth (wisdom teeth) board#glass (sheet glass)</p>	<p>III. flower#leaf rice cake#leaf (seed leaf) knee#side color#glass</p>
<p>IV. stepfather#son (step son) blanket#clothes (mattress cover) upper#clothes</p>	<p>V.</p>	<p>VI.</p>

## VI.

nose#blade  
 (nasal septum)  
 stream#water  
 teeth#body  
 (teeth gum)  
 boat#man  
 (sailor)

## VII.

## IX.

## X.

nose#hole  
 river#side  
 wood#fire  
 rib#stick  
 (a rib)  
 kinds#number  
 (number of species)

## XI.

road#side  
 inner#room  
 water#tub  
 (a water jar)  
 spring#wind  
 beans#powder  
 (soybean flour)

## XII.

fortune#lump  
 (the one who carries fortune)

It is important to notice that the epenthetic segment appears in various forms. It appears as two n's in data set I; as a single n in sets II, III and VII; as a single t in sets IV and X; as a [+tense] feature<sup>2)</sup> in sets XI and XII; and as a phonologically null segment (if it exists at all) in sets V, VI, VIII and IX.<sup>3)</sup> The present analysis attempts to account for all these data as a coherent phenomenon by using tiered representation of segments (Clements & Keyser 1983).

Turning now to the analysis, I agree with the majority of previous works that the "Epenthetic-s" is not underlyingly present, but is inserted between the two constituent nouns (eg., C-W Kim(1970a)). The reasons are: (i) The segments appear only in compounds but not in constituent nouns in isolation, and (ii) their feature specification is predictable.

If we are correct in assuming that Epenthetic-s is inserted between the two constituent nouns, there are three possible places of insertion: i) as a final segment of the first constituent, ii) as an initial segment of the second constituent, and iii) as a segment independent from either of the constituents. Most previous literature opts for the third possibility, essentially because we do not find evi-

2)The symbol p', t', k', c' represents obstruents with [+tense] value. Korean obstruents are classified into three groups; the plain group, the tense group and the aspirated group.

3) Examples of the set IV are relatively rare. The word [yodiy] "mattress cover" in data set IV in (1) is probably no longer in use. I do not have this word in my lexicon.

dence for either of the other two options(eg., Ahn(1985)). I will argue later however, for the first possibility in order to account for the neglected data set in V and VI.

For the moment, let us concentrate on the majority of data by positing the rule of C-insertion as the following.

(2) The rule of C-Insertion

$$\emptyset \rightarrow C / \dots\dots]_N [N$$

This rule inserts a consonant as a last segment of the first constituent noun of a compound noun.<sup>4)</sup> The rule environment is specified for nouns because other types of compounds (eg. verb compounds) do not obey this rule.<sup>5)</sup> The inserted segment is not associated with the phonemic melody tier.<sup>6)</sup>

In addition to the rule of insertion of an unassociated consonant, I also assume that the default C features in Korean are those of the segment t. This segment is proposed as being the most unmarked one in some phonetic studies(C-W Kim(1970b), Lindblom(1972)) and assumed to be the default value for Korean consonants in all current literature (S-C Ahn(1985), H-S Sohn(1987), K-H Kim (1987) among others).

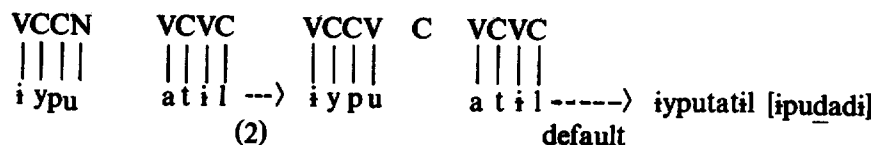
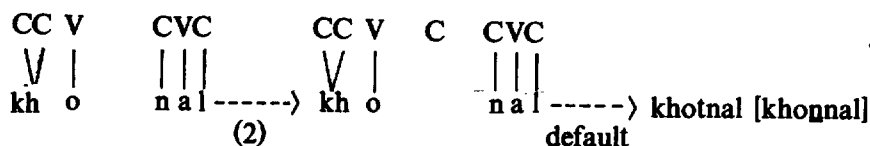
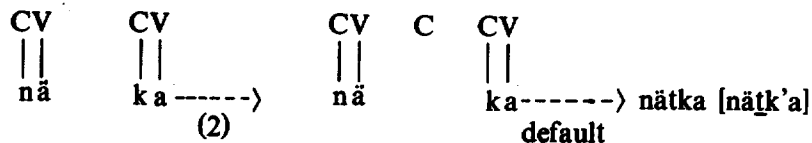
Once we assume this, a variety of data can be accounted for without any further rules. Let us review the data sets in (1) one by one. Data sets IV, VII and X are basically accounted for. I will illustrate this by taking one example per group.

4) According to Sohn(1987), the rule inserts a consonant as an adjectival morpheme. Thus, the phenomenon of Epenthetic-s is a change from a Noun Noun structure to an Adjective Noun structure. Her motivation comes from the morphological fact that the rule i) applies for a sub-compounding structure, ii) not for a co-compounding structure and iii) not for an adjective plus noun structure. I consider this an extremely interesting solution if valid for universal data, since such rule environment is often found in other languages as well (eg., Malayalam in Mohanan(1982)).

I did not follow her position for the present work because i) her environment needs more justification to account for all my morphological data in section 2, and ii) her translation of semantic relationship into syntactic structure may not conform to the modularity of the grammar in which the role of semantics is defined independently from the role of syntax.

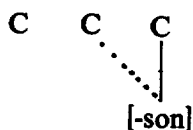
5) Y in this rule can not be a verb. For example, no "epenthetic-s" appears. For example /t'ŭ-nol-ta/"hop#play+Indicative (play vigorously) "surfaces as [t'ŭnolda].

6) One may also use the x-representation of segments as outlined in Hyman(1985). I opt CV-representation merely for convenience.

(3) Derivation of the data in IV, V and X in (1)a. example from IVb. example from Vc. example from X

In these examples, the inserted C is realized as the default [t]. The surface representations are derived by other independent rules such as voicing, nasal assimilation and tensing. The C-insertion rule (2) is in fact translation of C-W Kim (1970a). He inserts [t] instead of C, since only linear representation was available at that time. The translation into non-linear representation will later become convenient to account for tensing.

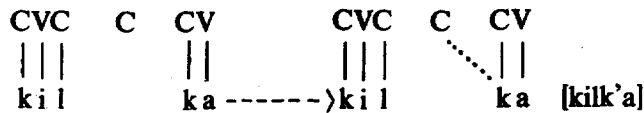
In order to account for other sets of the data in (1), however, we need some further rules. The following rule of spreading takes care of data set XI.

(4) C contraction

This rule spreads the features of the following obstruent onto an under-specified C sandwiched between a preceding consonant and the following obstruent, so that the inserted C will not get spelled out as [t] by default. As already implicit, the spreading takes place prior to default spelling-out. As a supporting argument for the ordering, I refer to Pulleyblank (1983) who suggests that default spelling-out is held off until the last stage of the derivation.

I will illustrate the rule application by taking one example of each from the data set XI and XII.<sup>7)</sup>

(5a) example from XI



(5b) example from XII



In these examples, the following C spreads to the underspecified C so that it will be realized with the feature [+tense], unlike in our previous examples in which it is realized as default [t]. Thus, the present analysis provides an explanation for why "Epenthetic-s," which is usually t, should be realized as tensing in some cases. As argued in my dissertation (pp.99-104) and in E-D Kook (1987), the representation  $C_{\setminus k} C$  corresponds to the phonetically tense [k'].<sup>8)</sup>

Had we not inserted a consonant in this environment, we would not get tensing for the data in XI. Tensing does not automatically occur after a [+son] consonant. For instance, /cal + ko/ "small +and" is pronounced as [calgo], not \*[calk'o].

7) Data set XII should have tensing without exception since the environments are met for the tensing rule (4).

8) In recent articles, there appear different representations of tense obstruents (H-S Sohn(1987), K-H Kim(1989)). I have not thoroughly evaluated these representations yet. If one adapts their representation, my rule description (4) can be translated into, for instance, the rule of [+CG] spreading by Sohn.

In order to handle this problem, previous analyses (eg., C-W Kim (1970), Kim-Renaud (1974:164)) insert t for these data, which causes tensing of the initial obstruent of the second constituent, then subsequently delete the inserted t. This is a reasonable account within the framework of linear analysis, given that the insertion of t is equivalent to our rule of C-insertion and tensing in obstruent cluster is an independently motivated rule in Korean, and the subsequent deletion is motivated by the surface phonetic constraint \*CCC in Korean. Thus, our rules at this point are not much superior to the previous ones.

An important aspect of the present analysis, however, is in the account of the next data set I, II and III where the epenthesized segments are now [n].

In our analysis, set I requires an n-insertion rule independently from our previous C-insertion rule. We thus formalize n-insertion rule as the following.

(6) n-insertion rule

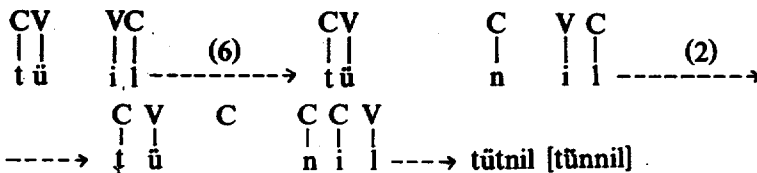
$$\emptyset \text{-----} \rightarrow \underset{\text{n}}{\text{C}} / \text{ ]}_N \left[ \text{-----} \begin{array}{l} \text{-round} \\ \text{-back} \\ \text{+high} \end{array} \right]$$

This rule inserts the segment n when the second constituent of a compound begins with i/y. Unlike the previous C-insertion rule, this n-insertion occurs i) between a noun and any stem including a verb, and ii) the inserted n is part of the second constituent.

As for the first point, n-insertion may also apply to a NV compound as in /path<sub>N</sub> # ilku<sub>v</sub>+ ta/ [pannilguda] "field # cultivate + Indicative" and /mun<sub>N</sub> # yöl<sub>v</sub>+ ta/ [munnyölda] "door # open + Indicative."

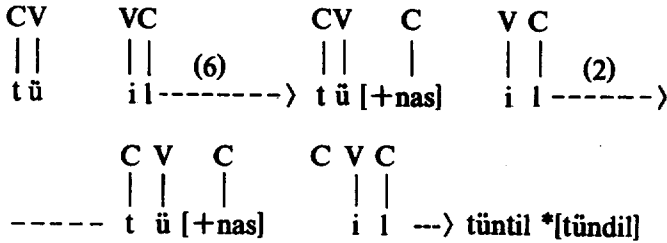
As for the second point, the inserted n always appears to the right of the epenthesized [t] by our previous rule (2) of Epenthetic-s. Let us consider the following alternative derivations from the data set I.

(7a) If n is inserted to the right of the C-insertion element:





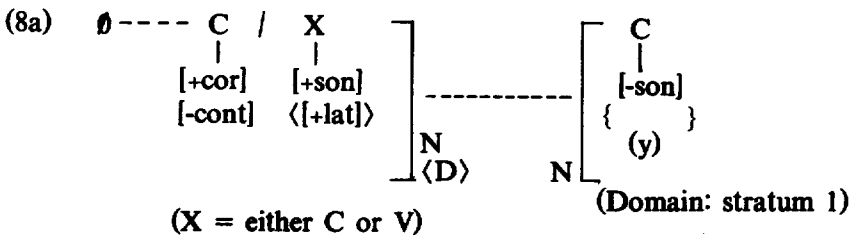
(7b)\*If n is inserted to the left of the C-insertion:



In these examples, (7a) is where the n-epenthesis occurs to the right of the C-insertion, and \*(7b) is where the n-epenthesis occurs to the left of the C-insertion. Other rules of nasal assimilation and voicing applies to produce a correct surface form in (7a) and an incorrect surface form in (7b). Thus, the insertion of the n obligatorily occurs to the right of the C-insertion.

There is also a historical hint from Middle Korean in which there were underlying ns which were subject to deletion before any i/y initial stems (Kim-Renaud (1974;149)). Kim-Renaud convincingly demonstrates that the historical deletion rule no longer exists in synchronic phonology and that an n-insertion rule is now in effect.<sup>9)</sup> Such historical fact suggests that n may be part of the second constituent. Also this view seems to explain though not conclusively, the fact that the inserted n must always follow the inserted C.

There has been a different analysis in order to account for the introduction of n in these data, Ahn (1985; 71) proposes the following two rules, where rule (8a) is supposed to insert a partially specified segment whose later realization is either [t] or [n], and subsequently rule (8b) fully specified the [n].



9) The i- or y- initial nouns are not considered to have underlying /n/, because it is predictable. Due to a historical process of deleting n in these environment, Korean virtually has no word initial ni- or ny-. There are some recently innovated words against this observation. These are [nyösök] "guy" and [nim] "sweet heart." Kim-Renaud(1974;151-154) provides further arguments for not assuming underlying n in these environments.

$$(8b) [+cor] \rightarrow [+nas] / \quad ]_N \text{ ----- } N[ \quad \begin{array}{c} C \\ | \\ y \end{array}$$

Among the details of the above rules, our present concern is that (a) both [t] and [n] are inserted between the constituent nouns of a compound but not as part of the left or right constituent noun, and that (b) the inserted segment will be spelled as nasal for these data sets. I argue that both these aspects of the rules are wrong because i) the insertion of n is an independent process from the insertion of t, and ii) the rule environment must be stated in that n is inserted as an initial element of the second constituent (whether a noun or a verb).

Let us see how Ahn's rules account for the data. The following derivation of Ahn's is an example on our data set III. (Some of the symbols are translated into my convention.)

$$(9)$$

$$/pukok \# y\ddot{o}k/ \xrightarrow{\text{rule(a)}} \begin{array}{c} \text{C} \text{Y} \text{C} \text{Y} \text{C} \\ | | | | | \\ p \text{u} \text{k} \text{o} \text{k} \end{array} \quad \begin{array}{c} \text{C} \\ | \\ [+cor] \\ -cont \end{array} \quad \begin{array}{c} \text{C} \text{Y} \text{C} \\ | | | \\ y \ddot{o} \text{k} \end{array} \rightarrow$$

$$\text{rule (b)} \\ \text{-----} \rightarrow \text{pukokny}\ddot{o}\text{k} \text{ [pug}\text{NGny}\ddot{o}\text{k}]$$

In this derivation, rule (a) inserts a partially specified C which could either be t or n, and rule (b) completes the specification of n. In this fashion, he can at least account for the data in II and III.

His analysis, however, fails to account for the data in set I. The data in the set I includes the insertion of two n s. Since his rule (8a) only inserts one coronal stop, and (8b) completes the specification of an existing consonant, he has no way of getting two epenthesized segments. This is the first weakness in his proposal.

Furthermore, the derivation in (7a) suggests that the rules of t-insertion and n-insertion are conjunctively applied, hence their structural description must be different according to the elsewhere condition (Kiparsky (1973)). According to our rule descriptions, this theoretical point is maintained. However, with Ahn's it is not. We thus conclude that our analysis is superior to Ahn's, in that n-inser-

tion rule must be stated independently from the C-insertion rule.

For the sake of completeness, let us complete our derivations of the data set I, II and III, where the n-insertion rule is involved.

(10) Derivation of the data in I, II & III in (1)

a. example from I

CV    VC    (6)    CV    CVC    (2)    CVC    CVC    default  
 | |    | |    | |    | | |    | |    | | |    | | |  
 [t ü]   [i l]----> t ü    n i l    t ü    n i l-----> tütnil [tünnil]

b. example from II

CV C    VCCVC    (6)    CVC    CVCCVC    (2)  
 | |    | | | |    | |    | | | | |  
 [s äNG]   [i pyōl]-----> s äNG    n i pyōl----->

          CVC    C    CVCCVC  
           | | |       | | | | |  
 ----> s äNG    n i pyōl [säNGnibyōl]

c. example from III

CC V CC VC    (6)    CCVCC    CVC    (2)    CCVCC    C    CVC  
 V | V | |    V | V    | | |    V | V  
 [ k o ch] [i p]-----> k o ch    n i p-----> k o ch    n i p  
 default  
 -----> k'och nip [k'onnip]

As shown above, data sets I, II and III are all covered by the present analysis, whereas the alternative analysis by Ahn could not account for the data set I. In particular, he cannot derive the two n's from this data. The solution for this problem is to be found in the insertion of n immediately before the second constituent, and the subsequent insertion of a dummy C for compounding. In (10 b&c) the dummy C is erased by the Stray Erasure Convention as outlined in Steriade (1982:89). SEC will repeatedly appear in (11) & (15).

In addition to the advantage of accounting for the larger set of data as mentioned above, there are further advantages to the present analysis. That is, the rule of C-contraction in (4) explains the relationship between the three different numbers of segments in "Epenthetic-s." i.e., Data sets XI and XII have no independent segment for "Epenthetic-s," but merely a feature [+tense] imposed on the

next consonant; sets IV, VII and X have one segment for "Epenthetic-s" on the surface; and set I has the two segments. This relationship would not be captured without the autosegmental representation of segmental tier and phonemic melody.

Thus we have now covered all the surface segments of the "Epenthetic-s" phenomenon. Let us now turn to sets V, VI, VIII and IX, where there is no "Epenthetic-s" on the surface. Among these data sets, the non-existence of "Epenthetic-s" in VIII and IX is exactly what is predicted by our previous rules. These are the cases where the first noun ends with a consonant and the second one begins with a sonorant consonant. As illustrated in the following (11), the inserted C is left floating, given that the coda allows only one consonant in Korean, and that the onset allows only one C for sonorant segments. Therefore, there will be no default spelling to create an "Epenthetic-s."

(11) Absence of "Epenthetic-s" in VIII and IX.

(a) Examples from VIII

CC	VC	CVC		CC	VC	C	CVC
V				V			
[s	a l]	[mu l]	----> (2) -->	s	a l		mu l [s'almul]

CVC	CVCC		CVC	C	CVC
	V				
[kaNG]	[mi th]	--> (2) -->	kaNG		mi t [kaNGmit]

(b) Examples from IX

CVC	CVCCV		CVC	C	CVCCV
[pa p]	[n ä m s ä]	-> (2) ->	pa p		n ä m s ä [pamnämsä]

The floating Cs in (11) are erased by the Stray Erasure Convention (Steriade 1982:89) which erases unsyllabified segments.

However, unlike sets VIII & IX, the absence of "Epenthetic-s" in sets V & VI remains unexplained under our previous analysis. According to the analysis provided so far, the examples in this category should surface with the "Epenthetic-s" [t] or [d], as in the following illustration in (12):

(12) Incorrect prediction by the analysis thus far

(a) Example from data set V

$$\begin{array}{cccc} \text{CVC} & \text{VCVC} & & \text{CVC} & \text{C} & \text{VCVC} \\ ||| & |||| & & ||| & & |||| \\ \text{yaNG} & \text{adil} & \text{-(2) -} & \text{yaNG} & & \text{adil} \end{array}$$
 ->default-> \*yaNGtadil,  
 but [yaNGadil]

(b) Example from data set VI

$$\begin{array}{ccc} \text{CVC} & \text{VC} & \\ ||| & || & \\ \text{sok} & \text{os} & \end{array} \text{-(2) -} \begin{array}{ccc} \text{CVC} & \text{C} & \text{VC} \\ ||| & & || \\ \text{sc} & & \text{os} \end{array} \text{->default-> *sokot, but [sogot]}$$

In order to handle these cases, I will argue below that the C-insertion rule in (2) still takes place for these sets; therefore these sets are not any exception to the “Epenthetic-s” phenomenon. While doing so, I will also discuss the reserved issue that the rule environment of C-insertion in (2) must be the last element of the first segment.

In order to argue, I will draw some data from s-Neutralization and Cluster Reduction as the following. The point of interest here is the behaviour of the underlined segments.

(13) s-Neutralization and Cluster Reduction

- |  |                        |
|--|------------------------|
| a' /cōs+i/ “milk=Nom(inative)”                                 | [cō̄si]                |
| a” /cōs/ “milk”  | [cō̄t]                 |
| a''' /cōs+kwa/ “milk+and”                                      | [cō̄ k'wa]             |
| a'''' /cōs#ōmi/ “milk#mother (wet nurse)”                      | [cō̄ ōmi]              |
|  |                        |
| b' /kkoc <sup>h</sup> +il/ “flower+Acc(usative)”               | [k'oc <sup>h</sup> il] |
| b” /kkoc <sup>h</sup> / “flower”                               | [k'ot]                 |
| b''' /kkoc <sup>h</sup> +pakke/ “flower+besides”               | [k'otp'akke]           |
| b'''' /kkoc <sup>h</sup> #alā/ “flower#bottom(below a flower)” | [k'odārā]              |

c' /ap <sup>h</sup> +in/ "front + Topic Marker"	[ap <sup>h</sup> in]
c" /ap <sup>h</sup> / "front"	[ap]
c''' /ap <sup>h</sup> +to/ "front+also"	[apt'o]
c"" /ap <sup>h</sup> #untoNGjaNG/ "front # playground"	[apundoNGjaNG]

In these three sets of data, the underlined s, c<sup>h</sup> and p<sup>h</sup> in (13 a'-c') have been changed into t, t and p respectively, either in final position as in data sets (13a"-c"), or when followed by a consonant as in (13a""-c'") are followed by vowels. And yet they behave the same as those in (13a""-c'") which are followed by a consonant, but differently from those in (13a'-b') which are followed by a vowel. Note that the crucial difference between (13') and (13'") is that (13'") are compound nouns whereas (13') are nouns plus suffixes.

What is interesting about the data in (13'") is that the coda consonants remain as coda for the re-syllabification (Kim and Shibatani 1974). Due to the syllabic constraint in Korean which allows only plain stops in coda, s, ch, ph in the above data are neutralized into t, d, p. Only after the coda neutralization, may the resyllabification process occur to make these segments phonetic onset.

Let us recall at this point our reservations concerning as to the structural description of the C-insertion rule (2). The inserted position is the last part of the first constituent noun, and the reason are the following.

Suppose we had an epenthetic-s segment as the last element of the first constituent noun for the data in (13'"), then that epenthesized segment would have no place in the coda, since Korean coda allows only one consonant. We would thus expect not to observe any epenthesized segments for data sets V and VI. These data in (13) constitute the first piece of evidence of applying the C-insertion rule (2) to the last part of the first constituent noun.

To support this argument, I provide below one more piece of evidence from the phenomenon of "Consonant Cluster Simplification." Note the surface representations of the underlying /s/ in the following example:

#### (14) Consonant Cluster Simplification

a' /kaps+i/ "price + Nom." [kaps'i]
a" /kaps+ <u>k</u> wa/ "price+and" [kapk'wa]

a''' /kaps#ōlim/ "price#measurement(estimate)" [kaḥōrim]

b' /nōks+il/ "spirit + Acc." [nōks'il]

b'' /nōks+to/ "spirit + also" [nōkt'o]

b''' /nōks#arā/ "spirit#below(for the spirit)" [nōgarā]

c' /tols+i/ "anniversary + Nom." [tols'i]

c'' /tols+macō/ "anniversary +even" [tolmacō]

c''' /tols#aki/ "anniversary#baby(oneyearoldbaby)" [toraki]

The underlying /s/s in (14''') are followed by vowels, yet they behave in the same way as those in (14'') which are followed by consonants, but differently from those in (14') which are followed by vowels. Note again that the crucial difference between (14') and (14''') is that (14''') are compound nouns whereas (14') are nouns plus suffixes.

This fact is also understood as the coda property in that the coda in Korean allows only one single consonant (Kim and Shibatani, 1974). At least for the initial syllabification, coda remains as coda and thus the clusters get simplified into single stops.

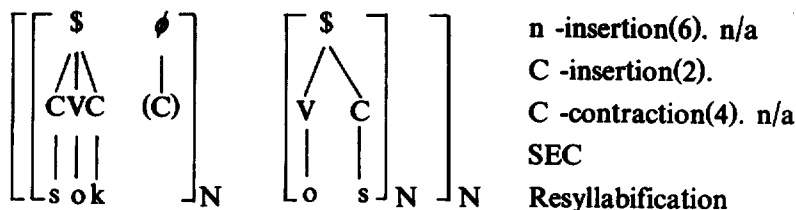
This constitutes the second piece of evidence for the rule environment of (2). Let us follow our hypothesis again, and suppose that there were an epenthetic-s segment as the last element of the first constituent noun for these data in (14'''). Then the epentheticized consonant would have no place to reside here. Thus it is also an expected consequence not to observe any Epenthetic-s for this kind of data. This constitutes the second piece of evidence that the C-insertion in (2) takes place at the last part of the first constituent noun.

Given the two pieces of evidence in (13) and (14), we conclude that the C-insertion rule (2) still took place for these data sets. By doing so, we achieve elegance of analysis in that data sets V and VI in (1) are not exceptional with respect to the "Epenthetic-s" phenomenon, but are instead different realizations of the same C-insertion rule (2).

What is the difference in realization? For these data in V and VI, the epentheticized segment can never have a place in the coda position and thus will never appear in the surface phonetic representation. H-S Sohn (1987:451) formalizes this in terms of Stray Erasure Convention (Steriade 1982:89) which erases un syl-

labified segments. Adopting Sohn's insight, we illustrate a sample data in the set (V) & (VI) as the following. The rule ordering is given on the right corner.

(15) non-appearance of Epenthetic-s in [sokot] 'underwear'



C is inserted by the rule (2) and it is subsequently deleted because of the Stray Erasure Convention. The n-insertion and C-contraction rules do not apply because the structural description is not met. As Sohn notes, it is crucial that the SEC be effective prior to resyllabification, since otherwise the unincorporated C would be resyllabified as the onset of the following syllable. If it is not erased and is resyllabified as the onset of the following syllable, the wrong form [sok<sub>ɬ</sub>ot] would be derived, the inserted C being specified with [t] by default.

To conclude, the phonological analysis of this section provides a comprehensive account of presence and non-presence of the Epenthetic-s phenomenon. It also explains the relationship between the three different numbers of segments in "Epenthetic-s". i.e., Data sets XI and XII have no independent segment for "Epenthetic-s," but merely a feature [+tense] imposed on the next consonant; sets IV, VII and X have one segment for "Epenthetic-s" on the surface and set I has two segments.

We have seen so far how the phonology of Epenthetic-s can be predicted. We will now turn into the morphology of Epenthetic-s and argue that the theory of lexical phonology gives us some insights into the nature of this process.

## 2. Morphology of Epenthetic-s Phenomenon

Epenthetic-s stemmed from a genitive marker-s in middle Korean (with several positional variants) which was once used with an honorific or inanimate possessor as opposed to -i/-hi for an animate possessor noun (S-N Lee 1954, Kim-



Renaud 1974). Historical traces of this genitive marker are left in the synchronic phonology.

Related to this historical fact are the following four synchronic generalizations about the application of this process in the compound noun [[X][Y]: i) application in modifier X and Head Y relationship, ii) non-occurrence in "dvanda" compounds, iii) non-occurrence in object X and action Y relationship, and iv) non-occurrence in animal X. We discuss these in the given order.

The first generalization is the application of Epenthetic-s between the modifier X and head Y. There is a general consensus that Epenthetic-s is a genitive marker (Huh (1975) among others). The genitive relationship is right-headed, with the first element modifying or specifying the second element in some way. In the compound structure [[X][Y]], Epenthetic-s is shown when:

(16) Occurrence of Epenthetic-S in modifier-head compounds

- i) Y is for the purpose of X as in [[mäkcu][pyōNG]] "beer # bottle," pronounced as in [mäkcut<sub>p</sub>'yōNG]
- ii) XY is a kind of Y as in [[phi][paNGu]] "blood # drop," pronounced as in [phit<sub>p</sub>'aNGu]
- iii) Y is part of X as in [[hyō][patak]] "tongue # bottom," pronounced as in [hyōt<sub>p</sub>'adak]

In these examples, Y is modified by X, and they contain an Epenthetic-s as underlined above. Thus we are led to hypothesize that the Epenthetic-s reflects a modifying relationship between the two elements in the compound.

Once we hypothesize so, the prediction is that the phenomenon must not occur in non-modifier relationship such as [X and Y]. Compounds with such a semantic relationship are often called "Coordinate compounds" or "dvanda compounds." Co-compounds have the structure "head+head+head..." whereas our earlier examples have the structure "modifier+head."

As noted by K-H Yi (1976), Y-S Kim (1984), S-C Ahn (1985), Co-compounds do not observe the Epenthetic-s phenomenon. The examples are the following.

(17) Non-occurrence of Epenthetic-s in Co-compounds

- (a) /pi # palam/ "rain and wind (rainstorm)" is pronounced [pibaram], but not \*[pitp'aram]
- (b) /pom # kai/ "spring and fall" is pronounced \*[pomgai], but not \*[pom-k'ai]
- (c) /nun # pi/ "snow and rain" is pronounced [nunbi], but not \*[nunp'i]

These examples are all "X and Y" relationship, where one does not modify the other. Thus, our hypothesis is assured that the epenthetic-s marks the modifying relationship.

In addition to these well-discussed conditions on the application of Epenthetic-s, a contrast can be found between the modifier-head cases and the compounds with a sentential source. Consider the following examples with the deverbalizer -i and -im.

(18) Non-occurrence of Epenthetic-s in sentential compounds

- (a) /hã # tot-i/ "sun # rise-Nominalizer (sunrise)" is pronounced [hãdoji], but not \*[hãtt'oji]
- (b) /mul # pat-i/ "water # receive-Nominalizer (drain-pipe)" is pronounced [mulbaji], but not \*[mulp'aji]
- (c) /caNG # coli-im/ "soy sauce # boil - Nominalizer (meat boiled in soy sauce)" is pronounced [caNGjorim], but not \*[caNGc'orim]

These examples illustrate various argument-predicate relationships between the first noun and the base verb of the second element. (a) is a subject and intransitive verb relationship; (b) is a direct object and transitive verb relationship; and (c) is an oblique noun and verb relationship. Since such argument-predicate relationships are the property of sentences, we conclude that all sentential compounds resist Epenthetic-s.

Previous literature differs from our view on the same data. The generalization has been that Epenthetic-s does not occur when the second noun is a derived noun. (K-H Lee(1976), Chung(1980), Ahn(1985)). This view is no more than a tendency, as is mine, since there are lexical exceptions such as [[ton][pōl-i]] "money # earn-Nominalizer (job)" where the first noun is the direct object of the base verb of the second noun. Thus, the data accounted for is actually the same as mine, and the difference lies in the interpretation of the data.

There are three reasons for choosing my view of a "sentential source" over theirs of a "deverbal noun." The first reason concerns the fact that some second elements may not be words by themselves. For instance, [tot-i], [pat-i] or [coli-im] in the above examples are not words in isolation. For our view, this fact is due to their sentential source, as in [[ha-tot]s -i]<sub>N</sub>, [[mul-pat]s -i]<sub>N</sub>, [[caNG-coli]s -im]<sub>N</sub>. These are synchronically reanalyzed into a compound structure as in [[hä] [toti]], since these lexical strings consist of two stems. Binary stems [[x][y]] result in compound structures, whereas mono stem [[x]y] in affixation. Thus the data are consistent with our view of a "sentential source."

On the other hand, the analysis involving "deverbal nouns" is now problematic, since the supposedly deverbal nouns are not words by themselves. In such an approach, there is no way to introduce the second element to compounding structure, without going through a sentential source.

The second reason for our view of the data is in the linguistic generalization about the modifier-head relationship. I have discussed earlier that Epenthetic-s marks a modifier X and head Y relationship. In our view, the generalization still holds for these data in (18), since these are argument-predicate relationships, but not modifier head relationships.

On the other hand, an analysis using "deverbal nouns" is again in trouble, since these data in (18) can be considered as subcompounding where the first element modifies the action of the second noun. That is, a certain kind of action in Y is restricted to its subkind in X. Thus their view based on "deverbal nouns" cannot avoid losing a linguistic generalization as to whether or not the Epenthetic-s applies to a modifier-head structure.

The third reason for our claiming a sentential source is from historical support. I have mentioned earlier that Epenthetic-s historically stemmed from a genitive marker. A genitive marker cannot occur between a sentential argument and the verb. Thus, the English example, "John's coming", with a genitive morphemes, can never be interpreted as a sentence. Such non-occurrence of a genitive morpheme straightforwardly accounts for the fact that epenthetic-s does not occur in compounds of a "sentential source."

On the other hand, the "deverbal noun" analysis treats these as accidental exceptions to historical genitive markers. Note that one may interpret the examples in (18) as having a synchronic genitive relationship as in "the sun's rise," "the water's receiver," "the boiling of soy sauce." For the deverbal noun analysis, these syn-

chronic genitive relationships are simply an exception to other genitive relationships with respect to the occurrence of Epenthetic-s. From these three arguments for "sentential source," we conclude that Epenthetic-s most readily applies where the two elements in a compound stand in a modification relationship, where "modification" excludes sentential origin.

The historical fact reemerges in our fourth generalization about the occurrence/non-occurrence of the epenthetic-s. It has often been noted in the literature that epenthetic-s does not apply when the first noun is an animate possessor. In other words, a semantic relationship in which, for example, animal X owns Y as in [[kolā][tūNG]] "whale # back (back of a whale)," is pronounced as [korädūNG], but not [korä'tūNG].

From these four generalizations about the occurrence/non-occurrence of Epenthetic-s, we conclude that the historical trace of the morphological rule is still observed in the synchronic grammar.

Given this conclusion, let us now recall Bauer (1983)'s position that lexicalization is essentially a diachronic process, but that the traces it leaves in the form of lexicalized lexemes should be dealt with within synchronic grammar. I will now argue for this position based on morpho-phonological evidence.

For such purposes, we need to support three facts: i) that a phenomenon X is lexical, ii) that X is a diachronic process, iii) X must be dealt in synchronic phonology. I have just completed supporting the second and third points by showing that the phenomenon of Epenthetic-s is diachronic, and that its morphological and phonological trace must be dealt in the synchronic analysis. We are now left with having to justify the lexical status of the Epenthetic-s phonology.

### 3. Lexical status of Epenthetic-s rules

In this section, I will agree that the morpho-phonology of Epenthetic-s discussed so far is readily explained by assuming that the rules apply within the lexicon. By assuming so, we are in essence following the central claim of the theory of lexical phonology that some phonology must take place within the Lexicon (Mohanani(1982) among others). Allowing any "rules" in the lexicon has been a ground-breaking claim since Chomsky(1970), because previous assumptions have considered the lexicon to have no rules as such.

Although I follow this central claim of Lexical Phonology, I do not automatically

adopt the prevailing definition of "lexicon" assumed by most of the literature supporting this. The prevailed definition of lexicon in this camp is that the lexicon is identical to the word-formation component (Jensen & Jensen (1984) among others), but I tried to show in my dissertation (1986) that lexicon should only be a proper subset of word-formation.

If we follow Jensen's notion of lexicon, although it is incorrect, we can easily identify what is lexical phonology and what is not lexical phonology, because any and all word-phonology is then lexical phonology. Since we do not follow this view of the lexicon, for the reasons given in my previous work, we must make it clear what is lexical phonology.

As Mohanan in this conference paper (section 6.1) reports, there are so many different notions of being "lexical." Although clarifying this issue is an interesting topic, let us for the present purpose hold onto the most agreed criteria among different notions of being "lexical." Let us now discuss in detail with concrete examples the lexical status of epenthetic-s phonology.

The first criterion is that lexical phonology applies only to syntactically invisible strings whereas post-lexical phonology may or may not. This follows from an agreed assumption that the lexicon is invisible for syntactic processes.

I shall provide two arguments that epenthetic-s is syntactically invisible. The first argument concerns our previous discussion that the phonology of Epenthetic-s does not apply between an argument-predicate relationship, but only in modification relationships. It goes without saying, therefore, that Epenthetic-s is irrelevant to sentential structure.

The first argument is that Epenthetic-s does not apply when the two constituent nouns are separated by another phrase, because in this case each of them has become a phrase. For instance, the compound  $[[nara]_N [il]]_N$  "national affairs" does have a [modifier X-head Y] structure where the first noun nara "nation" modifies the second noun il "affairs." As expected, in this compound noun, Epenthetic-s applies as in  $[narannil]$ .

If these two constituent nouns are separated, however, by another word or phrase, then Epenthetic-s no longer applies. For instance, if we insert an adjective cungtāhan "important" between the two constituents, then the surface string is  $[[nara]_N iy] [cuNGtāhan]_A [il]_N$  "important affairs of the nation," where iy is the regular genitive case marker. In this example, the modification-head relationship remains the same, but the Epenthetic-s does not apply when the constitu-

ency is disturbed and each noun become a phrase. Thus, Epenthetic-s is not a phrasal operation.

The second argument for the irrelevance of Epenthetic-s to syntax concerns syntactically ill-formed strings (Y-S Kim (1984)). When Epenthetic-s applies between two constituents which are syntactically ill-formed, then the whole string functions as a word. Consider the following data.

(19) Epenthetic-s in syntactically ill-formed strings

- (a)  $\text{üe-C-i}$  [üenni]  $\text{u-C-i}$  [ünni] "the upper teeth"  
(Gloss:  $\text{ü}$  the opper part + e (Locative) #  $\text{i}$  'teeth')
- (b)  $\text{aphe-C-cip}$  [ $\text{ap}^{\text{h}}$ etç'ip]  $\text{ap}^{\text{h}}\text{-C-cip}$  [ $\text{apç}$ 'ip] "the front house"  
(Gloss:  $\text{aph}$  'front' + e (Locative) #  $\text{cip}$  'house')
- (c)  $\text{kyōthe-C-salam}$  [ $\text{kyōt}^{\text{h}}$ etç'aram] "one's acquaintances"  
(Gloss:  $\text{kyōth}$  'nearby' + e (Locative) #  $\text{salam}$  'people')
- (d)  $\text{soke-C-mal}$  [so $\text{gen}$ mal]  $\text{sok-C-mal}$  [so $\text{NG}$ mal] "confidential talk"  
(Gloss:  $\text{sok}$  'inside' + e (Locative) #  $\text{mal}$  'words')
- (e)  $\text{kūe-C-mal}$  [küenmal] "whisper"  
(Gloss:  $\text{kü}$  'ear' + e (Locative) #  $\text{mal}$  'words')

The compound nouns in (19) would not be possible without the Epenthetic-s making the two parts stick together. Admittedly, it is unusual for a case marker -e to intrude into a compound. But for the 'Epenthetic-s', such a thing would never happen. What is expected instead are clausal expressions such as  $[[\text{ü-e}]_{\text{AdvP}} \text{iss -nin}]_{\text{S}}$  [ $\text{i}$ ]<sub>NP</sub> 'the(set of) teeth that are at the upperpart' (cf.(19a)),  $[[\text{kü-e-taka}]_{\text{AdvP}} \text{hanin}]_{\text{S}}$  [ $\text{mal}$ ]<sub>NP</sub> "a talk that is spoken in one's ear" (cf.(19e)). In other words, the occurrence of Epenthetic-s enables these ungrammatical strings to function as compounds. Since a compound word is not syntactically divisible, syntactic ill-formedness of the constituents does not occur.

This sort of example can readily be dealt within the theory of lexical phonology. These are lexicalized strings which are subject to Epenthetic-s. Since lexicon is irrelevant to syntax, these examples in (19) may be syntactically ill formed.

Assuming otherwise, however, we face a theoretical incoherence since these examples do not follow syntactic regulations. We thus conclude again that the morpho-phonology of Epenthetic-s must be placed in the lexicon.

From the above two arguments, we argue that epenthetic-s is syntactically invisible.

Let us now turn to the second criterion for the lexical status of a phonological rule. The second criterion for lexical phonology is that it may have lexical exceptions whereas post-lexical phonology must not have lexical exceptions. This follows from the assumption that lexicon may be idiosyncratic whereas post-lexicon is a productive syntactic process.

It has been claimed by those who have investigated Epenthetic-s process in great detail that it is largely unsystematic and idiosyncratic (eg., K-H Yi (1976)). In particular, there are minimal pairs involving the Epenthetic-s as in the following examples. The examples in (20)' are lexical items with the Epenthetic-s (underlined), and those in (20) are their lexical counterpart without Epenthetic-s. The underlying forms are given in (a), (b) and (c).

(20) Lexical minimal pairs

(a) [[namu]<sub>N</sub> [pǎ]<sub>N</sub>] "wood # boat"

(a') [namutpǎ] "a boat laden with wood"

(a'') [namubǎ] "a boat made of wood"

(b) [[namu]<sub>N</sub> [cip]<sub>N</sub>] "wood # house"

(b') [namutcip] "a house which sells wood"

(b'') [namujip] "a house made of wood"

(c) [[mun]<sub>N</sub> [ca]<sub>N</sub>] "literature # letter"

(c') [munc'a] "letters, characters"

(c'') [munja] "bookish prose"

In these examples, the occurrence/non-occurrence of Epenthetic-s determines different lexical items. Such lexical minimal pairs can never be predicted from the rule by itself. Since these are all modifier-head relationships, the rule should simply apply to all these examples including those in (20)". However, those in (20)" do not have the Epenthetic-s, and thus mark themselves as lexical exceptions.

Such lexical minimal pairs can readily be dealt by assuming the rule of epenthetic-s in the Lexicon, given that lexical exceptions are property of lexicon.

Assuming, on the other hand, the rule to be post-lexical, we would have to risk further complication in syntax by saying that some forms undergo the Epenthetic-s rules, and some do not. Obviously, this is against our expectation about syntax. Thus, we conclude that the rule of Epenthetic-s belongs to lexical phonology.

In summation, we argue that the rule of Epenthetic-s belongs to lexical morpho-phonology, on the grounds that i) the rule is syntactically invisible and ii) the rule observes lexical exceptions.

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