Licensing and Redundancy: [s]-Onset Neutralization[1]

Soonhyun Hong
(Hankuk University of Foreign Studies)

Hong, Soonhyun. 1998. Licensing and Redundancy: [s]-Onset Neutralization. *Linguistics*, 6-2, 263-287. In Korean, a noun-final coronal obstruent becomes [s] before a vowel at a morpheme boundary. If we assume that this phenomenon can be explained by spreading of [+cont] from a vowel to a preceding coronal as in M. Oh 1995, a question naturally arises: why a redundant feature [+cont] of a vowel affects a preceding coronal obstruent to be neutralized to [s]. The spread of redundant [+cont] of a vowel, in turn, serves as a marked feature in a coronal obstruent. To avoid this redundancy problem, we demonstrate that implementation of Licensing and Default implication of [+cont] successfully explains why redundant [+cont] of a vowel forces a preceding coronal obstruent to neutralize to [s]. **(Hankuk University of Foreign Studies)**

1. Optional [s]-Onset Neutralization in a Noun Root-final Coronal Obstruent

In Korean, /s, s'/ are neutralized to [t] in Coda (Kim, K. H. 1987, Hong 1996, 1997a).

(1) Coda Neutralization of /s/

a. /os/	**ot**	'clothes'
cf. /os-il/	**os-il**	'clothes-Acc'
b. /pəs-ko/	**pət-k'o**	'to take off-and'

1 This paper is a revised version of the paper presented at the Fall Meeting of the Linguistic Association of Korea, Chonbuk National University, Oct. 31, 1998.

cf. /pəs-ə/ pəs-ə 'to take off-Cont'

Korean has the following negative constraint for Coda Neutralization of underlying /s/ (Hong 1996; cf. Hong 1997a for a positive constraint for Coda Neutralization):

(2) Continuancy Coda Neutralization (hereafter, CN)

$$*C]_{syllable}$$
$$|$$
$$[+cont]$$

CN says that [+cont] is disallowed in Coda. Though we may use a positive constraint instead, we will stick to the negative constraint, CN, throughout this paper for simplicity.

On the other hand, Korean has [s]-Onset Neutralization (hereafter, [s]-ON) in which Noun Stem-final coronal obstruents /t^h, c, c^h/ optionally neutralize to [s] before a vowel when they are syllabified in Onset at a suffixal/clitic boundary (M. Oh 1995).

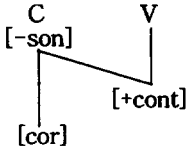
(3) [s]-Onset Neutralization in Noun Stem-final coronal obstruents

a. /pat^h-e/	pas-e, pat^h-e	'field-at'
b. /pat^h-ilaŋ/	pas-iraŋ, pac^h-iraŋ[2]	'field-and'
b. /k'oc^h-il/	k'os-il, k'oc^h-il	'flower-Acc'
c. /cəc-il/	cəc-il, cəs-il	'milk-Acc'
d. /suc^h-il/	suc^h-il, sus-il	'charcoal-Acc'
cf. /pan-e/	*pas-e, pan-e	'class-at'
cf. /pap-e/	*pas-e, pap-e	'rice-at'

According to the pioneering work in M. Oh 1995, [+cont] in a vowel spreads to a preceding coronal obstruent. The following rule is a simplified version of her proposal to serve the current purpose:

2. /t^h/ has palatalized to [c^h].

(4) [s]-ON[3]



The question we are interested in is why a redundant feature [+cont] of a vowel spreads to a preceding coronal obstruent. Considering the fact that all vowels are continuants and [+cont] in a vowel is redundant, the spread of a redundant feature to a preceding coronal obstruent is problematic. Furthermore, [+cont] in a coronal consonant is a marked feature and as a result, the rule [s]-ON is an abnomal case in which redundant continuancy of a segment (e.g. a vowel) affects the marked continuancy of a segment (e.g. a coronal obstruent). In this paper, we begin with the assumption as in M. Oh 1995 that the spread of redundant [+cont] of a vowel to a preceding coronal obstruent is basically correct. However, we would like to spell out a solution in Optimality Theory to the redundancy-related problem of [+cont] spreading.

In the next two sections we will show that similar redundancy-related phonological phenomena are observed in Japanese Voicing Assimilation in NC clusters (Itô Mester & Padgett 1995) and in Korean /t/-Palatalization (Hong 1997a, 1997c) and will review how those redundancy-related problems are explained by implementation of Licensing and Redundancy implication in OT.

2. Licensing and Redundancy of [voice] in Itô, Mester & Padgett 1995

3. In M. Oh 1995's original formulation, [cor] is not specified for coronals in description of [s]-ON. However, we assume in this paper that [cor] is underlyingly specified for coronals, following Smolensky 1993 and Lombardi 1997.

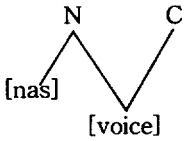
Itô, Mester & Padgett 1995 (hereafter, IMP 1995) implement the two notions Licensing and Redundancy in OT to explain Voicing Assimilation in a sequence of a nasal C and a voiceless obstruent in Yamato Japanese:

(5)Observation: a nasal must share [voice] with a following consonant (IMP 1995)

a. /yom-te/	yon-de	'reading'	
b. /ʃin-te/	ʃin-de	'dying'	
c. tombo		'dragonfly'	*tompo
d. ʃindo-i		'tired'	*ʃinto-i

Note that [voice] in a nasal consonant is a redundant feature since a nasal consonant redundantly implies [voice]. However, the redundant feature [voice] of a nasal affects the voicing of a following obstruent. Redundant [voice] in a nasal in Japanese exactly patterns together with the redundanct feature [+cont] in a vowel in [s]-ON in Korean, as a redundant feature of a segment spreads to a segment in which the spread feature, in turn, is a marked feature in the affected segment.

(6) Voicing Assimilation



From the observation that a nasal must share [voice] with a following consonant, IMP 1995 propose the following LICENSE[voice] and NasVoi constraints which appeal to Licensing and Redundancy, respectively:

(7) a. LICENSE[voice]: [voice] is licensed when linked to an obstruent
b. NasVoi: [nasal] ⊃ [voice]
[nasal] implies [voice] redundantly.

c. Constraint ranking: LICENSE[voice] >> NasVoi

d. Tableaux

	LICENSE[voi]	NasVoi
☞ k a m i		
k a m i | Voi	*!	
t o m p o		*!
t o m p o | Voi	*!	
☞ t o m b o \/ Voi		

In the first tableau above, the second candidate violates high ranked LICENSE[voi]. On the other hand, the first candidate violates low ranked NasVoi. As a result, the first candidate is optimal. In the second tableau, the last candidate does not violate any constraint and is optimal. The ranking LICENSE[voi]>>NasVoi chooses the optimal candidate in which a nasal and a following obstruent share [voice].

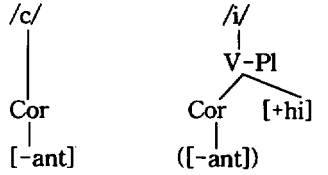
3. Licensing and Redundancy of [-ant] in Hong 1997a, 1997c

In Korean, /t, th/ become palatalized to [c, ch] before a front high vowel at a suffixal boundary (Primary Palatalization).

(8)	a. /mat-i/	mac-i	'the first son'	[Root-Nominalizer]
	b. /tot-i/	toc-i	'rising'	[Root-Nominalizer]
	c. /pat^{h}-i/	pac^{h}-i	'dry field-Nom'	[Stem-Nominative]

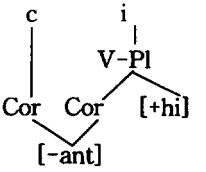
As palatal [c] may be represented with [-ant] under the Coronal node, we may say that Primary Palatalization is represented by [-ant] shared by a coronal obstruent and a following front high vowel [i].

(9) Feature Representations



where ([F]) is a redundant feature and specified only when necessary

(10) Assumed Palatalization



Hong 1997a & c demonstrate that the redundant feature [-ant] of a front high vowel in Korean patterns exactly together with [voice] in Yamato Japanese in terms of Feature Licensing and Redundancy. In Korean, [c] is represented with [-ant] under the Cor node. Hence, [-ant] is a marked feature of a coronal obstruent. However, [-ant] is a redundant feature of a front high vowel. Then a redundant feature [-ant] of a front high vowel spreads to a coronal obstruent, in which [-ant] is a marked feature. Then after spreading of [-ant], the redundant [-ant] of a front high vowel becomes a marked feature of a coronal consonant. Hong argues that [-ant] is a redundant feature of a front high vowel in Korean and provides the following constraint:

(11) FRONT-HI[-ant]: [V-pl/Cor, +high] ⊃ [-ant][4]
A front high vowel implies [-ant] redundantly.

He further argues that the consonantal feature [-anterior] must be licensed by the feature [-son] in the Root node.

(12) LICENSE[-anterior]
[-anterior] is licensed by [-son] in the Root node.

(13) Constraint ranking
LICENSE[-anterior] >> FRONT-Hi[-ant]

The Licensing constraint LICENSE[-anterior] is probable since [-anterior] is a typical coronal consonantal place feature, though it is a redundant feature in a front high vowel. Furthermore, only /t/ undergoes primary palatalization (i.e., sharing [-ant] by an obstruent coronal and a following high front vocoid). As a result, any [-anterior] which is associated with a high front vocoid must be licensed by being additionally linked to a Licenser obstruent.

The following tableau illustrates how the two constraints interact with each other in primary palatalization[5]:

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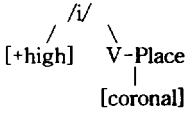
4. Hong 1997a assumes (partly following Clements & Hume 1995 and Hume 1992) that a front high vocoid is represented by [+high] and a V-Place node with a [cor] dependent:



5. Hong 1997a argues that underapplication of primary palatalization in /mati/ [mati] 'branch' in which a morpheme boundary is not involved, results from prespecification of [+ant] in /t/ in /mati/ (in the sense of Kiparsky 1993). For detailed discussion, see Hong 1997a and Kiparsky 1993 for prespecification of a feature.

(14) /mat-i/ mac-i 'first son'

/mat-i/	LICENSE [-ant]	FRONT-HI
a. m a t - i | | | | V-Pl | | [cor] [cor]		*!
b. m a t - i | | | | V-Pl | | [cor] [cor] | [-ant]	*!	
c. ☞ m a c - i | | | | V-Pl | | [cor] [cor] \ | [-ant]		

Candidate (14a) violates FRONT-HI[-ant] since [i] does not carry [-ant] under the V-pl node. Candidate (14b) violates LICENSE[-ant] since [-ant] is not licensed. However, candidate (14c) does not violate any constraint and is therefore optimal. LICENSE[-ant]>>FRONT-HI[-ant] forces [-ant] to be doubly linked to a coronal obstruent and a following front high vowel.

In analyzing /t/-Paltalization phenomenon, the feature [cor] which is not licensed by a vowel spreads to be licensed, otherwise it would delete. We will show in the next section, such notion of Licensing can be similarily implemented in [s]-ON: the redundant feature [+cont] of a vowel should spread to be licensed (by an obstruent).

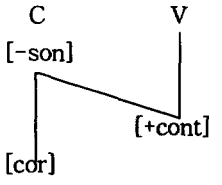
4. Proposal: Licensing and Redundancy of [+cont] in [s]-ON

We repeat the data for [s]-ON and the rule of [s]-ON in M. Oh 1995 as follows:

(15) [s]-Onset Neutralization in Noun Root-final coronal obstruents

a. /pat^h-e/	pas-e, pat^h-e	'field-at'
b. /k'oc^h-il/	k'os-il, k'oc^h-il	'flower-Acc'
cf. /pan-e/	*pas-e, pan-e	'class-at'
cf. /pis-il/	pis-il	'comb-Acc'

(16) [s]-Onset Neutralization



We will demonstrate in this section that Licensing and Redundancy implication of [+cont] can be implemented for Korean [s]-ON. First of all, we assume the following feature representations for obstruents and vowels:

(17) Feature representations of obstruents and vowels

Continuant	Non-continuant	Vowels
Obstruents	Obstruents	
Root[-son]	Root[-son]	Root[+son, +vocalic]
|	|	|
[+cont]	[-cont]	([+cont])

where "(F)" means it is redundant and is represented only when necessary

Since [+cont] is a typical feature of a (coronal) obstruent in Korean ([s, s', ʃ, ʃ']), we propose that [+cont] must be licensed by what characterizes an obstruent. In other words, [+cont] need to be licensed

by the Root node with [-son] in it.

(18) LICENSE[+cont]
[+cont] should be licensed by Root[-son].

However, since [+cont] is allowed only in coronal obstruents, we further propose that [+cont] is not compatible with other non-coronal features:

(19) a. *[+cont, lab]
b. *[+cont, dor]

The two feature imcompatiblity constraints are unviolable in Korean and are assumed to be undominated.

[+cont] in a vowel is a redundant feature and is represented in a vowel only when it is licensed (or necessary) to appear, as in Hong 1997a & c and IMP 1995. Hence, redundant [+cont] in a vowel must spread to a preceding coronal obstruent to be licensed, otherwise, it should delete to avoid fatal violation of undominated LICENSE[+cont]. We further propose the following Redundancy implication in which a vowel redundantly implies [+cont]:

(20) VOWEL[+cont]
[+son, +vocalic] ⊃ [+cont]
A vowel redundantly implies [+cont].

We propose the following constraint ranking:

(21) Constraint Ranking
LICENSE[+cont], *[+cont, lab], *[+cont, dor], IDENT[lab], IDENT[dor], IDENT[nas] >> VOWEL[+cont]

The relative ranking of IDENT[lab]/IDENT[dor] and IDENT[nas] with

other constraints will be spelled out in tableaux in (23).

Now, let us show how the proposed constraint ranking works in Noun derivatives, first. A Noun Stem-final coronal obstruent optionally neutralizes to [s] before a vowel.

(22) a. /pat^h-e/ pas-e 'field-at'
b. /k'oc^h-il/ k'os-il 'flower-Acc'
c. /os-e/ os-e 'clothes-at'

a. /pat^h-e/	LICENSE [+cont]	VOWEL [+cont]
pa.t^h-e | [+cont]	*!	
pa.t^h-e		**!
☞ pa.s-e \/ [+cont]		*
b. /k'oc^h-il/	LICENSE [+cont]	VOWEL [+cont]
k'o.c^h-il | [+cont]	*!	
k'o.c^h-il		**!
☞ k'o.s-il \/ [+cont]		*
c. /os-e/	LICENSE [+cont]	VOWEL [+cont]
o.s - e | | [+cont][+cont]	*!	
o.s - e | [+cont]		**!
☞ o.s-e \/ [+cont]		*

In tableau (22a), the first candidate violates LICENSE[+cont] since [+cont] is not linked to an obstruent. The second candidate receives two violation marks for VOWEL[+cont] since [a] and [e] are not associated with [+cont]. The third candidate, however, receives only one violation mark for lower ranked VOWEL[+cont] since [a] is not associated with [+cont].

On the other hand, Noun Stem-final /n/ and /p/ do not neutralize to [s] before a vowel-initial suffix or clitic.

(23) a. /pan-i/ pan-i 'class-Nom'
b. /pap-i/ pap-i 'rice-Nom'

a. /pan-i/	LICENSE [+cont]	IDENT [lab]	IDENT [nas]	VOWEL [+cont]
☞ pan-i | [nas]				
pan - i | | [nas][+cont]	*!			
pas-i \/ [+cont]			*!	

b. /pap-i/	LICENSE [+cont]	IDENT [lab]	IDENT [nas]	VOWEL [+cont]
☞ pap-i | [lab]				*
pap-i | | [lab][+cont]	*!			*
pas-i \/ [+cont]		*!		*

In the first tableau above, the first candidate receives two violation marks for lower ranked VOWEL[+cont] due to the fact that [a] and [i] do not have [+cont]. However, undominated LICNESE[+cont] is fatally violated in the second candidate since [+cont] is not licensed. The third

candidate fatally violates IDENT[nas] ranked higher than VOWEL[+cont]. Hence, the first candidate is optimal.

In the second table above, the first candidate receives two violation marks for lower ranked VOWEL[+cont] whereas the second and third candidate violate higher ranked LICENSE[+cont] and IDENT[lab], respectively. As a result, the first candidate is correctly predicted to be optimal.

5. Underapplication of [s]-ON in Verb Root-final coronal obstruents

So far we have shown that coronal obstruents optionally neutralize to [s] in the final position of a Noun Stem before a vowel-initial suffix or clitic. However, Verb Root-final coronal obstruents do not neutralize to [s] when they are syllabified in Onset at a suffixal boundary (underapplication of [s]-ON).

(24) Underapplication of [s]-ON in Verb Root-final coronal obstruents

a. /put^h-ə/	*pus-ə	put^h-ə	'to attach-Cont'
b. /c'ic-ə/	*c'is-ə	c'ic-ə	'to tear off-Cont'
c. /mac-a/	*mas-a,	mac-a	'to be battered-Cont'

Such underapplication of [s]-ON is observed only in the final-coronal obstruent of Verb Roots. Hence morphological information is critical in [s]-ON phonomenon.

In order to explain such underapplication, we need to refer to some morphological properties of Noun Stems and Verb Roots in Korean. Korean Nouns can appear as independent words whereas verbs cannnot. Verbs must always be morphologically accompanied by inflections and hence they do not have citation forms unlike Nouns.

(25) Noun and Verb derivatives

a. Noun derivatives

/os/	'clothes'	/pat^h/	'field'
ot	citation form	pat	citation form
os-i	'clothes-Nom'	pas-i	'field-Nom'
ot-t'o	'clothes-also'	pat-t'o	'field-also'
os-il	'clothes-Acc'	pas-il	'field-Acc'

b. Verb derivatives

/c'ic-/	'to tear off'	/put^h/	'to attach'
c'it-t'a	'to tear off-VE'	put-t'a	'to attach-VE'
c'ic-ə	'to tear off-Cont'	put^h-ə	'to attach-Cont'
c'ic-il	'to tear off-Mod'	put^h-il	'to attach-Mod'

We propose that Korean Verb Root-final position does not like [+cont] unless other higher ranked constraints are violated.

(26) *VROOT-FIN[s]

*C]$_{\text{verb Root}}$

|

[+cont]

[+cont] is disallowed in Verb Root-final position

The constraint *VROOT-FIN[s] is violated when a Verb Root-final C is occupied by underlying /s/ or /s'/, which surfaces in the output.

(27) Cases in which *VROOT-FIN[s] is violated

a. /pəs-ə/	pəs-ə	'to take off-Cont'
b. /is'-ə/	is'-ə	'to exist-Cont'

In these two cases, Verb Root-final /s, s'/ surface at the expense of violating *VROOT-FIN[s]. This suggests that *VROOT-FIN[s] must be ranked lower than MAX[+cont].

(28) Constraint Ranking
MAX[+cont] >> *VROOT-FIN[s]

On the other hand, MAX[+cont] should be ranked lower than CN since /s/ neutralizes to [t] in Coda at the expense of violating MAX[+cont].

(29) CN
/os/ ot 'clothes'

We propose the following constraint ranking:

(30) Constraint Ranking
CN, LICENSE[+cont] >> MAX[+cont] >> *VROOT-FIN[s] >> VOWEL[+cont]

Before demonstrating how the proposed constraint ranking works in Verb derivatives, we will show that the proposed ranking does not affect Noun derivatives which we showed in the previous section.

(31) a. Nouns

/os/	ot	'clothes'
/os-e/	os-e	'clothes-at'
/pat^{h}-e/	pas-e	'field-at'
/cəc-e/	cəs-e	'milk-at'

b. Verbs

/pəs-ə/	pəs-ə	'to take off-Cont'
/put^{h}-ə/	*pus-ə put^{h}-ə	'to attach-Cont'
/mac-a/	*mas-a, mac-a	'to be battered-Cont'

A Noun Stem-final coronal obstruent neutralizes to [s] before a vowel-initial suffix or clitic. The tableaux for [s]-ON in noun Roots are shown below:

(32)

a. /os/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
os	*!				
☞ ot					
b. /os-e/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
os-e | [+cont]				N/A	**!
☞ os-e \/ [+cont]				N/A	*
ot-e			*!	N/A	
ot-e | [+cont]		*!	*	N/A	
c. /pat^{h}-e/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
pat^{h}-e | [+cont]		*!		N/A	
pat^{h}-e				N/A	**!
☞ pas-e \/ [+cont]				N/A	*
pat-e				N/A	**!
pat-e | [+cont]		*!		N/A	*
d. /cəc-e/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
cəc-e | [+cont]		*!		N/A	*
cəc-e				N/A	**!
☞ cəs-e \/ [+cont]				N/A	*

In tableau (32b), for example, the second candidate in which [s]-ON takes place, is optimal since it receives one violation mark for lower

ranked VOWEL[+cont]. The first candidate receives two violation marks for lower ranked VOWEL[+cont]. The third and fourth candidate fatally violate higher ranked MAX[+cont] and LICENSE[+cont], respectively. Hence, the current constraint ranking correctly predicts that the second candidate is optimal.

Now, let us show how the current ranking explains underapplication of [s]-ON in verb derivatives.

(33) ("]" indicates the right edge of a Verb Root)

a. /pəs]-ə/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
☞ pəs-ə V [+cont]				*	*
pəs-ə | | [+cont][+cont]		*!		*	*
pəs-ə | [+cont]				*	**!
b. /put^{h}]-ə/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
put^{h}-ə | [+cont]		*!			*
☞ put^{h}-ə					*
pus-ə V [+cont]				*!	*
c. /mac]-a/	CN	LICENSE [+cont]	MAX [+cont]	*VROOT-FIN[s]	VOWEL [+cont]
☞ mac-a					*
mac-a | [+cont]		*!			*
mas-a | [+cont]				*!	*
mas-a V [+cont]				*!	*

(33a) is a case in which the verb Root-final consonant is /s/ underlyingly, which surfaces as [s] before a vowel. All candidates violate *VROOT-FIN[s]. However, the second candidate fatally violates undominated LICENSE[+cont] and the third candidate receives two violation marks for VOWEL[+cont]. Hence, the first candidate is optimal. In tableau (33b), the first candidate fatally violates undominated LICENSE[+cont]. The third candidate fatally violates *VROOT-FIN[s] since [s] is realized in Verb Root-final position. However, the second candidate receives two violation marks only for lower ranked VOWEL[+cont] and hence becomes optimal.

6. Optionality of [s]-ON

So far we have proposed the following constraint ranking to explain [s]-ON Phenomenon:

(34) Constraint Ranking for [s]-ON
CN, LICENSE[+cont] >> MAX[+cont] >> *VROOT-FIN[s] >> VOWEL[+cont]

However, we have not spelled out why [s]-ON is optional. This optionality varies depending on the speaker. We propose that the optionality of [s]-ON is due to Constraint Reranking of MAX[-cont], MAX[laryn] and MAX[-ant]. Note that MAX[-cont], MAX[laryn], and MAX[-ant] are lower ranked than VOWEL[+cont] in the constraint ranking for [s]-ON (in (34)) whereas they are higher ranked than *VROOT-FIN[s] in the constraint ranking for lack of [s]-ON (in (35a)). In other words, deletion of [-cont], [laryn] or [-ant] should be avoided at the expense of violation of *VROOT-FIN[s] or VOWEL[+cont]:

(35) Constraint Ranking for lack of [s]-ON

a. CN, LICENSE[+cont]
>> MAX[+cont], MAX[-cont], MAX[laryn], MAX[-ant]
>> *VROOT-FIN[s] >> VOWEL[+cont]

b. /pat^{h}-e/ pat^{h}-e 'field-at'
/os-e/ os-e 'clothes-at'
/cəc-e/ cəc-e 'milk-at'
/put^{h}-ə/ put^{h}-ə 'attach-Cont'
/pəs-ə/ pəs-ə 'take off-Cont'

a. /pat^{h}-e/	CN	LICEN [+cont]	MAX [+cont]	MAX [-cont]	MAX [-ant]	MAX [laryn]	*VROOT-FIN[s]	VOWEL [+cont]
pat^{h} - e | | [-cont][+cont]		*!						
☞ pat^{h}-e | [-cont]								
pas-e V [+cont]				*!				
pat-e | [-cont]						*!		
pat - e | | [-cont][+cont]		*!						
b. /os-e/	CN	LICEN [+cont]	MAX [+cont]	MAX [-cont]	MAX [-ant]	MAX [laryn]	*VROOT-FIN[s]	VOWEL [+cont]
os-e | [+cont]							N/A	**!
☞ os-e V [+cont]							N/A	*
ot-e			*!					
ot-e | [+cont]		*!						

c. /cəc-e/	CN	LICEN [+cont]	MAX [+cont]	MAX [-cont]	MAX [-ant]	MAX [laryn]	*VROOT-FIN[s]	VOWEL [+cont]
cəc-e | [+cont]		*!						
☞ cəc-e								
cəs-e ∨ [+cont]				*!				
d. /put^{h}]-ə	CN	LICEN [+cont]	MAX [+cont]	MAX [-cont]	MAX [-ant]	MAX [laryn]	*VROOT-FIN[s]	VOWEL [+cont]
put^{h} - ə | | [-cont][+cont]		*!						
☞ put^{h}-ə | [-cont]								
pus-ə ∨ [+cont]				*!				
e. /pəs]-ə	CN	LICEN [+cont]	MAX [+cont]	MAX [-cont]	MAX [-ant]	MAX [laryn]	*VROOT-FIN[s]	VOWEL [+cont]
☞ pəs-ə ∨ [+cont]							*	*
pəs - ə | | [+cont][+cont]		*!						
pəs-ə | [+cont]							*	**!

Before we conclude this section, it is observed that some speakers sometimes produces the two optional forms interchangeably within a discourse. This suggests that those speakers may have the two types of constraint ranking in the grammar.

7. Concluding remarks and residual issues

In this section, we are going to raise several questions with respect

to [s]-ON. First, consider the following foreign borrowings in which [s]-ON seems to be obligatory:

(36) [s]-ON in foreign borrowings

a. /syut/	syut	'shooting'
/syut-i/	syus-i	'shooting-Nom'
/syut-il/	syus-il	'shooting-Acc'
b. /syuphəmakhet/	syuphəmakhet	'super market'
/syuphəmakhet-i/	syuphəmakhes-i	'super market-Nom'
/syuphəmakhet-il/	syuphəmakhes-il	'super market-Acc'
c. /gut/	gut	'good'
/gut-i/	gus-i(-ta)	'to be good-be-VE'

However, we argue that the morpheme-final coronal consonant of those borrowings is not /t/ but /s/ underlyingly, though it is not clear at this stage why /s/ is preferred over coronal stops in the input (p.c. N. J. Kim). Hence, [s]-ON has not occurred in those examples, which are represented as follows:

(37) [s]-ON in foreign borrowings

a. /syus/	syut	'shooting'
/syus-i/	syus-i	'shooting-Nom'
/syus-il/	syus-il	'shooting-Acc'
b. /syuphəmakhes/	syuphəmakhet	'super market'
/syuphəmakhes-i/	syuphəmakhes-i	'super market-Nom'
/syuphəmakhes-il/	syuphəmakhes-il	'super market-Acc'
c. /gus/	gut	'good'
/gus-i/	gus-i(-ta)	'to be good-be-VE'

This might raise another question: why do we not assume two different UR forms for those optional [s]-ON examples of native Korean:

(38) Two UR forms for optional [s]-ON

/pat^h-e/	pat^h-e	'field-at'
/pas-e/	pas-e	'field-at'

However, the cost of assuming two different UR forms for the same morpheme in the Lexicon is too high. This approach also loses the generalization that only coronal obstruents becomes [s] before a vowel. Hence, I believe that this approach should be the last option to take.

The next question which we cannot answer in this paper is that there are some exceptions to [s]-ON phenomenon. Consider the following examples in which coronal obstruents resist [s]-ON before a low vowel:

(39) Underapplication of [s]-ON before a low vowel

a. /p^{h}at^h/	p^{h}at			'red bean'	
/pat^h-a/	pat-a,	*pas-a,	*pat^h-a	'red	beam-suffix (Vocative)'
b. /k'oc^h/	k'ot			'flower'	
/k'oc^h-a/	k'ot-a,	*k'os-a,	*k'oc^h-a		'flower-suffix (Vocative)'

It is not clear at this stage why [s]-ON underapplies before [a] in those cases. However, note also that [-ant] and [laryn] are mysteriously not allowed in Onset in those examples.

Finally, [s]-ON underapplies in a nonderived environment:

(40) Underapplication of [s]-ON in a nonderived environment

a. /canti/	canti, *cansi	'turf'
b. /mati/	mati, *masi	'knot'
c. /tal-/	tal-, *sal-	'to weigh'

d. /tili-/	tili-, *sili-	'to be heard'
e. /cu-/	cu-, *su-	'to give'
f. /tat-/	tat-, *sat-	'to shut'

[s]-ON does not occur within a morpheme. Underapplication in a nonderived environment is a pending question for further study in Optimality Theory and it is not clear at this stage how this question is handled[6].

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6. An anonymous reviewer commented on this problem: "It will not be a real problem if we do not assume the licensing rule (18)". However, note that most phonological changes which occur at morpheme boundaries are not observed morpheme-internally (Kiparsky 1973 for Revised Alternation Condition, 1982, 1993, Iverson 1993 for reevaluation of Revised Alternation Condition, and others). In Korean, for example, Primary Palatalization of /t/ to /c/ (i.e. /mat-i/ [maci] '(the) first son') underapplies morpheme-internally (i.e. /mati/ [mati] 'branch'). In Finnish, *t→s* phenomenon before [i], which is observed in the "derived environment" (i.e. /haluT-i/ [halusi], /veTE/ [vesi]), is not observed morpheme-internally (i.e. /koti/ [koti]). This suggests that morpheme-internal underapplication of [s]-ON does not necessarily entail that the licensing rule (18) is faulty. The morpheme boundary effect or "Derived Environment effect" should be should be incorporated in OT in some way, though not clear at this stage, (see, Lee, Byung-Gun 1996 in the framework of OT).

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Department of English
Hankuk University of Foreign Studies
Imun-Tong, Tongdaemun-Ku
Seoul, Korea
Fax: +82-2-637-6950