Morphologically Conditioned Phonological Asymmetries in Kyungsang Korean*

Suyeon Yun†
Ewha Womans University

ABSTRACT
This paper deals with two types of morphologically conditioned noun-verb asymmetries in Kyungsang Korean. In Kyungsang Korean, before a consonant-initial suffix, opacity between post-obstruent tensing and consonant cluster simplification occurs in verbal inflection, but not in nominal inflection. Before a vowel-initial suffix, optional overapplication of consonant cluster simplification applies for nominal inflection but not for verbal inflection. This paper analyzes the morphologically conditioned phonological asymmetries in Kyungsang Korean based on Optimality Theory with Candidate Chains (McCarthy 2007), which can explain opacity as well as the different behaviors depending on the part-of-speech by regulating the order of processes in a constraint. Alternative analyses based on Stratal OT (Kiparsky 2000) and base-derivative correspondence (Benua 1997) are also discussed.

Keywords: Kyungsang Korean, noun-verb asymmetry, opacity, OT-CC

1. Introduction

Phonological opacity has presented an outstanding problem in classic Optimality Theory (henceforth OT; Prince and Smolensky 1993/2004) since opacity needs to refer to a non-surface level of representation and is thus hard to be accounted for by an output-oriented theory like OT. A variety of extensions of basic OT have been proposed to account for opaque interactions between processes, including Optimality Theory with Candidate Chains (henceforth OT-CC; McCarthy 2007), Stratal OT (Kiparsky 2000), and base-derivative Correspondence (Benua 1997). This paper deals with Kyungsang Korean, which provides an interesting test case for these theories

* The earlier version of this paper was presented at the 42nd Meeting of North East Linguistic Society and published in *NELS 42: Proceedings of the 42nd Annual Meeting of the North East Linguistic Society* (2013). I am grateful to Adam Albright, Edward Flemming, Jongho Jun, Michael Kenstowicz and Donca Steriade for their valuable comments and suggestions on this paper. I also thank three anonymous reviewers for helpful feedback. All remaining errors are my own.
† Corresponding author: suyeonyun@ewha.ac.kr

because it involves morphologically conditioned phonological opacity; processes interact opaquely in verbal inflection, but not in nominal inflection. This paper will argue that OT-CC can successfully analyze the morphologically derived opacity since ordering of processes is governed by ranked, violable constraints. On the other hand, this morphological conditioning of opacity proves problematic in Stratal OT, in which ordering of processes is strictly tied to morphological structure and is thus more constrained. Also, this paper considers the prospects for an analysis of the Kyungsang Korean data in terms of base-derivative correspondence constraints which could give an analysis in a principled way.

2. Opacity and Noun-Verb Asymmetries in Kyungsang Korean

All dialects of Korean forbid consonant clusters in a syllable at the surface. Some stems, however, terminate in two consonants. These consonant clusters only surface when they precede a vowel-initial suffix (1a) while one of the consonants is omitted when preceding a consonant-initial suffix (1b) or in the isolation form (1c).

(1) Consonant cluster simplification in Korean nouns

a.	/kɑps+i/	[kɑps'i]	'price' + NOMINATIVE
b.	/kɑps+kwɑ/	[kɑpk'wɑ]	'price' + CONJUNCTIVE
c.	/kɑps/	[kɑp]	'price'

The first noun-verb asymmetry involves an opaque interaction between consonant cluster simplification (henceforth CCS) and post-obstruent tensing (henceforth POT) when a consonant-initial suffix is attached to a stem ending in a consonant cluster. In Korean, lax obstruents /p, t, c, k, s/ become tense /p', t', c', k', s'/ when preceded by another obstruent, a process referred to as POT.[1)] POT is a very productive and automatic process in Korean (Ahn 2009), which occurs within a morpheme (2a), in verbal inflection (2b), in nominal inflection (2c), and across words (2d).

(2) Post-obstruent Tensing in Korean

a.	/mɑktɛ/	[mɑkt'ɛ]	'stick'
b.	/cɑp+tɑ/	[cɑpt'ɑ]	'to grasp' + INFINITIVE
c.	/cip+kwɑ/	[cipk'wɑ]	'house' + CONJUNCTIVE
d.	/chk pwɑ/	[c^hɛkp'wɑ]	'book' + 'to look' IMPERATIVE

1) Kyungsang Korean lacks tense-lax distinction in fricative /s/, and POT applies only for stops.

The crucial data for the current discussion involve Kyungsang Korean stems ending in /l/+stop clusters that show different behavior in nouns and verbs, as reported in Kim-Renaud (1974) and Tak (1997). First, when combined with a consonant-initial suffix like /-tɑ/, /-ko/, and /-ci/, POT and CCS interact opaquely in verbal inflection in Kyungsang Korean.[2] As shown in (3), a stem-final stop deletes with tensification of the following suffix-initial stop. Although the consonant clusters appearing stem-finally involve a variety of sequences, only liquid-stop clusters, /lp/, /lk/, /lt^h/ and /lp^h/, show dialectal variation regarding which consonant deletes. Specifically, the liquid is omitted in liquid-stop clusters in Seoul Korean[3] (e.g., /mɑlk+tɑ/ → [mɑkt'ɑ] 'to be clean'), whereas the stop is omitted in Kyungsang Korean (Kim-Renaud 1974).

(3) Verbal inflection in Kyungsang Korean

a. /mɑlk+tɑ/	[mɑl**t'**ɑ]	'to be clean' + INFINITIVE
cf. /mɑlk+ɑ/	[mɑlkɑ]	'to be clean' + LINKER
b. /pɑlk+tɑ/	[pɑl**t'**ɑ]	'to be bright' + INFINITIVE
c. /pɑlp+ko/	[pɑl**k'**o]	'to step on' + CONJUNCTIVE

The outputs with tensification here are opaque with respect to POT in that they lack a triggering obstruent and so the context for the application of this process is not recoverable at the surface level. This is a case of counterbleeding opacity since POT must precede CCS to trigger tensification of the following consonant in the suffix, in the ordered rule framework. It is clear that the tensification of the suffix consonant is conditioned by the underlying stop in the stem because a verb stem ending in a single /l/ never triggers the tensification of the following consonant, e.g., /mɑl+tɑ/ → [mɑltɑ], *[mɑlt'ɑ] 'to roll up' + INFINITIVE.

In contrast, nominal inflection in Kyungsang Korean does not exhibit this opacity, as shown in (4). We do not see tensification of the suffix-initial stop even though the preceding noun stem ends in a stop underlyingly, as seen in forms with vowel-initial suffixes.

---

2) The pattern shown here is found only in the older generation of Kyungsang Korean speakers. The younger generation tends to omit /l/ in /lk/ clusters as in Seoul Korean and the tensification of the suffix consonant is no longer opaque. Kyungsang Korean data reported in this paper without references are collected from two native speakers aged 56 and 65 respectively. Examples from the previous studies were also verified by them.

3) Sometimes neither consonant in the /lp/ cluster deletes in the speech of the younger Seoul Korean speakers.

(4) Nominal inflection in Kyungsang Korean[4)]

a.	/tɑlk+kwɑ/ [tɑl**k**wɑ]		(*[tɑlk'wɑ])	'chicken' + CONJUNCTIVE
	cf. /tɑlk/ [tɑl] (citation form)	/tɑlk+i/ [tɑlki]~[tɑli]		'chicken'+ NOM
b.	/hɨlk+kwɑ/ [hɨl**k**wɑ]		(*[hɨlk'wɑ])	'soil' + CONJUNCTIVE
c.	/tɑlk+to/ [tɑl**t**o]		(*[tɑlt'o)	'chicken' + 'also'
d.	/tɑlk+putə/ [tɑl**p**utə]		(*[tɑlp'utə])	'chicken' + 'from'

(a, b from Tak 1997)

Next, the other noun-verb asymmetry arises when the stems with final clusters are combined with a vowel-initial suffix. In nominal inflection, CCS can overapply before vowel-initial suffixes. That is, the stem-final consonant may not appear even though it is not in the context of CCS, as shown in (5). In verbal inflection, however, CCS never overapplies, and both of the stem-final consonants always appear, as exemplified in (6).

(5) Optional overapplication of CCS in nouns

a.	/tɑlk+i/	[tɑlki]~[tɑli]	'chicken' + NOMINATIVE
b.	/kɑps+i/	[kɑpsi]~[kɑpi]	'price' + NOMINATIVE

(6) No overapplication of CCS in verbs

a.	/mɑlk+ɑ/	[mɑlkɑ]	*[mɑlɑ]	'to be clean' + LINKER
b.	/pɑlp+ɑ/	[pɑlpɑ]	*[pɑlɑ]	'to step on' + LINKER

To summarize, Kyungsang Korean shows two types of noun-verb asymmetry: (i) before a consonant-initial suffix, opacity between POT and CCS occurs in verbal inflection but not in nominal inflection; (ii) before a vowel-initial suffix, optional overapplication of CCS applies for nominal inflection but not for verbal inflection. In the next section, I will develop an OT-CC analysis that can explain opacity as well as the different behaviors depending on the part-of-speech by regulating the order of processes in a constraint.

4) In Korean, lax obstruents between sonorants become voiced, so the actual pronunciation of (4a) is [tɑlgwɑ], not [tɑlkwɑ]. I ignore inter-sonorant voicing of obstruents in this paper for simplicity.

3. An OT-CC Analysis

Let us first focus on the opacity. As pointed out by a lot of literature (e.g., Kager 1999, McCarthy 1999), opacity presents a problem for surface-oriented OT since standard analyses of opacity necessitate reference to a non-surface level of representation. To account for the interaction between POT and CCS in Kyungsang Korean, we first need two sets of constraint rankings. First, for POT, a markedness constraint prohibiting consecutive lax obstruents (*OO) in (7a) has to dominate a constraint requiring faithfulness to input tenseness specifications, ID(tense) in (7b). Also, for CCS, a markedness constraint prohibiting tautosyllabic consonant clusters (*CC) in (8a) must outrank MAX in (8b), which bans consonant deletion. A combination of these two rankings, however, cannot derive the opaque winner, as demonstrated in (9), since no markedness constraint favors a tense stop in the opaque output (9b) in the absence of a preceding stop and so tensification fatally violates ID(tense). So, the current system only prefers a transparent output, as observed in nominal inflection. In other words, this opaque interaction between POT and CCS is hard to explain in a parallel OT, and we need a theory that can account for it in a constraint-based framework.

(7) Constraints for POT: *OO >> ID(tense)
- a. *OO: No lax obstruent sequences (Yun 2008)
- b. ID(tense): The tenseness of the input segment must be identical to that of the output correspondent. (McCarthy and Prince 1995)

(8) Constraints for CCS: *CC >> MAX
- a. *CC: No consonant clusters in coda position (Yun 2008)
- b. MAX: No segment deletion (McCarthy and Prince 1995)

(9) An unwelcome result[5]

/malk+ta/	*OO	*CC	ID(tense)	MAX
a. ☞ mal.ta				1
b. ☹ mal.t'a			W_1	1
c. malk.ta	W_1	W_1		L
d. malk.t'a		W_1	W_1	L

5) In this paper, I use comparative tableau following Prince (2002).

To analyze the current data, I adopt OT-CC, one of the frameworks developed for explaining phonological opacity in OT. A primary difference between OT-CC and other versions of OT is that a candidate is a chain consisting of pronounceable intermediate forms whose initial form is fully-faithful to the input. Candidate chains have to satisfy two requirements to be valid. First, each link of the chain must differ from the previous link by one and only one faithfulness violation (LUM; local unfaithful mapping). The second requirement is harmonic improvement, which requires that each change in the chain be harmonically improving, according to the constraint hierarchy of the language in question. For example, as a candidate for input /mɑlk+tɑ/ 'to be clear' + INFINITIVE, we can construct a chain ⟨mɑlk.tɑ, mɑlk.t'ɑ, mɑl.t'ɑ⟩. This is a valid chain because (i) each step involves just a single violation of a faithfulness constraint, ID(tense) and then MAX; (ii) [mɑlk.t'ɑ] is more harmonic than [mɑlk.tɑ] given the ranking *OO >> ID(tense); and (iii) [mɑl.t'ɑ] is more harmonic than [mɑlk.t'ɑ] given the ranking *CC >> MAX. The last link of a chain becomes the actual output and is evaluated by the markedness constraints.

Since a candidate consists of a chain of intermediate forms with an associated sequence of constraint violations, opacity can be derived by a constraint on the order of constraint violations that allow a candidate chain with opaque ordering to win over the transparent candidate. Ordering constraints are referred to as PREC (for 'precedence') constraints, defined below in (10).

(10) PREC(A,B) (Wolf 2008: 38, adopting from McCarthy 2007)
Assign a violation-mark to a candidate for each time that:
  a. A process that violates faithfulness constraint B applies without having been preceded by a process that violates faithfulness constraint A;
  b. A process that violates faithfulness constraint B applies and is followed by a process that violates faithfulness constraint A.

Counterbleeding opacity is derived by a ranking of the form PREC(A,B) >> A because PREC(A,B) prefers a chain where constraint A is also violated and precedes the B violation when B is violated. A transparent output does not violate A while violating B and thus fatally violates PREC(A,B). For the opacity between POT and CCS in Kyungsang Korean, we need a PREC constraint that requires deletion, i.e., violation of MAX, to be preceded by tensification, i.e., violation of ID(tense), in a candidate chain. It is formulated as PREC(ID(tense), MAX), as given in (11).

(11) PREC(ID(tense), MAX): Assign a violation-mark to a candidate for each time that:
a. Deletion occurs and is not preceded by tensification;
b. Deletion occurs and is followed by tensification.

Let us see how this constraint can derive the opaque winner. First, we need to construct candidate chains. (12) shows two possible candidate chains for /malk+ta/ 'to be clean' + INFINITIVE. Chain (12a) first violates ID(tense) and then violates MAX, which satisfies PREC(ID(tense),MAX), and the last form of the chain, i.e., the actual output, is the tensed form. Chain (12b), on the other hand, only violates MAX, and the output is transparent, without tensification. This chain violates PREC(ID (tense), MAX) because there is no violation of ID(tense) prior to the violation of MAX. Since PREC(ID(tense),MAX) outranks the faithfulness constraint ID(tense), the opaque output with a tense consonant in suffix becomes optimal, as demonstrated in (13).

(12) Candidate chains for /malk+ta/
a. ⟨malk-ta, malk-t'a, mal-t'a⟩
⟨ID(tense), MAX⟩
b. ⟨malk-ta, mal-ta⟩
⟨MAX⟩

(13) Opaque tensification in verbal inflection: /malk+ta/ → [malt'a][6)]

/malk+ta/ 'to be clean'	*OO	*CC	MAX[7)]	PREC(ID(tense),MAX)	ID(tense)
☞ a. [mal.t'a] ⟨ID(tense), MAX⟩			1		1
b. [mal.ta] ⟨MAX⟩			1	W_1	L

Recall that nominal inflection has transparent outputs without tensification, but the current ranking favors opaque outputs regardless of morphology. In order to treat nominal inflection differently from verbal inflection, I adopt Wolf's (2008) assump-

6) For want of space, only the actual output form in squared brackets appears on behalf of the whole candidate chain. A LUMSeq appears in angle brackets.

7) A violation of PREC(A,B) entails a violation of B, and a metaconstraint ranking B >> PREC(A,B) is required so that PREC(A,B) cannot produce a B violation (McCarthy 2007: 98-99). The ranking MAX >> PREC(ID(tense), MAX) is derived from this.

tion that phonological and morphological operations are interleaved and interact in a serial way, called Optimal Interleaving (OI), against the standard assumption that morphology strictly precedes phonology. Wolf (2008) assumes that not only segments and phonological features but also feature structures of morphs and morphemes are in a correspondence relation. The gist of OI is that insertion of a morph counts as one change in a candidate chain, just like segment deletion and insertion, although morph insertion does not violate any faithfulness constraint. In Wolf's (2008) model, a chain starts with an abstract root morpheme and abstract affix morpheme, denoted ROOT-AF, which has a morphosyntactic structure though lacking phonological representations, and it is assumed that morph insertion starts from the root and proceeds outwards. For example, a possible chain ⟨ROOT-AF, tɑlk-AF, tɑlk-to, tɑl-to⟩ first inserts root /tɑlk/ and then nominal affix /to/, and deletes the root-final stop. Since morph insertion and phonological operations take place and serially interact as one of the basic derivational steps in OT-CC, morph insertion can also be ordered in PREC constraints just like phonological operations. From the perspective of OI, we can say that nominal affixation counterbleeds CCS in Kyungsang Korean. Thus, what makes the transparent output optimal in nominal inflection is a PREC constraint that requires nominal affixation to be preceded by a MAX violation, i.e., PREC(MAX, affixN), as given in (14).

(14) PREC(MAX, affixN): Assign a violation-mark to a candidate for each time that:
  a. A nominal affixal morph is inserted, and this is not preceded by deletion;
  b. A nominal affixal morph is inserted, and this is followed by deletion (modified from Wolf 2008: 47).

If this constraint is ranked over PREC(ID(tense), MAX), we derive a transparent output for nominal inflection. Possible chains for nominal inflection /tɑlk+to/ 'chicken' + 'also' are listed in (15). In chain (15a) whose output is the tensed form, the nominal affix /to/ is first inserted, and then violations of ID(tense) and MAX take place in sequence. In the case of the transparent output without tensification, there are two possible derivations. First, as in (15bi), nominal affixation occurs followed by a MAX violation, with no ID(tense) violation. It is also possible that nominal affixation happens after the MAX violation as in (15bii). Both chains result in the same final form, [tɑl.to], without tensification, and when two candidate chains end with the same output form, they are merged (chain merger; McCarthy 2007). After chain merger occurs, only partial, crucial ordering of LUMs, called rLUMSeq, is subject to evaluation by PREC. So in the two chains in (15b), the order between MAX and Insert-affixN does not matter since either way the chain would reach the final link [tɑl.to], so the rLUMSeq just specifies that Insert-root precedes MAX and Insert-affixN. As shown in (16), therefore, candidate (16a) (=(15b)) has one violation of PREC(MAX, affixN) because when a nominal affix is inserted there is no preceding MAX violation. The opaque candidate (16b) (=(15a)) is still dispreferred, however, since it violates PREC(MAX,affixN) twice because the MAX violation is preceded by nominal affixation, as well as not being followed by it.

(15) Candidate chains for /tɑlk+to/
  a. ⟨ROOT-AF, tɑlk-AF, tɑlk-to, tɑlk-t'o, tɑl-t'o⟩
     ⟨Insert-root, Insert-affixN, ID(tense), MAX⟩
  b. (i) ⟨ROOT-AF, tɑlk-AF, tɑlk-to, tɑl-to⟩
       ⟨Insert-root, Insert-affixN, MAX⟩
     (ii) ⟨ROOT-AF, tɑlk-AF, tɑl-AF, tɑl-to⟩
       ⟨Insert-root, MAX, Insert-affixN⟩
       rLUMSeq: ⟨Insert-root, Insert-affixN; Insert-root, MAX⟩

(16) Nominal inflection: /tɑlk+to/ → [tɑlto]

/tɑlk/ + /to/ 'chicken' + 'also'	PREC (MAX,affixN)	MAX	PREC (ID(tense),MAX)	ID (tense)
☞ a. [tɑl.to] (=(15b)) {Insert-root, Insert-affixN, MAX} ⟨Insert-root, Insert-affixN; Insert-root, MAX⟩	1	1	1	
b. [tɑl.t'o] (=(15a)) ⟨insert-root, insert-affixN, ID(tense), MAX⟩	W_2	1	L	W_1

We may need another PREC constraint corresponding to verbal inflection, as given in (17). For verbal inflection, we need the reverse order of affixation and MAX so that a candidate chain where affixation occurs first, creating the context for tensification, is preferred. However, it just plays a redundant role here because PREC(ID (tense), MAX) already favors the opaque output. (18) restates possible candidate chains for verbal inflection /mɑlk+tɑ/ 'to be clean' + INFINITIVE, beginning with an abstract root and an affix morpheme, and (19) demonstrates the selection of the opaque optimal output.

(17) PREC(affixV, MAX): Assign a violation-mark to a candidate for each time that:
   a. Deletion occurs and is not preceded by the insertion of a verbal affixal morph;
   b. Deletion occurs and is followed by the insertion of a verbal affixal morph.

(18) Candidate chains for /malk+tɑ/ 'to be clean' + INFINITIVE
   a. ⟨ROOT-AF, malk-AF, malk-tɑ, malk-t'ɑ, mal-t'ɑ⟩
      ⟨Insert-root, Insert-affixV, ID(tense), MAX⟩
   b. (i) ⟨ROOT-AF, malk-AF, malk-tɑ, mal-tɑ⟩
         ⟨Insert-root, Insert-affixV, MAX⟩
      (ii) ⟨ROOT-AF, malk-AF, mal-AF, mal-tɑ⟩
         ⟨Insert-root, MAX, Insert-affixV⟩
         rLUMSeq: ⟨Insert-root, MAX; Insert-root, Insert-affixV⟩

(19) Verbal inflection: /malk+tɑ/ → [malt'ɑ]

/malk/ + /tɑ/ 'to be clean'	PREC (affixV, MAX)	MAX	PREC (ID(tense),MAX)	ID (tense)
☞ a. [mal.t'ɑ] ⟨insert-root, insert-affixV, ID(tense), MAX⟩		1		1
b. [mal.tɑ] {Insert-root, MAX, Insert-affixV} ⟨Insert-root, MAX; Insert-root, Insert-affixV⟩	W_1	1	W_1	L

A great advantage of OT-CC here is that PREC is a constraint that is ranked and can be violated, which lets us account for optional overapplication of CCS in nominal inflection just by assuming free ranking between PREC(MAX,affixN) and MAX. For /talk+i/ 'chicken' + NOMINATIVE, we can construct a candidate chain with no faithfulness violation (20a) and another with one MAX violation (20b). As demonstrated in (21), candidate (20a) violates PREC(MAX,affixN) since there is no MAX violation prior to nominal affixation, and candidate (20b) violates MAX. Either candidate can be selected as optimal based on the free ranking between the two constraints each of them violates.

(20) Candidate chains for /tɑlk+i/ 'chicken' + NOMINATIVE

a. ⟨ROOT-AF, tɑlk-AF, tɑlk-i⟩
⟨Insert-root, Insert-affixN⟩

b. ⟨ROOT-AF, tɑlk-AF, tɑl-AF, tɑl-i⟩
⟨Insert-root, MAX, Insert-affixN⟩

(21) Optional overapplication of CCS: /tɑlk+i/ → [tɑlki]~[tɑli][8)]

/tɑlk+i/ 'chicken' + NOM	PREC (MAX,affixN)	MAX	PREC (ID(tense),MAX)
☞ a. [tɑl.ki] (=(20a)) ⟨Insert-root, Insert-affixN⟩	1		
☞ b. [tɑ.li] (=(20b) ⟨insert-root, MAX, insert-affixN⟩		1	1

On the other hand, overapplication of CCS cannot be derived for verbal inflection because for verbs a PREC constraint regulates the reversed order of affixation and MAX violation, i.e., PREC(affixV,MAX). Since neither PREC(affixV,MAX) nor MAX prefers the candidate chain (22b) where CCS is overapplied, candidate (22a) is always selected as optimal, as demonstrated in (23).

(22) Candidate chains for /mɑlk+ɑ/ 'to be clean' + linker

a. ⟨ROOT-AF, mɑlk-AF, mɑlk-ɑ⟩
⟨Insert-root, Insert-affixV⟩

b. ⟨ROOT-AF, mɑlk-AF, mɑl-AF, mɑl-ɑ⟩
⟨Insert-root, MAX, Insert-affixV⟩

8) An anonymous reviewer suggests that PREC(MAX,affixN) be ranked over MAX, because the reviewer thinks that speakers prefer the surface forms with deletion to the fully-faithful forms and the suggested ranking derives the same results. As the reviewer also points out, however, the CCS is subject to lexical variation, and there is no available variation data to use to concretely establish the ranking relation between the two constraints. This is beyond the scope of this study and I leave it for future study.

(23) No overapplication of CCS in verbs: /mɑlk+ɑ/ → [mɑlkɑ], *[mɑlɑ]

/mɑlk+ɑ/ 'to be clean'	PREC (MAX,affixN)	MAX	PREC (affixV,MAX)	PREC (ID(tense),MAX)
☞ a. [mɑl.kɑ] ⟨Insert-root, Insert-affixV⟩				
b. [mɑ.lɑ] ⟨Insert-root, MAX, Insert-affixV⟩		W_1	W_2	1

Summing up, the OT-CC analysis succeeds in providing an account for both opacity and noun-verb asymmetries in Kyungsang Korean through the ranking in (24). What plays a key role are PREC constraints, within which the order of unfaithful mappings and part-of-speech specific morph insertion are regulated. So the counterbleeding opacity between CCS and POT in verbs is accounted for by the ranking PREC(ID(tense),MAX) >> ID(tense), and the transparent interaction between these processes in nouns s accounted for by the ranking PREC(MAX,affixN) >> PREC(ID (tense),MAX). Since PREC is a violable constraint like others, the free ranking between PREC(MAX,affixN) and MAX explains optional overapplication of CCS in nouns.

(24) Ranking summary
*OO, *CC >> {PREC(MAX,affixN)~MAX}, PREC(affixV,MAX) >>
PREC(ID(tense), MAX) >> ID(tense)

4. Alternative Analyses

This section discusses two alternative analyses of the Kyungsang Korean data, based on Stratal OT (Kiparsky 2000) and base-derivative correspondence (Benua 1997) respectively. It will be shown that the alternative analyses cannot fully account for the current data.

4.1. Stratal OT

Stratal OT explains different phonological behaviors depending on the part-of-speech by positing and ordering multiple serially ordered strata correlated with morphological structures. In Stratal OT, opacity is accounted for by assigning processes to different strata with opaque ordering, and noun-verb asymmetries are derived by affixation at different strata depending on the part-of-speech. Yun (2008) accounts for Kyungsang Korean opacity, where POT has to precede CCS, by assuming that the stratum where POT occurs must be ordered before the stratum where CCS occurs. Also, noun-verb asymmetries are derived by affixation at different levels. For Korean, Yun (2008) assumes that verbal suffixes are attached to a verb at the stem level as in (25a), and nominal suffixes are attached to a noun at the word level as in (25b). Based on this assumption, different constraint rankings for each stratum yield an opaque surface form. At the stem level, since *OO dominates ID(tense), POT applies, and since MAX dominates *CC, CCS does not apply. At the word level, *CC becomes ranked over MAX, and CCS applies. For verbs in (25a), the stem level takes verb stem /mɑlk-/ and suffix /tɑ/ as its input, and the constraint ranking produces an intermediate output [mɑlkt'ɑ] where POT has applied but CCS has not. Then, this output of the stem level, [mɑlkt'ɑ] is fed as an input into the word level, which gives an output [mɑlt'ɑ] with /k/ deleted, which is the surface form. For nominal inflection in (25b), the input to the stem level is just a stem /tɑlk/, without a suffix, and the fully-faithful candidate is derived, since CCS does not apply at this level. At the word level, suffix /to/ is attached, and [tɑlto], without tensification, is the optimal output since ID(tense) is lowest ranked. To derive optional overapplication of CCS in nouns, Yun (2008) suggests that nominal affixation can either applies at the word level or applies at the postlexical level. If the nominative suffix /-i/ is attached to [tɑlk] without CCS at the word level as in (25c), [tɑlki] without any deletion is derived, and if the suffix /-i/ is attached to the input [tɑl] with reduced coda at the postlexical level as in (25d), [tɑli], where CCS is overapplied, is derived.

(25) Stratal OT analysis (Yun 2008)

a. verb + C-initial	*b. noun + C-initial*	*c. noun + V-initial*	*d. noun + V-initial*
/malk/ 'to be clean'	/talk/ 'chicken'	/talk/ 'chicken'	/talk/ 'chicken'
malk $\boxed{\text{+ ta}}$	talk	talk	talk
↓	↓	↓	↓
Stem level: *OO >> MAX >> ID(tense), *CC			
↓	↓	↓	↓
malkt'a	talk $\boxed{\text{+ to}}$	talk $\boxed{\text{+ i}}$	talk
↓	↓	↓	↓
Word level: *OO, *CC >> MAX >> ID(tense)			
↓	↓	↓	↓
malt'a	talto	talki	tal $\boxed{\text{+ i}}$
↓	↓	↓	↓
Postlexical level: *CC >> MAX >> ID(tense) >> *OO			
↓	↓	↓	↓
malt'a	talto	talki	tali
[malt'a]	[talto]	[talki]	[tali]

The Stratal OT analysis has problems and cannot satisfactorily derive the current data. To explain the optional overapplication of CCS, Yun (2008) proposes that nominal affixation can optionally occur at the postlexical level. This assumption does not seem plausible because postlexical phonology applies to phrases after syntactic operations are finished, and thus morphological operations are assumed to be over before the postlexical level (Kiparsky 1982). In explaining optional application of a phonological process, thus, Stratal OT might be too restrictive since ordering is tied to a limited number of strata. It is empirically problematic in this specific case since Korean nominal inflection cannot be postlexical based on evidence from other phonological patterns, e.g., palatalization (Cho and Sells 1995). Palatalization in Korean applies to derived environments including nominal inflection (e.g., /pat^h + i/ → [pac^{h}i] 'field' + NOM; Cho and Sells 1995: 125), but not across words (e.g., /pat^h + ilku + ko/ → [patilkuko][9] (*[pac^{h}ilkuko]) 'field' + 'till' + CONJ; Cho and Sells 1995: 126). If the nominal suffix could optionally be added at the postlexical level, palatalization should also apply only optionally, e.g., /pat^h + i/ → [pac^{h}i]~ *[pati], but palatalization is obligatory in this context. In the OT-CC analysis, on the other hand, PREC constraints regulate the order of unfaithful mappings and

9) The aspirated stop /t^h/ becomes the plain stop [t] as a result of coda neutralization.

part-of-speech specific morph insertion without any restriction to correspond to morphologically defined strata. This flexibility of OT-CC is an advantage in analyzing the Kyungsang Korean data. Moreover, POT occurs across words, as seen in (2d), which must occur at the postlexical level. However, Yun's (2008) ranking for the postlexical level predicts no POT since ID(tense) outranks *OO.

4.2. Base-derivative correspondence

In both the OT-CC and Stratal OT analyses, the fact that POT and CCS interact opaquely in verbal inflection but not in nominal inflection is derived by stipulations on ordering that have no independent motivation (the PREC constraints in the OT-CC analysis and the differences in the levels at which noun and verb inflections are affixed in the Stratal OT analysis). Analysis in terms of base-derivative correspondence constraints holds out the prospect of deriving this difference from an independently motivated difference in the bases of nominal and verbal inflection.[10] There have been several works (Kenstowicz 1996, Benua 1997 among others) proposing that the correspondence between a base form and a derivative form plays a crucial role in selecting an optimal output. For Korean, it has been proposed that the base of nouns is the citation form (Kenstowicz 1996). So the base of /tɑlk/ 'chicken' is [tɑl] with CCS. For verbs, Kang (2006) suggests that the base of Korean verbal paradigm is A-initial suffix form, where A can be [ɑ] or [ə] according to vowel harmony, based on the dialect data in Korean. For example, the base of /mɑlk-/ 'to be clean' is [mɑlk], from /mɑlk+ɑ/ → [mɑlkɑ]. Thus, the base has different forms depending on the part-of-speech. The idea is to explain the noun-verb asymmetry in the current data as originating from correspondence in duration between the base and the derivative form. For this account, I first adopt a skeletal slot X that represents segment duration and is equally assigned to all vowels and consonants (Steriade 1982, Levin 1985). I assume that a tense stop bears two Xs, while a lax stop bears a single X, because phonetically, tense stops are much longer than lax stops in Korean (Choi and Jun 1998), and many previous studies analyze tense stops as the geminate counterparts of lax stops. In this view, tensification of a lax stop is gemination of the stop, which thus bears two Xs. Based on these assumptions, the base of verbal inflection /mɑlk-tɑ/ bears four Xs since it has four segments ([mɑlk], from [mɑlk-ɑ]), and the base of nominal inflection /tɑlk+to/ bears three Xs since it has three segments ([tɑl], from citation form). The preservation of the base duration

10) I am grateful to Donca Steriade for suggesting this alternative.

is captured by a constraint requiring a derivative to preserve the duration of its base, measured in X slots, as given in (26).

(26) MAX-BD-X: Every X of the base has a correspondent in the derivative.

If this constraint dominates ID(tense) and DEP-IO-X requiring no insertion of X, tensification of the suffix stop in verbal inflection can be derived as the preservation of base duration in the face of deletion of the base-final stop. As shown in (27), candidate (27a) with tensification has six Xs in total and satisfies MAX-BD-X preserving the Xs in the base [malk]. In contrast, candidate (27d) without tensification violates MAX-BD-X since it loses one X in the base. On the other hand, in nominal inflection, MAX-BD-X does not play a role in choosing a winner because the nominal base of /talk/, i.e., [tal], bears only three Xs, as shown in (28). Both candidate (28a) without tensification and candidate (28d) with tensification satisfy MAX-BD-X, because both of them include three Xs from the base. Since candidate (28d) additionally violates ID(tense), it is ruled out.

(27) Verbal inflection: /malk+ta/ → [malt'a]

/malk+ta/ Base: malk	*OO	*CC	MAX-BD-X	MAX-C	ID(tense)	DEP-IO-X
a. ☞ malt'a				1	1	1
b. malkta	W_1	W_1		L	L	L
c. malkt'a		W_1		L	1	1
d. malta			W_1	1	L	L

(28) Nominal inflection: /talk+to/ → [talto]

/talk+to/ Base: tal	*OO	*CC	MAX-BD-X	MAX-C	ID(tense)	DEP-IO-X
a. ☞ talto				1		
b. talkto	W_1	W_1		L		
c. talkt'o		W_1		L	W_1	W_1
d. talt'o				1	W_1	

Overapplication of CCS only in nouns can be analyzed by assuming free ranking between MAX and DEP-BD-C (cf. Ko 2006), as demonstrated in (29). Candidate (29a) violates DEP-BD-C and candidate (29b) violates MAX, and they show free variation if the two constraints are freely ranked. For verbal inflection with a vowel-initial suffix, on the other hand, it is this derivation that determines the base and thus no base-derivative correspondence is established in here. Therefore, the fully-faithful candidate in (30a) with no deletion becomes the winner.

(29) Nominal inflection: /talk+i/ → [talki]~[tali]

/talk+i/ Base: tal	*OO	*CC	MAX-BD-X	MAX-C	DEP-BD-C	DEP-IO-X
a. ☞ talki					1	
b. ☞ tali				1		

(30) Verbal inflection: /malk+a/ → [malka]

/malk+a/ No Base	*OO	*CC	MAX-BD-X	MAX-C	DEP-BD-C	DEP-IO-X
a. ☞ malka						
b. mala				W_1		

While neither the OT-CC analysis nor the Stratal OT analysis has independent evidence for the proposed constraints or rankings, the base-derivative analysis may give an explanation of the current data in a more principled way in that it makes use of a concept of the base of inflection which plays a role in other phonological phenomena in Korean. However, there is data that cannot be explained by this analysis. Korean verbs have some stems ending in /lh/ clusters where the final /h/ appears as aspiration of the following stop and deletes in other contexts, e.g., /talh+tolok/ → [talt^{h}olok], /talh+a/ → [tala] 'to wear down'. Kyungsang Korean, however, shows a different pattern when an /lh/-final stem precedes a consonant-initial suffix. That is, the deleted /h/ conditions tensification of the suffix-initial stop as seen in (31i). In the base-derivative correspondence analysis, this tensification cannot be accounted for because, for example, the base form of /talh+ci/ in (31ai) is [tal] from the vowel-initial suffix form [tala] in (31aii), without the final /h/, and there is no X in the base form that has to be preserved in the derivative [talc'i].[11]

11) An anonymous reviewer points out that the tensification of the suffix-initial stop in (31) may result from the optional tensification of post-liquid stops in Korean (e.g., /silce/ → [silc'e] 'real'). However, this process is not obligatory and does not apply to the suffix-initial stop following the stem-final liquid. For example, /tal-/ 'to be sweet', does not trigger the tensification of the suffix-initial stop, i.e., /tal-ci/ → [talci], which creates a minimal pair with the example in (31ai). Therefore, it is

(31) Verbal inflection of /-lh/-final verb stems

	stem	*(i) C-initial suffix*		*(ii) V-initial suffix*	
a.	/tɑlh-/ 'to wear'	/tɑlh+ci/	[tɑlc'i]	/tɑlh+ɑ/	[tɑlɑ]
b.	/t'ulh-/ 'to drill'	/t'ulh+ko/	[t'ulk'o]	/t'ulh+ə/	[t'ulə]
c.	/k'ulh-/ 'to kneel'	/k'ulh+tɑkɑ/	[k'ult'ɑkɑ]	/k'ulh+ə/	[k'ulə]

5. Conclusion

We have considered two noun-verb asymmetries in Kyungsang Korean and sought a way to explain them within an OT framework. I have argued that OT-CC can best account for the different application of opaque interaction and optional application of the phonological operations depending on the morphological category in the current data. Particularly, regulating process ordering with ranked, violable PREC constraints makes it simple to analyze the optionally opaque interaction. This characteristic has a definite advantage over Stratal OT, in which morphological operations are tied to a small number of strata. Accounting for the data in a principled way based on independently motivated evidence would be a subject to future research.

References

Ahn, Sangchul. (2009). *Korean Phonology*. London: Saffron.

Benua, Laura. (1997). *Transderivational Identity*. PhD dissertation. University of Massachusetts, Amherst.

Cho, Young-Mee Yu and Peter Sells. (1995). A lexical account of inflectional suffixes in Korean. *Journal of East Asian Linguistics* 4, 119-174.

Choi, Song-Won and Jongho Jun. (1998). Are Korean fortis and aspirated stops geminate? *Language Research* 34(3), 521-546.

Kager, Renee. (1999). *Optimality Theory*. Cambridge University Press.

Kang, Yoonjung. (2006). Neutralization and variations in Korean verbal paradigms. In *Harvard Studies in Korean Linguistics* 11, 183-196.

Kenstowicz, Michael. (1996). Base-identity and uniform exponence: Alternative to cyclicity.

---

reasonable to say that the suffix-initial tense stop in (31) is derived from the deleted stem-final /h/ and is a problem for the base-derivative correspondence analysis.

in J. Durand and B. Laks, eds., *Current Trends in Phonology: Models and Methods*, 363-394. European Studies Research Institute, University of Salford Publication, Manchester.
Kim-Renaud, Young-Key. (1974). *Korean Consonantal Phonology*. PhD dissertation. University of Hawaii.
Kiparsky, Paul. (1982). Lexical morphology and phonology. In E. Yang, ed., *Linguistics in the Morning Calm*, 3-91. Seoul: Hanshin Publishing Co.
Kiparsky, Paul. (2000). Opacity and cyclicity. *The Linguistic Review* 17, 351-367.
Ko, Heejeong. (2006). Base-output correspondence in Korean nominal inflection. *Journal of East Asian Linguistics* 15(3), 195-243.
Levin, Juliette. (1985). *A Metrical Theory of Syllabicity*. PhD dissertation, MIT, Cambridge, MA.
McCarthy, John. (1999). Sympathy and phonological opacity. *Phonology* 16, 331-399.
McCarthy, John. (2007). *Hidden Generalizations: Phonological Opacity in Optimality Theory*. London: Equinox.
McCarthy, John and Alan Prince. (1995). Faithfulness and reduplicative identity. In J. Beckman, L. Walsh Dickey and S. Urbanczyk, eds., *University of Massachusetts Occasional Papers* 18. Amherst, Mass.: GLSA, 249-384.
Prince, Alan. (2002). Arguing optimality. In A. Carpenter, A. Coetzee, and P. de Lacy, eds., *Papers in Optimality Theory* II, 269-304. Amherst, MA: GLSA.
Prince, Alan and Paul Smolensky. (2004). *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA, and, Oxford, UK: Blackwell. Originally circulated in 1993.
Steriade, Donca. (1982). *Greek Prosodies and the Nature of Syllabification*. Doctoral dissertation, MIT, Cambridge, MA.
Tak, Jinyoung. (1997). Uniform exponence in accounting for post-obstruent tensification with special reference to Korean. *Harvard Studies in Korean Linguistics* 7, 213-224.
Wolf, Matthew. (2008). *Optimal Interleaving: Serial PhonoloGy-Morphology Interaction in a Constraint-Based Model.* PhD dissertation. University of Massachusetts, Amherst.
Yun, Jiwon. (2008). Noun-verb asymmetries in Korean phonology. In N. Abner and J. Bishop eds., *Proceedings of the 27th West Coast Conference on Formal Linguistics*, 449-457.

Suyeon Yun
Department of English Education
Ewha Womans University
52, Ewhayeodae-gil, Seodaemun-gu
Seoul 03760, Korea
E-mail: suyeonyun@ewha.ac.kr

Received: October 30, 2017
Revised version received: March 5, 2018
Accepted: March 19, 2018