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Neutralization and anti-homophony in Korean[1]

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Neutralization in Korean involves a large number of oppositions, and affects a significant portion of the lexicon. Nonetheless, it induces remarkably little homophony. These highly divergent facts are argued herein to be related. The present findings suggest a reconsideration of the role that 'functional load' (Martinet 1952, Hockett 1967) plays in patterns of sound change.

> There is no doubt that in some way or other, linguistic systems respond to change in ways that maintain meaning – more or less
> William Labov (1994: 569)

Generally speaking, low-level phonetic variation among contrastive values is passively delimited such that a comfortable perceptual 'buffer zone' is maintained between one value and its immediate systemic 'neighbors' (see e.g. Martinet 1952; Hockett 1955, 1967; Lindblom, MacNeilage & Studdert-Kennedy 1984; Labov 1994; Flemming 1995; de Boer 2001; Silverman 2006). However, under certain circumstances this buffer zone can be fatally breached such that one value may (diachronically) merge or (synchronically) neutralize with another. Martinet (1952), for example, observes that there is a strong tendency for merged values to have been phonological neighbors in the past, in the sense that they had already shared a significant number of phonetic features. For Martinet, though, the fact that a language possesses similar values does not necessarily increase the likelihood of these values' merging or neutralizing. What crucially matters, according to Martinet, is the extent to which this opposition minimally distinguishes meaningful units of the language (minimal pairs), since the amount of homophony in a lexicon may have an impact on communicative success: the more homophony, the more likely that the speech signal will contain lexical ambiguities, and so the more

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often speech might induce confusion in listeners. Under the assumption that successful speech is more likely to establish itself as the conventionalized norm than is unsuccessful speech, then *ceteris paribus* speech with fewer homophones is more likely to establish itself as the conventionalized norm than is speech with more homophones. In all, according to Martinet, the tendency toward merger or neutralization of an opposition is favored to the extent that:

1. The values in opposition are phonetically similar.
2. The number of minimal morpheme pairs that the opposition is responsible for is low.
3. The number of minimal pairs within a correlated opposition is low, or the opposition is uncorrelated (in the sense of Trubetzkoy 1939/1969).
4. The minimal pairs belong to different syntactic categories.
5. The token frequency of one or both members of the minimal pairs is low.
6. The presence of additional morphological markers serves a disambiguating function.

Ultimately, however, merger or neutralization is not likely to take place simply because some of the relevant morphemes have a low token frequency, or because some of the relevant minimal pairs happen to belong to different syntactic categories, etc. Rather if sounds are to merge or neutralize, then, according to Martinet's 'functional load' criteria, the output of the process – across the lexicon in use – should not yield a significant increase in the amount of communicative confusion.

Armed with these intuitively appealing criteria for the determination of functional load, Martinet is nonetheless quick to retreat:

> It is clear that the functional yield of an opposition can only be evaluated with any degree of accuracy if we deal with linguistic stages for which fairly exhaustive word lists are available. This circumstance makes it practically impossible to check the validity of the functional assumption in the case of prehistoric sound shifts. (Martinet 1952: 9)

It is not the purpose of the present study to investigate the role that 'functional load' may or may not play in (diachronic) sound mergers; Martinet's concerns appear fully justified in that, even at our present level of knowledge, extensive information about the lexicon in use is typically exceedingly difficult to ascertain for two different stages of a language, i.e. both before and after a merger takes place (but see Surendran & Niyogi 2003, 2006 for an example from Cantonese; see also King 1967 and Hockett 1967, who disagree with each other on the merits of Martinet's proposals). Instead, in this paper I report on a case study of (synchronic) neutralization and its functional consequences. With today's computer-tallied corpora, such an investigation can be readily undertaken.

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Taking all of Martinet's criteria into account, the hypothesis to be explored herein is straightforward:

> Neutralizing alternations are more likely to be present in a language if their outputs do not significantly increase the level of homophony; derived homophony should not be excessive.

The wording of this hypothesis is intentionally vague, because I do not pretend to be able to zero in on a numerical upper limit of derived homophony. While this value may ultimately be ascertained by thoroughly investigating many languages, I intend merely to show that, in a given language, the amount of derived homophony is remarkably low.

The overall goal of the present study is to reintroduce Martinet's proposals into modern discourse on phonological theory, and to provide a case study showing that a language may indeed possess significant amounts of neutralization with negligible counter-functional consequences. The focus of this paper is neutralization in Korean. Indeed, Korean is the prototypical 'Linguistics 101' example of neutralization, as neutralization here involves so many contrastive values.

Section 1 investigates the extent of potential homophony in Korean due to six neutralizing alternations: aplosivization, nasal lateralization, liquid nasalization, cluster reinforcement, assibilation, and nasal assimilation (Martin 1992), and shows that these induce very little homophony. Also briefly considered is variable assimilation of labials-to-dorsals, and coronals-to-labials and coronals-to-dorsals. Overall, it is found that, despite extensive neutralization, derived homophony in Korean is remarkably rare.

In section 2, actual patterns of neutralization in Korean are compared to hypothetical neutralizing patterns, including would-be word-initial laryngeal neutralization, would-be nasal lateralization, and would-be nasal + stop assimilation. It is shown that these hypothetical patterns, had they evolved in Korean, would have induced far more homophony than is actually found.

In section 3, some of the historical pressures that seem to have influenced the present-day Korean pattern are briefly considered, especially the role that Chinese has played in the history of the Korean sound pattern; I further discuss current developments in Korean, suggesting that these historical trends are continuing into the present. I speculate that 'functional load' (in the sense of Martinet) might indeed play a role in the diachronic comportment of linguistic sound systems.

1. Neutralization in Korean

Table 1 provides intervocalic consonantal values in Korean (adapted from Martin 1992). The first column lists morpheme-final consonants; the first row lists following morpheme-initial consonants, and the table's interior

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+C→ C+↓	p	pʰ	p’	t	tʰ	t’	s	s’	ʧ	ʧʰ	ʧ’	k	kʰ	k’	m	n	ɾ	h	∅
p	p’	pʰ	p’	pt’	ptʰ	pt’	ps’	ps’	pʧ’	pʧʰ	pʧ’	k’	kʰ	k’	m:	mn	mn	pʰ	b
pʰ	p’	pʰ	p’	pt’	ptʰ	pt’	ps’	ps’	pʧ’	pʧʰ	pʧ’	k’	kʰ	k’	m:	mn	mn	pʰ	pʰ
t	p’	pʰ	p’	t’	tʰ	t’	s’	s’	ʧ’	ʧʰ	ʧ’	k’	kʰ	k’	m:	l:	l:	tʰ	d
tʰ	p’	pʰ	p’	t’	tʰ	t’	s’	s’	ʧ’	ʧʰ	ʧ’	k’	kʰ	k’	m:	n:	n:	tʰ	tʰ
s	p’	pʰ	p’	t’	tʰ	t’	s’	s’	ʧ’	ʧʰ	ʧ’	k’	kʰ	k’	m:	n:	n:	s’	s
s’	p’	pʰ	p’	t’	tʰ	t’	s’	s’	ʧ’	ʧʰ	ʧ’	k’	kʰ	k’	m:	n:	n:	s’	ʃ’
ts	p’	pʰ	p’	t’	tʰ	t’	s’	s’	ʧ’	ʧʰ	ʧ’	k’	kʰ	k’	m:	n:	n:	ʧʰ	ʤ
ʧʰ	p’	pʰ	p’	t’	tʰ	t’	s’	s’	ʧ’	ʧʰ	ʧ’	k’	kʰ	k’	m:	n:	n:	tʰ	ʧʰ
k	kp’	kpʰ	kp’	kt’	ktʰ	kt’	ks’	ks’	kʧ’	kʧʰ	kʧ’	k’	kʰ	k’	ŋm	ŋn	ŋn	kʰ	g
kʰ	kp’	kpʰ	kpʰ	kt’	ktʰ	kt’	ks’	ks’	kʧ’	kʧʰ	kʧ’	k’	kʰ	k’	ŋm	ŋn	ŋn	kʰ	kʰ
k’	kp’	kpʰ	kp’	kt’	ktʰ	kt’	ks’	ks’	kʧ’	kʧʰ	kʧ’	k’	kʰ	k’	ŋm	ŋn	ŋn	kʰ	k’
m	mb	mpʰ	mb	md	mtʰ	mt’	ms’	ms’	mʧ’	mʧʰ	mʧ’	ŋk’	ŋkʰ	ŋk’	m:	mn	mn	mh	m
n	mb	mpʰ	mp’	nd	ntʰ	nt’	ns’	ns’	nʧ’	nʧʰ	nʧ’	ŋk’	ŋkʰ	ŋk’	m:	n:	n:	nh	n
ŋ	ŋb	ŋpʰ	ŋp’	ŋg	ŋtʰ	ŋt’	ŋs’	ŋs’	ŋʧ’	ŋʧʰ	ŋʧ’	ŋk’	ŋkʰ	ŋk’	ŋm	ŋn	ŋl	ŋh	ŋ
l	lb	lpʰ	lp’	ld	ltʰ	lt’	ls’	ls’	lʧ’	lʧʰ	lʧ’	lg	lkʰ	lk’	lm	l:	l:	lh	l
∅	b	pʰ	p’	d	tʰ	t’	s’	s’	ʤ	ʧʰ	ʧ’	g	kʰ	k’	m	n	ɾ	∅	∅

Table 1
Korean intervocalic values (shaded cells are variably implemented)

indicates the phonetic values of all combinations of these morphologically-ordered elements.

In all, there are 304 morphologically-ordered sequences here. Variable values are in shaded boxes. Including these variable values among the neutralized values for now, the 304 morphologically ordered sequences reduce to only 75 phonetic values, a reduction of about 75%. In this section I show that, despite this drastic reduction in the number of intervocalic values, derived homophony remains minimal. I consider in turn (1.1) aplosivization, (1.2) nasal lateralization, (1.3) liquid nasalization, (1.4) nasal assimilation, (1.5) coronal assibilation, (1.6) cluster reinforcement, and (1.7) variable assimilation.

The data for this study were tallied from the Sejong Corpus, a database collected from written sources (http://sejong.or.kr/). The version of the Sejong Corpus used here is the same as that used in Albright (2008). The Hangul was Romanized by Albright using HCode Hangul Code Conversion software (Lee 1994). As noun roots often appear unsuffixed as well as suffixed in Korean (unlike verb roots, which are obligatorily suffixed), they are far more likely to engage in neutralizing alternations involving their final consonantal elements. For this reason, only nouns are considered herein.

All told, out of 35,907 distinct nouns in the corpus, the six categorical neutralizing alternations (below) are shown to derive only 42 sets of homophones, involving 86 words. This is a very low level of homophony.

1.1 *Aplosivization induces very little homophony*

Cross-linguistically, laryngeal neutralization is quite prevalent among non-prevocalic stops, and virtually unattested among prevocalic ones (Lombardi 1991; Steriade 1995, 1997, 2000). This position of neutralization typically involves the loss of stop release, or aplosivization. For aerodynamic and auditory reasons, stop releases are the optimal location for laryngeally-based cues (Kingston 1985, 1990; Bladon 1986; Silverman 1995, 1996; Wright 2004). If a stop is not released into a more open gesture such as a vowel, it may lose the phonetic cues associated with this interval of the speech stream, among them, cues to the state of the larynx. In the limiting case, the perceptual distinction among contrastive laryngeal states is extinguished completely. This is laryngeal neutralization due to aplosivization.

Table 2 displays the pattern of aplosivization in Korean, a pattern that seems to have gradually entered Korean during and after The Kolye Dynasty, from about 1000 to 600 years ago, the era of extensive borrowing from Chinese (Martin 1992). (Shaded values do not alternate, as they never appear in morpheme-final position.) The plain obstruents, the aspirated plosives (and **h**), and the tensed obstruents may appear before vowels in Korean. Aplosives are found elsewhere, that is, in lexical non-prevocalic contexts. Due to the rich suffixing system in Korean, the plosives (except for

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	Lexically prevocalic				Lexically non-prevocalic
	Plain	Aspirated	Tensed		Aplosive
Labial	**p**	**pʰ**	**p'**	Alternates with	**p˺**
Coronal	**t**	**tʰ**	**t'**		**t˺**
	ʧ	**ʧʰ**	**ʧ'**		
	s	**(h)**	**s'**		
Dorsal	**k**	**kʰ**	**k'**		**k˺**

Table 2
Distribution of Korean obstruents (and **h**)

	Plosive		Aplosive	
	(a) Locative (-e)	(b) Nominative (-i)	(c) Isolation Form	Gloss
Labial	**pab-e**	**pab-i**	**pap˺**	rice
	ipʰ-e	**ipʰ-i**	**ip˺**	leaf
Coronal	**os-e**	**oʃ-i**	**ot˺**	clothes
	patʰ-e	**paʧʰ-i**	**pat˺**	field
	nadʒ-e	**nadʒ-i**	**nat˺**	day
	piʧʰ-e	**piʧʰ-i**	**pit˺**	light
Dorsal	**kug-e**	**kug-i**	**kuk˺**	soup
	puəkʰ-e	**puəkʰ-i**	**puək˺**	kitchen
	pak'-e	**pak'-i**	**pak˺**	outside

Alternates with

Table 3
Examples of plosive-aplosive alternation in Korean

the tense anterior plosives), the fricatives, as well as **h**, all alternate with the aplosives. Two values neutralize to the labial aplosive, seven values neutralize to the coronal aplosive, and three values neutralize to the dorsal aplosive. Altogether, twelve values neutralize to three, which constitutes a remarkably high 75% reduction in the number of contrasts here.

Some examples of alternating values are provided in table 3 (adapted from Jun 2007). In table 3, note especially that there is an array of laryngeal distinctions in root-final position when a vowel-initial suffix is added (3a, b;

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Labials		Coronals		Dorsals	
Non-neutralized alternant	Number of words	Non-neutralized alternant	Number of words	Non-neutralized alternant	Number of words
p#	1,154	**t**#	3	**k**#	3,522
p+	762	**t**+	0	**k**+	3,272
p^{h}#	189	**t^{h}**#	63	**k^{h}**#	12
p^{h}+	33	**t^{h}**+	60	**k^{h}**+	1
p'#	0	**t**'#	0	**k**'#	15
p'+	0	**t**'+	0	**k**'+	8
		dʒ#	10		
		dʒ+	41		
		tʃ^{h}#	74		
		tʃ^{h}+	43		
		tʃ'#	0		
		tʃ'+	0		
		s#	257		
		s+	612		
		(h)#	0		
		(h)+	5		
		s'#	0		
		s'+	2		
Totals					
p̚#	1,343	**t̚**#	407	**k̚**#	3,549
p̚+	795	**t̚**+	763	**k̚**+	3,281
Total	2,138	Total	1,170	Total	6,830
5299 nouns possess word-final neutralized aplosive alternants; 4839 nouns possess neutralized word-internal aplosive alternants; 10,138 out of 35,907 nouns; 28% of all nouns					

Table 4
Distribution of word-final (#) and morpheme-final (+) obstruents/h for 10,138 nouns, from the Sejong Project

underlined). However, these distinctions all neutralize to their corresponding aplosive value when lexically non-prevocalic (3c; also underlined). Note that coronals palatalize before **i**, and plain plosives voice between sonorants.

All told, the Sejong Project corpus lists 35,907 different nouns (not the number of tokens). Of this total, 10,138 nouns (28% of the total) possess aplosive alternants: 5,299 are word-final, and 4,839 are word-internal. These are pooled according to their word- and morpheme-final plosive (i.e. non-neutralized) alternant in table 4 (these would be 'underlying forms' in a

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nadʒ-i	day (Nominative)	**nat̚-k'wa**	day and
natʃʰ-i	face (Nominative)	**nat̚-k'wa**	face and
naʃ-i	sickle (Nominative)	**nat̚-k'wa**	sickle and

Table 5
Derived homophony in Korean

theory that hypothesizes the existence of this abstract level of representation). In principle, a given form can be counted more than once if, for example, it possesses both word-internal and word-final aplosive alternants, though this rarely seems to occur. At 28%, it is clear that the proportion of the noun vocabulary that is subject to neutralizing aplosivization is not insignificant.

Korean indeed possesses nouns that are rendered homophonous as a consequence of neutralizing aplosivization. An oft-cited example of derived noun homophony is provided in table 5. The Native (i.e. non-Sino-Korean) Korean words for 'day,' 'face', and 'sickle' are phonetically distinct when suffixed with the vowel-initial suffix **i** (the Nominative marker). However, when any of these words is suffixed with a consonant-initial suffix such as **kwa** 'and', the root-final obstruent aplosivizes to **t̚**, and the words are rendered phonetically non-distinct.

Among the 10,138 nouns that are subject to aplosivization, the sets in table 6 comprise an exhaustive list of the homophonous words. Certain words in the corpus have eluded a dictionary search, and are unfamiliar to native speakers of Korean, and these are marked 'unknown' – these sets are shaded. These facts, coupled with the very low token frequencies here, suggest that these are mere spelling errors documented in the Sejong Project corpus. (The significance of these errors is discussed in section 1.7.) Not including these suspect forms, in total, only 15 sets (32 words in all) – out of a total of 35,907 nouns in the corpus – are subject to derived homophony due to aplosivization.

It should be emphasized that the Sejong Project corpus tallies fully inflected words across the lexicon in use, and not simply bare roots. Consequently, it is not the case that all possible derived homophonic roots are documented here. Indeed, certain known potentially homophonous roots are absent from the corpus in their bare form, for example, **otʃʰ** 'lacquer' – **os** 'clothing'. Rather, the list in table 6 consists of those words documented in the Sejong Project corpus – whether bare roots or inflected – that are homophonous as a consequence of neutralizing aplosivization. This is an important point, because the present investigation intends to document homophony across the lexicon in use, and not across the lexicon *in toto*. The exhaustive list in table 6 makes it clear that the counter-functional

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consequences of neutralizing aplosivization among nouns must be exceedingly meager: only 32 out of 35,907 nouns are homophonous due to aplosivization.

Moreover, words that engage in aplosivization typically have a low token count. In table 6, I provide the token counts of all the relevant forms, tallied from the Sejong Project corpus. While the mean token count among nouns is 35, ten of the 15 noun sets possess at least one member with a token count below ten. While there are 46,781 tokens, a full 40,544 are of one word (것), while its homophone (겉) has a token count of 120. If we discount this one set – which, due to the high frequency of the one word and the low frequency of its homophone, is scarcely likely to induce confusion – then, out of 1,234,323 noun tokens, the total number of homophonic tokens due to aplosivization reduces to 6,117.

To summarize, the most salient – and saliently divergent – findings of our discussion are:

(i) Korean aplosivization induces the neutralization of a remarkably high number of oppositions: twelve values neutralize to three; 28% of the nouns are subject to neutralizing aplosivization, and yet (ii) Korean aplosivization induces the homophony of a remarkably low number of nouns: 15 sets of nouns are homophonous (32 nouns out of 35,907: <0.1%; 6,117 noun tokens out of 1,234,323 tokens: <0.1%). This is a very low level of homophony.

1.2 *Nasal lateralization induces very little homophony*

Coronal nasals and laterals bear certain perceptual similarities, since their formant transitions are rather comparable, and they both possess formants and anti-formants. In Korean, their perceptual confusability has apparently culminated in a neutralizing alternation: a sequence of a lateral or tap and a coronal nasal in either order is realized as a long lateral: **n**+ɾ, **l**+ɾ, **l**+**n**→**l:** (Kim-Renaud 1975, Martin 1992, Davis & Shin 1999). This process entered the language about 400 years ago (Martin 1992: 52).

As the non-prevocalic lateral alternates with the tap when prevocalic, the acoustic connection between this latter alternant and the coronal nasal becomes rather tenuous. Though aerodynamically a non-obstruent (since the duration of its oral closure is insufficient to significantly reduce transglottal airflow), the tap possesses neither formants nor anti-formants; it is an extremely short oral stop. However, critical to the implementation of a tap is an oral opening both after and before the oral closure: a tap is only a tap if the tongue makes BRIEF contact with a passive articulator. In the context of a preceding gesture that involves prolonged contact between these two articulators – such as a coronal nasal or a lateral – there is little opportunity for the tongue to fall away from its contact site, and then quickly re-implement contact. Rather, tongue contact is likely to be

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Set number	Hom-ophonous value	Non-neutralized allomorphs	Word number	Hangul	Token count	Gloss
1	**ʧʌt˺**	**ʧʌʧ**	1	젖	44	breast/milk
		ʧʌs	2	젓	5	salted fish
2	**ʧʌtkaɾak˺**	**ʧʌs-ka-ɾak**	3	젓가락	27	chopsticks
		ʧʌʧ-ka-ɾak	4	젖가락	3	unknown
3	**ʧip˺**	**ʧip**	5	집	9	house
		ʧip^{h}	6	짚	19	straw
4	**ʧot˺**	**ʧoʧ**	7	좇	21	penis
		ʧoʧ^{h}	8	좇	2	unknown
5	**ip˺**	**ip**	9	입	1,139	mouth
		ip^{h}	10	잎	158	leaf
6	**kʌt˺**	**kʌs**	11	것	40,544	one
		kʌt^{h}	12	겉	120	surface
7	**mat˺**	**mas**	13	맛	392	taste
		mat^{h}	14	맡	3	nearby place
8	**milʧ'ip˺**	**mil-ʧip**	15	밀집	21	crowd
		mil-ʧip^{h}	16	밀짚	2	straw
9	**nat˺**	**naʧ**	17	낮	294	day
		naʧ^{h}	18	낯	91	face
		nas	19	낫	25	sickle
10	**odʒiɾap˺**	**o-ʧi-ɾap**	20	오지랍	4	unknown
		o-ʧi-ɾap^{h}	21	오지랖	3	front of outer garment
11	**pak˺**	**pak**	22	박	581	gourd
		pak'	23	밖	1,568	exterior
12	**pat˺**	**pat^{h}**	24	밭	380	heritage
		pat	25	받	2	field
13	**pit˺**	**piʧ^{h}**	26	빛	726	light
		piʧ	27	빚	128	debt
		pis	28	빗	6	comb

Table 6
(Continued)

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Set number	Hom-ophonous value	Non-neutralized allomorphs	Word number	Hangul	Token count	Gloss
14	**pʲʌt˺**	**pʲʌtʰ**	29	볕	32	sunshine
		pʲʌs	30	볏	6	crest (of fowl)
15	**sɛudʒʌt˺**	**sɛ-u-tʃʌs**	31	새우젓	8	unknown
		sɛ-u-tʃʌtʃ	32	새우젖	2	salted shrimp
16	**sut˺**	**sutʃʰ**	33	숯	14	charcoal
		sutʰ	34	숱	7	hair density
17	**tʌt˺**	**tʌtʃʰ**	35	덫	31	trap
		tʌs	36	덧	4	a short time
18	**tʰe-ip˺**	**tʰe-ipʰ**	37	테잎	2	tape
		tʰe-ip	38	테입	9	unknown
19	**tʃipt'an**	**tʃip-tan**	39	집단	400	group
		tʃipʰ-tan	40	짚단	12	sheaf of straw
20	**natʃ'ak˺**	**natʃʰ-tʃ'ak**	41	낯짝	5	face
		natʃ-tʃ'ak	42	낯짝	2	unknown
21	**pitʃ'ulgi**	**pis-tʃul-ki**	43	빗줄기	16	sheets of rain
		pitʃʰ-tʃul-ki	44	빛줄기	2	rays of light
22	**takt'al**	**tak'-tal**	45	닦달	8	scolding
		tak-tal	46	닥달	3	unknown
15 actual sets (7 due to spelling errors); 32 nouns; 46,781 tokens						

Table 6
Homophonic noun sets due to aplosivization (shaded cells possess spelling errors)

maintained – much like aplosivization – resulting in a single gesture. This results in either a longer lateral or a longer coronal nasal. Nasal lateralization, consequently, may be seen as an analogous to aplosivization: due to the absence of lateral or nasal release, tongue contact is maintained for the duration of the morphologically-ordered consonantal sequence. Since the lateral and the coronal nasal are confusable, the origins of this neutralization pattern now come into focus.

Table 7 tallies the number of derived **l:** sequences found in the corpus. Out of 1,001 nouns in the corpus possessing **l:**, 681 derive from **n**+**ɾ**, 316 derive

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Sequence	Number of derived sequences	Homophonic sets
lː	681 (from **n**+**ɾ**)	10
	316 (from **l**+**ɾ**)	
	4 (from **l**+**n**)	
1001 sequences in the set of 35,907 nouns; 10 homophonic sets		

Table 7
Derived **lː** sequences

from **l**+**ɾ** and four derive from **l**+**n**. Table 8 provides an exhaustive list of derived homophonic sets due to nasal lateralization. There are ten homophonic sets, and 1001 homophonic tokens. Two additional cases are probably spelling errors. Seven of the actual sets possess at least one member with a token count under ten.

1.3 *Liquid nasalization induces very little homophony*

Another neutralizing alternation in Korean involves the nasalization of non-coronal obstruent – liquid (tap) sequences: **p**+**ɾ**→**mn**, **k**+**ɾ**→**ŋn** (Kim-Renaud 1975, Martin 1992, Davis & Shin 1999). This alternation is mentioned only in passing by Martin (1992); he does not discuss when the pattern may have entered the language. Surely there is no phonetic motivation for the pattern. Rather, this alternation has the 'feel' of being analogically derived from nasal assimilation (to be discussed in section 1.4). It is likely, therefore, that the alternation is a relatively recent innovation.

In all, 695 nouns listed in the corpus possess the relevant sequences. As shown in table 9, there are 119 nouns possessing **mn** (45 derive from **p**+**ɾ** and 74 are lexical **m**+**n**) and 576 nouns possessing **ŋn** (182 derive from **k**+**ɾ** and 394 are lexical **ŋ**+**n**).

In table 10 I provide an exhaustive list of homophones due to liquid nasalization. There are eight cases in all, two of which are suspected spelling errors. Excluding these two sets, a total of 520 nouns tokens (out of 1,234,323) are homophonous, which verges on 0% of the total.

1.4 *Nasal assimilation induces very little homophony*

Korean has a process of nasal assimilation such that any obstruent that comes to precede a nasal becomes nasal itself (Kim-Renaud 1975, Martin 1992,

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Set number	Hom-ophonous value	Non-neutralized allomorphs	Word number	Hangul	Token count	Gloss
1	**ʧʰaɭːa**	**ʧʰaɭ-ɾa**	1	찰라	5	unknown
		ʧʰaɭ-na	2	찰나	22	a moment
2	**hwaɭːo**	**hwan-ɾo**	3	환로	2	file
		hwaɭ-ɾo	4	활로	11	bow
3	**iɭːʲu**	**in-ɾʲu**	5	인류	179	humanity
		il-ɾʲu	6	일류	32	peculiarity
4	**ilsabuɭːan**	**il-sa-pun-ɾan**	7	일사분란	3	unknown
		il-sa-pul-ɾan	8	일사불란	7	being in perfect order
5	**kʌɭːip˥**	**kʌn-ɾip**	9	건립	55	building
		kʌl-ɾip	10	걸립	9	alms rounds
6	**kwʌɭːʲʌn**	**kwʌn-ɾʲʌn**	11	권련	2	deep affection
		kwʌl-ɾʲʌn	12	궐련	10	cigarette
7	**puɭːi**	**pun-ɾi**	13	분리	124	separation
		pul-ɾi	14	불리	7	handicap
8	**puɭːʲaŋ**	**pun-ɾʲaŋ**	15	분량	61	quantity
		pul-ɾʲaŋ	16	불량	40	inferiority
9	**saɭːim**	**san-ɾim**	17	산림	35	woodland
		sal-ɾim	18	살림	179	lifestyle
10	**ʃiɭːok˥**	**ʃin-ɾok**	19	신록	3	fresh verdure
		ʃil-ɾok	20	실록	6	chronicle
11	**suɭːɛ**	**sul-ɾɛ**	21	술래	20	smell of liquor
		sul-nɛ	22	술내	4	tagger
12	**jʌɭːak˥**	**jʌn-ɾak**	23	연락	220	connection
		jʌl-ɾak	24	열락	2	joy
10 actual sets (2 due to spelling errors); 20 words; 1,001 tokens						

Table 8
Homophonic noun sets due to nasal lateralization

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Sequence	Number of non-derived sequences	Number of derived sequences	Homophonic sets
m + **n**	97	45 (from **p** + **ɾ**)	0
ŋ + **n**	394	182 (from **k** + **ɾ**)	6
Totals	468	227	6
695 nasal + nasal sequences in the set of 35,907 nouns 6 homophonic sets			

Table 9
Number of nouns subject to liquid nasalization neutralization

Davis & Shin 1999). This process entered Korean at least 600 years ago (Martin 1992: 52). There are two domains of application of this pervasive process: across morpheme boundaries, and across word boundaries (Kim-Renaud 1975).

Regarding word-internal nasal sequences, 559 are derived through nasal assimilation: 46 nouns possess **m** + **m**, 102 **n** + **m**, 271 **ŋ** + **m**, 18 **m** + **n**, 47 **n** + **n**, and 75 **ŋ** + **n**. Meanwhile, there are 1,734 non-derived nasal–nasal sequences: 127 **m** + **m**, 473 **n** + **m**, 459 **ŋ** + **m**, 97 **m** + **n**, 184 **n** + **n**, and 394 **ŋ** + **n**. In all, then, there are 2,293 nasal–nasal sequences in the set of 35,907 nouns. These figures are displayed in table 11.

The sets in table 12 constitute an exhaustive list of homophones found in the Sejong Project corpus due to word-internal nasal assimilation. Discounting four probable spelling errors, there are ten homophonic sets out of 2,293 neutralized nouns in the list of 35,907 nouns. There are 732 homophonic tokens out of 1,234,323.

Hwang (2008) investigates the amount of potential noun homophony due to the word boundary process. Her results in table 13 show that a full 51% of all nouns (17,763 out of 35,907) are potentially subject to neutralizing nasal assimilation (**P** = any labial obstruent, **T** = any coronal obstruent, **K** = any dorsal obstruent). Despite the enormous amount of potential neutralization here, Hwang shows that a mere 2.8% of the noun inventory is potentially subject to derived homophony as a consequence of nasal neutralization. Her results are displayed in table 14.

Hwang is careful to point out that these numerical results do not show the actual rate of homophonic usage. Rather, these totals merely indicate the *potential* for derived homophony. Crucially, any noun that might be subject to derived homophony as a consequence of word-final nasal assimilation must be immediately followed by a nasal in the next word. This being the case, the amount of actual homophony is likely to be extremely low indeed. To get a sense of this value, there are 3,404 nouns in the corpus that are nasal-initial. Assuming this is representative of the language as a whole, this

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Set number	Hom-ophonous value	Non-neutralized allomorphs	Word number	Hangul	Token count	Gloss
1	**ʧʌŋni**	**ʧʌŋ-ɾi**	1	정리	287	arrangement
		ʧʌk-ɾi	2	적리	3	dysentery
2	**ʧʌŋnip˥**	**ʧʌŋ-ɾip**	3	정립	71	triangular position
		ʧʌk-ɾip	4	적립	4	accumulation
3	**kɑŋnon**	**kɑŋ-ɾon**	5	강론	8	sermon
		kɑk-ɾon	6	각론	4	detailed exposition
4	**kudʒiŋnan**	**ku-ʧik-nan**	7	구직난	2	unemployment problem
		ku-ʧik-ɾan	8	구직란	2	unknown
5	**kʲʌŋni**	**kʲʌŋ-ɾi**	9	경리	14	unknown
		kʲʌk-ɾi	10	격리	37	quarantine
6	**pɛŋnʲʌn**	**pɛk-ɾʲʌn**	11	백련	15	white lotus
		pɛk-nʲʌn	12	백년	5	century
7	**pʲʌŋnʲʌk˥**	**pʲʌŋ-ɾʲʌk**	13	병력	90	replacement depot
		pʲʌk-ɾʲʌk	14	벽력	4	thunder and lightning
8	**jɑŋnʲʌk˥**	**jɑŋ-ɾʲʌk**	15	양력	26	solar calendar
		jɑk-ɾʲʌk	16	약력	3	vita
6 actual sets (2 due to spelling errors); 12 words; 520 tokens						

Table 10
Homophonic noun sets due to liquid nasalization

constitutes about 10% of the lexicon. This suggests that the likelihood of derived homophony in the present case is probably about one-tenth of 2.8%, or .28%. This result is fully in keeping with the remarkably low levels of derived homophony found elsewhere.

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Sequence	Number of non-derived sequences	Number of derived sequences	Homophonic sets
m+**m**	127	46	0
n+**m**	473	102	2
ŋ+**m**	459	271	6
m+**n**	97	18	0
n+**n**	184	47	0
ŋ+**n**	394	75	2
Totals	1,734	559	10
2,293 nasal-nasal sequences in the set of 35,907 nouns 10 homophonic sets			

Table 11
Number of nouns subject to nasal assimilation neutralization

1.5 *Coronal assibilation induces very little homophony*

Coronal obstruents assibilate before **s** and **s'**, resulting in (neutralized) **s'** (Martin 1992). Out of the 35,907 nouns in the corpus, 131 words possess the relevant values: 41 lexical, 9 derived. There is a total of one homophonic set as a result of this alternation, 14 tokens in all, as shown in table 15. Out of 1,234,323 noun tokens, 14 are homophonous due to coronal assibilation.

1.6 *Cluster reinforcement induces no homophony*

When a non-aspirated obstruent comes to follow another obstruent, the second value tenses (Kim-Renaud 1975, Martin 1992); this process is called cluster reinforcement. There are 4,048 nouns in the corpus that possess word-medial tensed obstruents: 449 **p'**, 476 **t'**, 1017 **ʧ'**, 1090 **s'**, and 1016 **k'**. In table 16 I provide a list of the homophonic sets due to cluster reinforcement. All three sets are probable spelling errors. There is thus no homophony as a consequence of cluster reinforcement.

1.7 *Variable assimilation might induce more homophony* (*but might not*)

In colloquial Korean speech, coronals (excluding the lateral) variably assimilate to a following consonant (Kim-Renaud 1975, Martin 1992), and labials variably assimilate to a following dorsal. In theory, this assimilation process, unlike the others discussed herein, has the potential to induce a non-negligible amount of homophony. In table 17 I provide the total number of nouns that are potentially subject to this process (17a) alongside the total number of non-variable (genuinely morphologically-sequenced) values with

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Set number	Hom-ophonous value	Non-neutralized allomorphs	Word number	Hangul	Token count	Gloss
1	**ʧɑŋmok˥**	**ʧɑk-mok**	1	작목	7	poor night vision
		ʧɑŋ-mok	2	장목	3	lumber
2	**ʧɑŋmul**	**ʧɑk-mul**	3	작물	35	crops
		ʧɑŋ-mul	4	장물	14	loot
3	**ʧɑŋmun**	**ʧɑk-mun**	5	작문	24	composition
		ʧɑŋ-mun	6	장문	5	wide-open gate
4	**ʧɑŋnʲʌn**	**ʧɑk-nʲʌn**	7	작년	267	yesteryear
		ʧɑŋ-nʲʌn	8	장년	8	prime of life
5	**ʧʰanmul**	**ʧʰan-mul**	9	찬물	26	cold water
		ʧʰas-mul	10	찻물	2	tea
6	**haŋmun**	**hak-mun**	11	학문	234	scholarship
		haŋ-mun	12	항문	9	anus
7	**koŋmul**	**kok-mul**	13	곡물	20	corn
		koŋ-mul	14	공물	3	tribute
8	**kudʒiŋnan***	**ku-ʧik-nan**	15	구직난	2	unemployment problem
		ku-ʧik-ɾan	16	구직란	2	unknown
9	**kunmak˥**	**kun-mak**	17	군막	3	military tent
		kus-mak	18	굿막	3	miners' hut
10	**oɾɛnman**	**o-ɾɛn-man**	19	오랜만	116	unknown
		o-ɾɛs-man	20	오랫만	8	unknown
11	**pɛŋnʲʌn**	**pɛk-ɾʲʌn**	21	백련	15	white lotus
		pɛk-nʲʌn	22	백년	5	century
12	**pʌnːamu**	**pʌʧ-na-mu**	23	벚나무	5	cherry tree
		pʌs-na-mu	24	벗나무	2	unknown
13	**sʌŋmul**	**sʌŋ-mul**	25	성물	17	unknown
		sʌk-mul	26	석물	5	stone figures
14	**jaŋmul**	**jak-mul**	27	약물	42	medicinal waters
		jaŋ-mul	28	양물	7	penis
10 actual sets (4 due to spelling errors); 20 words; 732 tokens * = non-unique – already listed with liquid nasalization						

Table 12
Homophonic noun sets due to word-internal nasal assimilation

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Labials			Coronals			Dorsals		
Value	Number of words	% of total	Value	Number of words	% of total	Value	Number of words	% of total
m#	1,913	5.3	**n#**	5,477	15.3	**ŋ#**	5,074	14.15
P#	1,343	3	**T#**	407	1	**K#**	3,549	10
Total	3,256	8.7	Total	5,884	16.4	Total	8,623	23.9
17,763 out of 35,907 nouns; 51% of all nouns								

Table 13
Potential word-final nasal-assimilated nouns

Labials			Coronals			Dorsals		
Value	Number of words	% of total	Value	Number of words	% of total	Value	Number of words	% of total
m#	87	0.2	**n#**	44	0.1	**ŋ#**	354	1.0
P#	89	0.2	**T#**	59	0.1	**K#**	355	1.0
Total	176	0.4	Total	103	0.25	Total	709	2.0
988 words out of 35,907 nouns; 2.8% of all nouns								

Table 14
Potential word-final nasal-assimilated homophones

Set number	Homophonous value	Word number	Non-neutralized allomorph	Hangul	Token count	Gloss
1	**pis̲'al**	1	**pit͡ʃʰ-sal**	빛살	12	light ray
		2	**pis̲-sal**	빗살	2	comb teeth
1 set; 2 words; 14 tokens						

Table 15
Homophonic noun set due to coronal assibilation

which the variable forms might neutralize (17b). Finally, I provide the total number of potentially homophonic sets (17c).

A sizable number of homophonic sets, 62, is possible here. An important point to keep in mind, however, is that this is a VARIABLE pattern of

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Set number	Homo-phonous value	Non-neutralized allomorphs	Word number	Hangul	Token count	Gloss
1	**ʧʼɑk'uŋ**	**ʧʼɑk-k'uŋ**	1	짝꿍	3	buddy
		ʧʼɑk-kuŋ	2	짝궁	2	unknown
2	**k'ɑkt'ugi**	**k'ɑk-tu-ki**	3	깍두기	7	radish kimchi
		k'ɑk-t'u-ki	4	깍뚜기	4	unknown
3	**kop'ɛgi**	**kop-pɛ-ki**	5	곱배기	3	unknown
		kop-p'ɛ-ki	6	곱빼기	3	double shot
No actual sets (all due to spelling errors); 0 words; 0 tokens						

Table 16
Homophonic noun sets due to cluster reinforcement

(a) Variable value	Number of nouns	(b) Non-variable value	Number of nouns	(c) Number of potentially homophonic sets
t + P ~ p + P	126	**p + P**	92	No sets
n + P ~ m + P	683	**m + P**	385	15 sets
n + m ~ m + m	575	**m + m**	173	No sets
t + K ~ k + K	171	**k + K**	688	14 sets
p + K ~ k + K	177			
n + K ~ ŋ + K	1217	**ŋ + K**	1,324	62 sets
m + K ~ ŋ + K	249			
5,860 nouns; 91 potentially homophonic sets				

Table 17
Potential homophony due to variable assimilation

neutralization: sometimes neutralization occurs (more often in casual speech), and sometimes it doesn't (more often in formal speech). Jun (1995), for example, investigates the variable labial-to-dorsal obstruent assimilation pattern using the aerodynamic methodology introduced by Silverman & Jun

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(1994). He reports gestural reduction of labials (in **p**+**k** sequences) to occur about 35% of the time in casual speech, and about 15% of the time in formal speech. However, Jun finds that this variable pattern does not vary between discrete values **k:** versus **pk**. Rather, the variation is gradient, such that tokens may, in theory, fall anywhere on the phonetic continuum between these two endpoints. This sort of variation sets up a situation in which near-neutralizations are practically inevitable: some speech tokens are nearly – but, crucially, not completely – neutralized, and so contrasts may remain recoverable despite the near-obliteration of their acoustic distinctiveness. Many cases of near-neutralization are documented in the phonetics literature, increasingly so as analytic techniques become more sophisticated (e.g. Dinnsen & Charles-Luce 1984 and Charles-Luce 1993 for Catalan; Charles-Luce 1985, Port & O'Dell 1985, and Port & Crawford 1989 for German; Slowiaczek & Dinnsen 1985 for Polish; Pye 1986 for Russian; Warner, Jongman, Sereno & Kemps 2004 for Dutch; Bishop 2007 for Andalusian Spanish).

Among variable processes such as Korean coronal assimilation, it is quite possible that potentially homophonic forms in particular are more likely to maintain their distinctive status than are neutralized heterophones, at least in semantically ambiguous contexts. For example, Charles-Luce (1985) finds that potential homophones in Catalan are more likely to remain acoustically distinct from each other in semantically ambiguous contexts, in comparison to both homophones in semantically transparent contexts and, presumably, to neutralized values in heterophones. Comparable findings are reported for Dutch (Warner, Jongman, Sereno & Kemps 2004).

Anecdotally, an informal, non-systematic dictionary investigation of potentially homophonic sets due to variable coronal assimilation (approximately forty-five minutes checking an online dictionary 'Babylon Korean Dictionary', http://www.babylon.com/dictionary/1271/ Babylon-Korean-English.html) revealed only a few spelling errors documented in the corpus for words with optionally assimilated sequences. This suggests that such sequences are indeed realized as variably- and partially-assimilated, at least a significant portion of the time. Were these sequences completely neutralized, we might expect a higher number of spelling errors: completely neutralized forms are more likely to be subject to spelling errors, since, for such forms, there is less spur-of-the-moment (while writing or typing) evidence to suggest that their phonetic properties are a consequence of neutralization. Indeed, the documented spelling errors in the Sejong Project corpus are not random, but instead always reflect accurate pronunciations of the (presumably intended) word. (I note here that Kim & Jongman (1996), in their investigation of Korean neutralizing aplosivization, find no evidence of near-neutralization under any circumstances. That is, in the case of aplosivization at least – and unlike coronal and labial assimilation – neutralization is apparently complete.)

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Alternation	Number of nouns, both lexical and derived (out of 35,907)	Number of homophonic sets	Number of homophonic words	Number of homophonic tokens (out of 1,234,323)
(1) Aplosivization	10,138	15	32	6,117 (46,781–40,664)
(2) Nasal lateralization	1,001	10	20	288
(3) Liquid nasalization	695	6	12	520
(4) Word-internal nasal assimilation	7,592	10	20	732
(5) Coronal assibilation	131	1	2	14
(6) Cluster reinforcement	4,048	0	0	0
(7) Variable assimilation	(5,860)	(91)		(undetermined)
Totals	23,605	42	86	7,671

Table 18
Summary of neutralizing alternations and derived homophony

1.8 *Summary of neutralizing alternations in Korean*

We have now investigated six categorical neutralizing alternations and one variable/gradient neutralizing alternation in Korean. I summarize the numerical results in table 18. There are 42 homophonic sets out of 35,907 nouns involving 86 words. In running Korean speech, out of 1,234,323 noun tokens encountered, chances are that about 7,671 will be homophonous. This is a very low level of homophony.

2. 'A VERY LOW LEVEL OF HOMOPHONY' COMPARED TO WHAT?

As pointed out by Surendran & Niyogi (2006), totals such as those presented here acquire greater significance when they are compared to values that do not merge (or, for present purposes, neutralize). In this section I specifically do not compare actual patterns of derived homophony to those that might be encountered assuming raw consonant and vowel combinatorics. Since

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languages never possess unconstrained combinations of consonants and vowels, such a comparison would not provide a realistic basis for comparison. Rather, in this section I compare actual patterns of neutralization (along with their amounts of derived homophony) to hypothetical patterns of neutralization (along with their amounts of derived homophony). Two of the three patterns I consider, although plausible and within the realm of possibility, are in fact unattested in Korean. I will examine, in turn, true word-final aplosivization versus hypothetical word-initial laryngeal neutralization, true nasal lateralization versus lateral nasalization hypothetical, and true stop + nasal assimilation versus hypothetical nasal + stop assimilation. The first of these hypothetical cases is an implausible development, but the second and third are quite plausible indeed. It turns out that these hypothetical patterns of neutralization would derive a very large number of homophonic sets, in comparison to the meager amount of actual derived homophony. These results are thus consistent with the hypothesis that patterns of neutralization are more likely to be tolerated when they do not result in a significant increase in the amount of derived homophony. Again, I reiterate that the goal of the present investigation is not to zero in on a genuine upper limit for derived homophony. Rather, the present investigation is merely a single case study.

Our first comparison is between true neutralizing aplosivization versus hypothetical word-initial laryngeal neutralization. In table 19 I compare the number of words and the number of minimally distinctive sets, in both word-initial and word-final position. It is quite clear from these figures that the functional load of word-initial obstruent oppositions is far heavier than that of their word-final counterparts: 26,125 nouns begin with obstruents out of 35,907; 1,912 sets would be homophones due to laryngeal neutralization. By contrast, in reality, 5,134 words end with obstruents, and 15 homophonic sets arise due to aplosivization. This should not be surprising. Recall my proposal that languages do not evolve towards a state in which derived homophony is excessive. Initial laryngeal neutralization among Korean root-initial plosives would induce just such an excessive amount of homophony.

On the one hand, it might be argued that comparing genuine aplosivization to hypothetical word-initial neutralization heightens the significance of the present findings. Languages naturally evolve toward states that exploit the acoustic/auditory space to good advantage, and so lexicons are naturally structured such that more words are distinguished in contexts that are capable of saliently encoding critically distinctive cues, for example, lexically prevocalic contexts over lexically non-prevocalic ones.

On the other hand, it might be objected that, since languages never neutralize consonantal laryngeal distinctions in **#CV** contexts, any comparison to this hypothetical pattern is unilluminating. Consequently, in the following subsections I consider two more plausible hypothetical cases of neutralization. In each case, the actual amount of derived homophony is far lower than the would-be amount.

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Labials		Coronals		Dorsals	
True aplosivization	Would-be word-initial	True aplosivization	Would-be word-initial	True aplosivization	Would-be word-initial
1,202 words	4,323 words	408 words	15,988 words	3,524 words	5,814 words
4 sets	100 sets	10 sets	1,755 sets	1 set	57 sets
15 true sets of homophones due to aplosivization versus 1,912 sets of would-be word-initial homophones due to laryngeal neutralization					

Table 19

Genuine sets of homophones due to word-final aplosivization versus would-be homophonic noun sets due to word-initial laryngeal neutralization

True homophonic sets	Would-be sequence	Number of would-be sequences	Would-be homophonic sets
10	**nː**	681 (from **n** + **ɾ**)	47
		316 (from **l** + **ɾ**)	
		4 (from **l** + **n**)	
		187 (lexical **n** + **n**)	
10 true sets due to nasal lateralization versus 47 sets of would-be homophones due to lateral nasalization			

Table 20
Genuine sets of homophones due to nasal lateralization versus would-be homophonic noun sets due to lateral nasalization

In table 20 I compare cases of true nasal lateralization to hypothetical lateral nasalization. In comparison to the ten actual homophonic sets due to nasal lateralization, there are 47 would-be homophonic sets due to lateral nasalization.

A comparable result is obtained when comparing true stop + nasal assimilated sequences to hypothetical nasal + stop assimilated sequences: there are 10 sets of homophones due to stop + nasal assimilation, while there would be 1100 sets of homophones due to nasal + stop assimilation, 1072 if we discount unattested + **ŋ** forms (table 21).

To summarize the results of this section, the six categorical cases of neutralization found in Korean yield a total of 42 sets of homophones. By comparison, the three hypothetical cases of neutralization that are not found in Korean would produce 3,059 homophonic sets.

3. A brief history of Korean neutralization

Korean witnessed a massive influx of Chinese words in its distant past – beginning at least 1300 hundred years ago, with the greatest amount of borrowing during the Kolye Dynasty, about 600–1000 years ago – which served to supplant a significant portion of its native vocabulary, particularly its noun inventory. During the era of borrowing, Chinese possessed a very limited set of consonants in root-final position: **p̚ t̚ k̚ m n ŋ**. The Korean of this era had these endings, though Middle Chinese final **t** was typically – and oddly – incorporated into Korean as **l**. This is odd since, as stated, Native Korean indeed possessed **t**-final words. However, **t**-final Sino-Korean words were usually written with **lʔ**, in an apparent effort to call attention to their phonetically checked nature, at least in prescriptive pronunciations. Martin

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True lexical N + N sequences	Would-be sequence	Would-be N + N sequences derived from nasal + stop	True N + N sequences derived stop + nasal
127	**m + m**	512	46
473	**n + m**	1,179	102
459	**ŋ + m**	1,236	271
97	**m + n**	911	18
184	**n + n**	3,333	47
394	**ŋ + n**	4,571	75
–	**m + ŋ**	249	–
–	**n + ŋ**	1,238	–
–	**ŋ + ŋ**	1,327	–

Table 21
Would-be nasal + stop word-internal nasal assimilation sequences versus true stop + nasal word-internal nasal assimilation sequences

(1997) plausibly suggests that the sound in question was borrowed as a tap (**ɾ**). The dearth of roots with final **t** even in Middle Korean – only forty-eight verbs and a few nouns, according to Martin (1997) – suggests a frequency effect: the loan pattern may have been influenced by the infrequency of Native Korean **t**-final roots, and the high frequency of Native Korean **ɾ/l**-final roots. Though nothing crucial hinges on this issue, and though the question is far from resolved (indeed, I am doing Martin an injustice by simplifying his remarkably detailed discussion), I operate herein under the assumption that Middle Chinese root-final **t** was borrowed as **ɾ**, and alternated with **l** when non-prevocalic, much as this value does today.

In addition to these simple stop endings, Korean roots possessed what Martin (1992) terms 'overstuffed' endings, among them **pʰ pt ptʰ ps pst psk pts tsʰ tʰ sp st sn sk kʰ ks lk lp lpʰ lm nts nʰ** (the affricates were not yet palatalized; they were dental) (Martin 1992, Sohn 1999, Song 2005). Martin believes that up to 600 years ago, these endings were realized intact when a vowel followed, but by 400 years ago they had been reduced to a single member when non-prevocalic. Contemporary Korean root-final tensed values seem to be the reflexes of at least some of these previously complex root-final clusters; other root-final clusters survive to the present, including **ps ls ks nʧ ltʰ lh nh lk lp lpʰ** (Ko 2006). Also around 600 years ago, root-final **ts tsʰ s** began to reduce to **s** when non-prevocalic.

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By 400 years ago, non-prevocalic **s** (which was now an alternant of **ts ts^{h} s**) had succumbed to aplosivation, neutralizing to **t**$^{\urcorner}$. However, Manchu and Mongol loanwords were written with a final **s** as recently as 200 years ago. In the case of final **h**, it was dropped word-finally, but realized as post-aspiration when a lexical stop followed. In Contemporary Korean, root-final **h** has been completely eliminated among noun roots, surviving only in some (morphologically complex) forms.

The huge influx of Sino-Korean nouns was largely coincident with the onset of the process of root-final consonant attrition. What seems to have happened is that this property came to influence Korean phonotactics at large. The gradual attrition of the Korean system of root-final values thus appears to have been set in motion by the influx of Sino-Korean forms.

The trend towards simplification of the Korean coda system has continued down to recent times. Consider some additional findings, which demonstrate that root-final values in Korean are actually merging (in addition to neutralizing).

First, Ito (2006) observes that since the Middle Korean period, ten (out of 13) **t**-final roots have changed to **s**. She further reports that polysyllabic nouns were much more likely to change to **s** than were monosyllabic nouns.

Second, according to Jun (2007), young Korean speakers are introducing a significant amount of variation in the phonetic values among prevocalic root-final obstruents, though with preferences for some values over others. Among roots that heretofore have contrasted **t t^{h} s ʧ ʧ^{h}** prevocalically, there is now a substantial amount of variation among these values. In other words, the distinction among these prevocalic root-final values appears to be breaking down. Simplifying somewhat, among the coronals, **s** is the favored variant; among the labials (**p p^{h}**), **p** is the favored variant; among the dorsals (**k k^{h} k**'), **k** is the favored variant. These favored variants are also the most frequent in terms of the number of words that possess them. Jun suggests that this is no coincidence: the token prevalence of some variants over others is arguably a consequence of the lexical prevalence of some values over others.

Third, Kang (2006) observes that those coronal-final roots that vary toward **s** tend to be low-frequency items.

Fourth, Albright (2008) shows that these root-final mergers in Korean actually cause very little ambiguity, due to statistical asymmetries in the lexicon of Korean, and due to their frequencies of usage.

The upshot is that root-final obstruents in the noun system are becoming increasingly subject not only to neutralization, but to full merger as well, with few counter-functional consequences. Table 22 provides a simplified timeline of this diachrony. Note in particular that root-final consonant clusters are not listed. Many such clusters evolved into tensed obstruents. Consequently, the introduction of root-final tensed values actually involves a

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Labials	Coronals						Dorsals		Commentary
Korean consonantal root endings, lexically prevocalic, >600 years ago (*italic* values are also Sino-Korean):									
p	**p^h**	**t**	**t^h**	**ts**	**ts^h**	**s**	**(h)**	***k***	**k^h**	Chinese compounds enter Aplosivization expands
Korean consonantal root endings, lexically non-prevocalic, >600 years ago:									
$p^{\urcorner}$		**$t^{\urcorner}$**		**s**			**∅**	**$k^{\urcorner}$**		Nasal assimilation begins
Korean consonantal root endings, lexically prevocalic, >400 years ago:									
p	**p^h**	**t**	**t^h**	**ts**	**ts^h**	**s**	**(h)**	**k**	**k^h**	Nasal lateralization begins Liquid nasalization begins(?)
Korean consonantal root endings, lexically non-prevocalic, >400 years ago:									
$p^{\urcorner}$		**$t^{\urcorner}$**						**$k^{\urcorner}$**		**s→$t^{\urcorner}$**
Contemporary Korean consonantal root endings, lexically prevocalic (bold-edged cells may vary; *italic* values are preferred variants; tensed values arose from a collapse of 'overstuffed' root endings, thus simplifying the system – Martin 1992):									
p	**p^h**	**t**	**t^h**	**ʧ**	**$ʧ^h$**	***s***	**s'**	**(h)**	***k***	**k^h**	**k'**	Root-final values begin to merge
Contemporary Korean consonantal root endings, lexically non-prevocalic:									
$p^{\urcorner}$		$t^{\urcorner}$						$k^{\urcorner}$		

Table 22
Simplified timeline of Korean obstruent root ending attrition

decrease in the number of root endings, and not the increase that is suggested by the display.

In short, the inventory of root-final values in Korean seems to be in a rather steady – if slow – state of attrition. The current proposal is that this tendency has remained in place due to the absence of functional pressures that might inhibit it, since, as shown in section 1, the attrition does not create a significant amount of homophony.

4. Concluding remarks

Despite the very significant extent of neutralization in Korean, the counter-functional consequences are quite meager: out of 35,907 nouns in the Sejong Corpus, there are only 42 sets of homophones as a consequence of the six categorical neutralizing alternations investigated. These findings are consistent with the hypothesis that, even when there is a natural phonetic tendency toward a particular phonetic state (say, non-prevocalic aplosivization among obstruents, or various sorts of neutralizing consonantal assimilations), a given language will most likely not evolve toward that state if excessive homophony were to result, because the very speech tokens that are produced with homophone-inducing neutralized alternants are also the very speech tokens that might confuse listeners. Accordingly, as a natural, passive consequence, such tokens would not be reproduced as these listeners become speakers (Labov 1994, Silverman 2006). Rather, in such a language, there is likely to be a natural, passive maintenance of contrast, for it is exactly those speech tokens that are communicated successfully to listeners that are more likely to take hold and to become conventionalized as the speech norm. Indeed, as Hoenigswald (1960: 80) writes, 'it is entirely conceivable that threatened homonymy should also be considered as counteracting the forces of "articulatory ease" in holding back an entire merger process and in preserving a phonemic contrast even where it is not minimal'. By contrast, in Korean, there may be no functional counter-pressure inhibiting the natural tendency toward neutralization, since the introduction of the neutralizing patterns does not have significant counter-functional consequences, in the form of significantly increasing the amount of derived homophony.

I have not attempted to specify or determine a numerical upper limit for derived homophony. While this value may ultimately be empirically ascertainable by thoroughly investigating many languages, in this paper I have merely shown that, in Korean at least, the amount of derived homophony is remarkably low. The very low levels of homophony in Korean become especially salient by comparing ACTUAL homophonic sets to plausible WOULD-BE homophonic sets. Indeed, the present findings suggest that anti-homophony and Martinet's original formulation of the 'functional load' argument are genuine factors acting on linguistic sound systems.

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