Some data on nasal substitution in several languages

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0. Introduction

(1) Tobin Skinner's talk last week

Discussed Timugon Murut data in which a prefix may or may not trigger nasal substitution [Data orig. from Prentice 1971].

		(a) no substutition	(b) yes subst.	
/maN+buli/	→	[ma**m-b**uli]	[ma**m**uli]	'*Topic/Subject* will keep'
/maN+tutu/	→	[ma**n-t**utu]	[ma**n**utu]	'*Topic/Subject* will pound

Interpretation (see Gref 2008): In (a), the vP consisting of the root (V) is spelled out before the prefix attaches, disfavoring subsequent loss of the stem-initial consonant's obstruent-hood. In (b), the root moves out of vP and raises to *maN-* before being spelled out, so destructive phonological operations are possible.

(2) Today: some additional data

I've been looking at *phonological* conditions on nasal substitution in this language family, so I'd like to share some data (original and otherwise) and see what you think about how it fits in to the syntactic picture.

This handout is mostly cut and pasted from a submitted article, "A model of lexical variation and the grammar with application to Tagalog nasal substitution", where you can see details of the phonological analysis, the statistics, etc.

1. Nasal substitution in Tagalog

(3) The basic alternation (data from English 1986)
Triggered fairly productively by prefixes *paN-*, *maN-*, *naN-*.

Here they are with sonorants, which can't undergo nasal substitution:

	stem		*affixes*	*affixed form*	
h	**h**ukbó	'army'	paŋ-	paŋ-**h**ukbó	'military'
m	**m**arká	'mark'	paŋ-	paŋ-**m**arká	'marker'
n	**n**egósjo	'business'	paŋ-	paŋ-**n**egósjo	'for business'
ŋ	**ŋ**álit	'grinding of teeth'	paŋ-RED-	paŋ-**ŋ**a-**ŋ**álit	'grinding of teeth'
w	**w**isik-án	'to sprinkle on'	paŋ-	paŋ-**w**isík	'sprinkler'
j	**j**amót	'annoyance'	maŋ-	maŋ-**j**amót	'to annoy'
l	**l**abás	'exterior'	paŋ-	pa**n**-**l**abás	'external'
r	**r**ehjón	'region'	paŋ-	pa**n**-**r**ehjón	'regional'

Here they are with obstruents:

	stem		*affixes*	*affixed form*	
p	**p**o?ók	'district'	paŋ-	pa**m**-**p**o?ók	'local'
	pighatí?	'grief'	paŋ-RED-	pa-**m**i-**m**ighatí?	'being in grief'
t	**t**abój	'driving forward'	paŋ-	pa**n**-**t**abój	'to goad'
	tiwála?	'faith'	ka-paŋ- -an	kà-pa-**n**iwála?-an	'traditional belief'
s	**s**úlat	'writing'	paŋ-	pa**n**-**s**úlat	'writing instrument'
	súlat	'writing'	maŋ-RED-	mà-**n**u-**n**ulát	'writer'
k	**k**úlam	'sorcery'	maŋ-RED-	ma**ŋ**-**k**u-**k**úlam	'witch'
	kamkám	'usurpation'	ma-paŋ-	ma-pa-**ŋ**amkám	'rapacious'
ʔ	**ʔ**ulól	'silly'	maŋ-	ma**ŋ**-**ʔ**ulól	'to fool someone'
	ʔisdá?	'fish'	maŋ-	ma-**ŋ**isdá?	'to fish'
b	**b**igkás	'pronouncing'	maŋ-RED-	ma**m**-**b**i-**b**igkás	'reciter'
	mag-**b**igáj	'to give'	maŋ-	ma-**m**igáj	'to distribute'
d	**d**iníg	'audible'	paŋ-	pa**n**-**d**iníg	'sense of hearing'
	daláŋin	'prayer'	i-paŋ- -in	?i-pa-**n**aláŋinin	'to pray'
g	**g**áwaj	'witchcraft'	maŋ-RED-	ma**ŋ**-**g**a-**g**áwaj	'witch'
	gindáj	'unsteadiness on feet'	paŋ-RED-	pa-**ŋ**i-**ŋ**indáj	'unsteadiness on feet'

(4) Other affixes

- Impressionistically unproductive, can trigger: *taŋ-*, *tuŋ- siŋ-*, *hiŋ-*, *kaŋ-*, and *kuŋ-*:

taŋ-	*(no substituting examples found)*			
	bílaŋ	'number'	ta**m-b**ílaŋ	'digit'
tuŋ-	*(no substituting examples found)*			
	balík	'upside-down'	tu**m-b**alík	'return'
siŋ-	púno?	'leader'	si-**m**úno?	'grammatical subject'
	tábi?	'move aside!'	pa-si**n-t**ábi?	'respect; asking pardon'
hiŋ-	kúto	'louse'	hi-**ŋ**utú-han	'to pick out lice'
	túlot	'permission'	pa-hi**n-t**úlot	'permission'
kaŋ-	patáj	'corpse'	ka-**m**àtáj-an	'death'
	gatá?	'coconut milk'	kà-ka**ŋ-g**atá?	'first extraction of coconut milk; essence'
kuŋ-	*(no substituting examples found)*			
	babá?	'descent'	mag-pa-ku**m-b**abá?	'humble'

- Productive but never triggers: *mag-kaŋ-RED*, for verbs of accidental result
  dapá? 'face down' *mag-kan-da-rápa?* 'to fall on one's face'

- Never trigger, compound-like: *waláŋ-* 'not exist', *(ʔi)sáŋ-* 'one', *(ka)síŋ-* 'as X as', *pagigíŋ-* 'becoming', *magíŋ-* 'become'

bájad	'payment'	waláŋ-bájad	'free'
dáliʔ	'finger-width'	san-dáliʔ	'one finger width'
ʔitím	'black'	kasíŋ-ʔitím	'as black as'
táʔo	'person'	pagigíŋ-táʔo	'becoming a person'
ʔabogádo	'lawyer'	magíŋ-ʔabogádo	'to become a lawyer'

(Q: Why compound-like? A: At least two syllables long in their full forms, can bear their own stress, produce semantically transparent words; *waláŋ-* and *(ʔi)sáŋ-* are presumably derived from freestanding *waláʔ* 'does not have/exist' and *ʔisáʔ* 'one', plus "linker" *-ŋ-*. Forms with *magíŋ-* are usually spelled as two separate words.)

(5) Reduplication

/paŋ-RED-pighatíʔ/ → *pa-**m**i-**m**ighatíʔ* , not **pa-**m**i-**p**ighatíʔ*

Various explanations for this "double application"
- nasal substitution precedes reduplication, in a counterbleeding order (Bloomfield 1917; Carrier 1979; Raimy 2000)
- both reduplicant and base select a nasal-substituted allomorph because of the morphological context (Marantz 1982; Inkelas and Zoll 2000, 2005)
- a special relationship between base and reduplicant forces nasal substitution to apply to both (Wilbur 1973; McCarthy and Prince 1995)

Reduplicated forms suggest that when nasal substitution applies (and only then), the nasal belongs to a stem that serves as the base of reduplication:

*pa-**m**ighatíʔ* > *pa-**m**i-**m**ighatíʔ* not *pa**m**-ighatíʔ* > **pa**m**-i-(ʔ)ighatíʔ*
*ma**m**-bigkás* > *ma**m**-bi-bigkás* not *ma-**m**bigkás* > **ma-**m**bi-**m**bigkás.*

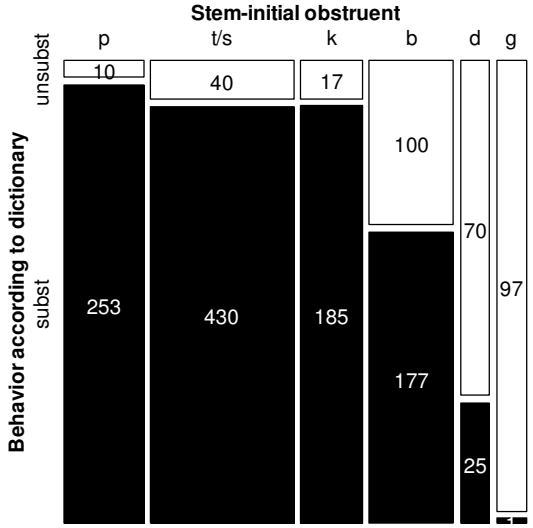
(6) Lexical statistics from dictionary: overall trends

Dictionary used: English's (1986), non-loans only, with an obstruent-initial stem and a potentially nasal-substituting prefix

Phonological trends
- Substitution is more likely if stem-initial consonant is voiceless than if voiced.
- Among the voiced consonants, substitution is most likely with *b* and least likely with *g*.[1]

[1] Previous accounts of the lexical distribution of nasal substitution have stated, mostly in passing, that *g* never substitutes (Bloomfield 1917; Schachter & Otanes 1972); that *d* and *g* rarely substitute (Blake 1925); that voiceless consonants substitute more than voiced ones (De Guzman 1978); and that morphology matters (Schachter & Otanes 1972; De Guzman 1978, who gives detailed claims about various morphological constructions).

Figure 1: Rates of nasal substitution for entire lexicon—dictionary data[2]



(7) Broken down by construction
Dictionary data for six most common affix patterns, accounting for 1,670 of the 1,736 words in the dictionary.

Breakdown by affix based mostly on De Guzman (1978):

- adversative verbs (hostile to the patient): *bató* 'stones' *ma-mató* ~ *mam-bató* 'to throw stones at'
- other verbs: inchoative (*paját* 'thin', *ma-maját* 'to become thin'), stative (*butiktîk* 'teeming with', *ma-mutiktîk* 'to teem with'), professional (*gamót* 'medicine', *maŋ-gamót* 'to practice medicine'), habitual (*sigarîljo* 'cigarette', *ma-nigarîljo* 'to be a smoker'), distributive (*k-um-úha* 'get', *ma-ŋúha* 'to gather things'), repetitive verbs (*bintána* 'window', *ma-mintána* 'to keep looking out a window'), and others.
- instrumental adjectives: *títik* 'writing', *pa-nítik* 'used for writing'
- reservative adjectives: *baŋkéte* 'banquet' *pam-baŋkéte* 'appropriate for a banquet'
- gerunds (*tahîʔ* 'stitch', *pa-na-nahîʔ* 'sewing') and less-transparent nominalizations

[2] Mosaic plot, made using the *mosaic()* function of the *vcd* package (Meyer et al. 2006, 2007) of the statistical computing program R (R Core Development Team 2007).

Figure 2: Rates of substitution for *paŋ-RED-* construction [mainly gerunds (*tahí?* 'stitch', *pa-na-nahí?* 'sewing'), but also some less transparent nominalizations]

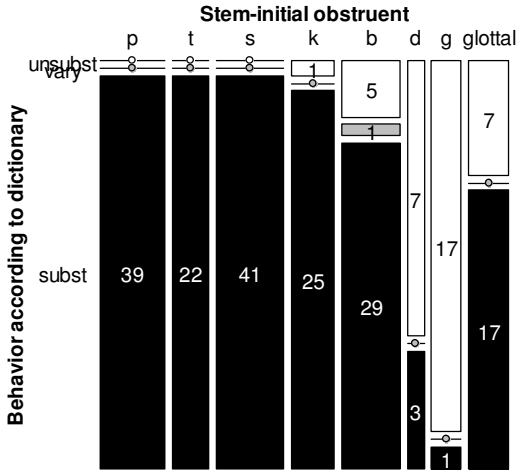


Figure 3: Rates of substitution for *maŋ-RED-* construction [professional or habitual nouns (*bátas* 'law', *mam-ba-batás* 'legislator')]

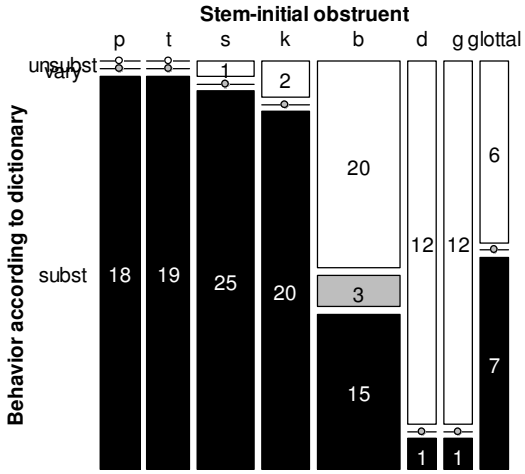


Figure 4: Rates of substitution for *maŋ-* (adversative) construction

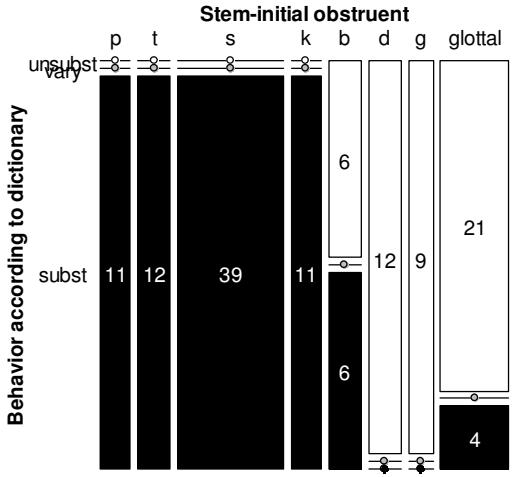


Figure 5: Rates of substitution for *maŋ-* (other verbs) construction

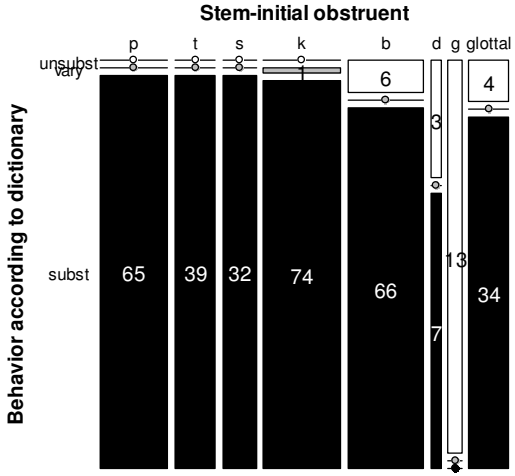


Figure 6: Rates of substitution for *paŋ-* (noun) construction [instrumentals, gerunds, and other nominalizations (*gúgol* 'expense', *paŋ-gúgol* 'spending money')]

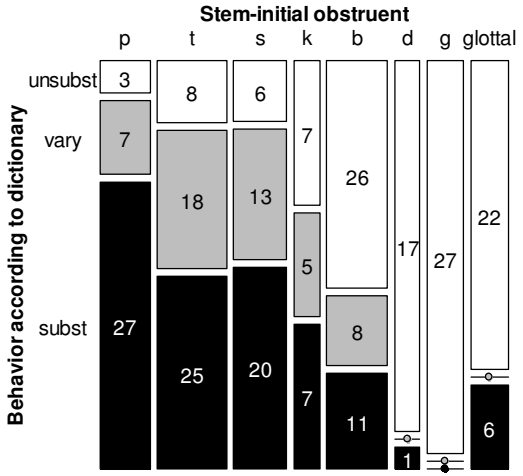
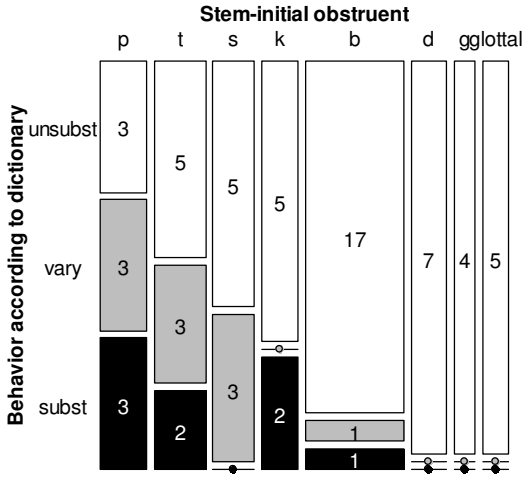


Figure 7: Rates of substitution for *paŋ-* (reservative) construction

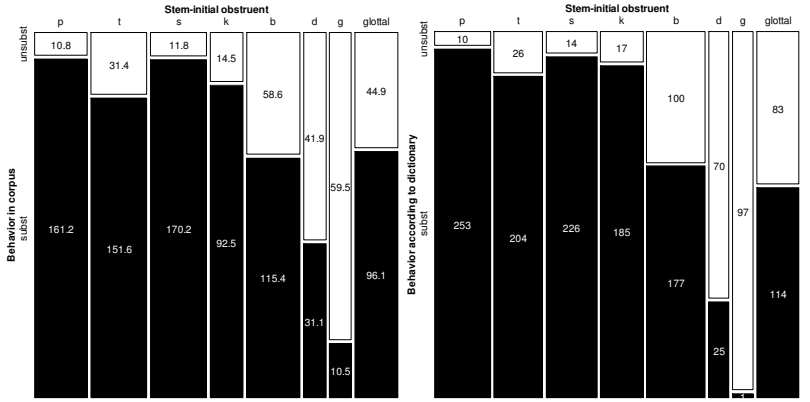


2. Reasons to take these patterns seriously

(8) Confirmation of dictionary data by written corpus

- Web derived, using software written by Ivan Tam and a seed corpus generously supplied by Rosie Jones (derived from Ghani, Jones and Mladenić 2004); see Zuraw 2006 for details.
- Out of 1,715 dictionary words probed in the corpus, 1,107 were attested in at least one variant, for a total of 195,513 tokens.
- Plot on left shows token-weighted type frequencies.

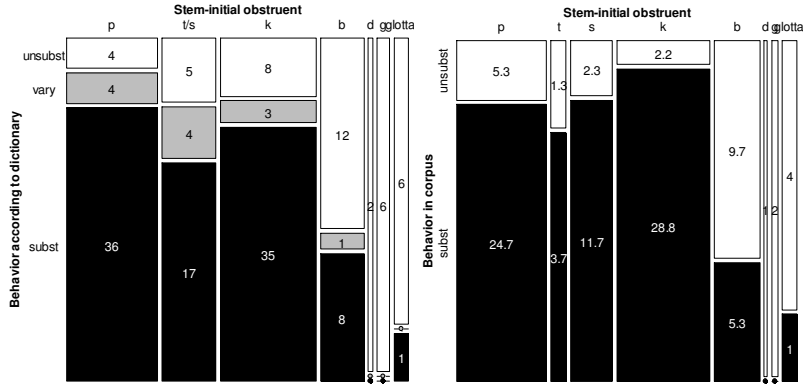
Figure 8: Rates of nasal substitution in corpus vs. dictionary, native words only



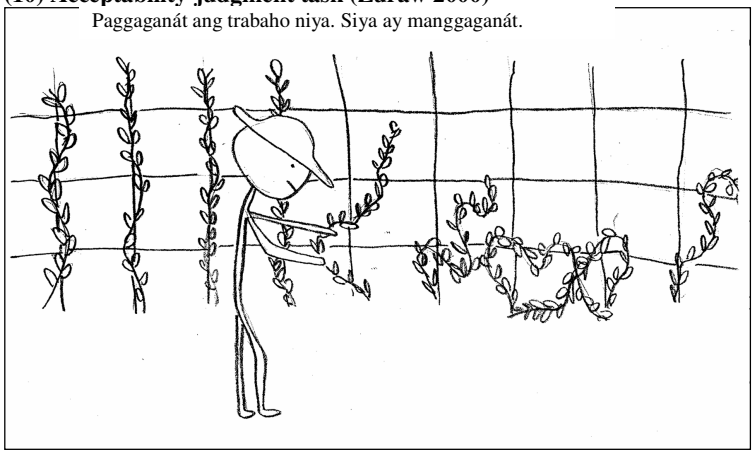
(9) Pattern is extended onto loans

- Tagalog in contact with Spanish from about mid-1500s to early 1900s (and with English since then)
- Loans from Spanish very well integrated, often not recognized as loans.
- A decent number enter into nasal-substituting constructions.
- Voicing effect clearly perpetuated; place effect less clear, but *b* seems to have higher rates than *d/g* (which are rare, at least in these constructions, for some reason).

Figure 9: Substitution rates for Spanish stems, all affixal patterns combined

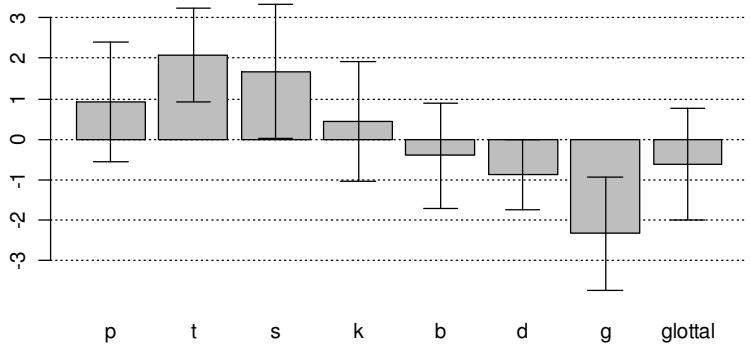


(10) Acceptability-judgment task (Zuraw 2000)



- Participant rates from 1 to 10; sees both substituted and unsubstituted version of each stem.

Figure 10: Acceptability judgments: substituted – non-substituted; error bars indicate 95% confidence interval



- Positive numbers (voiceless): substituted version rated higher
- Negative numbers (voiced): unsubstituted version rated higher
- Except for *p*, consistent with place effect

(11) Binary choice task

- Participants recruited over web
- Each participant sees a different set of items, to avoid item-specific distortions

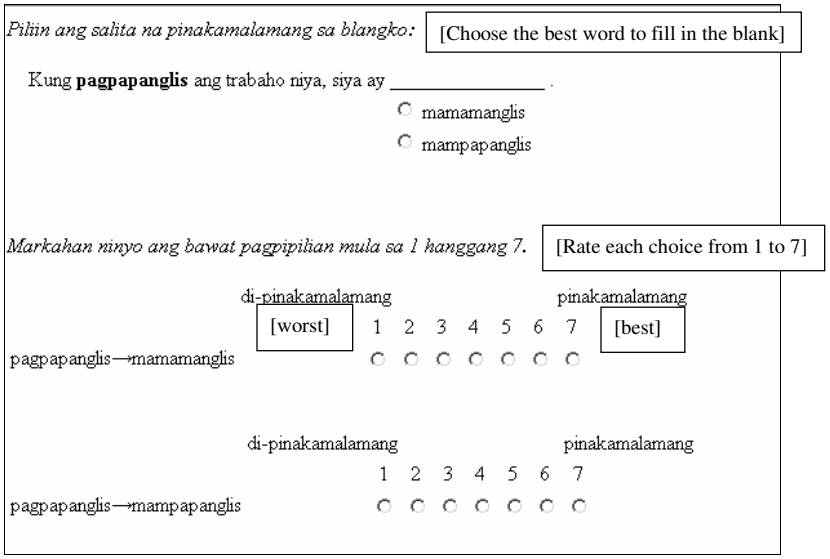
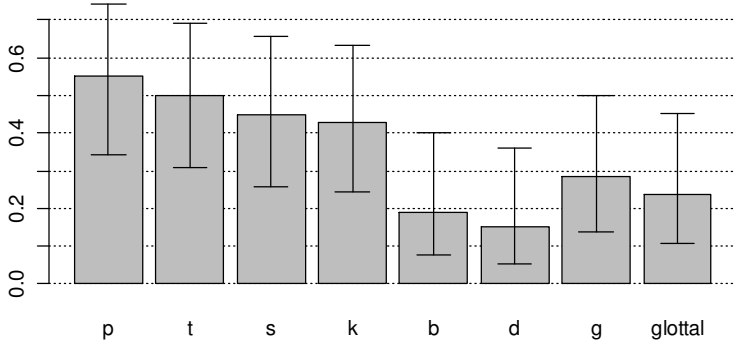


Figure 11: Rates at which subjects selected nasal-substituted option in web survey; error bars indicate 95% confidence intervals.[3]



- Voicing effect robust
- Suggestive place differences, except surprising results for *g*—possible visual confusion between <ng>=[ŋ] and <ngg>=[ŋg].

3. Lexical idiosyncrasy

Several ways in which words that take *paŋ-* and *maŋ-* prefixes can be idiosyncratic, suggesting that the lexical entry must be consulted to determine behavior.

[3] Using the *binconf()* function of the *Hmisc* package of R (Harrell 2008), default Wilson method.

(12) Variation seen above

- Despite the lexical trends, it's not completely predictable which words will undergo substitution (especially among *b*- and *d*-initial stems)

=> At least the words that buck the trend for their segment and morpheme must be listed as exceptions.

(13) Idiosyncrasy is whole-word

Substitution isn't even consistent among derivatives of the same stem:

prefixes	*nas. sub.?*	*(freq. no ; freq. yes)*		
			búhaj	'life'
paŋ-	no	(10 ; 0)	pam-**b**úhaj	'vivifying'
maŋ-	yes	(0 ; 652)	ma-**m**úhaj	'to live'
paŋ-RED-	yes	(1; 1975)	pa-**m**u-**m**úhaj	'manner of living'
			batás	'law'
paŋ-	no	(30 ; 0)	pam-**b**atás	'legal'
paŋ- -an	yes	(1 ; 47)	pa-**m**àtás-an	'legislative'
maŋ-RED-	no	(766 ; 0)	mam-**b**a-**b**atás, mam-**b**a-**b**átas	'legislator'

=> It doesn't suffice to access the stem's lexical entry. We (at least sometimes) need the whole word's entry, or at least need to know which stem *and* which affix are being used.

Walther and Wiese (1999) suggest that each stem and each prefix get a diacritic: if both are [+substitute], substitution occurs; otherwise no.

- But we'd still have to list some exceptional combinations. E.g., if *paŋ-* is [-substitute], the 3 cases where substitution does occur with *paŋ-* must be listed as exceptions; if *paŋ-* is [+substitute], cases like *pam-búhaj* are exceptions.

(14) Semantic idiosyncrasy

Semantic connection is typically apparent, but exact meanings can be unpredictable.

ʔabáŋ	'watcher'	ma-ŋabáŋ	'to wait near people who are eating, hoping to get food'
babáʔe	'woman'	mam-babáʔe	'to have a mistress'
siʔíl	'oppressed by ruler'	ma-niʔíl	'to strangle to death'
ʔibábaw	'surface'	paŋ-ʔibábaw	'veneer'
kíta	'visible'	pà-ŋitáʔ-in, pà-ŋitaʔ-ín	'apparition, omen'
túbig	'water'	ma-nubíg	'to urinate'
balík	'return'	pa-malík	'hand rudder'
gánùʃo	'hook'	maŋ-ga-gánùʃo	'con man'

=> Lexicon must sometimes specify the meaning of a potentially nasal-substituted word

(15) Idiosyncratic stress/length shifts

More often for substituted, but occurs for unsubstituted too.

		maŋ-RED- with stress shift	
tahíʔ	'sewing'	mà-na-náhiʔ	'seamstress'
		maŋ-RED- without stress shift	
puná	'remark'	mà-mu-muná	'critic'
ʔáwit	'song'	maŋ-ʔa-ʔáwit	'singer'
		maŋ- with stress shift	
túbig	'water'	ma-nubíg	'to urinate'
		maŋ- without stress shift	
kíkil	'carpenter's file'	ma-ŋíkil	'to chisel; to ask for money'
		paŋ- with stress shift	
sípit	'claws'	pan-sipít	'(type of) rat-trap'
		paŋ- without stress shift	
túkoj	'mention'	pan-túkoj	'article [grammar]'

=> Need to know what both stem and affix are in order to determine stress.[4]

(16) Three-way distinction

- words that are lexicalized as undergoing nasal substitution *mà-ma-mahála?* 'responsibility' (< *bahála?* 'manager')
- words lexicalized as not undergoing nasal substitution *mam-ba-básа* 'reader' (< *básа* 'reading')
  [*b*-initial stems in the *maŋ-RED-* construction; both are frequent in the corpus and consistent in their behavior there).
- words not yet having a lexicalized behavior, such as these presumably nonce or recent coinages, sampled from the *maŋ-* construction.

spelled form	*frequency*	*presumed English source*
mangkonjugation	1	conjugation
mam-bird-repel	1	bird-repel
mamblog	11	blog
man-takeover	1	takeover
ma-mrospect	1	prospect
mangareer	5	career (<ng> = [ŋ])

[4] Why do certain words (and not others) have idiosyncratic properties? The answers are presumably different from the diachronic point of view and from the point of view of the learner who must replicate the ambient pronunciations and meanings. Hay (2003) discusses a two-way relationship between lexical representation/access and idiosyncrasy: lexical idiosyncrasy can cause learners to treat the affected words more as wholes than as morphologically composed; conversely, if some other factor causes learners to treat certain words as wholes, then those words have a better chance of developing idiosyncrasies over time.

4. Why I thought this was worth talking about here

(17) If variation in substitution vs. not is driven by variation in the syntactic derivation...

- Can words be idiosyncratically marked for which syntactic derivation they take?? (seems strange since this information would be needed before lexical insertion, right?)
- It makes sense that different morphology would be associated with different rates of each derivation type (I think?), but does it make sense that different obstruents would be associated with different rates of each syntactic derivation?

If the variation is just encoded in lexical entries, with some words requiring nasal substitution and others forbidding it...

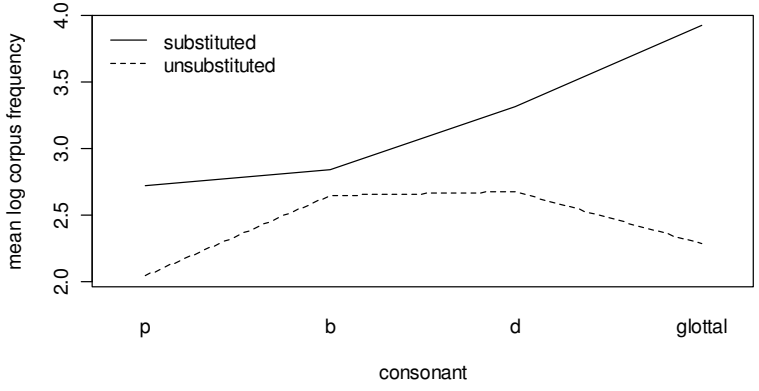
- How do we enforce a lexical nasal-substitution requirement if the spell-out-before-raising option is taken?

5. Nasal substitution and boundary strength

(18) Nasal substitution seems to be negatively correlated with degree to which a word is transparently prefixed

- Meaning: I haven't conducted a systematic study of semantic opacity, we can see some trends in the morpheme-by-morpheme breakdown above.
  - Lowest rates of substitution found in noun-forming *paŋ-* (often transparent) and reservative-adjective-forming *paŋ-* (almost always transparent).
  - Highest rates of substitution found in miscellaneous-verb-forming *maŋ-* construction (semantics very unpredictable) and nominalizing *paŋ-RED-*, (transparency varies).
- Frequency: Seems plausible that higher-frequency words are more likely to be treated by speakers as whole units rather than as prefix-stem combinations (see e.g. Hay 2003).
  - Nasal-substituted words have higher frequency on average. Figure 12 shows the four consonants that had at least 20 words in each of the two categories (substituted and not).

Figure 12: Corpus frequencies for substituted and unsubstituted words



(19) What do you guys think about semantic transparency/frequency vs. derivation type?

Is spell-out-before-raising more consistent with a transparent, compositional treatment?

6. Analysis/model [we can skip this part]

(20) Representations and constraints

I'll spare you the details—and am not that committed to these specific constraints anyway—but here are the key points in case you're curious.

- Prefix is treated as having a floating nasal feature /ma[+nas]/
- There is conflict between a constraint against inserting a segment to support the feature, and one against docking the floating feature to the initial segment of them stem, since it's a different morpheme (*ASSOCIATE$_{\text{hetero-morphemic}}$).

	/p$_1$a$_2$[+nas]$_3$/+/b$_4$i$_5$g$_6$a$_7$j$_8$/	MAX(+nas)	DEP-C	*ASSOCIATE$_{\text{hetero-morphemic}}$
☞ *a*	pa-m$_4$igaj | [+nas]$_3$			*
b	pam$_9$-b$_4$igaj | [+nas]$_3$		*!	
c	pa-b$_4$igaj	*!		

- A constraint MORPHEMECOHESION bans coalescence across a "big" morpheme boundary (shown as # below, though not literally Chomsky & Halle's #). Could also think in terms of derivational levels—or phases?

	/pa[+nas]$_3$/ # /p$_4$ulítika/	MORPHEME COHESION	MAX(+nas)	DEP-C	*ASSOCIATE
a	pa # m$_4$ulítika | [+nas]$_3$	*!			*
☞ *b*	pam$_{12}$ # p$_4$ulítika | [+nas]$_3$			*	
c	pa # p$_4$ulítika		*!		

- Phonetically motivated constraint against non-substitution on voiceless obstruents (Pater's *NÇ$_{\text{ɔ}}$).
- Phonetically motivated constraints against creating stem-initial nasals (through substitution): *[ŋ (or fronter) > > *[n (or fronter) >> *[m

(21) Model of variation

This is the bulk of the paper. Again I'll spare you the details, but here are the key points in case curious.

- Whole words can have lexical entries; high-ranked faithfulness constraints enforce the substitution behavior encoded in them.
- If a word is a new coinage, these faithfulness constraints are irrelevant, and lower, variably-ranked constraints determine the outcome.
- Boersma's Gradual Learning Algorithm (1997, 1998), when trained on the lexicon, is able to learn the rankings of the "subterranean" constraints before the

faithfulness constraints climb to the top and cause (error-driven) learning to cease. [This works even if the constraint set is symmetrical, e.g. including both the constraint for the voicing effect and its opposite.]

7. Cross-linguistic data

- See Newman (1984) for a survey that points out the typological trends below (and has other interesting nuggets), and Blust (2004) for a bigger survey that replicates Newman's findings, with the exception of Kapampangan (see below).
- Depending on the pattern's starting point, nasal substitution has either retreated from less susceptible segments in some daughter languages, spread to more susceptible segments in some daughter languages, or some of each.
- Whatever the case, we'll see that there seems to be great cross-linguistic consistency in what stem-initial consonants are more or less susceptible.
- Suggests that the voicing and place effects shape the diachronic development of a language's lexicon.[5]

(22) Simple factorial typology (ignoring possibility of variation)

		substituted?						
	languages	p	t	k	b	d	g	*sample ranking*
a	Da'a, Wolio, Bugis	–	–	–	–	–	–	*[ŋ, *[n, *[m, *ASSOC >> DEP-C, *NC̥
b	similar to Balantak	+	–	–	–	–	–	*[ŋ, *[n >> *NC̥ >> *ASSOC, *[m >> DEP-C
c	?	+	–	–	+	–	–	*[ŋ, *[n >> *NC̥, DEP-C >> *ASSOC, *[m
d	similar to Yami	+	+	–	–	–	–	*[ŋ >> *NC̥ >> *[n, *[m, * ASSOC >> DEP-C
e	sim. to Toba Batak	+	+	–	+	–	–	*[ŋ >> *NC̥ >> *[n >> DEP-C >> * ASSOC, *[m
f	?	+	+	–	+	+	–	*[ŋ >> *NC̥, DEP-C >> *[n, *[m, * ASSOC
g	Malay/Indonesian & others	+	+	+	–	–	–	*NC̥ >> *[ŋ, *[n, *[m, * ASSOC >> DEP-C
h	Sama-Badjau, Dibabawon Manobo	+	+	+	+	–	–	*NC̥ >> *[ŋ, *[n >> DEP-C >> *[m, * ASSOC
i	Cebuano, Isnag, Sarangani Manobo	+	+	+	+	+	–	*NC̥ >> *[ŋ >> DEP-C >> *[n, *[m, * ASSOC
j	Kalinga	+	+	+	+	+	+	*NC̥ or DEP-C >> *[ŋ, *[n, *[m, * ASSOC

(notation adapted from Newman 1984: 10)

[5] Malay/Indonesian presents one of the few cases where change can be observed in the written record. Currently, Malay/Indonesian has a system in which nasal substitution applies to all the voiceless obstruents and none of the voiced (Lapoliwa 1981; though see Delilkan 2002 for prosodic and morphological complications). But, as Newman (1984) points out, Brakel (1973) claims that substitution can be found on voiced obstruents in 16th and 17th-century Malay manuscripts, with some such words "maintain[ing] themselves as archaic forms till well into the 19th C." (Brakel: 4). It is not clear from Brakel's discussion whether substitution was the norm on (at least some) voiced obstruents in these manuscripts, but we can at least say that the lexicon of Malay has been reshaped over the last few hundred years to reflect a different grammar of nasal substitution.

(23) Some details (language-family designations from Gordon 2005)

- Da'a (Sulawesi, Barr 1995) and Wolio (Sulawesi, Anceaux and Grimes 1995): descendants of nasal-substituting prefixes induce prenasalization, not substitution
- Bugis (Sulawesi; Abas and Grimes 1995): gemination (/maŋ-tunu/ → [mattunu] 'burn s.th., bake s.th.') instead of nasal substitution.
- If we accept Ross's (1988) evidence that "[c]ases of nasal substitution are preserved sporadically in Oceanic languages" (p. 41), then nasal substitution has also died out in the entire Central/Eastern Malayo-Polynesian branch of Malayo-Polynesian (rather than being an innovation confined to Western Malayo-Polynesian).
- Balantak (Sulawesi; Busenitz and Busenitz 1991, Busenitz 1994): nasal substitution applies to *p*-initial stems, unless the next syllable also begins with *p* (Busenitz 1994: 3).
- Yami (Northern Philippine; West 1995) almost exemplifies pattern (d): it distinguishes *p*, *t* from the rest, but the difference is that *p*, *t* are reported to undergo nasal substitution uniformly, and the other stops vary.
- Indonesian/Malay (Sundic; Lapoliwa 1981)
- Sama-Bajau (Sama-Bajaw; Verheijen 1986)
- Dibabawon Manobo (S. Philippine; Forster 1970).
- Cebuano (Meso-Philippine; Wolff 1962): Van Odijk 1959, a description aimed at missionaries, appears to claim that application of nasal substitution is variable in Cebuano, but the passage (p. 44) is difficult to interpret because Odijk appears to be describing the distribution of the prefixes *maŋ-/naŋ-/paŋ-* vs. *mag-/nag-/pag-* rather than the distribution of nasal substitution vs. non-substitution.
- Isnag (N. Philippine; Vanoverbergh 1972): very few *g*-initial stems in Vanoverbergh's (1972) dictionary, and none takes a relevant prefix. Word-initial *g* of other Philippine languages seems to correspond to Isnag orthographic <x>, ([h] in some dialects and [ɣ] in others). When this consonant takes *maŋ-* or *paŋ-*, it behaves as a non-substituted *g*: <xabí> 'night', <ma[ŋ]-gabí> 'to abstain from rice and taro while in mourning' (p. 245), with one exception, <ma[ŋ]-xakkí> 'to have one's skin open piecemeal' (p. 248).
- Limos Kalinga (N. Philippine; Ferreirinho 1993)
- Ginaang Kalinga (N. Philippine; Gieser 1970)
- Sarangani Manobo (S. Philippine; DuBois n.d.)

(24) Cases with variation

- "~" = variation reported
- "+~" = variation reported but with preference for substitution
- "–~" = variation reported but with preference for non-substitution

	p	t	k	b	d	ɖ	g	*sample ranking*
Yami	+	+	~	~		~	~	*NC̥ > *[ŋ ~ DEP-C > *ASSOC >> *[n ~ *[m
Sasak	+	+	+~	~	–		–	*NC̥ > *[ŋ >> *[n >> *[m ~ DEP-C >> *ASSOC
T. Batak	+	+~	–	–~	–		–	*[ŋ >> *NC̥ > *[n >> *[m > DEP-C >> *ASSOC
K. Batak N^2-	+	–~	–~	–~	–		–	*[ŋ ~ *[n > *NC̥ >> *[m > DEP-C >> *ASSOC
K. Batak N^1-	+	+	~	+~	–		–	*NC̥ ~ *[ŋ >> *[n >> DEP-C > *[m >> *ASSOC
K. Batak $N^{3/5}$-	+	+	+	–	–		–	*NC̥ >> *[ŋ ~ *[n ~ *[m ~ *ASSOC >> DEP-C
Palawan	+	+	+	~	–		–	*NC̥ >> *[ŋ ~ *[n >>*[m ~ DEP-C >> *ASSOC
Kapampangan	+	+	+	+	–~		+~	*NC̥ >> *[ŋ ~ *[n ~ DEP-C >> *[m ~ *ASSOC

(25) Details

- Toba Batak (Sundic; Nababan 1981, Percival 1981, Van der Tuuk 1867/1971): reported that *p* always substitutes, *t* (and *s*) usually do, *b* usually doesn't, and *d* and *g* never do.
- Karo Batak (Sundic): Woollams (1996) reports that nasal substitution **applies differently with three different prefixes**
  - N^1- marks active voice
  - N^2- forms intransitive verbs
  - $N^{3/5}$- forms certain adjectives.
- Sasak (Bali-Sasak, Goris 1938)
- Palawan (Meso-Philippine language, Revel 1995)
- Kapampangan (N. Philippine language, Forman 1971a, 1971b; del Corro 1980): looking at Forman's (1971b) dictionary, both *d* and *g* vary, but with *d* non-substitution is more common, while with *g* substitution is more common. See Kaufman (2005) for a treatment of this case in terms on contrast preservation.

In all the languages included in Tryon (1995), the languages surveyed by Newman (1984) and by Blust (2004), and others whose descriptions I have encountered, Kapampangan is the only clear exception to Newman's implicational generalizations about voicing and place.

(26) Additional phonological regularities in Newman and Blust

- special treatment for pseudo-reduplicated stems
- special treatment for monosyllabic stems
- special treatment for stems that contain a nasal+obstruent sequence.
- Also Nomoto (2009), intriguing example from Malay: stem-initial *t͡ʃ* shows variation between substitution and not (*mən-t͡ʃinta* ~ *mə-ɲinta* 'to love', from *t͡ʃinta*). Nomoto uses web data to show that substitution is much more frequent when the stem contains a nasal+obstruent cluster than when it does not.

=> Phonological regulation of the distribution of nasal substitution in the lexicon is cross-linguistically common. Even if these factors now have categorical effects, these languages **must have gone through stages in which what are now regularities were merely tendencies**.

E.g. to get from Malay [variable and limited effect of nasal+obstruent cluster within stem] to Timugon Murut (Prentice 1971) [non-substitution is forbidden if the stem contains a nasal+obstruent sequence—the prefix nasal must either substitute or delete], probabilistic phonological effects on nasal substitution must not be a mere artifact of the lexicon, but must be learned and able to shape the treatment of new and even existing words.

=> Supports idea that lexical regularities can become encoded in the grammar.

==> More important for today's purposes, whatever problems are raised by variation in Tagalog probably are widespread (or have been).

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