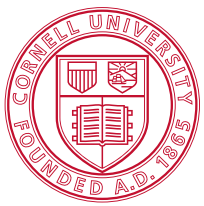
Contrast emergence, preservation, and loss:

A case study of Initial Geminates

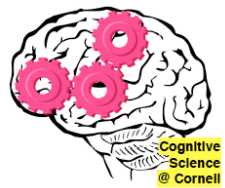
Francesco Burroni & Sireemas Maspong

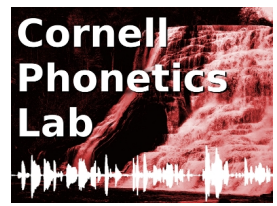
Department of Linguistics & Cognitive Science Program
Cornell University

ICHL 24th, July, 3rd



Cornell University

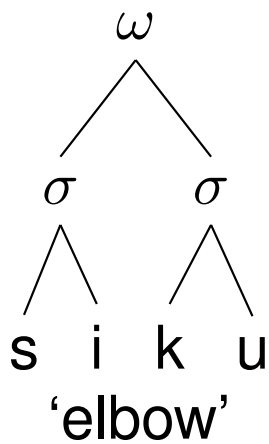




Introduction

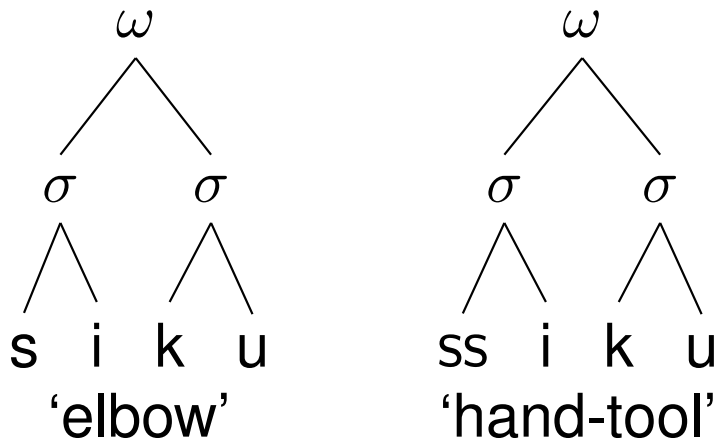
Pattani Malay

Malayic, Austronesian



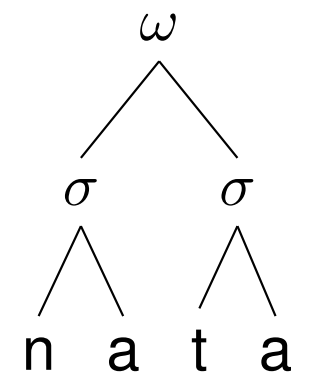
Pattani Malay

Malayic, Austronesian



Salentino

Romance, Indo-European



Salentino

Romance, Indo-European

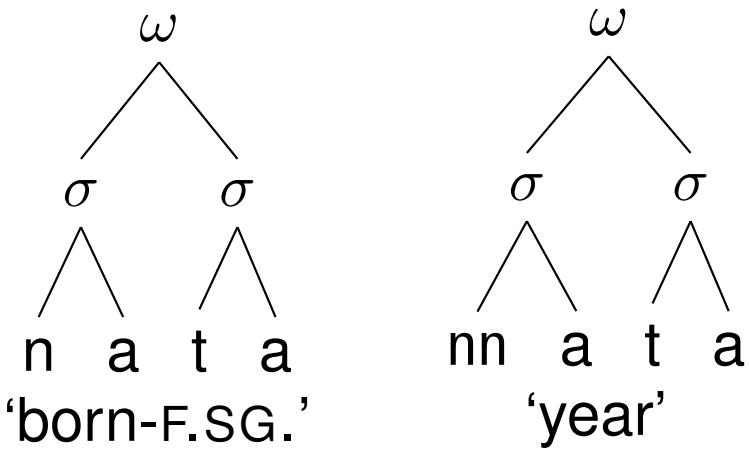


Figure 1: Typological distribution of IGs

We focus on two claims involving IGs

We focus on two claims involving IGs

1. Moraic Status of IGs (e.g. Topintzi and Davis 2017)

We focus on two claims involving IGs

1. Moraic Status of IGs (e.g. Topintzi and Davis 2017)

2. Phonetic Instability (e.g. Blevins 2004)

Moraic status of IGs is problematic because...

Moraic status of IGs is problematic because...

- Onsets effects on weight are probabilistic (e.g. Ryan 2014)

Moraic status of IGs is problematic because...

- Onsets effects on weight are probabilistic (e.g. Ryan 2014)
- IGs, however, have categorical effects on weight computation, but only in some languages

Moraic status of IGs is problematic because...

- Onsets effects on weight are probabilistic (e.g. Ryan 2014)
- IGs, however, have categorical effects on weight computation, but only in some languages
- Why are IGs moraic in some languages but non-moraic in others?

Moraic status of IGs is problematic because...

- Onsets effects on weight are probabilistic (e.g. Ryan 2014)
- IGs, however, have categorical effects on weight computation, but only in some languages
- Why are IGs moraic in some languages but non-moraic in others?
- Is this a language-specific property? How do we model it in either moraic (Topintzi, 2008) or gestural terms (Shaw, 2006)?

Phonetic instability of IGs is problematic because...

Phonetic instability of IGs is problematic because...

- IGs assumed to be rare because prone to Hyper- (transphonologization) or Hypo-articulation (degemination) (Blevins, 2004)

Phonetic instability of IGs is problematic because...

- IGs assumed to be rare because prone to Hyper- (transphonologization) or Hypo-articulation (degemination) (Blevins, 2004)

- There are languages where IGs are “stable” (Bertinetto and Loporcaro, 1999) in both synchronic and diachronic terms

Phonetic instability of IGs is problematic because...

- IGs assumed to be rare because prone to Hyper- (transphonologization) or Hypo-articulation (degemination) (Blevins, 2004)
- There are languages where IGs are “stable” (Bertinetto and Loporcaro, 1999) in both synchronic and diachronic terms
- How are stable and unstable initial geminates different?

Our take on these problems

Our take on these problems

- Derive synchronic properties of IGs from their diachrony *a lá* Evolutionary Phonology

Our take on these problems

- Derive synchronic properties of IGs from their diachrony *a lá* Evolutionary Phonology

- Acoustic study of two languages that can represent stable and unstable IGs (preliminary)

Diachrony and the Moraic Status of IGs

One caveat

One caveat

- In 28/44 (64%) languages of our database the moraic status of IGs cannot be determined

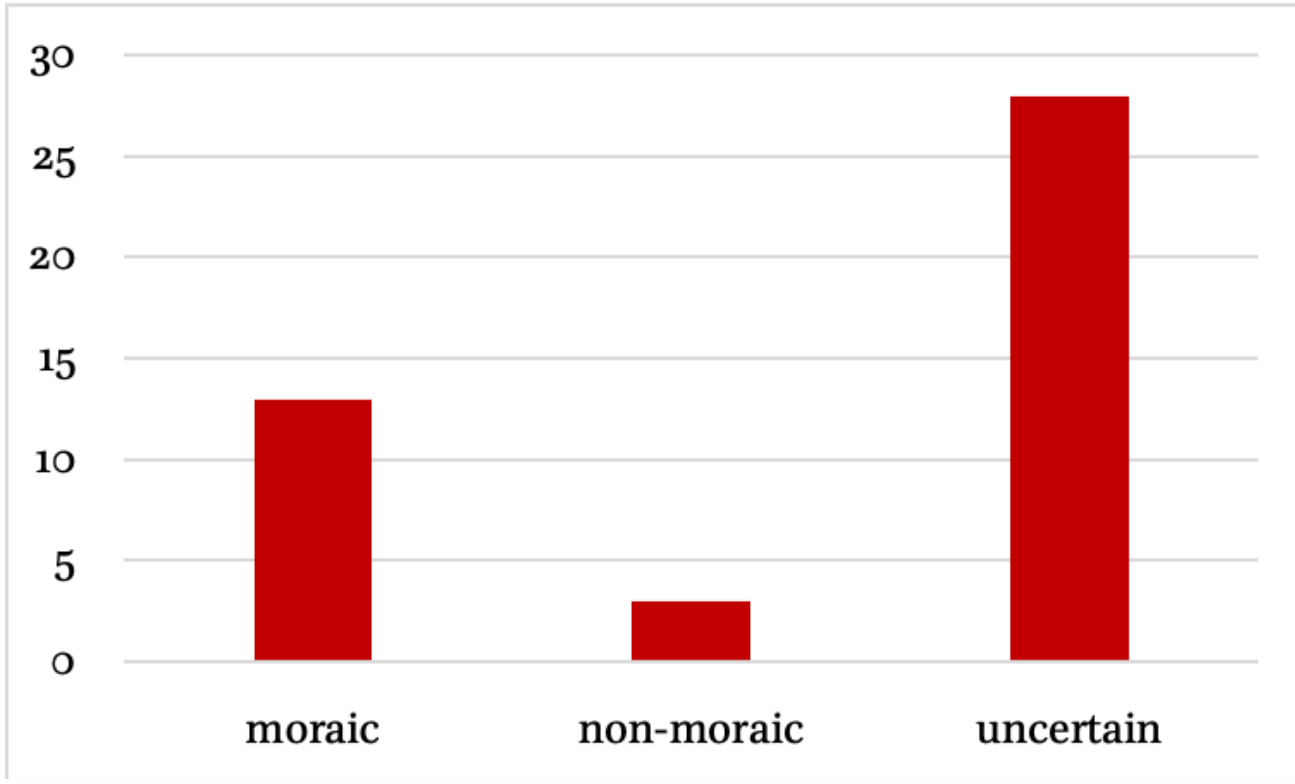


Figure 2: Frequency of (non-)moraic IGs in the database

This is because

This is because

- Lack of phonological processes sensitive to moraic structure

This is because

- Lack of phonological processes sensitive to moraic structure
- Lack of phonetic data

This is because

- Lack of phonological processes sensitive to moraic structure
- Lack of phonetic data
- No consensus on the phonetic correlates of moraic structure (acoustic e.g. Cohn 2003, Gordon et al. 2008, articulatory, e.g. Nam 2007, Tilsen 2016, *etc.*)

Moraic status of IGs seems to correlate with language family

Moraic status of IGs seems to correlate with language family

Family	Moraic IGs	Non-Moraic IGs
Austronesian	Trukese Ponapean Pattani Malay Piro	Leti
Indo-European		Thurgovian Swiss German
Afro-Asiatic		Tashlhiyt Berber
Semitic		Arabic (Moroccan, Levantine, Gulf)
Japonic	Okinawan (Tedumuni, Shuri, Antoh) Hatoma Ikema Ryukyuan	
Niger-Congo	LuGanda	

In our database we noted two generalizations

In our database we noted two generalizations

1. **Non-moraic IGs** continue initial non-moraic elements

In our database we noted two generalizations

1. **Non-moraic IGs** continue initial non-moraic elements
2. **Moraic IGs** continue initial moraic elements

Non-moraic IGs (1): reinterpreted voicing contrast

Non-moraic IGs (1): reinterpreted voicing contrast

1. **Thurgovian Swiss German** IGs continue voiceless stops in loanwords and they are not moraic (Kraehenmann, 2001).

/ppaaʀ/	‘pair’	*cf.* Fr. [pɛʁ]
/ttuʀttə/	‘layered cake’	*cf.* Fr. [tuʁt]
/kkomfi/	‘confiture’	*cf.* Fr. [kɔ̃fi]

Non-moraic IGs (1): reinterpreted voicing contrast

1. **Thurgovian Swiss German** IGs continue voiceless stops in loanwords and they are not moraic (Kraehenmann, 2001).

/ppaaʀ/	‘pair’	*cf.* Fr. [pɛʁ]
/ttuʀttə/	‘layered cake’	*cf.* Fr. [tuʁt]
/kkomfi/	‘confiture’	*cf.* Fr. [kɔ̃fi]

UR	**Gloss**	**Pl.**	**Sg.**
/has/	‘hare’	has-e	h aː s
/ttak/	‘day’	ttak-e	tt aː k
/walt/	‘forest’	walt-e	walt
/fɛtt/	‘fat’	fɛtt-e	fɛtt

Non-moraic IGs (2): templatic morphology

Non-moraic IGs (2): templatic morphology

2. **Tashlhiyt Berber**: IGs are the result of templatic morphology and they are not moraic (Ridouane, 2007).

Perfective	**Imperfective**	
krz	kkrz	‘to plough’
xng	xxng	‘to strangle’
zlm	zzlm	‘to peel’

Non-moraic IGs (2): templatic morphology

2. **Tashlhiyt Berber**: IGs are the result of templatic morphology and they are not moraic (Ridouane, 2007).

Perfective	**Imperfective**	
krz	kkrz	‘to plough’
xng	xxng	‘to strangle’
zlm	zzlm	‘to peel’

---

tk̩.ks̩t	‘you took off’
ta.zn̩.k^{w}t̩t	female gazelle’
ttsx̩.xan	‘dip (in sauce)’

Moraic IGs derive from the loss of initial moraic material

Moraic IGs derive from the loss of initial moraic material

1. **Ryukyuan languages** (e.g. Antoh Okinawan) have moraic IGs deriving from the diachronic loss of a syllable (Nitta, 2016)

Standard Jap		*Antoh Okinawan*
kura	‘store house’	fːa
huro	‘portable stove’	fːo
saroi	‘white’	sːoi

Moraic IGs derive from the loss of initial moraic material

1. **Ryukyuan languages** (e.g. Antoh Okinawan) have moraic IGs deriving from the diachronic loss of a syllable (Nitta, 2016)

Standard Jap		*Antoh Okinawan*
kura	'store house'	fːa
huro	'portable stove'	fːo
saroi	'white'	sːoi

There is a ban on *CV word

kusi	'back'
miː	'eye'
fːa	'child'

2. **Luganda**, has moraic IGs resulting from CV(C) prefix deletions (Clements, 1986)

UR	SR	
li-kubo	kkubo	‘path’
li-tabi	ttabi	‘branch’
ku-gula	kugula *or* ggula	‘to buy’
ku-mu-gulila	kumugulila *or* mmugulila	‘to buy for him or her’

- Unaccented words have LH(H)... tonal pattern

mùgó	‘rim of pot’	màtá	‘milk’
mùlímí	‘farmer’	kìmúlí	‘flower’
mùlámúzí	‘judge’	lùpápílá	‘paper’

- Unaccented words have LH(H)... tonal pattern

mùgó	‘rim of pot’	màtá	‘milk’
mùlímí	‘farmer’	kìmúlí	‘flower’
mùlámúzí	‘judge’	lùpápílá	‘paper’

- Unaccented words with IGs have H(H)... tonal pattern, L is “absorbed” on the IG

bbégá	‘back’	*bbègá
ggúlú	‘sky’	*ggùlú
ddágálá	‘medicine’	*ddàgálá

3. **Trukese**'s IGs is also the result of the loss of initial syllable (Davis, 2017)

Proto-Micronesian	*Trukese*
*kakaŋi	kken
*leleki	nnis
*kuku-	kkɯ-

3. **Trukese**'s IGs is also the result of the loss of initial syllable (Davis, 2017)

Proto-Micronesian	*Trukese*
*kakaŋi	kken
*leleki	nnis
*kuku-	kkɯ-

/omosu/	[omos]	'turban shell'
/maa/	[maa]	'behavior'
/ttoo/	[tto]	'clam'

Moraic IGs can be reduced to ...

Moraic IGs can be reduced to ...

- Cases where a vowel/syllable has been lost ...

Moraic IGs can be reduced to ...

- Cases where a vowel/syllable has been lost ...
- and no changes happened

Moraic IGs can be reduced to ...

- Cases where a vowel/syllable has been lost ...
- and no changes happened
- Forms in the lexicon are learned anyway

Moraic IGs can be reduced to ...

- Cases where a vowel/syllable has been lost ...
- and no changes happened
- Forms in the lexicon are learned anyway
- What we need is synchronic evidence of C:V productively manipulated as H syllables

A possible example of such evidence is a Trukese lullaby

A possible example of such evidence is a Trukese lullaby

- Trukese has a lullaby where each of the 5 lines has a fixed number of trochees (6-5-4-4-5) of shape (H) or (LL)

a)	aa	li	kə	li	kə	saan	tei	roo
	(H)	(L	L)	(L	L)	(H)	(H)	(H)
b)	i	se	i	se	iist	taa	roo	
	(L	L)	(L	L)	(H)	(H)	(H)	
c)	ma	ra	ma	ra	kii	Nei		
	(L	L)	(L	L)	(H)	(H)		
d)	ma	ra	ma	ra	kaa	Nei		
	(L	L)	(L	L)	(H)	(H)		
e)	mart	tei	nii	yaa	nii			
	(H)	(H)	(H)	(H)	(H)			

Figure 3: Trukese lullaby derived from names (*Alexander, Isttaro, Marki, Marka*, and *Martenia*) (Shaw, 2007)

- A CVCV word, e.g. *sipa*, fit into the lullaby yields:

sii	sii	sii	sii	paa
H	H	H	H	H

- A CVCV word, e.g. *sipa*, fit into the lullaby yields:

sii	sii	sii	sii	paa
H	H	H	H	H

- A C:VC word, e.g. *ssim*, fit into the lullaby yields:

ssi	ssi	ssi	ssi	iim
H	H	H	H	H

- A CVCV word, e.g. *sipa*, fit into the lullaby yields:

sii	sii	sii	sii	paa
H	H	H	H	H

- A C:VC word, e.g. *ssim*, fit into the lullaby yields:

ssi	ssi	ssi	ssi	iim
H	H	H	H	H

- If this is the scansion, C:V is heavy without further vowel lengthening.

- A CVCV word, e.g. *sipa*, fit into the lullaby yields:

sii	sii	sii	sii	paa
H	H	H	H	H

- A C:VC word, e.g. *ssim*, fit into the lullaby yields:

ssi	ssi	ssi	ssi	iim
H	H	H	H	H

- If this is the scansion, C:V is heavy without further vowel lengthening.

- However, the vowels may be long, but shortened by the following IGs.

- A CVCV word, e.g. *sipa*, fit into the lullaby yields:

sii	sii	sii	sii	paa
H	H	H	H	H

- A C:VC word, e.g. *ssim*, fit into the lullaby yields:

ssi	ssi	ssi	ssi	iim
H	H	H	H	H

- If this is the scansion, C:V is heavy without further vowel lengthening.

- However, the vowels may be long, but shortened by the following IGs.

- More evidence is necessary to assess phonological knowledge of speakers.

Possible counter example: are there non-moraic IGs that go back to moraic material?

Possible counter example: are there non-moraic IGs that go back to moraic material?

- IGs in **Leti** (Austronesian) derived from the loss of the initial syllable/morpheme

Possible counter example: are there non-moraic IGs that go back to moraic material?

- IGs in **Leti** (Austronesian) derived from the loss of the initial syllable/morpheme

- Hume et al. (1997) proposed that IGs in Leti are non-moraic based on secondary stress assignment.

ri.ˈmɔ.ta	kind of turtle
ma.ˈtru.ma	‘master of the house’
kɔk.ˈkɔ.i	‘child’
ˌrɔː.ˈne.nu	‘they eat turtle’
ppu.ˈnar.ta	‘edge of a nest’

Possible counter example: are there non-moraic IGs that go back to moraic material?

- IGs in **Leti** (Austronesian) derived from the loss of the initial syllable/morpheme

- Hume et al. (1997) proposed that IGs in Leti are non-moraic based on secondary stress assignment.

ri.ˈmɔ.ta	kind of turtle
ma.ˈtru.ma	‘master of the house’
kɔk.ˈkɔ.i	‘child’
ˌrɔː.ˈne.nu	‘they eat turtle’
ppu.ˈnar.ta	‘edge of a nest’

- *Contra* Hume et al. (1997), Curtis (2003) points out that secondary stress, and word-minimality, can be reanalyzed in quantity-insensitive terms.

- The Leti situation is not clear

- The Leti situation is not clear
- However, that moraic IGs may become non-moraic is to be expected

- The Leti situation is not clear
- However, that moraic IGs may become non-moraic is to be expected
- IGs would simply be losing their affiliation in the lexicon with CV syllable, becoming C or C-clusters

- The Leti situation is not clear
- However, that moraic IGs may become non-moraic is to be expected
- IGs would simply be losing their affiliation in the lexicon with CV syllable, becoming C or C-clusters
- Their status in the phonology is simply being 'updated'

Putting it all together

Putting it all together

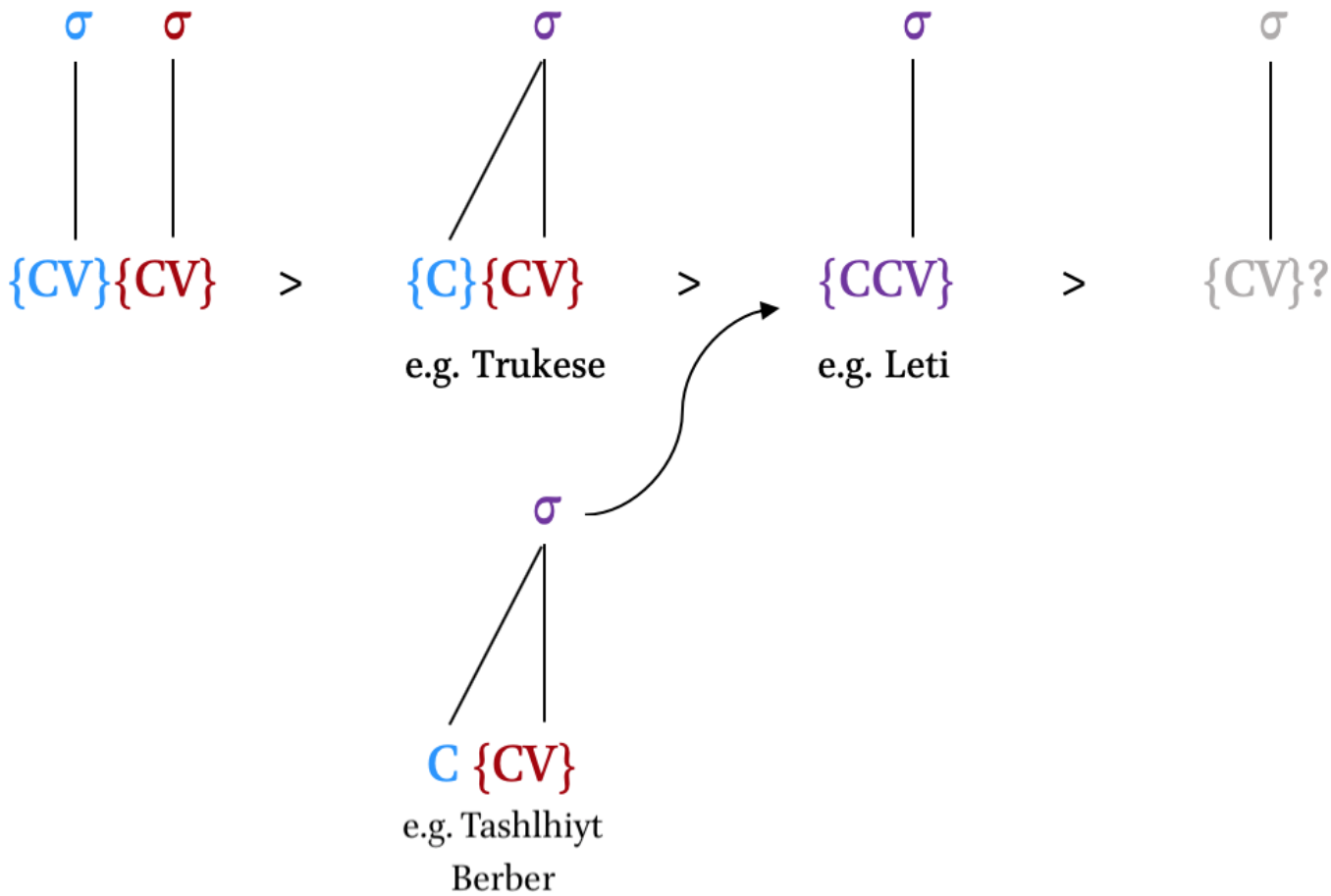


Figure 4: Life cycle of IGs

Take-aways from the phonology

Take-aways from the phonology

- The moraic status of IGs seem to be a diachronic epiphenomenon more than a synchronic reality

Take-aways from the phonology

- The moraic status of IGs seem to be a diachronic epiphenomenon more than a synchronic reality
- Diagnostics for moraic IGs only show that they still pattern in the lexicon as if they had not lost a vowel

Take-aways from the phonology

- The moraic status of IGs seem to be a diachronic epiphenomenon more than a synchronic reality
- Diagnostics for moraic IGs only show that they still pattern in the lexicon as if they had not lost a vowel
- In other words we observe pertinacity of the moraic status

Take-aways from the phonology

- The moraic status of IGs seem to be a diachronic epiphenomenon more than a synchronic reality
- Diagnostics for moraic IGs only show that they still pattern in the lexicon as if they had not lost a vowel
- In other words we observe pertinacity of the moraic status
- One final note: what happens at the end of the life cycle of IGs?

Phonetic Instability of IGs (preliminary)

Are IGs really rare and phonetically ‘unstable’ ?

Are IGs really rare and phonetically ‘unstable’ ?

- According to Blevins (2004), IGs are rare due to their phonetic instability

Are IGs really rare and phonetically ‘unstable’ ?

- According to Blevins (2004), IGs are rare due to their phonetic instability
- But is it true that IGs are doomed to disappear?

Are IGs really rare and phonetically ‘unstable’ ?

- According to Blevins (2004), IGs are rare due to their phonetic instability
- But is it true that IGs are doomed to disappear?
- Are there cases of IGs that are stable synchronically and diachronically?

Salentino and Pattani Malay are examples of languages with ‘stable’ and ‘unstable’ IGs

Salentino and Pattani Malay are examples of languages with ‘stable’ and ‘unstable’ IGs

- **Salentino** is a Romance variety with word-initial and word-medial geminates

Salentino and Pattani Malay are examples of languages with ‘stable’ and ‘unstable’ IGs

- **Salentino** is a Romance variety with word-initial and word-medial geminates
- Salentino’s IGs are ‘stable’ (Bertinetto and Loporcaro 1999) and can be productively created *via Raddoppiamento Sintattico*

Salentino and Pattani Malay are examples of languages with ‘stable’ and ‘unstable’ IGs

- **Salentino** is a Romance variety with word-initial and word-medial geminates
- Salentino’s IGs are ‘stable’ (Bertinetto and Loporcaro 1999) and can be productively created *via Raddoppiamento Sintattico*
- In contrast, **Pattani Malay** only has IGs and no active process creating them

Salentino and Pattani Malay are examples of languages with ‘stable’ and ‘unstable’ IGs

- **Salentino** is a Romance variety with word-initial and word-medial geminates
- Salentino’s IGs are ‘stable’ (Bertinetto and Loporcaro 1999) and can be productively created *via Raddoppiamento Sintattico*
- In contrast, **Pattani Malay** only has IGs and no active process creating them
- Pattani Malay data looks much different from what Abramson (1987) described.

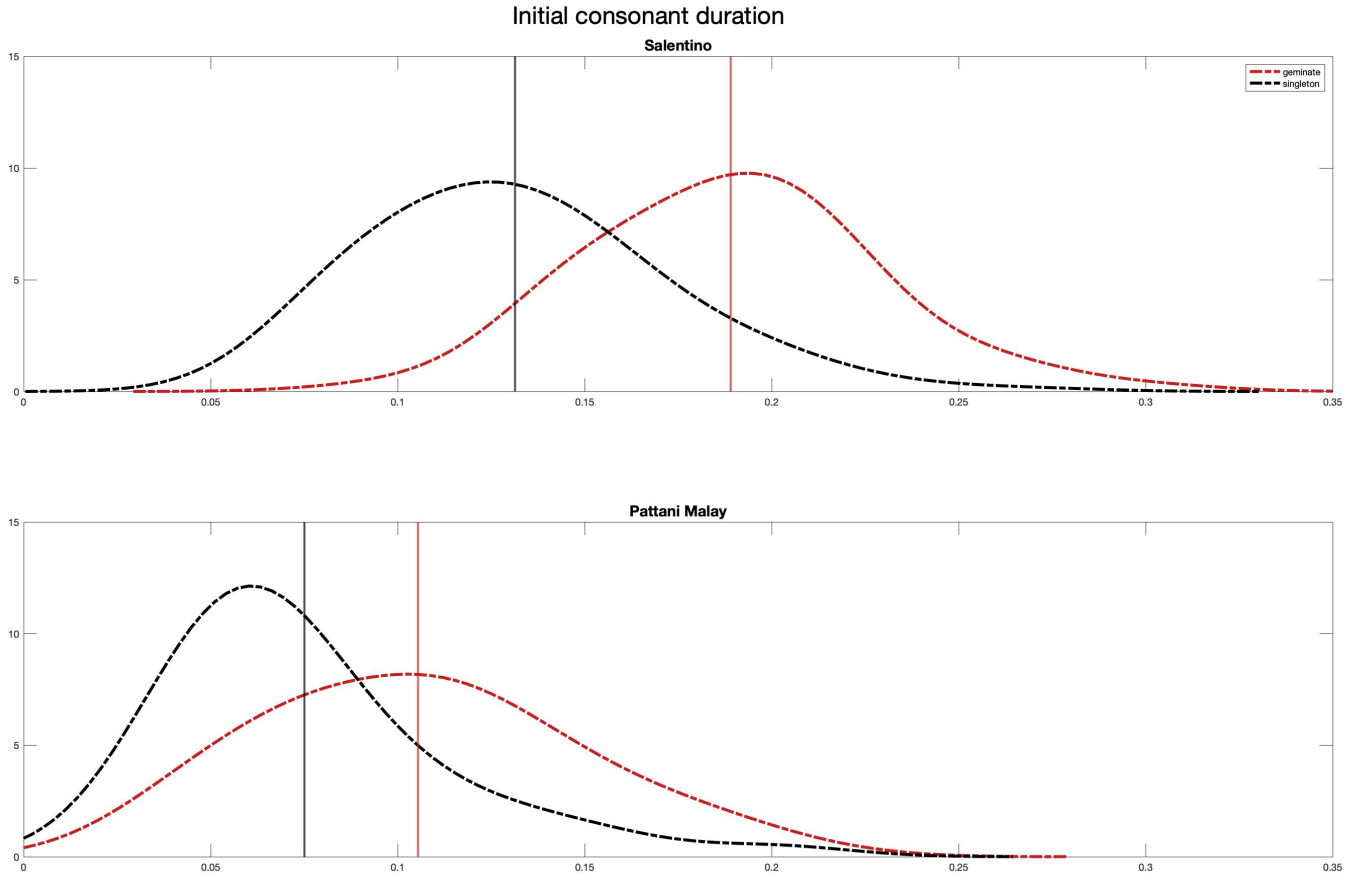


Figure 5: Durational distribution of singletons and geminates in Salentino and Pattani Malay

What does the overlap of geminates and singletons in Malay tell us?

What does the overlap of geminates and singletons in Malay tell us?

- Pattani Malay shows more overlap of singletons and geminates than Salentino

What does the overlap of geminates and singletons in Malay tell us?

- Pattani Malay shows more overlap of singletons and geminates than Salentino
- Contra Abramson (1987) IGs are (no) 3x the singletons in Pattani Malay

What does the overlap of geminates and singletons in Malay tell us?

- Pattani Malay shows more overlap of singletons and geminates than Salentino
- Contra Abramson (1987) IGs are (no) 3x the singletons in Pattani Malay
- The durational differences is not as large (30 msec).

What does the overlap of geminates and singletons in Malay tell us?

- Pattani Malay shows more overlap of singletons and geminates than Salentino
- Contra Abramson (1987) IGs are (no) 3x the singletons in Pattani Malay
- The durational differences is not as large (30 msec).
- This may suggest that closure duration differences are being reduced (and other cues are coming into play Abramson 1986; 1992)

Salentino seems to have stable durational distinction of IGs and singletons

Salentino seems to have stable durational distinction of IGs and singletons

- In Salentino IGs and singletons overlap less than the case in Pattani Malay (80ms)

Salentino seems to have stable durational distinction of IGs and singletons

- In Salentino IGs and singletons overlap less than the case in Pattani Malay (80ms)
- This suggests *synchronic* 'stability' of IGs in Salentino

Salentino seems to have stable durational distinction of IGs and singletons

- In Salentino IGs and singletons overlap less than the case in Pattani Malay (80ms)
- This suggests *synchronic* 'stability' of IGs in Salentino
- Salentino IGs go back a long way (early Romance times) and are still synchronically cued in terms of closure duration

Salentino seems to have stable durational distinction of IGs and singletons

- In Salentino IGs and singletons overlap less than the case in Pattani Malay (80ms)
- This suggests *synchronic* 'stability' of IGs in Salentino
- Salentino IGs go back a long way (early Romance times) and are still synchronically cued in terms of closure duration
- Similar example of diachronically 'stable' IGs can be found in Tashlhiyt Berber, for which IGs can be reconstructed for the proto-language

Morpho-phonology as a stabilizing agent of phonological systems

Morpho-phonology as a stabilizing agent of phonological systems

- A shared feature of Salentino and Tashlhiyt Berber is that the IGs can be derived productively through phono-morphological processes

Morpho-phonology as a stabilizing agent of phonological systems

- A shared feature of Salentino and Tashlhiyt Berber is that the IGs can be derived productively through phono-morphological processes
- These could be one (among many reasons) why a poorly cued phonetic contrast remains stable

Sound change goes beyond phonetics

Sound change goes beyond phonetics

- Sound change cannot be expected to follow from simplistic expectations on perception, for two reasons

Sound change goes beyond phonetics

- Sound change cannot be expected to follow from simplistic expectations on perception, for two reasons
- Phonetic implementation is more multidimensional than phonological representation

Sound change goes beyond phonetics

- Sound change cannot be expected to follow from simplistic expectations on perception, for two reasons
- Phonetic implementation is more multidimensional than phonological representation
- Stability in the phonological system depends not only on phonetics, but also phonological process, phonotactics, morphology *etc.*

Sound change goes beyond phonetics

- Sound change cannot be expected to follow from simplistic expectations on perception, for two reasons
- Phonetic implementation is more multidimensional than phonological representation
- Stability in the phonological system depends not only on phonetics, but also phonological process, phonotactics, morphology *etc.*
- Synchrony and diachrony, i.e. lexical distributions, are both necessary for a more nuanced understanding of IGs and linguistic knowledge at large.

Thank you!

Special Thanks to

- Draga Zec
- Abby Cohn
- Sam Tilsen
- John Whitman
- Pittayawat Pittayaporn
- Pimthip Kochaiyaphum

References I

Abramson, A. (1987). Word-initial consonant length in pattani malay. In *The 11th international Congress of Phonetic Association*, volume 6, pages 68–70.

Abramson, A. (1992). Amplitude as a cue to word-initial consonant length: Pattani malay. In *The 12th International Congress of Phonetic Association*, volume 3, pages 98–101.

Abramson, A. S. (1986). The perception of word-initial consonant length: Pattani malay. *Journal of the International Phonetic Association*, 16:8–16.

Bertinetto, P. M. and Loporcaro, M. (1999). Geminate distintive in posizione iniziale: uno studio percettivo sul dialetto di altamura (bari). *Annali della Scuola Normale Superiore di Pisa. Classe di Lettere e Filosofia*, 4(2):305–322.

Blevins, J. (2004). *Evolutionary phonology: the emergence of sound patterns*. Cambridge University Press, Cambridge.

References II

Clements, G. N. (1986). *Compensatory lengthening and consonant gemination in LuGanda*, page 37–77. Foris, Dordrecht.

Cohn, A. C. (2003). Phonological structure and phonetic duration: The role of the mora. *Working Papers of the Cornell Phonetics Laboratory*, 15:69–100.

Curtis, E. (2003). *Geminate weight: case studies and formal models*. Thesis.

Davis, S. (2017). *Geminates and Weight Manipulating Phonology in Chuukese*, pages 230–259. Oxford University Press, New York.

Gordon, M., Jany, C., Nash, C., and Takara, N. (2008). *Vowel and Consonant Sonority and Coda Weight: A Cross-Linguistic Study*, pages 208–216. Cascadilla Proceedings Project, Somerville, MA.

References III

Hume, E., Muller, J., and van Engelenhoven, A. (1997). Non-moraic geminates in leti. *Phonology*, 14:371–402.

Kennedy, R. (2003). *Confluence in phonology: evidence from Micronesian reduplication*. Thesis.

Kraehenmann, A. (2001). Swiss german stops: Geminates all over the word. *Phonology*, 18(1):109–145.

Muller, J. (2001). *The phonology and phonetics of word-initial geminates*. Thesis.

Nam, H. (2007). Syllable-level intergestural timing model: Split-gesture dynamics focusing on positional asymmetry and moraic structure. *Laboratory phonology*, 9:483–506.

Nitta, T. (2016). On the geminate consonants of the antoh dialect in fukui prefecture. *Journal of the Phonetic Society of Japan*, 20(1):36–46.

References IV

Ridouane, R. (2007). Gemination in tashlhiyt berber: An acoustic and articulatory study. *Journal of the International Phonetic Association*, 37:119–142.

Ryan, K. M. (2014). Onsets contribute to syllable weight: Statistical evidence from stress and meter. *Language*, 90(2):309–341.

Shaw, J. (2006). Deriving initial Geminate Moraicity from Temporal Coordination.

Shaw, J. (2007). Geminate consonants in Mortlockese.

Tilsen, S. (2016). Selection and coordination: The articulatory basis for the emergence of phonological structure. *Journal of Phonetics*, 55:53–77.

Topintzi, N. (2008). On the existence of moraic onsets. *Natural Language and Linguistic Theory*, 26:147–184.

Topintzi, N. and Davis, S. (2017). *On the weight of edge geminates*, pages 260–282. Oxford University Press, New York.

Bonus slides

2. **Luganda**: Unaccented words have an unmarked H tone which spreads leftward, but leaves the initial syllable as a 'buffer'

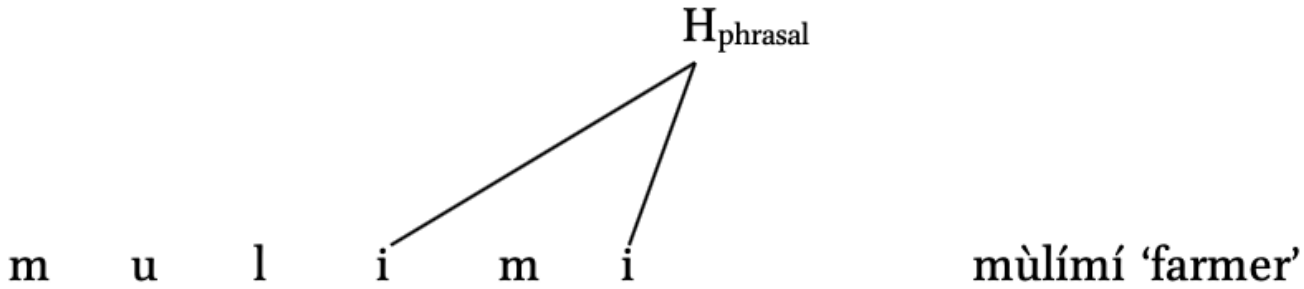


Figure 6: Tonal spreading in unaccented words in Luganda (Muller, 2001)

5. **Ponapean** has a reduplication process that relies on the moraic structure of the stem

   - Monomoraic stems: $\mu\mu$ - L

pa	‘weave’	ppa-pa
dod	‘frequent’	don-dod
tep	‘begin’	tepi-tep

5. **Ponapean** has a reduplication process that relies on the moraic structure of the stem

   - Monomoraic stems: $\mu\mu$ - L

pa	‘weave’	ppa-pa
dod	‘frequent’	don-dod
tep	‘begin’	tepi-tep

   - Bimoraic stems: μ - H

duup	‘dive’	du-duup
pei	‘fight’	pe-pei

5. **Ponapean** has a reduplication process that relies on the moraic structure of the stem

- Monomoraic stems: $\mu\mu$ - L

pa	'weave'	ppa-pa
dod	'frequent'	don-dod
tep	'begin'	tepi-tep

- Bimoraic stems: μ - H

duup	'dive'	du-duup
pei	'fight'	pe-pei

- Stems with two monomoraic syllables: $\mu\mu$ - LL

dune	'attach in a sequence'	dun-dune
siped	'shake out'	sipi-siped

- Stems with IGs pattern with stems with two monomoraic syllables

mmed	‘full’	mmi-mmed
ŋŋar	‘to see’	ŋŋi-ŋŋar
mm^{w}us	‘frequent’	mm^{w}u-mm^{w}us

Figure 7: Moraic representation of words with an IG (Kennedy, 2003)

- Stems with IGs pattern with stems with two monomoraic syllables

mmed	‘full’	mmi-mmed
ŋŋar	‘to see’	ŋŋi-ŋŋar
mm^{w}us	‘frequent’	mm^{w}u-mm^{w}us

Figure 7: Moraic representation of words with an IG (Kennedy, 2003)

- **Diachronically**, IGs in Ponapean also derived from the loss of a syllable. This can explain why they are patterned with disyllabic stems.

5. **Pattani Malay** is claimed to display stress shift (from final) to initial syllables whose onset is geminate.
    - This is not correct, stress remains final.
    - No difference in duration, F0, or intensity in final in CV.**CV** vs CCV.**CV** disyllabic forms (Pittayaporn et al. *in prep*)

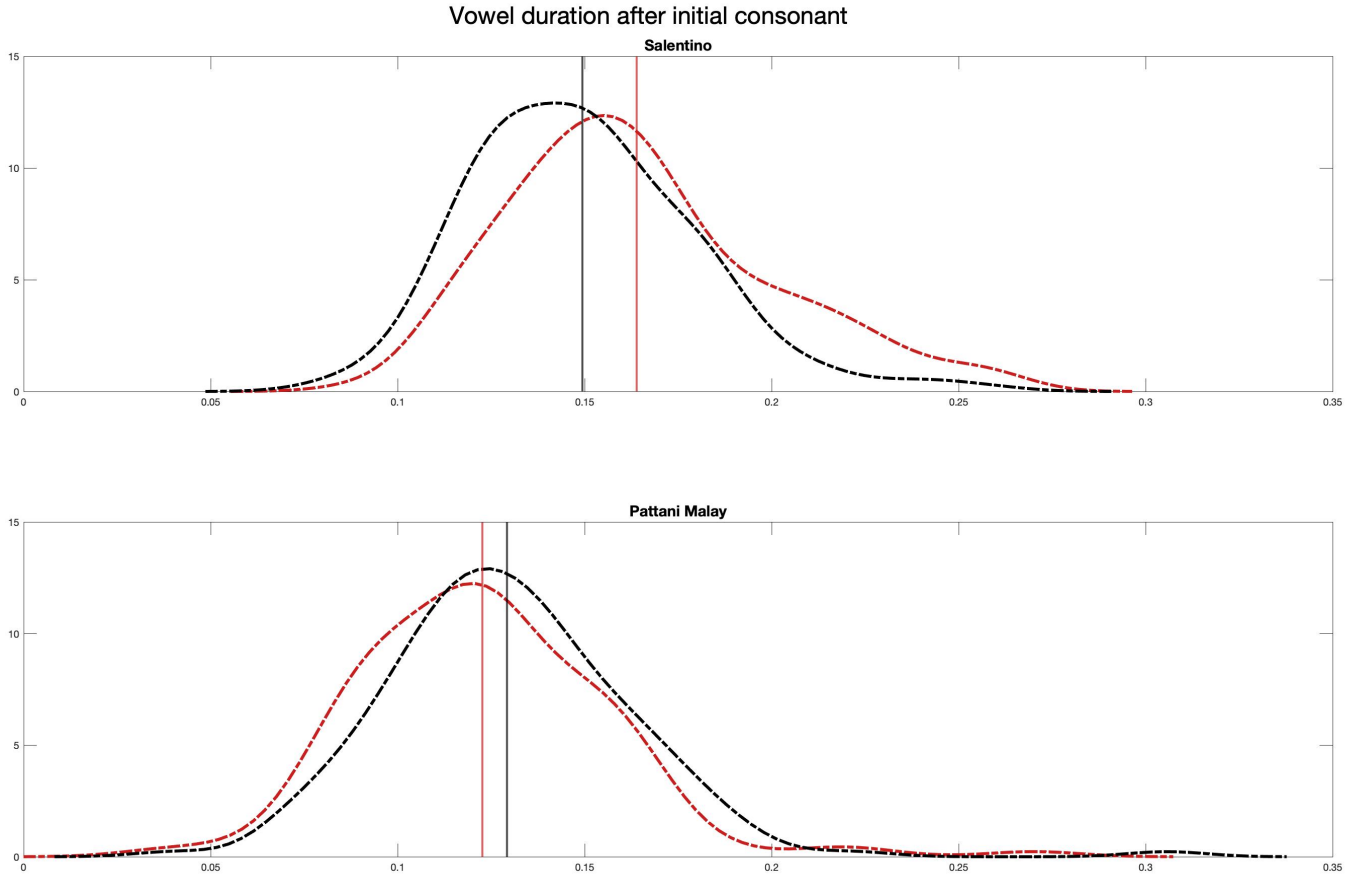


Figure 8: Durational distribution of vowel following geminates and singletons in Salentino and Pattani Malay