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ORIGINAL PAPER

On the existence of moraic onset geminates

Nina Topintzi

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Abstract Moraic theory standardly syllabifies geminates in a coda-onset configuration whereby the coda bears a mora. Initial geminates pose a serious problem for the theory since word-initially no coda exists to host the first half of the geminate. Previous proposals have addressed this issue but have not resolved it satisfactorily, because they have created new difficulties pertaining to prosodification, syllabification or generation of insufficient or incorrect patterns. I propose that treating the geminate as a moraic onset simultaneously resolves all the issues above, provided we dispense with the *stipulation* that onsets are never moraic. An important prediction emerges from this proposal: onset geminates could also occur word-medially. I claim that such prediction is empirically confirmed in languages like Marshallese and Trique. I also argue that moraic theory is right in claiming that geminates are underlyingly moraic consonants – rather than simply long – and demonstrate how in the current model the contrast between geminates and singletons is preserved in all positions in the word.

Keywords Moraic onsets · Geminates · Onset weight

1 Introduction

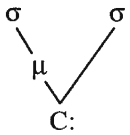
According to a relatively standard assumption in phonology (cf. Hayes 1989; Morén 2001) what differentiates geminate from singleton consonants is the presence of a mora in the input of the former, but not of the latter, i.e. /C^{μ}/ denotes a geminate, /C/

N. Topintzi
School of English, Aristotle University of Thessaloniki, 54 124, P.O. Box 58, Thessaloniki, Greece

N. Topintzi (✉)
Department of Philology, University of Patras, 26 504 Rio, Patras, Greece
e-mail: topintzi@enl.auth.gr, topintzi@upatras.gr

denotes a singleton. The following – flopped – structure is most usually assumed for output geminates word-medially.

(1) *Flopped structure of geminates word-medially*



The geminate is split in two halves, each of which belongs to a different syllable. The first half syllabifies as a moraic coda and hence contributes to the weight of its syllable. The second half syllabifies as an onset to the next syllable, e.g. Italian *fat.to* 'fact'. Such a configuration not only captures the increased length of a geminate compared to a singleton, but it can also express the fact that the first syllable can attract stress or participate in other weight sensitive phenomena due to its heaviness.

Unfortunately, such representation does not prove equally successful in initial and final positions. Word-finally, there is no onset for the second half of the geminate to attach to; word-initially, there is no coda – let alone a moraic coda – for the geminate to link to. In this paper, I will deal with initial geminates and show that a different representation that does not involve codas is in order. A proposal for word-final geminates is briefly outlined in section 4.1 (and see Ham (2001) for a more detailed discussion).

Building on Davis (1999b), Davis and Torretta (1998), and Hart (1991), all of whom demonstrate the moraicity of initial geminates in Trukese, I will claim that initial geminates are better represented as moraic onsets, as has been suggested by Hajek and Goedemans (2003) for Pattani Malay and Churchyard (1991) for Trukese. Going a step further, I will propose that onset geminates are also available word-medially. If it is true that a geminate is simply an underlyingly moraic consonant that somehow needs to realise its mora, then nothing precludes a syllabification whereby the geminate indeed appears as a medial moraic onset. The only way to block such configuration is by denying its existence, as standard moraic theory does (Hayes 1989). But this is merely a stipulation, which proves "convenient" (Morén 2001: 8) given that in "virtually all languages, the onset is ignored for purposes of calculating weight" (Gordon 1999: 3). However, if we question the validity of such a stipulation – given that it is based on a flawed argument, that of rarity – then we will find that there do exist languages which support medial onset geminates. I will claim that Marshallese and Trique are two of them.

Interestingly, the introduction of moraic onsets also fills in a gap that was up to now not accountable for in the typology of moraicity that syllable constituents exhibit. More specifically, there are nuclei which can be moraic, as in most languages, but also nuclei that lack moraicity (Crosswhite 1999), such as /e/ in Mohawk (Pigott 1998; Michelson 1989) or in Malagasy (Erwin 1996). There are also codas which act as moraic, as in Latin, Delaware or English, but also those which behave as weightless, as in Wargamay, Lenakel, Eastern Ojibwa (Hayes 1995).

However, due to the assumption of previous models that all onsets are weightless (Hyman 1985; Hayes 1989; Morén 2001), an asymmetry arises with respect to weightful onsets, whose absence is attributed to the *stipulation* that onsets are never moraic. Obviously this stands as no explanation to the asymmetry. In this paper, this problem is resolved by simply arguing that there is no such asymmetry. Onsets too can be moraic.

The proposed situation is thus schematized in (2). The shaded cell indicates the introduction of moraic onsets in the system. With them, a symmetrical weight system is now produced, whereby all syllable constituents have their weightless and weightful versions.

(2) *Moraicity typology of syllable constituents*

	Nuclei	*Codas*	*Onsets*
NON-MORAIC	✓ (Mohawk)	✓ (Lenakel)	✓ (majority of Ls)
MORAIC	✓ (majority of Ls)	✓ (Latin)	✓ **(Pat. Malay, Trukese)**

The remainder of the paper is structured as follows.[1] Section 2 deals with initial geminates. Section 2.1 introduces the proposed representation for them, i.e. that of moraic onsets. Section 2.2 examines empirical data from Pattani Malay, exploring

[1]The table in (2) refers to *geminate* moraic onsets. *Singleton* moraic onsets exist too, but due to the absence of space, they will not be addressed here. The interested reader is referred to Topintzi (2006, in press), where they are thoroughly discussed. However, it is interesting to note that if we consider the findings of the present paper as well as those of Topintzi (2006, in press) together, then it becomes evident that onsets participate in the same prosodic phenomena involving moraicity considerations that nuclei and codas do. A non-exhaustive list of the relevant cases is presented below. Section numbers under the column entitled 'onset' indicate where in the present paper one can find further discussion about the language mentioned. Discussion of all remaining cases in that same column can be found in Topintzi (2006, in press). The remaining sources with respect to nuclei and codas are as follows: Hayes (1995) for stress, Kenstowicz (1994a) for geminates, Hayes (1989) for compensatory lengthening, Gordon (1999) for minimal word, McCarthy and Prince (1986) for reduplication.

(a) *Moras associated to nuclei, codas and onsets and their emergence in prosodic phenomena*

Phenomena:	Moras in: *Nuclei*	*Codas*	*Onsets*
STRESS	Wargamay, Lenakel	English, German	Pirahã, Karo, Arabela
GEMINATES	N/A	Italian, Japanese	Trukese (Section 2.1) Pattani Malay (Section 2.2), Marshallese (Section 3.2)
COMPENSATORY LENGTHENING	Middle English, Slavic	Latin, Komi Ižma	Samothraki Greek, Trique (Section 3.3), Pattani Malay (Section 2.2.2)
MINIMAL WORD	Cebuano, Fijian	Basque, Koasati	Bella Coola, Trukese (Section 2.1), Damin
REDUPLICATION	Ponapean, Mokilese	Mokilese, Manam	Bellonese

the interplay between initial geminates and stress and greatly improving on Hajek and Goedemans' previous account (2003) of the same facts.

A consequence of utilising moraic onsets to handle initial geminates is that there is no *a priori* reason why moraic onsets could not also emerge word-medially. If this is the case, then the prediction is that there could also be medial onset geminates. This issue is addressed in Section 3 where it is shown that such a proposal is actually totally in line with moraic theory – whose claim is that the primary characteristic of a geminate is to be underlyingly moraic – provided we are not bound by the theory's stipulation that onsets are never moraic. Section 3.1 examines theoretical issues pertaining to this proposal, while Section 3.2 presents empirical data from Marshallese in favour of medial onset geminates. Section 3.3 briefly comments on treating Trique geminates in the same way.

Section 4 addresses potential objections and alternatives to the current proposal. More specifically, moraic onsets no longer present the double linking traditionally attributed to geminates as an indication of their increased length. Consequently, an important aspect of gemination may have been lost. Section 4.1 however argues that the implementation of phonological weight is a task assigned to the phonetics and adopts Hubbard's (1994) and Ham's (2001) models in doing so. Importantly, it is shown that the phonological contrast between geminates and singletons can be maintained in all positions, if one combines representations of medial (Hayes 1989) and final geminates (Ham 2001) with the present one for initial geminates.

Section 4.2 focuses on proposals that have questioned the moraicity of geminates based on languages like Malayalam or Selkup (Tranel 1991). Following Ham (2001) and Selkirk (1990), I claim that a different representation is in order for such consonants, which are not real geminates, but simply doubled consonants with two root-nodes. Section 4.3 offers a host of alternatives and shows how they prove inadequate (Gordon 2005 in Section 3.1; Shaw 2006 in Section 4.3.2) or face syllabification and prosodification difficulties (Section 4.3.3). Finally, Section 5 offers some concluding remarks.

Before moving on, a final word on terminology and notation is in order. In the remainder of the paper, *geminate* refers to a consonant that is underlyingly moraic, i.e. /C^{μ}/, and as such, contrasts with a *singleton* that has no mora in the input, i.e. /C/, but can nonetheless acquire one on the surface, as happens e.g. in *moraic singleton* codas. On the surface, both geminate and moraic singleton codas are in practice [C^{μ}], but this notation does not adequately differentiate them. For clarification purposes then, I will represent surface geminates as either C: or C_iC_i and surface singletons as C (their mora indicated too whenever appropriate). This double notation for geminates has both a practical and – more seriously – a theoretical justification. Practically speaking, I often maintain the notation used in the original data sources to simplify comparison with them. Moreover, different geminate syllabification is enhanced by different notations. For instance, it is much easier to represent a medial coda-onset geminate by means of $C_i.C_i$ than by means of C:. Similarly, tautosyllabic syllabification of the geminate, like the one I will be proposing, is easily indicated using the C: notation. Notably, the indication of length

on the skeletal level is merely there to clarify that reference to geminates and not to simply moraic consonants is made.

2 Initial onset geminates

2.1 Moraic onsets

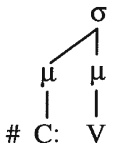
Languages with initial geminates include Trukese, Pattani Malay, Logbara, Oneida (the latter three cited in Hajek and Goedemans 2003). In Trukese (Hart 1991; Churchyard 1991; Davis and Torretta 1998; Davis 1999a, b; Muller 1999) geminates arise both initially e.g. [ffit] 'package' and medially, e.g. [orosset] 'shore'. It can be shown that geminates are moraic, because Trukese words must satisfy a bimoraic minimality criterion that only CVV and C_iC_iV words fulfill. CVC or CV words do not. Some data are given below.

(3) *Trukese Minimal Words*

	Form	Gloss
a. CVV words	núú	'unripe coconut'
	oo	'omen'
	tée	'islet'
b. CCV words	tto	'clam sp.'
	kka	'taro sp.'
	čča	'blood'

I argue that the most appropriate way to represent such geminates is one that classical phonological theory rejects by stipulation, but nonetheless falls out naturally given the structural possibilities that syllable theory admits. This involves moraic onsets (4). The case study on Pattani Malay next exemplifies this point in detail. The core of the analysis also applies to Trukese.

(4) *Initial geminates as moraic onsets*



2.2 A case study: Pattani Malay

2.2.1 The data

Pattani Malay is a dialect of Malay spoken widely among the Muslim communities of the southern provinces of Thailand. The analysis that I will construct is based on

data presented by Yupho (1989) and will be compared to the one Hajek and Goedemans (2003; henceforth H&G) provide for the same set of facts.

The consonantal phonemic inventory of the language includes: the stops /p t c k ʔ b d ɟ g/, fricatives /s h z ɣ/, nasals /m n ɲ ŋ/, post-stopped nasals /m^b n^d $ɲ^ɟ$ $ŋ^g$/, liquids /r l/ and the glides /w y/.[2] There are also twelve vowels /i e ɛ ɨ a u o ɔ ɛ̯ a̯ u̯ ɔ̯/. Vowel length is predictable, so that vowels in open syllables are long, whereas those in closed syllables are short. Only the schwa-like vowel /ɨ/ is special in that it is relatively short even in open syllables. Consonant length contrasts only word-initially, where the language distinguishes between short consonants and long geminates. Geminates are banned from other positions. Representative examples follow. Additional ones are available in Abramson (1991, 1998) and Yupho (1989).

(5) *Initial geminates vs. singletons in Pattani Malay* (Abramson 1999, 2003)

Singletons		Geminates	
pagi	'morning'	p:agi	'early morning'
tido	'to sleep'	t:ido	'put to sleep'
makɛ	'to eat'	m:akɛ	'to be eaten'
labɔ	'to profit'	l:abɔ	'cause to be late'
ɣatɔ	'comprehensive'	ɣ:atɔ	'to spread out'
sɛpaʔ	'to kick'	s:ɛpaʔ	'to be kicked'
cabɛ	'branch'	c:abɛ	'side road'
butɔ	'blind'	b:utɔ	'kind of tree'

First, let us see what phonetic evidence is available for the existence of geminates. Abramson (1987) claims that the primary phonetic correlate for initial geminates in Pattani Malay is the increased duration of the closure or constriction, which is about three times longer than that of the singleton counterparts (Abramson 1986). Oddly enough, speakers detect the geminate~singleton distinction even in voiceless stops despite their silent occlusions, suggesting that other factors are involved too. Indeed, greater amplitude (Abramson 1991) and higher fundamental frequency (Abramson 1999) are significant to the perception of geminates versus singletons. In particular, amplitude differences are moderately significant for voiced stops and continuants (Abramson 2004), whereas the effect of fundamental frequency is also present in voiced stops, albeit smaller compared to the one found in their voiceless counterparts. Hardly any effect is found in fricatives, whereas none at all is found in nasals.

Geminates are found in loanwords, e.g. *t:a* from Thai /ta:n/ 'police station' (Yupho 1989), or much more commonly, they are the product of initial syllable or morpheme reduction. The initial syllable of a word can delete and a free variant is produced where the second onset (in the original form) geminates as in e.g. *buwi* ~ *w:i* 'give', *sɨdadu* ~ *d:adu* 'police', *pimatɔ* ~ *m:atɔ* 'jewellery' (Yupho 1989: 130). The same effect can

[2]This is H&G's description. Yupho excludes post-stopped nasals from the phonemes, as she considers them clusters of nasals and stops. However, the fact that – as she admits – the stop portion is almost inaudible and the syllabification of such consonants in the onset position, merely suggest secondary articulation of a single consonant. Note also that /ɣ/ is a rhotic-like velar (H&G: 83), so it is not clear whether it should be considered a fricative. For Hajek and Goedemans (2003: 83), /ɣ/ does not geminate, but [ɣ:at] is a clear counterexample.

also occur in some morphological environments, namely in: i) words that have a derivational or verbal prefix of the type /Cɨ-/ plus the stem, ii) reduplicated forms where instead of the reduplicated form, one finds a geminate, iii) cases where a functional word deletes. Some examples with geminates in prefixed forms are given below.[3]

(6) *Geminates in prefixed forms* (Yupho 1989)

Unprefixed form	Prefixed form		Geminate variant	
ɟalɛ 'road, path'	bɨɟalɛ	~	ɟ:alɛ	'to walk'
buwɔh 'fruit'	bɨbuwɔh	~	b:uwɔh	'to bear fruit'
diɣi 'self'	bɨdiɣi	~	d:iɣi	'to stand'
kaɟi 'no gloss'	miŋaɟi	~	ŋ:aɟi	'to study'

Geminates become relevant when considering stress. Yupho's description of the stress algorithm is the following (1989: 134–135). Primary stress is normally on the final syllable (7i), while all preceding syllables bear secondary stress (7i.a), unless they include the vowel /ɨ/ in which case they are stressless (7i.b). Things are different in words with initial geminates. Primary stress there retracts from the final syllable and is placed on the initial one, with all remaining syllables receiving secondary stress (7ii). Unlike Hajek and Goedemans (2003), but like Yupho (1989), I do not mark vowel length for reasons that should become evident soon.

(7) *Stress in Pattani Malay*

i) Words lacking geminates

a.	ɟàlɛ́	'road path'	(Yupho 1989: 133)
	dàlɛ́	'in, deep'	(Yupho 1989: 134)
	mà̰kɛ̀nɛ̰́	'food'	(Yupho 1989: 135)
b.	sɨpɨnɔ́	'perfect, complete'	(Yupho 1989: 128; stress here constructed given algorithm)
	bɨlàkɛ́	'back'	(Yupho 1989: 134)

ii) Words with initial geminates

	m:átɔ̀	'jewellery'	(Yupho 1989: 135)
	ɟ:álɛ̀	'to walk'	(Yupho 1989: 133)

In this way, some minimal pairs are created, e.g. singleton [bùwɔ́h] 'fruit', [ɟàlɛ́] 'road', vs. geminated [b:úwɔ̀h] 'to bear fruit' and [ɟàlɛ́] 'to walk' respectively (cf. Yupho 1989: 135). The versions with initial singletons present final stress, while those with initial geminates carry initial stress, even if the geminate is followed by /ɨ/ (8), which as we have seen in (7i.b) otherwise repels stress.

(8) *Geminates and /ɨ/*
kɨdá 'shop' vs. k:ídà 'to the shop' [from /kɨ+kɨda/] (Yupho 1989: 133)

[3]While it seems that geminate formation is not totally oblivious to morphology, data are murky, so not much can be concluded. Moreover, there are still cases, like loanwords and first syllable deletion where no morphology seems to be involved. I will thus assume that gemination is a phonological phenomenon which can be morphologically conditioned.

In *kɨdá*, the final syllable is stressed as anticipated, while the first syllable bears no stress whatsoever. In *kɨdá* though, it is now the first syllable that includes a geminate which receives primary stress. Secondary stress appears on the final syllable.

2.2.2 Current analysis

The present analysis of these data argues that Pattani Malay has a single weight distinction between heavy and light syllables. Heavy syllables are those that include a geminate moraic onset consonant. Light syllables are all the remaining syllable types. Two phenomena corroborate this analysis: compensatory lengthening and stress.

First, consider compensatory lengthening. Recall that it is common in Pattani for the initial syllable of a word to delete, producing a free variant where the second onset (in the original form) geminates as in e.g. [buwi] ~ [w:i] 'give' or [sɨdadu] ~ [d:adu] 'police'.[4] One way to view this would be that the loss of the initial syllable is followed by compensatory lengthening. The latter would be realised through the association of the mora left behind by the lost syllable to the onset of the newly-created initial syllable, which now acquires an onset geminate.

This could be an especially strong argument in favour of moraic onset geminates in Pattani, because no reference to some sort of segment or slot preservation can be made, as the mora clearly moves from a vowel onto an onset. The end result would be that the total number of moras between the two variants would remain the same, i.e. [sɨ$^{\mu}$da$^{\mu}$du$^{\mu}$] ~ [d:$^{\mu}$a$^{\mu}$du$^{\mu}$]. While this falls out naturally in an analysis that makes use of (onset) weight, the same insight is totally missed in most other alternatives discussed in section 2.2.3.[5]

Second, consider stress, where I will argue for a partly weight-based and partly quality-based analysis. As we have seen, heavy syllables cause stress shift from the final default position for stress to the first one, as a result of the WSP (Weight-to-Stress Principle), which is why we find initial stress whenever an initial geminate is present. The quality-based component of the system involves the behaviour of the vowel /ɨ/ compared to all the other vowels of the language. It is only /ɨ/ which cannot receive stress at all (unless preceded by a geminate), whereas the other vowels can be primarily or secondarily stressed. This asymmetrical behaviour will be attributed to the low sonority of /ɨ/ and to the well-known fact that in certain languages, low-sonority vowels tend to or systematically remain unstressed (Kenstowicz 1994b;

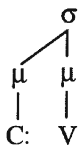
[4]Thanks to Michael Kenstowicz (p.c.) for drawing my attention to this piece of data.

[5]A reviewer asks whether Pattani displays weight-sensitive phenomena other than stress. This instance of CL would be an example. As for a process of Word Minimality, I have been unable to verify its presence with certainty. Yupho (1989: 128) however mentions that "monosyllabic root words are limited". Most of the examples offered involve function words. It is nonetheless clear that lexically contentful monosyllabic words with geminates are allowed, e.g. [w:i] 'give'. A single CVC word of the same type has also been found: [nɔʔ] 'wish, want', but the same cannot be said for CV words. This might indicate that Word Minimality (and its satisfaction by bimoraic C:V words) is present. Yupho's discussion of reduplication is limited to the observation that occasionally geminates replace reduplicated forms, but provides no further details about the process.

Crosswhite 1999; de Lacy 2007). Pattani Malay is an additional example of such a case. The remainder of this section develops the analysis in full.

2.2.2.1 Analysis in detail Default primary stress in Pattani Malay is word-final. This pattern is disrupted only when a geminate is present word-initially. In this case, stress shifts to the first syllable because the mora carried by the onset geminate (9) renders its syllable heavy and as such is subject to requirements that force stress on heavy syllables (WSP). This means that any syllable that begins with a geminate is bimoraic.

(9) *Initial geminates as moraic onsets*



Moreover, recall that vowels in open syllables are long, whereas those in closed syllables are short. Effectively this suggests that there is no phonemic vowel length contrast. It could thus be claimed that this lengthening is merely phonetic, but has no phonological substance.[6] Consequently, CVV and CVC syllables phonologically contain just one mora. In this approach, the moraic composition of Pattani syllables is the following.

(10) *Pattani Malay syllables and their moras in current approach*

i) CV(V)=1μ	for all vowels including /ɨ/
ii) CVC=1μ	
iii) C:V=2μ	for all vowels including /ɨ/

Under the assumptions in (10) and a few phonological constraints, all the cases of *primary* stress as described in 2.2.1 can be accounted for. (11) illustrates.

(11) a. i) *Non-geminate, non-/ɨ/ words* [bùwɔ́h] (ɔ̀)$_{\mu}$ (ɔ́)$_{\mu}$ ii) *Non-geminate, /ɨ/ words* [pɨmàtɔ́] σ$_{\mu}$ (ɔ̀)$_{\mu}$ (ɔ́)$_{\mu}$

b. i) *Geminate, non-/ɨ/ words* [b:úwɔ̀h] (ɔ́)$_{\mu\mu}$ (ɔ̀)$_{\mu}$ ii) *Geminate, /ɨ/ words* [k:ɨ́dà] (ɔ́)$_{\mu\mu}$ (ɔ̀)$_{\mu}$

[6]The central vowel /ɨ/ does not lengthen at all, as is also the case in Yakima Sahaptin (Hargus 2001 and below). This may relate to its inherent weakness (van Oostendorp 2000) or its low sonority (de Lacy 2007; see next footnote for more discussion). /ɨ/ is commonly schwa-like, as seems to be the case in Pattani Malay too. The absence of long /ɨ/ is then fully parallel with the lack of long /ə/ that other languages exhibit, e.g. Yiddish (Albright 2002: 7) and Yupik (Bakovic 1996: 13).

In (11a) all syllables are monomoraic, hence default final stress will arise, as the alignment constraint ALIGN-HD-R – which requires final stress – ensures.

(12) ALIGN-R (PrWd, HdFt) [abbreviated as ALIGN-HD-R]: the right edge of the Prosodic Word aligns with the right edge of the Head Foot

The lack of stress on /ɨ/ in (11a.ii) will be discussed in a moment. In (11b) however, a geminate is present and renders its syllable bimoraic. While all remaining syllables are monomoraic, stress now appears on the first syllable, an effect captured by the widely-accepted WSP, provided it is ranked above ALIGN-HEAD-R.

While this adequately explains primary stress, it does not account for secondary stress on the remaining syllables. What is more, it fails to explain why all vowels save /ɨ/ may carry secondary stress (compare (11a.i) with (11a.ii)). To account for this asymmetry in the vowel behaviour, I appeal to considerations of the quality of the nuclear vowel and its effect on stress assignment. In particular, it is well-known that central vowels like /ɨ/ are cross-linguistically weak and low in terms of sonority. This property is recognised by the stress systems of some languages, which consequently avoid stressing these vowels. Pattani Malay, I claim, merely needs to be added to the pool of such languages.

More specifically, consider Kenstowicz (1994b). Based on data from Kobon, Chukchee, Aljutor and Mari, Kenstowicz devises a hierarchy which reflects the sensitivity of stress to the relative sonority of the vowels involved. This is schematised below. Note that reference to *P/ə encompasses central schwa-like vowels such as /ɨ/ as mentioned with regard to Kobon and Mari. Kenstowicz's Peak Hierarchy with respect to metrical structure is displayed below. Note that this is different from Prince's and Smolensky's (1993/2004) Peak Hierarchy which refers to the segments that make the best/worst syllable nuclei.

(13) Kenstowicz's (1994b) Peak Hierarchy:
*P/ə >> *P/i, u >> *P/e, o >> *P/a

This hierarchy explicitly states that there will be languages which avoid stressing a schwa-like vowel. The same point is made in Chuvash and Javanese by Gordon (2002). In the same way that Yil avoids stressing the mid central vowel /ə/ (cf. de Lacy 2007), Pattani Malay avoids stressing the high central vowel /ɨ/ indicating that the constraint *P/ɨ (in the spirit of Kenstowicz 1994b) is high-ranked. It should thus be clear that this preference is cross-linguistically well-grounded.[7]

[7]While for de Lacy it is the low sonority of central vowels that sometimes makes them unable to bear stress, for other researchers, such as van Oostendorp (2000), it is their weakness due to the lack of featural content. In Pattani Malay, either approach would work, since it is only /ɨ/ that behaves differently from other vowels. However, as de Lacy observes, if featurelessness is responsible for this effect, then in a language like Nganasan where all of /ɨ ə i u y/ equally repel stress, we would need to say that all these vowels lack features. But this is highly problematic, as it would make them phonologically indistinguishable.

Yakima Sahaptin (Hargus 2001) resembles Pattani even more closely. In Yakima, just like in Pattani, /ɨ/ cannot appear long and tends to remain unstressed, while it fulfills most criteria of its schwa-like nature as formulated by van Oostendorp (2000). Sahaptin /ɨ/ – in contrast to other vowels – deletes and fails to appear in diphthongs or word-finally. Similarly, given Yupho's (1989) description of Pattani, /ɨ/ also does not appear word-finally and tends to delete in a word-initial position, although occasionally other vowels can delete in the same position, e.g. [b:aeʔ] from /baeʔ-baeʔ/ (Yupho 1989: 131). According to Yupho, there are no diphthongs in the language, so that property cannot be tested. All in all then, the marked nature of /ɨ/ and its inability to get stressed find precedents in several other languages.

With this much empirical grounding, we can now examine the technical aspects of the analysis. ALIGN-HD-R and *P/ɨ, which have already been mentioned, along with some additional constraints will give us the full range of the Pattani facts. Let us first take the simplest case, i.e. a word that lacks an initial geminate and contains any vowels except /ɨ/, e.g. [buwɔh] or [mạkɛnɛ̱]. Such words receive final primary stress and secondary stress on the remaining syllables, i.e. [bùwɔ́h] and [mạ̀kɛ̀nɛ̱́]. In other words, every syllable receives some level of stress. This property is rather strange and unusual, since languages tend to avoid consecutive stresses due to the numerous *CLASH violations they incur.

On the other hand, if Yupho's (1989) description is accurate, then there is a contrast which needs to be accounted for, i.e. between syllables with full vowels that receive secondary stress and those with an /ɨ/ that lack stress altogether, e.g. [mà] and [pɨ] respectively in [pɨmàtɔ́]. Still then, it is an issue to what extent this is really phonological stress, rather than perhaps a phonetic effect due to the relatively longer duration of a CVC or a CVV lengthened syllable compared to shorter Cɨ(C). Importantly though, the core of the proposal, i.e. the existence of moraic onset geminates, remains unaffected even if it is actually proved that there is no contrast between unstressed and stressless vowels. In the absence of any conclusive evidence, I will build an analysis that accounts for the contrast described by Yupho.

The first step in doing so is to explain how all syllables receive stress and thus form monosyllabic feet. The answer to this lies in the following foot alignment constraints.

(14) ALIGN-L (Ft, FtHd): Align the L edge of every foot with the L edge of a foot head
ALIGN-R (Ft, FtHd): Align the R edge of every foot with the R edge of a foot head
[N.B: Following Prince (1997), I will abbreviate these as Ft-Hd-L and Ft-Hd-R respectively]

As Prince (1997, citing Bruce Tesar) and Green (2002) observe, the constraints above can both be simultaneously satisfied only in a monosyllabic foot. Prince (1997) also notes that if these constraints are very highly ranked, then we can produce languages which only allow monosyllabic feet, like Cantonese (Moira Yip, p.c). Obviously, feet in Pattani Malay, which are strictly monosyllabic as the stress facts reveal, call for a similar account. In addition, all syllables – with the exception of those including /ɨ/ (we will return to this in a moment) – are parsed into feet.

Thus, Pattani Malay feet require the ranking in (15) which expresses the fact that all syllables have to be parsed into monosyllabic feet, even at the expense of creating several stress clashes or non-binary feet. Tableau (16) exemplifies this result.

(15) *Monosyllabic feet in P. Malay*: Ft-Hd-L, Ft-Hd-R, PARSE-σ >> FTBIN, *CLASH

(16) [bùwɔ́h]: Ft-Hd-L, Ft-Hd-R, PARSE-σ >> FTBIN, *CLASH

buwɔh	Ft-Hd-L	Ft-Hd-R	PARSE-σ	FTBIN	*CLASH
a. (buwɔ́h)	*!				
b. (búwɔh)		*!			
c. bu(wɔ́h)			*!		
☞ d. (bù)(wɔ́h)				**	*

To keep tableaux as manageable as possible, I will use the cover constraint FTFORM to represent the constraints Ft-Hd-L, Ft-Hd-R, PARSE-σ. While (16d) is the correct winner, it is not the only possible candidate with monosyllabic feet. [(bú)(wɔ̀h)] is another. To rule this out, we need to make reference to ALIGN-HD-R. Incorporating it to our ranking – although no ranking argument can be established – provides the right candidate.

(17) [bùwɔ́h]: FTFORM, ALIGN-HD-R

buwɔh	FTFORM	ALIGN-HD-R
a. (bú)(wɔ̀h)		*!
☞ b. (bù)(wɔ́h)		

The next ingredient in the analysis involves the treatment of words including /ɨ/. The constraint *P/ɨ, which expresses the fact that stress on /ɨ/ is avoided, is useful here. If we rank *P/ɨ >> FTFORM, then we ensure that the syllable which includes /ɨ/ will be left unstressed. An illustration with the example [pɨmàtɔ́] follows. Here, we get primary stress on the final syllable and secondary on the syllable before. The first syllable remains unstressed. This can be done by either leaving it unparsed (18e) or

by parsing it in the foot tail position (18d). Either of the two will do, as empirically they are the same.

(18) [pɨmàtɔ́]: *P/ɨ >> FTFORM, ALIGN-HD-R

	pimatɔ	*P/ɨ	FTFORM	ALIGN-HD-R
	a. (pɨ̀)(mà)(tɔ́)	*!		
	b. pɨ(matɔ́)		* (Ft-Hd-L), *! (PARSE-σ)	
	c. pɨ(má)(tɔ̀)		* (PARSE-σ)	*!
☞	d. (pɨmà)(tɔ́)		* (Ft-Hd-L)	
☞	e. pɨ(mà)(tɔ́)		* (PARSE-σ)	

Up to now, we have seen that in words composed of monomoraic syllables only, primary stress is final (ALIGN-HD-R) and all remaining syllables receive secondary stresses (PARSE-σ) forming monosyllabic feet (Ft-Hd-L/R >> FTBIN). The only exception to that is with a syllable that comprises the schwa-like /i/, which has to stay unstressed (top-ranked *P/ɨ).

(19) *Pattani Malay stress (to be revised)*

*P/ɨ >> Ft-Hd-L, Ft-Hd-R, PARSE-σ, ALIGN-HD-R >> FTBIN, *CLASH

Now we only need to consider cases which involve an initial geminate. In contrast to [bùwɔ́h] above, [b:úwɔ̀h] differs in that it includes a geminate, whose effect is to attract *primary* stress on its host syllable. This can be attributed to a high-ranking WSP constraint whose effects now become visible, since it applies on a syllable which is bimoraic in virtue of one mora for the vowel and one for the initial onset geminate. However, reference to general WSP is not sufficient, as it can be satisfied by either primary or secondary stress. What we need is a version of this constraint specific to primary stress, namely WSP_{PrWd} (cf. McGarrity 2003).

(20) WSP_{PrWd}: Heavy syllables receive primary stress

WSP can still be present in the ranking, but no matter what its ranking with respect to WSP_{PrWd}, the winning form will be the one that assigns primary stress on the initial heavy syllable, so it will always satisfy both WSP_{PrWd} and WSP, whereas secondary stress on that syllable will satisfy WSP, but violate WSP_{PrWd}. For this reason, I will leave WSP out of the following tableaux. With this in mind, the only candidates we need to take into account are: i) (21a) with primary stress on the first

syllable, and ii) (21b) with secondary stress on the first syllable. Due to the ranking WSP_{PrWd} >> ALIGN-HD-R, the winner will be the former candidate, despite misaligning primary stress from the right edge.

(21) WSP_{PrWd} >> ALIGN-HD-R

b:uwɔh	WSP_{PrWd}	ALIGN-HD-R
☞ a. (b:ú)(wɔ̀h)		*
b. (b:ù)(wɔ́h)	*!	

Only one thing remains to be discussed. What happens when there is a word that consists of both a geminate and a /ɨ/, e.g. like in [k:ɨ́dà]? Since the first syllable can be stressed despite the presence of /ɨ/, we need to conclude that satisfaction of WSP_{PrWd} is so overpowering that it must also dominate *P/ɨ.

(22) WSP_{PrWd} >> *P/ɨ

k:ɨda	WSP_{PrWd}	*P/ɨ
☞ a. (k:ɨ́)(dà)		*
b. k:ɨ(dá)	*!	

With this modification, the newly acquired ranking for Pattani Malay stress is given below.

(23) *Pattani Malay stress (final version)*

WSP_{PrWd} >> *P/ɨ >> Ft-Hd-L/R, PARSE-σ, ALIGN-HD-R >> FTBIN, *CLASH

2.2.3 Other possible analyses of Pattani Malay

This section examines several alternatives to the proposed account. Some are either akin to it (Section 2.2.3.1), conceptually (Section 2.2.3.2) or dramatically different from it (Sections 2.2.3.3–2.2.3.4.), but at any rate less successful than it.

2.2.3.1 Hajek and Goedemans (2003) The first account to be reviewed is the one by H&G, who also explicitly state that to account for the Pattani Malay data, use of moraic onsets needs to be invoked. In particular, they argue that the conclusion that there can be languages, like Pattani Malay, whose stress placement is determined by moraic onsets is inescapable, if we accept the following claims in phonological theory (most of which are uncontroversial): i) moraic weight affects the stress algorithm in many languages, ii) geminates are generally moraic, and iii) onset geminates exist and can be moraic (cf. Davis 1999b who acknowledges this possibility).

In this respect then, their approach is quite similar to the one presently argued. However, the accounts diverge in two crucial points. First, H&G, as we will see, are forced to propose the prioritisation of onset weight over nucleic weight. This not only seems unprecedented, but also wrong, as it predicts various unattested systems. Second, H&G put forward a purely weight-based analysis of Pattani Malay stress, whereas I contend that a partly weight- and partly quality-based analysis is more well-suited and more plausible on a cross-linguistic basis. These issues as well as the technical points of H&G's analysis are dealt with in the remainder of this section.

H&G base their analysis on the assumption that all vowels – apart from /ɨ/ – are long in open syllables and short in closed ones. In spite of the predictable nature of this distribution, H&G see this difference as phonemic and therefore treat CVV and CVC sequences as bimoraic. The moraic composition of syllables that results from this assumption is illustrated in (24). CVV and CVC syllables are bimoraic (ii–iii), whereas an open syllable with /ɨ/, which does not ever receive stress, is treated as monomoraic (i). Geminates are moraic, thus when they precede /ɨ/, they render the syllable bimoraic (iv), whereas in front of the other vowels, the syllable becomes trimoraic (v).

(24) *Pattani Malay syllables and their moras in H&G's approach*[8]
i) Cɨ=1μ
ii) CVV=2μ, where V is not /ɨ/
iii) CVC=2μ
iv) C:ɨ=2μ
v) C:VV=3μ, where V is not /ɨ/

Moving on to stress now, the regular pattern of final stress – when all syllables are maximally bimoraic, e.g. [bù$^{\mu\mu}$.wɔ́$^{\mu}$h$^{\mu}$] – is attributed to right-alignment preferences.

[8] As far as I can tell, there is no C:VC example in the data provided, but this should not come as a surprise, since it would imply the presence of a medial cluster, but medial clusters are relatively rare. Most of them are homorganic nasals and voiced stops, which actually get to be realized as post-stopped nasals in onset position. Only a few clusters occur in coda-onset position, such as *baʔpɔ* 'why' or *kiɣenmɛ* 'sending', but these are usually loanwords or morphologically complex (Yupho 1989: 128–129).

Any remaining syllables receive secondary stress, unless they include the monomoraic /ɨ/, as in [pɨ$^{\mu}$.mà$^{\mu\mu}$.tɔ́$^{\mu\mu}$], in which case they remain stressless. In words with initial geminates, things change, since the first syllable is now trimoraic. By being the heaviest syllable of all, it attracts stress, correctly yielding forms like [b:$^{\mu}$ú$^{\mu\mu}$.wɔ̀$^{\mu}$h$^{\mu}$] or [m:$^{\mu}$á$^{\mu\mu}$.tɔ̀$^{\mu\mu}$].

This analysis however carries along an undesirable prediction. More specifically, when the first syllable is bimoraic due to a moraic onset geminate followed by /ɨ/, and the remaining syllables are bimoraic CVV or CVC, primary stress should be word-final by virtue of right-alignment preferences. Nonetheless, the example *k:ɨ́dà* with a final open syllable (cf. (8)) contradicts this prediction, since primary stress retracts to the initial syllable, although it should stay put on the final.

To account for this stress shift, H&G claim that Pattani Malay illustrates an instance where onset weight takes priority over general weight. The presence of an onset geminate is enough to attract stress even if this syllable is not trimoraic. To express this fact, they utilize a constraint, whose name is never provided, but is described as follows.

(25) *cf. H&G's (12) on p. 89*

The left edge of the main stress foot must be aligned to a moraic consonant

Note that this edge must also coincide with a moraic onset and not with a moraic coda, because in the latter instance, we would have a violation of syllable integrity. This constraint obviously needs to dominate the constraint that ensures that primary stress will otherwise reside on the final syllable (ALIGN-HEAD-R). While H&G offer no fully-fledged analysis, it should be clear that their proposal can account for the whole range of facts, once the addition of (25) is acknowledged.

Onset weight prioritisation, however, is undesirable both on empirical and technical grounds. Adopting (25) entails that C:V > CVV, where onset weight takes priority over nuclear weight, should be empirically attested. What is more, the right edge counterpart of the constraint in (25), which can be proposed by analogy, predicts a similar pattern for codas, yielding: CVC > CVV, where coda weight would be more significant than nuclear weight.

The patterns, however, we get with respect to CVV and CVC are the following (see Gordon 2002 and references cited therein): i) CVV > CVC, CV, i.e. CVV is heavier than both the light CVC and CV (Khalkha Mongolian), ii) CVV, CVC > CV, that is, both CVV and CVC are heavy, whereas CV is light (Latin, Yana, Japanese, Finnish) and iii) CVV > CVC > CV where there is a three-way weight hierarchy where CVV is heavier than CVC and CVC is heavier than CV (Kashmiri, Klamath, Chickasaw, Telugu). What we do not get is what H&G predict, namely: CVC > CVV > CV,[9] where the contribution of coda weight is more important than that of the nucleus.

[9]Or even CVC > CVV, CV, but then we could argue that vowel length is not really contrastive, so that this actually boils down to CVC > CV which would be possible to get in a language that lacks long vowels. Such a case occurs in Hixkaryana (Hayes 1995), West Tarangan (Gordon 1999) and Moro (Gordon 1999). The latter's weight pattern is CVC > Full V > Reduced V.

Possible illustrations of exactly that pattern have been proposed in Dutch, Tiberian Hebrew and Kashaya Pomo. These are not real counter-examples to the above generalisation though; for instance, Gussenhoven (in press) points out that previous assumptions about vowel length in Dutch are precisely those which allow for an interpretation of CVC > CVV weight, but this is erroneous, since what really matters is vowel tenseness. If this is taken into consideration instead, then Dutch actually presents the well-attested CVV, CVC > CV schema.

The incorrect prediction of CVC > CVV can also associate to another possible pattern. If we have languages where onset weight takes priority, and others where coda weight takes priority, then perhaps we could simultaneously combine the two in one language. This would generate extremely complicated weight systems, such as $C^{\mu}V^{\mu}C^{\mu} > C^{\mu}V^{\mu\mu}$, $V^{\mu\mu}C^{\mu} > C^{\mu}V^{\mu}$, $V^{\mu}C^{\mu} > V^{\mu\mu} > V^{\mu}$ which fail to arise.

Finally, observe that the constraint mentioned in (25), which could perhaps be represented as ALIGN-L (HDFOOT, C^{μ}) is both unprecedented and unnecessarily complex, as it does not simply require the alignment of a foot with a consonant, but the alignment of the *head* foot with a consonant which is *moraic*. It would then be desirable to produce an analysis that dispenses with it, which is exactly what the current proposal has done.

It should by now be clear that H&G's analysis suffers from a number of serious shortcomings that the account in Section 2.2.2 avoids. In particular, the assumption that CVV and CVC syllables were bimoraic and Cɨ monomoraic, resulted in a problem when considering a word like [kːɨ́dà]. There, due to the contribution of a mora by the initial onset geminate, both syllables became equally bimoraic, and thus primary stress should be word-final, due to right-edge stress preferences. To solve this problem, the authors proposed that onset weight can take priority over general weight, but as we have shown, this is undesirable for reasons both empirical and technical.

These problems dissolve as soon as we take the predictability of vowel length literally and assume that phonologically all vowels are monomoraic in Pattani. Assuming that the only contrast available is the one between singleton and geminate consonants, then syllable weight will only distinguish between bimoraic syllables containing a geminate and all other monomoraic ones. The former attracts stress by virtue of their heaviness. The picture gets completed through well-attested considerations regarding the behaviour of central vowels with respect to stress. It is evident that the analysis in Section 2.2.2 is clearly advantageous in that it is based on well-known phonological principles, such as the WSP or the weakness of central vowels, without making use of any other implausible mechanisms. Like H&G however, it demonstrates the necessity of moraic onset geminates.

2.2.3.2 Conflicting directionality In Pattani Malay, as we have seen, primary stress is normally on one edge of the word (right), but appears at the opposite left edge if this hosts a heavy syllable, i.e. one with an initial geminate plus vowel. This opposing orientation of stress renders Pattani a potential case of Conflicting Directionality, which as Zoll (1997: 264) explains, refers to "the opposition between the preferred edge of association for a morphological/prosodic unit *vs*. the restricted licensing of complex or marked structure only in strong positions." For Zoll, the preferred edge of association of stress in Pattani would be the left edge, whereas the

right edge would be able to license marked structure, i.e. stressed light syllables (Zoll 1997: 276).

To capture this pattern, Zoll proposes the ranking ALIGN-R($\acute{\sigma}_{\mu}$) >> ALIGN-L($\acute{\sigma}$), where the licensing constraint ALIGN-R($\acute{\sigma}_{\mu}$) asks that stressed light syllables should be word-final, whereas the general constraint ALIGN-L($\acute{\sigma}$) prefers initial stress. ALIGN-R($\acute{\sigma}_{\mu}$) is however worded in such a way that it only becomes applicable in words without any heavy syllables at all. In words that contain at least one heavy syllable, ALIGN-R($\acute{\sigma}_{\mu}$) is vacuously satisfied, leaving ALIGN-L($\acute{\sigma}$) to decide the winner by picking out the leftmost heavy stressed syllable.

At first glance, one may note that this approach is conceptually different from the one proposed here. It seems to assume that default stress is initial, but can shift to the final position in the presence of marked structure. The present analysis instead assumes that the default stress position is final, but can appear word-initially if attracted by a heavy syllable, a well-known magnet for stress. In fact, Zoll herself (1997: 283) makes use of the 'well-motivated' WSP constraint, which makes one wonder, why one should not use it in cases like Pattani Malay too, as done here.

Most importantly for our purposes though, Zoll would still need to make reference to initial onset geminates and accept their heaviness,[10] because otherwise syllables that contain them would be construed as light. In that case, they would be subject to ALIGN-R($\acute{\sigma}_{\mu}$) and thus unable to receive initial stress as commanded by ALIGN-L($\acute{\sigma}$) in the absence of light-syllable-only words. Consequently, even if one chooses to adopt Zoll's analysis on conceptual grounds, the need to refer to moraic onset geminates – the major thesis of this paper – still holds.

2.2.3.3 Geminates as syllabic consonants Another account that merits brief discussion is one that does not make use of gemination at all. Examples like the ones in (6) could perhaps suggest an analysis where the prefix vowel deletes and subsequently a syllabic consonant is formed (Moira Yip, p.c.). If we were then to argue that the language forms iambs, most of the stress facts would fall out easily.

For instance in a word with an initial singleton, e.g. [diγi], primary stress is final, so the footing with respect to main stress only, i.e. abstracting away from secondary stress for a moment, would be (diγí). Its geminated counterpart [d:iγi] however would now actually include a syllabic consonant, therefore it would be footed as (ḍ.dí)γi, accounting for the stress pattern described in Pattani Malay above. To also get the secondary stress facts, it would be crucial to assume that: i) all syllables are bimoraic (i.e. $CV^{\mu\mu}$, $CV^{\mu}C^{\mu}$ or C:V; the latter are in practice disyllables $Ç^{\mu}.CV^{\mu}$) with the exception of open ones including /ɨ/ as these would be monomoraic and that: ii) the possible iambic feet should either be (H) or (LH). The combination of these allows us to take secondary stress into account too and parse [dìγí] as (dì)(γí) and [d:íγì] as (ḍ.dí)(γì).

[10]Incidentally, a constraint along Zoll's lines can explain why geminates only appear word-initially in Pattani (cf. Zoll 1997: 266–7). Given that geminates can be considered marked structure, one could propose a constraint that only licenses them in the word-initial strong position, e.g. ALIGN-L (C^{μ}, PrWd).

The major objection to this analysis however comes from an empirical point of view, as it fails to explain why only in words with syllabic consonants is primary stress systematically assigned on the first syllable, i.e. the contrast between *dìγí* and *d:íγì* receives no explanation. Thus, in the absence of any supporting evidence for syllabic consonants and in the presence of overwhelming phonetic evidence for the existence of initial geminates in Pattani Malay, I opt for an account that assumes the latter.[11]

2.2.3.4 Geminates as an early stage of tonogenesis The final alternative considered here builds on the following two facts about Pattani: i) fundamental frequency is one of the perceptual features associated with the initial geminates and ii) Pattani speakers are bilingual in Thai – a tonal language (Abramson 2004). Given these two observations, one can possibly construe the patterns above not as stress, as I did, but instead as an early stage of tonogenesis, a proposal that Abramson (2004) himself tentatively makes and a reviewer also suggests.

However, I would like to argue that this alternative is not sufficiently convincing. First, as Joseph Salmons (p.c.) notes, it is debatable whether exposure to a tonal *second* language is capable of having such an overwhelming effect in turning the *first* language into a tonal one. Others however, as Mary Pearce (p.c.) reminds me, argue that a lot of tonogenesis does occur when there is a slight fluctuation in pitch from voicing and then contact with a tonal language, as in e.g. most Chadic languages.

Granted, pitch may be a correlate of Pattani initial geminates, but to reach the point whereby the language becomes tonal, a number of things should have occurred, one of which would probably be the demotion of duration to a secondary cue for the geminate~singleton distinction and the promotion of pitch to a primary cue. But this is not the case in Pattani. Abramson has shown through a series of experiments and studies (Abramson 1987, 1991, 1998, 1999, 2003) that duration is the primary cue to the singleton versus geminate contrast. This holds across all consonant types, with the exception of voiceless stops and affricates in utterance-*initial* positions, where no direct acoustic sign of duration is available. Utterance-*medially*, duration is a very robust and reliable cue even for these consonants. This fact has prompted Abramson to investigate any additional cues that enhance the distinction utterance-initially. What he found is that greater amplitude (Abramson 1991) and higher fundamental frequency (Abramson 1999) are highly significant to the perception of geminates versus singletons, especially with regard to voiceless

[11] As a mere tendency, we can also mention Bell's (1978: 160) typological study which found that in a sample of 53 languages with syllabic consonants, these occurred: i) medially, ii) initially and medially, iii) medially and finally, and iv) in all three positions of the word. Crucially, no syllabic consonants occurred initially-only (or for that matter finally-only), as would be required for Pattani Malay. Pattani Malay would additionally be highly unusual in also admitting voiceless stops as syllabic consonants, e.g. as in *c:abɛ* 'side road', although these are not unprecedented, e.g. Koryak (Bell 1978: 185), Berber (Dell and Elmedlaoui 1985, 1988). Notably, none of these typological findings alone can exclude the syllabic consonant approach, especially since languages with only word-initial moraic consonants, as suggested in the present account, are also typologically rare.

stops.[12] Notably though, neither serves as a sufficient cue for this perceptual contrast (Abramson 1999, 2004).

What we can conclude from the above is that F0 is just one of the correlates associated with the initial geminates, the other major two being duration and amplitude. But these three phonetic properties can all be correlates of stress (cf. e.g. Hayes 1995, Hyman 2006), a position totally in line with the treatment that Pattani has received in the present work. In fact, Abramson (2004) himself mentions that Pattani might be shifting to a replacement of the initial consonant length by either a stress or tonal contrast. It seems that the only reason he prefers the tonogenesis approach is the contact Pattani speakers have with Thai. But as we have pointed out, this seems at best a dubious argument in favour of tonogenesis.

On the other hand, in the present account, all the above observations fall into place. Syllables with initial geminates indeed sound accented as Abramson reports and this salience happens to be stress, correlates of which can be pitch, duration and amplitude. Pattani exhibits all three. If we now simply accept that syllables with a geminate onset in Pattani are heavy, no need to propose any extra, unsubstantiated phonological shift towards tone arises. Heavy syllables, as is well known, often attract stress and in that respect Pattani's pattern comes as no surprise.

An additional major drawback for the tonogenesis approach is its inability to account for variants like [buwi] ~ [w:i] 'give' or [sɨdadu] ~ [d:adu] 'police', which as discussed in Section 2.2.2., are easily captured as a case of compensatory lengthening by a weight-based approach to geminates, but totally missed in tonogenesis.

Before closing this section, a final argument against tonogenesis is in order. One of the most typical characteristics of tonogenesis is the loss of a phonological contrast in consonants, such as voicing or aspiration, and its re-interpretation over time as a tonal contrast (Matisoff 1973; Hombert et al. 1979, among others). This 'evolutionary' path can even be traced synchronically. For instance, among the dialects of Kammu (Svantesson 1983; Yip 2002: 35), one finds that the southern dialects exhibit a voicing contrast for obstruents in onsets, but the same does not occur in the northern dialects. Instead, the contrast there has been replaced by a tonal one. In particular, a H tone appears in positions that correspond to voiceless obstruents in the southern dialects and a L tone in positions that correspond to voiced obstruents in the same dialects.

(26) *Kammu dialects*

South (voicing contrast-no tone)	North (no voicing contrast-tonal contrast)	
klaaŋ	klǽaŋ	'eagle'
glaaŋ	klàaŋ	'stone'

[12] Amplitude differences are moderately significant for voiced stops and continuants (Abramson 2004), whereas the effect of fundamental frequency is also present in voiced stops, albeit smaller compared to the one found in their voiceless counterparts. Hardly any effect is found in fricatives, whereas none at all is found in nasals.

In a similar vein, we could perhaps expect a different behaviour with respect to the F0 effects of voiceless versus voiced geminates in Pattani, i.e. higher F0 associated with voiceless obstruents and lower F0 with voiced ones. The prediction is not verified; Abramson (1999: 593) finds that the higher fundamental frequency associated with voiceless stop geminates is also found in the voiced ones, although to a somewhat smaller degree.

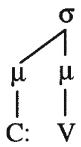
The bottom line then is that the evidence for a tonogenesis account is fragmentary and unsubstantiated. On the contrary, the weight-based approach argued for in this paper is much more straightforward and offers better coverage of the facts. More specifically, it can fully account for what can certainly be considered as stress given its phonetic correlates and it can capture a case of compensatory lengthening that completely evades the tonogenesis approach.

3 Medial onset geminates

3.1 Theoretical discussion

So far, we have investigated initial geminates and have argued that their representation as moraic onsets is appropriate. Pattani Malay has been used to illustrate the point. In this section, I will deal with a further prediction that the representation in (4), repeated here as (27), makes.

(27) *Geminates as moraic onsets*



Given that the structure above affects onsets in general, it should be able to emerge not only word-initially, but also word-medially, thus effectively generating medial onset geminates. In the next sections, I argue that Marshallese (Abo et al. 1976; Zewen 1977) and Trique (Hollenbach 1977) back up this prediction. But let us first examine how this prediction is justified.

The possibility for the structure in (27) word-medially stems from an idea proposed by Ham (2001), who claims that the usual 'flopped' structure of a medial geminate, i.e. $VC_i^{\mu}.C_iV$, is not necessitated by moraic theory but by syllable theory, which prefers onsetful syllables. Moraic theory only asks that the geminate bear a mora. The geminate's double-linking to a coda and an onset is the result of preferring more well-formed syllables, i.e. those beginning with an onset. This becomes apparent if we compare (28a), where the geminate is wholly syllabified as a coda, leaving the following syllable onsetless, with (28b), where the mora of the geminate is still linked to the coda, but itself also links to the onset of the next syllable, rendering it onsetful.

(28) *Geminates word-medially*

a. Avoidance of onsetless σs b. Preferred structure

What Ham (2001) fails to see is that (28b) is not the only way to simultaneously adhere to syllabification and moraicity requirements. Analysing the geminate as a moraic onset, as shown in (27), achieves both these results.

The next question is to see how we are to generate medial geminates of the type in (28b) and those in (27). I propose to answer this question by considering in what way each of these structures is disadvantageous when compared to the other. The 'flopped' structure contains a coda, therefore violating NoCoda (Prince and Smolensky 1993/2004). (27) on the other hand avoids extra codas, but at the cost of introducing a moraic onset. Thus, it violates the constraint that militates against such onsets, dubbed *Moraic Onset. This constraint is not new, but implicitly assumed – by practically all analyses in the moraic framework which assume that onsets never bear weight – either as constraining GEN or as top-ranked in EVAL. It has also been explicitly used in some works, such as Muller (1999) or Crosswhite (2001).

A language with geminates of the type in (27) should thus have NoCoda >> *Moraic Onset, so that codas will be minimised in favour of tautosyllabic moraic onsets. This ranking of NoCoda – if sufficiently low-ranked – does not entail that codas will be banned altogether (e.g. they should be allowed in non-geminate CC clusters), but that they will be avoided wherever possible. However, since in most languages moraic onsets are banned (due to high-ranked *Moraic Onset), it is only natural that geminates almost always instead syllabify heterosyllabically, as in (28b), offering an explanation to this distributional asymmetry. Medial onset geminates are merely rarer, but by no means impossible.[13]

Recall that moraic theory also permits a form like VC:$^{\mu}$.V (cf. (28a)), which is however never chosen because it defies syllable structure requirements. OT offers a neat account of why this is the case. VC:$^{\mu}$.V is harmonically bounded by VC$_i$$^{\mu}$.C$_i$V and thus can never win under any ranking of the proposed constraints, Onset, NoCoda and *Moraic Onset.

To see this compare (29a) with (29b): Both violate NoCoda equally, but (29b), i.e. VC:$^{\mu}$.V, also incurs a fatal violation of Onset, so it will always be worse than (29a). Effectively, (29a) and (29c) survive and it is the relationship between NoCoda and *Moraic Onset that decides which of the two is the right representation for

[13]This of course relates to the question of why moraic onsets are rare in the first place. Reasons for the typical weightlessness of onsets are offered in Goedemans (1998), Smith (2005) and Gordon (2005). Like these authors, I believe the answer to this question lies more in functional reasons, whose more detailed discussion is beyond the scope of the present work.

medial geminates in the language at hand. For completeness, it can be shown that the factorial typology of ONSET, NO CODA and *MORAIC ONSET yields six grammars, half of which prefer the 'flopped' $VC_i^{\mu}.C_iV$ structure and half the moraic onset $V.C{:}^{\mu}V$ one. Importantly, $VC{:}^{\mu}.V$ is never chosen. To illustrate, it suffices to consider two tableaux.

(29) *Medial geminate factorial typology*

(i)	/$VC^{\mu}V$/	ONSET	*MORAIC ONSET	NOCODA
☞ a.	$VC^{\mu}_i.C_iV$			*
b.	$VC{:}^{\mu}.V$	*!		*
c.	$V.C{:}^{\mu}V$		*!	
(ii)	**/$VC^{\mu}V$/**	**ONSET**	**NOCODA**	***MORAIC ONSET**
a.	$VC^{\mu}_i.C_iV$		*!	
b.	$VC{:}^{\mu}.V$	*!	*	
☞ c.	$V.C{:}^{\mu}V$			*

Only the relative positions of NOCODA and *MORAIC ONSET differ. In the first case, moraic onsets are banned due to *MORAIC ONSET >> NOCODA, therefore the 'flopped' structure is selected. In the second case, avoidance of a coda is more important because of NOCODA >> *MORAIC ONSET; therefore, a moraic onset geminate is admitted. Of the four remaining grammars in the factorial typology, the two with NOCODA top-ranked choose (29c) as the winner and the two with *MORAIC ONSET top-ranked choose (29a). In the next section, I will present data from Marshallese that require the ranking in (29ii).

A final note before moving on: the exclusion of $VC{:}^{\mu}.V$ as a possibility rests on the assumption that constraints like SYLL-SEG (Rosenthall 1994 'a segment is not linked both to a mora and a syllable node') or CRISP-EDGE-μ (Baker 1998 'material dominated by a mora is exclusively dominated by it') do not exist. Both constraints eliminate geminates with the syllabification $[VC_i^{\mu}.C_iV]$, since the geminate in that case *is* not exclusively dominated by a mora, given that it links to a mora and a syllable. When top-ranked then, as in hypothetical SYLL-SEG / CRISP-EDGE-μ, *MORAIC ONSET >> ONSET, NO CODA, the undesirable candidate $[VC{:}^{\mu}.V]$ would be rendered optimal. But such constraints should not be part of CON (cf. Keer 1999). As McCarthy (2003) points out, their inclusion fatally predicts unattested contrastive syllabification whenever they dominate ONSET so that /pata/ maps to [pa.ta] but /$pat^{\mu}a$/ maps to $[pat^{\mu}.a]$.

3.2 Marshallese

The Marshallese (Micronesian) data that illustrate that the language exhibits moraic onset *medial* geminates come from stress, as reported in Zewen (1977: 40–41).[14] Stress (marked in boldface here; in the original it is simply stated) is assigned within a trisyllabic window at the right edge. If the final three syllables are light, the antepenult gets stress. Codas, at least final ones, do not count for stress purposes (e.g. ***e**kajet* and not **eka**jet***).[15]

(30) *Trisyllabic words LLL: Antepenultimate stress*

ekajet	'to judge'
nukileb	'to have a big family'
jekaru	'coconut syrup'
lakatib	'to make angry'

If there is a heavy syllable, then it is stressed.

(31) *Trisyllabic words LHL or (L)LH: Stress H*

je.**u:**.rur	'commotion, excitement'
je.ro.**a:n**	'to waste'
kö**rä:**	'woman'
je**lä:**	'to know'
ki**je:k**	'fire'

Penultimate stress appears on disyllabic words where both syllables are either heavy or light, i.e. the leftmost of the two is stressed (32).

(32) *Disyllabic words (either LL or HH): Penultimate stress*

neɓ̩ar	'to praise'
ma:ja:j	'to be clear of underwood'

Default stress then is leftward (within the trisyllabic window), but can shift so that it docks onto a heavy syllable.[16] As we have mentioned already, coda consonants – or at least final codas – do not render a syllable heavy and thus do not attract stress.

[14]Most works on Marshallese ignore stress, e.g. Abo et al. (1976); Bender (1976); Bender (1991); Hendricks (1999). The remaining ones discuss it either briefly (Lynch 2000 based on Rehg 1993) or more generally (Bender et al. work in progress), leaving many issues unanswered. Zewen's description is on the other hand more specific.

[15]Marshallese diphthongs are: ao, au, ai, ae, ei, öu. These act as long vowels. It is implied that the remaining vowel sequences are heterosyllabic. Spelling conventions used in sources and adopted here: (I) from Zewen (1977): ɓ̩=rounded bilabial plosive, i.e. something like b^w, m̩=rounded bilabial nasal, i.e. something like m^w, n̩=n, l̩=l, r=alveolar-coronal trill, r̩=dental-apical trill, (II) from Abo et al. (1976): n̩ = n^w, ū = ɯ.·

[16]Schematically, the stress pattern can be given by the ranking: Trisyll. Window >> WSP >> Align-L (PrWd, Ft), so that heavy syllables get stressed so long as they satisfy the trisyllabic window (see Gordon 2005 and references therein for a possible way to capture the window effect). In the absence of heavies, the leftmost syllable receives stress.

This proves crucial when we consider what happens in the case of medial geminates.[17]

(33) *Geminate stress* (Zewen 1977: 27)

jiƀ**ƀu**ŋ	'morning'
(y)em**m**an	'good'
emm**er**̀	'to be ripe'

These examples suggest tautosyllabic syllabification and contribution of a mora.[18] To show this, see what happens if syllabification were e.g. *jiƀ.ƀuŋ*. Since codas do not contribute any weight, then both syllables should be light, in which case we would expect ***jiƀ**.ƀuŋ*, because this is the leftmost syllable that can carry stress (cf. (32)). For the sake of the argument though, let us assume that only final codas do not contribute weight (maybe because they are extrametrical), whereas medial ones are moraic. Again, ***jiƀ**.ƀuŋ* is predicted since it is the heaviest syllable (cf. (31)). But this is not the right result. The only representation that can give us the correct stress pattern is the following:

(34)

ji.**ƀƀu**ŋ	***jiƀ**.ƀuŋ
(y)e.**m^{w}m^{w}an**	***(y)em^{w}**.m^{w}an

The geminate is wholly syllabified in the onset of the syllable. Moreover, it contributes a mora, which renders the syllable heavy and thus stress-attracting. Unfortunately, no further data are available to shed more light on this issue, but one potential test for stress could be the following: Abo et al. (1976: xxxi) report that Marshallese commonly employs the prefix *ri-* with its various alternants to form person nouns, e.g. *ruwa* 'sailor'. Now, a number of person nouns have their first consonant doubled when this prefix is added, thus *tariaṇae* > *rūttariaṇae* 'soldier'. If stress assignment occurs as described above, then we can imagine the following situation: we take a base like *katta*, which we should expect to be stressed as *katt**a*** if the geminate is tautosyllabic, but *k**a**tta* if it is heterosyllabic. Then we add the prefix *ri-*. Assuming that consonant doubling occurs, what we should get is something like *ri-kkatta*.[19] Given that the leftmost heaviest syllable receives stress, then depending on whether the geminate is tautosyllabic or heterosyllabic, we should expect *rikk**a**tta* or *r**i**kkatta* respectively.

Through this discussion, it should be evident that it is highly plausible to analyse medial geminates in Marshallese in terms of moraic onsets. It is also anticipated that

[17]Here, I deliberately mark only the stressed vowel in bold, as I am going to argue that the anticipated coda-onset syllabification of the geminate is incorrect.

[18]I have managed to spot only four examples with geminate consonants and stress clearly marked. Three of them appear in (33). The exception is *larr̀ik* 'boy' (Zewen 1977: 27) with stress on the first syllable. This suggests a heterosyllabic syllabification. Unfortunately, investigation for additional data has not been fruitful.

[19]Two geminates within a word occur as in *yibbiddikdik* 'many crumbs, grains, morsels' (Abo et al. 1976: 32).

additional data in the future, perhaps from other prosodic phenomena in Marshallese, will corroborate this proposal.

3.3 Trique

Moving on to more speculative ground now, another example of medial onset geminates possibly appears in Trique with respect to compensatory lengthening in a manner similar to Pattani Malay (Section 2.2.2). In the San Juan Copala dialect (Hollenbach 1977), phrasal stress is marked both by the intensity on the ultima of the word receiving it and by lengthening of open long vowels or shortening of short vowels. "The latter is accompanied by compensatory lengthening of an immediately preceding fortis stop, fortis sibilant or resonant" (Hollenbach 1977: 49). If this is accurate, then presumably short vowels get reduced with their mora being inherited by the preceding onset consonant. Given that the language lacks codas (except for word-final laryngeal codas (Hollenbach 1977: 36)), it seems reasonable that the newly created geminate syllabifies wholly in the onset and is rendered a moraic onset. Trique could thus exhibit medial onset geminates.

4 Remaining issues

In this Section I address issues of a theoretical nature that arise as a consequence of the preceding discussion and could perhaps challenge the current proposal. Given that I subscribe to the view that gemination only requires the presence of an underlying mora and consequently double linking of the geminate to higher prosodic structure is not obligatory, the relationship between weight and length in geminates is possibly at stake.

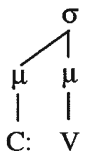
In Section 4.1 however I present recent phonetic work (after Ham 2001) that shows that the added duration of geminates observed in the phonetics is the product of an underlying mora and not of double linking per se. Moreover, I argue that the phonological contrast between geminates and singletons is preserved in all positions. The purpose of this section is more to show that the present account is consistent with various phonetic and phonological findings, rather than to offer a compelling argument in favour of it.

In the next sub-section (Section 4.2), I consider instances of 'weightless' geminates, and argue that these are not real geminates, but simply doubled consonants with two root nodes. Finally, Section 4.3 considers alternatives to the present proposal and shows in what respects these are not viable or adequate.

4.1 Weight and length in geminates

Geminates are longer than singletons, although exactly how long, varies across languages (cf. Ladefoged and Maddieson 1996). In moraic frameworks this property is reflected in the double linking of a geminate to a coda and an onset, as opposed to singletons, which only present single linking. However, in the present proposal certain geminates only associate to an onset through a single link as in (35), thus potentially eliminating the length contrast between geminates and singletons.

(35) *Onset geminates*



Recall that in moraic theory, the distinction between geminates and singletons is between an *underlyingly* moraic consonant /C^{μ}/ versus a non-moraic one /C/. In other words, moraic theory on its own does not impose any double-linking in geminates. As pointed out in Section 3.1, geminates in medial position can achieve better syllabification by spanning the syllable boundary, since the geminate can be moraic in a coda position and provide an onset to the otherwise onsetless syllable that follows. In addition, the resulting double linking can also be interpreted as longer duration.

Word-initially and word-finally no such double linking occurs, and yet, geminates are longer than singletons, although there is impressive variation in duration differences cross-linguistically. In fact, Ladefoged and Maddieson (1996: 91–92) report that, depending on the language, geminate stops can be anywhere between one and a half to three times longer than their singleton counterparts. So if double linking is not necessary, then what about the relationship between weight and duration in geminates? And how can we contrast singletons from geminates?

Starting with the first question, I will claim that adopting the proposals made by Hubbard (1994) and extended by Ham (2001) about moraic primacy in the implementation of timing are entirely compatible with the view of geminates taken here. The main idea in these works is that moras are allocated a minimum target duration, whose implementation in terms of timing takes precedence over any other segment-specific effects, such as place of articulation and voicing. If the main characteristic of geminates is to be moraic, then it is anticipated that the implementational priority is to achieve the mora's minimum duration target, thus leaving smaller space for other durational segment-related differences.

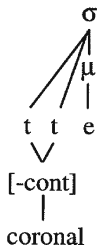
Ham (2001) tested this hypothesis comparing the segment durational effects of voicing and place of articulation in four languages with geminates: Bernese, Madurese, Levantine Arabic and Hungarian. With respect to place of articulation, a strong tendency is that closure duration decreases as the point of oral constriction becomes less anterior (Ham 2001: 215 and references therein). Ham found that the place effect on closure duration is substantially larger in singletons than in geminates. Similarly, although voiced stops are generally shorter than their voiceless counterparts due to the aerodynamic difficulties of sustaining vocal fold vibration in the presence of a complete oral seal (Ham 2001: 217 and references therein), singletons exhibited more voice-conditioned variation in closure duration than the geminates.

Both these findings corroborate the anticipated prediction, namely that due to moraic primacy, geminates should present smaller durational effects on the segmental level compared to singletons. In other accounts, this is unexpected. In particular, studies like Tranel (1991), Selkirk (1990) and others, claim that geminates are not moraic, but inherently long. Their phonological representation

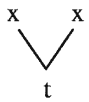
takes the shape of double-linking in terms of two timing slots or two root nodes, as illustrated below.

(36) *Geminate representations based on length*

Selkirk (1990): as two root nodes



Tranel (1991): as two timing slots[20]



The prediction with respect to segmental effects on duration is now different (cf. Ham 2001: 223). More specifically, these should either be greater in geminates, if the magnitude of the effects directly correlates to the number of timing slots, or they should be the same between geminates and singletons, under the assumption that the effects are distributed across both the timing slots. Neither of these predictions corresponds to the empirical facts, whereby segmental effects actually minimize in geminates.

The variability of duration between geminates and singletons is also missed by a two-slot geminate model. This is because such models predict that all else being equal, geminates should have double the duration of singletons owing to the double association to timing structure. Moraic theory on the other hand only says that the geminate is underlyingly moraic leaving the phonetic implementation of phonological weight to language-specific considerations. All in all then, according to Ham, the added duration of geminates observed in the phonetics is the product of an underlying mora and not of double linking per se. As these findings regarding length are entirely compatible with the proposals of the present model, whereby geminates are underlyingly moraic and may present single linking, the length of geminates does not serve as a testing ground for it.

In terms of phonological representations now, we have seen that word-medially languages usually opt for the 'flopped' $VC^{\mu}_{i}.C_{i}V$ structure of geminates, although in some cases, onset $V.C{:}^{\mu}V$ syllabification is chosen, as in Marshallese. Word-finally and word-initially though such preferences are inapplicable and consequently we find single linking of a geminate to a mora, yielding $VC^{\mu}{:}]\#$ word-finally in languages like Hungarian and $\#[C^{\mu}{:}V$ word-initially in Pattani Malay and Trukese.

One question remains. If phonetics and not phonology is responsible for the implementation of phonological weight, then how can we ensure that the surface

[20] A reviewer suggests that the advantage of a skeletal slot model of weight would be that it could equally generate languages with weightless and weighted geminates. Although this is true, it would also carry the serious flaw that it would not be able to distinguish between the two types of geminates, unless it used an additional 'layer' of weight (cf. the Composite Model of Curtis 2003), but then this seems to create a far too powerful system. For additional discussion, see Section 4.2.

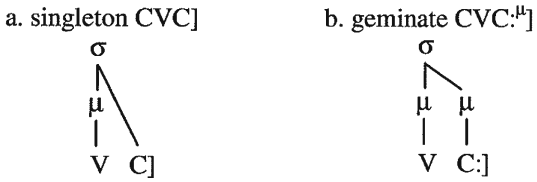
contrast between a singleton CVC$^{\mu}$ (where the coda acquires a mora on the surface through WEIGHT-BY-POSITION/MORAIC CODA) and a geminate CVC:$^{\mu}$ is retained, given that both are phonologically moraic?

First, observe that this issue does not arise word-medially, because the preferred – as discussed previously – 'flopped' structure also serves to distinguish between singletons and geminates as in (37).

(37) *Word-medial distinction between singletons and geminates*

Word-finally however, Ham finds that in all the languages he examined (Bernese, Levantine Arabic and Hungarian), singletons were treated as light (therefore it could be argued that WBYP was inapplicable), but geminates acted as heavy, a fact attributed to their inherent moraicity.[21] The contrast is thus retained word-finally too in the guise of:

(38) *Word-final distinction between singletons and geminates*

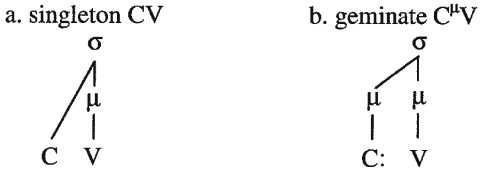


Ham therefore makes the strong prediction that there will be no language which has both heavy singleton CVC$^{\mu}$ and geminate CVC:$^{\mu}$ word-finally; word-medially singletons can be moraic, given that the contrast with geminates is available through other means (cf. (37)). In the sample of languages he has investigated, this prediction holds true; nonetheless further empirical testing is in order.

Word-initially the issue is again resolved easily. In languages like Pattani Malay the contrast between singleton and geminate onsets, e.g. [jàlé] 'road, path' vs. [j:álɛ̀] 'to walk' is represented by assigning a mora to the initial onset of 'to walk', while leaving the corresponding onset of 'road' mora-less.

[21] A reviewer suggests that in Hungarian both CVC]$_{\#}$ singletons and geminates observe the Word Minimality requirement, a fact that is unexpected if CVC is light. However, Grimes (2005) argues that final CVCs with singletons are light, based on frequency results which indicate that the overwhelming majority of monosyllabic words are CVVC and not CVC. One may also find alternations that lead to the same conclusion. For instance, inflected forms come up with a short V, whereas plain monosyllabic ones emerge with the corresponding lengthened vowel, presumably to satisfy the minimality considerations, e.g. [vizet] 'water-GEN' vs. [vi:z] 'water-NOM'. Notably, almost all CVC 'exceptions' include low vowels.

(39) *Word-initial distinction between singletons and geminates*[22]



In the next section, I will briefly consider one more case, that of alleged 'weightless geminates' and argue that since these lack weight, then they cannot be real geminates. A different representation is instead appropriate.

4.2 'Weightless' geminates

As noted before, researchers like Selkirk (1990) and Tranel (1991) claim that the characteristic of geminates is not their input moraicity, but their length, indicated by means of double linking. Tranel in particular proposes the Principle of Equal Weight for Codas, which suggests that the behaviour of singleton and geminate codas should always be identical, in that if a language treats singleton codas as heavy, then geminates should also be heavy, but if the language treats singleton codas as light, then geminates should also be light. Such an assertion, if true, is problematic for moraic theory, and consequently, for the current proposal, which merely extends moraic theory.

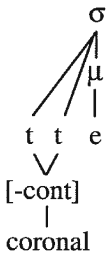
The hazardous aspect of the Principle of Equal Weight for Codas for moraic theory is that the latter actually predicts that it should be possible to have a language where geminates are heavy (because they carry an underlying mora), but singletons are not (because WbyP/Moraic Coda does not apply). Tranel argues that no case of this sort arises. Davis (1999a) however offers evidence from Koya, Sinhala and Hausa where CVV and CVG (G=geminate) syllables act as heavy, whereas CVC and CV ones behave as light syllables. Moraic theory's claim then that what makes a geminate is its underlying weight is corroborated.

This in its turn means that the so-called (light) 'weightless geminates', as in Malayalam, Selkup and Tübatulabal (Tranel 1991), cannot be represented as suggested above. In a view that endorses moraic theory (see also Ham 2001; Hayes 1989), these cannot be real geminates, since geminates are by definition underlyingly moraic. Rather, they are simply doubled consonants with two root nodes (cf. Selkirk 1990), which can receive a representation that involves a complex onset made of two identical consonantal root nodes (also used in Hayes for 'fake' geminates which arise under morphological concatenation).[23]

[22] The same contrast is also available word-medially for cases like Marshallese with 'initial' geminates.

[23] Fake geminates also occur across a syllable boundary when they involve duplicated segments (cf. Schein and Steriade 1986).

(40) *Representation of fake geminates and of doubled consonants*



That this representation seems well-suited for at least some of the languages Tranel discusses becomes evident when we consider, for instance, Malayalam. Mohanan (1986: 73–74) and Mohanan (1989) argue that Malayalam bans codas and that 'weightless geminates' are tautosyllabic in the onset position. Mohanan (1989) is more specific in claiming that the language actually allows codas during initial syllabification, but bans them in later syllabification. It is in the latter stage where this type of 'geminates' are tautosyllabic, as evidenced by native speaker intuitions, language games and word-level restrictions. Given the representation in (40), 'geminates' in Malayalam can thus be argued to be an instance of doubled consonants.

In fact, if geminates and doubled consonants are different species, one may expect to find them co-occur in the same language. This is what Ham (2001) argues for the case of Bernese, since he treats word-medial and word-final geminates as real geminates, but word-initial ones as doubled consonants resulting from morphological concatenation. As a reviewer points out, a final prediction – this time with respect to morphological boundaries – emerges; we can expect to find geminates that syllabify in a coda-onset manner tautomorphemically (due to high-ranked *MORAIC ONSET), but as moraic onset geminates heteromorphemically if linkage across a morpheme boundary has to be avoided. This prediction awaits empirical confirmation.

4.3 Alternatives to the moraic-onset proposal

4.3.1 Gordon (2005)

Gordon (2005) explores the phenomenon of onset-sensitive *stress* focusing on languages like Pirahã (Everett 1988), where onsetful syllables or syllables with onsets of a particular quality seem to attract stress more than others. Since most of the data of the present paper and that of Gordon's do not overlap, it is impossible to provide a full evaluation of that work (but cf. Topintzi 2006 who discusses Gordon's set of data and offers a fuller examination of his account), thus the present discussion will be necessarily limited to parts that are comparable between the two accounts.

Gordon bases his discussion on the notions of adaptation and recovery (Delgutte 1982; Vieimeister 1980). The former expresses the decline in auditory sensitivity to a stimulus while the latter refers to the fact that sensitivity to a new stimulus can be regained by means of a period of silence or reduced acoustic energy. Onsets – and in particular less intense and thus less sonorous onsets – provide exactly this recovery phase best and enhance the perceptual energy of the rime. Thus, (low sonority)

onsets can contribute to weight through the perceptual boost they offer to the following vowel and render it stress-attracting.

This idea is also used to explain why in a $VC_1.C_2V$ sequence, the coda C_1 does not contribute any weight to the immediately *following* syllable. Delgutte (1982) has found that a period of 0–40 ms of preceding silence offers the greatest auditory boost to the following vowel, whereas a silence that lasts 40–100 ms only has a minor effect. Given that most consonants are longer than 40ms, it falls out naturally that only the presence of the first prevocalic consonant (C_2) will offer a significant auditory boost to the following vowel, whereas C_1's contribution to the auditory effect will be insignificant.

Applying this line of thought to geminates is problematic, since Gordon does not predict any significant difference between geminates and singletons, given that the latter are already long enough to sufficiently offer the auditory boost required. The pattern then where a singleton does not render its following vowel stress-attracting, but a geminate does, is not predicted, but this is exactly what we find in Pattani Malay and Marshallese (cf. Sections 2.2.2, 3.2).

A more general problem that Gordon also faces is that he builds a prominence-based account which is inherently designed to account for stress, but less so for other prosodic phenomena such as compensatory lengthening (cf. Pattani Malay, Trique) that clearly make reference to weight. This means that along with prominence, Gordon also does not dispense with weight units (he actually chooses timing slots over moras). The present paper instead has proposed the sole use of moras throughout, so in that respect too it is advantageous as it is more economical.

4.3.2 Shaw (2006)

Unlike Gordon, Shaw (2006), inspired by findings of Articulatory Phonology (Browman and Goldstein 1986; Gafos 2002), focuses specifically on initial geminates and builds a proposal that makes use of gestural co-ordination. Apart from the moraic and syllable level, Shaw adds an additional level of structure, that of segmental gestures. Both consonants and vowels present gestural structure, but only the latter introduce moras of their own. Consonants never bear their own moras, but may *appear* moraic if they overlap with the gesture of a mora-bearing vowel. Consonantal gestures lacking such an overlap surface as non-moraic. This effect results in the contrast between seemingly non-moraic and moraic consonants, which word-initially translates to a contrast between singletons and geminates, as in (41).

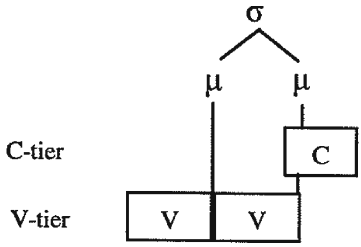
(41) *Non-moraic (a) vs. moraic (b) consonants initially according to Shaw (2006)*

In a geminate (41b), the consonantal gesture overlaps the V-tier and extends past the mora association line of the vowel. Consequently it may appear as moraic, but in reality it is only pseudo-moraic given that its mora originates in the vowel. In (41a) the consonantal gesture does not reach the vocalic mora, so it cannot surface as moraic. Notably, it is assumed that the reason the consonantal gesture in geminates can overlap the V-tier is because this gesture is longer compared to the one of singletons.[24] The importance of this claim will be discussed below. While this approach seems workable for initial geminates, it raises several, more general issues.

First, accepting that consonants never bear moras is problematic. For example, there is good evidence – due to reduplication and syllabification structure pertinent to sonority (cf. Bagemihl 1991) – that Bella Coola allows unsyllabified consonants next to other syllabified consonants provided they are moraic (Bagemihl 1998; Topintzi 2005, 2006). That unsyllabified consonants (indicated in bold) are moraic is highlighted by the fact that obstruent-only words respect bimoraic Word-Minimality, e.g. *tk'* 'sticky' (Bagemihl 1998) as well as Root Maximality which states that Bella Coola roots – not polymorphemic words – maximally consist of four moras. Words like *ƛ'iq**l**kn̩* '(low)dwarf blueberry' that contain a bimoraic CVC [ƛ'iq'], a monomoraic CV [kn̩], and a moraic unsyllabified C [**ɬ**] are allowed, but words that contain just one more unsyllabified consonant are banned indicating that such consonants count for maximality purposes. A proposal like Shaw's that rejects the moraicity of consonants fails to capture these facts.

Moreover, it is unclear how moraic singleton and geminate consonants are differentiated from one another word-medially. Shaw does not offer any representation of medial geminates, but presents one of medial singletons.

(42) *Medial singleton consonants*



The obvious question here is that if it is the *long* consonantal gesture overlapping with a neighbouring vowel that allows a geminate to be moraic, then how can a *short* singleton also be moraic? If both can be moraic, due to the vocalic mora (and not because for example a geminate brings along its own input mora) independently of their length, then what is the factor differentiating between the two?

What is more, given that consonantal gestures can overlap with either the preceding or the following vowel, how is it explained that word-medially the overwhelming majority of languages choose to overlap with the preceding vowel,

[24]This is why Shaw also allows for geminates that are light, but simply long. Their gesture, albeit long, is not sufficient enough to reach the vocalic mora and consequently appear as pseudo-moraic.

rendering a coda and not an onset moraic? Obviously, reference to gestures is not sufficient. Instead, consideration of syllable structure and association of moraicity to consonantal syllable margins is still required.

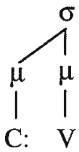
4.3.3 Other alternatives

Two more approaches towards the representation of initial geminates deserve brief examination. In reply to the problem that word-initially a geminate cannot receive the usual coda-onset configuration found word-medially, Davis (1999b) proposes that the first part of the geminate remains unlinked as illustrated in (43a). Adopting this though creates a different problem. Since the geminate mora is unlinked, it should not be able to participate in weight-related processes such as Word Minimality in Trukese, because to do so, linking to higher prosodic structure is required (Kiparsky 2002). One way out is to actually allow the geminate to be linked to the PrWd, which is exactly what Curtis (2003) proposes (43b), but this leads to a new complication; (43b) seems to partially identify initial geminates with unsyllabified, yet moraic, consonants like the ones surfacing in Bella Coola (Bagemihl 1991, 1998) or Piro (Lin 1997), even though the status of geminates provides no evidence against syllabification.

(43) *a. Davis (1999b)* *b. Curtis (2003)*

The representation of initial geminates as moraic onsets (44), however, bypasses all the problems above: the geminate is fully prosodified and thus can contribute to syllable weight without difficulty (cf. (43a)); it is dominated by the syllable node, consequently it no longer bears any resemblance to unsyllabified consonants (cf. (43b)); finally, by being in a moraic onset position, it avoids the flopped structure yet retains the mora that is characteristic of geminates.

(44) *Initial geminates as moraic onsets*



5 Conclusion

This paper has argued for the existence of onset geminates both initially and medially. On the one hand it has adhered to moraic theory's proposal that geminates

are underlyingly moraic consonants (cf. Hayes 1989), but on the other, it has departed from the standard assumption that onsets are never moraic, as this is merely a stipulation, whose validity has already been questioned in the past (cf. Everett 1988; Goedemans 1998; Gordon 2005), but has not been unequivocally challenged. The present paper hopes to have shown that the prosodic inertness of onsets can no longer be maintained.

More specifically, it has been demonstrated that the syllabification and moraification of an initial moraic geminate wholly in the onset resolves one of the longstanding problems of standard moraic theory, namely its inherent inability to represent a geminate with the familiar coda-onset structure in word-initial position. The problem is settled by allowing the geminate to be simultaneously syllabified and moraified as an onset without any ad hoc assumptions that either leave part of it unlinked to any structure (Davis 1999b) or unsyllabified and linked to higher prosodic structure (Curtis 2003). The implementation of this idea in Pattani Malay successfully accounts for the facts at hand and also improves on the previous analysis by Hajek and Goedemans (2003) by dispensing with their undesirable proposal of prioritisation of onset weight.

The proposal has subsequently been extended to medial positions. This is an entirely reasonable step given that nothing precludes the existence of *medial* moraic onsets. Combining this with the fact that moraic theory only asks that a geminate bear a mora without imposing any particular syllabification, it is logically possible and in fact attested – in languages like Marshallese and Trique – to have a /CVC$^{\mu}$V/ form syllabify as CV.C$^{\mu}$:V instead of the more familiar CVC$_i^{\mu}$.C$_i$V. The latter's split syllabification is a by-product of syllable well-formedness, but not necessitated by the weight theory itself.

The ranking NoCoda >> *Moraic Onset expresses the preference to syllabify a geminate wholly in the onset to avoid the creation of closed syllables. The reverse ranking produces the opposite result, namely of syllabifying medial geminates in a coda-onset configuration, and thus avoiding the creation of moraic onsets. Medial onset geminates may be rare, but this can be seen as a direct consequence of the general avoidance of moraic onsets that the overwhelming majority of languages exhibit. Their occurrence is thus scarcer, but by no means impossible.

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