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Lenition and metathesis in Hawu: A quantity-sensitive language

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Abstract
Hawu shows highly unusual distributions of strength/weakness. Firstly, it appears unique in restricting schwa to stressed positions, excluding it elsewhere. Secondly, Hawu has undergone rampant intervocalic lenition of consonants, except after schwa where consonants are immune to lenition and are automatically geminated. This situation creates unusual synchronic structural contrasts. Hawu seems to be unique, appearing to violate a linguistic universal, however, this will be revealed to be due to its phonology-to-phonetics mapping known as virtual length. From a revised phonological perspective, Hawu's strength distribution is actually commonplace: a quantity-sensitive language with metrical bolstering, like Italian. This offers an explanation for, firstly, the otherwise unrelated lack of (C)ə́V word-shapes; and, secondly, the strange diachronic condition on metathesis, that it only applies across consonants: *$V_{\alpha}CV_{\beta}$ > $V_{\beta}CV_{\alpha}$ - *ika > [ə́k:i] 'tie/bind' vs. *VαVβ **(> VβVα) *bua > [búe] **[bə́u] 'fruit'. Both facts are explained via quantity restrictions imposed by Hawu's metrical system.

Keywords: phonology, Austronesian, Italo-Romance, quantity-sensitivity, metathesis, Strict CV

1. Introduction

Hawu (Glottolog code: sabu1255) is a Malayo-Polynesian language spoken by approximately 100,000 people on Savu and Raijua of the Lesser Sunda Islands. The closely related language, Dhao is spoken by some 5,000 people on the nearby island of Ndao. Much of what is discussed in this paper is true also for Dhao, but there are significant differences, and the languages are no longer mutually intelligible. Literature discussing Hawu consists primarily of Blust (2008; 2012), Grimes (2006) and Walker (1982), as well as some older sources whose findings are largely incorporated into Blust (2008).[1]

Hawu remains an understudied language and the analysis that follows is a phonological one based on the pattern reported primarily by Blust (2008; 2012). This paper demonstrates, for the first time, the potentially unique aspects of its phonological system, and hopefully this will spur further work on the language. Specifically, as a reviewer mentions, careful phonetic measurements of the language would be warranted. Though these are unlikely to change the phonological aspect of the analysis that are presented in this paper, they are undoubtedly required to provide a more complete description of the

[1] Thank you to Jacklin Bunga for providing me with audio samples and information on the language, and to the editors Kúnmi Ọlátúnjí and Joseph Lovestrand for their dedication to the volume. Thanks also go to Tobias Scheer and Noam Faust for comments on the manuscript, and finally to Steve Parker for his generous and extensive comments as well as to Andriana Koumbarou whose comments helped improve the structure of the paper.

language's phonetics, and they may indeed throw up some phonologically relevant facts that are hitherto unknown.

Section 2 introduces the reader to basic facts of Hawu and puts its vowel distributions and diachronic consonant-lenition pattern in a typological perspective. It discusses the language's diachronic process of metathesis and presents its resultant synchronic phonological pattern – remarking on its typologically oddity.

Section 3 then provides an overarching explanation for the pattern; it diagnoses Hawu as a quantity-sensitive language with metrical bolstering. The distributions are, structurally speaking, remarkably similar to those of Italian (for instance). This comparison is demonstrated, and it requires understanding Hawu as a language with virtual length. This is a non-transparent mapping between phonological representations and phonetic forms which is robustly attested for Semitic languages, but which is previously unknown in analyses of Austronesian. Since virtual length is not well known, the concept is introduced for the unfamiliar reader in this section.

Section 4 then discusses Hawu's quantity system and word-minimality in light of virtual length. This is done in the framework of Strict CV. The framework's basic assumptions and mechanism are presented for the unfamiliar reader in this section.

Section 5 then provides the core of the analysis. In light of its metrical requirements, this section explains the word-shapes that are synchronically possible in Hawu. It then relates this to an otherwise apparently unrelated fact, the diachronic development of metathesis in the language. Finally, the conclusions are presented in Section 6.

2. Hawu facts and typological implications

Blust (2008) provides an invaluable and detailed diachronic account of the development of Hawu phonology. The Hawu consonant and vowel inventory is listed in (1).

(1) Consonant and Vowel inventories

p	t		k	ʔ	i	
u						
b	d	ɟ	g		e	ə
o						
ɓ	ɗ	ɗʲ	ɠ			a
m	n	ɲ	ŋ			
				h		
	r l					
w						

There are no tautosyllabic consonant clusters. Hawu has many words of the shape $(C)V_x.V_y$, but these sequences are disyllabic: [ni.ŋa.a] 'what' (Grimes 2006); an argument for this is found in Walker (1982). There appears to be only extremely marginal contrastivity of long vowels. They cannot be found, for instance, preceding a consonant: *CVVCV(CV), and when they do occur, they appear only in final position (cf. [niŋaa] 'what'), which may be ideophonic. Stress is also non-contrastive in the language and treating these few final long vowels as disyllables allows for a fixed stress system

(penultimate): [peké.e] ‘neigh’ vs. [péke] ‘tell.SG’ (Walker 1982: 7). The only vowel that is permitted in the antepenultimate syllable is /e/. The canonical word-shape is: (C)(e)(C)V(C)V (Blust 2008: 7).

2.1. Vowel quality and its position in the word

The three requirements of Hawu mentioned so far are that (a) syllables are without consonant clusters, (b) vowel-vowel sequences are disyllabic, and (c) stress is penultimate. These facts create a regular prosodic shape to words. Vowels can be located in three essentially uniform environments: the stressed position, the post-tonic position, and (optionally) the pretonic position. As is shown in (2), Hawu has some strict phonotactic restrictions regarding the distribution of vowel quality and these three canonical positions.

(2) Positions of vowels

Pretonic		**Stressed**		**Post-tonic**	
C	V	C	V	C	V
	{e}		{i, a, u, o, e, ə}		{i, a, u, o, e}

In the pretonic position, all vowels were diachronically neutralized to schwa and subsequently shifted to ‘e’ (Blust 2008: 70): *s**u**maŋəd > h**e**maŋa ‘soul/life force’, *k**a**mali > k**e**mali ‘men’s house’, *k**a**l**i**-wati (> *k**ə**l**ə**wati) > k**e**late ‘earthworm’ (Blust 2008: 69).

Schwa is restricted to stressed positions. It is inherited from *ə, which was also stressed: *bə́qak > [ɓə́k:a] ‘split’, *lə́ku > [lə́k:u] ‘fold’ (Blust 2008: 70).

Elsewhere, *ə shifted to ‘a’ if it became word-final through final consonant loss: *tanəm > dan**a** ‘bury’, *daləm > ɗar**a** ‘in/inside’, *tələn > [dəl:**a**] ‘to swallow’ (Blust 2008: 70).

In addition to ‘a’, the final position also gained ‘e’ and ‘o’ from monophthongisation of *aj: *b-in-ahi (> *bin**aj** > bin**e**) > [bən:i] ‘woman’, *beR**aj** > [wi**e]** ‘give’, and *aw: *pan**aw** > [an**o**] ‘leucoderma’ (Blust 2008: 69). The final position also gained ‘i’ and ‘u’ through metathesis (described in Section 2.4), as well as inheriting these vowels directly: *lək**u** > [lə́k:**u**] ‘fold’.

Returning to the restrictions on schwa, there is no stressed schwa in a (C)V_xV_y word structure: **(C)ə́V (Blust 2012: 7).[2] Blust (2008) attributes this to a further (more general) condition that schwa is never found in contact with another vowel (Blust 2012). A condition in the earlier historical condition that occurred prior to Proto-Sumba-Hawu where ***ə*** is deleted when in contact with a vowel: *qah**ə**lu (> *qa**ə**lu) > [alu] ‘pestle’, *ma-buh**ə**k (> *mabu**ə**k > mabuk) > [mawo] ‘drunk’ (Blust 2008: 70). This historical contingency eliminates a large potential source for (C)ə́V sequences. Because schwa in Hawu is inherited from ***ə***, Hawu sequences of the shape (C)ə́V are primarily expected to develop from *(C)əV sequences, however these had already shifted to (C)V (Blust 2008). There is no condition banning prevocalic Vs (*keli > [kei] ‘dig/dig up’), however, the

[2] Grimes (2006) does give a few such forms, though they are mainly sub-minimal words such as grammatical particles. These do not appear in Blust (2008). Schwa is claimed not to be found before vowels (Blust 2012: 7), perhaps with a few exceptions.

restriction on (C)əV sequences is still active. This condition appears to be synchronically enforced because there have been no subsequent vowel shifts to (C)əV, despite the ample opportunities for these sequences to form via metathesis (Section 2.4).

2.2. Typological observations

The synchronic vocalic restrictions of Hawu are summarized here.

(3) a. Schwa can only occur in stressed positions; (corollary) schwa is banned from prosodically weak positions.
b. Schwa is banned from (C)əV sequences.
c. Only ‘e’ is allowed in pretonic position.

While it is common in related languages of the region to neutralize pretonic vowels to a vowel other than schwa, it is not common for this to be done in a language that also has a schwa vowel.

Timugon Murut (phonologically schwaless) limits the pretonic positions to ‘a’ (or ‘o’ under vowel harmony (Kroeger 1992; Barnes 2003)). This proceeded via an earlier schwa stage (Blust 2008: 69; cf. Barnes 2003). Hawu is particular in only having pretonic ‘e’ (Blust 2008).

When it comes to the distribution of schwa, Hawu is shown to go against typological preferences. Almost universally, schwa constitutes a phonologically weak vowel. Fittingly, it is often restricted to unstressed positions and weak positions, where it is additionally often elided (merging with zero). Due to this deleteability in weak positions, a number of languages ban word-final schwa, such as Hindi (Pandey 1990 and references therein), however, perhaps no other language than Hawu bans schwa from *all and only* prosodically weak positions.

Typologically, schwa is frequently systematically banned from stressed positions. English is one well-known example; it has pre- and post-tonic schwa, but schwa is excluded from the tonic position (Harris 1997; Gussmann 2002: 125). Many other languages share this restriction, to name a few non-related examples, one could give: Indonesian (Cohn 1989), Javanese (Ras 1982), Dutch (van Oostendorp 2000; Flemming 2007), and Tundra Nenets (Salminen 1993).

Yet other languages have schwa in all positions and only stress the schwa if no full vowel is present in the word. In these languages, the placement of fixed stress shifts away from its canonical position when the canonical position contains schwa: T’boli (Southern Mindanao, Austronesian) (Awed, Underwood & Van Wynen 2004), Tondano (Sneddon 1975) and Sye (Vanuatu) (Crowley 1998). Another common situation is for languages to have prosodically irrelevant epenthetic or intrusive schwas (for careful discussion and many examples, see Hall (2006). Finally, while there are some few languages that permit stressed schwas, such as some dialects of Catalan and Zabiče Slovene (Crosswhite 2001), all these languages *also* allow schwa in prosodically weak positions.

To my knowledge there is no language like Hawu where schwa is entirely restricted to the stressed position. Hawu seemingly violates a universal constraint against schwa being restricted to stressed positions / excluded from all weak positions.

2.3. Consonant lenition

The diachrony of Hawu is characterized by much consonant lenition and deletion; the conditions on these are informative. Consonants in the initial position were only sporadically affected by lenition, whereas final consonants were all deleted in Hawu (Blust 2008: 64). Elsewhere, the intervocalic position underwent regular and pervasive weakening, as is shown in (4). Curiously, there was only one intervocalic context where consonant lenition was resisted: following a schwa. This situation creates some unusual structural contrasts.

As shown in (4), all consonants are automatically geminated after a stressed schwa (Walker 1982). Blust (2012) hypothesizes that the geminate status of these post-schwa consonants allowed them to resist lenition via the well-known effect of geminate inalterability (Kenstowicz & Pyle 1973; Guerssel 1978; Kenstowicz 1994). The reason for this special gemination will be explained in Section 3.

(4) Intervocalic lenition and contrast in Hawu (based on Blust 2008: 64–69)

			Weak				**Strong**			
*p	>	(p ~ ∅)	*ní**p**i	>	ní	‘dream’	*ə**p**at	>	ə**p:**at[3]	‘four’
*t	>	(t ~ d)	*má**t**a	>	má**d**a	‘eye’	*bə**t**ak	>	wə**t:**a	‘split’
*k	>	(k ~ ʔ)	*paní**k**i	>	ní**ʔ**i	‘fruit bat’	*lə**k**uq	>	lə**k:**u	‘fold’
*b	>	(b ~ w)	*qá**b**u	>	qá**w**u	‘secret’	*sə́**b**u	>	hə́**ɓ:**u	‘stream’
							*tə**b**uh	>	də̃**b:**u	‘cane’
*d	>	(d/ɗ ~ r)	*tá**d**a	>	tá**r**a	‘cockspur’	*kə́**d**en	>	kə́**ɗ:**u	‘stand’
*ɟ	>	(ɗ ~ r)	*pá**ɟ**ay	>	pa**r**e	‘rice’	*qapə́**ɟ**u	>	pə́**ɗ:**u	‘gall’

Typologically, post- and inter-vocalic spirantisation is extremely common, but it is far less common for the quality of the vowels to be a determining factor. Conditions such as ‘lenite after labial but not coronal vowels’ is entirely unheard of. Moreover, it is not standardly expected for intervocalic lenition to be blocked in post-tonic position. Indeed, post-tonic intervocalic positions are one of the weakest possible environments (Harris 1997). Consider the English pattern: [tʰɒ́m] ‘Tom’, [tʰɒ́ʔə] ‘totter’, [ǽʔəm] ‘atom’, [ətʰɒ́mık] *[əʔɒ́mık] ‘atomic’.[4]

2.4. Metathesis

Hawu is perhaps best known for regular diachronic metathesis (Blust 2008; 2012).[5] The generalization can be stated as in (5).

(5) Metathesis generalisation

a. ***If*** V_2[–high] ***prec*** C ***prec*** V_1[+high]
Then V_1[+high] ***prec*** C ***prec*** V_2[–high]

[3] Blust (2008) and subsequent work never marks consonantal phonetic length of geminates because it is entirely predictable, this will be marked consistently in this paper as their length is key to the analysis.
[4] English examples of post-tonic intervocalic lenition after schwa cannot be supplied because schwa is not strong enough to occupy this position, again highlighting Hawu’s unusual strength distributions.
[5] This has been reanalysed as pseudometathesis (feature spreading) by Lysvik (2015). The argument in this paper speaks to either proposal.

b. ***And*** V_1 shifts to [ə]
C geminates

Though there is one exceptional form (*binə > [bə́n:i] ‘female/woman’), the [–high] vowel in the generalisation is almost exclusively ‘a’ (Blust 2008: 71). The metathesized word-shapes are therefore practically always iCa or uCa (ibid.). The order of the high and non-high vowel is reversed (6a) and in all cases, the metathesized ‘a’ becomes schwa once it is stressed.

(6) Metathesis

a. *iCa > əC:i

*miŋak	(> *miŋ**a**)	>	[mə́ŋ:i]	‘fatty, oily’
*lim**a**		>	[lə́m:i]	‘five’
*piɟa	(> *pir**a**)	>	[pə́r:i]	‘how (many)’[6]

b. *uCa > əC:u

*pusəj	(> *uh**a**)	>	[ə́h:u]	‘navel’
*kudən	(> *ur**a**)	>	[ə́r:u]	‘cooking pot’
*sukat	(> *suk**a**)	>	[hə́k:u]	‘measure’

In addition to these facts, there is a curious condition on Hawu metathesis: the C shown in generalization (5) is obligatorily part of the context. Crucially (but very strangely), metathesis can only apply if a consonant intervenes: (a) *buaq (> *bu.a) > [bu.e] **[bə́.u] or **[bá.u] or **[bu(:)] ‘fruit’, (b) *liaŋ (> *lia) > [li.e] **[lə́.i] or **[lá.i] or **[li(:)] ‘cave’ (Blust 2008: 71; 2012).

There is no natural explanation for metathesis obligatorily occurring across a consonant. Especially because in Hawu all V_xV_y sequences are disyllabic. This means that the metathesis is being blocked specifically by an empty onset (C-slot in the syllable structure). This point is particularly evident considering the pseudo-metathesis account presented in Lysvik (2015).[7]

(7) Empty onset blocks metathesis

(a) *bula > [bə́l:u] ‘forget’ (b) *bu.a > [bu.e] **bə́u ‘fruit’ (no metathesis)

[6] Here (and elsewhere) stops are shown to lenite before metathesis, however, many other forms show the metathesised form without lenition. In all cases, the consonant is automatically geminated after schwa (Walker 1982; Blust 2012).
[7] Though this paper is focused on metathesis in general and does not discuss CV.V forms

Lysvik (2015) represents this VV metathesis as final vowel loss plus feature spreading (7a). Whatever the mechanism, (7b) further shows how arbitrary it is for metathesis to be blocked by an empty onset.

2.5. What requires analysis?

The Hawu facts that require discussion and reanalysis or explanation are summarized in (8).

(8) Explananda

a. Schwa, a universally weak vowel, can only occupy the stressed position. It is excluded from prosodically weak positions. (This distribution appears unique to Hawu.)

b. Schwa triggers gemination of a right-adjacent C. Diachronically this allowed C to resist lenition, unlike after any other vowel: [lə́k:u] ‘fold’ vs. [níʔi] ‘fruit bat’.

c. There are no Cə́V sequences. Metathesis is blocked in $CV_{[+high]}.V_{[-high]}$ forms. Metathesized final /a/ becomes schwa in stressed position.

3 Hawu as a quantity-sensitive language and its schwa

3.1 Schwa in Hawu

I start by addressing explanandum (a), the unusual distribution of schwa. It is helpful to distinguish between phonetic and phonological definitions of schwa. Phonetically, schwa refers to a vowel quality approximated by the IPA symbol: [ə]. Phonologically, however, a schwa is a ‘featureless vowel’, or a null set dominated by a nucleus (a.k.a. an empty nucleus (Charette 1991)). The phonetic interpretation of this empty nucleus is language specific. Examples are shown in (9).

(9) Empty nuclei and phonetic interpretation (for more, cf. Scheer 2004)

	Phonetic Quality	**Language**	**Source**
a.	[ə]	French	(Charette 1991)
		Tocharian	(Koller 2008)
		Upper Chehalis (Salish)	(Kinkade 1998)
		Malayalam	(Sadanandan 1999)
		Chukchi, Itelman, Karo Batak, Ladahki, Malay, Wolof	(DeLacy 2002 Lombardi 2002)
b.	[ɨ]	Moroccan Arabic	(Kaye 1990)
		Turkish	(Charette & Göksel 1998)
		Pattani Malay	(Topintzi 2010)
c.	[ɯ]	Japanese	(Ito & Mester 1995)

d.	[i]	Yawelmani	(Archangeli 1984)
		Arabic dialects (Lebanese)	(Abdul-Karim 1980)
		Yoruba, Samoan	(Uffmann 2007)
		Tongan	(Kitto 1997)
		Cantonese	(Yip 1993)
		Navaho	(Lombardi 2002)
e.	[e]	Hebrew	(Bolozky 2005)
		Central Italian (Word-Final)	(Repetti 2012)
		Gengbe (at least in initial position)	(Lombardi 2002)
		Sawai (in final position)	
f.	[ʌ]	Tundra Nenets	(Lombardi 2002) (Kavitskaya & Staroverov 2008)
g.	[a]	Axininca, Lardil, Marathi, Balochi, Brahui, Sundanese, Wapishana, Iraqw, Klamath, Dakota, Coos, Mabalay Atayal	(Lombardi 2002)
h.	[ɔ]	Bengali	(Heimisdottir 2013)

3.1.1. Schwa allophony in Hawu

The hypothesis I pursue for Hawu is that only *phonetic* schwa is restricted to stressed positions. Phonological schwa can occur in all positions: pretonic, stressed and post-tonic positions, however, phonetically it manifests differently in pretonic and post-tonic position, not unlike Italian, with its initial [i] epenthesis and its final [e] epenthesis (Repetti 2012).

I claim there are three allophones of schwa. Schwa surfaces as [e] pretonically, [ə] in stressed position, and [a] post-tonically. Diachronically, the development of pretonic e-schwa and post-tonic a-schwa result from neutralisations to or from a schwa stage. I argue these have since only changed their phonetic quality rather than their featural identity.

Hawu's pretonic [e] originates from the neutralization of all vowels to schwa: *s**u**maŋed (> *h**ə**maŋa) > [h**e**maŋa] 'soul/life force', *k**a**mali (> *k**ə**mali) > [k**e**mali] 'men's house', *k**a**l**i**-wati (> *k**ə**l**ə**wati) > [k**e**late] 'earthworm' (Blust 2008: 69). This first step in this change, the neutralization to schwa, is consistent with lenition (and loss of vocalic distinctive features) in unstressed positions such as the pretonic (Crosswhite 2001; Harris 1997).

The final position also underwent neutralization, though a less drastic one. Word-final schwa *ə merged with final *a: *tan**ə**m > [dan**a]** 'bury', *dal**ə**m > [ɗar**a]** 'in/inside', *t**ə**l**ə**n > [d**ə**l:**a**] 'to swallow' (Blust 2008: 70). The merger with 'a', is attested in a round-about way. It is widely accepted that [ə] can be the phonetic expression of an unstressed 'a' (cf. Malagasy). The final schwa of Modern London English[8] is actually phonetically

[8] This is usually referred to as Multicultural London English, a term I object to as I find all English is multicultural.

pronounced with a low vowel: [bɹávɐ] ‘brother’. This is also a feature that it shares with other English varieties, New Zealand (one variant) (Bauer & Warren 2004), Fiji (Tent & Mugler 2004), [ʌ] in Pakistani English (Mahboob & Huma Ahmar 2004) and many more. The hypothesis for Hawu is that unstressed [a] is a ‘schwa’, that is, still phonologically featureless. Phonologically, schwa is not restricted to the stressed position; it is found in all positions.

(10) Distribution of schwa and phonetic interpretation

		Pretonic		**Stressed**		**Post-tonic**	
		C	V	C	V	C	V
If	Phonology:		{ }		{ }		{ }
Then	Phonetics:		[**e**]		[**ə**]		[**a**]

Consequently, Hawu does not have a unique distribution of vocalic strength and weakness, rather Hawu has the typologically ordinary pattern of permitting less contrasts in pretonic and post-tonic positions, as well as hosting a larger array of contrasts in stressed position (cf. Crosswhite 2001). This analysis is confirmed by the alternations from metathesis that will be explored later: suk**a**t (> *suk**a**) > [h**ə́**k:u] ‘measure’.

3.2. Gemination, lenition and schwa

Although schwa has no phonological positional restrictions, there is one strong phonotactic restriction on a stressed schwa, stated in (11). Its discussion takes us directly into the heart of the second explanandum (8b).

(11) **If** schwa is in stressed position, **then** it must be in a closed syllable (preceding a geminate)

This distribution of schwa is similar to a family-wide preference in Salish languages to ban schwa from open syllables (Kinkade 1998: 209). These languages often feature əC.C vs. á.CV alternations such as this one from Upper Chehalis: s-p**ə́l**xw-t-n & sp**ála**xw-t-n, s-p**ə́l**’xw-n & p**ála**xw-n ‘doctor, cure.transitive’ (Kinkade 1998: 206). Like Hawu, schwa is permitted to be stressed but only in closed syllables.

The previous section demonstrates that, in stressed position, schwa is restricted to closed syllables. This observation has wide reaching implications that speak to the second explanandum (8b), repeated here for convenience.

(12) Explanandum (b)

> Schwa triggers gemination of a right-adjacent C. Diachronically this allowed C to resist lenition, unlike after any other vowel: [l**ə́k:**u] ‘fold’ vs. [n**íʔ**i] ‘fruit bat’.

The relevant structural contrast is: $\acute{V}C_{(weak)}$ vs. $\acute{ə}C_{(strong)}$. Abstracted from its quality, the pattern can be interpreted as: $V_{(strong)}C_{(weak)}$ vs. $V_{(weak)}C_{(strong)}$. This configurational contrast is highly reminiscent of the weight trade-offs between Vs and Cs in languages with Metrical Lengthening (i.e. Standard Italian).

(13) Metrical Lengthening in Standard Italian[9]

	$V_{(strong)}C_{(weak)}$				$V_{(weak)}C_{(strong)}$		
a.	[ví:peɾa]	**[vípeɾa]	'viper'	vs.	[dít:eɾo]	**[dí:t:eɾo]	'fly genera'
b.	[muɾé:na]	**[muɾéna]	'moray eel'	vs.	[pét:o]	**[pé:t:o]	'chest'

Standard Italian shows this structural strength-based opposition through phonetic length: (V:C vs. VC:). Tuscan (Italian) goes further by maximizing this strength-based opposition by expressing it with both phonetic length and segmental quality (strong = stop vs. weak = fricative) (Marotta 2008; Ulfsbjorninn 2017).

(14) Gorgia Toscana and length

a.	/pɔ́ko/	[p**ɔ́:x**o]	'few/little'
b.	/kɔ́k:o/	[k**ɔ́k:**o]	'coconut'

The Tuscan pattern reveals a structural contrast based on both length and strength of the consonant. In stressed positions, long vowels are accompanied by lenited singletons and short vowels accompany strong, unlenited consonants. The parallel with Hawu is sketched in (15).

(15) Strength and length distributions in stressed positions in Tuscan and Hawu

a. Tuscan

ɔ́:x		**ɔ́k:**	
V [long]	C [continuant]	V [short]	C [occlusive]
Strong	*Weak*	*Weak*	*Strong*

b. Hawu

íʔ		**ə́k:**	
V [full]	C [short]	V [schwa]	C [long]
Strong	*Weak*	*Weak*	*Strong*

The Tuscan contrast shown in (15a) demonstrates that a strong long vowel is offset by a weak lenited non-occlusive consonant. Conversely, Tuscan also has a weak short vowel that is compensated for by a strong consonant that is long and can be occlusive.

It is not the phonetic property of the vowel that causes the strengthening of the consonant. That misunderstanding underlies the apparent paradox embodied in explanandum (b): "schwa (the weakest of vowels) causes the strengthening of consonants." In fact, it is the strength inherent to the stressed position that is not satisfied by a weak vowel. Neither the short vowel of Tuscan, nor the schwa of Hawu can satisfy stress. In both languages, the stressed position requires more in the way of phonological weight than a short vowel or a schwa can provide. In both languages, however, a stressed position can contain a weak

[9] This refers to Standard Italian 'Variety A'. Vowel length is not restricted to open syllables in penultimate position.

vowel, but it is compensated for by the strength of an adjacent consonant. I propose therefore that, like Tuscan Italian (and also Norwegian, Icelandic and many other languages), Hawu is quantity-sensitive with metrical lengthening/bolstering.

3.2.1. Metrical lengthening/bolstering in Hawu

I will present the argument here that, like Tuscan, Hawu has a prosodic condition on the number of objects in the stressed position. Expressed in standard terms, all words must contain a syllable dominating two moras. In Hawu, the first of these two moras corresponds to a schwa, while the other comes from the geminate: (l**ə**$_{\mu}$**k**$_{\mu}$)$_{\sigma}$.ku ‘fold’. In order to be explicative, this weight requirement is minimal and maximal. The stressed position must minimally and maximally contain two units of weight: (a) Italian - [k**á:**ne] **[káne] *cane* ‘dog’ & [k**án**:e] **[ká:n:e] *canne* ‘spliffs’ (b) Hawu - [l**ə́k**:u] **[lə́ku] ‘fold’.

For Tuscan this minimal-maximal requirement is phonetically evident in all forms, but in Hawu this phonological status must be inferred. However, we know it must be the case with an argument that follows logically from something we can directly observe: the schwa’s behaviour under stress. Even remaining agnostic about the representation, the argument is sketched out in (16).

(16) Argument for minimally ‘heavy rimes’ in Hawu

a. **Observation**	In Hawu, a schwa is not enough, on its own, to occupy a stressed position (it obligatorily induces gemination).
b. **Axiom**	Consistent with autosegmental principles: Where *x* is melody and *y* is a position/skeletal slot/mora, *x* may associate to *y*. If *x* associates to *y*, then *x* has the value of 1*y*, if *x* associates to *y* and another *y* it has the value of 2*y*.
b′. **Corollary**	Schwa cannot occupy half a skeletal slot, or half a mora, or half a unit of weight, it is either linked or not linked.
c. **Conclusion**	We know a schwa occupies minimally one position *and* we know that the schwa on its own is not enough to satisfy the requirements of a stressed position.
d. **Observation**	A schwa and a geminate satisfy the requirement together.
e. **Inference**	The geminate occupies a second position.
f. **Conclusion**	A stressed position requires minimally two positions: C**ə́**$_{\mu}$C$_{\mu}$.CV, CV́.CV = CV$_{\mu\mu}$.CV

In both languages, a coda consonant or geminate will be present in the phonetic form. From this, the learner can deduce the weight it provides to its syllable. In addition to this, as an extra phonetic cue, Italian /CV́CV/ forms are bolstered by a prolonged duration of the vowel: [CV́:CV].

Hawu must be the same because, as is demonstrated in (16), stressed positions must contain a heavy syllable. However, this vowel does not have to be phonetically marked by extra duration, evidently because Hawu has phonetic [CV́CV] sequences. However,

Hawu is only different from Tuscan because what Tuscan does with duration, Hawu does with vowel quality.

In stressed position, a full vowel quality [a,e,i,o,u] corresponds to a phonologically heavy nucleus, in standard terms, full phonetic vowel quality indicates a bimoraic phonological object. It behaves like a heavy vowel of Tuscan, regardless of its phonetic length.

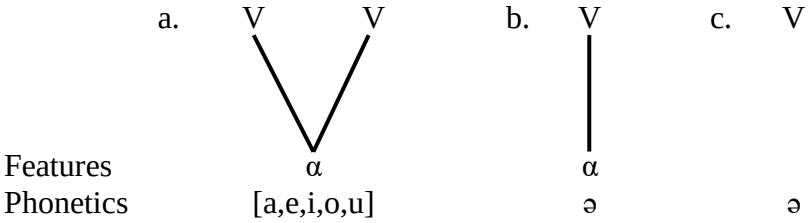
A phonetic schwa, on the other hand, does not correspond to a phonological heavy/bimoraic object. Since schwa is monomoraic, it behaves like a short vowel of Tuscan and it is obligatorily followed by a geminate in its second stressed position. This way, in Hawu, just as in Tuscan, all stressed positions are phonologically heavy: C**ə$_{\mu}$C$_{\mu}$** or C**[á/é/í/ó/ú]$_{\mu\mu}$**.

This mapping of phonological weight to vowel quality rather than duration is known as virtual length. Because not all readers may be familiar with this concept, I introduce virtual length briefly in the following subsection.

3.2.2. Virtual length

Virtual length is the term for a certain kind of phonology-to-phonetics mapping. At the phonological level, it involves bipositional structures (one-to-many relations) that define *phonological length* (Scheer 2014), defined by *bipositionality* (occupying two positions). Virtual length is a situation where the bipositionality of a phonological structure is phonetically translated as anything other than increased duration. There is a large phonetic range of properties that have been argued to correlate with phonological bipositionality (see Scheer 2014 for a summary). The type of mapping that relates to Hawu is one robustly and importantly synchronically attested in various Afro-Asiatic languages. A number of these languages are shown to map phonetic schwa to a monopositional/short vowel, while vowels of a 'full' phonetic quality [a,e,i,o,u] are phonologically bipositional, attached to two positions of syllable structure (despite being phonetically short). For the argumentation as relates to Semitic and Kabyle Berber see Lowenstamm (1991; 2011)(1991, 2011) and Ben Si Saïd (2011), respectively.

(17) Virtual length (Scheer 2014)



The diagram in (17) shows how a bipositional phonological object, in opposition with a monopositional object, can be phonetically interpreted as a short vowel with a full vowel quality. Meanwhile, a monopositional structure is interpreted as schwa. A featureless schwa vowel would also be the phonetic interpretation of a single V position, except that the V is not attached to phonological features. This difference is phonetically neutralized, but the distinction can be shown by various processes depending on the language such as

(17b) revealing its quality when the vowel is lengthened unlike (17c), which is featurally empty, and which can alternate with zero (see the literature above for examples).

4. Hawu vowel quality and phonological weight

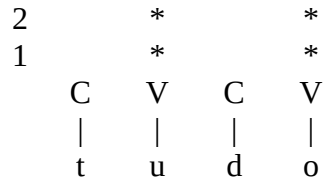
The metrical framework used here is based on Ulfsbjorninn (2014), a Strict CV grid-theory of word stress that builds on Scheer and Szigetvari (2005). Because it is a rather new approach, the metrical model is introduced in the following subsection. Then we will return to discussion of the weight requirements and phonetic interpretation of that weight in Section 4.2.

4.1. Strict CV metrics

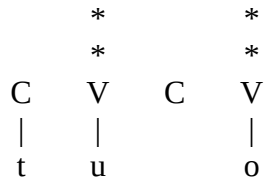
This approach models phonological quantity without using syllables or moras. It is a grid system where metrical structure is projected directly from the skeletal tier (CV). Only V-slots can metrically project. The projection of empty V-slots is parametrically controlled, whereas filled V-slots inherently project a metrical position. Filled V-slots project to Line 2. Empty V-slots (including the second position of long vowels and diphthongs) project to Line 1 (Ulfsbjorninn 2014). The different height of projection reflects their head-dependent status. The various configurations/word shapes are shown below in (18). The forms sketched there are not shown with the final step – the winning projection that determines weight (those are in 19). For a recent publication in this framework, see Faust & Ulfsbjorninn (2018).

(18) Basic projections with hypothetical forms. Light (a-b) and Heavy (c-e)

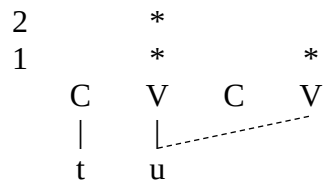
a. CVCV /tudo/



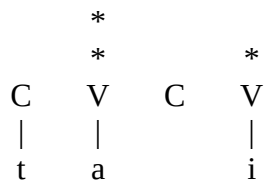
b. $CV_x.V_y$ /tu.o/ *hiatus*



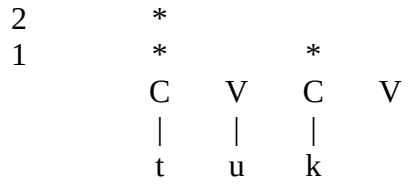
c. CV_xV_x /tu:/ *long vowel*



d. CV_xV_y /tai/ *diphthong*



e. CVC /tuk/



What is traditionally taken as a "heavy syllable" is driven by Incorporation. In this model quantity is the projection of a V-slot according to its phonological environment. This is

an asymmetric relationship between nuclei; a filled V-slot (Line 2) gains a level in the projection if it linearly precedes a dependent V-slot (Line 1). When this occurs, it is said that a filled V-slot incorporates another V-slot; this has a function of "identifying" empty V-slots (Faust & Torres-Tamarit 2017) and distinguishing hiatuses from diphthongs.

This is shown in (19). The forms in (19a-b) are phonologically light, while (19c-e) are the phonologically heavy ones, where the winning V-slot occurs before a dependent V-slot.

In the structures beneath, for the reader's visual convenience the grid-slots that are achieved by V-slot incorporation (phonological quantity) are shown with an alpha index. This is purely to assist the reader; the indices have no ontological status in the representation.

(19) Incorporation and projection

a. CVCV /tudo/

3		*		
2		*		*
1		*		*
	C	V	C	V
	|	|	|	|
	t	u	d	o

b. $CV_x.V_y$ /tu.o/ *hiatus*

		*		
		*		*
		*		*
	C	V	C	V
	|	|		|
	t	u		o

c. CV_xV_x /tu:/ *long vowel*

3		*α		
2		*		
1		*		*)α
	C	V	C	V
	|	|		
	t	u		

d. CV_xV_y /tai/ *diphthong*

		*α		
		*		
		*		*)α
	C	V	C	V
	|	|		|
	t	a		i

e. CVC 'tuk' *closed syllable*

3		*α		
2		*		
1		*		*)α
	C	V	C	V
	|	|	|	
	t	u	k	

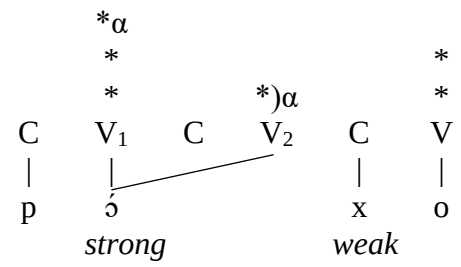
I hypothesise that full quality vowels of Hawu, when located in the stressed position of open syllables, are underlyingly bipositional. They are in effect "bimoraic" but their bimoracity is expressed through vowel quality rather than increased duration.[10]

[10] I assume this is true only for vowels in the stressed position, though it's not clear what evidence could be used to test the weight of non-stressed positions. It is reasonable to assume, I believe, that a learner would, in absence of evidence elsewhere, assume that a virtual length interpretation of vowel quality applies only in stressed position.

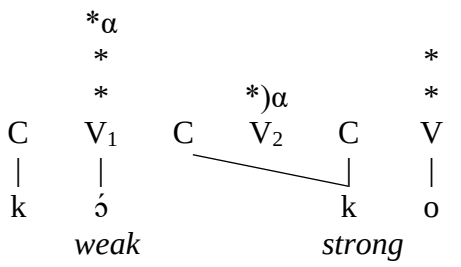
(20) Weight and strength in Tuscan and Hawu

a. Tuscan

[pɔ́:xo] ‘few/little’

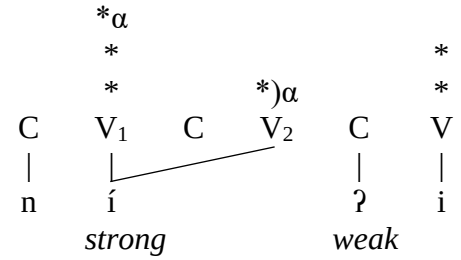


[kɔ́k:o] ‘coconut’

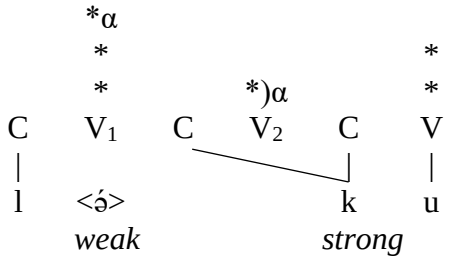


b. Hawu

[níʔi] ‘fruit bat’



[lə́k:u] ‘fold’



As the comparison between Hawu and Tuscan shows, in both languages, and in all forms, the V-slot that projects main stress (V_1) must incorporate a V position to its right (V_2). Having incorporated a V-slot at Line 1, the incorporating V-slot (V_1) gains a grid-mark and projects to Line 3.

4.2. Word Minimality in Strict CV Metrics

Reaching Line 3 is the core metrical prerequisite of Hawu; it is equivalent to standard treatments of minimal word conditions (e.g. LexicalWordProminence (Prince & Smolensky 1993)).

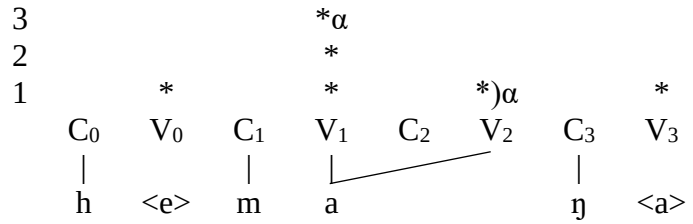
(21) ‘Minimal word’ Domain-hood condition in Hawu

A Domain must contain a metrical head (V-slot) that projects to Line 3

Head:	Penultimate V-slot
Incorporation (obligatory)	V-slot at Line 2 incorporates a V-slot at line 1

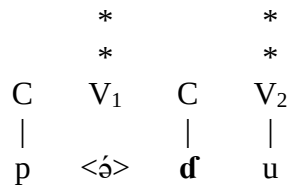
As explained in Section 3.2.2, vowels with a full phonetic quality are underlyingly bipositional (a.k.a. bimoraic). Although they are expressed as phonetically short, this phonological bipositionality allows them to satisfy the metrical conditions of the minimal word (see (20b) in analogy with Tuscan (20a)). A further Hawu example is shown beneath. Epenthetic vowel qualities are shown in angle brackets <>, they follow the rule of schwa allophony explained in Section 3.1.

(22) /hmáŋ/ [heməáŋa] ‘soul/life force’



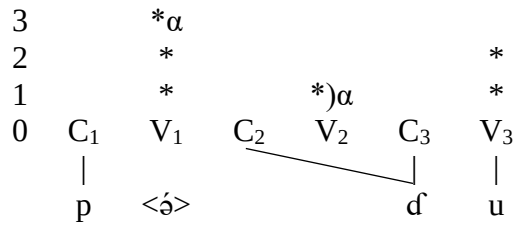
The word shown in (22) has a pretonic metrically weak (CV_0) corresponding to its e-schwa allophone. Then it has the metrical head (CV_1) with its (full quality) bipositional vowel, followed by the metrically weak (CV_3) and its a-schwa allophone. In (22), the metrical head is V_1. At the metrical level, the head incorporates the position (V_2). The incorporated (CV_2) is occupied melodically by the bipositional vowel that spreads across V_1 and V_2. The fact that V_1 incorporates V_2 allows V_1 to project one level further to Line 3, thereby satisfying the metrical condition of domain-hood. Schwa, on the other hand, is the phonetic expression of an empty nucleus, a single V-slot. On its own, a schwa cannot project to L3. As shown in (23), this results in a word shape that does not meet the minimal word condition.

(23) Ill-formed word **[pə**ɗ**u][11]



A word of the shape CəCV is illicit because its metrical head (V_1) has not incorporated a position. The domain-hood condition requires that V_1 incorporates a position. The CV position can be supplied by epenthesis (if needs be) (Larsen 1998; Scheer 2004; Bucci 2013), however, the schwa, being featurally empty, has nothing to spread into that empty CV. So as not to leave the position empty, a consonant (C_3) can instead spread into the position. Gemination ensues. This is shown in (24); C_3 fills the empty (CV_2) and forms a geminate. Meanwhile, the schwa’s position, the domain-head (V_1) incorporates the V-slot (V_2) and projects to Line 3 satisfying the domain-hood condition.

(24) Geminate satisfying weight of stressed schwa, [pə**ɗ**ːu] ‘gall’



[11] Stressed positions are assumed to project to line 2 despite being (potentially) empty. This may be how underlyingly stressed V slots are marked in the lexicon.

In the absence of any other heterosyllabic configuration (there are no other "coda-onset" sequences), the geminate is the only structure of Hawu that can follow a schwa. It is for this reason that a stressed schwa can only ever be found in a "closed syllable".

This quantity-sensitive account of Hawu explains (automatic) gemination after a schwa as well as its absence after any full vowels. These are phonologically bipositional (bimoraic), as such they are large enough to incorporate a V-slot and satisfy the quantity requirement on domain-hood. This analysis fully resolves explanandum (b).

5. Implications for word-shapes and metathesis

The previous section reveals Hawu to be a quantity-sensitive language and concludes with a definition of the metrical condition licensing its words. These metrical conditions also explain two other facts about the language that have been grouped together as explanandum (c): firstly, that (C)ə́V words are illicit, and secondly that metathesis has the strange condition that it must apply over a filled onset/consonant.

5.1. Motivating the ban on (C)ə́V

As has already been shown, (C)ə́CV words are illicit in Hawu (shown in (25)). In these structures, the metrical head does not project high enough to meet the "minimal word" domain-hood condition. When the schwa is a metrical head, it needs to be bolstered by incorporating a dependent CV. However, because schwa is featureless it cannot spread, ruling out forms such as **(C)ə́:CV. This is resolved with gemination, (C)ə́C:V is a licit word structure (shown in (26)). In this form, the dependent CV (CV_2) is present and it gets featurally filled by a consonant. From this discussion, the restriction on **(C)ə́CV words falls out automatically.

(25) Illicit structure of **(C)ə́V words

2		*		*
1		*		*
0	C	V_1	C_2	V
	|			|
	p	<ə́>		u

The metrical head (V_1) in structure in (25) cannot project sufficiently to meet the quantity condition on domain-hood. Consequently, an extra empty CV should be inserted. The difficulty, however, lies in how to fill the empty structure that is metrically required. This is shown in (26); the large span of featurally-empty pieces of structure are shaded grey. The incorporation of V_2 by V_1 and its projection to Line 3 is counterfactual here because the structure is not licit.

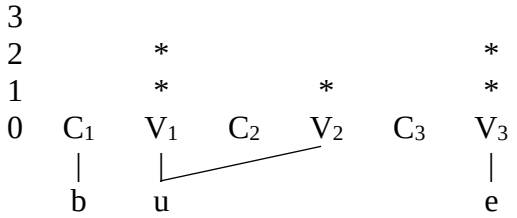
(26) Empty structure in **(C)ə́V word

3		*α				
2		*				*
1		*		*)α		*
0	C_1	V_1	C_2	V_2	C_3	V_3
	|					|
	p	<ə́>				u

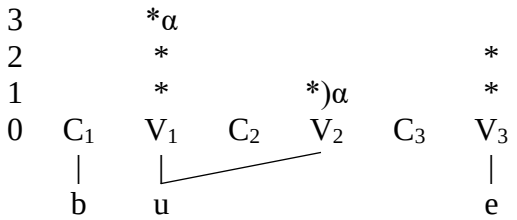
As we have already seen, the schwa in V_1 is featurally empty, therefore it is not able to spread and occupy the empty structure (CV_2). If (26) were a (C)ə́CV word, the content of C_3 would spread into C_2 forming a geminate, but in (26) C_3 is empty, so that may not spread either. The emptiness of C_3 means that the usual means by which schwa-headed words to gain weight are missing. There is simply nothing local to spread into all the empty structure.[12,13] This discussion shows that there is no way of licensing structures such as (26), thereby neatly explaining why (C)ə́CV are unattested in Hawu. Conversely, $CV_x.V_y$ words are fully permissible. Their dependent CV is occupied by bipositional, full-quality vowels; their structures are shown below.

(27) Empty structure in CV.V word [bu.e] ‘fruit’

a. Underlying form



b. Computed form



As is shown in (27), the spreading of the full quality vowel leaves only the onsets C_2 and C_3 as empty categories. These are straightforwardly licensed by their adjacent filled nuclei.

5.2. Explaining why metathesis is blocked by empty onsets

The discussion so far handles the first part of explanandum (c): the impermissibility of (C)ə́CV word shapes. The second part of explanandum (c) relates to the strange condition that metathesis is blocked over an empty onset (C-slot). As we discussed in Section 2.3, Blust (2008; 2012) describes Hawu metathesis as a swapping of the order of vowels when

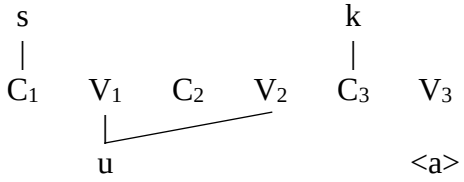
[12] The ‘u’ of V_3 cannot spread to V_2. V_1 is the metrical head and /u/ spreading would create an ill-formed iamb (that is, the designated metrical head would not reach its required projection because its position was coopted by another V.

[13] Government Phonology and Strict CV have developed strong and simple formal conditions on the licensing/permissibility of empty structure. The precise formal details are highly technical and their exposition here would not help the reader accept the analysis. Therefore, I limit exposition of formal mechanisms constraining empty structure to a description in this footnote. Readers interested in the details may consult the references here. Successive units of empty structure cannot be left unfilled due to the (universal) phonological ECP condition (Kaye, Lowenstamm & Vergnaud 1990). Empty onsets parametrically count as empty categories. In some languages their emptiness is marked (requiring filling or licensing), and in others they are essentially transparent. Hawu is a language where onsets are relevant to the ECP (Charette 2003; Pagliano 2003; Ulfsbjorninn 2014; Faust 2015; Faust, Lampitelli & Ulfsbjorninn 2018; Ulfsbjorninn 2020; Ulfsbjorninn forthcoming). Without going into the details here, the outcome of these conditions would be that forms such as (25, 26 and 27a) could not simultaneously fill C_2 and V_2. This means that the dependent CV cannot be licensed in **(C)əV shaped words. Consequently, this word shape cannot legitimately meet the “minimal word” condition of the language.

V_1[+high] precedes V_2[–high]: *suka > [hə́k:u] ‘measure’. In practice, metathesis almost exclusively occurs to uCa and iCa sequences. According to the analysis in this paper, the final [a] in Hawu is the phonetic interpretation of an empty nucleus. It is a featureless schwa vowel in final position. Blust (2008) notices a further oddness of the metathesis rule he describes. When ‘a’ is metathesized, it becomes schwa in the stressed position: *suk**a** > [hə́k:u] ‘measure’. This finds a ready explanation in the present account because both stressed schwa and final [a] are phonologically featureless. Since both schwa and final [a] are contextually determined phonetic interpretations of the same featureless vowel, the [a]-schwa alternation is actually expected. As we demonstrate in (28), this account confirms and even simplifies Lysvik’s (2015) analysis of metathesis.[14]

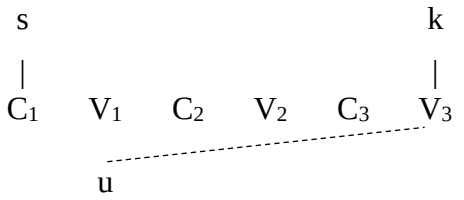
(28) Pseudo-metathesis with my schwa analysis (based on Lysvik 2015)[15]

a. *suka

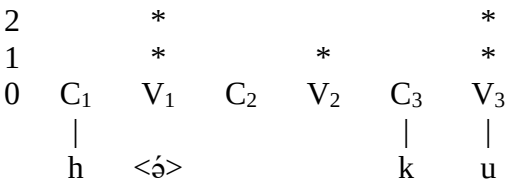


b. Metathesis

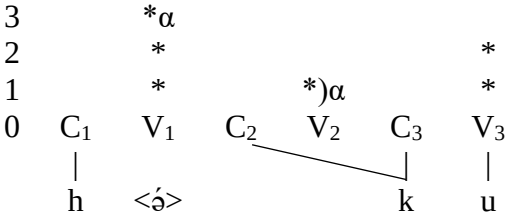
i. Step 1



ii. Outcome[16]



d. Metrical bolstering and the modern form [hə́k:u] “measure”



[14] The mechanism behind metathesis in Hawu, a diachronic process, is not at issue in this paper. Readers are encouraged to read Lysvik (2015). However, our analysis does lend support to Lysvik (2015) and other accounts that show metathesis operating via feature spreading rather than position swapping. Here the precise mechanism is not at issue.

[15] I present the consonants and vowels on separate tiers as Lysvik (2015) does for convenience.

[16] “s to h” is a process that appears very recent, the etymological *s is preserved for instance in the name of the island name, Savu, because at the point of Hawu’s earliest documentation (Wijngaarden 1896), the language still had [s].

The allophonic schwa analysis that is proposed in Section 3.1.1, and the metrical condition on stressed positions (Section 4.2) have conspired to prevent (C)ua or (C)ia from metathesizing into modern Hawu. The outcome of these forms should be **(C)ə́V, but this form fails to meet the quantity requirement of a stressed position and there is no way to repair it through spreading (as shown in Section 5.1).

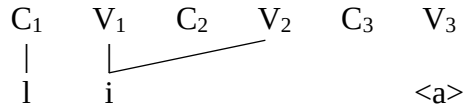
(29) Metathesis is blocked by an empty onset (Blust 2008: 71)

a.	*buaq	(> bu.a)	>	[bu.e]	**[bə́.u]	**[bá.u]	**[bu(:)]	‘fruit’
b.	*liaŋ	(> lia)	>	[li.e]	**[lə́.i]	**[lá.i]	**[li(:)]	‘cave’

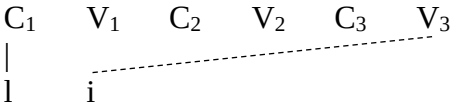
The following diagrams sketched in (30) show that a metathesis derivation cannot operate on (C)ua or (C)ia stems. This is because the output of the process finds no way to be licensed.

(30) *liaŋ (> *lia) > [li.e] **[lə́.i], **[lá.i], **[li(:)] ‘cave’

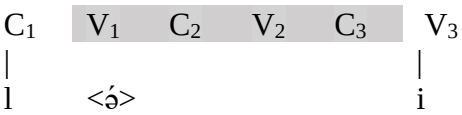
a. *lia



b. Metathesis



c. **Outcome



The derivation reaches an impasse with structure in (30c). There are multiple empty positions to license or fill through spreading: the dependent CV (C_2V_2) and the empty onset C_3. Schwa is featureless; it cannot spread. Likewise, C_3 is empty, so this position is also unable to spread so as to fill dependent CV_2. There is simply nothing local to spread to fill all the empty positions.[17]

6. Conclusion

This paper started by showing that Hawu appears to present rare (if not unique) distributions of strength and weakness at the phonetic level. These rare conditions were summarized as follows: (a) schwa, a universally weak vowel, can only occupy the stressed

[17] Most, if not all(?), of the final a-schwa of Cua and Cia sequences was shifted to ‘e’. This could be analysed as ‘e’ or ‘i’-insertion. If that is the case it would seem that there is a diachronic filling of this final position with actual phonological material in lieu of metathesis. This change might suggest the diagnosis of the underlying cause of metathesis, though more research is required to confirm this is the case and establish the cause.

position. It is excluded from prosodically weak positions; (b) schwa triggers gemination of a right-adjacent consonant. Diachronically this allowed C to resist lenition. Synchronically it appears that the position after a schwa is a strong position, while the position after all other vowels is weak: [lə́**k:**u] ‘fold’ vs. [ní**ʔ**i] ‘fruit bat’; (c) there are no (C)əV sequences and metathesis is blocked in (C)$V_{[+high]}$.$V_{[-high]}$ forms. Metathesized final ‘a’ becomes schwa in stressed position.

The paper explained that these facts were all connected to a central organising fact of Hawu phonology that had so far gone unnoticed: Hawu is a quantity-sensitive language. The vowel/ə phonotactics of Hawu were shown to be strictly analogous to those of Tuscan Italian and its metrical lengthening/bolstering and lenition. Hawu was shown also to have metrical bolstering. The reason why Hawu’s quantity-sensitivity went unnoticed is because, in vowels, phonetic duration (length) is not the phonetic correlate of phonological bipositionality. Instead, consistent with virtual length of the Afro-Asiatic type, bipositionality/bimoraicity is correlated to full vowel quality. The quantity requirement of stressed positions is shown to be satisfied by either (a) full phonetic quality or (b) a schwa followed by a geminate. We then showed that this diagnosis rules out words of the shape *(C)əV and, simultaneously, it explains the lack of metathesis in *(C)ua or *(C)ia word-shapes.

Language specific phonetic mappings can often obscure the structural similarities in the phonology of languages. Though they look rather dissimilar, Hawu is phonologically similar, and in fact, typologically of the same type, as Tuscan Italian, Norwegian, Icelandic and other quantity-sensitive languages with metrical lengthening/bolstering. This conclusion has important implications for phonological theory; because, under the standard analysis, Hawu appears to have a unique distribution of strength and weakness, with its unique condition that schwa can be exclusively found in a metrically strong position. In fact, under this reanalysis, Hawu’s phonological system is typologically common, what is very rare is its language specific phonetic mappings.

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