VV > VC > V for Stress: Coercion vs. Prominence

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A common approach to ternary VV > VC > V weight for stress involves coerced moraicity, by which codas are moraic only under stress, when no VV is available. As I show, coercion is untenable for about half of 17 such systems surveyed, and must be augmented by a theory of vowel prominence (e.g., VV-TO-STRESS). I further argue that vowel prominence is superior to a previously suggested solution in terms of coda prominence, which favors stress on syllables with (nonmoraic) codas.

Keywords: stress, weight, prosody, coercion, prominence, metrical phonology

The ternary scale VV > VC > V is now known to characterize weight in at least 17 languages.[1] At first glance, such a scale might appear to be recalcitrant to moras, since V and VV could only reasonably have one and two, respectively, leaving VC in the lurch. However, as demonstrated by Morén (1999, 2000) and Rosenthall and van der Hulst (1999), VV > VC > V can be reduced to μμ > μ with constraint ranking: if weight-to-stress dominates weight-by-position, a coda is moraic only when stressed, when VV is unavailable. This approach to ternarity, which has since been standard, is known as *contextual moraicity* or *coercion*.

This article proposes that coercion is untenable for roughly half of VV > VC > V systems, in which VC is demonstrably heavy even when it yields stress to VV. Moreover, when VC includes geminates (VG), coercion requires analyzing geminates as nonmoraic, contradicting other evidence for their moraicity, evidence that sometimes arises even from the stress system itself (e.g., VG attracts secondary stress). Thus, coercion is not a general solution to ternarity and must be augmented by a theory of prominence, such as vowel prominence (VV-TO-STRESS), as advocated here. With vowel prominence, ternary systems can be analyzed with uniform moraicity (V is monomoraic; VC and VV are bimoraic). VV then lures stress away from VC not because the latter has fewer moras, but because vocalic moras are effectively more prominent than consonantal moras.

The prominence approach to ternarity has its origins in two lines of research. First, Hayes (1995:299–305) makes a similar proposal in terms of moraic grids, whereby nuclear moras are stronger than coda moras. More recently, within Optimality Theory, most analysts recognize that weight reflects both quantity and prominence (e.g., Kenstowicz 1996, Anttila 1997, Prince 1999, Gordon 2002, Zec 2003, de Lacy 2004, Crowhurst and Michael 2005, Nevins and Plaster 2008, Carpenter 2010, Ryan 2011, Munshi and Crowhurst 2012, Garcia 2017). A constraint like VV-TO-STRESS is akin to vowel prominence constraints more generally, except that it invokes length.

[1] *V* notates a short vowel, *VV* a long vowel or diphthong, and *C* a consonant.
None of these 17 cases is diagnosed as such on the basis of behavior in final position that can be attributed to extrametricality. Some of the cases involve more complex scales that contain this one.

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To be sure, I do not argue here against coercion in general. Indeed, I could not do so in principle, as my account retains the constraints necessary to implement coercion. Coercion has uses aside from scale reduction, including positional specificities (e.g., Rosenthall and van der Hulst 1999), processual specificities (e.g., Blumenfeld 2011), and foot-form optimization (e.g., Mester 1994). Rather, I argue only that coercion is insufficient as an explanation for ternary weight and must be augmented.

The article is organized as follows. Coercion is illustrated for Kashmiri in section 1, and its deficiencies are illustrated for Chickasaw in section 2. Several additional cases like Chickasaw are reviewed in section 3. Section 4 adduces four additional arguments for vowel prominence beyond ternary weight for stress. In section 5, vowel prominence is compared with another possible prominence approach: coda prominence. Section 6 concludes.

1 The Coercion Analysis of VV > VC > V

In Kashmiri (Morén 2000 and references therein), primary stress is nonfinal, except in monosyllables. Among nonfinal syllables, it falls on the leftmost instance of the heaviest rime type available in (1). Some examples are provided in (2).

(1) VVC > VV > VC > V

(2) *Default initial when nonfinal syllables are equal in weight*
   a. ˈpʰi.ki.ri ‘understand’
   b. ˈjəm.bɨr.zal ‘narcissus’
   c. ˈbaː.laː.dər ‘balcony’
   VC outweighs V
   d. ʃoˈkɨr.vaːr ‘Friday’
   VV outweighs VC
   e. vuʃˈnaː.vun ‘to warm’
   VVC outweighs VV
   f. boːˈdeːs.var ‘Lord’

The following constraints are invoked, all of them standard in metrical phonology. First, Nonfinality penalizes a candidate with final stress. Second, WbyP (weight-by-position) penalizes a nonmoraic coda. Third, WTS (weight-to-stress) penalizes a heavy (bi- or trimoraic) syllable lacking stress. Fourth, a constraint is needed for VVC > VV; Morén (2000) invokes Pk-Prom (peak prominence) for this purpose, arguing that both it and WTS are needed.[2] Finally, Align-L favors leftmost stress, breaking ties between equally heavy nonfinal syllables. It assigns a penalty to every syllable intervening between the primary stress and the left edge of the word.

[2] A candidate violates Pk-Prom if a syllable without primary stress exceeds the syllable with primary stress in mora count. Even with Pk-Prom in the picture, WTS is needed on Morén’s (2000) account in order to suppress coda moras when VV is present, thereby preventing VC from taking stress when VV is present. As an alternative to Pk-Prom, one could employ Superheavy-to-Stress, which favors stress on trimoraic syllables (Gussenhoven 1999).

The key to coercion is WTS ≫ WByP. This ranking entails that VC is parsed as monomoraic when unstressed but as bimoraic when stressed. When (nonfinal) VV is available, it receives stress, as in (3). Meanwhile, WTS forces all codas to be nonmoraic (compare (a) with (d)). (In tableaux, C_{μ} is moraic and unannotated C is nonmoraic.) This accounts for the VV > VC portion of the scale.

(3)

vuʃnaːvun	WTS	WByP	Align-L
a. ☞ vuʃˈnaːvun		**	*
b. ˈvuʃnaːvun	*!	**	
c. ˈvuʃ$_{\mu}$naːvun	*!	*	
d. vuʃ$_{\mu}$ˈnaːvun	*!	*	*
e. vuʃˈnaːvun$_{\mu}$	*!	*	*

When VV is unavailable, VC is stressed and its coda is moraic, as in (4). This accounts for the VC > V portion of the scale, and (3) and (4) together yield VV > VC > V.

(4)

ʃokɨrvaːr	WTS	WByP	Align-L
a. ☞ ʃoˈkɨr$_{\mu}$vaːr$_{\mu}$	*		*
b. ˈʃokɨrvaːr$_{\mu}$	*	*!	
c. ˈʃokɨr$_{\mu}$vaːr$_{\mu}$	**!		
d. ʃoˈkɨrvaːr$_{\mu}$	*	*!	*
e. ʃoˈkɨr$_{\mu}$vaːr	*	*!	*

In short, coercion depends on the variable moraicity of codas, such that they are moraic under stress, but nonmoraic otherwise.

2 Two Problems for Coercion, and a Solution in Terms of Vowel Prominence

Coercion works for Kashmiri. That said, at least 16 other languages exhibit VV > VC > V for stress, and coercion is viable for only about half of them. Consider stress in Chickasaw, the subject of a detailed phonetic study by Gordon (2004a), which corroborates earlier descriptions (though no constraint-based analysis is offered). Primary stress seeks out VV anywhere in the word.[3] If no VV is present, primary stress is final. Secondary stress falls on all remaining heavies (VC, VV, etc.) as well as on the ultima if it is not primary stressed. (5) provides some examples.

[3] If multiple VV rimes cooccur, it is unclear which takes precedence (Gordon 2004a).

(5) a. noˌtakˈfa ‘jaw’
b. ˌokˌfokˈkol ‘type of snail’
c. ˌhattaˈkat ‘man’
d. tʃoˈkaːˌno ‘fly’
e. ˌʃimmaˈnoːˌliʔ ‘Seminole’
f. taˈlaːˌnomˌpaʔ ‘telephone’
g. ˈsaːɬkoˌna ‘earthworm’

Thus, Chickasaw exhibits VV > VC > V, with primary stress revealing VV > {VC, V} and secondary stress revealing {VV, VC} > V. This system cannot be analyzed with variably moraic codas, as coercion requires. In order for VV to lure primary stress away from VC, the latter must be monomoraic. But if VC is monomoraic, it cannot receive secondary stress, which is conditional on heaviness (compare (5f), with secondary stress on the penult, and (5g), without). A related problem for coercion is that it requires geminates to be nonmoraic (again, lest they attract primary stress). In other words, coercion requires one to reject the moraic theory of geminates. Regardless of whether this move is viable in general, it is not viable for Chickasaw: secondary stress, for one, confirms that geminates are moraic.

A solution is available with uniform moraicity and vowel prominence. The proposed constraint VV-to-Main penalizes any VV lacking primary stress.[4] WTS handles secondary stress. Align-R and Align-R-Main are both needed, as shown in (6). Align-R is short for Align(stress, R, p-word, R); that is, for every stress, it assigns a penalty to every syllable that intervenes between that stress and the right edge of the word, effectively pressuring all stresses to be rightmost.[5] Align-R-Main is the same except that it evaluates only the primary stress. Finally, Align(p-word, R, stress, R) is needed to ensure that the ultima is stressed. For simplicity, Align(p-word, R, stress, R) and WbyP, both undominated, are omitted from tableaux.

In (6), no VV is present, so primary stress is final.

(6)

notakfa	VV-to-Main	WTS	Align-R-Main	Align-R
a. ☞ noˌtak$_\mu$ˈfa				*
b. noˈtak$_\mu$ˌfa			*!	*
c. notak$_\mu$ˈfa		*!		
d. ˌnoˌtak$_\mu$ˈfa				**!*

[4] As stated in the introduction, VV includes both long vowels and diphthongs. Diphthongs are usually equal to VV in weight, but in some languages, such as Pulaar (Niang 1997), diphthongs are lighter than long vowels. There are a few possible approaches to the latter case. In Pulaar, since diphthongs are equal to VC in weight but heavier than V, one might analyze the offglides as codas. In other languages, it might be possible simply to analyze diphthongs as V, that is, as contour segments that are nevertheless short vowels. A final possibility is to invoke stress-weight mapping constraints referring directly to diphthongs, as with *P$_{PW}$/Diph in Crowhurst and Michael 2005.

[5] These constraints could also be expressed in terms of foot alignment. For simplicity, feet are omitted in this article.

In (7), VV attracts primary stress away from the ultima. This outcome differs from (6) even though the moraic profiles are both $\sigma_{\mu}\sigma_{\mu\mu}\sigma_{\mu}$.

(7)

tʃokaːno	VV-TO-MAIN	WTS	ALIGN-R-MAIN	ALIGN-R
a. ☞ tʃoˈkaːˌno			*	*
b. tʃoˌkaːˈno	*!			*

Finally, geminates are treated like VC rather than VV, in that they do not attract primary stress away from the ultima, as shown in (8). With vowel prominence, VV > VG is compatible with moraic geminates.

(8)

hattakat	VV-TO-MAIN	WTS	ALIGN-R-MAIN	ALIGN-R
a. ☞ ˌhat$_{\mu}$taˈkat			*	**
b. ˈhat$_{\mu}$taˌkat			*!*	**

3 Other Cases of VV > VC > V for Stress

Aside from Kashmiri and Chickasaw, I am aware of 15 other cases of VV > VC > V for stress. About half of these languages are amenable to coercion (Asheninca, Hupa, Mam, San'ani Arabic, Shipibo, Srinagar Koshur, and Yahi). The remaining languages are incompatible with coercion, either because coercion requires VC to be light in a context in which secondary stress requires VC to be heavy (the "secondary stress problem") and/or because coercion requires geminates to be nonmoraic in a context in which other evidence compels the moraicity of geminates (the "geminate problem"). Specifically, the geminate problem arises in Finnish and Tamil; the secondary stress problem arises in Kara, Nanti, and Yapese; and both problems arise in Chickasaw, Klamath, Maithili, and Pulaar.

Finnish. VV is heavier than VC (including VG) for secondary stress (Karvonen 2005:90, Anttila 2010:5, pers. comm.). For example, words like *hélikòpteri* 'helicopter' and *ánalỳytikko* 'analyst' are stressed on the antepenult, while those like *hórisontàali* 'horizontal' and *kótiuttàako* 'send home' are stressed on the penult. Coercion would therefore require unstressed geminates to be nonmoraic. This contradicts abundant evidence for the moraicity of geminates in Finnish. For example, consonant gradation is conditioned by a following heavy (e.g., *mátto* 'mat' degeminates to *mátolla* in the adessive), which corroborates the moraicity of unstressed geminates (Kiparsky 2011). Indeed, Karvonen (2005) suggests the constraint *{CV̆V} for this case, which is equivalent to VV-TO-STRESS.

Kara. Weight is complex, but includes the subhierarchy VV > VC > V (e.g., aː > aC > a) (Schlie and Schlie 1993, de Lacy 1997, Gordon 2006). Similar to what happens in Chickasaw, primary stress seeks out VV in any position, while VC remains heavy for secondary stress (e.g., [ˈɸaːsiˌlak] 'abstinence' vs. [ˈkaːksaxa] 'one leg').

Klamath. Primary stress falls on the rightmost VV if available, and otherwise follows the Latin rule (Barker 1964, Hayes 1995). If primary stress precedes the penult and the penult is heavy (VC, VV, etc.), the penult receives secondary stress. Once again, VC (including VG) is heavy for secondary stress even while it yields primary stress to VV.

Maithili. The facts are complicated, but in brief, Hayes (1995) (on the basis of Jha 1940–44) maintains that VC is uniformly bimoraic, while VV is heavier than VC, as evidence from primary stress indicates. Consider [ˌmɑnə̆ˈmoːˌˌhɒnə̆] (proper name) and [ˌčʰuˌˌčʰunˈnɒrĭ] (no gloss). That primary stress is antepenultimate in the former but penultimate in the latter illustrates VV > VC. (VC includes VG.) At the same time, VC > V is supported by vowel reduction, which applies only to V, which Hayes (1995) takes to suggest that VC always receives at least tertiary stress, notated ˌˌ here.

Nanti. Nanti stress cannot be fully described in a few lines, but Crowhurst and Michael (2005) and Munshi and Crowhurst (2012) make explicit that it defeats coercion. In general, words are parsed into disyllabic feet from left to right. By default, feet are iambic, and the final foot receives primary stress. However, both of these defaults can be overridden by weight. Within a foot, if the first syllable is heavier than the second, the first receives stress. Moreover, primary stress is lured away from the final foot by a heavier syllable in a preceding foot. With this brief background, a form such as [(iˈroː)(gaˌksem)pa=ra] ‘he will consume’ offers an inkling of the authors’ argument. In this word, VV must be heavier than VC; otherwise, the final foot would bear primary stress. Therefore, coercion would require the coda to be nonmoraic. But VC must outweigh V within the final foot, since without the coda, stress would be initial in that foot, that is, (ˌga.kse). When both syllables are equal in terms of skeletal structure, vowel height determines weight, with lower vowels patterning as heavier (Munshi and Crowhurst 2012:467). Crowhurst and Michael (2005) and Munshi and Crowhurst (2012) employ a form of coda prominence as an alternative to coercion (see section 5).

Pulaar. Primary stress is the same as in Kashmiri in section 1 (Niang 1997, Wiltshire 2006). Niang (1997) also describes secondary stress, which falls on all non-primary-stressed, nonfinal heavies (VC, VV, etc.), modulo clash. Wiltshire (2006) observes that secondary stress defeats coercion, and suggests instead a coda prominence analysis (see section 5). Another problem for coercion that Wiltshire (2006) does not raise concerns geminates. Because VG yields primary stress to VV, coercion requires geminates to be nonmoraic. As before, however, this is infeasible, since other diagnostics, including the stress system itself, require geminates to be moraic. As one example of a non-stress-based diagnostic of geminate moraicity, a word-initial geminate is only permitted if the following vowel is short (Niang 1997:70).

Tamil. Primary stress is initial unless the initial is V and the peninitial is VV, in which case it is peninitial (Gordon 2004b). Initial VC > V and peninitial VV > VC together yield VV > VC > V. The only potential problem for coercion is that it requires geminates to be analyzed as nonmoraic whenever they close unstressed syllables. For example, compare *palā́* ‘jackfruit’ with *váruttam* ‘worry’. VV attracts stress in the former, but VG does not do so in the latter. Thus, under coercion, peninitial VG must be analyzed as monomoraic. This may or may not be feasible for Tamil, though it can at least be said that it contradicts other systems, such as meter (e.g., *váruttam* scans as light-heavy-heavy in Kamban’s epic).

Yapese. Primary stress is final unless the penult contains VV and the ultima is not superheavy, in which case it is penultimate (Jensen 1977). The penult therefore diagnoses VV > VC, and coercion requires VC to be monomoraic in the penult in order to preclude it from attracting stress from a non-superheavy ultima. Nevertheless, all pretonic heavies (VC, VV, etc.) receive secondary stress, refuting coercion.

In sum, this section outlines eight additional cases of VV > VC > V for stress in which VC must be analyzed as heavy even when it yields stress to heavier VV. This situation is incompatible with coercion, which requires unstressed VC to be equivalent to V. Vowel prominence does not have this problem: VV-TO-MAIN can lure stress away from VC even while VC remains bimoraic.

At this point, it can be observed that both VV-TO-MAIN and generic VV-TO-STRESS are needed. VV-TO-STRESS assigns a penalty for any VV lacking stress. For example, only VV-TO-MAIN works for Chickasaw, while only VV-TO-STRESS works for Finnish. Primary stress in Finnish is not sensitive to VV vs. VC, but it is still possible to employ generic VV-TO-STRESS for that language, since other, more highly ranked constraints can then fix primary stress in initial position regardless of weight. I am not aware of any case in which a constraint indexed to secondary stress is needed. The stringent predicates MAIN and STRESS suffice.

4 Four Other Arguments for Vowel Prominence

This section puts forth four additional arguments for VV-TO-STRESS as opposed to coercion alone. First, binary VV > V(C) is widely attested. When VG is available, it usually aligns with V(C) in such systems. I am aware of the following languages with geminates and VV > V(C) for stress: Cahuilla, Chuvash, Eastern Ojibwa, Koasati, Koya, Krongo, Leti, Malayalam, Nepali, Ossetic, San'ani Arabic, Selkup, Telugu, Tiberian Hebrew, Tübatulabal, Wolof, and Yupik. Among those for which I could determine the behavior of VG, VG aligns with V(C) in Chuvash, Eastern Ojibwa, Koasati, Krongo, Leti, Malayalam, Nepali, Ossetic, Selkup, Tübatulabal, and Wolof, and with VV in Cahuilla (Hayes 1995) and San'ani Arabic (Davis 2011). VG is thus roughly five times as likely to align with V(C) as with VV. Without vowel prominence, geminates must be treated as nonmoraic in such languages (cf. Selkirk 1990, Tranel 1991, Davis 2011, Topintzi and Davis 2017). However, this treatment is often problematic, because other evidence within the same languages supports geminate moraicity (Mohanan 1989, et seq.). With vowel prominence, there is no problem: VV can outweigh VG even while the latter remains bimoraic.

Second, consider quantitative meter. In Ryan 2011, I find that VV > VC > V obtains gradiently in a number of meters. The Ancient Greek hexameter, for one, furnishes an argument against coercion. Each line of hexameter comprises six metrical feet. Each metrical foot, in turn, comprises two positions, the first termed the longum and the second the biceps. The longum must be filled by a single heavy syllable (i.e., VC, VV, etc.), while the biceps can be filled by either one heavy or two lights. Heavies in longa tend to be lighter than heavies in bicipitia (West 1982, Ryan 2011). For example, VC is significantly more skewed toward longa than VV. VV > VC in this system cannot be analyzed with variable moraicity. Consider a word like *pánta* 'whole (masculine accusative singular)'. If VC were variably moraic, one would predict that the initial syllable of such a word could be parsed as light, and thus pair up with another light in the biceps. But this is not an option; *pán-* is categorically heavy, even if gradiently lighter than a VV syllable. Such a system therefore requires a metrical version of vowel prominence (e.g., VV-TO-STRONG).

Third, consider end-weight. In binomials (e.g., 'X and Y'), Y tends to be heavier than X, all else being equal. As recognized since Cooper and Ross 1975, VV outweighs VC in this system (e.g., *hem and haw*, *lock and key*, *betwixt and between*). Since both monosyllables are prosodic words, they must be analyzed as bimoraic (Morén 1997). The heavier weight of VV must therefore be implemented by prominence, not by coercion.

An anonymous reviewer draws my attention to a fourth additional argument for prominence over coercion. Languages with VV > VC for stress sometimes treat VC as heavy on the basis of other, non-stress-based diagnostics, such as mora population limits on syllables. Consider Koasati, in which codas are ignored for stress. In root nouns, primary stress is final unless the penult is VV, in which case it is penultimate (Kimball 1991). At the same time, Koasati permits codas only in syllables with short vowels. A standard analysis of the latter is to assume that VVC exceeds a bimoraic maximum (*3μ; Prince and Smolensky 1993/2004, Kager 1999). But coercion requires codas to be nonmoraic, contradicting this analysis. With vowel prominence, once again, there is no issue: VV can outweigh VC for stress even while codas are uniformly moraic.

5 Vowel vs. Coda Prominence

Consider the following hypothetical stress rule, a simplified version of several cases in sections 2–3: VV receives primary stress and VC secondary stress, regardless of position. This rule cannot be analyzed with contextual moraicity, since VC is always heavy. One solution is vowel prominence along with undominated WBYP, as illustrated in section 2 for Chickasaw and schematized more compactly in (9).[6]

(9)

bartaːba	VV-TO-MAIN	WTS
a. ☞ ˌbar$_{\mu}$ˈtaːba		
b. bar$_{\mu}$ˈtaːba		*!
c. ˈbar$_{\mu}$ˌtaːba	*!	

An alternative solution is coda prominence, say, CODA-TO-STRESS, along with uniformly nonmoraic codas (*μ ≫ WBYP), as in (10). CODA-TO-STRESS penalizes an unstressed coda regardless of whether it is moraic. Additionally, WTS is now adjusted to WTS-MAIN, penalizing a bimoraic syllable lacking primary stress.[7]

[6] Candidates with stress on the light syllable are not shown. They can be ruled out by any antistress constraint, such as alignment or *GRIDSTRUC (Walker 1996).

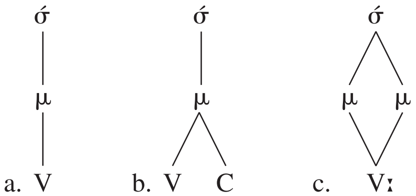
[7] In this language, in which codas are nonmoraic, WTS-MAIN has the same effect as VV-TO-MAIN. However, in the general case WTS-MAIN and VV-TO-MAIN are distinct constraints, with distinct typologies, only the latter being vowel prominence. Since the purpose of this fragment is to illustrate an alternative to vowel prominence, WTS-MAIN is employed.

(10)

bartaːba	CODA-TO-STRESS	WTS-MAIN
a. ☞ ˌbarˈtaːba		
b. barˈtaːba	*!	
c. ˈbarˌtaːba		*!

Thus, both vowel and coda prominence can implement VV > VC > V, and both with uniform moraicity. With vowel prominence, VC is uniformly bimoraic. With coda prominence, VC is uniformly monomoraic, but still attracts stress away from V thanks to CODA-TO-STRESS.

Previous scholarship analyzing ternary weight without coercion relies on some form of coda prominence (Crowhurst and Michael 2005, Wiltshire 2006, Munshi and Crowhurst 2012). Munshi and Crowhurst (2012) use $*P_{PWd}$/NOBRANCH(μ) (henceforth BRANCH), which penalizes every nonbranching mora under primary stress. (11a) incurs one violation of BRANCH, (11b) none, and (11c) two. Other constraints ensure that codas fuse to vocalic moras, as in (11b), rather than projecting their own moras. With STW (stress-to-weight) ≫ BRANCH, ternary weight arises: stress seeks out a bimoraic (VV) rime if available; otherwise, BRANCH favors stress on VC over V. Though the formalism differs, this analysis is essentially the same as the CODA-TO-STRESS fragment in (10). V and VC are uniformly monomoraic, while VV is bimoraic. A constraint (CODA-TO-STRESS or BRANCH) then favors stress on VC despite its monomoraicity.[8]

(11)


As Munshi and Crowhurst (2012) observe, coda prominence has the advantage of permitting stress systems with superheavy grades to be analyzed without invoking trimoraic syllables. VVC can be analyzed as bimoraic but still attract stress away from VV due to its coda. Vowel prominence does not share this advantage: VVC must be analyzed as trimoraic in order to outweigh VV. However, I still adopt vowel prominence here, for three reasons. First, eliminating trimoraic syllables from certain stress systems is only an advantage if trimoraic syllables can be eliminated in general. But several independent arguments have been put forth for trimoraic syllables, which (aside from stress) include compensatory lengthening, syllable structure, ternary length distinctions, and quantitative meter (Hayes 1989:291–293, Baković 1996, Hajek 2000, Hall 2002).

[8] Wiltshire (2006) employs both coda prominence and vowel prominence (in the present terminology) to analyze Pulaar primary stress, for which VVC > VV > VC > V. She takes V to be monomoraic and VC, VV, and VVC to be bimoraic. {VVC, VV, VC} > V is implemented by a constraint akin to STW. VVC > VV (both being bimoraic) is implemented by coda prominence via EXIST(ˈσ,seg) (based on de Lacy 1997), which requires a primary stressed syllable to have a nonmoraic coda. VV > VC (both being bimoraic) is implemented by vowel prominence via NOTMIN(seg,ˈμ) (de Lacy 1997), which requires a primary stressed syllable to contain a long vowel.

Second, coda prominence posits that codas are nonmoraic, which in turn entails that geminates are nonmoraic.[9] As discussed in sections 2–4, this creates problems for several systems in which other evidence supports the moraicity of geminates. Recall Finnish, for instance, in which processes such as consonant gradation diagnose (unstressed) VG as bimoraic, while a coerced-weight account of secondary stress requires unstressed VG to be monomoraic. Similarly, a coda prominence account of Chickasaw, as in section 2, would require treating geminates as nonmoraic in that language, since VG is lighter than VV for primary stress. But Chickasaw morphophonology involves processes of gemination and vowel lengthening that are usually analyzed in moraic terms (on such processes in Chickasaw and/or closely related Choctaw, see Lombardi and McCarthy 1991, Ulrich 1994, Grimes 2002, Trommer and Zimmermann 2014). Vowel prominence, being compatible with moraic geminates, raises no such issues.

A third point favoring vowel prominence over coda prominence is that the latter generates systems in which VC > VV (e.g., if coda prominence is the only active constraint), arguably a pathology. Vowel prominence cannot generate this criterion: VC cannot contain more moras than VV, and nothing else favors stress on a coda. VC > VV for stress is rare at best, and arguably unattested. Gordon's (2006) survey of 408 genealogically diverse languages, 136 with weight-sensitive stress, yields zero cases of VC > VV (vs. over 40 cases of VV > VC), though Gordon notes that Tiberian Hebrew, not in his survey, is claimed to be such a system (see below), and further that VC > VV is claimed for certain pitch accent systems, such as Seneca. Similarly, WALS (Goedemans and van der Hulst 2013) identifies at least 118 languages with weight-sensitive stress, but mentions only Dutch as a possible case of VC > VV, allowing that there are alternative analyses, which are cited. Hayes (1995:160) observes that "there are many rules that count CVː as heavy and CVC as light, but no rules that go the other way." Morén (1999) also implies that VC > VV is impossible.

That said, I address two potential cases of VC > VV for stress. First, Tiberian Hebrew primary stress falls on a closed ultima and otherwise (even if the ultima is VV) on the penult, ostensibly diagnosing VC > VV. Nevertheless, as Balcaen (1995) and Dresher (2009) observe, the length of final vowels is not contrastive; only VV occurs (with the caveat in Dresher 2009: 222). They therefore suggest that final vowels are underlyingly short, such that weight is treated naturally for stress assignment, but opacified by a late rule of final lengthening. For example, consider [hɔːrɔ́ːɣuː] 'they slew' (prepausal form), for which Dresher (2009) posits underlying /harag-u/. The synchronic derivation then constructs a right-aligned moraic trochee before final lengthening applies: /harag-u/ → [ha(rágu)] → [ha(ráguː)]. On this approach, there is no need for a rule or constraint that treats VC as heavier than VV. Indeed, as Dresher (2009:214) observes, other aspects of Tiberian Hebrew stress treat VC as lighter than VV, so this approach has the added benefit of rendering weight internally consistent. Moreover, such opacity is commonplace:

[9] This second argument applies to a pure coda prominence account such as CODA-TO-STRESS or BRANCH, in which codas are nonmoraic across the board. Because Wiltshire (2006) employs both vowel and coda prominence constraints for Pulaar, she is able to treat codas as moraic in VC, leaving vowel prominence to distinguish between $VV_{\mu\mu}$ and $V_{\mu}C_{\mu}$. Nevertheless, she must still treat a geminate as nonmoraic after a long vowel (i.e., in VVG), which occurs in Pulaar.

compare the final high vowels of words like *happy* in English, which are treated as light despite being realized as long in many dialects (Chomsky and Halle 1968).

To implement such an analysis in Optimality Theory (which Dresher (2009) does not employ), one would need to adopt a version of the theory that is compatible with this type of opacity, such as Harmonic Serialism (McCarthy 2000, 2010).[10] To briefly sketch such an analysis, consider three constraints: GRWD=PWD (which requires a grammatical word to have prosodic structure), FAITH-STRESS (which requires an input stress, if any, to be preserved; cf. MAX-PROM, DEP-PROM, and NO-FLOP-PROM in Alderete 2001), and $*\breve{V}]_{\text{p-phrase}}$ (to compel final lengthening). In Harmonic Serialism, an input cycles through the grammar multiple times, with at most one change per cycle, until no further improvement is possible. A sketch derivation is provided in (12)–(14), abstracting away from irrelevant rules. Various other constraints, such as ALIGN-R and TROCHEE, are not shown, nor are candidates flouting them. Because stress assignment and lengthening are separate processes, no candidate is available in (12) in which both processes apply simultaneously. In (14), the input and output are identical, so the derivation converges.

(12) *Step 1*

haragu	GRWD=PWD	FAITH-STRESS	$*\breve{V}]_{\text{p-phrase}}$
a. ☞ ha(ˈragu)			*
b. haragu	*!		*
c. haraguː	*!		

(13) *Step 2*

ha(ˈragu)	GRWD=PWD	FAITH-STRESS	$*\breve{V}]_{\text{p-phrase}}$
a. ☞ ha(ˈraguː)			
b. ha(ˈragu)			*!
c. haragu	*!	*	*

[10] An alternative approach would be to assume that phrase-final lengthening is an aspect of phonetic implementation that does not involve the phonological adjunction of a mora. On this view, final vowels that the scribes marked long were not bimoraic.

(14) *Step 3*

ha(ˈraguː)	GrWd=PWd	Faith-Stress	*V̆]$_{p\text{-}phrase}$
a. ☞ ha(ˈraguː)			
b. ha(ˈragu)			*!
c. haraguː	*!	*	
d. hara(ˈguː)		*!	

Opacity is otherwise widespread in Tiberian Hebrew stress, so a classical Optimality Theory analysis may be a nonstarter anyway. For example, [ˈmelex] 'king' is not stressed on the final VC because its [e] is epenthetic (from /malk/; Prince 1975:37). It may also be worth remarking that the Tiberian variety was not a living language at the time length annotations were developed; rather, it was a centuries-old recitational tradition. As Dresher (2009:223) notes, "Khan (1987) argues that Hebrew vowels at the time of completion of the Tiberian notation system were no longer distinguished by quantity. Thus, the transcriptions and grammar presented here refer to an earlier stage of the language." In short, Tiberian Hebrew stress is arguably problematic only because it involves layers (whether synchronic or diachronic), not because it necessitates a VC > VV criterion.

Another potential case of VC > VV for stress comes from Huehuetla Tepehua (Kung 2007). Primary stress is described as being final if and only if the ultima contains a sonorant coda (/m, n, l, h, ʔ, w, j, ɾ, r/; NB, Kung 2007 classifies /h/ and /ʔ/ as [+son]), otherwise penultimate. In other words, the rule is the same as in Tiberian Hebrew, except limited to sonorant codas. In what follows, *N* refers to sonorants, and *T* to obstruents. The fact that VN > VT is unproblematic, as this same distinction is found in several languages (Zec 1995, Gordon 2006). Kung (2007) suggests, following Zec (1995), that sonorants project moras, while obstruents do not. She further supports this analysis from compensatory lengthening.

The problem (which remains unresolved in Kung 2007) is that VN must also outweigh VV for stress. At least two possible solutions are available. First, if one admits coda prominence, one could posit a constraint that directly favors the association of stress with a sonorant coda, such as SonCoda-to-Stress. However, a second approach is conceivable that obviates the need for coda prominence, namely, treating final VV as (surface) monomoraic. At first glance, this is untenable, since V and VV ostensibly contrast in final position. However, phrase-final V is "always voiceless" and often deletes (Kung 2007:124–126 et passim). Thus, the ostensible V vs. VV contrast in final position might be reanalyzed as a reduced/voiceless vs. full/voiced contrast. It is not uncommon for stress systems to eschew stress on reduced vowels (Crosswhite 2001, de Lacy 2004, Gordon 2006). If final "VV" is in fact simply V (perhaps with some gradient final lengthening), there is no need to invoke coda prominence: VN is bimoraic while V̥, V, and VT are monomoraic. Loanwords support such a reanalysis, in that short final vowels from Spanish are invariably borrowed as long (e.g., *atole* > [ʔaˈtoːliː], *borrego* > [boˈreːguː]). That said, this hypothesis needs to be more thoroughly tested, ideally with phonetic data on final position.[11]

To summarize this section, both vowel prominence (e.g., VV-TO-MAIN) and coda prominence (e.g., CODA-TO-STRESS) are compatible with ternary VV > VC > V. CODA-TO-STRESS has the advantage that it does not require VVC to be trimoraic in systems in which VVC outweighs VV, though this is only an advantage if trimoraic syllables can otherwise be eliminated. Nevertheless, coda prominence is problematic in two respects. First, it requires geminates to be analyzed as nonmoraic. Regardless of whether such a move is viable in general, it is not viable for languages such as Finnish, Pulaar, and Chickasaw, where evidence from the stress system and elsewhere converges on geminates being moraic. Second, coda prominence generates stress systems in which VC is heavier than VV. As discussed, such a criterion is arguably unattested. Two cases in which it at first blush arises both involve the special phonology of VV in final position, opening them up to alternative analyses. I have therefore favored the more restrictive vowel prominence approach here, which is compatible with moraic geminates and does not generate VC > VV. At any rate, even if VC > VV were robustly attested for stress, it would not alter any of the arguments against coercion in the previous sections. It would just mean that both vowel and coda prominence are needed (cf. Wiltshire 2006).

6 Conclusion

The coercion analysis of VV > VC > V requires codas to be nonmoraic when they yield stress to VV. This is often untenable, either because secondary stress requires VC to remain heavy, or because it is infeasible to analyze geminates as nonmoraic in the relevant language. A simple solution, as advanced here, is vowel prominence (e.g., VV-TO-STRESS), which favors stress on a long vowel regardless of the presence and moraicity of the coda. Another possible solution is coda prominence, which favors stress on a syllable with a coda regardless of its moraicity. However, coda prominence, like coercion, is incompatible with moraic geminates. Moreover, coda prominence generates the arguably pathological criterion VC > VV.

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[11] This discussion glosses over several complications. First, stress assignment is highly opaque. I have noted from Kung 2007 at least six independent ways in which stress is opaque (to give one example, /l/ and /ɬ/ merge to [ɬ] finally, but stress remains sensitive to the underlying sonorancy). Second, stress is morphologically conditioned (e.g., prefixes reject primary, but not secondary, stress). Third, the rule does not apply to loanwords, and certain subsets of the lexicon follow unrelated rules. Fourth, even among relevant lexical items, exceptions are found. Given these points, it would be worth verifying that the rule is productive. As a further issue, final short vowels are voiceless only phrase-finally, not when a word is phrase-medial. However, it might still be possible to analyze them as reduced, or perhaps to base stress assignment on isolation forms.

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