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Primary Word Stress in Brazilian Portuguese and the Weight Parameter

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Abstract

In this paper, we develop an analysis of primary word stress in Brazilian Portuguese (BP). We evaluate the typological and language-specific arguments that are presented in the literature against the relevance of syllable weight in Portuguese, and show that none of them appears to be valid when confronted with cross-linguistic evidence or the facts of BP phonology. We then go on to show that stress in BP represents a mixed system, in which verbs receive stress as a function of the morphological categories of tense (past, present, future), whereas stress in non-verbs is prosody-based and sensitive to the distinction between heavy and light syllables. We finally propose a constraint analysis of this system, which we claim functions in the lexical part of a stratified model.

1 Introduction

In this paper*, we will discuss a number of observations which strongly suggest that syllable weight plays an important role in predicting the main stress of non-verbs in Brazilian Portuguese (henceforth BP), as well as in other parts of the BP phonological grammar. We will evaluate the arguments that are presented in the literature against the relevance of syllable weight and show that none of them appears to be valid when confronted with the facts of BP phonology. Moreover, since the stress patterns of Spanish and BP are to a large extent comparable, a demonstration of the phonological significance of syllable weight in BP must also consider the arguments put forward against a weight-sensitive stress rule for Spanish¹.

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We will subsequently sketch a constraint analysis that captures the main facts of BP stress by way of two sets of constraints. One is morphology-based and predicts primary stress in verbs on the basis of morphological category. The other is prosody-based and locates stress in non-verbs in function of syllable weight.

2. Assessing the arguments against the relevance of syllable weight in BP

Phonologists of Portuguese either have formulated serious doubts with respect to the relevance of syllable weight or have dismissed it altogether. Many analyses of Portuguese stress are based upon the observation that, at least in non-verbs, stress falls on the last vowel of the stem, where ‘stem’ is defined as the lexical word, disregarding the ‘desinence’, which in most cases is one of the thematic vowels /e,o,a/. Thus, the thematic noun *cabeça* ‘head’ has prefinal stress, whereas in the athematic *nariz* ‘nose’ stress is on the word-final syllable. This stem-based analysis successfully predicts main stress in a large majority of the Portuguese non-verbs. However, both the fact that stress could never fall on the antepenultimate vowel in a word like *aberto* ‘open’ (with a prefinal **heavy** syllable), and the fact that athematic non-verbs usually end in a **heavy** syllable (*feliz* ‘happy’), remain, from this perspective, purely accidental. A mechanism that takes syllable weight to be a conditioning factor for main-stress placement is at least equally successful. If properly worked out, a quantity-based account provides a principled explanation for the systematic absence of proparoxytonic stress in words with a prefinal heavy syllable, and also explains why stress-placement in newly created words is systematically governed by the closed vs. open syllable distinction. Given this situation, one may ask why phonologists working on Portuguese have been so reluctant to admit that syllable weight plays a role in at least part of the phonological grammar of BP. In this section we will present the arguments that have been put forth in the literature to dismiss the relevance of syllable weight

and evaluate their validity against the background of phonological typology and the facts of BP phonology.

2.1 Kuryłowicz's Universal

One argument that is frequently mentioned to dismiss the relevance of a moraic approach to the stress rules of Portuguese, and also of Spanish and Italian, is based on the typological claim that contrastive vowel length is a prerequisite to weight-sensitive stress. The interest of the argument does not only derive from its persistence in the literature (see, among others, Kuryłowicz, 1948; Newman, 1972; Greenberg and Kaschube, 1976; Hyman, 1977; Ohsiek 1978; Hyman 1985; Roca, 1990; Andrade and Laks, 1991), but also from the fact that Trubetzkoy (1939) is usually referred to as the source for this implicational universal. In his *Grundzüge der Phonologie*, translated into English as *Principles of Phonology*, which is how we will henceforth refer to it, Trubetzkoy expressed himself in a way that could be interpreted along the lines suggested by the critics of a moraic approach to stress in Romance. We provide Trubetzkoy's full statement below:³

- (1) The interpretation of long nuclei as geminated, or in terms of multinumber constituency in general, may be regarded as an 'arithmetic conception of quantity'. Languages in which this conception finds expression are 'mora counting' languages since in these languages the smallest prosodic unit does not always coincide with the syllable (1939/69:177).

According to Trubetzkoy, languages may represent phonemic vowel length in several ways, one of which is by way of a geminate vs. single vowel opposition. Languages that choose this option are mora-counting languages. There are also languages that have a vowel length contrast in which the long member is not a geminate vowel, but an 'extended'

short vowel. In these languages, which are not mora-counting languages, vowel length is the phonetic realization of the phonological category of ‘intensity’.

The phonologists who refer to Trubetzkoy in the context of Romance stress interpret the cited passage in the following way: Spanish, Italian, and Portuguese cannot have a geminate representation of vowel length, because long vowels are not phonemic. They cannot, therefore, be mora-counting and, consequently, their stress system cannot depend on syllable weight. In Wetzels (2002a; 2003), it was shown that this interpretation is based on the erroneous assumption that Trubetzkoy’s conception of the mora is equivalent to the one underlying present theories of syllable weight. As it turns out, Trubetzkoy’s view as expressed in citation (1) represents the end point of a search into the phonological interpretation of vowel quantity, which he had started almost twenty years earlier. The fundamental and only question that Trubetzkoy was concerned with was how to represent contrastive vowel length. Nowhere was his attention directed towards the factors that cause stress to select syllables with specific properties in some languages, and, consequently, nowhere was he explicitly interested in the relation between weight-sensitive stress and phonological length. One illuminating example that demonstrates how different Trubetzkoy’s mora concept was from the one that underlies present theories of syllable weight comes from Italian, a language that opposes single consonants to geminate ones. In Trubetzkoy’s view, the fact that this language uses the analytical quantity correlation in consonants does not in itself qualify it as a mora-counting language. Still in *Principles of Phonology* Trubetzkoy is explicit in including Italian in the class of non-moraic languages. Consequently, in Italian, one part of the geminate belongs to the left-hand syllable, the other part to the right-hand syllable.⁴ Also the fact that in *Principles of Phonology* Trubetzkoy still distinguishes two different ways of expressing contrastive vowel length clearly shows that his concept of the mora relates to the representation of vocalic nuclei, not of syllables. To the best of our knowledge, the universal

implication defined in (2) below was never formulated and probably never even envisioned by Trubetzkoy⁵.

(2) Weight-sensitive stress implies contrastive vocalic length

Regarding the intellectual origin of (2) it appears significant that, of all the linguists mentioned earlier, Kuryłowicz (1948) is the only one who does not attribute it to Trubetzkoy - rightly so, as we have just seen⁶. To the best of our knowledge, it was Kuryłowicz himself who first claimed explicitly that syllable quantity can only exist in languages with vowel quantity, as he states:

(3) Kuryłowicz's Universal

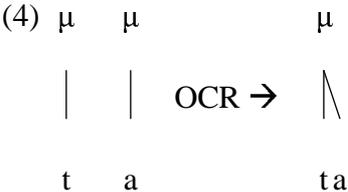
Syllable quantity cannot be based exclusively on the opposition $e \sim et$, but requires the existence of $e:$, which makes possible the relation $e \sim e: = et$ [where e stands for any vowel and t for any consonant; our translation, LW] (1948:220)⁷.

In the remainder of this study we will therefore refer to the implicational law (2, 3) as **Kuryłowicz's Universal**. The validity of Kuryłowicz's Universal as a cross-linguistic generalization is called into question in this section via the numerous languages that count as counterexamples.

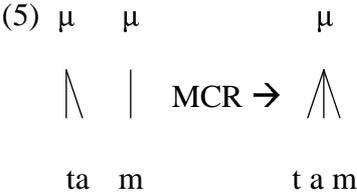
Let us start by observing that in present theories of the mora the question of phonological weight in tautosyllabic VC clusters does not depend on the presence of long vowels in a principled way.

According to Hyman (1985), moras are prosodic 'units of weight' that belong to segments or segment sequences. Lexical associations between segments and weight units are one-to-one, except for phonologically long segments, which are associated with two weight units. Underlying associations between weight units and segments may differ from surface

associations. One difference is systematic and is explained as the effect of a universal Onset Creation Rule (OCR). The OCR acts upon sequences of [+consonantal] and [-consonantal] segments which are joined to become a single weight unit in all of the world's languages. The OCR explains why a [+consonantal] segment always becomes an onset in front of a [-consonantal] segment, and, moreover, why onset consonants never contribute to the weight of a syllable. The universal OCR is exemplified in (4):



Consonants that do not immediately precede a vowel may remain moraic in some languages or lose their mora by language-specific rules of mora deletion and reassociation. In Latin, for example, the coda consonant contributes to the weight of the syllable as is shown by the stress rule of the language, among other rules. In Hyman's view, the Latin coda consonants remain moraic at least until the level at which stress assignment takes place. Since coda consonants in Latin are not syllable peaks phonetically, the Margin Creation Rule (MCR) removes a consonantal weight unit from the representation, after the rules that need to refer to weight have applied. The effect of the language-specific MCR is shown in (5):



Since phonemic vowel length is expressed lexically as the association between a vocalic segment with a single mora (short vowel) or with two moras (long vowel), it is predicted that in languages with phonologically long vowels, when closed syllables behave as heavy for phonological generalizations that are based on a mora count, open syllables containing long vowels may not behave as light. On the other hand, there are languages in which long vowels count as heavy, while VC syllables are counted as short. In those languages, the MCR must apply to eliminate consonantal weight units before the application of the phonological rules that refer to weight. Interestingly, despite the fact that Hyman seems to endorse Kuryłowicz's Universal, it does not follow from his theory in a natural way. In fact, the *obligatory* application of the MCR in languages without phonological length would have to be independently stipulated⁸. As we will see below, this is a fortunate coincidence, because the implication does not hold universally.

A slightly different formalization of the function of the mora in the phonology of the world's languages is proposed by Hayes (1989). As in Hyman's theory, vowels are universally moraic and in languages with a vocalic length contrast long vowels are represented as single segments linked to two moras. Consonants are not moraic underlyingly, except for geminate consonants, which are attached to a single mora in their lexical representation. Additional moras are assigned to coda consonants by a language-specific rule of 'Weight by Position' (WbP). As in Hyman's proposal, the prediction is made that long vowels universally count as heavy for the purpose of rules that discriminate between light and heavy syllables. The case of closed syllables constituting a natural class with syllables containing a long vowel is accounted for by a mechanism that adds moras to the representation (WbP)⁹.

An interesting prediction that follows from mora theory and which bears directly upon the weight issue under discussion is that, if VC syllables do indeed count as bi-moraic in languages with a vowel length contrast only, one would not expect C(ompensatory)

L(engthening) to be possible in languages without phonemic long vowels¹⁰. Hayes, who explicitly addresses this question, concludes: “a language that lacks a vowel length contrast, but has a syllable weight contrast, can create surface long vowels through a process essentially equivalent to CL” (1989:290). Hayes cites Ilokano as an example of such a language. Not only does the Ilokano stress system refer to syllable quantity, that is, to the distinction between CV and CVC, it also creates surface long vowels through a process of compensatory lengthening.

It is clear from the above that Hayes does not adhere to Kuryłowicz’s Universal. Since the application in a given language of his Weight-by-Position rule is not related to the presence of phonemically long vowels, we expect languages like Ilokano to exist. Indeed, every language without phonemic quantity with a stress system that refers to weight, or that has a rule of compensatory lengthening, consonant gemination, or any other generalization that must be expressed in terms of mora structure, would be problematic from the point of view of Kuryłowicz’s Universal. In Wetzels (2003) a number of languages were discussed, from different geographical areas and belonging to different linguistic families, which have stress rules referring to syllable weight but don’t have a phonemic length contrast: Inga (Quechua), Kilivila (Austronesian), Sentani (Papuan), Stoney (Assiniboine Dakota). In a recent survey of the word-prosodic systems of South-American indigenous languages more cases were encountered: Tiriyó (Cariban), Apurinã (Arawakan), Yurakaré, Bakairi (Cariban) (cf. Meira and Wetzels, forthcoming).

To be sure, the languages mentioned above do not exhaust the number of languages that falsify Kuryłowicz’s Universal. In the StressTyp database set up by Goedemans, van der Hulst and Visch at Leiden University¹¹ at least twenty of the five hundred languages represented in the database turn out to have a syllable weight distinction for the purpose of stress placement without having phonemically long vowels. In his discussion of the

typological aspects of the database Goedemans (forthcoming) states: “Even if we discard the questionable cases..., there are still enough languages left to question the universality of the claim that all Q[quantity]S[ensitive] languages need to have long vowels”.

We conclude that Kuryłowicz’s Universal does not survive the test of empirical verification.

2.2 Mixed systems

In this section we briefly address another typological claim, which was made recently by Andrade and Mateus (2000:117), who state: “...the pure quantity-sensitive hypothesis seems, in principle, to be incompatible with the coexistence of two stress subsystems, one for nouns and one for verbs”.

To the extent that the above statement refers to (variants of) Portuguese, we agree with Andrade and Mateus, because BP is not a **pure** quantity-sensitive system, in the sense that syllable weight is only relevant for non-verbal lexical categories. If the statement is about languages in general, which we assume it is, meaning that there can be no stress system in which a quantity-sensitive subsystem co-exists with a subsystem that is not sensitive to syllable quantity, it is not valid as a cross-linguistic generalization, as was also shown in Wetzels (2003). Many, perhaps even most, languages that assign stress on the basis of prosodic categories possess at least some suffixes that disrupt the general prosody-based positioning of the primary accent (quantity-sensitive or not), by being pre-accenting or stress-attracting. Among the languages mentioned earlier, Inga and Stoney combine a subsystem that is weight-sensitive with a subsystem that is morphologically conditioned. An example that closely resembles Portuguese in making a distinction between verbs and non-verbs is Archi, a Southern Daghestanian language.¹² In Archi, stress is assigned within a two-syllable window at the left edge of the word. Stress in non-verbs is sensitive to the open vs. closed syllable distinction, as well as to the

degree of sonority of the vowels that occur in the initial or post-initial syllable. In Archi, monosyllabic nominal roots are always closed. Suffixes may be consonant-initial or vowel-initial. When a consonant-initial suffix is added to the root, the root syllable remains closed and stress will always be initial: *dump* ‘ball’, *dúmp-li* ‘ball-erg sg’, *dúmp-mul* ‘ball-pl’. If the addition of a vowel-initial suffix causes the root syllable to become open, stress will be on the second syllable, unless its nuclear vowel is less sonorous than the vowel in the first syllable: [buχ] ‘vein’, [buχ-út] ‘vein-nom pl’, [q’es] ‘boot’, [q’és-i] ‘boot-erg si’, [q’és-ur] ‘boot-nom pl’, [bel] ‘spade’, [bél-um] ‘spade-nom pl’, [č’ut] ‘bug’, [č’ut-á] ‘bug-erg si’, [č’ut-úr] ‘bug-nom pl’. Disyllabic roots are in conformity with the general stress rule of Archi: [dijá] ‘father’, [zulú] ‘spring’, [gátu] ‘cat’, [génuk] ‘egg’, but [sársi] ‘sand’. In verbs, stress is on the initial vowel if the verb stem is disyllabic, whereas in monosyllabic verb stems stress shifts to the suffix: [kum-mús] ‘eat-inf’, [kun-né] ‘eat-past’, [dáχi-s] ‘beat-inf’, [dá-r-χi-r] ‘beat-pres’, [dáχ-di] ‘beat-past’. Neither syllable weight, nor the sonority degree of vowels influences stress placement in verbs¹³. Interestingly, the set of lexical categories (non-verbs) that is submitted to the quantity/sonority-sensitive subsystem in Archi is identical to that of Portuguese.

2.3 Spondaic Lowering

In the literature on Portuguese stress, the issue of syllable weight was also addressed in Andrade and Laks (1991) who provide the following arguments against weight sensitivity in Portuguese main stress, alongside the ones discussed in sections 2.1 and 2.2:

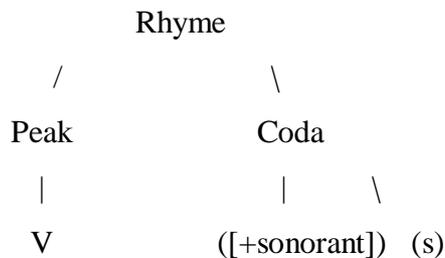
- i. Syllable weight plays no role in other parts of Portuguese phonology;
- ii. The assumption that syllable weight is relevant for main stress makes it impossible to derive main and secondary stress ‘in one sweep’.

Here we will turn to the first of these arguments, leaving the second for a later section. Since we now start addressing arguments that are specific to Portuguese and to BP in particular, we must determine what counts as a heavy syllable in BP.

The BP syllable allows for only two positions in the rhyme. Moreover, the non-peak position is reserved exclusively for sonorant segments (high vowels, liquids, the nasal mora) and /s/. The latter phoneme can moreover be adjoined to the syllable as a second coda element.

We may consequently represent the BP syllable rhyme as in (6):

(6) BP syllable rhyme



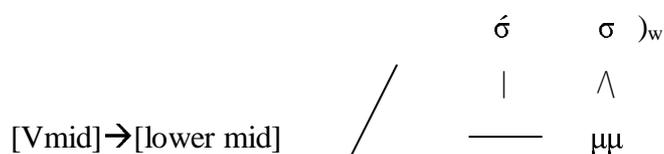
BP has both open and closed syllables. With regard to stress, we may use the notion ‘heavy rhyme’ in its most general interpretation, which is that any syllable that has two filled rhyme positions counts as heavy. The list of possible rhymes in BP is presented in (7)¹⁴:

(7) BP Heavy Rhymes

Possible rhymes	Illustrations	
	final	prefinal
VI	anél ring	Estocólmo Stockholm
Vr	abajúr lampshade	alérto alert
Vs	cortés courteous	adéstro spare
oral diphthongs	herói hero	perféito perfect
nasal diphthongs	irmão brother	cãibra cramp
nasal vowels ¹⁵	irmã sister	macúmba voodoo

There is at least one phonological rule in BP that is conditioned by syllable weight. This rule, called ‘Spondaic Lowering’ in Wetzels (1992; 1995), accounts for the neutralization of stressed mid vowels in prefinal syllables followed by a (final) heavy syllable. Spondaic Lowering, a lexical rule that applies almost without exception in the nonderived vocabulary, is completely productive in paroxytonic words derived by derivational suffixes that consist of a heavy syllable (*-vel*, *-oN*, *-il*). This generalization is stated in (8):

(8) Spondaic Lowering



In paroxytonic position, mid vowels are contrastive in words that end in an open syllable: *borra* [o] ‘sediment’, *borra* [ɔ] ‘bird species’, *consolo* [o] ‘consolation’, *consolo* [ɔ] ‘console’, *molho* [o] ‘gravy’, *molho* [ɔ] ‘bundle’, *ele* [e] ‘he, it, him’, *ele* [ɛ] ‘letter L’, *sede* [e] ‘thirst’, *sede* [ɛ] ‘seat’, *aparelho* [e] ‘equipment’, *velho* [ɛ] ‘old’. The same contrast is not found in prefinal stressed syllables when the final syllable is heavy. The examples in (9) show the effect of Spondaic Lowering:

(9)	Vl#	m[ɔ]vel	mobile
		proj[ɛ]til	projectile
	Vr#	d[ɔ]lar	dollar
		C[ɛ]sar	Caesar
	Vs#	D[ɔ]ris	Doris
		f[ɛ]zes	faeces
	oral diphthong #	j[ɔ]quei	jockey
		j[ɛ]rsei	jersey
	nasal diphthong#	s[ɔ]tão	loft
		m[ɛ]dão	sand dune
	nasal vowel#	[ɔ]rfã	orphan girl
		el[ɛ]tron	electron

Most loans have been adapted to fit this generalization: *b[ɔ]ton* ‘button’, *d[ɔ]lar* ‘dollar’, *d[ɛ]cor* ‘décor’, *F[ɛ]lix* ‘Felix’, *D[ɔ]ris* ‘Doris’, *C[ɛ]sar* ‘Caesar’, etc. The following nouns, all names from German origin, have also undergone the lowering rule¹⁶: *Scherer*, *Sopher*, *Weber*, *Vogel*, *Peter*, *Bohrer*, *Dreher*. Exceptions in the underived vocabulary that cannot be explained by independent constraints such as prenasal vowel raising (cf. *[ó]nus* ‘burden’)¹⁷ or dissimilatory raising (cf. *lag[ó]a* ‘lagoon’, *can[ó]a* ‘canoe’, *Alag[ó]as* ‘id.’) are very rare: *t[é~é]xtil* ‘textile’ *p[ó]ster* ‘poster’, *pul[ó]ver* ‘pullover’, *p[ó]quer*, ‘poker’, *f[ó]lder* ‘folder’. A productive word formation process constructs words with the learned preaccenting suffix *-on*, used in nouns that express subatomic particles, quanta, or other minimal entities, as in *cáon*, *báron*, *glúon*, *f[ó]non*, *b[ó]son*, *f[ó]ton*, *magn[é]ton*, *el[é]tron*, *l[é]pton*, *m[é]son*, *pr[é]on*. Upper mid vowels [e,o] may not occur under stress in such words, unless by virtue of some more powerful constraint. The same happens in deverbal adjectives formed with the heavy-syllable suffix *-vel*: *m[ó]vel* ‘mobile’, *(in)del[é]vel* ‘(un)erasable’, as well as in words containing the suffix *-il*: *d[ó]cil* ‘docile’, *est[é]ril* ‘sterile’, *proj[é]til* ‘projectile’, *ign[ó]bil* ‘ignoble’, *er[é]til* ‘erectile’, *d[é]bil* ‘weak’, *f[é]rtil* ‘fertile’, *ins[é]til* ‘indivisible’, etc.

Spondaic Lowering does not apply in verbs or in plural nouns. The following examples show that verbal suffixes or suffix sequences that make rhymes heavy do not create environments for vowel lowering, and neither does the plural suffix in non-verbs¹⁸:

- (10)
- | | |
|---------------------------|----------------|
| <i>aprender</i> to learn | |
| pluperfect 2pl | impf subj 2pl |
| aprend[é]reis | aprend[é]sseis |
|
 | |
| <i>esquecer</i> to forget | |
| pres subj 2si | pres subj 3pl |
| esqu[é]ças | esqu[é]çam |

<i>mover</i>	to move	
pres subj 2si		pres subj 3pl
m[ó]vas		m[ó]vam
profess[ó]r(es)		esquel[é]to(s)
professor(s)		skeleton(s)

We conclude that the light versus heavy syllable distinction does play a role in the phonology of BP, independently of the stress placement rules. More interestingly, Spondaic Lowering shows that the weight of the word-final syllable is crucial for the proper definition of this constraint. It is precisely the role of the word-final syllable that constitutes the most condemned aspect of the weight-based stress rule, because of the existence of exceptions like *útil* ‘useful’, *garágem* ‘garage’, *móvel* ‘mobile’ etc. (see also section 2.6 below). This scepticism, which seems to be difficult to maintain in view of the structural condition of Spondaic Lowering, is even more surprising in the context of a discussion that favors the morphology-based stress account of non-verbs, because the class of paroxytonic words with a final heavy syllable is exceptional in both accounts. Similar to the rules of stress placement, Spondaic Lowering only applies to non-verbs. Note also that pluralization usually does not alter the stress position of the corresponding singular form. Similarly, plural nouns and adjectives preserve the mid-vowel quality of their singular correspondents¹⁹.

2.4 Primary and secondary stress

We have seen that Andrade and Laks (1991) criticize the quantity-sensitive (henceforth QS) analysis for not allowing the derivation of main and secondary stress in one sweep. A similar criticism is formulated by Roca (1990), when he observes that Spanish secondary stress is quantity-insensitive (henceforth QI).

It is true that syllable weight is not relevant for secondary stress in BP. This fact makes it impossible to assign primary and secondary stresses with a single QS mechanism that would

apply in an iterative fashion. However, what looks like an analytical weakness at first sight turns out to be an argument in favor of keeping the two phenomena apart, if we consider the different properties of primary and secondary stresses and their status in the phonological grammar of BP. First, secondary stress shows variation, unlike primary stress. It was observed by Collichon (1994) that secondary stress in BP usually follows a binary pattern, but a word-initial dactyl is also possible, as in *abacaˈxi* ‘pineapple’ with main stress on the final syllable: *ˌabacaˈxi* with an initial dactyl, or *abˌacaˈxi*²⁰. Primary stress, on the other hand, does not allow for variation, except under very specific circumstances, when it may shift to a different position, or disappear, in order to avoid stress clashes (cf. *caf[é]+zínho* → *câf[ɛ]zínho* ‘small coffee’, where unstressed [ɛ] shows that /kafé/ was used as the base for the formation of the diminutive with the suffix *-zínho*, which has prosodic-word status²¹). Note, however, that clashes or potential clashes of primary stresses are configurations of accents whose location is fixed categorically at a deeper level of representation.

Primary stress in BP is a lexical phenomenon, in the sense that the constraints that account for its distribution interact with morphology by way of selecting specific lexical categories (verbs, non-verbs). Also, as we will see below, within the class of verbs, the specific distribution of main stress is conditioned by the inflectional categories of tense. As is to be expected, primary stress in BP is intertwined with lexical (and postlexical) phonology. A large part of the lexical constraints that deal with vocalic alternations are directly or indirectly related to main stress. Spondaic Lowering discussed in the previous section was an example of a lexical constraint that refers to the location of primary stress. Many more generalizations in the lexical phonology of BP are stress-dependent, especially in the area of vowel alternations. One of these is unstressed vowel neutralization, which reduces the number of vocalic contrasts by merging the upper and lower mid vowels to a single series of (upper) mid vowels in unstressed syllables (*c[ɔ̃]lo* ‘neck’, but *c[o]lár* ‘necklace’; *v[é]la* ‘sail’, but *v[e]léiro*

‘sailing ship’) or Dactylic Lowering, which is very similar to Spondaic Lowering, except that it counts syllables instead of moras, and neutralizes the mid vowel contrast in proparoxytonic position, in favor of the lower mid vowels²²: *p[ó]vo* ‘people’, but *p[ɔ]voa* ‘hamlet’; *esquel[é]to* ‘skeleton’, but *esquel[ɛ]tico* ‘skeletal’. On the other hand, we have not encountered, nor have we seen reported in the literature on BP, clear cases of lexical rules of phonology or morphology that refer to secondary stress. Our interpretation of this situation is that primary and secondary stress in BP are assigned in different components of the grammar, as was also argued in Wetzels (1992). We will assume that these different components correspond to the levels that are usually referred to as lexical and postlexical phonology. In this sense, we regard the different ways in which primary and secondary stress function in the grammar of BP as a strong argument in favor of a model, whether derivational or constraint-based, that distinguishes these two components.

When considered from a typological perspective, one observes that in many languages culminative and rhythmic stress are governed by different factors. This is obvious in languages where primary stress is unpredictable, or conditioned by morphology. Similarly, while languages are known that assign primary stress on the basis of the degree of sonority of the syllable nucleus, there seem to be no languages in which rhythmic stress is sonority-driven. In languages where both culminative and rhythmic stress are sensitive to weight, it may happen that the segment classes that count as heavy are not identical for both. According to Hayes (1995:333), Chugach is a language that counts both long vowels and closed syllables as heavy for primary stress, whereas only long vowels are considered heavy for the sake of rhythmic stress. Exactly the opposite situation is found in Sri Lanka Creole Portuguese, analyzed by Smith (1978) (see footnote 8). Goedemans (forthcoming) establishes on the basis of a sample of 97 StressTyp languages in which weight is relevant for the attribution of primary and/or secondary stress, that in 32 languages primary stress is QS while secondary

stress is not. Inversely, in 17 languages primary stress is QS and secondary stress QI. Finally, in 8 languages both primary and secondary stresses are QS, but the definition of what counts as heavy is different for primary accent and rhythm. In less than half of the QS languages in the sample, weight is defined uniformly for primary and secondary stresses. These and other asymmetries between primary and secondary stress have been used by Van der Hulst (1996) to defend his Primary Accent First (PAF) theory²³.

2.5 Palatal onsets in final syllables

Most scholars agree that proparoxytonic stress in BP is incompatible with a prefinal heavy syllable. Supplementary evidence for the awareness of BP native speakers of this restriction can be obtained from hypercorrect diphthongization.

The optional monophthongization of the diphthongs /ej/ and /aj/ is a process that occurs throughout Brazil²⁴. It happens most frequently before /r/, but also before the palatal fricatives /ʃ, ʒ/, and more frequently in stressed syllables than in unstressed ones. Some examples are given in (11):

(11)	primeiro	[primé(j)ru]	first
	caixa	[ká(j)ʃa]	box
	caixeiro	[ka(j)ʃé(j)ru]	sales assistant
	paixão	[pa(j)ʃ ɛ̃õ]	passion
	ameixa	[amé(j)ʃa]	plum
	feijão	[fe(j)ʒ ɛ̃õ]	bean
	beijo	[bé(j)ʒu]	kiss
	beijar	[be(j)ʒár]	kiss-inf

The variation created by monophthongization leads to hypercorrect diphthongization in words that contain /e/ or /a/ in the contexts in which usually diphthongs are reduced to monophthongs, as in the examples in (12):

(12)	caranguejo	[karãgɛ(j)ʒu]	crab
	igreja	[igrɛ(j)ʒa]	church
	fechar	[fɛ(j)ʃár]	close-inf
	remelexo	[xemelɛ(j)ʃu]	swaying
	prazeroso (compare <i>prazér</i> ‘joy’)	[praze(j)rózu]	pleasant

Just like optional monophthongization, hypercorrect diphthongization occurs in stressed and unstressed syllables alike. However, it is never observed in post-tonic position in proparoxytonic words like *câmera* (**câmejra*) ‘camera’, *cólera* (**cólejra*) ‘cholera’, *ópera* (**ópejra*) ‘opera’, *áspero* (**áspejro*) ‘rough’, *efêmero* (**efêmejro*) ‘ephemeral’, etc. One may conjecture that the reason why diphthongization never occurs in these words is because it would create a prosodic pattern that is prohibited in the language²⁵.

It was observed by Harris (1983) and Roca (1990) for Spanish that a palatal onset in the final syllable prevents leftward stress shift from a light penultimate. According to Roca the systematic absence of the pattern $X\acute{V}CVC_{\text{palatal}}V\#$ cannot be explained by a weight-based algorithm, because “there is not a shred of evidence to suggest that these palatals can be analyzed as consonant clusters synchronically...(1990:154).” With his remark, Roca refers to the fact that stress in Spanish, like in Portuguese, cannot ‘skip’ a prefinal heavy syllable. Since palatal consonants cannot be analysed as hetero-syllabic clusters, some *ad hoc* stipulation is necessary to express the property that these consonants are pre-accenting when they occur in the onset of the word-final syllable. As in Spanish, in BP antepenultimate syllables cannot be stressed if the final syllable begins with a palatal glide or consonant. However, it was shown in Wetzels (1997) that, at least in the case of BP, there is sufficient proof for the fact that these sounds add weight to the preceding rhyme²⁶. We summarize the discussion in Wetzels (1997) below.

Within the set of words that belong to the exceptional proparoxytonic pattern (*médico* ‘physician’, *cérebro* ‘brain’, *pássaro* ‘bird’, etc.) the presence of the word type $\acute{V}XVC_{\text{palatal}}V\#$ (e.g. **álcunha*) is conspicuously absent. This would not be alarming if this word type were

rare, because one could argue that as proparoxytonic words are exceptional anyway, the absence of the **álcunha* type is an accidental gap. In reality, however, this word-type is not uncommon, either in Spanish or in Portuguese. Some BP examples are given below (the starred words represent word **types** with the obvious characteristics):

(13)	alcúnha	[ɲ]	nickname	*álcunha
	batálha	[ʎ]	battle	*bátalha
	bolácha	[ʃ]	biscuit	*bólacha
	garágem	[ʒ]	garage	*gáragem
	apóio	[j]	support	*ápoio
	(cachórrro	[x]	dog'	*cáchorro)

We have added 'strong /R/', phonetically realized as a velar or uvular approximant [x,χ], to the list of word-final onsets that are incompatible with antepenultimate stress. As in Spanish (cf. Harris 1983), Portuguese strong /R/ is traditionally analyzed as a geminate consonant (cf. Câmara, 1953:70). Arguments for the underlying geminate structure of strong /R/ are derived from the largely complementary distribution that exists between the strong and the weak /R/, which is usually realized as an alveolar tap [ɾ]. The distribution of [x] and [ɾ] is shown in (14)²⁷.

(14) Distribution of weak and strong /R/

		strong /R/		weak /R/
a.	word-initial	rato	rat	
b.	coda	mar	sea	
		carta	letter	
c.	V-init after hetero-syll C	bilro	bobbin	
d.	V-init after tauto-syll C			praia beach
e.	between diphthong and vowel			beira edge
f.	between vowels	carro	car	caro expensive

As can be observed in (14), with the exception of the contrast intervocalically, weak and strong /R/ are in complementary distribution. This indicates a common phonological source for both /R/s. Furthermore, the lexical qualitative distinction that seems necessary to account for the

intervocalic contrast can be eliminated in favor of a quantitative distinction between a simple and a geminate /R/. This analysis has the advantage of explaining the stress behaviour of words that have strong /R/ in the onset of their final syllable: the syllable preceding strong /R/ would count as heavy and the ungrammaticality of words like **cáchorro* ‘dog’ could be explained on a par with all other words that have a prefinal heavy syllable.

Other facts of BP phonology show that, at least morpheme-finally, both /R/-sounds derive from a single lexical source, as is clear from the following alternations:

(15)	derivation					
	ma[x]	~	ma[r]ujo	sea	~	seaman
	mulhe[x]	~	mulhe[r]ada	woman	~	group of woman
	flection					
	amo[x]	~	amo[r]es	love-si	~	love-pl
	fala[x]	~	fala[r]ei	speak-inf	~	speak-1si-fut-ind
	external sandhi					
	supe[x]	~	supe[r]-homen	super	~	superman
	ma[x]	~	ma[r] azul	sea	~	blue sea
	fala[x]	~	fala[r] alto	speak-inf	~	speak loudly

Furthermore, the language game of ‘backwards speech’ discussed in Leite (1974) shows that [r] and [x] are treated by native speakers as a complementary set: when one member of the set is put in a context where it may not occur, it is replaced by the other member: *trágico* [tráziku] ‘tragic’ → [okizáxt], *órfão* [óxfãõ] ‘orphan-masc’ → [o3fró]. The same behavior can be observed in speech errors: *africano* [afrikánu] ‘African’ → [axfikánu], *presidente* [prezidẽ.tʃi] ‘president’ → [pexzidẽ.tʃi] (cf. Angenot and Vandresen, 1981: 96).

Although the precise formalization of the distribution of /x/ and /r/ is not crucial to the point at issue here, we will assume that both the alveolar tap and the velar approximant are derived from a segment that is lexically underspecified, which we will represent, adopting Hayes’ (1989) representation for geminates, as in (16):

(16a)	root - vocalic +approximant +continuant (as in <i>caro, praia, carta</i> , etc.)	(16b)	μ root - vocalic +approximant +continuant (as in <i>carro</i>)
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The different ways in which underlying /R/ is realized phonetically (its intervocalic occurrences included) can now be derived from its distributional and structural properties. In principle, the phonological spell-out of the underspecified segment can, for a given context or for all contexts, be postponed until a late level in the derivation (postlexical), or even be left to the care of the phonetic component²⁸. The analysis of intervocalic strong /R/ as a lexical geminate predicts the velar pronunciation by the independently needed spell-out rules, when properly defined: both the coda part and the onset part, which is post-consonantal, are spelled out as phonetic [x] (compare the distribution in 14 above), yielding intermediate /xx/, not */rɾ/. This might simultaneously explain why the velar sound is phonetically realized as a non-geminate [x], because it already contrasts with the alveolar variant for place of articulation. In view of the geminate analysis of strong /R/, one may ask whether a similar analysis is possible for the palatal consonants²⁹.

Of the word types that are listed in (13), we will only discuss the palatal sonorants [ɲ] and [ʎ]. This is because the facts are not so clear with regard to the palatal fricatives [ʃ,ʒ] as well as the palatal glide [j]. There is at least the very frequent word, *cônjuge* [kõ.ʒuʒi] ‘spouse’, and the loans *íidiche* [íidiʃi] ‘Yiddish’ and *ápaga* [ápazi] ‘go away’, which show that antepenultimate stress in words that end in a syllable with a palatal fricative onset are not categorically excluded. As for the non-existence of the **ápoio* type, several explanations are available in the literature. One proposal considers the intervocalic glide a nuclear vowel at the level of representation where stress is assigned, in which case **ápoio* would carry accent on a

syllable that falls outside the three-syllable window and would therefore be unacceptable (cf. Cristóforo, 1989:113). In another analysis, which is the one proposed in the traditional grammars, the glide closes the preceding syllable: *a.poi.o*. The main argument for this (marked) syllabification is based on the fact that word-initial glides only occur optionally in BP, with a clear preference for the syllabic pronunciation of /i/: [i/j]ota ‘iota’, [i/j]ogurte ‘yogurt’, [i/j]ati ‘yacht’, [i/j]emen ‘Yemen’, etc.³⁰ In a phonetic discussion of BP by Cagliari (1981), the geminate pronunciation of intervocalic /i/ is given as a possible variant. A similar pronunciation of the intervocalic glide is described by Taddey (1971: 364), who states referring to the words *maior* ‘bigger’, *idéia* ‘idea’, *areia* ‘sand’, and *epopéia* ‘epopee’: “Considering the exact pronunciation of the word, we see that after the falling diphthong a semi-consonant appears...: mai-yor, i-déi-ya, a-rei-ya, e-po-péi-ya [our translation, LW]”. Notice that, if the glide functions as a nucleus for the sake of primary stress, we would expect the *apóio* class to undergo Dactylic Lowering. Consequently, no stressed upper mid vowels could appear in these words, which nevertheless occur abundantly: *ap[ó]io* ‘support’, *bal[é]ia* ‘whale’, *ald[é]ia* ‘village’, *corr[é]io* ‘mail’, *cad[é]ia* ‘prison’, etc. Unless the upper mid quality can be explained by an independent constraint, these words provide phonological evidence against the (lexical) syllabic status of the high vowel. As it turns out, stressed upper mid vowels are systematic in non-verbs that end in *-io* (phonetic [ju]): *arr[ó]io* ‘streamlet’, *ap[ó]io* ‘support’, *corr[é]io* ‘mail’, *f[é]io* ‘ugly’. However, in words that end in *-ia* (phonetic [ja]) upper and lower mid vowels contrast: *id[é]ia* ‘idea’, *jib[ó]ia* ‘boa constrictor’, *gel[é]ia* ‘jam’, etc. At least the latter word type behaves like a ##XCV.CV## sequence by allowing a mid-vowel contrast. Our preference therefore tends towards the traditional heavy syllable (or geminate) analysis, which we would be willing to accept, if Taddy and Cagliari’s transcriptions of intervocalic palatal glides as geminates can be confirmed with laboratory evidence³¹. We will leave this issue for further study³².

Let us now turn to the sonorant palatals /ɲ, ʎ/, for which we have proposed a geminate analysis in Wetzels (1997), based on the observations outlined in the following subsections.

2.5.1 Allophonic nasalization and the palatal nasal consonant

The phonology of BP must account for two types of nasality, one allophonic (*men[ĩ]na* ‘little girl’), the other (surface) contrastive (*c[ã]pa* ‘hand bell’ vs. *c[á]pa* ‘cape’). It was suggested by Câmara (1970:37) that contrastive nasality, which is obligatory and independent of stress (compare [kápa] with [kãponés] *camponês* ‘countryman’), be derived from an underlying oral vowel followed by a tautosyllabic nasal mora (VN), an analysis which was adopted in Wetzels (1997). Here we will concentrate on allophonic nasalization.

Many speakers of BP, especially in southern Brazil, realize an alternation in the stem /am/ of the verb *amar*, as in such forms as *ámo* ‘I love’, with a nasal /ã/, and *amár* ‘love-inf’, in which /a/ is oral (see also Vandresen, 1975). More examples of allophonic nasalization are provided in (17).

(17) Allophonic nasalization

(a) Stressed before /m, n/

[sĩnu]	sino	bell	[fũmu]	fumo	smoke
[lẽmi]	leme	helm	[dõnu]	dono	owner
		[kãma]	cama		bed

(b) Unstressed before /m, n/

[pinója]	pinóia	bad deal	[kumarí]	cumari	chili
[tenás]	tenaz	tenacious	[bonéka]	boneca	doll
		[tamãku]	tamanco	wooden shoe	

(c) Stressed before /ɲ/

[koʒiɲa]	cozinha	kitchen	[awkũɲa]	algunha	nickname
[azẽɲa]	azenha	water wheel	[segõɲa]	cegonha	stork
		[arãɲa]	aranha	spider	

(d) Unstressed before /ɲ/

[dĩɲéjɾu]	dinheiro	money	[kũɲádu]	cunhado	brother-in-law
[sẽɲóx]	senhor	mister	[vexgõɲózu]	vergonhoso	shameful
		[kãɲótu]	canhoto	left-handed	

As can be observed in the words given in (17), the coronal and labial nasal stops, on the one hand, and the palatal nasal stop, on the other, behave differently in their choice for the targets of nasal spreading. Quite surprisingly, nasalization is general before /ɲ/, but not before /n, m/. To be more precise, allophonic nasalization before palatal nasals occurs independently of the position of primary stress, just like contrastive nasalization. The robustness of this phenomenon was confirmed in a striking way by a large-scale survey carried out in Brazil by Abaurre and Paggotto (1995). These scholars found that contrastive nasality was realised in 100% of the cases. Moreover, allophonic nasalization was categorical in (primary) stressed syllables. They then observe: “Nasalization is categorical when a vowel precedes a palatal nasal consonant, independently of whether the vowel is stressed or unstressed” (1995:24)³³.

If we are allowed to explain the similar behavior of contrastive nasality and allophonic nasalization before /ɲ/ in terms of a similar lexical representation, we must conclude that in the case of /ɲ/, nasality is located in the syllable coda. Of course, the immediate consequence of this hypothesis is that, whatever precise underlying representation for /ɲ/ is chosen, it will be such that it makes the preceding syllable heavy. A geminate representation of palatal nasals would account for the observed parallel.

2.5.2 The Maximal Rhyme Constraint: no branching rhymes before [ʎ, ɲ]

Given the structural properties of the BP rhyme, the analysis of sonorant palatals as phonological geminates makes a number of predictions that can be easily tested. It was shown above that, the exceptional status of /s/ aside, the BP rhyme contains two segments in its maximal expansion. Clearly, if palatal sonorant consonants are geminates, unlike other sonorant consonants, we predict that the former class cannot be preceded by a branching rhyme, whereas the latter can. This is because the left-hand part of the geminate would occupy the only non-nuclear position available in the syllable preceding the palatal sonorant. The predicted difference between /ɲ/ and /m,n/ is borne out by the facts. In the example set (18), the question mark stands for the elements that may occupy the second position in the rhyme preceding the nasal onset. The reader will recall from (7) that the heavy rhymes of BP are Vɪ, Vɹ, Vɹ, oral diphthong, nasal vowel, and nasal diphthong. Consider now the words in (18):

(18)	V?m		V?n		*V?ɲ(/ʎ)
	alma	soul	vulnerável	vulnerable	*Vɲɲ/ʎV
	arma	weapon	adorno	ornament	*Vɹɲ/ʎV ³⁴
	abismo	abyss	cisne	swan	*Vɹɲ/ʎV
	teimar	be stubborn	reino	kingdom	*Vɲɲ/ʎV
	fleuma	apathy	eunuco	eunuch	*Vwɲ/ʎV

Except for nasal vowels and the nasal diphthongs, which cannot occur before nasal onsets for structural reasons³⁵, before onset /m, n/ all possible branching rhymes are found, whereas not a single one may occur before /ɲ, ʎ/. This exact distribution of branching rhymes is predicted by the geminate analysis of sonorant palatals.

2.5.3 The Maximal Rhyme Constraint: syllabification of V V[+high] before [ɲ, ʎ]

In the preceding section it was observed that /ɲ, ʎ/ cannot be preceded by branching rhymes, including oral diphthongs. The systematic absence of oral diphthongs in front of palatal sonorants does not mean that these consonants cannot be preceded by a vowel sequence of the type /V{i,u}/. As a matter of fact, in BP this is a very common pattern, which we exemplify with the words in (19):

(19)	rainha	queen	bainha	sheath
	ladainha	litany	moinha	chaff
	moinho	mill	tainha	mullet
	fuinha	weasel	fuinho	woodpecker
	graú lho	grape-stone	faúlha	spark

It was argued at length in Wetzels (1997) that contrastively nasal vowels (i.e. nasal vowels that occur before an oral onset) represent heavy syllables in BP. Word-finally, they attract stress, and words with a contrastive nasal vowel in the prefinal syllable never show proparoxytonic stress:

(20)	ainda	[a.á.da]	still
	reconstituente	[xekõstitu.á.tʃi]	restorative
	amendoim	[amêdo.á]	peanut
	destruindo	[destru.á.du]	destroying
	transeunte	[trãze.ú.tʃi]	passer-by
	Efraim	[efra.á]	Efraim

As predicted, when the nasal vowel derives from an underlying [V+high]N sequence, as in the examples in (20), it is never syllabified with a preceding vowel to form a falling diphthong³⁶, which would be the regular syllabification in the case of high oral vowels (compare *ainda* [a.á.da] ‘still’ with *vaidade* [vaj.dádi] ‘vanity’). Obviously, if contrastive nasal vowels represent branching rhymes (lexically /VN/), and given the maximal rhyme constraint, a sequence of an oral vowel followed by a nasal vowel (i.e. VVN) is automatically syllabified as a two-syllable

sequence. It is, therefore, the maximal rhyme constraint that explains the different syllabification of word pairs such as /kaiN/ → ([ka.í]) *Caim* ‘Cain’ and [ʒáj.mi] *Jaime* ‘Jaime’. Consequently, the syllabification of the words given in (20) is completely regular, as is further confirmed by the following examples, which also contain a vowel plus high vowel sequence, followed by a word-final coda:

- (21) [pa.úω] paul marsh compare [páω.lu] Paulo Paul
 [ada.íω] adail chief
 [ra.úω] Raul id.
 [aωda.íx] Aldair id.

The word-final sequences /VC/, as in *paul*, *Aldair*, etc. are analysed as independent syllables, because the presence of [VGC] in a single syllable, e.g. *[a.dájx] is ruled out by the maximal rhyme constraint.

Returning now to the words in (19), the claimed geminate representation for palatal consonants predicts that syllable structure will always split the /V{i,u}/ sequences into two syllables before /k, ɲ/. This indeed always happens: [fu.í.ɲu] *fuinho* ‘woodpecker’, [gra.ú.ɫu] *grauího* ‘grape-stone’, etc.

2.5.4 Word-initial palatal sonorants

The geminate analysis of palatal sonorants is sometimes criticized for ignoring the fact that these sounds sporadically occur syllable- (including word-) initially, mostly in loans: *lhama* (Sp. *llama*) ‘llama’, *lhano* (Sp. *llano*) ‘friendly’, *lornhão* (Fr. *lorgnon*) ‘eye-glass’, *nhandu* (Tupi *nãdu*) ‘rhea’, *nhambu* (Tupi *nãbi*) ‘tinamou’, *nhô* or *nhonhô* (<*senhor*) ‘sir’, *nhoque* (It. *gnocchi*) ‘gnocchi’, *nhaca* ‘body stench’, and a few others, as well as in the personal pronoun clitics *lhe* ‘to him/her/you’, *lhes* ‘to them/you’, *lha* (<*lhe+a*), and *lho* (<*lhe+o*), all of which are

hardly ever used in colloquial BP and, when one is used, are pronounced most of the time with initial [l], as in *lhe* [li] etc. It is a fact that the syllable-initial occurrences of these sounds are avoided. Moreover, palatal sonorants never occur in codas. Indeed, the attested distribution of palatal sonorants in BP is typical for geminates cross-linguistically.

When confronted with a word-initial palatal sonorant, the speaker may or may not parse the underlying mora. If it is not parsed, a non-geminate palatal sonorant will result, if it is parsed, a structure must be created in which the parsed coda can be accommodated, such as a supplementary syllable, a strategy often followed by BP speakers: the words *lhama* and *nhaca* are usually pronounced as [i]lhama and [ĩ]nhaca, while *nhoque* is pronounced by some speakers as [ĩ]nhoque and by many others as [ĩj]oque, *nhandu* is also pronounced *nandu*, and for *nhambu* the variants *inhambu*, *inamu*, and *namu* exist, etc. The number of alternative pronunciations typical for these words clearly shows that syllable-initial palatal sonorants are felt as foreign to the BP sound pattern.

In the foregoing discussion it was shown that the distribution of branching rhymes, syllabification of vowel sequences before /ɲ ʎ/, allophonic nasalization before /ɲ/, and the restriction of palatal sonorants to intervocalic position point to a geminate analysis for these sounds, which explains at the same time why stress may not shift to the antepenultimate syllable in words with a palatal sonorant onset in their final syllable.

2.6 Exceptional and regular stress in BP non-verbs

In BP, productive stress in non-verbs falls on the word-final syllable if it is heavy, and otherwise on the prefinal syllable: *pomár* ‘orchard’, *sapáto* ‘shoe’. Given this formulation of the stress rule, three classes of exceptions must be distinguished. In one class, stress is on the antepenultimate syllable, as in the words below:

(22)	dúzia	[dúzja]	duza	dozen
	farmácia	[faxmásja]	farmasa	pharmacy
	armário	[axmárju]	armaro	wardrobe
	abóbora	[abób(u)ra]	abobra	pumpkin
	árvore	[áxv(u)ri]	arvre	tree
	música	[múzika]	musga	music
	pássaro	[pásaru]	passo	bird
	cócegas	[kósegas]	cosca	tickle
	lâmpada	[lâpada]	lampa	lamp
	simpático	[šípátiku]	simpate	pleasant
	escrúpulo	[iskrúpulu]	escrupo	scruple
	sábado	[sábadu]	sabo	Saturday
	ônibus	[ónibus]	ombus	bus
	bêbado	[bébadu]	bebo	drunk
	estômago	[istómagu]	estomo, estobo	stomack
	espírito	[ispíritu]	sprito	spirit
	helicóptero	[elikópteru]	helicopto	helicopter

It is often suggested for BP that post-stress vowel deletion in words like *abóbora* [abób(u)ra] ‘pumpkin’, *árvore* [áxv(u)ri] ‘tree’, where it leads to grammatical onset clusters in the final syllable, finds an explanation in the fact that prefinal stress represents the unmarked pattern for this language³⁷. Glide formation in words like *dúzia* [dúzja] ‘dozen’, *armário* [axmárju] ‘wardrobe’, etc., which is a rule that applies less categorically in pre-stress sequences (cf. *vicioso* [visj/iósu] ‘vicious’), is often explained in a similar way. If these processes are rightly seen as motivated by a tendency to generalize the unmarked stress pattern, the same motive may perhaps explain the massive elimination of proparoxytonic stress in the northern and northeastern dialects of Brazil³⁸, in many of which this pattern has completely vanished, in non-verbs as well as in verbs. The reduced forms in (22), which all have prefinal stress, represent northeastern variants, most of which were taken from Alancar (1997), who describes the dialect of the town of Cariré, in the southern part of the state of Ceará.³⁹

An interesting aspect of the rule of Post-Stress Gliding in the southern dialects is that it renders the effect of Dactylic Lowering opaque. Stressed mid vowels preceding the

Consonant+Glide word-final onsets are lower mid without fail, as in the following examples: *cemit[é]rio* ‘graveyard’, *bact[é]ria* ‘bacterium’, *pres[é]pio* ‘crib’, *Be[ó]cia* ‘Beotia’, *neg[ó]cio* ‘business’, *[ó]dio* ‘hatred’, etc. Since we usually find a contrast between upper and lower mid vowels in prefinal stressed syllables followed by a (word-final) open syllable, this situation is unexpected. Supposing that, at the level in the grammar where Dactylic Lowering applies, post-consonantal high vocoids are represented as syllable nuclei, we can explain the persistent occurrence of lower mid vowels in these words as the expected effect of this constraint. Consequently, Post-Stress Gliding can be assigned to the postlexical component⁴⁰. The proposed analysis presupposes at least two rounds of syllabification, one lexical, the other postlexical. Interestingly, the contrast between *ap[ó]io*, in which [...ojo] counts as bisyllabic for the sake of Dactylic Lowering and *[ó]dio*, which counts as trisyllabic, shows that this constraint really counts syllables, not vowels.

The second set of exceptional stresses is represented by words that are accented on the prefinal syllable, despite the fact that their final syllable is heavy. Some examples are given in (23):

(23)	órfã	[óxfã]	[óɿfa]	orphan fem.
	dólar	[dóɿax]	[dóɿla]	dollar
	fórum	[fóru]	[fóru]	forum
	estévil	[ɿstéviw]	[stévi]	sterile
	jovem	[óvẽ]	[óvi]	young
	móvel	[móvew]	[móvi]	mobile
	órfão	[óxfãw]	[óɿfu]	orphan masc.
	Vésper	[véspex]	[véspri]	Vesper
	repórter	[xepóxtex]	[xepóɿti]	reporter

In (23) we have given two sets of phonetic transcriptions. The left-hand set represents the standard pronunciation of the words given in the first column, which is typical for most of the southern dialect zone as well as for the speech of Rio de Janeiro (carioca). The right-hand set, for which we follow the transcription of Netto (2001: 182), represents a variant

spoken in the western part of the state of São Paulo⁴¹. We have added this dialect because it has eliminated complex rhymes in word-final unstressed syllables. According to Netto, the changes that have occurred in this variant of BP may have been induced by the desire to bring the final syllable in line with the unmarked penultimate stress pattern⁴². Whereas it is difficult to determine whether there is a direct causal relation between the markedness of the stress types represented by the words in (22) and (23) and the changes they have undergone, or whether their getting in tune with the regular stress pattern for words with a final open syllable is the side-effect of the weakening and deletion processes typical for the weak prosodic position of the affected syllables, it is clear that both exceptional stress types are disappearing from the non-standard variants.

The last class of exceptions concerns words that have stress on a final open syllable, as in the examples below⁴³:

(24)	abacaxi	[í]	pineapple
	urubu	[ú]	vulture
	canjerê	[é]	voodoo ritual
	camelô	[ó]	street vendor
	jacaré	[é]	alligator
	igapó	[ó]	swampland
	maracujá	[á]	passion fruit

Most polysyllabic words that end in a stressed open syllable are of foreign origin: African languages, indigenous languages (mostly Tupi), French, and English. The fact that these words were not adapted to the regular stress pattern of BP is probably due to the large scale at which oxytonic words from African and Indian origin have entered the language, as well as the fact that within the non-verbal categories of BP a class of ##CV## words exist, which (necessarily) have stress on their only syllable: *pó* ‘powder’, *pá* ‘spade’, *pé* ‘foot’, *fé* ‘faith’, *chá* ‘tea’, *nu* ‘naked’, *nó* ‘node’, *só* ‘only’, etc. Despite their relatively large number, we will consider the class of polysyllabic words with a final stressed open syllable as foreign to the

BP stress system and treat them as exceptions. In this respect, the stress algorithm based on syllable weight diverges from the stem-based approach, which treats these words as athematic and, consequently, predicts that stress is always on the final syllable⁴⁴. On the other hand, the words in (22) and (23) represent exceptions to both approaches. The question that comes to mind is whether it is possible to show which characterization of the class in (24) is correct, the one that treats it as regular or the one that treats it as exceptional.

The productivity of phonological rules can be tested by observing how they apply to newly created words. To test the stress rules that apply to non-verbs one should only consider underived words, for which no accentual model is available and with regard to which the speaker needs to make a decision as to where main stress will fall. For BP there exist at least two sources for new words. One source is constituted by the very large class of acronyms, of which the following represent only a small sample:

(25)	VN##	JOCÚM FEBÉM PROCÓN DETRÁN
	VG##	INÉI FUNÁI SUSÁU SENÁI
	Vs##	BENÉS REIPLÁS
	Vr##	UFÍR PROÉR ALUNÓR CONÁR
	Vl##	VARSÚL ANPÓL UFÁL
	VC(C)##	VAPÉSP(i) VALMÉT(i) TELÉRG(i) TELÉSP(i)

The distribution of stress in the words above, which all end in a closed syllable, shows that there is an unmarked stress rule for BP non-verbs, despite the relatively large class of exceptions in the existing vocabulary. Prefinal stress in acronyms that end in a heavy syllable is extremely rare⁴⁵ and not a single one was encountered in which stress skips a prefinal heavy. On the other hand, in acronyms that end in an open syllable stress is prefinal: ÓVNI, BANÉSPA, FINÁSA, ÚFBA, BRADÉSCO, TELÁSA, TEXÁCO, etc. Again, counterexamples to the unmarked stress location are very rare. The latter fact is surprising under the analysis that takes the root, instead of the word, as the domain for stress assignment in BP, because all these words must be analyzed as ending in a theme vowel. This then raises the question of why none of these words is analyzed as athematic. Under the assumption that the word is the domain for stress and that the stress rules are sensitive to weight in the way understood in this study, it is not necessary to make any previous assumptions about the morphological structure of acronyms. Instead of considering athematicity as the reason for word-final stress, one might consider word-final stress as the reason for athematicity: unstressed vowels in word-final open syllables are taken to be ‘mobile’, whereas stressed vowels in this position are treated as ‘immobile’.

Let us next consider the accentuation of the foreign names in (26). The Spanish examples were taken from Roca (1990: 155).

(26)	Spanish	Brazilian Portuguese
	Cólchester	Colchéster
	Mánchester	Manchéster
	Wáshington	Wáshington~Washingtón
	Núrenberg	Nurenbérg
	Héidelberg	Heidelbérg
	Dússeldorf	Dússeldórf
	Ámsterdam	Amsterdám
	Róterdam	Rotterdám
		Utrécht (Dutch: Útrecht)
		Muníque
		Hollywóod
		Ajác (Amsterdam football club; Dutch Ájax)

Feijenoord (Rotterdam football club; Dutch Féijenoord)

Foreign nouns do not always adapt automatically to the phonotactic requirements of the borrowing language. This is particularly true for geographical names, especially if the pronunciation in the language of origin is known to (some of) the speakers of the borrowing language. For some words it takes time to adapt, while others only adapt partially, for example with regard to their segmental properties only, but not for the accent position. The question why foreign words are adapted more easily in a given language than in another, even closely related, language is an interesting one, but still poorly understood⁴⁶. The interest of the BP words in (26), therefore, arises from their confrontation with the corresponding Spanish words. Roca observes for Spanish that foreign proper nouns do not submit to the generalization that prefinal heavy syllables cannot be ‘skipped’ by the stress rule. Interestingly, in BP not only do prefinal heavy syllables in these words resist the proparoxytonic pattern, but also a final heavy syllable is usually stressed. Clearly, Spanish and BP are very different in their treatment of foreign names and at least in the case of BP the general pattern of adaptation is consistent with a weight-sensitive stress algorithm⁴⁷.

2.7 Syllable weight and stress in non-verbs

In section 2 we have addressed the arguments that have been given in the literature against the relevance of syllable weight in Portuguese and Spanish and we have shown that none of them can be backed up with either typological evidence or with evidence drawn from the grammar of BP. With regard to the latter, we have seen that words with a prefinal heavy syllable reject antepenultimate stress systematically. The behavior of words with a palatal sonorant onset in their final syllable was shown to be entirely consistent with this generalization, because of the geminate-like behavior of this consonant type. As regards pre-final syllables, heaviness in BP

is defined straightforwardly as ‘any branching rhyme’. This is equally true for the stress-attracting nature of word-final heavy syllables⁴⁸. Also, all and only heavy syllables condition a rule of mid-vowel neutralization in non-verbs. Furthermore, non-verbs that newly enter the language attract stress on a final heavy and, when their prefinal syllable is heavy, they strongly resist antepenultimate stress. It is equally relevant to recall that Frota and Vigário (2000) have shown that some rhythmic measures (%V)⁴⁹ group BP with mora-timed languages like Japanese, which reinforces the idea that weight is a functional notion in the phonological grammar of BP. We find it difficult to consider this array of facts as accidental and irrelevant from the point of view of the speaker’s structural knowledge of his language’s sound structure. We will therefore consider the weight-based patterns discussed in the previous sections as representing generalizations that are relevant from the point of view of the organization of the phonological grammar of BP.

3. An Analysis of Brazilian Portuguese Stress

We regard stress in BP as representing a mixed system, conditioned by the tense categories ‘present’, ‘past’, and ‘future’ in verbs, but prosody-based and quantity-sensitive in the non-verbal lexical categories.

3.1 Stress in verbs

In the verb forms below, representing the past tenses of BP at some intermediate level of representation, stress falls predictably on the vowel immediately following the root, or theme vowel (in (27) the stressed vowel is italicized and boldened). The different conjugations are illustrated with the verbs *falar* ‘to speak’ (a-theme, first conjugation), *bater*

‘to beat’ (e-theme, second conjugation), and *partir* ‘to leave’ (i-theme, third conjugation). The different forms are given in the traditional order: 1si, 2si, 3si, 1pl, 2pl, 3pl.

(27) **Past**

Indicative imperfect

$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{va}$	$\text{bat}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{a}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{a}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{vas}$	$\text{bat}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{as}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{as}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{va}$	$\text{bat}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{a}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{a}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{vamos}$	$\text{bat}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{amos}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{amos}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{veis}^{50}$	$\text{bat}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{eis}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{eis}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{vaũ}^{51}$	$\text{bat}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{aũ}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{aũ}$

Indicative Perfect

$\text{fal}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{i}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{i}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{i}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{ste}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{ste}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{ste}$
$\text{fal}]_{\text{root}}\mathbf{o}]_{\text{theme}}\text{u}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{u}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{u}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{mos}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{mos}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{mos}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{stes}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{stes}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{stes}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{raũ}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{raũ}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{raũ}$

Indicative pluperfect

$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{ra}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{ra}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{ra}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{ras}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{ras}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{ras}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{ra}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{ra}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{ra}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{ramos}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{ramos}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{ramos}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{reis}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{reis}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{reis}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{raũ}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{raũ}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{raũ}$

Subjunctive imperfect

$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{se}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{se}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{se}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{ses}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{ses}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{ses}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{se}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{se}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{se}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{semos}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{semos}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{semos}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{seis}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{seis}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{seis}$
$\text{fal}]_{\text{root}}\mathbf{a}]_{\text{theme}}\text{seũ}$	$\text{bat}]_{\text{root}}\mathbf{e}]_{\text{theme}}\text{seũ}$	$\text{part}]_{\text{root}}\mathbf{i}]_{\text{theme}}\text{seũ}$

We state the constraint that accounts for stress in the past tense forms as in (28):

- (28) $XVC_0]_{\text{root}} \check{V} Y_0]_{\text{past}}$: Past tense forms are accented on the vowel immediately following the root

Although the generalization stated as (28) is surface-true, we assume, in agreement with the lexical-postlexical distinction we have adopted, that it belongs to the lexical phonology and applies to the sequences provided in (27). In these sequences, some generalizations regarding the phonological structure of BP verb forms are already accounted for. One is the fact that in the indicative imperfect the theme vowels of the second (-e-) and third (-i-) conjugation classes are neutralized to -i-. We thus need a statement in the lexical phonology that accounts for this fact (cf. also Câmara 1971:71). Next, consider the forms in (29):

- (29) Indicative perfect

$fal]_{\text{root}e}]_{\text{theme}i}$	[faléj]	speak-1si	compare <i>falaste, falamos</i> , etc.
$fal]_{\text{root}o}]_{\text{theme}u}$	[falóω]	speak-3si	compare „ „

Indicative imperfect

$fal+a]_{\text{theme}ve}is$	[falávejs]	speak-2pl	compare <i>falava, falávamos</i> , etc.
$bat+i]_{\text{theme}eis}$	[batíejs]	beat-2pl	compare <i>batia, batíamos</i> , etc.
$part+i]_{\text{theme}eis}$	[paxtíejs]	leave-2pl	compare <i>partia, partíamos</i> , etc.

Indicative pluperfect

$fal]_{\text{root}a}]_{\text{theme}reis}$	[falárejs]	speak-2pl	compare <i>falara, faláramos</i> , etc.
$bat]_{\text{root}e}]_{\text{theme}reis}$	[batérejs]	beat-2pl	compare <i>batera, batêramos</i> , etc.
$part]_{\text{root}i}]_{\text{theme}reis}$	[paxtírejs]	leave-2pl	compare <i>partira, partíramos</i> , etc.

The sequences given in (29) all represent verb forms in which /a/ is raised to /e/ before /i/. We will see below that the same happens in some future forms. Moreover, /a/ is raised to /o/ before /u/ in the indicative perfect, the only verb form that contains this sequence. Some more adjustments are necessary to generate the correct output sequences of the past tenses. The underlying forms of the first person perfect indicative /bat+e+i/ and /part+i+i/ have as their surface correspondents the forms [batí] and [partí], with stress on the final vowel. Since

[ej], stressed as well as unstressed, is a possible surface sequence in BP, we need a very specific lexical operation to account for the height assimilation of /e/ in the 2conj.1si.perf.ind. (/bate+i/ → /bati+i/) as well as a lexical application of a diphthongization rule that reduces /í+i/ to /íj/⁵².

The following sequences represent the abstract forms of the BP future tenses. As in the past tenses, the location of primary stress in the future forms is completely transparent: it systematically falls on the first syllable following the theme, which is at the same time the syllable that initiates the sequence of segments representing the inflectional morphemes⁵³.

(30) Future

Indicative

fal] _{root a}] _{theme rei}	bat] _{root e}] _{theme rei}	part] _{root i}] _{theme rei}
fal] _{root a}] _{theme ras}	bat] _{root e}] _{theme ras}	part] _{root i}] _{theme ras}
fal] _{root a}] _{theme ra}	bat] _{root e}] _{theme ra}	part] _{root i}] _{theme ra}
fal] _{root a}] _{theme remos}	bat] _{root e}] _{theme remos}	part] _{root i}] _{theme remos}
fal] _{root a}] _{theme reis}	bat] _{root e}] _{theme reis}	part] _{root i}] _{theme reis}
fal] _{root a}] _{theme raũ}	bat] _{root e}] _{theme raũ}	part] _{root i}] _{theme raũ}

Conditional

fal] _{root a}] _{theme ria}	bat] _{root e}] _{theme ria}	part] _{root i}] _{theme ria}
fal] _{root a}] _{theme rias}	bat] _{root e}] _{theme rias}	part] _{root i}] _{theme rias}
fal] _{root a}] _{theme ria}	bat] _{root e}] _{theme ria}	part] _{root i}] _{theme ria}
fal] _{root a}] _{theme riamos}	bat] _{root e}] _{theme riamos}	part] _{root i}] _{theme riamos}
fal] _{root a}] _{theme rieis}	bat] _{root e}] _{theme rieis}	part] _{root i}] _{theme rieis}
fal] _{root a}] _{theme riaũ}	bat] _{root e}] _{theme riaũ}	part] _{root i}] _{theme riaũ}

We state the constraint that assigns stress to the past tense forms as in (31):

- (31) X]_{theme}rV̄ Y₀]_{future} Future tense forms are accented on the first syllable of the future suffixe

As in the forms of the past, in the future we find the mid vowel /e/ before /i/ where other forms have /a/, as in the future indicative forms *falarei*, *baterei*, *partirei*, *falareis*, *batereis*, and *partireis*, as well as in the conditional forms *falarieis*, *baterieis*, and *partirieis* (vowels

under focus are boldened). Although it will be shown below that the generalization in (32) is not valid for the present tenses, we can predict the alternation between /a/ and /e/ in all of the /...a+i.../ sequences considered so far by the following rule, which applies to verb forms:

- (32) /a/ → /e/ / __ + i] _{verb} The lexical vowel /a/ corresponds with the surface vowel /e/ before the vowel /i/ that initiates an inflectional suffix

Let us finally notice that the future indicative is different from the past tenses: it has /e/ instead of /a/ also in the forms of the 1st plural: *falaremos*, *bateremos*, and *partiremos*. We propose that a separate rule accounts for this fact.

The following sequences represent the verb forms that express the present tenses at some intermediate level of representation.

(33) **Present**

Indicative			Subjunctive		
<i>fal</i>] _{root} o	<i>bat</i>] _{root} o	<i>part</i>] _{root} o	<i>fal</i>] _{root} e	<i>bat</i>] _{root} a	<i>part</i>] _{root} a
<i>fal</i>] _{root} as	<i>bat</i>] _{root} es	<i>part</i>] _{root} is	<i>fal</i>] _{root} es	<i>bat</i>] _{root} as	<i>part</i>] _{root} as
<i>fal</i>] _{root} a	<i>bat</i>] _{root} e	<i>part</i>] _{root} i	<i>fal</i>] _{root} e	<i>bat</i>] _{root} a	<i>part</i>] _{root} a
<i>fal</i>] _{root} a mos	<i>bat</i>] _{root} e mos	<i>part</i>] _{root} i mos	<i>fal</i>] _{root} e mos	<i>bat</i>] _{root} a mos	<i>part</i>] _{root} a mos
<i>fal</i>] _{root} a is	<i>bat</i>] _{root} e is	<i>part</i>] _{root} i s	<i>fal</i>] _{root} e is	<i>bat</i>] _{root} a is	<i>part</i>] _{root} a is
<i>fal</i>] _{root} aũ	<i>bat</i>] _{root} eũ	<i>part</i>] _{root} eũ	<i>fal</i>] _{root} eũ	<i>bat</i>] _{root} aũ	<i>part</i>] _{root} aũ

In the verb forms of (33), we have already accounted for the fact that theme vowels are deleted before a following vowel-initial suffix, as in /fala+o/ > *falo*, /bate+o/ > *bato*, /parti+o/ > *parto*, and in all forms of the present subjunctive: /fala+e/ > *fale*, /bate+a/ > *bata*, /parti+ais/ > *partais*, etc⁵⁴. Notice also that in the second person plural forms the raising of /a/ before /+i/ does not occur. We may suppose that this is due to a functional constraint, which blocks the raising of /a/ in order to preserve the underlying distinction between indicative and subjunctive. If this hypothesis is correct, we may maintain the generalization in (32) the way

it is stated, and formulate an identity constraint for the present tense vocalism ranked above (32).

For the paradigm of the present tenses the main stress cannot be predicted by a single morphological conditioning, as is possible in the paradigms of the past and the future. Although in most forms of the present stress falls on the last root vowel, in the 1st and 2nd person plural it is attributed to the vowel immediately following the root (or theme vowel), as in the past tenses. Compare the scheme (28), repeated here as (34a), with (34b) where Y is realized as the 1st or 2nd plural suffix:

- (34) a. $X\check{V}C_0]_{\text{root}} \check{V} Y_0]_{\text{past}}$
 b. $X\check{V}C_0]_{\text{root}} \check{V} \{\text{mos, is}\}]_{\text{present 1,2pl}}$

The elsewhere case for the present tenses is stated in (35):

- (35) $X\check{V}C_0]_{\text{root}} Y]_{\text{present (elsewhere)}}$ In the present tense, stress falls on the last vowel of the root

Although the verb roots given in (33) are all monosyllabic, the generalization expressed in (35) applies to all verbs: *cumprimént-o, -as, -a, -ámos*, etc. of the verb *cumprimentar* ‘to greet’. Taken together, (34) and (35) are surface-true.

Another way of predicting stress on the present tense forms is by a rule that places stress on the prefinal syllable. Such a rule would be surface-true at a level of representation before falling diphthongs are created. However, this level does not correspond with the output of the lexical phonology if we wish to express the generalization that, at least in non-verbs, stress cannot be on the fourth syllable counting from the right word edge, as would be the case for words like *hermenêutico* ‘hermeneutic’, *nêurico* ‘neural’, *terapêutico* ‘therapeutic’,

and some others. In the next section, it will be argued that the three-syllable-window does constrain stress placement for non-verbs in the lexical phonology of BP. Furthermore, stress in the present tense would be assigned on the basis of a prosodic factor - the syllable count - and thus be different from the other verb-stress rules, which locate stress by reference to some morphological boundary. To the extent that external evidence is available that could help us choose between the alternatives discussed, it points to the correctness of the more complex analysis proposed in (34b-35), which considers the present tenses as irregular (or non-uniform) from the point of view of stress distribution, instead of regular, as is implicit in the prosody-based analysis. There are several instances of paradigmatic (analogical) changes available in the history of Romance that relate to tense categories and for which the direction of levelling was decided by the categories (singular and third person plural) corresponding to the elsewhere case (35). These are mentioned in Hooper (1976:27, 30). For example, the survival of Latin stress in the indicative imperfect should have given the stress pattern of (34a) in Portuguese. We have seen above that in contemporary Portuguese stress is on the vowel following the root in all past tenses.

(36)	a.	falava falavas falava falavamos (falaveis falavaũ	falavamos (Port.) falaveis) (Port.)	b.	ame ames ame amemos (ameis) ⁵⁵ amen	amemos (Castilian) ameis (Castilian)
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The paradigm in (36b) corresponds to the Chicano Spanish present subjunctive, in which the last root vowel is stressed in all forms, different from Castilian Spanish. In Andalusian, the Chicano pattern is represented in the second and third conjugations only. In all of these cases a penultimate stress pattern has been abandoned in favour of a pattern that is oriented towards the root boundary: first vowel following the root (36a) or last root vowel (36b). It is difficult

to imagine the rationale of these changes, if the penultimate pattern represents a regular paradigm from the point of view of the language learner. We therefore keep to the generalizations (34-35), closely following Hooper's (1976) analysis for Spanish.

In this section we have briefly discussed the verb-stress rules of BP. Stress is distributed in function of the tense (present, past, future) categories in a way that is surface true and, therefore, completely transparent. The different generalizations proposed above can be formulated in the following way⁵⁶:

(37) FOOT HEAD PRESENT:

a. The rightmost syllable that is fully contained within the root must coincide with the head of a foot, in all present tense forms

b. The syllable containing the first nucleus following the root must coincide with the head of a foot, in the 1st and 2nd person plural of the present tense

Ranking: 37b >> 37a

(38) FOOT HEAD PAST

The syllable containing the first nucleus following the root must coincide with the head of a foot, in all past tense forms

(39) FOOT HEAD FUTURE

The first syllable of the future suffix must coincide with the head of a foot

All constraints have a defined domain of application, and, the constraints (37a, b) aside, are unordered with respect to each other.

The constraints (37-39) only identify the location of the foot head and do not specify the foot form or the location of the primary stress foot inside the word. In the following section, where we discuss stress in non-verbs, we will return to this issue, as well as to the role of the three-syllable-window.

3.2 Stress in non-verbs

We have argued above that in BP the productive location of primary accent in non-verbs is determined by the structural properties (branching or non-branching) of the two rightmost syllable rhymes in the prosodic word. I will here adopt the definition of weight-sensitivity proposed by van der Hulst (1994) according to which “weight-sensitivity arises whenever certain syllables (i.e. those that are ‘heavy’) refuse to occupy the dependent position in the foot” (1994: 5)⁵⁷. The combination of the weight parameter with the right-edge oriented location of primary accent, and with the requirement that feet must be left-headed will predict main stress for the following words as indicated:

- (40) po(már) ‘orchard’ for(mál) ‘formal’ a(bérto) ‘open’
 l h h h h l

For words that show a sequence of two light syllables at the right edge of the word, primary stress is on the prefinal syllable. The bi-syllabic foot that is constructed over the last two syllables respects the requirements of alignment with the right word edge and left-headedness:

- (41) ga(véta) ‘drawer’
 l l l

We propose that the following constraints define the basic properties of primary accent in BP non-verbs:

- (42) (a) MATCH-PROSODY(SI-PL): Singular and plural forms in non-verbs match for the location of the foot head⁵⁸
(b) WEIGHT: A heavy syllable may not occupy the dependent position of a foot (van der Hulst 1994)

- (c) ALIGN-FT-R, PRWD-R: The right edge of a foot must coincide with the right edge of PrWd (McCarthy and Prince, 1993)
- (d) TROCHEE: Feet are left-headed
- (e) BINARITY (σ) (cf van der Hulst 1994: ‘Unmarked foot’): Feet are bisyllabic
- (f) Crucial rankings: MATCH-PROSODY(SI-PL), WEIGHT, ALIGN-FT-R, PRWD-R, TROCHEE >> BINARITY (σ)
MATCH-PROSODY(SI-PL), ALIGN-FT-R, PRWD-R >> WEIGHT

The tableaux (43-46) illustrate how the (partial) grammar (42) selects the grammatical prosodic structure for each lexical item given. We have not included the undominated⁵⁹ constraint MATCH-PROSODY(SI-PL), the effect of which is obvious.

(43)

pomar	WEIGHT	ALIGN-FT-R, PRWD-R	TROCHEE	BINARITY (σ)
po(már)				*
(pomár)			*!	
(pó)mar		*!		*
(pómar)	*!			

(44)

formal	WEIGHT	ALIGN-FT-R, PRWD-R	TROCHEE	BINARITY (σ)
for(mál)				*
(formál)	*!		*	
(fór)mal		*!		*
(fórmal)	*!			

The ungrammaticality of the candidates */(pó)mar/, */(fórmal)/, and */(formál)/ in (43) and (44) is due to the specific definition of WEIGHT, which prohibits the occurrence of a heavy syllable in the weak position of the foot.

(45)

aberto	WEIGHT	ALIGN-FT-R, PRWD-R	TROCHEE	BINARITY (σ)
☞ a(bérto)				
a(bér)to		*!		*
(áber)to	*!	*		
a(bertó)	*!		*	
aber(tó)				*!
(áberto)	*!			*

As is clear from (45), the grammar in (42) does not allow for proparoxitonic words, independently of the weight of the prefinal syllable (see tableau (46) also). A perhaps somewhat surprising aspect of tableau (45) is the preference given for the candidate /a(bérto)/ over /a(bér)to/, which goes counter to the tradition that in weight-sensitive systems the foot contains at most two moras. It also implies that feet may be unbalanced, an issue that is still being debated at the theoretical level. Notice that, in order to select [a(bér)to] as the preferred candidate, it would be enough to rank a bimoraicity requirement higher in the constraint hierarchy, as is done in most weight-based analyses of BP. We will assume here that the sequence of syllables constituted by the primary stressed syllable represents a prosodic unit together with all remaining syllables to its right within the prosodic word. We will maintain this position until urgent theoretical considerations or language-specific arguments derived from BP phonology suggest a different solution.

In (46) below, BINARITY (σ) selects *ga(véta)* as the preferred form over other candidates that contain a right-aligned trochee, *gave(tá)* and *(gáveta)*.

(46)

gaveta	WEIGHT	ALIGN-FT-R, PRWD-R	TROCHEE	BINARITY (σ)
☞ ga(véta)				
ga(vé)ta		*!		*
(gáve)ta		*!		
ga(vetá)			*!	
gave(tá)				*!
(gáveta)				*!

Let us next consider the exceptional stresses in words of the type *bêbado* ‘drunk’ (cf. 22), *pomár* ‘orchard’ (cf. 23), and *jacaré* ‘alligator’ (cf. 24).

The usual way for OT-type analyses to account for antepenultimate stress (e.g. *bêbado*) in right-edge oriented bounded stress systems is by appealing to a constraint known as NON-FINALITY. This constraint, which is parametrized for syllables or moras, rejects feet whose right edge coincides with the prosodic-word boundary: a highly-ranked NON-FINALITY (σ) constraint would leave the final syllable unparsed: *bêba)do*. However, the invisibility of the word-final syllable with respect to the location of stress contrasts with its visibility for the rule of Dactylic Lowering discussed above, which targets the subset of the class of proparoxitonic words that contains a mid-vowel under stress: compare the mid vowel qualities in the word pairs *camel[ó]* ‘street vendor’ ~ *camel[ó]dromo* ‘covered market’, *visig[ó]do* ‘visigoth’ ~ *visig[ó]tico* ‘visigothic’, *p[ó]vo* ‘people’ ~ *p[ó]voa* ‘hamlet’, etc. Assuming that syllable-counting generalizations are indicative of foot structure, Dactylic Lowering shows that the final syllable in these words is part of the primary stress foot. It seems, therefore, that the BP grammar must generate a ternary foot at the right edge of the word. We can achieve this by giving NON-FINALITY an interpretation such that the final syllable is disregarded for foot structure without remaining unparsed.

(47) NON-FINALITY (σ/μ): Constraints that evaluate the foot type disregard the right-most syllable/mora in the stress domain.

Tableau (48) shows the effect of the proposed interpretation of NON-FINALITY, as illustrated for the word *abóbora* ‘pumpkin’. The word *abérto* ‘open’ is added to show that antepenultimate stress in words with a prefinal heavy syllable cannot be derived:

(48)

abobora	NON-FINALITY(σ)	WEIGHT	ALIGN-FT-R, PRWD-R	TROCHEE	BINARITY (σ)
☞ a(bóbo<ra>)					
a(bóbo)<ra>			*!		
abo(bóra)	*!				
abo(bó<ra>)					*!
a(bobó<ra>)				*!	
(ábobo<ra>)					*!
aberto					
☞ a(bér<to>)					
(áber<to>)		*!			*!
a(bérto)	*!				*

In a grammar containing a high-ranked NON-FINALITY(σ) requirement, the constraints that relate to foot type disregard the word-final syllable in the process of evaluating the word-prosodic structure, whereas all other constraints, including those that control the edge-orientation of the foot, take the whole sequence into account. As a result, a ternary foot is created at the right word edge. Given the high ranking of NON-FINALITY(σ), the evaluation of the candidate set projected from /aberto/ is achieved in exactly the same way as it is for words that end in a heavy syllable in a grammar that has a low-ranked NON-FINALITY(σ) constraint, as (48) shows. From this it follows that a constraint ranking as proposed in (48) will never allow antepenultimate stress in words with a pre-final heavy syllable.

In line with the discussion above, it seems natural to account for prefinal stress in words with a final heavy syllable by way of mora extrametricality, which makes the second mora of a word-final branching rhyme invisible for the sake of accent location, as is illustrated below for the words *útil* ‘useful’ and *órfão* ‘orphan-masc’:

(49)

util	NON-FINALITY(μ)	WEIGHT	ALIGN-Ft-R, PRWD-R	TROCHEE	BINARITY (σ)
σ (úti<l>)					
u(tí<l>)					*!
(utíl)	*!			*	
(utí<l>)				*!	
(útil)	*!	*			
orfaũ					
σ (órfa<ũ>)					
or(fá<ũ>)					*!
(orfáũ)	*!	*		*	
(orfá<ũ>)		*!		*	
(órfaũ)	*!	*			

As before, the grammar requires the extrametrical element to be incorporated in the primary stress foot. Proof for the prosodic integration of the final mora comes from Spondaic Lowering, a mora-counting constraint discussed above that bans upper mid-vowels from prefinal syllables followed by a heavy syllable (recall alternations such as *m[o]ver* ‘to move’ ~ *m[ɔ]vel* ‘mobile’, etc.).

The last class of exceptions we must account for are words that are accented on their final open syllable, such as *jacaré* ‘alligator’. The most straightforward way to obtain the word-final accent in this class is by way of the constraint IAMB, which requires feet to be right-headed. The high ranking of this constraint in the grammar (46) will result in a monomoraic (degenerate) foot at the right word-edge, a foot type that is independently necessary, given the existence in BP of subminimal words like *chá* ‘tea’, *pá* ‘shovel’, *cá* ‘here’, *já* ‘already’, *lá* ‘there’, etc.:

(50)

jacare	IAMB	WEIGHT	ALIGN-Ft-R, PRWD-R	TROCHEE	BINARITY (σ)
☞ jaca(ré)					*
ja(caré)				*!	
ja(cáre)	*!			*!	
(jácare)	*!				*

The different accounts of exceptional types of stress illustrated in (48-50) must, of course, be limited to specific word sets. At the same time, we must exclude the possibility for the grammar to generate impossible primary accent positions, i.e. accents that do not respect the three-syllable window (TSW) requirement, typical for bounded, right-edge oriented stress systems. In BP, this possibility could only arise in the case of irregular accents, because the productive part of the grammar always generates stress on one of the last two syllables⁶⁰. On the other hand, in a language like BP, but with a productive NON-FINALITY constraint, the grammar would always assign accent to the penultimate or antepenultimate syllable. In other words, the TSW is the result of constraint interaction and, ideally, should not itself acquire constraint status. Moreover, a TSW constraint would be visible only in languages in which the effect of NON-FINALITY is limited to a marked class of lexical items, as in BP. It seems natural, therefore, to use NON-FINALITY also to account for the TSW effect in the case of exceptional stress. In order to limit the effect of NON-FINALITY to a restricted class of morphemes, we may adopt a proposal by Pater (2000; forthcoming⁶¹), who argues that constraints should be allowed to be triggered by a specific lexical item or a lexically marked set of items. In a similar vein, we may adopt an IAMB constraint triggered by the set of morphemes that have stress on their final open syllable. These constraints are formulated in (51):

(51) NON-FINALITY(σ), triggered by /abobora_{NON-FINALITY(σ)}/, etc.

NON-FINALITY(μ), triggered by /util_{NON-FINALITY(μ)}/, etc.

IAMB, triggered by /jacare_{IAMB} /, etc.

Since the constraints in (51) are triggered by specific sets of lexical items, they will have no effect on the evaluation of candidates projected from the set of morphemes that are lexically unmarked. However, there is one problem with this way of accounting for irregular stress: how can it be avoided that lexical items be marked for triggering some other constraint, one that could generate an impossible accent? Above it was pointed out that the TSW effect on exceptions is typical for bounded, right-edge oriented stress systems. We suggest that the choice of the constraints that are to account for exceptional stress depends on the structure of the productive part of the prosodic (sub)grammar. For the derivation of exceptional stress in a bounded stress system such as that of BP, only NON-FINALITY is allowed to be triggered by marked lexical items and, consequently, be promoted to a high position in the grammar. In the same spirit, in a grammar that allows degenerate feet to account for stress on monosyllabic words, a morpheme-specific IAMB may account for exceptional word-final stress. By making the high ranking of some morpheme-specific constraints dependent on specific properties of the productive part of the grammar, the generation of prosodic structures by other morpheme-specific constraints can be avoided, such as a high-ranked constraint that requires the exceptional alignment of a foot with the left word-edge, which should be excluded in a right-edge oriented system⁶².

Considering the different foot types that surface in the grammar established above, one observes that all primary stress feet in BP are left-headed and right-aligned with the right edge of the word. The same prosodic structure is obtained for the primary accent in verbs, if the constraints that determine the foot head for the different tenses (36-39) are ranked above WEIGHT and BINARITY, as is illustrated below for the verb forms *falámos* (1pl present indicative), *faléi* (1si indicative perfect), *partiríeis* (2pl conditional). Note that the grammaticality of the sequence /fa(lámos)/ as compared to the ungrammatical /((falá)mos/ shows that ALIGN-FT-R, PRWD-R dominates the constraint WEIGHT.

(52)

$\text{fal}]_{\text{root}}\text{a}]_{\text{theme}}\text{mos}$	HEAD TENSE	ALIGN-FT-R, PRWD-R	TROCHEE	WEIGHT	BINARITY (σ)
$\text{fa}(\text{l}]_{\text{root}}\text{á}]_{\text{theme}}\text{mos})$	$]\text{root } \acute{V}]_{\text{theme}}$			*	
$\text{fa}(\text{l}]_{\text{root}}\text{a}]_{\text{theme}}\text{mós})$	*!		*		
$(\text{fal}]_{\text{root}}\text{á}]_{\text{theme}}\text{mos}$		*!	*		
$\text{fa}(\text{l}]_{\text{root}}\text{á}]_{\text{theme}}\text{mos}$		*!			*
$(\text{fál}]_{\text{root}}\text{a}]_{\text{theme}}\text{mos})$	*!			*	*
$\text{part}]_{\text{root}}\text{i}]_{\text{theme}}\text{rieis}$					
$\text{part}]_{\text{root}}\text{i}]_{\text{theme}}(\text{ríejs})$	$-\text{r}\acute{V}\text{X}$			*	
$\text{part}]_{\text{root}}\text{i}]_{\text{theme}}\text{ri}(\text{éjs})$	*!				
$\text{fal}]_{\text{root}}\text{e}]_{\text{theme}}\text{i}$					
$\text{fal}]_{\text{root}}(\acute{e}]_{\text{theme}}\text{j})$	$]\text{root } \acute{V}]_{\text{theme}}$				
$(\text{fal}]_{\text{root}}\acute{e}]_{\text{theme}}\text{j})$			*!		
$(\text{fál}]_{\text{root}}\text{e}]_{\text{theme}}\text{j})$	*!				

Accent in verbs is fully predictable in BP and no verb forms exist in which the main accent violates the TSW. In our analysis this is an accidental fact, which follows from the specific morphological edge orientation for prosodic head selection: the left-most accent coincides with the last syllable of the root, as in /convérs]a/ ‘talk-2/3p’. The phonological sequence following the root, which consists of the theme vowel and/or inflection markers, contains at most two syllables. Stress on the fourth syllable from the right can therefore not be derived. It is not clear to us if it would in principle be possible to have a regular morphology-based accent that violates the TSW in mixed systems like that of BP, but we expect that such a system could exist. On the other hand, in line with our earlier discussion, we would not expect to find an exceptional verbal accent that does not respect the regular right-alignment of the main foot with the right word edge, to create, for example, an exceptional word class with root-initial accent in the present tense: exceptional *cúmpremento* ‘I greet’ next to productive *convérso* ‘I talk’.

4. Conclusion

In this paper we have shown that all the arguments used in the literature to dismiss the weight-sensitivity of BP primary word stress are not compelling when confronted with the facts of language typology and of BP phonology. As for the typological claims, there is no universal implication between contrastive vowel length and weight-sensitive stress. Also, mixed systems of the kind defended here for BP are commonly found in the world's languages.

Primary stress is a lexical phenomenon in BP, which is distributed in function of the tense system in verb forms. In non-verbs, main stress is assigned on the basis of phonological properties, of which syllable weight is a determining factor. Palatal sonorant consonants function as phonological geminates, a property which explains their non-occurrence after branching rhymes, their behavior in syllabification, and, for the nasal sonorant, why the nasalization of the preceding vowel is obligatory (insensitive to stress). It is moreover correctly predicted that, when sonorant consonants appear in the onset of word-final syllables, their constraining effect on the possible position of primary stress is typical of prefinal heavy syllables in general and as such does not weaken, but strengthen the claim that the weight of the prefinal syllable is a relevant factor in the location of main stress. The rule of Spondaic Lowering was studied to show that the relevance of syllable weight is not restricted to the BP stress system. In particular, this process reveals the speaker's sensitivity to the bimoraic structure of the word-final syllable. We have then tested the productivity of the stress rules for non-verbs with regard to newly created words and loan words and observed that these rules are fully productive, despite the existence of relatively large classes of exceptions.

As was expressed in our formal account of BP main stress, our proposal differs from earlier accounts by the claim that all primary stress feet in BP, regular and exceptional, in verbs as well as in non-verbs, are left-headed and that all stress feet are aligned with the right word-

edge. We have furthermore suggested that there exists a relation between the overall properties of the subgrammar that accounts for a language's foot structure and the mechanisms that may be used to account for exceptional stress patterns.

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¹ This does not necessarily imply that our conclusions regarding BP are as such transferable to Spanish.

² This is particularly true for European Portuguese, as in Mateus (1983) and subsequent work by this scholar. For Spanish, a stem-based analysis was proposed by Wong Opasi (1987). Most recent studies on BP accent favor the weight-based approach, such as Magalhães (2004) and Massini-Cagliari (2005). See also Bisol (1992), where the morphology-based and weight-based analyses are compared. For BP, the stem-based analysis is most forcefully defended by Lee (1995) and subsequent work.

³ We suppose that this is the part that the linguists we have cited had in mind when they referred to *Principles*. As a matter of fact, we have only seen references to the book, never to

a specific page or to the quoted passage. In any case, to the best of our knowledge, this is the only place where Trubetzkoy makes a statement that is interpretable in the way it was understood by these scholars.

⁴ For further discussion of Italian, see also *Principles* (1969/71:201).

⁵ It is also noteworthy that only in *Principles* does Trubetzkoy analyse Latin as mora-counting instead of syllable-counting, as he did in his previous publications. He uses the equivalence of one long vowel ~ two short vowels ~ one short vowel plus consonant on which the Latin stress rule was based as proof for the arithmetic conception of vowel length in this language. Again, nothing is said about the moraic value of consonants in languages without contrastive vowel length.

⁶ We know with certainty that Kuryłowicz knew Trubetzkoy's theory of vocalic quantity, because he was present at the Copenhagen conference when Trubetzkoy delivered his lecture *Die Quantität als phonologisches Problem*, as we can tell from the discussion session in which Kuryłowicz participated.

⁷ « ...la quantité syllabique ne peut se fonder uniquement sur l'opposition *e ~ et*, mais exige l'existence d'un *e:*, qui rend possible le rapport $e \sim e: = et$ ».

⁸ Unless, of course, only languages with long vowels can have moras to begin with. This cannot have been Hyman's intention, given his mora-based analysis of French liaison, a language without contrastive vowel length.

⁹ Notice that, from the point of view of lexical phonology, the theories make at least one interesting different empirical prediction. In Hyman's theory, it is predicted that, if a phonological rule that applies at a given level counts long vowels as heavy, but syllables closed by a consonant as short, the language should not have a rule applying at a later level that counts both syllable types as heavy. In Hayes's theory such a configuration of facts is in principle describable. On the other hand, Hayes's theory predicts that in languages with a

phonological length distinction in vowels and consonants, rules that treat syllables containing long vowels as heavy should also treat syllables closed by (half of) a geminate consonant as heavy, but not necessarily simplex coda consonants. One language that appears to falsify both predictions is Sri Lanka Creole Portuguese, analysed by Smith (1978). Sri Lanka Creole Portuguese has both long and short consonants and long and short vowels. The language has a primary stress rule that applies lexically and only counts long vowels as heavy. Post-lexical secondary stress is distributed by a rule for which both closed syllables (including syllables closed by geminates) and syllables containing long vowels are counted as heavy.

¹⁰ This is exactly the hypothesis defended by De Chene and Anderson (1979).

¹¹ Many thanks go to Rob Goedemans for putting the StressTyp database at our disposal.

¹² Based on Kodzasov (1999), from which all the examples are taken.

¹³ Notice that, since both syllable weight and sonority of the vowel play a role in the Archi stress rule, this may indicate that the stress rule is prominence-sensitive rather than weight-sensitive, in the sense of Hayes (1995:273). Nevertheless, Archi is a language that combines two different prosodic subsystems, one for non-verbs and one for verbs. With regard to the vocalic sonority classes, it is interesting to note that /o/ patterns with the high vowels. As a matter of fact, historically /o/ derives from a central high vowel. Synchronically, the assignment of vowels to sonority classes is partially unnatural.

¹⁴ We disregard rhymes in which /s/ functions as part of a complex coda. In the syllable coda, <l> is pronounced [w] in most, but not all, dialects of BP. In all dialects, underlying /l/ often is recoverable through the existence of alternations, as is the case of *anel* [anɛw]: cf. *anelão* ‘big ring’, *anelado* ‘curly’, *aneleira* ‘ring case’, etc.

¹⁶ Thanks to Elisa Battisti and Maria-José Vieira for pointing out these examples.

¹⁷ For some speakers the Spondaic Lowering constraint is more forceful than the one that imposes Prenasal Raising. These speakers pronounce [ɔ̃]nus, etc.

¹⁸ Alternatively, the upper mid vowels in the present subjunctive forms could be explained as a result of Vowel Harmony (see Wetzels, 1995), and thus do not qualify as real counterexamples to Spondaic Lowering.

¹⁹ There is an idiosyncratic class of BP nouns and adjectives that does show a mid-vowel alternation corresponding to the singular and the plural, as in *p[ó]vo ~ p[ɔ̃]vos* ‘people(s)’. However, this alternation is not conditioned by the structure of the word-final rhyme, as is shown by nominal paradigms that also contain singular and plural feminine forms, as *p[ó]rco*, *p[ɔ̃]rcos*, *p[ó]rca*, *p[ɔ̃]rcas* ‘pig(s)-msc’, ‘pig(s)-fem’. These data suggest that there is a rule that raises an underlying lower mid-vowel to upper mid in the masculine singular form of these words.

²⁰ Secondary stress shows different properties in European Portuguese, where, moreover, variation is greater. See Sândalo et al. (2006) for a recent discussion of secondary stress in both languages.

²¹ In BP unstressed lower mid vowels do not usually occur (see the discussion immediately below). A sequence like *caf[é]zínho* suggests that the elimination of the stress of the base takes place in the postlexical component, where unstressed mid-vowel neutralization no longer applies.

²² As always happens in BP when the mid-vowel opposition is neutralized under stress. Cf. Wetzels (1992).

²³ Roca (1986) provides convincing evidence that secondary stress in Spanish is assigned after primary stress, and in a separate process. See also Vigário (2003:119) for arguments in favour of the postlexical status of rhythmic stress and (prosodic word) initial stress in European Portuguese.

²⁴ Ribeiro (1999) discusses the properties of monophthongization of [ej] in the dialect spoken in the city of Caxias, in the State of Maranhão, northeastern Brazil. It also contains a summary of the existing literature on the subject and a discussion of the relevance of the different linguistic and sociolinguistic variables that favor or disfavor the application of the rule in the different dialects for which the process has been studied.

²⁵ If this explanation is correct, these diphthongs represent heavy rhymes, contrary to what is proposed in Bisol (1994).

²⁶ See, however, Baker (2004) for an analysis of Spanish palatal sonorants very similar to the one proposed in Wetzels (1997) for Portuguese.

²⁷ For more details and the distribution of these sounds in the different dialects, see Angenot and Vandresen (1981: 82); Cristófaró (1998: 51); Netto (2001: 103).

²⁸ We will not address here the question of where in the grammar the distinguishing features of /R/ are spelled out for the different positions in which it occurs, which is not crucial for the problem at hand.

²⁹ The proposal to analyze palatal sonorants as phonological geminates as well as the underlying argumentation was first presented at the European Science Foundation Euro-Type meeting in Lund 1993 and subsequently, both formally and informally, at several occasions thereafter, before its publication as Wetzels (1997). The analysis was inspired by Carreira (1988) who posits a bisegmental analysis for Spanish palatals that consists of a coronal consonant followed by the palatal glide /j/. This analysis, which is problematic for Spanish, is impossible for BP, where word-final sequences derived from /-lia, -nio/, etc. behave differently both phonetically and phonologically from /-la, -no/ etc. See Baker (2004) for discussion of Carreira's proposal for Spanish.

³⁰ Words that have a word-initial ##uV sequence or in which /u/ occurs intervocalically are almost exclusively loans from indigenous languages or African languages. Word-initially, the

pronunciation of /u/ in these words shows the same variation as the one observed for /i/:
uakarí [u/wakarí] ‘monkey, spec.’, *uacanga* [u/wakâga] ‘palmtree, spec.’

³¹ Cagliari (1981) does not state explicitly whether his transcriptions are based on laboratory evidence. If they are not, although we know Cagliari as a phonetician with a very good ear, it should be possible to confirm these impressionistic judgments by acoustic evidence. Importantly, the examples given by Cagliari do not exclusively concern palatal glides preceded by a stressed nucleus. It is a well-known cross-linguistic phenomenon that onsets following stressed open syllables tend towards an ambisyllabic pronunciation.

³² See Baker for discussion of the palatal glide in Spanish: “We may therefore expect that it triggers the same high degree of coarticulatory F2 activity in preceding vowels as the complex segments and that the same lengthening effect should be present” (2004: 238).

³³ “A nasalização é categórica quando a vogal precede uma consoante nasal palatal, independentemente do contexto tónico ou átono”.

³⁴ Except for the loan *lornhãu*, from French *lorgnon* ‘eye-glass’.

³⁵ In BP sequences of a contrastive nasal vowel (/VN/) followed by a nasal consonant do not occur. However, the fact that the oral diphthong [aj] before nasal onsets is unpredictably nasalized in the southern dialects (São Paulo, Curitiba, etc.) – compare *and[ãj]me* ‘scaffold’, *Ror[ãj]ma* ‘Roraima’ with *J[ai]me* ‘Jaime’ – shows that [ãj] as in *and[ãi]me* is nasal in lexical representation (cf. Wetzels, 1997). As expected, the nasal diphthong [ãj] is never found in front of palatal sonorants. Notice that diphthongs with a nuclear front vowel, as in *reino* [ej] ‘kingdom’ or *fleuma* [ew] ‘apathy’ are never nasalized.

³⁶ It may be concluded that nasal diphthongs, as in *cãimbra* [kãjbra], do not derive from underlying V[V+high]N, as was shown in Wetzels (1997).

³⁷ See also Amaral (2002) for a variation study based on the dialect of São José do Norte in the State of Rio Grande do Sul, the most southern state of Brazil.

³⁸ See, for example, Netto (2001: 171-180) and some very early sources cited there that contain this suggestion.

³⁹ See also Assis (1985:28) for the ‘caboclo’ dialect in the interior of the state of Pará, and Corrêa (1979), for the dialect of the Silvânia region, in the state of Goiás.

⁴⁰ The postlexical application of Post-Stress Gliding is consistent with the optional application of this rule, which is generally applied in casual speech, but which may be suppressed in careful pronunciation. In this respect /Ci/ sequences are different from palatal sonorant consonants. Compare *Orélia* [orélia] ~ [orélja] ~ [oréɫa] with *orelha* [oréɫa] ‘ear’. For the latter word, a four-syllable pronunciation is excluded under all circumstances.

⁴¹ At least, that is our interpretation of the data based on the retroflex pronunciation of /R/ in the syllable coda, which is typical for that region.

⁴² The fact that we have chosen Netto’s examples of the western paulistano dialect does not imply that the reductions that occur in word-final unstressed syllables are limited to this particular region. In reality these changes are much more general. The reader will also recall that in most dialects of Brazil the vowel system occurring in word-final unstressed open syllables is represented by the ‘basic triangle’ [i, u, a]. The raising of /e, o/ in the words of the third column as compared to their correspondents in the second column is the result of the loss of the syllable coda (or, in the case of the nasal diphthong, monophthongization).

⁴³ In most words with stress on a final open syllable the prefinal syllable is also open. This, however, is a characteristic of the indigenous languages from which these words were taken, rather than a condition on this stress type. Words borrowed from African and European languages show that the prefinal syllable may be heavy in such words: *candomblé* ‘religion (of African origin)’, *dendê* ‘African oil palm’, *carne* ‘booklet’.

⁴⁴ Which is, in itself, surprising: why are there no athematic nouns with stress on their prefinal syllable?

⁴⁵ We have found a single example *VÁRIG(i)*, with stress on a non-final syllable. In BP, vowel epenthesis after illicit (non-sonorant) codas, although productive, is neutralizing, because words that end in unstressed /i/ exist: *álibi* ‘alibi’, *cáqui* ‘khaki’, *júri* ‘jury’, *míni* ‘mini’, *ravióli* ‘ravioli’, *táxi* ‘taxi’, etc. [i]-epenthesis, which is variable most of the time, is categorical in *VÁRIGi*. One may therefore consider the possibility that word-final [i] is lexicalized in this word. Under the epenthesis account as well as under the lexical account of final [i], stress is exceptional in *VÁRIGi*, although, under the latter analysis, it would not constitute a counterexample to the final-heavy-stressed hypothesis.

⁴⁶ Probably because the problem is partly linguistic, partly sociolinguistic.

⁴⁷ The pronunciation of *Wáshington* has a northeastern variant with stress on the final syllable. Prefinal stress in *Colchéster* and *Manchéster* is not typical for these words, but is usual for non-verbs ending in *-er*, most of which are loans: *revólver* ‘revolver’, *pôquer* ‘poker’, *pulôver* ‘pullover’, *repórter* ‘reporter’, *suéter* ‘sweater’, *tênder* ‘tender’, *tíner* ‘thinner’, *scráper* ‘scraper’, etc. Compare also the set of German proper nouns discussed in section 2.3. There are a number of subregularities that need to be discussed in a fully fledged analysis of BP stress, which is not the purpose of this study.

⁴⁸ With the possible exception of word-final *-er*. See the previous footnote.

⁴⁹ The symbol %V stands for the proportion of vocalic intervals in a sentence calculated as the sum of the durations of the vocalic intervals divided by the total duration of the sentence. According to the same measure European Portuguese is grouped with syllable-timed languages (like Spanish, and other Romance languages). See also Ramus (1999) and Wetzels (2002) for discussion.

⁵⁰ The second person plural forms are no longer used in any dialect of BP that I know of. It still appears in very formal written speech, or it can be heard in the theatre, when some historical scene is evoked. We mention it nevertheless, because it is still part of the linguistic

competence of the speakers of the ‘lingua culta’ and, when solicited, it is always produced with stress as indicated in the example sets.

⁵¹ Following Wetzels (1997), we assume that the 3pl suffix is lexically represented as a high nasal vowel, which is realized as a high coronal vowel after /e/, as in [bátẽj] ‘they beat’, etc.

⁵² The diphthong [íj] is postlexically reduced to [i]. Diphthongization itself must be a lexical constraint, because it interacts with the lexical process of Vowel Harmony (cf. Wetzels 1995).

⁵³ We take *-r* to be the initial segment of the future morphemes *-ra* (future indicative) and *-ria* (conditional) in BP.

⁵⁴ We follow Câmara’s proposal for the underlying morphological composition of verb forms. See also Wetzels (1995), for evidence from Vowel Harmony in favor of this representation:

	root	theme	t/m/a-marker	p/n-marker
1sg. pres. ind.			∅	+ o
pres. subj.	...VC ₀ + {a,e,i} +		{e,a}	+ ...

⁵⁵ In Chicano, as in most dialects of BP, the second person plural form is not used.

⁵⁶ We will sidestep here the technical issue of how to account for this type of morphologically governed accent from a universalist (constraint) perspective. For some relevant discussion, see Alderete (1999).

⁵⁷ Thanks to Harry van der Hulst for sending me his unpublished paper on foot typology in OT, which is listed in the bibliography as Van der Hulst (1994).

⁵⁸ We assume that it is the relative unmarkedness of the singular vis-à-vis the plural that determines the singular as the base for the output-to-output correspondence relation established in this constraint. For a possible, more detailed, formalization, see Alderete (1999: 120). We furthermore suggest that a similar constraint accounts for the prosodic identity

between the infinitive and the forms of the personal infinitive and future subjunctive (1p-si *falar*, 2p-si *falares*, 3p-si *falar*, 1p-pl *falarmos*, 2p-pl *falardes*, 3p-pl *falarem*).

⁵⁹ There is a handfull of words in BP that, according to the ‘norm’ show a mobile accent: *Lúcifer* ~ *Lucíferes* ‘Lucifer’, *sénior* ~ *seniões* ‘senior’, *júnior* ~ *juniões* ‘junior’, *carácter* ~ *caractéres* ‘character’ However, as Luiz-Carlos Schwindt (p.c.) pointed out, the popular pronunciation of the plural forms is more commonly with the –s suffix, without the stress shift: *Lúcifers*, *séniors*, *juniors*, *carátters*.

⁶⁰ As is predicted by a two-level analysis of BP phonology in which main stress is treated as a lexical phenomenon, the restriction of the main stress position to the last three syllables of the word does not necessarily hold postlexically, even for non-verbs. In BP, stress may indeed be on the fourth syllable postlexically, as in [xítʃ(i)miku] *rítmico* ‘rhythmic’ or [étʃ(i)niku] *étnico* ‘ethnic’, etc., where the (optional) vowel between parantheses is epenthetic, triggered by the ban on non-sonorant (except /s/) coda segments.

⁶¹ Thanks to Joe Pater for sending a copy of this (yet unpublished) paper. See also Wetzels (2002b), for the use of a morpheme-specific constraint (word/syllable alignment) to account for h-aspiré words in modern French.