

Headedness, |A| & head-alignment: capturing the properties of the vowels of Montreal French¹

Monik Charette
SOAS – University of London

Abstract

Among the differences between Montreal and Standard French are the laxing of high vowels in front of a final consonant and a tense-lax contrast of non-high vowels in that syllabic context. While those facts are well documented, most analyses concentrate on the phonetic properties of the vowels and rarer are the attempts to theoretically explain the vocalic distribution. This paper aims to account for the distribution of vowel length and ATRness in the last syllable of Montreal French words. It provides an analysis of the vowel system of Montreal French in (Standard) Government Phonology. It aims to discuss an area rarely previously treated in this representational, phonologically (rather than phonetically) based, formal model. Its major claim is that several apparently unrelated aspects of the tense-lax dimension of Montreal French vowels are given an insightful account if we resort to the concept of the headedness of phonological expressions and the alignment of heads between dominant and recessive prosodic positions contracting dependency relations.

Keywords Montreal French; vowel laxing; trochaic foot; headedness; empty nuclei

1 Introduction

Headedness in Element Theory plays a dual role in the analysis of vocalic systems.² It is a property of ATR vowels whatever their length, and it is a property of long vowels whatever their quality. What this means is that headedness captures a phonetic contrast between an ATR and a non-ATR short vowel in representing the former as a headed expression and the latter as headless, and it also captures lexical length in analysing long vowels as headed.

In this article, I revisit the vocalic system of Montreal French (henceforth MF) aiming to determine what are the lexical vowels of the system, what are the internal representations of those vowels and what are the contexts that determine their distribution.³ Similarly to Côté (2010), I concentrate on the end of a word-domain and more specifically on the last syllable.

¹ I wish to thank Connor Youngberg, Noam Faust and three anonymous reviewers for their useful comments. All errors are mine.

² Element Theory refers to how phonological expressions are analysed in Government Phonology since the mid-nineties. In KLV (1985) there is an “ATR” element present in tense vowels and a “Nasal” element present in nasal vowels. As the theory developed it became clear that the system was generating too many segments and to overcome this problem those two elements were eliminated. ATR-ness is now expressed in terms of headedness and depending on the role it occupies within an expression, Low tone expresses voicing/nasality in consonants and nasality/low tone in vowels (see Walker (1995), Cobb (1995), Ploch (1995) and Charette & Göksel (1996, 1998) for a discussion of headedness in vowels and Ploch (1999) and Nasukawa (2000) for a discussion of nasality and voicing in consonants).

³ There are different varieties of Montreal French. In this article I concentrate on my own variety.

The article is organised as follows. In Section 2 I present the main lines of Element Theory. Taking Turkish as an example, I discuss the roles that Headedness and Licensing Constraints play in determining the nature of the vocalic inventory and the processes of harmony operating in the language. Then, as the quality and the length of the vowels of MF are dependent on the structure of syllables, I discuss the relevant principles of Government Phonology. I re-examine ‘final closed syllable’ in Section 3, a context which plays a crucial role in my analysis of MF. Contrary to general assumption, I argue that in Government Phonology the syllabification of a final consonant is in a final Onset and not in a final branching rhyme. Having presented the theoretical tools necessary to the understanding of the analysis of the vowels of MF, in Section 4, I turn to the presentation of the facts and to my proposals to account for them. Concentrating on the distribution of the vowels occurring before a final onset, I claim that both the final empty nucleus and the consonant syllabified in the final onset play an important role in determining what can precede them.

2 Element theory

2.1 Phonological expressions

Kaye, Lowenstamm & Vergnaud (1985) proposed that segments are phonological expressions that are internally composed of elements and not of articulatory binary features.⁴ Elements they claim, are either present or absent in a given phonological expression (i.e. the system is privative) and it is the elements that phonology sees and manipulates.

In Element Theory (henceforth ET), a phonological expression is said to be simplex when it contains a single element and complex when it is composed of more than one.⁵ Elements can occupy the role of Head or the role of Operator within an expression. Roughly speaking, the Head contributes all its acoustic properties and the Operator(s) contributes its salient property, i.e. it colours the expression. For example, an expression which contains the element |U| as Head and the element |A| as Operator will result in a lowered *u*, (i.e. [o]) and one which contains the element |A| as Head and |U| as Operator will result in a rounded low vowel. Within a phonological expression the number of Heads is restricted to one and there is no limit on the number of Operators as long as a given element does not occur more than once in an expression. Finally, and as I will discuss below, expressions can be headed (i.e. have an element in the position of Head) or can be headless (i.e. the elements are Operators and no element occupies the position of Head). With respect to their phonetic realisation, headless expressions are realised lax and headed expressions are realised tense when headed by the elements |I| or |U|, and lax when headed by the element |A|.

The three elements |I, U, A| are involved in the representation of vowels. The signature of the element |I| is frontness, of |U| is roundness and of |A| is lowness.⁶ In

⁴ Particle Phonology (Schane 1984), Government Phonology (Kaye, Lowenstamm & Vergnaud 1985), Dependency Phonology (Anderson & Ewen 1987) and Radical CV Phonology (van der Hulst 1989) are the main theories that propose that segments are composed of elements.

⁵ In KLV (1985) and in Harris & Lindsey (1995) all phonological expressions are composed of a Head and an Operator. In expressions where the elements I, U, A are Operators, the head position is occupied by the cold vowel in KLV and by @ in H&L. In those models, tense vowels are headed by |I, U or A| and lax vowels by v°/@. I depart from those models because I do not believe that the absence of an element (which is how I see v°/@) should be represented by an element.

⁶ For more on the acoustic properties of elements, see Harris & Lindsey (1995).

languages which have only three vowels (i.e. the smallest vocalic inventory possible), elements occur in isolation and cannot combine to create more complex vowels. (We could propose that in those languages |I, U and A| must be Heads.)

(1) 3-vowel system (e.g. some Arabic dialects)⁷

[i] (|I|) [u] (|U|) [a] (|A|)

From a three-vowel system languages can go up to five vowels (e.g. Standard Japanese). In those languages, the elements |I| and |U| cannot combine with each other (there are no front rounded vowels), but they can combine with the element |A| to create mid-vowels.

(2) 5-vowel system (e.g. Standard Japanese)

[i] (|I|) [u] (|U|) [a] (|A|)
[e] (|A-I|) [o] (|A-U|)

It goes without saying that languages may have a more complex vocalic inventory than the one of Arabic or Japanese, and French and Turkish are among those languages. Let us first consider Turkish which has 8 vowels on the surface and two types of vowel harmony, namely front and round, or |I| and |U| harmony.

(3) Turkish surface vowels

[i] [y] [u] [ɨ]
[e] [ø] [o] [a]

There is no tense/lax contrast in Turkish and the language has two front rounded vowels. In ET this means that the elements |I| and |U| can combine resulting in vowels which are front and round. I give below the internal representation of the vowels as proposed by Charette & Göksel (1996, 1998).

(4) Internal representation of the Turkish vowels⁸

[i] (|I|) [y] (|U-I|) [u] (|U|) [ɨ] (| |)
[e] (|A-I|) [ø] (|A-U-I|) [o] (|U-A|) [a] (|A|)

As I said earlier, phonological expressions are simplex when they contain a single element and complex when they contain more than one. Front-rounded vowels minimally contain the elements |I| and |U| and mid and low vowels minimally contain the element |A|. With respect to capturing the contrast between tense and lax, it is done in terms of headedness. Roughly speaking, tense vowels are headed and lax

⁷ By convention an element in Head position is underlined.

⁸ To simplify the discussion, I omit to fully justify the role of Head/Operator an element occupies within an expression and refer the reader to Charette & Göksel (1996), (1998) for a detailed analysis of the vocalic inventory and harmony processes.

vowels are headless.⁹ Let us take English where long vowels are tense and short vowels are lax, as an example. The contrast between *feet* and *fit* and *boot* and *book* is one where the long vowels are simplex and headed expressions and their lax counterparts are also simplex but headless.¹⁰ In languages where tense/lax and short/long do not contrast, as in Turkish native words, the vowels are either all headed or all headless. The only way to find out the nature of the expressions is by looking at their phonological behaviour. In Turkish, Charette & Göksel claim that U-harmony reveals that the vowel [a] is headed, which leads them to conclude (given the absence of tense/lax and short/long contrast) that all vocalic expressions are headed. The absence of a mixture of headed and headless expressions results in the absence of a tense/lax contrast.

Pursuing the discussion of Turkish, while we are now able to express the absence of tense/lax contrast in saying that all expressions are headed, it remains to explain why the language does not have two *y* (i.e. (|U-I|) and (|I-U|)), three *ø* (i.e. (|A-U-I|), (|A-I-U|), (|I-U-A|)), two *e* (i.e. (|A-I|), (|I-A|)) and two *o* (i.e. (|A-U|), (|U-A|)). In other words, saying that expressions are headed is not sufficient to capture the 8 surface vowels of Turkish. While I refer the reader to Charette & Göksel (1996, 1998) for a detailed analysis of Turkish, what is important to note here is that elements are theoretically free to combine with each other and the fact that languages imposed restrictions on their combinations is captured by the presence of Licensing Constraints which I consider next.

2.2 Licensing constraints

The role Licensing Constraints play in the grammar is dual. First, they express the licensing potential of a given element in a given language and second they express the role an element must or cannot occupy within an expression. For example, an element X in the position of Head may not have the potential to license Operators, or an element Y may only be allowed to occur in the position of Head. The Licensing Constraints needed to capture those two facts are respectively: X cannot license operators; Y must be Head. Licensing is a property of Heads. Within an expression operators are licensed if the expression contains a Head and are free if it does not. The central idea is that elements are theoretically free to combine with each other. That the vocalic inventory of any given language is only a sub-set of those combinations of elements is captured by Licensing Constraints that operate in that language. In other words, from the set of all the possible combinations of elements, language specific constraints may be imposed on certain elements and as a consequence of those constraints the segmental inventory is limited.

The way to identify the Licensing Constraints present in the grammar of a language is by looking at the segmental inventory, at the distribution of the phonological expressions within a word as well as by looking at the phonological behaviour of the elements (i.e. the phonological processes). In Turkish, labial harmony does not affect the vowel *a*. Charette & Göksel explain this fact about U-harmony by proposing that: i) Operators must be licensed (which means that all

⁹ Note that phonological expressions that have the element |A| in Head position can be phonetically lax (e.g. (|I-A|) = [ɛ]). I look at those expressions in more detail in the analysis of MF. Theoretically, a language could have three lexical vowels composed of the elements |I| and |A|, namely (|A-I|) = [e], (|I-A|) = [ɛ] / [æ] and (|A-I|) = [ɛ]. As we will see, I claim the MF is such a language.

¹⁰ Long vowels are headed due to the fact that they constitute a governing domain. I discuss this further in the analysis of MF.

expressions are headed) and ii) |U| must be head. Given that the vowel *a* is headed (like all the vowels of the inventory) and given that |U| must be head, |U| cannot harmonise (|A|) because of a conflict of headship. That is, |A| in head position prevents |U| from spreading into the position of head. Notice that the constraint ‘|U| must be head’ reduces the vocalic system to one *u*, one *y*, one *ø* and one *o*, in addition to explaining how labial harmony operates.

Having presented the main lines of Element Theory and the role Licensing Constraints play in the grammar, I turn to the syllabification of final consonants, a context which plays a crucial role in my analysis of the vocalic system of Montreal French.

3 The syllabification of final consonants

In my analysis of the vocalic system of MF, I concentrate on the vowels occurring in word-final position and before a word-final consonant. This latter context is traditionally understood as ‘occurring in a final closed syllable’. Before we look at the facts, I briefly present some of the arguments which led to the proposal that a word-final consonant is not syllabified in a final coda, but is in an onset which is followed by a nucleus with no phonetic interpretation. That is, final syllables are always ‘open’ they are never ‘closed’.

3.1 ‘Coda’ licensing

I refer the reader to Kaye (1990) and Harris & Gussmann (1998) for a detailed discussion of why final codas should be rejected and here it suffices to point out the following problematic facts for the proposal that a final consonant is syllabified in a final coda:

- (5) a. *Vowels can be long before a word-final coda, but not before a word-internal coda.*
If a final consonant is not in a coda but in an onset, the vowel preceding a final consonant occurs in an open syllable and can therefore be long.
- b. *Internal codas cannot branch, but there is no such restriction on final codas.*
If a final RT cluster is analysed as a coda-onset, a final TR cluster as a branching onset and a final RTR cluster as a coda followed by a branching onset, then the coda never branches.¹¹ In other words, if consonant clusters have the same syllabification word-internally and word-finally there is no reason to differentiate word-internal and word-final ‘codas’.
- c. *The type of consonants that can occur in a word-internal coda are restricted, but no such restrictions are imposed on final codas.*
If ‘final codas’ are onsets, the restrictions on what can occur in a coda are the same word-internally and word-finally. Any type of consonant can occur word-finally because it is syllabified in an onset and not in a coda.

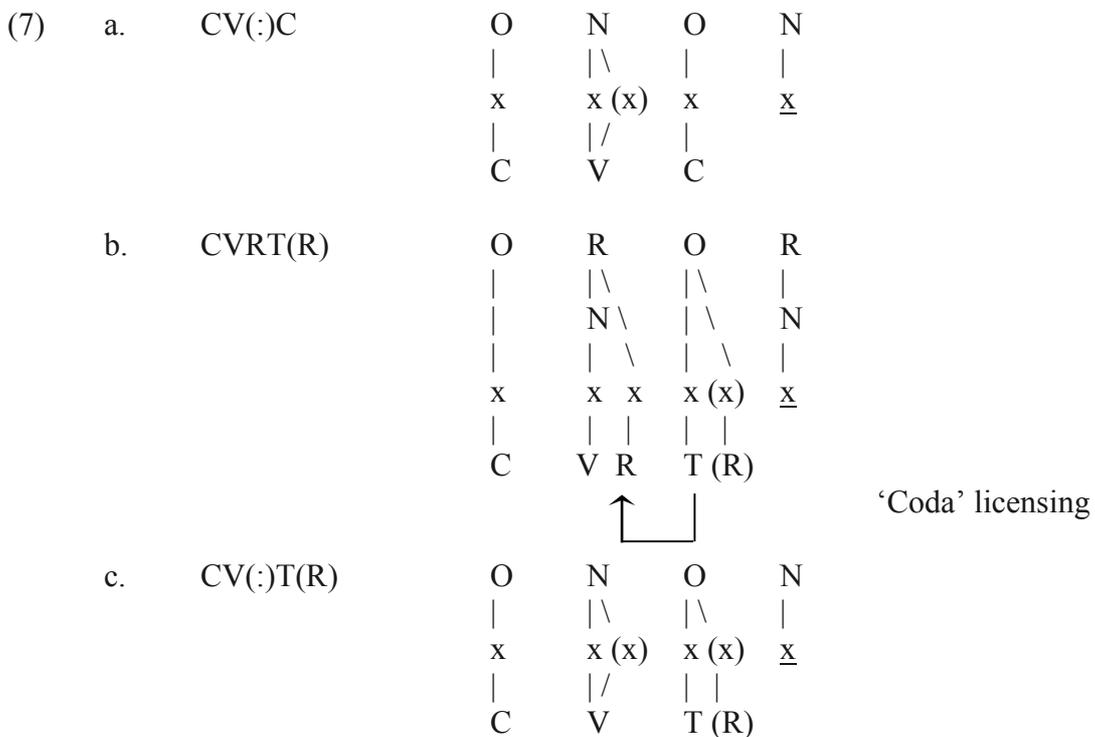
¹¹ R stands for sonorant and T for obstruent.

- d. *Stress is sensitive to word-internal branching rhymes, but not to final ones*
 If a final consonant is in an onset, the final syllable is never closed.¹²

The facts above lead to the conclusion that if word-final consonants are syllabified in a coda, then word-internal and word-final ‘codas’ are very different. However, if a so-called final ‘coda’ is an onset, the preceding facts find a natural explanation. Note that:

- (6) a. The fact that any consonant can occur word-finally is similar to the fact that any consonant can occur in a word-internal onset.
 b. Final RT clusters are identical to word-internal RT clusters (e.g. a long vowel can never precede such clusters).
 c. Final TR clusters are identical to word-internal TR clusters. They are branching onsets (e.g. long vowels can precede TR clusters).

In Government Phonology, that a final consonant is syllabified in an onset and not in a final coda follows from the principle of ‘Coda’ Licensing proposed by Kaye (1990) according to which: a consonant can be syllabified in a rhyme iff it is governed by a consonant in a following onset. It follows from ‘Coda’ Licensing that final ‘codas’ must be followed by a consonant in an onset and since an onset is always followed by its nucleus, words universally end in a nucleus. In languages where words can phonetically end in a consonant, the final nucleus is empty and parametrically licensed to be uninterpreted. I give below the structure of CV(:)C, CVRT(R) and CV(:)TR words.



¹² See Scheer (2000), Scheer & Szigetvari (2005), Ulfsgjorninn (2014) for more on the role of empty nuclei in stress systems.

Now that the main lines of ET and the principles regulating the syllabification of final consonants in Government Phonology have been presented, I proceed to the analysis of the vowels of MF.

4 The vowels of Montreal French

4.1 *The facts*

Two of the characteristics of MF, compared with Standard French, is to have long (and often diphthongised) vowels as well as high lax vowels.¹³ It is commonly argued that ignoring loanwords, the surface vowels are as given in (8) below.

(8) The surface vowels of MF

[i]	[i:]	[ɪ]	[y]	[y:]	[ɥ]	[u]	[u:]	[ʊ]
[e]	[ɛ:]	[ɛ]	[ø]	[ø:]	[œ]	[o]	[o:]	[ɔ]
[a]	[a:]	[ɑ:]	[ə]					
[ɛ̃]	[œ̃]	[ɔ̃]	[ɑ̃]					

I now go into the details of the distribution of those vowels starting with the mid and low vowels followed by the high vowels. I focus my attention on the end of words and look at the vowels occurring word-finally, before a final consonant or a final TR cluster and in a final branching rhyme. Regarding the word-final consonants, I leave to a later section the lengthening consonants {r, z, v, ʒ} because of their special property to lengthen the vowel preceding them.

4.1.1 *Mid and low vowels*¹⁴

In light of their distribution, the mid and low vowels can be divided into the two sets {ø, o, a, nasal vowels}, and {œ, ɔ, a}.

(9) The distribution of {ø, o, a, nasal vowels} and {œ, ɔ, a}

a. Word-finally we only find {ø, o, a, nasal vowels}^{15 16}

<i>oeufs</i>	[ø]	‘eggs’	<i>heureux</i>	[ø:rø]	‘happy’
<i>creux</i>	[krø]	‘deep’	<i>feu</i>	[fø]	‘fire’
<i>bleu</i>	[blø]	‘blue’	<i>jeu</i>	[ʒø]	‘game’

¹³ I refer the reader to Côté (2010) for a discussion of the diphthongised quality of the long vowels. In this article I am concerned with phonological length and not with the narrow phonetic realisation of the long vowels.

¹⁴ To help the presentation of the facts, I look at the vowels [ɛ], [ɛ:] and [e] in a separate section.

¹⁵ [a] is possible in the few monosyllabic words *ma, ta, sa* ‘mine, yours, his/hers’ and the musical notes *fa* and *la*.

¹⁶ In this section I follow what is commonly assumed and transcribe the final vowels as short. I will discuss the length of the final vowels in the analysis section and I will propose that contrary to general assumption all final vowels are long in MF. For the time being I concentrate on their quality and do not worry about their length.

<i>sceau</i>	[so]	‘bucket’	<i>marteau</i>	[marto]	‘hammer’
<i>poteau</i>	[po:to]	‘post’	<i>peau</i>	[po]	‘skin’
<i>mulot</i>	[mylo]	‘field mouse’	<i>sirop</i>	[siro]	‘syrup’
<i>rat</i>	[ra]	‘rat (m)’	<i>matelas</i>	[matla]	‘mattress’
<i>cinéma</i>	[sinema]	‘cinema’	<i>chat</i>	[ʃa]	‘cat’
<i>cadenas</i>	[kadna]	‘padlock’	<i>bras</i>	[bra]	‘arm’
<i>sain</i>	[sɛ̃]	‘healthy’ ¹⁷			
<i>brun</i>	[brœ̃]	‘brown’			
<i>bon</i>	[bɔ̃]	‘good’			
<i>partisan</i>	[partʰizã]	‘partisan’			

b. Before a final non-lengthening consonant and a final TR cluster

In this context we find the two sets of vowels, but we should note that {ø, o, a, nasal vowels} are long and {œ, ɔ, a} are short.

	<i>Long & tense</i>	vs	<i>Short & lax</i>			
i.	ø: / œ					
	<i>jeûne</i>	[ʒø:n]	‘fast’	<i>jeune</i>	[ʒœn]	‘young’
	<i>meule</i>	[mø:l]	‘millstone’	<i>gueule</i>	[gœl]	‘mouth’
	<i>beugle</i>	[bø:g(l)]	‘moo’	<i>aveugle</i>	[avœg(l)]	‘blind’
ii.	o: / ɔ					
	<i>paume</i>	[po:m]	‘palm’	<i>pomme</i>	[pɔm]	‘apple’
	<i>jaune</i>	[ʒo:n]	‘yellow’	<i>nonne</i>	[nɔn]	‘nun’
	<i>saute</i>	[so:t]	‘jump!’	<i>sotte</i>	[sɔt]	‘idiot’
iii.	a: / a					
	<i>pâte</i>	[pa:t]	‘pasta’	<i>patte</i>	[pat]	‘paw’
	<i>male</i>	[ma:l]	‘male’	<i>mal</i>	[mal]	‘bad’
	<i>sable</i>	[sa:b(l)]	‘sand’	<i>érable</i>	[erab(l)]	‘maple’
iv.	nasal vowels					
	<i>crainte</i>	[krɛ̃:t]	‘fear’			
	<i>défunte</i>	[defœ̃:t]	‘deceased’			
	<i>sombre</i>	[sɔ̃:b(r)]	‘dark’			
	<i>attente</i>	[atã:t]	‘wait’			

c. Before a final RT cluster

In this context we only find the short lax vowels.

<i>Meurtre</i>	[mœrt(r)]	‘murder’	<i>heurte</i>	[œrt]	‘collide’
<i>poste</i>	[pɔst]	‘post’	<i>solde</i>	[sɔld]	‘sale’
<i>carte</i>	[kart]	‘card’	<i>calme</i>	[kalm]	‘calm’

¹⁷ Walker (1984) claims that the French nasal vowels are tense and Ploch (1999) claims that they are long. More on this later.

To sum up the facts, the vowels { \emptyset , o, α , nasal vowels} occur word-finally and their lax counterparts do not; the vowels { œ , ɔ , a} occur before a final RT cluster and their tense counterparts do not; all the vowels are found in front of a final non-lengthening consonant and a final TR cluster and in that context the tense vowels are long and the lax vowels are short. In addition, nasal vowels have the same distribution as the tense vowels.¹⁸

In light of the above facts two conclusions come to mind. Namely, that final stressed vowels must be tense,¹⁹ and given their syllabic distribution, that { \emptyset , o, α , nasal vowels} can be phonologically long while { œ , ɔ , a} are phonologically short.²⁰ In ET, a contrast of ATR-ness is expressed in terms of headedness where tense vowels are headed expressions and their lax counterparts are headless.²¹ Also, in GP a long vowel is syllabified in a branching nucleus which because it constitutes a governing domain must dominate a headed expression. This leads us to tentatively propose, leaving their length aside for the moment and concentrating on their quality, that the internal representations of the vowels we have looked at so far, are as given below.

(10) Internal representation of the vowels²²

\emptyset / = (A-I- <u>U</u>)	/o/ = (A- <u>U</u>)	/α/ = (<u>A</u>)	
/ɛ̃/ = (L-A- <u>I</u>)	/œ̃/ = (L-A-I- <u>U</u>)	/ɔ̃/ = (L-A- <u>U</u>)	/ã/ = (L- <u>A</u>)
	/œ/ = (A-I-U)	/ɔ/ = (A-U)	/a/ = (A)

Regarding the fact that final vowels are tense and never lax, this property appears to be both lexical and phonological. The words in (11a) below show a tense-lax alternation whereby the vowel is lax in front of a final consonant and tense word-finally. The words in (11b) on the other hand show no such alternation. The vowels are tense in both syllabic contexts.

(11) Tense/Lax alternation

a.	Lax / <u> </u> C#		Tense / <u> </u> #	
<i>oeuf</i>	[œf]	‘egg’	<i>oeufs</i> [ø]	‘eggs’
<i>galope</i>	[galɔp]	‘gallop (v)’	<i>galop</i> [galo]	‘gallop (n)’
<i>rate</i>	[rat]	‘rat (f)’	<i>rat</i> [ra]	‘rat (m)’

¹⁸ As for word-internally, { \emptyset , o, α , nasal vowels} only occur in open syllables while { œ , ɔ , a} occur in both open and closed syllables.

¹⁹ Stress always falls on the rightmost vowel of a word.

²⁰ The vowels { \emptyset , o, α , nasal vowels} are traditionally claimed to be “longues par nature” [intrinsicly long] (Côté 2010, Santerre 1974 among others). I will discuss the length of all the vowels in more details in the analysis section.

²¹ Except for A-headed expressions which as we will see can be phonetically lax.

²² I will justify the roles of head and operator later.

b.	Tense / _C#		Tense / _#		
	<i>heureuse</i>	[ø:rø:z]	‘happy (f)’	<i>heureux</i> [ø:rø]	‘happy (m)’
	<i>saute</i>	[so:t]	‘jump (v)’	<i>saut</i> [so]	‘jump (n)’
	<i>grasse</i>	[gra:s]	‘fat (f)’	<i>gras</i> [gra]	‘fat (m)’

The tense-lax alternation in (11a) could be due to a process of laxing of a tense vowel in a context where it is followed by a final consonant, or to a process of tensing of a lax vowel word-finally. No such alternations are seen in (11b) and we note that the difference between the forms in (11a) and those in (11b) is the length of the vowels in front of a final consonant. I will discuss the tense-lax alternation further when all the vowels have been presented.

I now turn to the distribution of the mid vowels [e], [ɛ] and [ɛ:].

4.1.2 The vowels [e], [ɛ] and [ɛ:]

There is a contrast between three mid front unrounded vowels namely, a short tense [e], a short lax [ɛ] and a long lax [ɛ:]. [e] is tense and always short except in loanwords from English (e.g. *steak* [ste:k]); it occurs word-finally and in word-internal open syllables where its pronunciation often varies between [e] ~ [ɛ] (e.g. *céder* [sede]~[sɛde] ‘to give up’); it never occurs before a final consonant/TR final cluster. The short [ɛ] is both the lax counterpart of [e] (e.g. *céder* [sede] ‘to give up’, *cède* [sɛd] ‘give up’) and the counterpart of schwa in stressed position (e.g. *lever* [ləve] ‘to raise’, *lève* [lɛv] ‘raise’). As for the long [ɛ:], it is a lexical vowel which is always long and always lax. As we will see, it has the same distribution as the vowels {ø, o, a, nasal vowels}. Below are some examples of the distribution of the three mid-front unrounded vowels.

(12) Mid-front unrounded vowels

a. Word-finally

In word-final position we find both [e] and [ɛ]

i. [e]

<i>été</i>	[ete]	‘summer’	<i>clef</i>	[kle]	‘key’
<i>soulier</i>	[sulje]	‘shoe’	<i>tablier</i>	[tablije]	‘apron’
<i>vallée</i>	[vale]	‘valley’	<i>malgré</i>	[malgre]	‘despite’

ii. [ɛ]

<i>valet</i>	[valɛ]	‘servant’	<i>jamais</i>	[ʒameɛ]	‘never’
<i>balai</i>	[baleɛ]	‘broom’	<i>billet</i>	[biɛ]	‘ticket’
<i>craie</i>	[kreɛ]	‘chalk’	<i>palais</i>	[palɛ]	‘palace’

Preceding a final non-lengthening consonant or a final TR cluster, we find the short and long ‘ɛ’s. [e] is never found in that position. Long [ɛ:] is lexical and contrasts with short [ɛ].

The forms in (14a) below show the vowel [e] (pronounced either [e] or [ɛ]) in an open syllable being realised [ɛ] in front of a final consonant. (Notice that in those two syllabic contexts there is no such tense-lax alternation when the vowel is a long [ɛ:].)

(14)	a.	[e] ~ [ɛ]		[ɛ] *[e]
	<i>céder</i>	[sede] ~ [sɛde]	‘to give up’	<i>cède</i> [sɛd] ‘give up’
	<i>péter</i>	[pete] ~ [pɛte]	‘to fart’	<i>pète</i> [pɛt] ‘fart’
	<i>crémer</i>	[kreme] ~ [krɛme]	‘to cream’	<i>crème</i> [krɛm] ‘cream’
	<i>saigner</i>	[sepe] ~ [sɛpe]	‘to bleed’	<i>saigne</i> [sɛɲ] ‘bleed’
	vs.	[ɛ:] *[e:]		
	<i>fêter</i>	[fɛ:te]	‘to celebrate’	<i>fête</i> [fɛ:t] ‘celebrate’
	<i>mêler</i>	[mɛ:le]	‘to mix’	<i>mêle</i> [mɛ:l] ‘mix’

The forms in (15) below show a lexical contrast between long and short ‘ɛ’ in front of a final consonant.

(15) Long ɛ: / ɛ before final singleton

<i>fête</i>	[fɛ:t]	‘birthday’	<i>faite</i>	[fɛt]	‘done’
<i>carême</i>	[karɛ:m]	‘lent’	<i>crème</i>	[krɛm]	‘cream’
<i>bête</i>	[bɛ:l]	‘bleat’	<i>belle</i>	[bɛl]	‘pretty’
<i>maître</i>	[mɛ:t(r)]	‘master’	<i>mettre</i>	[mɛt(r)]	‘to put’
<i>tête</i>	[tɛ:t]	‘head’	<i>tète</i>	[tɛt]	‘suck’

Meanwhile, before a final branching rhyme we only find the short [ɛ], as shown beneath.

(16) Only short [ɛ] before final rhyme

<i>perte</i>	[pɛrt]	‘loss’	<i>verte</i>	[vɛrt]	‘green (f)’
<i>fresque</i>	[frɛsk]	‘fresco’	<i>peste</i>	[pɛst]	‘plague’
<i>pelte</i>	[pɛlt]	‘shovel’	<i>svelte</i>	[zvɛlt]	‘slender’

In summary, there is a tense-lax contrast word-finally (e.g. *fée* [fe] ‘witch’, *fait* [fɛ] ‘done’); in front of a final non-lengthening consonant/TR final cluster we find the vowels [ɛ] and [ɛ:], but not [e]; in a final branching rhyme we only find the short [ɛ].

In line with what we have seen with the vowels {ø, o, ɑ, nasal vowels}, it must be that the vowels [e] and [ɛ] occur in word-final position by virtue of being headed expressions. But at the same time, the alternation between [e] and [ɛ] must mean that [e] is a headed expression and [ɛ] its headless counterpart. This therefore means that MF might have the following three mid-front-unrounded vowels in its vocalic inventory.

$$(17) [e] = (|A-|) \quad [ɛ] = (|I-\underline{A}|) \quad [ɛ:] = (|A-I|)$$

Above are three expressions composed of the elements |A| and |I| which are theoretically expected to be found in languages. When I turn to the analysis of the facts after the section on high vowels, we will discuss whether or not MF has the three of them in its vocalic inventory. At present what is of importance is that given that words can end in a final [ɛ] along with the fact that there is a clear contrast between a

short and long ‘ε’, it well seems that one of the ‘ε’ of MF is a headed expression which would be phonetically lax because it is headed by the element |A|.

I now turn to the distribution of the high vowels.

4.1.3 The high vowels

I mentioned earlier that one of the characteristics of MF, compared to Standard French, is to have high lax vowels. As the following forms illustrate, the high vowels are tense in word-final position and are lax when followed by a final non-lengthening consonant or a final TR cluster.

- (18) a. High vowels are lax before a (non-lengthening) final consonant/final TR cluster and are tense word-finally. Note that this is similar to the alternations we have seen earlier involving $\text{ø} \sim \text{œ}$, $\text{o} \sim \text{ɔ}$, $\text{a} \sim \text{ɑ}$ and $\text{e} \sim \text{ɛ}$.

<i>Lax</i>			<i>Tense</i>		
<i>salissent</i>	[salɪs]	‘soil (pl)’	<i>sali</i>	[salɪ]	‘soiled’
<i>petite</i>	[pət ^s it]	‘small (f)’	<i>petit</i>	[pət ^s i]	‘small (m)’
<i>crime</i>	[kɾim]	‘crime’	<i>cri</i>	[kɾi]	‘yell’
<i>cible</i>	[sibl]	‘target’	<i>cabri</i>	[kabɾi]	‘goat’
<i>chahute</i>	[ʃavt]	‘kick up’	<i>chahut</i>	[ʃay]	‘uproar’
<i>rhume</i>	[rvm]	‘cold’	<i>rue</i>	[ry]	‘street’
<i>puce</i>	[pys]	‘flea’	<i>pus</i>	[py]	‘pus’
<i>sucre</i>	[syk(r)]	‘sugar’	<i>cru</i>	[kry]	‘raw’
<i>toute</i>	[tɔt]	‘all (f)’	<i>tout</i>	[tu]	‘all (m)’
<i>soupe</i>	[sɔp]	‘soup’	<i>sou</i>	[su]	‘cent’
<i>boule</i>	[bɔl]	‘ball’	<i>tabou</i>	[tabu]	‘taboo’
<i>couple</i>	[kɔpl]	‘couple’	<i>cou</i>	[ku]	‘neck’

As seen earlier with:

<i>sonnette</i>	[sɔnɛt]	‘doorbell’	<i>sonner</i>	[sɔne]	‘to ring’
<i>oeuf</i>	[œf]	‘egg’	<i>oeufs</i>	[ø]	‘eggs’
<i>sotte</i>	[sɔt]	‘idiot (f)’	<i>sot</i>	[so]	‘idiot (m)’
<i>rate</i>	[rat]	‘rat (f)’	<i>rat</i>	[rɑ]	‘rat (m)’

- b. Before a final RT cluster the high vowels are lax

<i>risque</i>	[ɾɪsk]	‘risk’	<i>film</i>	[fɪlm]	‘movie’
<i>brusque</i>	[bɾysk]	‘rough’	<i>culte</i>	[kylt]	‘cult’
<i>courte</i>	[kɔrt]	‘short’	<i>poulpe</i>	[pɔlp]	‘octopus’

Now that the facts have been presented, I turn to their analysis.

4.2 The analysis

4.2.1 Tense – lax alternation

I begin the analysis with the tense-lax alternation which affects all the short vowels. As we have seen, short vowels are lax in front of a final non-lengthening consonant and a final TR cluster and are realised tense when they occur word-finally. For convenience I give some more examples below.

(19)	CV#		CVC#		
	<i>frit</i>	[fri]	‘fried (m)’	<i>frite</i>	[frit] ‘fried (f)’
	<i>but</i>	[by]	‘goal’	<i>butte</i>	[byt] ‘mound’
	<i>tout</i>	[tu]	‘all (m)’	<i>toute</i>	[tøt] ‘all (f)’
	<i>dernier</i>	[dɛrnje]	‘last (m)’	<i>dernière</i>	[dɛrnjɛr] ‘last (f)’
	<i>boeufs</i>	[bø]	‘ox (pl)’	<i>boeuf</i>	[bœf] ‘ox’
	<i>sot</i>	[so]	‘idiot (m)’	<i>sotte</i>	[søt] ‘idiot (f)’
	<i>rat</i>	[ra]	‘rat (m)’	<i>rate</i>	[rat] ‘rat (f)’

Those facts are indeed very clear in that, except for the final [ɛ] (e.g. *laid* [lɛ] ‘ugly (m)’, *laide* [lɛd] ‘ugly (f)’) which I consider shortly, short vowels are lax when they precede a non-lengthening final consonant and are tense in final position. Hypothetical words like *[purɪ], *[pilɔ] or *[purit], *[purøt] are ungrammatical.

I suggest that the difference in the quality of the vowels in those two contexts is due to their metrical position. In French, stress falls on the rightmost vowel (e.g. *Capri* [kapri] ‘Capri’, *caprice* [kapris]. ‘whim’). Starting the analysis with the words ending in a consonant, we know that they end in an empty nucleus following the principle of ‘Coda’ licensing that I have presented earlier. To capture their lax quality, I propose that a trochaic foot is built on the last two nuclei of a word. To be more precise, I claim that this trochaic foot is built on the last two nuclei and that the dependent position must dominate an empty nucleus.^{23 24} Within the foot, the two nuclei have to dominate expressions which agree in headedness. Given that an empty nucleus has no elemental content it is not headed and its headlessness forces the short vocalic expression occupying the metrical head position to also be headless. This is why a short vowel occurring before a word-final consonant is always lax.

²³ Very differently from what I propose here, but in the same spirit, Selkirk (1978) proposed that syllables in French are grouped together into feet. The French foot she claims, generally consists of a single syllable, but can be more complex when the following syllable contains a schwa. She proposes that a syllable containing schwa forms a trochaic foot along with a preceding syllable.

²⁴ Proposing a final trochaic foot makes me question whether the setting of the word-final parameter (according to which a final empty nucleus is parametrically licensed to be uninterpreted) in French would not be OFF instead of ON as previously thought. I have so far claimed that in French and in Turkish (Charette 2008), two languages with ‘final’ stress, a final empty nucleus is p-licensed within a final trochaic foot, which for those two languages could mean that the final parameter is set to OFF. If the final parameter is indeed set to OFF in French and in Turkish, final stress could then be conceived as resulting from the pressure to p-license the final empty nucleus. I refer the reader to Rowicka (1999) for more on Trochaic Proper Government. I will return to this issue.

(20)	a.	h-----d O N O N \ x x x x <u>x</u> p (U) t r	b.	h-----d O N O N x x x <u>x</u> b (A-I-U) f
		[pʊtr]		[bœf]
	c.	h-----d O N O N O N x x x x x <u>x</u> g (A) l (A-U) p	d. *	h-----d O N O N x x x <u>x</u> p (U) l
		[galɒp]		*[pul]

Except for (20d) the forms given above contain a final trochaic foot with a short headless vowel in the position of metrical head and an empty nucleus in the position of dependent. The vowel is headless and realised lax because it is head-aligned with the following empty nucleus. Failure for the short vowel to head-align with the empty nucleus results in an ungrammatical form as illustrated in (20d).

Before turning our attention to final vowels, let us pursue with the context ‘preceding a word-final non-lengthening consonant’ and look at what else can occur in that context. As we have seen in the previous section, in addition to short lax vowels, the vowels {o, ø, a, ε, ɛ̃, œ̃, ð̃, ã̃} are also found before a final consonant. Crucially, those vowels are long and tense (except for lax [ɛ:]) and not short and lax like those we have just seen. Some examples are repeated below for convenience. On the left I give words containing a long vowel and on the right words with a short lax vowel for comparison.

(21)	<i>Tense or ε & Long</i>		<i>Short & Lax</i>
	<i>paume</i> [po:m] ‘palm’		<i>pomme</i> [pɒm] ‘apple’
	<i>saute</i> [so:t] ‘jump!’		<i>sotte</i> [sɒt] ‘idiot’
	<i>jeune</i> [žø:n] ‘fast’		<i>jeune</i> [žœn] ‘young’
	<i>beugle</i> [bø:g(l)] ‘moo’		<i>aveugle</i> [avœg(l)] ‘blind’
	<i>maître</i> [mɛ:t(r)] ‘master’		<i>mettre</i> [met(r)] ‘to put’
	<i>bêlé</i> [bɛ:l] ‘bleat’		<i>belle</i> [bɛl] ‘pretty’
	<i>pâte</i> [pa:t] ‘pasta’		<i>patte</i> [pat] ‘paw’
	<i>male</i> [ma:l] ‘male’		<i>mal</i> [mal] ‘bad’
	 <i>peintre</i> [pɛ̃:t(r)] ‘painter’		 <i>défunte</i> [defœ̃:t] ‘deceased’
	<i>monde</i> [mɔ̃:d] ‘world’		<i>menthe</i> [mã:t] ‘mint’

What we should first notice is that the long tense vowels {i:, y:, u:, e:} do not occur preceding a word-final non-lengthening consonant.²⁵ The only long vowels occurring in that context are the tense mid and low vowels, the vowel [ɛ:] and the nasal vowels.

I would like to briefly digress here to discuss the vowel ‘ɛ’. In the examples above we observed a lexical contrast between a short and a long ‘ɛ’ in MF. Both are found in front of a final consonant/TR cluster. We have also seen that ‘ɛ’ occurs word-finally along with the tense vowels and unlike the other lax vowels. What this means is that there are two ‘ɛ’s in the vocalic inventory of MF. I propose that the ‘ɛ’ which occurs in final and which can be long corresponds to an expression headed by the element |A| (i.e. (|I-A|)). Because it is headed it can be long and because it is headed by |A| it is phonetically lax.²⁶ Regarding the stressed final vowels, if instead of saying that only tense vowels can occur in final, we say that only headed expressions can occur in that position, we explain why words can end with ‘ɛ’. They have the expression (|I-A|) in word-final position.²⁷

As for the short ‘ɛ’, it is a headless expression (i.e. (|I-A|)). It is found preceding RT clusters (e.g. *perte* [pɛrt] ‘loss’) and it is the lax counterpart of the vowel [e] as seen in the alternation *céder* [sede], *cède* [sɛd]. It is not found word-finally and it is never long.

Returning to the analysis of the data in (21), the two questions to be addressed are: i) isn’t the proposal of head-alignment within a final trochaic foot undermined by the presence of long-tense vowels and [ɛ:] before a final consonant, and ii) why aren’t the long high vowels and [e:] found in that context?

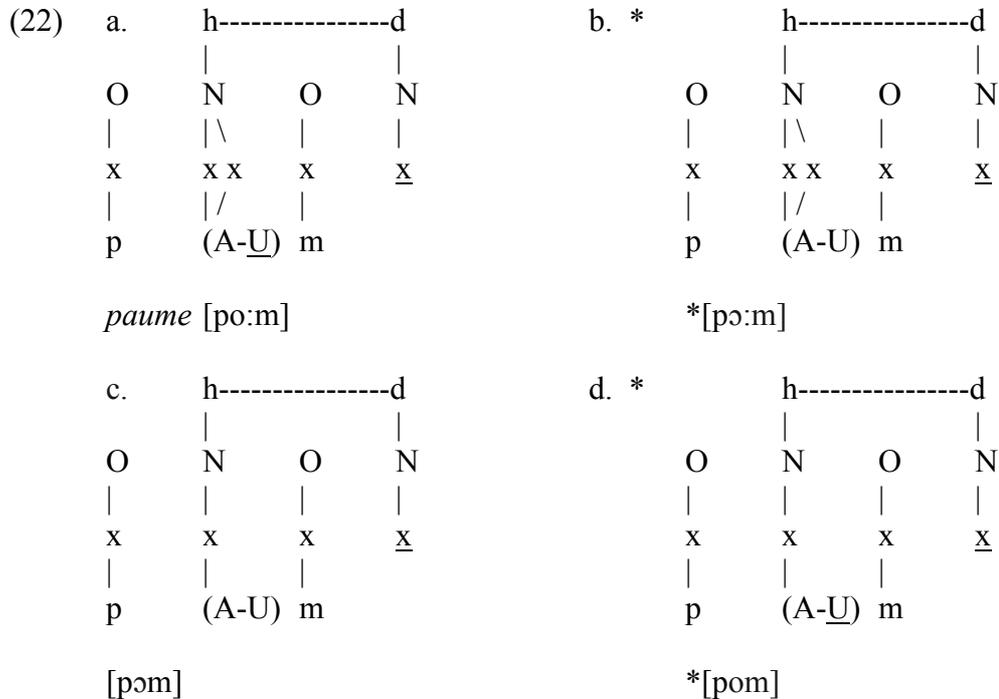
Regarding the absence of head-alignment of the long vowels within the trochaic foot, it is explained by the fact that in GP a long vowel is syllabified in a branching nucleus which constitutes a governing domain where the nuclear point on the left governs the nuclear point on its right, and to satisfy the conditions on constituent governors the expression the branching nucleus dominates must be headed (recall that the long vowels of English are always tense, i.e. headed). This means that while short vowels (because they do not constitute a governing domain) can theoretically be headed or headless, headlessness (i.e. empty headedness) is claimed to be theoretically impossible for long vowels because of the conditions imposed on constituent governors – they must be headed. It therefore means that the lexical long vowels in (21) form a (constituent) governing domain; must consequently dominate a headed expression; resulting in the impossibility to head align with the empty nucleus. The impossibility for vowels which are lexically long to head-align with the final empty nucleus is similar to geminates being immune to spirantisation while single consonants do undergo this process (cf. Hayes 1986). It is indeed a well-known fact that long vowels and geminates resist the changes that short vowels and single consonants undergo. Looking at a similar phenomenon, namely that long vowels do not get umlauted in Korean (Charette 1989), I proposed – in the spirit of Chomsky’s Minimality Condition (Chomsky 1986) – that nothing from outside can enter a governing domain, which for the data in (17) means that the branching nucleus acts as

²⁵ Except in loanwords from English which I discuss shortly.

²⁶ One may wonder if the element A is the head of other complex phonological expressions of MF. For example, is there a (|U-A|) or a (|I-U-A|) in MF? I suggest that there are not which could be accounted for by a Licensing Constraint “U cannot be licensed”. This constraint restricts the element U to occur in the position of head of an expression or as an operator of a headless expression. Where U cannot occur is as an operator in an expression headed by another element.

²⁷ The [ɛ] I analyse as headed by A is described as phonetically more open and more back than its short counterpart (cf. Santerre (1974) and Côté (2010)) who use the symbol [ɜ] for this vowel.

a barrier to head-alignment. I therefore claim that because they form a governing domain, long vowels must be headed and consequently cannot head-align with a following empty nucleus and be headless.²⁸ I propose that the trochaic foot is built as we saw in (20), but in these cases, the metrical head is heavy and not light. This is illustrated below.



(22a) is well-formed as it contains a long headed vowel in head position of the trochaic foot. Head-alignment is not possible because the metrical head nucleus is branching. The structure in (22b) is theoretically ill-formed because headless expressions cannot be linked to branching nuclei. In (22c) there is a short vowel in the position of metrical head which is head-aligned with the empty dependent. And finally (22d), while theoretically possible, is ill-formed in MF because in this dialect all short vowels must head-align with the final empty nucleus within the trochaic foot.

This therefore means that preceding a final non-lengthening consonant, words can lexically contain a short or a long vowel. When the lexical vowel is short it head-aligns with the final empty nucleus and is realised lax. When the vowel is lexically long it remains headed (tense or [ɛ:]) because of the conditions imposed on constituent governors

As for the second question: why aren't the high vowels and the vowel /e/ also long and tense in front of a final non-lengthening consonant, we must here differentiate native words from English loanwords since long {i:, y:, u:, e:} preceding a final non-lengthening consonant do not occur in native words, but (except for [y:]) are found in English loanwords. If we ignore loanwords, the absence of long {i:, y:, u:, e:} before a final non-lengthening consonant is an indication that those vowels are not lexically long in MF. That is, based on native words only, the vocalic inventory

²⁸ As to why the long vowels do not shorten to head-align with the empty nucleus, I do not know. Perhaps vowel shortening is not a possible phonological process.

consists of short /i, y, u, e/ only. Those four short vowels do not have a long counterpart.²⁹

Regarding the fact that {i, y, u, e} are not long while {o:, ø:, a:, ε:, ê:, œ:, ð:, ã:} are always long, most phonologists working on MF have claimed that given their distribution and their phonetic length, the vowels of the latter group are “longues par nature”, i.e. intrinsically long. In ET terms, what distinguishes {o:, ø:, a:, ε:, ê:, œ:, ð:, ã:} from the high vowels is that they are headed phonological expressions which contain the element |A|. ³⁰ In MF, we observe that those expressions have the special property to be long.³¹ The headed mid and low vowels and the nasal vowels can be long because they contain an element A and /i, y, u, e/ cannot be long because they do not. That said, it is not absolutely accurate to claim that the headed expressions which contain the element |A| are lexically long in MF since the vowel *e* is such an expression (i.e. (|A-|)), but is never long. To exclude *e* from the group of vowels “longues par nature”, we could suggest that it is the A-headed expressions that are intrinsically long in MF. While this would capture the correct group of vowels it would imply that some A-headed vowels are phonetically lax (i.e. [ɛ]) while others are phonetically tense (i.e. [ø], [o]). So, either the long vowels are the headed expressions which contain the element |A| (and we have a problem with the absence of long *e*), or the long vowels are the A-headed expressions (and we have a problem with the phonetic difference between [o:], [ø:] and [ɛ:]). While I believe that the former possibility is the correct one, I leave this question open until I have a better understanding of the vowel *e*, which in many respects behaves more like a high vowel than a mid vowel.³²

If, however, we were to take loanwords into consideration, then all the headed vowels of the system would have the property of being long before a final non-lengthening consonant/TR cluster.³³

(23)	<i>tweed</i> [twi:d]	<i>beam</i> [bi:m]	<i>green</i> [gri:n]
	<i>feel</i> [fi:l]	<i>deal</i> [di:l]	<i>spleen</i> [spli:n]
	<i>mean</i> [mi:n]	<i>cheap</i> [či:p]	<i>(sex) appeal</i> [api:l]
	<i>cool</i> [ku:l]	<i>suit</i> [su:t]	<i>mood</i> [mu:d]
	<i>pool</i> [pu:l]	<i>(baby) boom</i> [bu:m]	<i>(sum.)school</i> [sku:l]
	<i>steak</i> [ste:k]	<i>break</i> [bre:k]	<i>game</i> [ge:m]
	<i>remake</i> [rime:k]	<i>date</i> [de:t]	<i>tape</i> [te:p]

²⁹ I remind the reader that as we will see shortly, high vowels can be long in front of a final lengthening consonant in MF.

³⁰ That said, nothing in Element Theory explains why A-expressions have the property to be long and it is one of the reasons why Pöchtrager (2010) and Pöchtrager & Kaye (2013) have proposed a new theory of elements known as GP2.0 where some elements, namely Glottal [ʔ], High tone [H], and |A|, are eliminated from the pool of elements and replaced by structure. The role of headedness is not yet clear in GP2.0 and I refer the reader to those references for an in depth discussion and here it suffices to say that if ‘A’ (and perhaps headedness) is indeed structure, then the intrinsic length of the vowels {o, ø, a, ε, ê, œ, ð, ã} finds an explanation. In Pöchtrager & Kaye’s terms those vowels are structurally heavy.

³¹ This property of requiring to contain the element |A| in order to be long is not exceptional to MF as it has been claimed to also be the case in Yawelmani and in Hebrew (Kenstowicz & Kisseberth (1979), Ploch (1995)).

³² The vowel [e] patterns with the high vowels in i) occurring in word-final position, ii) being realised short and lax in front of a final non-lengthening consonant and iii) being realised tense in open syllable and lax in closed syllable. However, unlike [i] and [y] it does not trigger affrication of a preceding coronal stop and unlike the three high vowels it does not occur before a lengthening consonant.

³³ Since English does not have a vowel ‘y’, there is no long ‘y’ in the system of MF.

Those loanwords are now part of the lexicon of many MF speakers and they can be an indication that the vocalic system is changing. It is beyond the scope of this paper to discuss the phonology of loanwords and I will assume that the absence of long high vowels and of long ‘e’ in front of a final non-lengthening consonant in native French words is not due to lexical gaps, but to the fact that the vocalic inventory of MF does not contain those long vowels.

To sum up, what we have seen in this section devoted to the context $_C\#$, I have proposed that short vowels head-align with a following empty dependent within a final trochaic foot and that lexically long vowels do not undergo laxing in that context due to the fact that they form a governing domain and must therefore be headed. We have also seen that MF has two vowels ‘ε’. One is headed by the element A and the other one is headless. Both vowels are lexical and they are both found in front of a final consonant. We have also seen that while both short and long mid and low vowels can freely precede a final non-lengthening consonant, long high vowels and long e are only found in that context in words borrowed from English. This leads me to propose that long high vowels and long ‘e’ are not part of the lexical vocalic inventory of MF, even though the vocalic system may well be changing. What is of importance here, is that in native French words lexical long vowels contain the element |A|.

Now that we have captured the quality of all the vowels occurring before a word-final non-lengthening consonant we turn to the word-final position.

4.2.2 Final vowels

In word-final position we find the tense vowels {i, y, u, e, ø, o, a}, the vowel {ε} and the nasal vowels. Those are the headed expressions of the system. The lax vowels {ɪ, ʏ, ʊ, œ, ɔ, a} are not found in final position. Theoretically speaking, it means that we find the headed expressions word-finally and not the headless ones.

To explain the tense quality of the final vowels, as well as the nasal vowels and [ε], a first hypothesis is that given the absence of a following empty nucleus, a trochaic foot cannot be built. The final lexically filled nucleus projects as metrical head and bears stress. The fact that the final vowels are never lax (except for [ε] (|I-A|)), tells us that a final non-branching foot in MF must dominate a headed expression. The stress structure of the two words *coût* [ku] ‘cost (n)’ and *coûter* [kute] ‘to cost’ would be as given below.³⁴

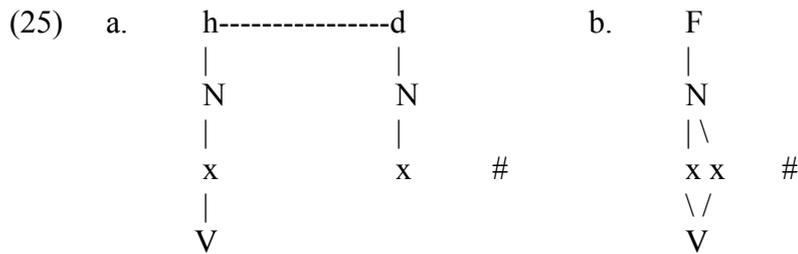
(24)

a.	F	b. *	F	c.	F
O	N	O	N	O	N
x	x	x	x	x	x
k	(<u>U</u>)	k	(<u>U</u>)	k	(<u>A-I</u>)
[ku]		*[kʊ]		[kute]	

³⁴ We should note here that the tense quality of a final vowel has no influence on the quality of the vowel preceding it, as words like [vɔte] ‘to vote’ are as possible as words like [kule] ‘to leak’.

There is, however, another possibility to account for the stressed and the headed property of the final vowels that I would like to consider.

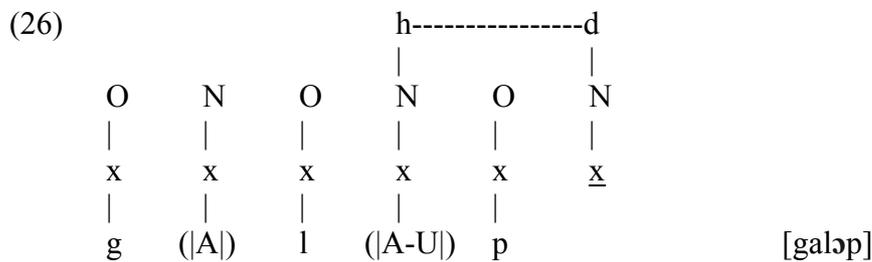
Suppose that a foot is indeed present in final of all words, but that this foot must be heavy. The weight requirement would either be met by a trochaic foot with an empty dependent (if the metrical head dominates a non-branching nucleus) or by a non-branching foot if the metrical head dominates a branching nucleus. In other words, the foot must dominate two nuclear points.³⁵



Trochaic with a light head and an empty dependent

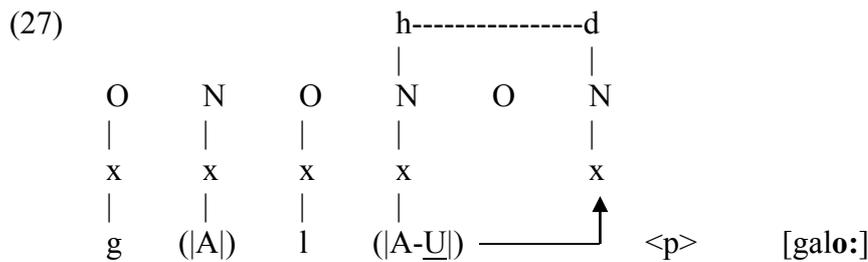
Non-branching with heavy head

Words with a tense-lax alternation (e.g. *galope* [galɔp], *galop* [galo]) have a short lax vowel in front of the final consonant which is realised tense in final. As we saw earlier, the short vowel is lax due to head-alignment with a final empty nucleus.

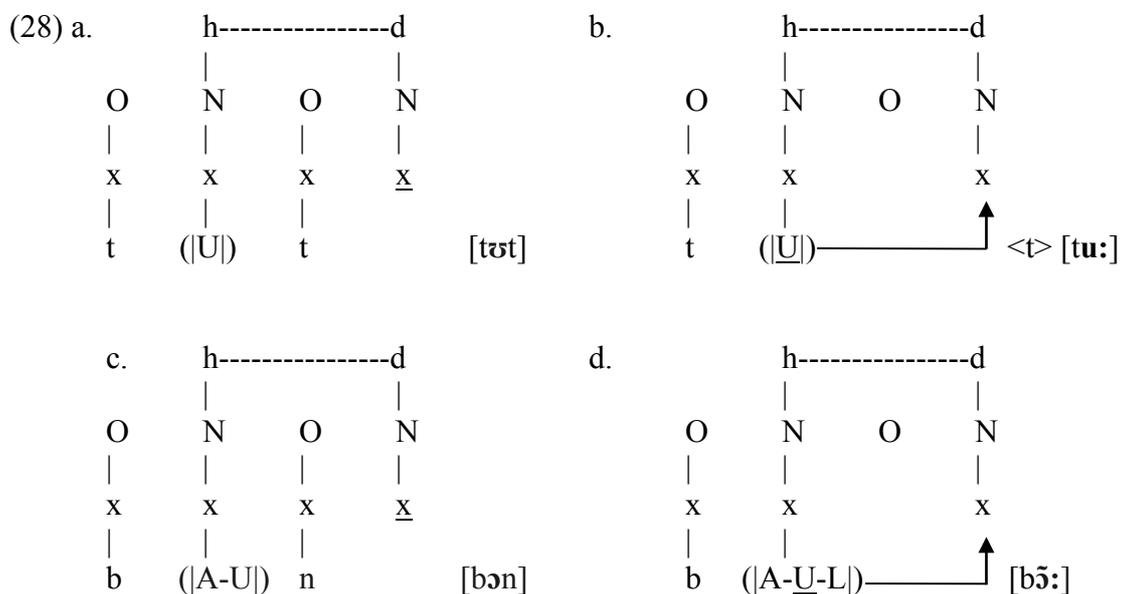


In final position, this short vowel is realised tense (i.e. [galo]). What I suggest is that [galo] has the same structure as [galɔp] except for the final consonant which is now floating instead of anchored in the final onset. As we can see in the structure below, the final short vowel in metrical head position is adjacent to a following empty nucleus which can act as its dependent. The two nuclear points are however adjacent which constitutes an OCP violation. This OCP violation is resolved by the spreading of the vowel to the empty nucleus following it. Being attached to two skeletal points, the phonological expression is part of a governing domain and must therefore be headed (a requirement for any phonologically long vowel). This is illustrated below.

³⁵ If it is the case that the foot does not branch when it dominates a branching nucleus, it means that unlike what I have proposed earlier, there is no trochaic foot in words ending in V:C#. In that context, the long vowel is headed not because it cannot head-align with a following empty nucleus, but simply because the foot is not branching.



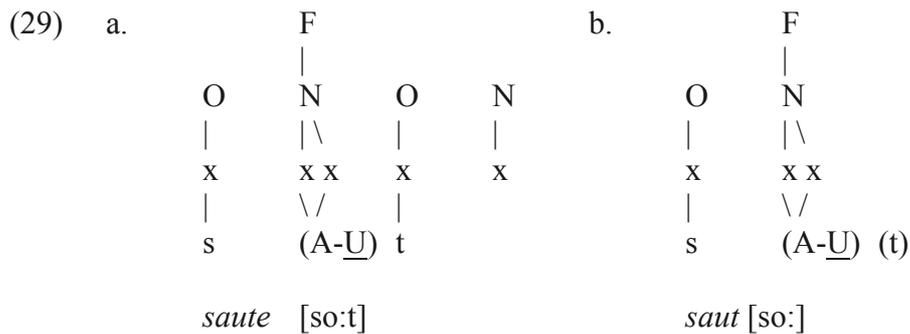
The hypothesis of a trochaic foot with an empty dependent in final of words having a tense-lax alternation (i.e. in final of words that have a short vowel) provides an explanation not only for the tense-lax alternation, but also for the minimal word requirement. If *CV* words like those in (24b, d) lexically contain two nuclei, the condition on the minimal words (Dresher & van der Hulst 1998) according to which lexical heads (roots, stems) must prosodically branch, is satisfied.³⁶



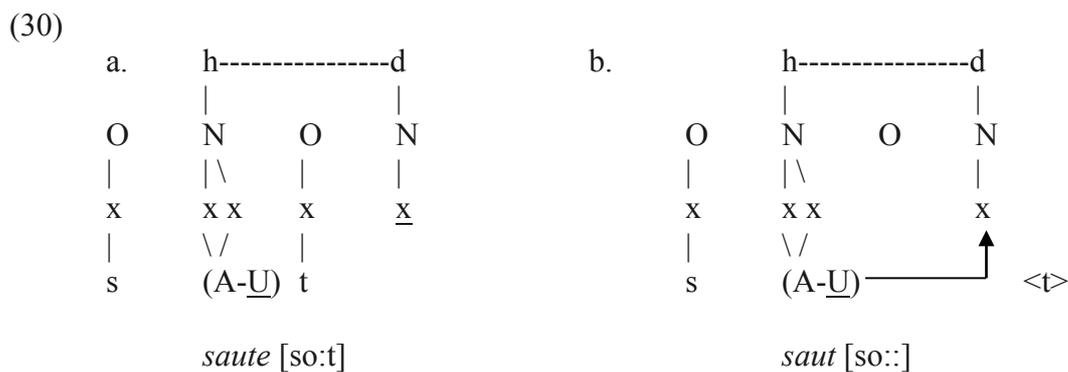
Crucially, my proposal of a final trochaic foot in words ending in a vowel implies that the final vowels are long in MF. In the examples above, the vowel is short and lax preceding the final consonant and because it lengthens to capture the final empty nucleus, it is a long headed expression word-finally. This means that the tense/lax alternation does not only involve a change of headedness, it also involves a difference in length.

Turning to words with a long vowel preceding a final non-lengthening consonant, (e.g. *saute* [so:t] ‘jump’, *saut* [so:] ‘a jump’), their vowel is lexically long. When the long vowel occurs in final, the word ends in a non-branching foot whose weight is satisfied because it dominates a branching nucleus.

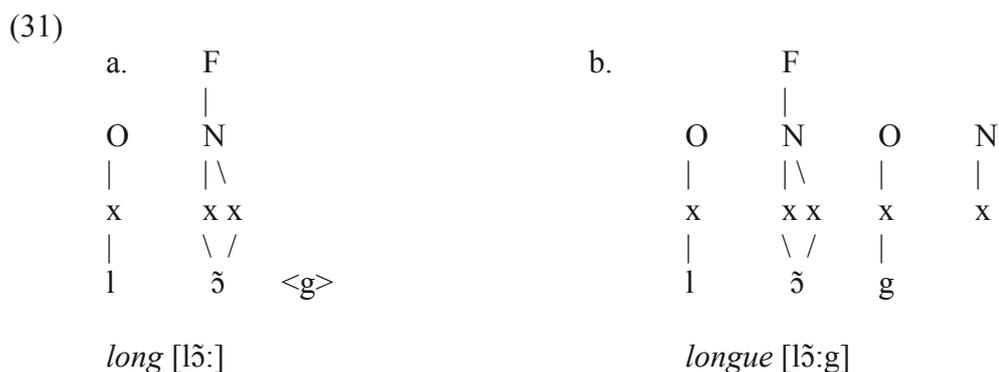
³⁶ See Dresher and van der Hulst (1998) who proposed the notion of Head-Dependent Asymmetry according to which head morphemes are enhanced by requiring more complex prosodic structure. On this note, I have proposed that the French schwa is nothing else than the phonetic interpretation of an empty nucleus failing to be p-licensed (i.e. schwa has no phonological composition) (Charette 1990). Interestingly, no lexical heads of the type [Cə] exist in French. If *CV* words contain two nuclei and if [ə] is ‘nothing’, then [Cə] words cannot exist because schwa cannot be long.

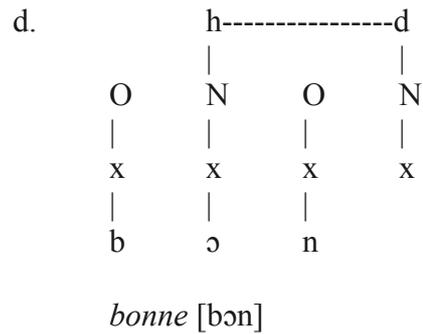
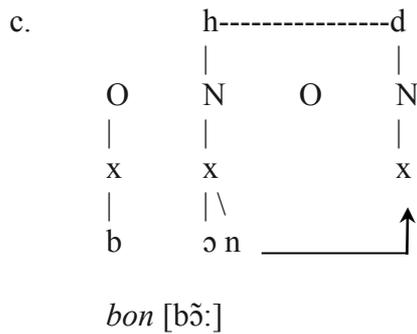


Note that the structure in (29a) is different from what I have proposed earlier in my account of the non-laxing of long vowels in front of a final consonant. Having now looked at the final vowels, it seems to me that their property reveals that the requirement for the foot to always branch seems to be less likely than a simple requirement to dominate two nuclear points. And I must add that if the foot was always trochaic, words with a final lexically long vowel would have a sequence of three adjacent nuclear points in final, predicting that to avoid an OCP violation the vowel would spread to the empty nucleus resulting in an extra-long final vowel. This unlikely scenario is illustrated below.



Interestingly, the difference we observed in forms like *sote* [sɔt] - *sot* [so:] vs *saute* [so:t] - *saut* [so:] is also found with nasal vowels. That is, some words with a final nasal vowel also have a nasal vowel in front of a final consonant (e.g. *long* [lɔ̃:] ‘long (m)’ – *longue* [lɔ̃:g] ‘long (f)’), while other words show an alternation between a final nasal vowel and a vowel-nasal consonant (*bon* [bɔ̃:] ‘good (m)’, *bonne* [bɔn] ‘good (f)’). Under my analysis, the nasal vowel in words of the type of *long* is a lexical long nasal vowel while the nasal vowel in words of the type of *bon* is a lengthened nasalised vowel.





Suggesting that all final vowels are long in MF is unlikely to be controversial regarding the vowels {o, ø, a, ε, ê, œ, ô, ã} which as I said earlier are claimed by most phonologists working on MF to be “longues par nature”. What might be more controversial is to suggest that the final high vowels are also long. What I would say here is that in MF the tense high vowels are clearly longer word-finally than word-internally where they are often unpronounced/devoiced (e.g. *citation* [stasjɔ̃] ‘citation’), or realised lax when followed by another lax high vowel (e.g. *pilule* [pilyl] ‘pill’).

To conclude this section on final vowels, I have proposed that the reason why final vowels must be headed is because they are long and the reason why they are long is because words end in a foot which must be metrically heavy. Short vowels spread to their empty dependent and must be headed because they form a governing domain and lexically long vowel are by nature headed.

Having carefully discussed the distribution of the vowels in word-final position and preceding a final non-lengthening consonant, I turn to the effect {r, z, v(r), ž} have on a preceding vowel.

4.2.3 Final lengthening consonants

The consonants {r, z, v, ž} in word-final position have the property to lengthen the vowel preceding them. They are known as the lengthening consonants. However, as Côté (2010) rightly pointed out, *r* should not belong to that group since as I will show, it has a somehow different effect on a preceding vowel.

Starting with {z, v(r), ž} in final of words, they are preceded by long headed vowels only. Note that instead of a long [e:] we have a long [ɛ:] in that context.

(32)

a.	<i>église</i>	[egli:z]	‘church’	(*[egliz], *[eglɪz], *[eglɪ:z])
	<i>livre</i>	[li:v(r)]	‘book’	
	<i>fige</i>	[fi:ž]	‘freeze’	
b.	<i>muse</i>	[my:z]	‘muse’	
	<i>cuve</i>	[ky:v]	‘tank’	
	<i>juge</i>	[žy:ž]	‘judge’	
c.	<i>couse</i>	[ku:z]	‘sew’	
	<i>louve</i>	[lu:v]	‘she-wolf’	
	<i>bouge</i>	[bu:ž]	‘move’	

d.	<i>seize</i>	[sɛ:z]	‘sixteen’
	<i>rêve</i>	[rɛ:v]	‘dream’
	<i>neige</i>	[nɛ:ʒ]	‘snow’
e.	<i>heureuse</i>	[øʀø:z]	‘happy (f)’
f.	<i>rose</i>	[ro:z]	‘pink’
	<i>pauvre</i>	[po:v(r)]	‘poor’
	<i>sauge</i>	[so:ʒ]	‘sage’
g.	<i>base</i>	[ba:z]	‘base’
	<i>cadavre</i>	[kada:v(r)]	‘corpse’
	<i>nage</i>	[na:ʒ]	‘swim’
h.	<i>quinze</i>	[kɛ̃:z]	‘fifteen’
	<i>singe</i>	[sɛ̃:ʒ]	‘monkey’
	<i>onze</i>	[ɔ̃:z]	‘fifteen’
	<i>songe</i>	[sɔ̃:ʒ]	‘reflect’
	<i>ange</i>	[ɑ̃:ʒ]	‘angel’

When the vowels are lexically headed and contain the element A (as in 32d-h) there is nothing special to say since those vowels are lexically long and are long in front of any final consonant. However, the situation is different with the high vowels which are usually realised short and lax when followed by a final consonant. A final {z, v, ʒ} lengthens a high vowel occurring before it and the high vowel is consequently realised tense. In other words, like any other long vowels, the expression must be headed since it occurs in a branching nucleus.

I do not have a clear understanding of why the consonants {z, v, ʒ} and no other consonants (except for *r*) have a lengthening effect on a preceding vowel. Having excluded *r* from the set, we are left with voiced fricatives which is a welcome result because they form a natural class, but even so I do not see what in their representation forces the preceding nucleus to branch. It might be tempting to follow Pöchtrager (2006) and claim that since voicing is structural, it is because of the structure of the consonant that the vowels lengthen. This is how Pöchtrager accounts for the length difference in English words like *beat* vs *bead*, or *bit* vs *bid*. But in MF, only the voiced fricatives lengthen the vowels. The voiced stops do not have that effect, which means that there is more to it than only voicing. The only thing I can therefore explain is not how, but simply why the vowels are headed in such a context. The effect of a lengthening consonant is phonological. For a reason unknown to me, words containing {v, z, ʒ} in the final onset must be preceded by a branching nucleus.³⁷

³⁷ Scottish also has a process of vowel lengthening triggered by voiced fricatives and ‘*r*’. See Zdziebko (2015) who analyses the Scottish Length Rule in terms of licensing.

4.2.4 Final *r*

The final context to consider is when *r* occurs in word-final position. In that context, *r* has a lengthening effect on the preceding vowel, but unlike with {z, v, ž}, the vowels preceding *r* are lax. Here are some examples.³⁸

(33)

a.	<i>respire</i>	[rɛspɪ:r]	‘breathe’ (*[rɛspɪr], *[rɛspɪr], *[rɛspɪ:r])
	<i>partir</i>	[partʰɪ:r]	‘to leave’
	<i>souvenir</i>	[suvni:r]	‘memory’
b.	<i>pure</i>	[pɥ:r]	‘pure’
	<i>moulure</i>	[mulɥ:r]	‘moulding’
	<i>aventure</i>	[avãtʰɥ:r]	‘adventure’
c.	<i>four</i>	[fʊ:r]	‘oven’
	<i>détour</i>	[detʊ:r]	‘detour’
	<i>velours</i>	[v(ə)lʊ:r]	‘velvet’
d.	<i>vert</i>	[vɛ:r]	‘green’
	<i>éclair</i>	[ekle:r]	‘lightning’
	<i>misère</i>	[mizɛ:r]	‘misery’
e.	<i>beurre</i>	[bœ:r]	‘butter’
	<i>fleur</i>	[flœ:r]	‘flower’
	<i>soeur</i>	[sœ:r]	‘sister’
f.	<i>port</i>	[pɔ:r]	‘port’
	<i>décor</i>	[dekɔ:r]	‘décor’
	<i>météore</i>	[meteɔ:r]	‘meteor’
g.	<i>cigare</i>	[sigɑ:r]	‘cigar’
	<i>mirroir</i>	[mirwa:r]	‘mirror’
	<i>depart</i>	[depa:r]	‘departure’

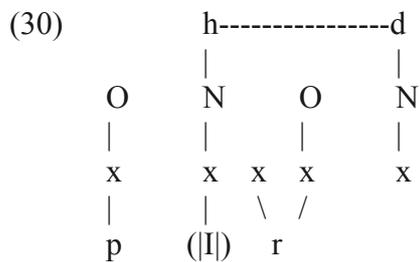
What we never find before a final *r* is a headed vowel. The vowels {i, y, u, e, ø, o, a, ɛ̃, œ̃, õ̃} never precede *r*.³⁹ This leads me to conclude that the vowel [ɛ] in (29d) is not the headed expression (|I-A|), but the headless (|I-A|). The theoretical problem that we face here is that the vowels in (29) are all headless and long, something that is not allowed in Government Phonology and ET. We have seen that the lengthening effect of {z, v, ž} results in a long and headed expression, which is not the case before a final *r*. What this means is that the long lax vowels in (29) cannot be headless expressions occurring in a branching nucleus. We might think that in front of a final *r*

³⁸ Nasal vowels almost never occur before a final ‘r’. This either follows from the fact that nasal vowels are headed expressions and that the vowels preceding a final ‘r’ are headless or, as pointed out by one of the reviewers, it is a consequence of the historical development of these vowels from former Vn sequences, which, for independent phonotactic reasons, do not occur before a final ‘r’. If the latter, that this correlates with the observation that vowels preceding a final ‘r’ are headless would be a coincidence.

³⁹ We can find a long (L-A) as in *genre* [žã:r] ‘gender’, but those appear to be extremely rare.

the vowels are long and headed by the element |A|, but this proposal cannot stand given that we find long lax high vowels in that context. The other possibility is that the length we observe is not the length of the vowels, but of *r* itself. Again this would make sense in GP2.0 where |A| is replaced by structure (Pöchtrager (2010), Živanović & Pöchtrager (2010), Pöchtrager & Kaye (2013)).

In ET the representation of *r* is (|A|).⁴⁰ In GP2.0 however, the element |A| has been eliminated and it has been replaced by structure. So, if GP2.0 is right and |A| is structure, we then find an explanation to the facts that i) headed expressions containing |A| are long and that ii) *r* is long. Of course GP2.0 is more complex than what I have just said, and a presentation of the theory is beyond the scope of this paper, but it suffices to say that if *r* controls the structure, the vocalic expressions occurring in front of a final *r* would be short and headless. The length would be that of the consonant *r* and not of the vowel. Expressed in a Standard GP structure, a word like [pr:r] ‘worst’ would look like in (30).⁴¹



Before I conclude, I briefly look at the vowels occurring in front of final consonant clusters.

4.2.5 Final clusters

Words in French can end in a vowel, in a single consonant, in a branching onset (i.e. TR), or in a rhyme-onset cluster (i.e. RT(R)).

We have seen that the vowels occurring in front of a final branching onset are the same as those found in front of a single final consonant, since the latter is syllabified in an onset and not in a final coda. In fact, in MF all final branching onsets are simplified into T, i.e. the liquid is not pronounced. As for words ending in a rhyme-onset cluster, the vowel preceding the cluster occurs in a branching rhyme and is therefore always short. In GP, constituents are maximally binary branching which means that a long vowel cannot occur in a branching rhyme. As predicted by our analysis, the vowels {o:, ø:, a:, ε:, ê:, œ:, ð:, ã:} are not found in front of final RT clusters because they are lexically long.⁴² As we can see in the examples below, only short and lax vowels precede a final RT cluster.

⁴⁰ Harris (1994) proposes that coronals contain a |R| element and not a |A|.

⁴¹ This effect of *r* (and of all the lengthening consonants) on a preceding vowel only occurs word-finally, i.e. when the consonant precedes a word-final p-licensed empty nucleus. The final nucleus may well have a role to play in the lengthening process, but this is beyond the scope of this paper. See Zdziebko (2015) for such a proposal in Scottish English.

⁴² Except for *monstre* which is the only counterexample I can think of.

References

- Anderson, John & Colin. J. Ewen. 1987. *Principles of Dependency Phonology*, Cambridge: CUP.
- Charette, Monik. 1989. The minimality condition in phonology. *Journal of Linguistics*. 25. 159-187.
- Charette, Monik. 2008. The vital role of the trochaic foot in explaining Turkish word endings. *Lingua*. 118. 46-65.
- Charette, Monik & Aslı Göksel. 1996. Vowel harmony and Switching in Turkic languages. In Kardela, Henrik & Bogdan Szymanek (eds.), *A Festschrift for Edmund Gussmann from his friends and colleagues*, 29-56. KUL, Lublin.
- Charette, Monik & Aslı Göksel. 1998. Licensing constraints and vowel harmony in Turkic languages. In Cyran, Eugeniusz (ed.), *Structure and interpretation in phonology: studies in phonology*. PASE Studies and Monographs 4, 65-88. Lublin.
- Chomsky, Noam. 1986. *Barriers*. Linguistic Inquiry Monograph 13. Cambridge, Mass: MIT Press.
- Cobb, Margaret. 1995. Vowel harmony in Zulu & Basque: the interaction of licensing constraints, h-licensing & constituent structure'. *SOAS Working Papers in Linguistics & Phonetics*. 5. 23-39.
- Côté, Marie-Hélène. 2005. *Phonologie française*. [ms]. University of Ottawa.
- Côté, Marie-Hélène. 2010. La longueur vocalique devant consonne allongée en contexte final et dérivé en français laurentien. In LeBlanc, C., F. Martineau & Y.
- Frenette (eds.), *Vues sur les français d'ici*. 49-75. Québec: Presse de l'Université Laval.
- Harris, John. 1994. *English Sound Structure*. Oxford: Blackwell.
- Harris, John & Geoff Lindsey. 1995. The elements of phonological representation. In: Jacques Durand, & Francis Katamba (eds.), *Frontiers of Phonology*. 34-79. Harlow: Longman.
- Harris, J. & E. Gussmann, (1998) 'Final codas: why the west was wrong', in: *Structure and interpretation in phonology: studies in phonology*, Cyran, E. (ed.), PASE Studies and Monographs 4, Lublin, 139-162.
- Hayes, Bruce. 1986. Inalterability in CV phonology. *Language*. 62. 321-351.
- Kaye, Jonathan. 1990. 'Coda' Licensing'. *Phonology*. 7. 301-330.

- Kaye, Jonathan, Lowenstamm, Jean & Jean-Roger Vergnaud. 1985. The internal structure of phonological representations: a theory of charm and government. *Phonology Yearbook*. 2. 305-328.
- Kaye, Jonathan, Lowenstamm, Jean & Jean-Roger Vergnaud. 1990. Constituent Structure and Government in Phonology. *Phonology*. 7. 193-231.
- Kenstowicz, Michael & Charles Kisseberth. 1979. *Generative Phonology: description and theory*. San Diego/New York: Academic Press.
- Nasukawa, Kuniya. 2000. *A unified approach to nasality and voicing*. PhD dissertation, UCL.
- Ploch, Stefan. 1995. French Nasal Vowels – a first approach. *SOAS Working Papers in Linguistics & Phonetics*. 5. 91-106.
- Ploch, Stefan. 1999. *Nasals on my mind: the phonetic and the cognitive approach to the phonology of nasality*. PhD dissertation, SOAS.
- Pöchtrager, Markus. 2006. *The Structure of Length*. PhD dissertation, University of Vienna.
- Pöchtrager, Markus. 2010. The structure of A. Paper presented at the 33rd GLOW colloquium, Wrocław.
- Pöchtrager Markus & Jonathan Kaye. 2013. GP 2.0. *SOAS Working Papers in Linguistics*. 16. 51-64.
- Rowicka, Grazyna. 1999. *On ghost vowels: a strict approach*. PhD dissertation. Den Haag: Holland Academic Graphics.
- Santerre, Laurent. 1974. Deux E et deux A phonologiques en français Québécois. *Cahier de linguistique*. 4. 117-145.
- Schane, Sanford. 1984. The fundamentals of particle phonology. *Phonology*. 1. 129-155.
- Scheer, Tobias. 2000. *De la localité, de la morphologie et de la phonologie en phonologie*. HDR dissertation [ms], University of Nice Sophia-Antipolis.
- Scheer, Tobias & Peter Szigetvári. 2005. Unified Representations for Stress and the Syllable. *Phonology*. 22. 37-75.
- Selkirk, Elizabeth. 1978. Comments on Morin's paper: The French foot: on the status of "mute" e. *Studies in French Linguistics*. 1. 141-150.
- Ulfsbjorninn, Shanti. 2014. *A Field Theory of Stress: The role of empty nuclei in stress systems*, PhD dissertation, SOAS, University of London.

Walker, Caitlin. 1995. ATR-harmony as h-licensing. *SOAS Working Papers in Linguistics & Phonetics*. 5. 107-120.

Walker, Douglas. 1984. *The Pronunciation of Canadian French*. Ottawa: University Press.

Zdziebko, Sławomir. 2015. Licensing of vowel quantity and the Scottish Vowel Length Rule. *Roczniki Humanistyczne* 11. 151-176.

Živanovič, Sašo, Kaye, Jonathan, Jensen, Sean & M. A. Pöchtrager. 2010. GP 2.0 and Putonghua, too. *Acta Linguistica Hungarica*. 57. 357-380 .