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Moroccan Arabic's Adaptation of French Nasal Vowels: An OT-Theoretic Analysis

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Abstract--This study investigates the phonological adaptation of French nasal vowels into Moroccan Arabic (MA), focusing on the processes that govern this transformation. In MA, French nasal vowels typically undergo "VNASALUnpacking," a process where the nasal vowel is split into an oral vowel followed by a nasal consonant to avoid onsetless syllables. MA speakers perceive French nasal vowels as VN sequences, a phenomenon supported by cross-linguistic evidence of the biphonemic nature of nasal vowels. Using an Optimality Theory (OT) framework, this adaptation is driven by the UNPACKNASALV constraint, which enforces the decomposition of nasal vowels into two segments. This process is further influenced by the CODA-COND NASAL-Stop constraint, resulting in nasal place assimilation and specific output forms in MA. The markedness constraint UNPACKNASALV dominates the anti-unpacking faithfulness constraint INTEGRITY, leading to adaptations that favor structural conditions in MA, such as avoiding *VNASAL and ensuring syllables have onsets (ONSET), at the expense of lexical contrast. French, on the other hand, unpacks nasal vowels primarily in liaison contexts to avoid vowel hiatus, due to the high-ranking NOHIATUS constraint. This preference for unpacking over deletion indicates that the MAX-IO constraint is ranked higher than UNPACKNASALV in French. Yoruba, however, resolves vowel hiatus through deletion rather than unpacking, showcasing different phonological strategies across languages. In MA, the nasal vowels of borrowed French words are realized as VN sequences, neutralizing the orality-nasality contrast in the input. This process indicates the lower ranking of the faithfulness constraint MAX-IO (V) in MA, especially when unpacking would lead to onsetless syllables. The findings highlight the interplay between markedness and faithfulness constraints in the phonological adaptation of borrowed words, emphasizing the structural priorities of MA.

Keywords*:* Phonological adaptation, Optimality Theory, Vowel unpacking, Cross-linguistic phonology

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1. Introduction

There are several inquiries about the phonological processes involved in the adaptation of borrowed words into the target language. The adaptation of French Nasal vowels into Moroccan Arabic (Henceforth, MA) as a borrowing language involves "VNASALUnpacking" in most cases and nasal vowel deletion when the preservation of a vowel would only produce an onsetless syllable. In fact, MA native speakers perceive French nasal vowels as VN sequences, and that involves the application of a process called unpacking in rule-based phonology. We shall see cross-linguistic evidence of the biphonemicity of nasal vowels [1] (ỌLANIKẸ, 2014). Within an Optimality Theory (OT) framework, this phonological process is triggered by UNPACKNASALV, a constraint that enforces the decomposition of nasal vowel into two segments (see section 2), an oral vowel followed by a nasal consonant which is homorganically adjusted to the next syllable's onset word-medially. This nasal place assimilation, a cross-linguistically attested process, is enforced by the constraint CODA-COND NASAL-Stop and triggered by UnpackNASALV. This latter markedness constraint is applied at the expense of anti-unpacking faithfulness constraint which is INTEGRITY. An OT analysis is, thus, meant to demonstrate how output forms in the adaptations of French loanwords (Nasal vowels in this paper) emerge due to the conflict and domination relations between the faithfulness constraints, which push for lexical contrast preservation, and the markedness constraints which enforce structural conditions to be met in output, at the expense of lexical contrast.

Indeed, MA's adaptation of French Nasal vowels is carried out at the *cost of lexical contrast* and in favour of markedness structures required by MA, namely *V_{NASAL} and ONSET. The ***Unpacking*** of *lexically sponsored* nasal vowels in the French data on Hiatus contexts **(see data (1))** is evidence that *V_{NASAL} is *not* **undominated**. French unpacks nasal vowels only in Liaison contexts where Vowel Hiatus is avoided. This is due to the ***supremacy*** of NOHIATUS as a ***markedness constraint*** on top of the hierarchy in French. In other words, the ***integer*** **UNPACKnasalV** is *activated* (its process is applied) only to avoid the violation of NOHIATUS. Yet, UNPACKnasalV is not ***so costly***, as it involves the violation of ***VoralN**, which is a ***dominated constraint.*** French does not opt for the deletion of a vowel, which suggests that the integer MAX-IO is ranked higher than UNPACKnasalV. Yoruba is a language that never unpacks nasal vowels even in vowel Hiatus contexts as argued by Pulleyblank (1988a). This language resolves vowel Hiatus by means of ***vowel deletion,*** rather than nasal vowel unpacking.

Nevertheless, Nasal vowels are realized as VN sequence in MA, leading to a complete neutralization to their orality-nasality contrast in input. all vowels are oral, even those within French borrowed words. We also note that the Faithfulness constraint MAX-IO (V) must be ranked low in Moroccan Arabic, as there is a context where MA opts for the deletion of a nasal vowel when its unpacking results in an onsetless syllable (FR: /ɛfermj ɛ/ ➔ MA [fərmli] > [*enfərmli]). The deletion of a word-initial nasal vowel is evidence that ONSET dominates MAX-IO and UNPACKNASALV in MA. As for the data analyzed, this paper draws upon secondary data from well renowned studies which investigated different phonological processes in the adaptation of French loan words into Moroccan Arabic and Yoruba's treatment of nasal vowels (See Data (7) Smirkou, 2020, DATA (2), Paradis & Prunet, 2000, respectively).

2. A LITERATURE REVIEW

1.1 Optimality Theory: What is new?

Prince and Smolensky introduced the optimality theory (OT) in 1993 as a model for linguistic analysis. MaCarthy (2002) notes when

[1] Ọlanikẹ, Theories Of Nasal Vowel Representation And Nasal Vowel Asymmetries In Yoruba Borrowings, 2014 , p. 15

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linguistic generalizations are explained via conflicting constraints which are ranked based on their importance, then that is what optimality theory is based on. Accordingly, constraints are **universal** but their ranking is **language specific**. Prince and Smolensky argued they constraints are ***violable*** and can be classified as either **faithfulness constraints or markedness constraints.** The former ensure that **output** representations (surface) resemble **input** representation (underlying) while the latter require the output to meet certain ***well formedness conditions*** (ibid). The basics of optimality are not restricted to constraints, but rather as **McCarthy (2007)** claimed involves evaluator (EVAL) and generator (GEN). He contends that GEN is capable of generating ***an infinite number*** of outputs and the *EVAL function* is to ***select*** the **most harmonious** (optimal= least costly) candidate that violates the ***least*** ranked constraints. Constraints are violated only minimally, so that markedness is never increased to excess (**Economy Principle**). In fact, it is the ***functional unity*** (*conspiracy*) amongst *different* processes which were discretely approached in rule-based analysis is what OT has excelled in foregrounding. Thanks to OT, one can account for the way different phonological and morphological processes conspire to give rise to the most *harmonious output form.*

1.2 On the make-up of nasal vowels: The one-root node vs. two-root node analysis

While Pulleyblank (1988a) proposed that a Nasal vowel is a single segment with **feature [+Nasal],** which is a **Feature Theory** perspective, Paradis and Prunet considered that Nasal vowels are inherently **bi-segmental**. The latter camp did present strong evidence for the universal representation of *contrastive* nasal vowels as **biphonemic** (Paradis & Prunet (2000)). In other words, a nasal vowel is *phonemically perceived* as consisting of ***two root nodes,*** one mapping to an oral vowel and the other mapping to a nasal consonant. Evidence for the biphonemic representation of nasal vowels comes from *nasal vowel borrowing* into languages with no contrastive nasal vowels. These languages include English, Arabic and by extension Moroccan Arabic (MA). Indeed, we will see that both English and MA involve the same phonological processes with regard to the adaptation of nasal vowels into their inventory. As already shown by Paradis & Prunet (2000), nasal vowels in languages like French ***have two root nodes,*** and they ***unpack.*** **Unpacking** is a phonological process that involves the decomposition of a **nasal vowel** into V_{ORAL} and a Nasal Consonant sequence. In data (2), we could not posit the violation of ***DEP-IO,*** as ***Epenthetic*** segments tend to be ***less marked*** cross-linguistically. In fact, ***only*** **nasal** consonants "***pop up***" after the vowel. We thus posited that this process is ***V-nasal unpacking*** rather than the insertion of a nasal. As noted by Paradis and Prunet, the unpacking of nasal vowels to VN occurs before morphemes beginning in vowels so that an **onsetless syllable** is avoided as required by the **ONSET PRINCIPLE** of Ito (1989). In OT framework, the markedness constraint **Unpack $_{Nasal}$ V**, which enforces the ***decomposition*** of a nasal vowel into a vowel and nasal-C sequence VN, is violated when nasal vowels are not realized as VN sequences. This violates the **anti-unpacking** constraint **INTEGRITY**.

1.3 Basic Constraints

In the analysis of the phonological adaptation of French nasal vowels into Moroccan Arabic (MA), several basic constraints are considered. "Unpack Nasal V" mandates that a nasal vowel is decomposed into an oral vowel followed by a nasal consonant (VN) (Orie, 2018, p. 187). "IDENT-I→O(nasal)" ensures that any input segment specified as nasal remains nasal in the output, preventing denasalization (Kager, 1999). "MAX-IO" (anti-deletion) requires that all underlying segments are preserved in the output, highlighting the importance of undominated MAX (McCarthy and Prince, 1995). The "ONSET" constraint mandates that syllables must have onsets, avoiding onsetless syllables. "INTEGRITY" (No Breaking) prohibits a single

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input segment from being represented by multiple output segments, thereby banning unpacking (McCarthy and Prince, 2004, p. 93). "*VNASAL" disallows nasal vowels from surfacing. "*VORALN" restricts oral vowels from appearing before a tautosyllabic nasal. The "CODA-Condition (NASAL-PLACE)" requires that a nasal coda and the onset of the following syllable must be homorganic. Lastly, "DEP-IO" ensures that output segments must have correspondents in the input, maintaining the integrity of the input segments in the output. As we will use these constraints in the analysis of the data, we see it a convenience to sum up all the basic constraints reviewed here as follows:

- **Unpack Nasal V**: "a nasal vowel is decomposed into an oral vowel and a nasal-C (VN)" (Orie, 2018, p.187).
- **IDENT-I→O**(nasal): Any correspondent of an input segment specified as F must be F. ('No denasalization'(Kager, 1999))
- **MAX-IO** (anti-deletion): All underlying segments are preserved in the output, a requirement ensured by undominated MAX (McCarthy and Prince, 1995).
- **ONSET*[**σ V 'Syllables must have onsets.
- **INTEGRITY** (No Breaking): No element in the input has multiple correspondents in the output (McCarthy and Prince 2004, p. 93). This constraint bans unpacking of a single segment into a sequence of segments.
- ***VNASAL:** No nasal vowel is allowed to surface.
- ***VORALN:** Before a tautosyllabic nasal, vowels must not be oral.
- **CODA-Condition** (NASAL-PLACE) a nasal coda and onset of the following syllable must be homorganic.
- **DEP-IO:** Output segments must have correspondents in the input.

2. AN OT ANALYSIS

2.1 The Unpacking of French Vowels: Yoruba VS. French, MA and English

An interesting inquiry on **language-internal unpacking** contexts carried out by ỌLANIKẸ (2014) gives supporting evidence where nasal vowels in languages such as **Yoruba** have ***one root node*** and ***never unpack***. This position receives crucial support from **language-internal** evidence involving nasal vowel behaviour in ***vowel hiatus*** settings. Standard Yoruba, unlike French, never unpacks nasal vowels in *hiatus contexts* (*VV- No clash). Instead, it resolves hiatus violations via **vowel deletion**, as a repair strategy. Let ponder the following data:

When a nasal vowel is introduced into a

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language prohibiting nasal vowels, the language is faced with two obvious choices (Paradis & Prunet, 2000). While languages such as French, English, Japanese, Fula, and Arabic choose to violate INTEGRITY and satisfy $UNPACK_{NASAL}V$ at the expense of $V_{oral}Nasal$, Yoruba ranks INTEGRITY at the top of its language-specific hierarchy. In this language, unpacking is not triggered even when its *Structural Conditions are met* (*VV hiatus). The data[1] from Yoruba shows that unpacking produces suboptimal output forms (DATA1).

Data (1)

pi̩ owó	pó wó	*pi nowó	'divide money'
pi̩ èbà	pɛ̀ bà	*pi nèbà	'divide eba'
sù ɪʃu	sù ʃu	*su niʃu	'bake, roast

Since this language prefers not to unpack the vowel, there must a constraint that militates against its application. **$Unpack_{NASAL}V$** is violated, not to satisfy ONSET; as unpacking would grant the otherwise onsetless syllable a nasal consonant that would be syllabified as its ***onset* (*pi néba).** ONSET, however, must be higher ranked, as the data does not attest to any onsetless syllables in optimal output forms. Rather, this language prefers **deletion** of the vowel rather unpacking the nasal vowel. This is evidence that $Unpack_{NASAL}V$ and MAX-IO are violated in order to satisfy ONSET and MAX-IO (V_{Nasal}) so that INTEGRITY is not violated. In other words, this language opts for deleting the oral vowel rather than the $*V_{nasal}$ *and this creates a syllable with an onset (pẽbá).* Also, Yoruba allows for the violation of ***vNASAL**. Thus, the constraints conflicting in this hierarchy are ranked as follows:

ONSET, INTEGRITY >> UnpackVNASAL, MAX-IO, *vNASAL

Põ wó > *pi nowó

French, however, does unpack nasal vowels in **liaison contexts** as illustrated by the following examples (**DATA 2)**

a) **ton:** t*on invité* is pronounced like /tɔ̃.**n**ɛ vite/ (your guest)

b) **son:** *son arbre* is pronounced like /sɔ̃.**na**ʀbʀ/ (his tree)

c) **aucun:** *aucun appel* is pronounced like /okœ̃.**n**a.pɛl/ (no call)

This liaison-driven **N-surfacing** is evidence that nasal vowels are ***perceived*** as VN sequences in French-internal contexts; there is a violation of $*V_{Nasal}$ to satisfy the undominated markedness constraint **NOHIATUS *by means*** of the enforcing of $UNPACK_{NASAL}V$ application. Note that French does not opt for *vowel deletion*, which suggests that the ***integer* MAX-IO** is ranked **higher** than **UNPACKnasalV**. Let us observe the chart 1 below:

/savɔ̃e/	NoHIATUS	MAX	*Voral N	UNPACK nasal V
a) savɔ̃	*!			*
b) save		*!		
c) savone			*	
d) savɔ̃		*!		*

Chart 1. **integer MAX-IO** is ranked **higher** than **UNPACKnasalV**

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Candidate a) fatally violates **undominated** NOHIATUS as it contains a VV clash which is not allowed in French. Candidate b) deletes the vowel to avoid the violation of NOHIATUS, but that is a fatal violation of the higher ranked constraint MAX, as French does not employ deletion as a **repair strategy**. Candidate c) emerges as the optimal one as it incurs a violation of the lower ranking constraint ***V$_{ORAL}$N** by unpacking the nasal vowel into a VN sequence (on) to avoid the violation of NOHIATUS. Candidate trivially violates ***UNPACKNASALV*** for no reason, and it incurs a fatal violation of MAX, by deleting the suffix vowel (**e**). Therefore, French unpacks the nasal vowel into VN only when forced, which is an instance of **positional Neutralization** of nasal vowels in some contexts. Thus, ***Context-sensitive markedness*** constraints must dominate free faithfulness constraints and Free markedness constraints as we have deduced the hierarchy below**:**

NoHIATUS ,MAX >> *VoralN>> UNPACKnasalV

2.2 English and Moroccan Arabic's ranking of UNPACKNASALV and INTEGRITY

English treats nasal vowels the same way as MA. It denasalizes the vowel, hence the violation of **IDENT-IO** (V-**nasal**), and it allows a nasal consonant to surface, which is the ***second step*** of the **unpacking process**, both of which amount to the violation of **INTEGRITY**. The constraint ***V$_{NASAL}$**, which *militates against* any nasalized vowel from surfacing, is a **context-free *markedness constraint*** that "***filters*** *in" only oral vowels* to surface. Let us look at the data (chart 2) and (data 4) below:

(Chart 2)

LOAN WORDS	SOURCE LANGUAGE (***INPUT***) FRENCH	TARGET LANGUAGE (**OUTPUT**) English
chiffon	/ʃɪ. fɔ̃/	[ˈʃɪ. f**ɒn**]
garçon	/Gaʁ. sɔ̃/	[gar. 's**ɒn**]
coupon	/Ku: .pɔ̃/	[Ku: .p**ɒn**]

LOANWORDS	SOURCE LANGUAGE (***INPUT***) FRENCH	TARGET LANGUAGE (**OUTPUT**) MA
CHIFFON	/ʃɪ.ˈfɔ̨/	[ʃɪ. ˈf**u:**n]
savɔ̃	/sa .ˈvɔ̃/	[sa.b**on**]
garçon	/gaʁ.ˈsɔ̃/	[gər.ˈs**on**]

Data 4 : French → Arabic

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a) ʁ**õ**devu: R**on**d̲ivu ‘rendez-vous’

b) fχãs fr**anṣa** ‘France’

c) kaχtᵩ kɑrˤtˤ**on** ‘cardboard’

d) tχɛ ttr**an** ‘train’

e) sɛʁʒɑ ʃɑrˤʒˤ**ɑn** ‘sergeant’

f) ɛf̃ ʁm**je** f(ə)rmli ‘nurse’

g) tɛb̥ ʁ t**am**b(ə)r ‘stamp

First, ***Vnasal** must be **undominated** in MA and English, as there ***are no nasal vowels*** that surface in the data, whereas ***VoralN** is lower ranked. Nasal vowels are *invariably* **unpacked** into VN sequences. Therefore, English and MA opt for **full decomposition** of the nasal vowel into VN sequences with the **complete neutralization** of vowels with regard to their orality/nasality contrast. Chart 3) illustrates this interaction in the data for the **Input /ʃɪ.ˈfɔ̃/.**

Input: /ʃɪ.ˈfɔ̃/	*V NASAL	UNPACK$_{NASAL}$V	**INTEGRITY**
a) ʃɪ.fɒ	*!	*	
☞ b) ʃɪ. fɒn			*
c) ʃɪ. fɒ		*!	

Chart 3. the interaction in the data for the **Input /ʃɪ.ˈfɔ̃/.**

In both MA and English, unpacking is carried out at the expense of INTEGRITY and both languages ban nasal vowels from surfacing. Candidate a) is suboptimal, due to its fatal violation of the undominated constraint *VNASAL. It keeps a nasal vowel in the output. Candidate c) is disqualified for the evaluation UNPACKNASALV, as it fails to complete full decomposition of the Ṽ into VN sequence. The vowel ɔ̃ has been denasalized (e.g. a violation of IDENT-I→O (v nasal)) rather than unpacked. Candidate b) emerges as the optimal one, because it incurs the least costly violation, which is its inconformity with **INTEGRITY**, a lower ranking constraint. Thus, the configuration that gives rise to such a complete neutralization of contrast for vowels for their nasality/orality is sketched as follows (figure 1 below)

$*V_{NASAL}$, $Unpack_{NASAL}V$ >> INTEGRITY, IDENT-I→O(v-nasal).

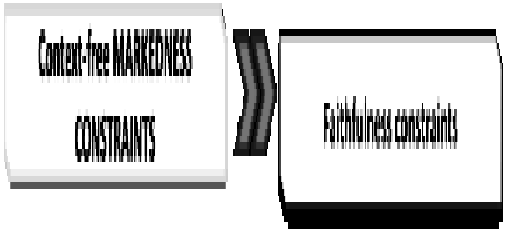

Figure 1. the underlying interaction giving rise to a complete neutralization of contrast for vowels

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It can be easily noted that ***V_{NASAL}** is a markedness constraint that *militates against* any nasal vowel from emerging in output forms. As opposed to MA and English, this constraint is ***violated*** in Yoruba, as the optimal candidate **Põ wó** has kept a lexically sponsored ***nasal vowel.*** Therefore, this constraint is at the bottom of the hierarchy in Yoruba, whereas **INTEGRITY** is higher ranked. Contrariwise, MA has the reverse ranking.

2.3 The supremacy of ONSET over UnpacNasalV,MAX and DEP in MA

To infer the constraints, let us look at the data attesting to the strategy of **vowel deletion** and the **undominated ONSET** in MA:

(Data 5)

a) **A**utomobile → **t**omobil

b) **A**ppartement→ **p**artma

c) **I**nternet → **l**anternit

d) **A**mericain → **m**eri:kani

e) asyʁãs → **l**asirons

f) ɔk̃ ɛt→ **lo*n***ki:t

h) ɜfĩrmjɛ → **f**ərmli

In data (5), the seemingly **epenthetic [l]** stems from the **cliticized definite article *la*** *or* **le** in French (**l**'assurance> **l**asir<u>ons</u>*).* So, we are not concerned with ***e)*** and **f).** However, *the other examples are interesting for this analysis.*

The behaviour of ***word-initial*** imported French nasal vowel [ɜ̃] shows the following constraints' interaction:

- ✓ It may seem that DEP-IO dominates MAX-IO**.** Yet**,** MA uses both DEP and MAX to avoid the violation of ***undominated*** ONSET.
- ✓ MA opts for the strategy of **vowel deletion *be it an oral vowel or a nasal one* to avoid onsetless syllables,** due to **domination of ONSET** in MA.

The behaviour of ***word-initial*** imported French nasal vowel [ɜ] shows interaction (Chart 4) :
the following constraints'

/ɜfĩrmjɛ/	***V_{NASAL}** ONSET	MAX-IO UNPAC $K_{NASAL}V$
a) ɜfĩrmjɛ	*! *	*
b) e*n*fərmli	*!	
☞ **c)** fərmli		* *

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In this data, it is clear that UNPACKNASALV is in conflict with ONSET, given that the satisfaction of the former entails the violation of the latter (*enfərmli). Candidate a) is suboptimal, as it has a word-initial nasal vowel [ɜ̃] which is a fatal violation of the higher ranking constraints *VNASAL (which is fatal enough) and ONSET. The constraint ONSET is violated in b), as it leads to the creation of an ill-formed syllable (onsetless syllable: *en), although b̲) trivially satisfies the lower constraints UNPACKNASALV and MAX-IO. Candidate c) is the optimal one, as it violates the lower constraints, in order to satisfy ONSET and *VNASAL. In the optimal output form, the nasal vowel ɛ̃ is deleted altogether, rather than unpacked, because the preservation of the vowel in initial position will not improve markedness. It would rather create an onsetless syllable, which is a marked structure. This is evidence that ONSET is higher ranked below *VNasal in the hierarchy, as there is no data in MA attesting to a Nasal Vowel that has preserved its nasality after adaptation. The complete Neutralization of lexical contrast with regard to nasal vowels in MA is evidenced by the dominance relation below:

V_{Nasal}** >> ***ONSET>> MAX-IO, $UNPACK_{NASAL}V$>> INTEGRITY

It may seem that DEP-IO dominates MAX-IO**. Yet,** when we explore further data, we find that MA use both DEP and MAX to avoid the violation of ***undominated*** ONSET. Also, MA tolerates ***V $_{ORAL}$N** sequences in all contexts following constraint interaction in which case nasal vowels lose their nasality. Thus, we will add this constraint at the **bottom** of the hierarchy in MA:

V_{NASAL}** >> ***ONSET >> ***MAX, DEP>> $UNPACK_{NASAL}V$>> INTEGRITY>> $*V_{ORAL}N$.***

The fact that *Faithfulness constraints* are "***sandwiched"*** between *markedness constraints* entails that some ***lexically contrastive input forms*** *will* never surface in the output even if this "***erodes***" their lexical contrast altogether; this is where only ***less marked forms are allowed to surface***. Although most languages push for the realization of less marked forms, it is always the ***least costly output*** form which is selected to surface, depending on the **language-particular constraint hierarchy**.

2.4 UNPACKNASALV and Schwa epenthesis in MA

Smirkou (2020) provides evidence that the unpacking of nasalized vowels in MA results in a sequence of three final consonants CCC, where schwa is epenthesized to break this tri-consonantal cluster. Example (b) **(sɑ̃tχ →ṣontər)** provides a case point where epenthesis is governed by sonority principle. Therefore, the nasal consonant engendered by

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UnpackNASALV constraint creates CCC for which DEP-IO is violated in order to decluster it. Yet, epenthetic schwa must be inserted before the most sonorous sound in the context of three final coda consonants (**ibid**). We now see that Unpack$_{NASAL}$V is a *costly* as it involves the violation of other lower ranking constraints and triggers other seemingly disconnected processes such as schwa epenthesis in MA.

2.5 The ranking of UnpackNASALV and its CODA-COND(NASAL-PLACE) effect

Given these adaptation facts in the MA data below (6), one can notice that the satisfaction **UNPACKV$_{NASAL}$** activates another markedness **integer** (CODA-COND $_{nasal\text{-}place}$) which places constraints on the **place of the articulation** of the ***unpacking-resultant nasal***; that it must be homorganic with the *following onset* word-medially. Data (7) below illustrates this interaction:

Data [7] :

French: Data 7	MA	Gloss
ʃɑ̃bʁ	ʃombəṛ	'room'
sɑ̃tχ	ṣoṇtəṛ	'center'
ɔbʁ̃	lombəṛ	'shadow'
sɛptɑ̃bʁ	sibṭomḅəṛ	'September'

French: Data 8		
a) Rɔ. d̃ e.ˈvu:	ron. di.vu:	ˈschedule'
b) Rõ. ˈpwɜ̃	'rom. pwan	'roundabout'

To make the point in case more concrete, we analyze the illustrative *input* / ***sɛptɑ̃bʁ/*** in the chart below:

Input / sɛptɑ̃bʁ /	***VNasal**	**CODA-cond**	**Unpack NASALV**	**INTEGRITY**
a) sibṭɑ̃ ḅəṛ	*!		*	
a) sibṭ **on ḅ**əṛ		* !		*

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c) sibṭomṃ bəṛ				*

Candidate a) is suboptimal as it incurs a **fatal violation** of ***V_{NASAL}** and satisfies the lower constraints ***trivially***. Candidate b) fatally violates **CODA-COND** by failing to assimilate a **homorganic** nasal with the following onset (***nb̤**). A constraint ***can be active*** even if it is crucially dominated, in this case a markedness constraint. As **McCarthy** and **Prince** rightly note **"a low ranking markedness constraint can decide between candidates"** as to which one wins in an evaluation **(McCarthy and Prince, 1994).** Although **c)** unpacks a nasal vowel which is a violation of **INTEGRITY,** it satisfies the higher ranking constraint **CODA-Cond** (homorganic coda-onset= Coda Condition) by assimilating the nasal place to the following syllable's Onset**.** Therefore, Candidate c) emerges as the optimal one. All examples in data (6) satisfy CODA-Cond(nasal place- ***mb̤- n̤t̤ - nd mp).*** However, we do not have enough evidence for the kind of interaction between and the ranking of CODA-Cond and $UNPACK_{NASAL}V$. We thus infer the ranking below:

$*V_{NASAL}$ >> Coda-Condition, $UNPACK_{NASAL}V$ >>INETEGRITY

CONCLUSION

All in all, we have seen cross-linguistic and language-internal evidence of the **biphonemicity** of nasal vowels where speakers perceive French nasal vowels as VN sequences rather than a single segment, and that involves the application of a process called **unpacking** in rule-based phonology. Unpacking involves the decomposition of nasal vowel into **two segment: an oral vowel and a nasal**. French unpacks nasal vowels **only** in Liaison contexts where Vowel Hiatus is avoided. This is due to the supremacy of NOHIATUS as a markedness constraint on top of the hierarchy in French. The **integer** UNPACKnasalV is **activated** (its process is applied) only to avoid the violation of NOHIATUS. This is an instance of **positional Neutralization** of nasal vowels(oral vowels appear only in some contexts). **Context-sensitive markedness** constraints must dominate free faithfulness constraints and Free markedness constraints as we have inferred (**NoHIATUS, MAX >> *VoralN >> UNPACKNASALV**).

However, In MA, Nasal vowels are realized as VN sequence (V-oral) leading to **a complete neutralization** to their orality nasality contrast in input. When *Faithfulness constraints* are "*sandwiched***"** between *markedness constraints* entails that some ***lexically contrastive input forms*** *will* never surface in the output even if this "***erodes***" their lexical contrast altogether. We also found that MA and English have the ***reverse*** Constraint hierarchy of **Yoruba**, a language that *violates*

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UNPACK$_{NASAL}$V and *V$_{NASAL}$ to satisfy ***higher ranking*** IDENT-IO (nasal) and ***INTEGRITY***.

This analysis uncovered that **ONSET** is ***higher*** ranked below **undominated** *Vnasal in MA's hierarchy. First, there is no data attesting to a Nasal Vowel surfacing **after adaptation of french borrowed words.** Second, the anti-deletion MAX-IO is violated and the markedness constraint UNPACKNASAL is ***blocked (*** violated) to ***avoid an output form with an onsetless syllable***. Hence, this is to satisfy the higher ranked constraint ONSET (***VNasal >> ONSET>> DEP-IO, MAX-IO>> UNPACKNASAL.** Finally, the analysis demonstrated how the application of **UNPACKNASALV** activates the universally attested markedness constraint ***CODA COND(NASAL-place)** allowing only nasal codas which are **homorganic** to the following onsets to surface. This is at the detriment of IDENT-IO(place) for all lexically sponsored coda, due to the ranking posited earlier as specified below:

(ONSET>> UNPACK$_{NASAL}$V, Coda-Condition >> IDENT-IO(coda place), INETEGRITY).

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