VOWEL ELISION AND GLIDE FORMATION IN IVIE: AN OPTIMALITY-THEORETIC APPROACH[1]

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We present here an Optimality-Theoretic (OT) approach to glide formation and vowel elision in Ivie, an Edoid language spoken in Nigeria. It is shown that the action of the constraint ONSET is enough to 'drive' such instances of hiatus resolution whose outcome is in addition conditioned by the activity of other constraints. Employing mora-based representations of syllable structure, we show that constraints banning diphthongs and demanding tautosyllabic falling sonority contours play a crucial role in accounting for the attested patterns. The rather low position of MAX-μ and *CG, in particular their domination by the constraint MAX-V, gives formal expression to the generalization that glide formation is preferred over elision as a strategy to avoid hiatus configurations.

Cet article traite de la glidation et de l'élision de la voyelle en ivie, une langue édoïde du Nigéria, suivant le modèle de la théorie de l'Optimalité. L'on démontre que l'action de la contrainte ATTAQUE est suffisante pour « guider » des cas de la résolution d'un hiatus dont le résultat est par surcroît conditionné par l'activité d'autres contraintes. En utilisant des représentations de la structure de la syllabe en mores, nous montrons que les contraintes qui bannissent les diphtongues et qui exigent des contours de sonorité abaissante au sein d'une même syllabe jouent un rôle important pour rendre compte des structures attestées. La position relativement basse de la position de MAX-μ et de *CG, en particulier leur domination par la contrainte MAX-V, donne l'expression formelle pour la généralisation que la glidation est préférée par rapport à l'élision comme stratégie d'éviter les configurations d'hiatus.

0. INTRODUCTION

G. Masagbor (1989) presents an analysis of glide formation and vowel elision processes in Ivie, an Edoid language spoken in Nigeria (Bennett and Sterk 1977, Williamson 2006). In all Edoid languages nouns start and end in vowels, while all verbs end in a vowel (e.g. Omoruyi 1986: 66 on Edo; Thomas 1978: 15 on Engenni and Donwa-Ifode 1985: 43 on Isoko). Such 'morpheme-structure' constraints furnish plenty of opportunities for the creation of potential hiatus configurations.

The analysis presented in G. Masagbor (1989) for such processes makes two fundamental theoretical assumptions that help frame her account: in representational terms the author adopts the autosegmental theory of syllable structure of Clements and Keyser (1983): that is, she accepts the existence of a CV-tier of 'prosodic units' which define functional positions within the syllable and mediate the association between segments (or their root nodes, in more recent parlance) and the syllable tier. As for the general structure of phonological grammars the author works within a rule-based derivational approach to phonology.

In the present paper we propose an alternative account of vowel elision and glide formation in Ivie, one which we argue to be superior. In representational terms we adopt a moraic approach to syllable-internal structure. In addition, we reject the view of phonological systems as ordered rule-systems and propose instead an analysis couched in terms of the framework of Optimality Theory (OT).

This paper is organized as follows: section 1 below presents some basic patterns of vowel elision and glide formation in Ivie and introduces the CV-based account for these phenomena given in G. Masagbor (1989). Section 2 outlines the general

[1] I would like to thank an anonymous reviewer whose insightful comments and advices greatly improved both the presentation and the content of this paper.

theoretical assumptions of the present study, in special as these concern relevant prosodic well-formedness constraints and representations and how they relate to the analysis presented here. In section 3 we advance an OT analysis for the Ivie vowel elision and glide formation patterns introduced in section 1. Finally, section 4 gives an overall discussion of the proposals and discusses some open issues. All the data on Ivie discussed here come from the descriptions found in G. Masagbor (1989) and R. Masagbor (1989).

1. GLIDE FORMATION, ELISION AND SYLLABIFICATION IN IVIE

'Glide formation' is here understood as a process which converts a vocoid into a non-syllabic vocoid occupying a position of 'syllable margin' in surface structure. In Ivie, whose contrastive vowel inventory is shown below in (1), the vowels **/i e/** may be realized as the palatal glide [**j**], while the labio-dorsal glide [w] may occur as the non-syllabic realization of **/o u/** as in (2) after G. Masagbor 1989: 90-1:

(1)

	[high]	[low]	[back]	[round]
/i/	+	-	-	-
/e/	-	-	-	-
/ɛ/	-	+	-	-
/u/	+	-	+	+
/o/	-	-	+	+
/ɔ/	-	+	+	+
/a/	-	+	+	-

(2) a. **ùkólò ɔ́mɔ̀** → [**ùkólwɔ́mɔ̀**] 'child's cup'
b. **únù ɛ̀ná** → [**únwɛ̀ná**] 'cow's mouth'
c. **pfì ákpèkpè** → [**pfjǎkpèkpè**] 'blow wind'
d. **dòtsúá** → [**dòtswá**] 'to steal'
e. **úlùé** → [**úlwě**] 'snail'
f. **mìsèá** → [**mìsjǎ**] 'wring' (of clothes)

On the basis of (1) above one is able to infer that the feature specification [-low] identifies the natural class of vowels that may be subject to glide formation[2]. The data in (2) include both non-low vowels that alternate with vocoids (a-c) and non-alternating semivowels that, given the assumption that vowels and semivowels do not contrast underlyingly, are derived from underlying vowels as well (d-f). This latter set is referred to by G. Masagbor (1989: 90) as exemplifying 'glide formation within words'.

Thus, in Ivie, the [+ low] vowels **/a ɛ ɔ/** never alternate with glides, instantiating in this way a universal pattern according to which vowels in pre-vocalic position are split into one set of high vowels that alternate with glides and another set of non-high vowels that are subject to elision (Rosenthall 1997: 140). In contrast with (2a) above, in which a **/oɔ/** surfaces as [**wɔ**], the [+low] vowels are simply elided (data from Masagbor 1989: 96):

[2] G. Masagbor 1989: 87 states that 'Our Ivie data include two additional vowels **ɪ** and **ɷ**. At this point the phonemic status of these is uncertain'. Given this uncertainty our account omits all reference to these vowels.

(3) a. **ésɔ̀ ɛ̀ná** → [**ésɛ̀ná**] 'cow's ear' *[**éswɛ̀na**]
b. **óɾɛ̀** 'tree' /**óɾɛ̀ + óɾɛ̀**/ → [**óɾóɾɛ̀**] 'trees'

As discussed in the next section, constraints on the sonority contour of syllables seem to play a role in the hiatus resolution strategies employed in Ivie. There is, for this reason, something to be said about the relation between the feature values in (1) and their relation to the relative sonority of different vowels. I assume here that all [+ low] vowels have a higher sonority value than all [- low] vowels and that within the set of [-low] vowels those with a [-high] feature value are more sonorous than those with a [+ high] specification. All of this seems relatively uncontroversial and in line with much work on vowels and their place in the sonority hierarchy (Selkirk 1984; Crosswhite 2004; de Lacy 2007).

Of particular importance here we note that a constraint demanding a falling sonority contour for tautosyllabic vowels, which has been argued to be part of Universal Grammar (as conceived in Optimality Theory) features crucially in the analysis for some input-output pairs in this language argued for in the remainder of this paper. Anticipating a little bit, we observe that in the cases of glide formation in (2) above, *if* the vowel sequences were tolerated as such in surface structure and syllabified as tautosyllabic sequences, these sequences would have a rising rather than falling sonority contour. With this much in mind, consider the following data:

(4) a. /**úkpè**/ 'year' /**úkpè + úkpè + úkpè**/ → [**úkpúkpúkpè**] 'yearly'
b. /**íkpágò**/ 'money' /**íkpágò + íkpágò**/ → [**íkpágíkpágò**] 'money' (pl.)
c. /**ɛ́kpà éjɛ̀**/ → [**ɛ́kpéjɛ̀**] 'our bag'

One important difference between the data in (4) above and that in (2) is that in the former case the preservation of the vowel sequences in the output and the parsing of these two vowels as contained in the same syllable *would not* produce the proscribed rising sonority contours (e.g. /**ɛ́kpà éjɛ̀**/ → *[**ɛ́kpàéjɛ̀**]). As discussed in the next section, the action of a separate principle or constraint succeeds in accounting for the form in (4c). Those in (4a,b) however are shown in the final section of this paper to resist a sensible account in terms of the analysis is sketched here.

Finally, the following patterns of hiatus resolution are also found in Ivie:

(5) a. **dò òdé** → [**dwòdé**] 'weave cloth'
b. **ɾɔ̀kálí ítà** → [**ɾɔ̀kálítà**] 'follow father'
c. **únù úlùé** → [**únúlwě**] 'snail's mouth'

In (a), (b) and (c) above, sequences of identical vowels are subject to different treatments as a function of the quality of the vowels involved. When two identical high vowels, /**i + i**/ and /**u + u**/, are brought into adjacency, V_1 elision takes place while when the sequence is /**o + o**/, glide formation occurs. G. Masagbor (1989: 91) offers an account of this differential treatment by invoking a 'height distinction' between the two vowels in the /**o + o**/ sequence so that V_1 does not elide because it is actually higher than V_2. The most obvious problem with this hypothesis lies of course in its *ad hoc* character, given that no independent evidence is given to support this claim. In section 3 we present an account of this pattern that does not rely on this putative height distinction.

At this point, I will assume that vowel elision only takes place as a *last resort* whenever the process of glide formation is blocked by the action of a higher-priority restriction in the grammar of Ivie. It may be the case, for instance, that glide formation does not take place in sequences of identical high vowels due to the well-known marked status of [**wu**] and [**ji**] sequences (cf. e.g. Booij 1989: 322; Maddieson and Precoda 1992). In section 3 we will briefly consider some consequences of these patterns for the OT analysis proposed here, though accounting for this particular differential behavior is not among the main concerns of the present paper and will be ultimately left as an open issue.

In the approach to glide formation presented in G. Masagbor 1989, this consists in the result of the application of an ordered set of rules to an input such as (6a) that produces, in the end, representations such as in (6b):

(6)


As presented in G. Masagbor (1989: 89, 92) the first rule applying in the derivation of (6b) from (6a), and indeed the first rule to apply in all instances of glide formation, consists in the deletion of the V slot to which the vocoid /**i**/ associates. The application of this rule however, is not motivated within her account. It is a matter of stipulation that this rule applies to exactly these forms. In an analysis based on the action of output constraints on the other hand, the operation of glide formation can be seen as enforced by independent output constraints. In the next section the theoretical assumptions of the alternative account for the Ivie patterns presented here will be discussed.

2. THEORETICAL ASSUMPTIONS: MORAS AND OPTIMALITY THEORY

As noted in the Introduction to this paper, the core of this paper consists in offering an alternative analysis to glide formation and vowel elision in Ivie framed within Optimality Theory (OT) and assuming moras to be part of phonological representations.

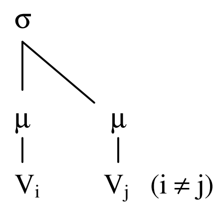
In the OT framework the phonological grammar of each natural language is seen as a particular ‘solution’ to conflicts which arise from the conflicting demands of two broad types of grammatical constraints found in Universal Grammar: on the one hand there are *markedness constraints* which favor or ban the presence of particular structures or configurations in outputs. Such constraints are usually seen as grounded on extra-linguistic phonetic constraints of an articulatory and/or acoustic nature. On the other hand, the demands of such markedness constraints often conflict with the imperative set by the different *faithfulness* constraints: the minimization of disparities between input and output structures.

A core assumption of the present paper, one which has important consequences for the way constraint violations are assessed, is that patterns of vowel distribution in vocalic sequences consists in the comparative evaluation of moraic and non-moraic parsing for underlying or input vocoids (cf. e.g. Rosenthall 1997). In this vein, given the central role played by the moraic theory of the syllable in our account, output constraints that make reference to moraic structure will play an indispensable role. The following constraints are assumed here:

(7) a. MAX-μ: Every mora present in the input has a correspondent in the output.
b. SONFALL: In bi-moraic, tautosyllabic sequences the sonority value of the first or left-most segment is higher than the sonority of the second or right-most segment.
c. *CG: Consonant-Glide sequences are not allowed.
d. MAX-V: Every vocoid present in the input has a correspondent in the output.
e. ONSET: Syllables must have onsets.
f. NODIPH: Diphthongs are not allowed.

The restriction SONFALL in (b) above may be employed, in principle, to ban long vowels from output items, doing away thus with the need for an independent constraint forbidding long vowels. This constraint plays a crucial role in the analysis sketched here and is discussed again below in relation to some independent claims found in the literature concerning prosodic representations. The constraint in (c) is employed in Casali (1997: 499) and does the same work as SECARTIC does in Rosenthall (1997). The constraint in (f) assigns one violation mark to every diphthong present in a candidate output. We assume diphthongs to have the structure as in (8) below (Rosenthall 1994, 1997; Zec 2007):

(8)



The constraint Max-V deserves separate discussion given that an anonymous reviewer of this paper has called into question the interpretation of the action of MAX-V in the evaluations presented below. In particular, the reviewer questions the assumption of a correspondence between an input vowel and an output glide, with the consequence that MAX-V is not violated in outputs such as [**dwɔ̀dé**]. It seems then that my assumptions concerning glide formation and the role of MAX-V need to be spelled out in a more explicit manner. I take the main difference between a vowel and its corresponding glide to be one of prosodic parsing: a vowel associates to a mora, a glide does not (Hayes 1989, Rosenthall 1997). The assumption that this is the sole difference and that therefore a vowel and a glide stand in correspondence - and that, as a consequence, glide formation does not imply a violation of MAX-V - seems fairly standard in the literature (see Casali 1997: 499; Rosenthall 1997: 153; Bakovic 2007)[3]. The label 'vowel' and even more so the labeling 'V', is notoriously ambiguous: it may refer either to a 'vocoid' (thus working effectively as a catch term for the class formed by vowels plus 'semivowels' such as [j] and [w]) or as a reference to a 'functional position within the syllable', as in Clements and Keyser 1983. The reviewer is correct in his qualms if the latter interpretation of 'vowel' was intended: as a segment that

[3] Though it is true that both Casali 1997 and Rosenthall 1997 employ only an 'unadorned' constraint Max-IO (Bakovic 2007 does employ Max-V) the crucial information is that gliding does not violate this constraint, while elision does. I hasten to add that in cases where a mid /e/ maps to [j] or /o/ maps to [w] there is obviously an additional violation of IDENT-[HIGH] though this has not been considered here since it is not crucial to the present analyses.

occupies a syllable margin, a surface glide cannot be a 'vowel' in this sense. The interpretation assumed here is, however, the former, that is, 'V' stands for 'vocoid segment'. This is justified on the grounds that high vowels and their corresponding glides are taken to be featurally identical, distinguished only by the way they associate to higher-level prosodic structure.

We assume here a moraic approach to syllable structure (Hyman 1985; Hayes 1989; Itô and Mester 1993; Zec 1995, 2007) in which prosodic representations are characterized instead by units that code temporal and syllable weight information, called moras (μ), which are the sole phonological units that may intermediate a segment's association to a syllable node (σ).

Two other fundamental assumption of our work, enshrined here in terms of 'well-formedness' principles, need separate discussion. The first assumption, one that receives varied expression in studies such as Kiparsky 1979; Prince 1983; Kager 1993 and Zec 1995: 92, 2007, states that a syllable-internal *prominence contrast* (or 'sonority contrast') must obtain in heavy, bimoraic syllables. In particular, a sonority difference pattern is observed between the head mora (μ_h) and the non-head mora (μ):

(9) $|\mu_h| > |\mu|$: The sonority value of the segment associated to the head mora has to be greater than the sonority of the segment associated to the non-head mora.

In addition to this intra-syllabic contrast, we also accept - with Prince 1983: 57-9; Kaye 1990: 306-7; Kager 1993 and Zec 2007 - that this contrast has a falling contour. That is, the more prominent or higher-sonority mora *precedes* the non-nuclear mora:

(10) $[\mu_h\,\mu]_\sigma$: The head-mora precedes the non-head mora

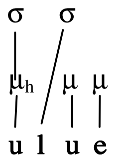
In the implementation of these constraints for vowel sequences in candidate forms, we assume the relation established in section 1 between feature values and relative sonority. Thus, the candidate output [**ɛ́.kpàé.jè**] does not violate the constraint in (9) above - given that |a| > |e| in the bimoraic syllable [**.kpae.**] **.** The candidate [**ú.nùɛ̀.ná**] on the other hand, does violate it, since [**u**] is less sonorous than [**ɛ**]. The conjoined effect of these two assumptions is to derive the constraint SONFALL introduced above.

Finally, we assume as a working hypothesis that high vowels and their corresponding glides *do not* contrast underlyingly in Ivie, as it has been argued to be the case in say, some Berber varieties (Guerssel 1986). Indeed, the main objective of this work lies in showing how the assumed surface glides of Ivie can be derived as predictable non-syllabic - non-moraic - variants of underlying vocoids.

Before presenting an OT account of the Ivie patterns, we will discuss in the remainder of this section how the representational assumptions outlined here would work for the present case.

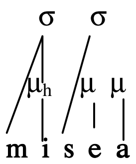
Assuming here that all underlying vocoids predictably associate to moras the following intermediate or pre-surface forms may be postulated for Ivie (tonal associations omitted):

(11) a.



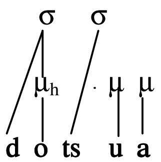
/úlùé/ 'snail'

b.



/mìsèá/ 'wring' (of clothes)

c.

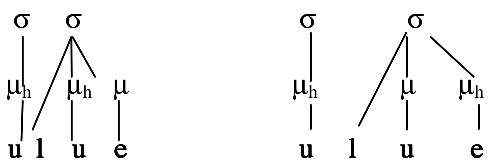


/dòtsúá/ 'to steal'

In (11a-c) only the non-problematic syllabic associations are shown. In (11a) for instance, a mora followed by a consonant projects its own syllabic node. In (11b-c) consonants preceding moraic segments associate directly to syllable nodes as 'onsets'. Any theory of syllable structure to date has some expedient expressing a preference for the parsing of these consonants as onsets (cf. the 'CV linking rule' of Steriade 1982; the 'Onset Creation Rule' of Hyman 1985: 15; the 'Principle of Onset Priority' in Clements and Keyser 1983: 37 and the 'Onset Principle' in Selkirk 1982: 259).

Given representations such as these in (11) above, and assuming with Hayes 1989 and Rosenthall 1997: 145 that vowels and glides differ in that the latter lack an independent moraic association, the aim of any approach to glide formation boils down to a specification of the conditions under which a vocoid may fail to show up with its predictable association to an independent mora. We contend here that the principles or constraints in (9) and (10) account in their essence for the distribution of glides in Ivie. In order to see how this works, we present in (12) below two slightly different complete syllabic parsings of the item in (11a):

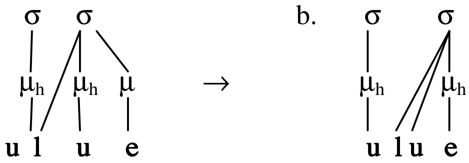
(12) a. b.



The crucial feature of the alternative analyses in (12) - which differ in terms of the assignment of nuclear or head status to the vowel sequence /ue/ - is that in none of these different parsing *both* principles in (9) and (10) are satisfied, thus leading to a situation of constraint conflict. In (12a) the constraint in (9) is violated since the head mora is associated to a segment with a lower sonority value than that of the segment linked to the non-head mora. In (12b) on the other hand, though the demands of (9) are met, (10) is violated instead, given that the head mora follows the non-head mora.

As a head start toward a resolution of this conflict, and anticipating somewhat the analysis to be presented below, we may take the restriction in (10) to be universally inviolable, or at least inviolable in the Ivie grammar (cf. Rosenthall 1994: 19). That is, we assume that all bi-moraic syllables have the structure as $[\mu_h\ \mu]_\sigma$ showing therefore a 'trochaic' pattern of initial prominence (see Prince 1983, Kaye 1990 and Kager 1993). From this it follows that the only possible parsing for the item **/úlùé/** is that in (12a), implying thus that (9), the constraint demanding the association of the head mora with vowel with the highest sonority value in the tautosyllabic sequence, is violated. The core of our proposal is constituted in effect by the claim that glide formation in Ivie is a way to avoid this violation of the constraint in (9) by the elimination of the mora associated with the relatively less sonorous segment in the sequence, as shown in (13) below:

(13) a. b.



[**úlwě**] 'snail'

The representation in (13b) above shows the *output* of the process of glide formation which consists, as pointed out above, in the association of a vocoid directly to the syllable node as a way to avoid the violation of the constraint that imposes a falling sonority contour on the intra-syllabic moraic structure. The reader will have no trouble in figuring out that the same analysis applies to the other examples in (11), deriving the surface forms [**mìsjǎ**] and [**dòtswá**].

3. AN OPTIMALITY-THEORETIC APPROACH TO HIATUS RESOLUTION IN IVIE

This section presents an OT account of the patterns of vowel elision and glide formation in Ivie. In the analyses below we will employ the so-called 'combined Table' format (McCarthy 2008: 46-7) which combines the traditional 'violation marks Table' with the 'comparative Table' presented in Prince 2002, 2007. Here, a traditional violation mark Table is construed but the labels 'W' and 'L' which indicate, respectively, whether the constraint at hand prefers the attested output (that is, the optimal candidate or *Winner*) or some suboptimal candidate (a *Loser*) to each line introducing one of the suboptimal candidates. In the first Table below, for instance, the W label in the row of the sub-optimal candidate indicates that the constraint occurring in this column prefers the winning candidate (that is, the attested output which appears in the other row) over the loser, the sub-optimal candidate. The inclusion of the comparative information provided by the annotations W and L is ideally suited to 'ranking problems', that is, problems that consist in figuring out the correct constraint ranking necessary to produce some set of attested outputs (Brasoveanu and Prince 2005: 3) thus fitting well with the aims of the present paper. Some readers will no doubt note the absence of dotted lines in the Tables presented below. The difference between dotted and non-dotted lines is of no use once the comparative format is adopted (one might as well employ *only* dotted lines, as McCarthy 2008 for instance does at many points). The ordering of the constraints in each Table is more or less arbitrary. In very general terms, the relevant information on ranking is given by the so-called Elementary Ranking Conditions (ERCs). These include all the information about ranking that can be extracted from each row annotated with W and L labels and each such ERC demands that *at least* one W-assessing constraint (i.e. one constraint preferring the optimal output over the relevant competitor) dominates *all* L-assessing constraints (i.e. those preferring the sub-optimal candidate) if the optimal status of the attested output is to be accounted for. The fact that any particular ranking is backed-up by a ranking argument is therefore apparent from the distribution of W and L marks. Thus, even though SONFALL appears in Table 3 *as if* it dominates MAX-V this should be not read as a ranking. Indeed, no ERC in any Table supports this particular ranking. Hasse diagrams will also provide explicit information on which ranking relations are justified in the analyses.

Table 1 below demonstrates how a faithful mapping provides evidence for the dominated status of the constraint ONSET in the grammar of Ivie. The optimal candidate in (b) below violates ONSET while the suboptimal candidate in (a) avoids a similar violation only at the expense of violating the faithfulness constraint MAX-V (the optimal output is indicated by shading of the leftmost cell in the Tables):

Table 1. *Evidence for the Dominance Relation* MAX-V >> ONSET.

	/ɔ́mɔ̀/ → [ɔ́mɔ̀]	MAX-V	ONSET
a.	[mɔ̀]	W*	
b.	[ɔ́.mɔ̀]		*

In Table 2 below we deal with the assumption presented in section 2 that glides and vowels do not contrast in Ivie and, therefore, even non-alternating glides must be derived from underlying vocoids without an input specification of the their non-syllabic status. Therefore, an output such as [òwɛ̀] 'foot' (morphologically /ò-uɛ̀/) is selected in the following way:

Table 2. *Evidence for the action of* SONFALL *in the exclusion of sub-optimal candidates.*

	/òuɛ̀/ → [òwɛ̀]	MAX-V	SONFALL	ONSET	MAX-μ
a.	μ | [wɛ̀]	W*		L	* *
b.	μ μ | | [ò.wɛ̀]			*	*
c.	μ μ |/ [.wɛ̀ː.]		W*	L	*
d.	μ μ μ | | / [.oue.]		W*	*	L

A comparison between candidates (a) and (b) demonstrates that the violation of the constraint MAX-V incurred by the candidate [wɛ̀] is enough to make it sub-optimal, even though the optimal candidate violates ONSET. This is consistent with the ranking established in Table 1. The fact that candidate (b) beats candidate (c) shows that SONFALL dominates ONSET. For Ivie then, the correct output is one that does not show compensatory lengthening as a joint effect of glide formation, differently from what occurs in hiatus resolution contexts in languages such as Luganda (Clements 1986) and Kimatuumbi (Odden 1995).

Table 3 below deals with a conflict involving the constraints SonFall and Max-μ and also shows that the correct output (b) can be selected only under the rankings SonFall >> Max-μ, *CG and Max-V >> *CG:

Table 3. *Evidence for the dominance relations* SonFall >> Max-μ, *CG *and* Max-V >> *CG.

	/ulue/ → [**u.lwe**]	SonFall	Max-V	Max-μ	*CG
a.	μ μ μ [**u.l u e**]	W *		L	L
b.	μ μ [**u. lw e**]			*	*
c.	μ μ [**u . lu**]		W *	*	L

As a follow up, Table 4 below demonstrates the action of the same local hierarchy in the case of a vocalic sequence /**o + o**/:

Table 4. *Action of the Hierarchy* SonFall >> Max-μ, *CG *in an input sequence* /**o** + **o**/.

	dò òdé → [**dwòdé**]	SonFall	Max-V	Max-μ	*CG
a.	μμ μ [**dòː.dé**]	W *		L	L
b.	μ μ [**dwò.dé**]			*	*
c.	μ μ [**dò.dé**]		W *	*	L

The two Tables above furnish the ranking arguments for the dominance relations alluded to in the last section. In particular, the restriction SonFall forbids the occurrence of sonority-increasing tautosyllabic vowel sequences. Glide formation avoids the violation of this constraint in the optimal candidates. The fact that this leads to violations of both Max-μ and *CG changes nothing.

Table 4 in particular merits separate discussion. As the data in (5) have shown (see section 1) /**o + o**/ sequences are given a distinct treatment in the grammar of Ivie when compared to a sequence of high vowels such as /**i + i**/. The rankings motivated in Table 4 for instance would give an incorrect result for the latter, as shown in Table 5 below:

Table 5. *Hierarchies justified so far fail with sequences of high vowels.*

	ɾɔ̀káli ítà → [ɾɔ̀kálità]	SONFALL	MAX-V	MAX-μ	*CG
a.	μ μ μ μ μ ɾ ɔ k a l i t a	W *		L	
b.	μ μ μ μ ɾ ɔ k a l ı t a		*	*	
c.	μ μ μ μ ɾ ɔ k a lj ı t a		L	*	W*

Note that in order for the attested output, candidate (b), to win the competition with candidate (c) the grammar of Ivie would have to include ranking *CG >> MAX-V. As Table 4 shows, however, the correct ranking is MAX-V >> *CG instead.

As briefly suggested at the end of section 1, an account of these singularities may be founded on the relatively marked status of the sequences [wu] and [ji] that would result from the application of glide formation to sequences of high vowels (see e.g. Booij 1989: 322; Maddieson and Precoda 1992). This hypothesis will not be pursued here in any depth, remaining thus as an open issue meriting further investigation. It is enough now to point out that, as it relates to the example in Table 5 above, it may be the case that a specific constraint banning palatal laterals may be active in Ivie, given that this same context - a preceding lateral consonant - also blocks the expected glide formation process elsewhere, as in the case of the Focus marker **/li/** in prevocalic context (cf. G. Masagbor 1989: 97).

Table 6 introduces the action of the markedness constraint NODIPH which forbis the formation of diphthongs, as pointed out in section 3:

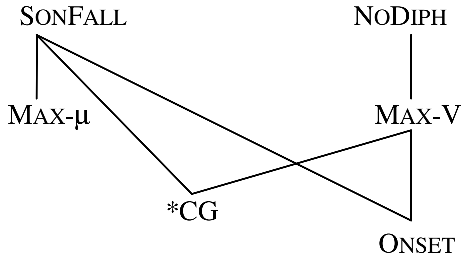
Table 6. *Evidence for the dominance relation* NODIPH >> MAX-V.

	/ɛ́kpà éjɛ̀/ → [ɛ́kpéjɛ̀]	NODIPH	MAX-V
a.	μ μ μ μ [ɛ́ . kpà é . j ɛ̀]	W *	
b.	μ μ μ [ɛ́ . kpé . jɛ̀]		*

In (14a) below we present each of the relations of constraint domination justified so far, with an indication of the Table in which the crucial ranking arguments are given. It is important to note that the dominance relation between NODIPH and ONSET was established on the basis of the transitive nature of the dominance relation: given NODIPH >> MAX-V (5) and MAX-V >> ONSET (1, 2) it follows by transitivity that NO-DIPH >> ONSET. In (14b) a Hasse diagram is shown presenting the same relations in a more explicit fashion, given that no total ordering of the constraint set has been achieved (McCarthy 2008: 48-9):

(14) a. Max-V >> Onset (1, 2)
Sonfall >> Onset (2)
Sonfall >> Max-μ, *CG (3, 4)
Max-V >> *CG (3, 4)
NoDiph >> Max-V (6)

b.



3.1. REMARKS ON THE ROLE OF ONSET.

The present section is devoted to a more detailed consideration of the activity of the Onset constraint in motivating the operation of 'hiatus resolution' strategies in Ivie. Focusing on this particular point, we restate below the Table 3 above, but now including an additional candidate with heterosyllabic adjacent vowels:

Table 7. *Restatement of Table 3 showing the activity of* Onset.

	/ulue/ → [u.lwe]	SonFall	Max-V	Onset	Max-μ	*CG
a.	μ μ μ [u.l u e]	W *		*	L	L
b.	μ μ [u. lw e]			*	*	*
c.	μ μ [u . lu]		W *	*	*	L
d.	μ μ μ [u.l u.e]			W **	L	L

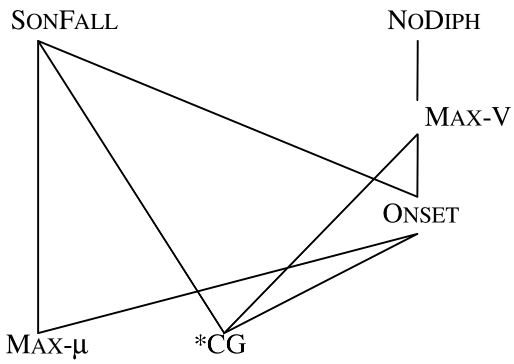
The relevant row for the discussion at hand is of course (d), the row of the candidate with a configuration of hiatus. Note that this candidate loses the competition due to its multiple loci of violation for the constraint Onset (cf. McCarthy 2003 on the notion 'locus of violation') making it less harmonic than the attested output which incurs in a single violation. The double violation of Onset in candidate (d) is of course a consequence of the fact that in Ivie and in Edoid languages in general nouns always start in a vowel (and, as shown in Table 1, a vowel is never deleted to avoid such a violation of Onset). For completeness sake we show below in Table 8 the activity of the constraint Onset in verbs, that is, consonant-initial words:

Table 8. *Activity of* ONSET *in verbs.*

	/pfɪákpèkpè/→ [pfjǎ.kpè.kpè]	SONFALL	MAX-V	ONSET	MAX-μ	*CG
a.	μ μ μ [pfja.kpe.kpe]				*	*
b.	μ μ μ μ [pfia.kpe.kpe]	W *			L	L
c.	μ μ μ μ [pfi.a.kpe.kpe]			W *	L	L

The main conclusion of this section is that - in spite of the relatively 'low position' of the constraint ONSET in the grammar of Ivie - its activity is still crucial to exclude non-optimal candidates with heterosyllabic vowel sequences, without the need for a specific NOHIATUS constraint. At this point however, given the additional information provided by Tables 7 and 8 on the role of ONSET, it is necessary to revise the relations of dominance characterizing the grammar of the Ivie language. In (15) below we provide a modified version of the Hasse diagram given in (14b):

(15) *Hasse diagram showing constraint domination relations in the grammar of Ivie.*



In the next, final section of the paper some properties and a general outline of the constraint hierarchy justified in the present paper are discussed.

4. CONCLUSIONS, FINAL DISCUSSION AND SOME OPEN ISSUES.

The constraint domination relations motivated in the present article, particularly in sections 3 and 3.1, as characterizing the grammar of the Ivie language depict the following (verbally described) scenario: diphthongs are throughout banned from outputs and such demand may be met in optimal outputs by the deletion of input vowels (thus violating the faithfulness constraint MAX-V). This faithfulness constraint on the other hand, cannot be violated as a simple expedient to avoid a violation of the markedness constraint ONSET; therefore, vowel initial words are allowed in Ivie. The constraint ONSET is enforced, however, whenever it conflicts with constraints that militate against the loss of an input mora (MAX-μ) or the formation of consonant-glide sequences (*CG): in this way, a candidate output that undoes an underlying vowel sequence by means of glide formation is more harmonic than a candidate output that parses both vowels in a sequence as heterosyllabic vowels.

Both NODIPH and SONFALL are thoroughly enforced in attested outputs by occupying high, non-dominated positions in the phonological grammar of the Ivie language. The latter plays a crucial role forcing violations of MAX-μ, *CG and ONSET whenever the satisfaction of one of these constraints conflicts with the demand that tautosyllabic moras must have a falling sonority contour. A consequence of the non-dominated status of SONFALL and NODIPH is that syllables in Ivie are effectively restricted to a monomoraic minimum $[\mu]_\sigma$.

Finally, an additional set of phenomena whose correct analysis remains an open issue consists in apparently reduplicated items such as those given in (4). It is a well-known fact concerning reduplicated forms that they often escape or avoid the application of otherwise general phonological processes. In the Table below we show that the attested output in (b) is outcompeted by the non-attested form in (a), a form showing glide formation instead of the observed pattern of vowel elision:

Table 9. *Hierarchies justified so far fail with reduplicated items.*

	/íkpágò + íkpágò/ → [íkpágíkpágò]	NODIPH	MAX-V	MAX-μ
a.	í.kpá.gwí.kpá.gò		L	W *
b.	í.kpá.gí.kpá.gò		*	
c.	í.kpá.gòí.kpá.gò	W *	L	

Note that the Elementary Ranking Condition for (a) above requires MAX-μ to dominate MAX-V in order for the attested output in (b) to be selected as optimal. Given however, the hierarchies MAX-V >> ONSET >> MAX-μ (see 17) justified in the present paper for the grammar of Ivie, we know that this can't be the case. We are therefore unable to account for the selection of the attested output in this case.

Summing up, a more inclusive analysis of the processes undoing input vowel sequences in Ivie that accounts for cases such as these shown in Tables 5 and 9 above, involving sequences of identical high vowels and reduplicated forms, seems to demand further investigation that complements both the theoretical machinery employed in this paper and its empirical coverage.

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