Prosodic and analogical effects in lexical glide formation in Catalan[1]

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Abstract

This paper provides a broad empirical description and a close examination of how Catalan speakers sillabify sequences of vocoids of rising sonority within the lexicon (e.g., piano *'piano',* clariana *'clearing' or* àvia *'grandmother'). A survey with 381 words administered to 60 speakers has enabled us to identify two distinct varieties of Central Catalan: a more innovative variety (which displays a stronger tendency to glide formation) and a more conservative variety. This situation, together with a certain degree of inter-speaker variation found in the data, reveals the existence of language change in progress. Both varieties display clear prosodic regularities: word-initial positional effects (that is, gliding tends to be blocked in word-initial position; cf.* m*[iˈɔ]*l *'mewl',* p*[iˈa]*no *'piano',* d*[iə]*dema *'diadem') and distance-to-stress effects (that is, gliding increases when the distance to the tonic syllable is greater; cf.* d*[iə]*lecte *'dialect'*

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vs. d*[jə]*lectologia *'dialectology'). These prosodic effects are also strikingly similar to the ones found in Spanish (cf. Hualde 1999). The article shows that this gliding process can be accounted for in a very intuitive way in terms of a correspondence-based OT analysis which captures the prosodic and analogical forces governing this process together with the dialectal and inter-speaker variation found in the data. In OT terms, the difference between the innovative and the conservative varieties will be interpreted as the loss (or weakening) of a prosodic constraint in the innovative variety. Idiolectal variation will be interpreted as the set of analogical/correspondence relationships each speaker establishes with other words in the lexicon.*

1. Introduction

In contrast with other Romance languages, up until recently Catalan has shown a systematic tendency to pronounce all lexical sequences of vocoids of rising sonority in hiatus, such as *m*[i.ˈɔ]*l* 'mewl', *p*[i.ˈa]*no* 'piano', *d*[iə]*dema* 'diadem', *com*[i.ˈa]*t* 'farewell', *clar*[i.ˈa]*na* 'clearing'. The current situation nowadays, however, is that there exists an ever stronger trend to contract sequences traditionally pronounced as hiatus into diphthongs. Indeed, all of the studies dealing with rising diphthong/hiatus contrasts have acknowledged this trend and have highlighted both the dialectal and inter-speaker variation to which this process is subject (Badia 2000, Bonet and Lloret 1998, Jiménez 1999, Oliva 1977, Recasens 1991a, 1993). We believe that the state of language change displayed by this gliding process provides us with an extremely interesting case study to examine the active forces that influence this phenomenon.

The aim of this paper is twofold. First, to provide a broad empirical description of the present-day lexical distribution of the rising diphthong/hiatus alternations in Central Catalan. Second, to discover the regularities and tendencies which guide the speakers' decisions when pronouncing vocoid sequences of rising sonority in the lexicon, and, more specifically, to investigate the role that prosodic and analogical forces play in this process.

The article presents the results of a questionnaire of 381 words administered to 60 speakers of Central Catalan. The empirical exploration of such data is a worthy task that will provide enough quantitative data to discover the role prosodic and analogical patterns play in the resolution of lexical vowel contacts The data has revealed the existence of two different varieties: a more innovative and a more conservative variety, which display distinct treatments of the $CV_{[high]}V$ sequences. As we will see in Section 4, other Romance languages like Spanish have striking points of agreement with Catalan.

This article contends that the tendency to contract vowels into rising diphthongs in Catalan can be regarded as a process closely guided by competing

prosodic and analogical conditions, i.e., by forces which optimise prosodic structure and by forces which tend to keep identity relations. A prosodic/identity constraint analysis (Prince and Smolensky 1993; McCarthy and Prince 1994, 1995; Benua 1995) is especially well-suited for a formal expression of the different conflicting pressures that determine glide formation in Catalan, as it allows us to capture the interplay between both prosodic and analogical pressures together with the dialectal and idiolectal variation found in the data. Specifically, the deletion/weakening of a prosodic enforcement constraint will account for the dialectal variation found in rising diphthong/hiatus distribution within the Central Catalan area, and concomitantly, for the direction that change has taken in this language.

The paper is organized as follows. Section 2 presents some well-known facts about the lexical distribution of rising diphthong/hiatus alternations in Central Catalan, as well as a brief review of the literature. Section 3 presents quantitative results of the questionnaire together with a discussion of the prosodic and analogical patterns found in the data. Section 4 compares Catalan with other Romance languages, in particular with Spanish. Finally, Section 5 presents an analysis of the data within the Optimality/Correspondence Theory framework, focussing especially on how the dialectal and idiolectal differences are accounted for.

2. Basic facts

In Catalan, lexical unstressed high vowels ([i],[u]) can either constitute the nucleus of a syllable (i.e., *universitat* [uniβərsiˈtat] ‘university’, *imitar* [imiˈta] ‘to mimic’) or be produced as glides [j], [w] in the context before and after a vowel (*quasi* [ˈkwazi] ‘almost’, *estació* [əstəˈsjo], *àvia* [ˈaβjə] ‘grandmother’) (*vailet* [bəjˈlɛt] ‘boy’, *eina* [ˈɛjnə] ‘tool’, *brau* [ˈbraw] ‘bull’, *cuina* [ˈkujnə] ‘kitchen’).[2] When high vowels are stressed, they are always a nucleus, making it clear that in Catalan (as well as in other Romance languages) stress protects a high vowel from devocalization. Finally, vowel contacts which do not involve a high vowel are usually syllabified in two syllables (cf. *aleatori* [əleəˈtɔɾi] ‘fortuitous.ms’, *teatre* [teˈatrə] ‘theater’, *teatral* [teəˈtral] ‘theatrical’, *lleó* [ʎəˈo] ‘lion’, [ʒəˈɔɣɾəf] ‘geographer’).

Falling sonority vocoid sequences present a rather different behavior than rising sonority sequences. Intramorphemic sequences are almost indefectibly pronounced with a diphthong (cf. *mai* [ˈmaj] ‘never’, *peu* [ˈpɛw] ‘foot’, *noi*

2. Note that, in contrast with neighboring languages such as Spanish or French, the diphthongs *iu* and *ui* are pronounced in Central Catalan as sequences of falling sonority, that is, with the nucleus in the first high vowel: *cuina* [ˈkujnə] ‘kitchen’, *piu* [ˈpiw] ‘button’.

[ˈnɔj] ‘boy’, *bou* [ˈbɔw] ‘ox’). They are pronounced in two syllables in the following cases: (1) forms which have morphologically-related forms containing a high stressed vowel tend to be pronounced with an ‘unexpected’ hiatus (cf. *raïm* [rəˈim] ‘grape’ → *raïmet* [rəiˈmɛt] ‘grape.dim’; *saüc* [səˈuk] ‘elder’ → *saüquer* [səuˈke] ‘elder’; *veí* [bəˈi] ‘neighbor’ → *veïnatge* [bəiˈnadʒɛ] ‘neighborhood’); (2) inflectional and derivative morphemes are syllabified as single units, preventing glide formation from applying (cf. *conre-ïs* [kunˈrɛis] ‘cultivate 2sg.Pr.Subj.’, *conre-o* [kunˈrɛu] ‘cultivate 1sg.Pr.Ind.’, *cre-ï* [ˈkrei] ‘create 3sg.Pr.Subj.’, *cre-o* [ˈkreu] ‘create 1sg.Pr.Ind.’, *posse-ïdor* [pusəiˈðo] ‘possessor’, *agra-ïment* [əɣfrəiˈmen] ‘thanks’, *fru-ïció* [fruiˈsjo] ‘delight’, *fatu-ïtat* [fətuiˈtat] ‘fatuity’.

In contrast with the stable behavior of vocoid sequences of falling sonority, sequences of rising sonority display a more variable behavior. Even though the prescriptive grammars of the language still portrait the old pronunciation of these sequences as hiatus,[3] there exists a strong trend today to pronounce sequences traditionally pronounced as hiatus as diphthongs. As Recasens (1993: 113) remarks, “the degree of variation this process displays reveals the existence of a change in progress to favor a pronunciation with diphthong (a newer one) over a pronunciation with hiatus (an older one)” [translated text]. The fact that among young speakers *clariana* ‘clearing’ is often pronounced [kləˈrjanə] rather than [kləriˈanə] distinctly reflects the state of variation to which this process is subject. It is a well-accepted fact that variation is often a passing stage signalling change in progress. As Kiparsky notes, “sound change can be assumed to originate through synchronic variation in the production, perception and acquisition of language, from where it is internalised by language learners as part of their phonological system.” (Kiparsky 1995: 657–658)

We have textual evidence that $CV_{[high]}V$ sequences started to contract into diphthongs as early as the XVIIth century. While scansion of medieval verses indicates that the old pronunciation of rising sonority vocoid sequences was with hiatus, some centuries later, Josep Pau Ballot (1747–1821) already notices a pronunciation with a diphthong in items such as *oració*, *unió*, *victòria* or *desgràcia*. One of the main pieces of evidence he presents is the scansion of these words in poems by Francesc Vicens Garcia (1582–1623). At the beginning of the XXth century, in one of his first Catalan grammars, Fabra (1912: 14) reports a tendency to contract into a diphthong sequences of rising sonority in postaccentual environments (*llànt*[jə] ‘stain’, *ingèn*[wə] ‘naïve.fem’), in nom-

3. For instance, the recent oral guidelines issued by the Institut d’Estudis Catalans (1990) recommend that practically all vocoid sequences of rising sonority should be pronounced in hiatus in a formal register. This recent prescriptive document states that “the pronunciation with a diphthong in words such as *condició* ‘condition’, *ciència* ‘science’, etc. is only admissible in the general territory in an informal register.” (Institut d’Estudis Catalans 1990: 15)

inal suffixes (*comprens*[ˈjo] ‘comprehension’, *flex*[ˈjo] ‘flexion’), and in some other word-internal unstressed positions (*var*[jə]*bilitat* ‘variability’).

Language contact with Castilian Spanish (and also French) has often been identified as one of the external factors that have influenced the increasing tendency to gliding in Catalan.[4] As is well-known, the unmarked pronunciation of a vocoid sequence of rising sonority in Spanish is a diphthong: *d*[ˈje]*nte* ‘tooth’, *m*[ˈje]*l* ‘honey’, *ser*[ˈja]*l* ‘serial’, *rad*[ˈjo]*logo* ‘radiologist’, *prec*[ˈjo]*so* ‘pretty.ms’.[5] Roughly the same situation occurs in French: *bruit* [ˈbʁɥi] ‘noise‘, *nuit* [ˈnɥi]t ‘night’, *croire* [ˈkʁwaʁ] ‘to believe’, *trois* [ˈtʁwa] ‘three’, *rien* [ˈʁjɛ̃] ‘nothing’, *mien* [ˈmjɛ̃] ‘mine’, *soigner* [swaˈɲe] ‘to soothe’, *défié* [deˈfje] ‘to defy’, *confiance* [kõːˈfjãːs] ‘trust’. The Catalan tendency, thus, can be inscribed within a general glide formation propensity present in all Romance languages: among them, Catalan represents one of the most conservative varieties, French and Italian being the most innovative.[6]

As we mentioned, the prescriptive grammars of Catalan portray a systematic pronunciation of these sequences with hiatus. Yet, the following are two well-known exceptions where the pronunciation with a diphthong is almost systematic:

(a) When the high vowel constitutes the onset of the syllable: *iaia* [ˈjajə] ‘granny’, *iuca* [ˈjukə] ‘yucca’, *iode* [ˈjɔðə] ‘iodine’, *ioga* [ˈjɔɣə] ‘yoga’, *iogurt* [juˈɣur] ‘yogurt’, *ianqui* [ˈjaŋki] ‘yankee’, *noia* [ˈnɔjə] ‘girl’, *veiem* [bəˈjɛm] ‘look.1pl.Pr.Ind’, *joiós* [ʒuˈjos] ‘joyous’, *peuet* [pəˈwɛt] ‘foot.dim’, *cacauet* [kəkəˈwɛt] ‘peanut’, *reialme* [rəˈjalmə] ‘kingdom’. To our knowledge, there are few exceptions to this consistent pattern and all of them are bisyllabic words like *ió* [iˈo] ‘ion’, *IEC* [iˈɛk] (acronym of *Institut d’Estudis Catalans*), *hiat* [iˈat] ‘hiatus’.

(b) After a velar consonant ([k], [g], [ɣ]) the unstressed back vowel [u] is always a glide: *quasi* [ˈkwazi] ‘almost’, *quan* [ˈkwan] ‘when’, *guant* [ˈgwan] ‘glove’, *ungüent* [uŋˈgwen] ‘ointment’, *aigua* [ˈajɣwə] ‘water’, *qüestió* [kwəsˈtjo] ‘question’, *evacuar* [əβəˈkwa] ‘to evacuate’,

4. As Recasens (1991a: 155) points out, “it is very plausible to think that Castilian and French pronunciations have favored the tendency to glide formation through the existence of loanwords (*siesta* ‘siesta’, *travieso* ‘mischievous.ms’, …). This influence can be seen in the fact that generally traditional words without a parallelism in Castilian are pronounced with hiatus (*flabiol* ‘fife’, *oliós* ‘oily’), while other words with a clear Spanish correlate are often pronounced with diphthongs (*pacient* ‘patient.ms’, *nerviós* ‘upset.ms’, *acció* ‘action’).” [translated text].
5. As we will see in Section 4, despite the well-known anti-hiatus trend shown by the Spanish language, there are some residual contexts where exceptional hiatus appear. For a comprehensive descriptive study of “unexpected” hiatuses, cf. Hualde (1999) and Colina (1999).
6. Cf. section 4 for a comparison between Catalan and other Romance languages.

vàcua [ˈbakwə] ‘empty.fem’, *quatre* [ˈkwatrə] ‘four’, *quota* [ˈkwɔtə] ‘regular fee’, *guatlla* [ˈgwaʎʎə] ‘quail’, *quòrum* [ˈkwɔrum] ‘quorum’ (cf. also exceptions like *coet* [kuˈɛt] ‘rocket’, *coent* [kuˈen] ‘stinging, smarting’, *cuota* [kuˈɔtə] ‘tail.desp’ pronounced with hiatus).[7]

Similarly, postaccentual environments (*històr*[jə] ‘history’, *ingèn*[wə] ‘naïve.fem’, *sandàl*[jə] ‘sandal’, *Cecíl*[jə] ‘Cecily’, *misericòrd*[jə] ‘pity’ and derived nominal suffixes with *–ió* (*afirmac*[ˈjo] ‘statement’, *un*[ˈjo] ‘union’) have practically generalized the presence of a diphthong, as Fabra and Ballot already noticed in their grammars.

Even though prosody has been sporadically mentioned as one of the factors that might govern such diphthong/hiatus contrasts, it still has not been examined in a systematic fashion. One of the first pronouncements regarding the importance of foot structure in this process relates to the role word bisyllabicity has in ruling out glide formation. Recasens (1993:114) points out that bisyllabic words in Central Catalan “have been resistant to gliding whether or not the vocoid sequence belongs to the same morpheme.” Thus, items such as *tió* [tiˈo] ‘log’, *pioc* [piˈɔk] ‘sick’, *crioll* [kriˈɔʎ] ‘creole’, *miol* [miˈɔl] ‘mewl’, *miop* [miˈɔp] ‘short-sighted’, *du-al* [duˈal] ‘dual’, *fi-ar* [fiˈa] ‘to trust’, *ni-ar* [niˈa] ‘to nest’, *su-or* [suˈo] ‘sweat’ are almost always pronounced with two syllables, regardless of their morphological structure. Very clear evidence in favor of a productive bisyllabic enforcement in Catalan phonology is provided by the process of hypochoristic formation. The following proper nouns in (1) illustrate the fact that, whereas the base form usually contains a rising diphthong, its corresponding truncated form unexpectedly surfaces with hiatus (Cabré 1993: 118 ff, Cabré 1998: 15 ff).

(1) Hypochoristic Formation

Sebast[ˈja]	T[iˈa]
Concepc[ˈjo]	C[iˈo]
Encarnac[ˈjo]	C[iˈo]
Gabr[ˈjɛ]l	B[iˈɛ]l

7. These types of sequences have been considered underlying sequences /k^{w}/, /g^{w}/ by Wheeler (1979). In contrast with the back vowel, the front vowel [i] does not become glide obligatorily in this context (e.g., *quiosc* [kiˈɔsk]). The majority of exceptions can be explained by the presence of a morphological boundary between both vowels (cf. the contrasts *quota* [ˈkwɔtə] ‘regular fee’ vs. *cu-ota* [kuˈɔtə] ‘tail.desp’, *quasi* [ˈkwazi] ‘almost’ vs. *cu-assa* [kuˈasə] ‘tail.augm’). By contrast, the bisyllabicity of the loanword *coet* [kuˈɛt] ‘rocket’ might be attributed to several factors: presence of underlying /o/, morphological analogy with words with the diminutive morpheme *–et*, and finally, the influence of the Spanish pronunciation of *cohete* (pronounced [koˈete] ‘rocket’).

Dan[ˈjɛ]l	N[iˈɛ]l
Dam[ˈja]	M[iˈa]
Martir[ˈja]	T[iˈa]

Even though a few generalizations have been established, the remarkable degree of dialectal and inter-speaker variation present in the data have prevented authors from discovering the presence of clear patterns in one direction or another. In one of the latest monographs on the issue, Badia (2000) concludes that "it is practically impossible to systematize the contexts which favor a hiatus or a diphthong solution. The only thing we can do is to present some examples of each tendency taking into account stress facts, speech style and frequency of use" [translated text]. In this state of affairs, a broader empirical description of the data is needed to provide crucial clues as to why we find more resistance to gliding in certain environments and less in others.

3. New data on the issue

In order to better understand the conditions which favor and disfavor glide formation in sequences of unstressed high vowel + vowel, we administered a questionnaire with 357 common words and 24 nonsense words to 60 speakers of Central Catalan (The reader can find the complete questionnaire in the Appendix). The speakers ranged from ages 20 to 60, many of them being within the 20–25 range. All of them come from such places in the Central Catalan dialectal area as Barcelona, Berga, Ripoll, Manresa, Granollers, Igualada, Reus, to name a few. The speakers were asked to parse the target items into syllables according to their phonological intuitions. In general, speakers showed very clear intuitions about syllabification: a lexical item was always parsed with either a diphthong or a hiatus (not both) and only in some isolated cases were both solutions possible.

The lexical items included in the questionnaire covered the following six main types of prosodic configurations presented in (2). Note that the first vocoid in the sequence of two vocoids VV is always a high vowel. Also bear in mind that CV in parenthesis expresses syllable optionality, and optional complex onsets and codas are not represented. Finally, longer words were also included in the questionnaire and will be analized separately.

(2)

CVV́	(*miol* 'mewl', *dual* 'dual')
CVV́CV	(*diana* 'target', *jueva* 'Jewish.fem')
CVCVV́CV	(*moniato* 'sweet potato', *saviesa* 'wisdom')
CVCVV́	(*camió* 'truck', *enciam* 'lettuce')
CVVCV́ (CV)	(*diadema* 'diadem', *violí* 'violin')
(CV)CV́CVV	(*història* 'history', *llàntia* 'stain').

The table in (3) illustrates the general solutions adopted by the speakers in each of the main prosodic configurations under study (arranged from top to bottom according to the amount of exceptions to the general norm), together with the mean percentage of words that are in accordance with the general pattern and the standard deviation displayed by each group (SD, a measure of the dispersion of the data belonging to the same group). Results include the analysis of the data from the majority of interviewed speakers (50 out of 60), which we consider as belonging to the general variety. The rest of the speakers will be considered part of a more conservative variety because they generally produce words in groups 4 and 5 with a hiatus (see the table in (5)).

(3) General variety

Group	Prosodic type	General pronunciation	Mean percentage hiatus / diphthong %	Standard deviation %
1	m[iˈɔ]l ‘mewl’	hiatus	86,4	6,46
2	d[iˈa]na ‘target’	hiatus	85,2	7,5
3	d[iə]dema ‘diadem’	hiatus	73,65	14,55
4	savˈ[jɛ]sa ‘wisdom’	diphthong	67,2	11,69
5	camˈ[jo] ‘truck’	diphthong	67,6	11,3
6	històr[jə] ‘history’	diphthong	84,75	12,05

The results in the table reveal the existence of a clear contrast between words that fall into one of the first three groups (1, 2, 3) and the rest (4, 5, 6), separated in the table by a line. That is, even though they lexically admit a pronunciation with a diphthong, there is a very strong quantitative preference to pronounce the items in the first three groups with a hiatus (*t*[iˈo] ‘log’, *d*[iˈa]*na* ‘target’ and *d*[iə]*dema* ‘diadem’) and the last three with a diphthong (*sav*[iˈɛ]*sa* ‘wisdom’, *cam*[iˈo] ‘truck’, *històr*[jə] ‘history’). On the one hand, we find common lexical exceptions in each of the groups: for example, words containing *ie, ue* sequences are generally pronounced with a diphthong despite the fact that they belong to the first three groups (cf. *s*[ˈwɛ]*c* ‘Swedish.fem’, *c*[ˈjɛ]*ncia* ‘science’, *p*[jə]*tat* ‘pity’), as well as specific lexical items such as *tr*[ˈjo]*mf* ‘triumph’. We also find a certain degree of interspeaker variation: for example, even though the word *piano* ‘piano’ is generally pronounced with a hiatus (*p*[iˈa]*no*), there are a few speakers which pronounce it with a diphthong (*p*[ˈja]*no*). The standard deviation measures show the degree of normal variation found in each of the groups: for example, the fact that groups 1 and 2 display similar arithmetic means and an SD value of 6,46 % and 7,50 % respectively means that the two populations are not substantially different and that arithmetic means across speakers could vary within a 6–7 % range. We also contend that there is

a weak gradation in the resistance to glide formation that is directly reflected in the number of exceptions to the general norm: the number of exceptions progressively increases as we move down (or up) to the center of the table (1, 2 < 3; 4, 5 > 6); moreover, groups 3 to 6 are the ones displaying more degree of variation, as the SD measures indicate.

Even though some inter-speaker variation is found, the quantitative patterns that emerge from the questionnaire are strinkingly clear: words belonging to group 4 (cf. *clar*[ˈja]*na* 'clearing', *guard*[ˈjɔ]*la* 'money box', *tap*[ˈjɔ]*ca* 'tapioca', *ax*[ˈjo]*ma* 'axiom') or group 5 (cf. *cam*[ˈjo] 'truck', *jul*[ˈjɔ]*l* 'July', *av*[ˈja]*t* 'soon') show a very strong preference for a diphthong. The near-minimal pairs in (4) demonstrate the existing contrast between vocoid sequences appearing at the beginning of the word (left-hand columns) and vocoid sequences appearing in word-medial and word-final position (right-hand columns).

(4)

Word-initial		*Word-medial*	
f[iˈa]nça	'security'	conf[ˈja]nça	'trust'
b[iˈɔ]leg	'biologist'	rad[ˈjɔ]leg	'radiologist'
r[iˈɔ]ta	'laugh'	corr[ˈjɔ]la	'polley'
f[iˈa]ble	'trustworthy'	conf[ˈja]ble	'trustworthy'
r[iˈa]da	'flood'	barr[ˈja]da	'neighborhood'
c[iˈa]tica	'sciatica'	man[ˈja]tica	'picky.fem'
Word-initial		*Word-final*	
m[iˈɔ]l	'mewl'	pon[ˈjɔ]l	'plant species'
v[iˈa]l	'road'	triv[ˈja]l	'trivial'
d[iˈe]nt	'saying'	ad[ˈje]nt	'appropiate'
t[iˈo]	'log'	cam[ˈjo]	'truck'
C[iˈo]	'first name'	nac[ˈjo]	'nation'
n[iˈa]r	'to nest'	Dam[ˈja]	'Damian'

As we mentioned, 10 out of 60 speakers differed in the way they pronounced words belonging to groups 4 and 5, which were generally pronounced with hiatus. Speakers belonging to this conservative variety of Central Catalan are from peripheral towns such as Banyoles, Manresa, or Reus, and so are the older speakers from the Barcelona area (ages 50 and above). The table in (5) summarizes the main results of the conservative variety's group.

(5) Conservative variety

Group	Prosodic type	General pronunciation	Mean percentage hiatus / diphthong %	Standard deviation %
1	m[iˈɔ]l ‘mewl’	hiatus	86,25	5,35
2	d[iˈa]na ‘target’	hiatus	85,15	6,48
3	d[iə]dema ‘diadem’	hiatus	76,33	10,4
4	sav[iˈɛ]sa ‘wisdom’	hiatus	62,75	11,33
5	cam[iˈo] ‘truck’	hiatus	57,75	8,15
6	històr[jə] ‘history’	diphthong	80,25	8,6

As the Table in (5) shows, data from older generations and conservative varieties of Central Catalan pronounce with hiatus the majority of lexical items except for those words in the last group (separated by a line in the table above). Words belonging to groups 4 and 5 display a contrast between the conservative and the innovative variety (*sav*[ˈjɛ]sa vs. *sav*[iˈɛ]*sa* ‘wisdom; *cam*[ˈjo] vs. *cam*[iˈo] ‘truck’), as the examples in (6) illustrate. The rest of the groups are treated roughly in the same way by speakers from both varieties.

(6)

Conservative varieties	*Innovative varieties*	
mon[iˈa]to	mon[ˈja]to	‘sweet potato’
id[iˈo]ma	id[ˈjo]ma	‘language’
corr[iˈɔ]la	corr[ˈjɔ]la	‘polley’
barr[iˈa]da	barr[ˈja]da	‘neigborhood’
conf[iˈa]nça	conf[ˈja]nça	‘trust’
mar[iˈɛ]ta	mar[ˈjɛ]ta	‘ladybird’
sav[iˈɛ]sa	sav[ˈjɛ]sa	‘wisdom’
av[iˈo]	av[ˈjo]	‘airplane’
cam[iˈo]	cam[ˈjo]	‘truck’
jul[iˈɛ]l	jul[ˈjɔ]l	‘July’
enc[iˈa]m	enc[ˈja]m	‘lettuce’
fil[iˈa]l	fil[ˈja]l	‘filial’
com[iˈa]t	com[ˈja]t	‘farewell’
Dan[iˈɛ]l	Dan[ˈjɛ]l	‘Daniel’
lit[uˈa]na	lit[ˈwa]na	‘Lithuanian.fem’

The conservative varieties of Central Catalan strongly favor the presence of a hiatus both in stressed word-medial sequences (cf. *mon*[iˈa]*to* ‘sweet potato’, *clar*[iˈa]*na* ‘clearing’, *id*[iˈo]*ma* ‘language’, *lit*[uˈa]*na* ‘Lithuanian.fem’, *var*[iˈa]*ble* ‘variable’, *barr*[iˈa]*da* ‘neighborhood’, *man*[iˈa]*tic* ‘picky.ms’, *corr*[iˈɔ]*la* ‘pulley’) and stressed word-final sequences (cf. *cam*[iˈo] ‘truck’

jul[iˈɔ]*l* ‘July’, *av*[iˈa]*t* ‘soon’, *Dan*[iˈɛ]*l* ‘Daniel’, *Dam*[iˈa] ‘Damian’, *com*[iˈa]t ‘farewell’, *pon*[iˈɔ]*l* ‘plant species’). In fact, Oliva (1977), himself a speaker of a conservative variety, points out the contrast between *as*[iˈa]*tic* ‘Asian.ms’/ *Às*[jə] ‘Asia’ and *glor*[iˈɛ]*ta* ‘bower’/*glòr*[jə] ‘glory’ in his speech. The only systematic exception to this generalization occurs with words ending in nominal suffixes with [ˈjo] (*il·lus*[ˈjo] ‘dream’, *afirmac*[ˈjo] ‘statement’, *reflex*[ˈjo] ‘reflection’), revealing that some analogical pattern has probably played an important role in initiating such a tendency.[8]

In both dialects, general anti-diphthong environments (1, 2, 3) are those in word-initial position: *t*[iˈo] ‘log’, *m*[iˈɔ]*l* ‘mewl’, *b*[iˈa]*ix* ‘cross’, *d*[iˈa]*n-a* ‘target’, *d*[uˈa]*n-a* ‘custom’, *v*[iˈɔ]*l-a* ‘viola’, *d*[iˈa]*bl-e* ‘devil’, *d*[iə]*dema* ‘diadem’, *c*[iə]*nur* ‘cyanide’, *p*[uə]*sia* ‘poetry’. We might speculate that hiatuses in the groups 2 and 3 might have been kept due to morphological analogy (*v*[ˈiə] ‘road’ > *v*[iˈa]*ri* ‘road.adj’ > *v*[iə]*rany* ‘shortcut’; *r*[ˈiə] ‘stuary’ > *r*[iˈe]*ra* ‘stream’ > *r*[iə]*rol* ‘rivulet’) and might have been extended to other contexts by analogy through gradual lexical diffusion (*c*[iə]*nur* ‘cyanide’, *d*[iə]*dema* ‘diadem’), following the well-attested fact that lexical diffusion is very often conditioned by a phonological rationale (Kiparsky 1995). Yet, a compelling argument supporting the idea that synchronically we are dealing with an emerging prosodic pattern is the fact that word-initial hiatuses appear in many more examples than the ones related morphologically: in other words, it is not possible to find a paradigmatic explanation for the presence of hiatus in words such as *p*[iˈa]*no* ‘piano’, *b*[iˈɛ]*la* ‘connecting rod’, *j*[uˈe]*va* ‘Jewish.fem’, *d*[uˈa]*na* ‘custom’, *l*[iˈa]*na* ‘liana’, *d*[iˈa]*leg* ‘dialogue’, *d*[iə]*lecte* ‘dialect’, *d*[iə]*dema*, ‘diadem’, *c*[iə]*nur* ‘cyanide’, *p*[uə]*sia* ‘poetry’, among many others. We will argue that the greater phonological prominence of word-initial positions, which is quite common crosslinguistically, prevents the occurrence of glide formation in this context.

Distance of the vocoid sequence from the main word stress is another factor which conditions glide formation: the greater the distance, the greater the tendency to pronounce a diphthong. Even though a hiatus appears word-initially when the stress is located in the vowel next to the high vowel (*d*[iˈa]*leg* ‘dialogue’, *d*[iˈa]*ri* ‘newspaper’, *d*[iˈa]*metre* ‘diameter’) or one syllable to the right (*d*[iə]***frag****ma* ‘diaphragm’, *c*[iə]*nur* ‘cyanide’, *d*[iə]*g****nòs****tic* ‘diagnose’, d[iə]***gra****ma* ‘diagram’), once the stress moves further to the right the same sequence is pronounced with a diphthong (*d*[jə]*go****nal*** ‘diagonal’, d[jə]cro**ni**a ‘diachrony’, *c*[jə]*nu****rat*** ‘cyanide’, *d*[jə]*pa****só*** ‘diapason’, *d*[jə]*posi****ti****va* ‘slide’).

8. Oliva (1977) also points out the effect of preceding *s* on glide formation: he notes the contrast between *acc*[ˈjo] ‘action’, *dicc*[ˈjo] ‘diction’ and *ficc*[ˈjo] ‘fiction’ (parsed in two syllables) with *av*[iˈo] ‘airplane’, *cam*[iˈo] ‘truck’ and *mun*[iˈo] ‘quantity’ (parsed in three syllables).

The productivity of such pattern can be seen in (7) – the stressed syllable is marked in boldface:

(7)				
	d[iˈa]leg 'dialogue'	d[iə]**lo**ga 'engage-in- -dialogue.3sg.Pr.Ind'	d[jə]lo**gar** 'engage-in- -dialogue.Inf'	d[jə]loga**ré** 'engage-in- -dialogue.1sg.Fut'
	d[iˈa]ble 'devil'	d[iə]**bò**lic 'diabolical'	d[jə]bo**lis**me 'satanism'	d[jə]boli**cal** 'diabolical'
	v[iˈɔ]la 'viola'	v[iu]**lí** 'violin'	v[ju]li**nis**ta 'violinist'	v[ju]lonce**lis**ta 'cellist'
	d[uˈa]l 'dual'	d[uə]**lis**ta 'dualist'	d[wə]li**tat** 'duality'	d[wə]litza**ció** 'dualisation'
	p[iˈa]lno 'piano'	p[iə]**nis**ta 'pianist'	p[jə]ne**jar** 'play-the-piano. Inf'	p[jə]neja**rà** 'play-the- piano.3sg.Fut'

Finally, one of the most favoring environments of gliding (and historically one of the first to trigger glide formation) is a word-final postaccentual syllable in words such as *històr*[jə] 'history', *justíc*[jə] 'justice', *ingèn*[wə] 'naïve.fem', *àv*[jə] 'grandmother'.[9] As we have seen before (cf. Ballot's grammar), we have evidence for penultimate stress in these words from the XVIIth century onwards. Glide formation in this context can be easily explained by the strong prosodic preference for trochaic feet (and the avoidance of antepenultimate stress) shown by the Catalan language: *històr*[iə] > *històr*[jə] 'history'; *àv*[iə] > *àv*[jə] 'grandmother'. To our knowledge, all varieties (and speakers of all ages) have practically generalized the presence of a diphthong in these environments. Yet, even though hiatuses are strongly dispreferred in postaccentual environments, the sequence /uV/ is somewhat less prone to contract (cf. *vàl*[uə] 'worth', *fàt*[uə] 'fatuous.fem', *pèrd*[uə] 'loss').[10]

The presence of rising diphthongs in Catalan seems to be strongly controlled at the foot level rather than at the syllable level. Evidence that syllable structure does not play a substantial role in gliding comes from examples showing that the structure of the onset or the rhyme is irrelevant for this process. Even though Bonet and Lloret (1998: 63–64) list some words that apparently show

9. Majorcan and Roussillon Catalan have resolved such historical antepenultimate stress patterns by deleting the final vowel: *història* → *histori* 'history', *família* → *famili* 'family'.

10. Badia i Cardús (2000: 81) also points out that "in words with postaccentual *u*, glide formation is less frequent than with postaccentual *i*; thus, hiatus is maintained in the former case, especially in words shorter than four syllables." [translated text]

that complex onsets block glide formation (*cr*[iə]*tura* 'creature', gr[iˈa]l 'grail', *Adr*[iˈa]*na* 'Adriana', *afl*[uˈe]*nt* 'tributary', *vidr*[iˈe]*ra* 'stained-glass window'), this tendency is subject to variation and tends not to occur in cases where gliding is independently motivated. The examples in (8) show how glide formation of word-final sequences is not blocked by the presence of complex onsets[11] (cf. also word-medial cases such as *patr*[ju]*tisme* 'patriotism', *segr*[jə]*nenc* 'from the Segrià region', *calandr*[ˈjɛ]*ta* 'calandra lark.dim').

(8)

Penultimate stress		Final stress	
pàtr[jə]	'homeland'	cambr[ˈja]	'Cambrian'
calàndr[jə]	'calandra lark'	ampl[ˈja]r	'to expand '
síndr[jə]	'watermelon'	amfitr[ˈjo]	'host'
galipàndr[jə]	'illness'	repatr[ˈja]r	'to repatriate'
sòbr[jə]	'temperate fem.'	alexandr[ˈja]	'Alexandrine'
Calàbr[jə]	'Calabrian'	Adr[ˈja]	'Adrian'
èbr[jə]	'drunk.fem.'	Segr[ˈja]	'Catalan region'
pètr[jə]	'stony.fem.'	embr[ˈjo]	'embryo'
indústr[jə]	'industry'		
àmpl[jə]	'broad.fem'		
panòpl[jə]	'panoply'		
bíbl[jə]	'Bible'		

Despite the general tendencies reported so far, it should be noted that the hiatus/rising diphthong lexical distribution in Central Catalan is subject to a certain degree of inter-speaker variation. Segmental factors might play a role, albeit a minor one, in the diphthong/hiatus contrasts under discussion. In fact, we have already made note of how after velar consonants, the back vowel [u] is always a glide: *quasi* [ˈkwazi] 'almost', *guant* [ˈgwan] 'glove', *ungüent* [uŋˈgwen] 'ointment'. Even though such segmental factors are not very well-known, Oliva (1977) and Recasens (1993: 115 ff) note that the incompatibility between articulatory gestures might be the main reason behind the presence of hiatus after consonants such as [r] or [l]. Yet, even though syllable-initial [r] and [l] have been singled out as one of the strongest hiatus-favoring environments, this tendency is not maintained in word-final position, as is shown in (9) (cf. also *aliena* 'alien.fem.', *Juliana* 'Juliana').[12] In other words, in both varieties words generally behave depending on the prosodic pattern of the word, regardless of syllabic and segmental factors.

11. You must keep in mind that words in group 5 are pronounced in hiatus in conservative varieties.
12. As Hualde (1999) points out, "it appears that hiatus is specially favored after word-initial [r] (cf. r[iˈe]l)."

(9)

Penultimate stress		Final stress	
fèrr[jə]	'ferrous.fem'	arr[ˈja]	'Arian'
púrr[jə]	'rabble'	Sarr[ˈja]	'place name'
fanfàrr[jə]	'bluster'	sarr[ˈjo]	'small basket'
sàrr[jə]	'large basket'	morr[ˈjo]	'muzzle'
tírr[jə]	'hate'	fil[ˈja]l	'filial'
bandúrr[jə]	'bandurria'	austral[ˈja]	'Australian.ms'
Cecíl[jə]	'Cecily'	ital[ˈja]	'Italian.ms'
Èl[jə]	'first name'	jul[ˈjɔ]l	'July'
Eulàl[jə]	'first name'	mil[ˈjo]	'million'

Despite the clear prosodic tendencies identified so far, we also noticed the existence of analogical pressures. Most words with a sequence *ie* and *ue* have a diphthong (cf. *s*[ˈwɛ]*c* 'Swedish.ms', *d*[ˈwɛ]*l* 'duel', *qu*[ˈje]*t* 'calm.ms', *s*[ˈwɛ]*ter* 'sweater', *c*[ˈjɛ]*ncia* 'science', *p*[jə]*tat* 'pity' or *V*[ˈjɛ]*na* 'Vienna'). In this case, the Spanish historical diphthongs class [je, we] might be acting as a lexical attractor in the speakers' decisions about syllabification through the Spanish loanwords present in the Catalan lexicon. At any rate, further research is needed in order to determine the extent to which segmental subregularities might play a role in this process.

In sum, the above data has made manifest that the prosodic configuration of the word plays a very substantial role in guiding Catalan speakers decisions on glide formation. Yet, we still can wonder whether Catalan speakers' have generalized such prosodic patterns and apply them regularly to borrowings or to nonce words. The results of the questionnaire with nonsense words basically give us a positive answer to this question: the fact that the same prosodic patterns emerge in the pronunciation of nonce words reveals that speakers must have a productive knowledge of such prosodic patterns and that they use them actively in the pronunciation of new items. Even though the process of glide formation of rising sonority sequences might have been initially conditioned by a complex amalgam of phonological, morphological and lexical attractors, this phenomenon has evolved into a process strongly conditioned by prosodic structure. Nevertheless, it is also clear that we cannot speak of complete categorical regularity but rather of strong quantitative preferences.

3.1. The role of morphological analogy

Let us now examine the role of paradigm uniformity in the diphthong/hiatus distribution in sequences of rising sonority, a tendency which is very strongly settled in the case of sequences of falling sonority (see Section 2). Does the presence of a high stressed vowel in a morphologically-related word favor a

pronunciation with a hiatus? Is it the case that the presence of morphological boundaries blocks glide formation? The examples in (10) show that vowel contraction into a diphthong is quite systematic across morpheme boundaries separating nominal suffixes such as *-ant*, *-ent*, *-al*, *-ació*, provided that such sequences are located in diphthong-favoring prosodic environments (cf. previous section): *rad*[ˈja]*nt* 'radiant', *pac*[ˈje]*nt* 'pacient.ms', *soc*[ˈja]*l* 'social', *med*[jə]*ció* 'mediator'. Not surprisingly, the only cases surfacing with a hiatus in the general variety correspond to word-initial examples: *d*[u.ˈa]*l* 'dual', *r*[i.ˈe]*nt* 'laughing' (cf. the contrast between *d*[i.ˈe]*nt* 'saying' and *obed*[ˈje]*nt* 'obedient'). The situation in the conservative variety follows the same pattern: that is, morpheme boundaries do not block glide formation and glides appear whenever the prosodic requirements of the dialect are met.

(10)

-ant		*-ent*	
conferenc[ˈja]nt	'speaker'	recip[ˈje]nt	'recipient'
negoc[ˈja]nt	'business man'	conven[ˈje]nt	'suitable'
comerc[ˈja]nt	'trader'	defic[ˈje]nt	'defficient'
rad[ˈja]nt	'radiant'	somr[ˈje]nt	'laughing'
comed[ˈja]nt	'commedian'	nutr[ˈje]nt	'nutrient'
estud[ˈja]nt	'student'	infl[ˈwe]nt	'influent'
princip[ˈja]nt	'beginner'	fur[ˈje]nt	'infuriating'
var[ˈja]nt	'variant'	contrib[ˈwe]nt	'tax payer'
asfix[ˈja]nt	'suffocating'	obed[ˈje]nt	'obedient'
aten[ˈwa]nt	'extenuating'	exped[ˈje]nt	'expedient'

-al		*-ació*	
col·loqu[ˈja]l	'colloquial'	humil[jə]ció	'humiliation'
rac[ˈja]l	'racial'	diferenc[jə]ció	'differentiation'
ofic[ˈja]l	'official'	med[jə]ció	'measurement'
inic[ˈja]l	'initial'	act[wə]ció	'performance'
credenc[ˈja]l	'credential'	deprec[jə]ció	'depreciation'
soc[ˈja]l	'social'	concil[jə]ció	'conciliation'
celest[ˈja]l	'celestial'	ampl[jə]ció	'expansion'
rad[ˈja]l	'radial'	var[jə]ció	'variation'
mater[ˈja]l	'material'	sit[wə]ció	'situation'
histor[ˈja]l	'record'	aval[wə]ció	'evaluation'

Similarly, the feminine marker *-a* does not prevent gliding from applying (*tebi* [ˈtɛβi] 'tepid.ms' / *tèbi-a* [ˈtɛβjə] 'tepid.fem', *fictici* [fikˈtisi] 'fictitious.ms'/ *fictíci-a* [fikˈtisjə] 'fictitious.fem'). This behavior contrasts strongly with that of falling diphthongs. The minimal pairs in (11) show that in falling sonority sequences a hiatus systematically appears whenever there is an intervening verbal morpheme boundary between the two vowels: whereas words in the left-hand

column are pronounced with a diphthong (*conreu* [kunˈrɛw] ‘cultivation’), the verbal morpheme boundary present in words in the right-hand column gives rise to a hiatus (*conre-o* [kunˈrɛ.u] ‘to cultivate.1sg.Pr.Ind’).[13]

(11)	esplai ‘playtime’	[əsˈplaj]	espla-ï ‘relax.1sg.Pr.Subj’	[əsˈplai]
	menyspreu ‘contempt’	[mɛnʃˈprɛw]	menyspre-o ‘despise.1sg.Pr.Ind’	[mɛnʃˈprɛu]
	esquiu ‘shy.ms’	[əsˈkiw]	esqui-o ‘to ski.1sg.Pr.Ind’	[əsˈkiu]
	conreu ‘cultivation’	[kunˈrɛw]	conre-o ‘cultivate.1sg.Pr.Ind’	[kunˈrɛu]

The contrast between sequences of rising vs. falling sonority can be clearly observed with the behavior of derivational suffixes such as *-ador* and *-idor*. Sequences of rising sonority systematically become diphthongs across an intervening morphological boundary (cf. *inic*[jə]*dor* ‘initiator’, *som*[jə]*dor* ‘dreamer’) despite the fact that correspondent high vowels are stressed underlyingly (cf. *inic*[ˈi]*o* ‘initiate.1sg.Pr.Ind’, *som*[ˈi]*o* ‘dream.1sg.Pr.Ind’). By contrast, sequences of falling sonority are pronounced with hiatus under the same circumstances (cf. *poss*[ə.i]*dor* ‘owner’, *esfer*[ə.i]*dor* ‘frightening’).[14]

(12)	Rising sonority sequences		Falling sonority sequences	
	-ador		*-idor*	
	inic[jə]dor	‘initiator’	esbal[əi]dor	‘frightening’
	negoc[jə]dor	‘negotiator’	esv[əi]dor	‘vanish’
	med[jə]dor	‘mediator’	succ[əi]dor	‘following’
	histor[jə]dor	‘historian’	esfer[əi]dor	‘frightening’
	concil[jə]dor	‘conciliatory’	poss[əi]dor	‘owner’
	som[jə]dor	‘dreamer’	esmort[əi]dor	‘softening’
	canv[jə]dor	‘dressing room’	env[əi]dor	‘invading’

The presence of a stress in other paradigm forms is not relevant for glide formation in rising sonority sequences. The verbal forms in (13) convincingly

13. Even though the word-final vowel *-u* in words of the left-hand column was historically a masculine gender marker [u] (cf. Mascaró 1985: 97–98), we consider these vowels to belong to the morphological root in the synchronic phonology of Catalan. In the diminutive form with [-ˈɛt], for example, this vowel appears systematically: *conreuet* ‘cultivation.dim’, *museuet* ‘museum.dim’, *preuet* ‘price.dim’.
14. Indeed, systematic exceptions to glide formation across morpheme boundaries were word-initial sequences such as *fiador* ‘sponsor’, *guiador* ‘guide’, *nuador* ‘person who knots’, *criador* ‘breeder’, *oïdor* ‘hearer’ or *suador* ‘person who sweats’.

demonstrate that the presence of a hiatus in a word of the same verbal paradigm is completely irrelevant with regards to syllabification of such vocoid sequences. Thus, the following verbs systematically surface with a diphthong regardless of the fact that they all have morphologically related forms with a high stressed vowel (cf. aval[ˈu]o ‘evaluate 1sg.Pr.Ind.’ vs. aval[ˈwa]r ‘evaluate Inf.’, canv[ˈi]o ‘change 1sg.Pr.Ind.’ vs. canv[ˈja]r ‘to change Inf.’).

(13)

conf[ˈi]o ‘trust.1sg.Pr.Ind’	conf[ˈja]r ‘trust.Inf’	conf[jə]ré ‘trust.1sg.Fut’	conf[jə]ria ‘trust.1-3sg. Cond’
estalv[ˈi]o ‘save.1sg.Pr.Ind’	estalv[ˈja]r ‘save.Inf’	estalv[jə]ria ‘save.3sg.Cond’	estalv[ˈja]va ‘save.3sg. Imp.Pst’
od[ˈi]ï ‘hate.1sg.Pr.Subj’	od[ˈja]r ‘hate.Inf’	od[jə]ré ‘hate.3sg.Fut’	od[jə]ria ‘hate.3sg. Cond’
assoc[ˈi]o ‘associate.1sg. Pr.Ind’	assoc[ˈja]r ‘associate.Inf’	assoc[jə]ré ‘associate.3sg. Fut’	assoc[jə]ria ‘associate.3sg. Cond’
insin[ˈu]o ‘insinuate.1sg. Pr.Ind’	insin[ˈwa]r ‘insinuate.Inf’	insin[wə]ré ‘insinuate.3sg. Fut’	insin[ˈwa]va ‘insinuate.3sg. Imp.Pst’
contin[ˈu]o ‘continue 1sg Pr.Ind’	contin[ˈwa]r ‘continue.Inf’	contin[wə]ria ‘continue.3sg. Cond’	contin[ˈwa]va ‘continue.3sg. Imp.Pst’
aval[ˈu]i ‘evaluate.1sg. Pr.Subj’	aval[ˈwa]r ‘evaluate.Inf’	aval[wə]ré ‘evaluate.3sg. Fut’	aval[wə]ria ‘evaluate.3sg. Imp.Pst’
efect[ˈu]i ‘carry out 1sg Pr.Subj’	efect[ˈwa]r ‘carry out.Inf’	efect[wə]ré ‘carry out.3sg Fut’	efect[ˈwa]va ‘carry out.3sg. Imp.Pst’

In sum, in Catalan morphological and analogical principles play no substantial role on the general distribution of rising diphthongs and hiatuses in the lexicon. In fact, some apparent ‘exceptions’ to glide formation across morpheme boundaries can be easily accounted for by resorting to the initial position effect mentioned in the preceding section: *s*[u.ˈa]*r* ‘to sweat’, *n*[u.ˈa]*r* ‘to tie’, *f*[i.ˈa]*r* ‘to trust’, *cr*[i.ˈa]*r* ‘to raise’, *tr*[i.ˈa]*r* ‘to choose’, *gu*[i.ˈa]*r* ‘to guide’, *n*[i.ˈa]*r*

'to nest'. Also, some speakers of the innovative variety pronounce some verbal forms with hiatus even though we would expect them to be pronounced with diphthongs: *env*[i.ˈa]*r* 'to send', *at*[i.ˈa]*r* 'to poke a fire', *destr*[i.ˈa]*r* 'to separate', *arr*[i.ˈa]*r* 'to tow', *grad*[u.ˈa]*r* 'to grade', *esqu*[i.ˈa]*r* 'to ski', *esp*[i.ˈa]*r* 'to spy'. We suggest that these isolated cases are reflecting a previous historical stage similar to the one found in conservative varieties (cf. *cam*[i.ˈo] 'truck').

4. The behavior of Spanish

Sequences of unstressed high vowel plus vowel have tended to contract as diphthongs in all Romance languages. French and Italian, for example, display a systematic tendency to diphthongize even in word-initial position (Fr. *rien* [ˈɹjɛ̃] 'nothing', *soigner* [swaˈɲe] 'to soothe', It. *diàvolo* [ˈdjavolo] 'devil', *fiasco* [ˈfjasko] 'fiasco'; cf. Tranel 1987, Saltarelli 1970).[15] Portuguese rising diphthongs are said to alternate with hiatus realizations in all contexts, and, to our knowledge, possible restrictions on semivocalization have not been examined (Mateus and Andrade 2000; Vigário and Frota, p.c.).[16] Thus, glide formation seems possible in word-initial position, as well as in word-internal and word-final position: *real* [ˈʁjaɬ] 'royal', *pior* [ˈpjɔɾ] 'worst', *mioma* [ˈmjomɐ], *frieza* [ˈfɾjezɐ] 'cold'. Finally, in Romanian, heterosyllabic sequences are still lexical hiatus (*ital*[iˈa]*na* 'Italian.fem', *f*[iˈa]*sco* 'fiasco', *s*[iˈe]*sta* 'nap'), although they can be reduced to diphthongs in rapid speech. As in Portuguese, factors that determine the likelihood of reduction into diphthong in different types of words remain to be investigated (Chitoran 2001, Chitoran and Hualde 2002).

Hualde (p.c.) notes that the strength of the tendency to onglide formation appears to depend in part on the prior existence and frequency of historical diphthongs coming from the "breaking" of mid vowels, which act as 'lexical attractors' within the lexicon. Even though this effect is quite clear in Italian and French (cf. *bonu* > It. *b*[wo]*no*, Sp. *b*[we]*no* 'good'; *pede* > Fr. *p*[je]*d*

15. In French, the only systematic exception to glide formation is due to a special segmental restriction which disallows a glide after a complex onset composed of a stop or a fricative followed by a liquid. For instance, *lou-er* 'to rent' is pronounced [ˈlwe] but *clou-er* 'to nail' is pronounced [kluˈe]; and *li-er* 'to tie' is pronounced [ˈlje] but *pli-er* 'to fold' [pliˈe] (cf. Kaye and Lowenstamm 1984: 137). In Italian, some studies have reported the existence of paradigmatic effects, that is, hiatus may be maintained if a related word has the stress on the high vowel). For instance, there is a contrast between *sp*[ja]*nti* 'you unroot' (< *splantare) and *sp*[i.a]*nti* 'people who spy' because of [spía] 'spy' (cf. Hualde and Prieto 2002 for more references).

16. Sónia Frota and Marina Vigário (p.c.) point out that morphological boundaries and distance from stress do not seem to matter (i.e., words belonging to these groups can be pronounced either with hiatus or diphthong). Yet, they note that a diphthong is less accepted in posttonic position (*familia* 'family').

> Sp. *p*[je] 'foot'), the fact that Catalan (which did not develop such diphthongs) and Peninsular Spanish (with the historical diphthongs [je] and [we]) share a similar scenario indicates that the presence of historical diphthongs has not been a necessary condition for the spreading of glide formation within the lexicon.

The distribution of rising diphthong vs. hiatus found in Peninsular Spanish is strikingly similar to the situation of the innovative variety of Catalan reported in this article. The table in (14) summarizes the main correspondences between Spanish and Catalan (for more references, see Hualde 1999, Colina 1999).

(14)

	Catalan (innovative variety)	Peninsular Spanish
Word-bisyllabicity effects	**yes** (J[uˈa]n 'John', m[iˈɔ]l 'mewl')	**no** (J[ˈwa]n 'John', D[ˈjo]s 'God')
Word-initial effects	**yes** (b[iˈɔ]leg 'biologist' vs. rad[ˈjɔ]leg 'radiologist')	**yes** (b[iˈo]logo 'biologist' vs. rad[ˈjo]logo 'radiologist')
Distance-from-stress effects	**yes** (d[iə]loga 'engage-in-dialogue.3sg.Pr.Ind' vs. d[jə]logar 'engage-in-dialogue.Inf)	**yes** (d[ia]fragma 'diaphragm' vs. d[ja]me.tral 'diametral')
Paradigm uniformity effects	**no** (contin[ˈuə] 'continue.Inf' vs. contin[ˈwɛ]m 'continue.1pl.Pr.Ind')	**yes** (contin[ˈua] 'continue.Inf' vs. contin[uˈa]mos 'continue.1pl.Pr.Ind')
Morpheme-boundary effects	**no** (respect[ˈwo]s 'respectful.ms', man[ˈwa]l 'manual')	**yes** (respet[uˈo]so 'respectful.ms', man[uˈa]l 'manual')

Spanish displays a clear preference to have hiatuses word-initially. Lexical hiatuses are extremely frequent in word initial position in Castilian Spanish (*p*[iˈa]*no* 'piano', *cl*[iˈe]*nte* 'client', *r*[iˈe]*l* 'track', *r*[iˈe]*ndo* 'laughing', *d*[iˈu]*rno* 'diurnal'; cf. Hualde 1999, Chitoran and Hualde 2002). Hualde asks himself:

> What could be the reason for this preference for hiatus in initial position, which goes against the general 'anti-hiatus' preference in the language? Here I must confess ignorance. It could be that there is some phonetic or other reason for it, having to do, for instance, with articulatory ease or with parsing. Or, on the

> contrary, the reason could be an accident of lexical distribution, starting from a small bias in this direction and progressively the strong becoming stronger. (Hualde 1999)

One of the differences with Catalan, though, is the non-observance of the minimal binarity effect (cf. Cat. *miol* [miˈɔl] 'mewl' vs. Span. *Dios* [ˈdjos] 'God'). Distance-to-stress effects have also been reported in Spanish. As Hualde (1999) points out:

> [I]n hiatus words, the stress always falls either on the second vowel in hiatus or in the following syllable, but not further to the right. Thus there is *d*[iˈa]*blo* 'devil', *d*[iˈa]*metro* 'diameter', *d*[ia]*fragma* 'diaphragm', but *d*[ja]*gonal* 'diagonal', *d*[ja]*pasón* 'scale' and even *d*[ja]*metral* 'diametral'.

Spanish glide formation shows sensitivity to morpheme boundaries and paradigm effects. A rising sonority sequence is usually pronounced with hiatus if there is an intervening suffix boundary such as *-oso* or *-al* (*respet*[uˈo]*so* 'respectful.ms', *virt*[uˈo]*so* 'virtuous', *man*[uˈa]*l* 'manual', *punt*[uˈa]*l* 'punctual') – cf. Hualde (1999) –. Similarly, a stressed high vowel in the morphological paradigm favors a hiatus. As Navarro Tomás (1948: 159) points out:

> [A]nalogy favors the presence of a hiatus, especially in verbal forms where in the same paradigm one finds cases of stressed *i, u*: *fiar* 'to trust', *fianza* 'security' (*fían* 'trust.3pl.Pr.Ind'); *guiaba* 'guide.3sg.Pst.Imp' (*guía* 'guide'); *liamos* 'tie.1pl.Pr.Ind' (*lías* 'tie.2sg.Pr.Ind'); *acentuar* 'to stress' (*acentúo* 'stress.1sg. Pr.Ind'), *actuamos* 'perform.1pl.Pr.Ind' (*actúan* 'perform.3pl.Pr.Ind'), etc.

In sum, even though Spanish represents a more advanced stage of glide formation, it shows sensitivity to the same prosodic constraints, that is, preference for hiatus word-initially (*b*[iˈo]*logo* 'biologist' vs. *rad*[ˈjo]*logo* 'radiologist') and distance-to-stress effects (*d*[ia]*fragma* 'diaphragm' vs. *d*[ja]*metral* 'diametral'). The two languages differ with regards to the effects of paradigm uniformity, sensitivity to morpheme boundaries and the lack of enforcement of word bisyllabicity (*D*[ˈjo]*s* 'God', *J*[ˈwa]*n* 'John'). Also, if we compare it to the conservative variety of Catalan, Spanish shows a lack of hiatus in word-medial and word-final contexts (*pers*[ja]*na* 'blind', *cam*[ˈjo]*n* 'truck').

5. An OT analysis of the data

The data reviewed in the preceding sections has made manifest that the choice between a hiatus or a rising diphthong in Catalan lexical sequences is to a significant extent guided by prosody. We claim that glides in sequences of rising sonority are derived from vowels and surface as the result of the interaction

between a set of prosodic constraints.[17] By contrast, postvocalic glides inside a morpheme are considered glides underlyingly and thus will not be subject to the same constraints that are applied to rising sonority sequences (e.g., *peu* [ˈpɛw] 'foot', *boin-a* [ˈbɔjnə] 'beret'). With regards to the position of prevocalic glides within the syllable structure, our data does not offer any conclusive arguments favoring any particular affiliation of the glide to the onset or to the nucleus. Since its position within the syllable is not a crucial assumption of our analysis, we will leave this question open.[18]

5.1. Prosodic enforcement of prosodic patterns

Glide formation is triggered by a general instantiation of the Onset Principle. Within OT, ONSET expresses the general prosodic restriction that every syllable must have an onset and motivates the strong preference for CV syllables rather than V syllables. To express the fact that only high vowels become glides in this context (cf. *avions* [əˈβjons] 'airplanes' vs. *oceans* [useˈans] 'oceans'),

17. The phonemic or derived status of prevocalic glides in Catalan has been a matter of discussion in Catalan phonology. For example, Wheeler (1979: 198) argues for a phonemic status of glides; for Bonet and Lloret (1998: 179) all glides are phonemic and depend on the speaker's pronunciation:

> There are contexts in which [j], [w] never alternate with their corresponding vowels: *aire* [ˈajrə] 'air', *noi* [ˈnɔj] 'boy', *quaresma* [kwəˈrɛzmə] 'Lent', *deia* [ˈdɛjə] 'say.3sg.Imp.Pst', *iambe* [ˈjambə] 'iamb', *nació* [nəˈsjo] 'nation' (in many Catalan varieties), etc. In these cases we assume we have a glide underlyingly /j/ o /w/ (thus, the underlying form of a word such as *nació* 'nation' would be /na'sjon/. In cases where there is variation across dialects or speakers between a glide and a vowel, we assume that underlying forms also can vary depending on the speaker. Thus, a word like *diana* 'target' has the underlying form /diˈan+a/ for those speakers which systematically pronounce [diˈanə] and the underlying form /ˈdjana/ for those speakers which systematically pronounce [ˈdjanə]. [translated text]

Other analyses argue that underlying high vowels /i/, /u/ become glides under some prosodic restrictions unless they are marked as nucleus (Serra 1996) or [+ stress] (Jiménez 1999).

18. Bonet and Lloret (1998: 63–64) and Jiménez (1999: 68) assume that they are part of the onset because of the tendency of complex onsets to prevent glide formation from applying (*Adr*[iˈa]*na* 'Adriana', *afl*[uˈe]*nt* 'tributary', *vidr*[iˈe]*ra* 'stained-glass window'. Yet, as we mentioned before, this tendency is subject to variation and tends not to be active in cases which can be prosodically motivated: *àmpl*[jə] 'broad.fem', *indústr*[jə] 'industry', *pàtr*[jə] 'homeland', *patr*[ju]*tisme* 'patriotism', *segr*[jə]*nenc* 'from the Segrià region', *calandr*[ˈjɛ]*ta* 'calandra lark.dim', *alexandr*[ˈja] 'Alexandrine', *amfitr*[ˈjo] 'host'. In Spanish it is generally assumed that the prevocalic glides are part of the nucleus (cf. Hualde 1991). As Harris (2000) point out "prevocalic glides form a complex nucleus when preceded by a less sonorous segment: s[C n[GV]…]." One of the main arguments in favor of this assumption is the fact that antepenultimate stress is ruled out if the penultimate has a branching rhyme: **Venézwela*, **Marácaibo*, **Salámanca*. In Spanish, [w] and [j] easily coocur with complex onsets: *prueba* 'proof', *Prieto* 'family name', *pliegue* 'fold'.

we assume that the restriction against having high vowels in the margins of the syllable (*M/V$_{[+high]}$) is dominated by ONSET, while the restriction against having non-high vowels in the margins (*M/V$_{[-high]}$) dominates the constraints just mentioned (cf. Jiménez 1999, Serra 1996, Wheeler forthcoming for similar strategies). This explains the stronger resistance displayed by low vowels to become glides, even under syllabic pressure. The tableau in (15) shows that the ranking *M/V$_{[-high]}$ > ONSET > *M/V$_{[+high]}$ correctly predicts the optimal output *av*[ˈjo]*ns* (pronounced with a diphthong) vs. *oc*[eˈa]*ns*. Even though we are aware that syllable and metrical structure are constructed in parallel and also might interact with the constraints presented in this section, we are not dealing with the constraints which assign metrical structure and stress and will just assume that they are already present in our input form.[19] Input forms are shown in orthographical form with morphological barriers.

(15) oceˈan+s

	Candidates	*M/V$_{[-high]}$	ONSET	*M/V$_{[+high]}$
☞	oc[eˈa]ns		*	
	oc[ˈe͡a]ns	*!		

aviˈon+s

	Candidates	*M/V$_{[-high]}$	ONSET	*M/V$_{[+high]}$
	av[iˈo]ns		*!	
☞	av[ˈjo]ns			*

This set of ordered constraints explains the preference for an unstressed high vowel followed by another vowel to become a glide in the phonetic form. In fact, as we have seen in Section 3, this tendency is quite systematic in all contexts except when we are dealing with the first mora of the word. We will argue that the greater phonological salience of word-initial positions, which is quite pervasive crosslinguistically, is preventing the occurrence of glide formation.[20] We express this fact through a faithfulness constraint (MAX$_{INIT_\mu}$) which requires every word-initial input mora to have an output correspondent.[21] In

19. As one of the reviewers points out, we should make clear that the majority of evaluation tableaux perform classical input-to-output evaluation procedures. Only later in the paper we will find some output-to-output comparisons in order to explain interspeaker variation and for uniformity in the case of the [sjo] pattern.
20. In European Portuguese, there are two kinds of prominences that can be assigned to prosodic word initial positions: either an emphatic stress or a secondary prominence. In case one of these two kinds of prominence is assigned, semivocalization is blocked from applying and thus VV is not realized as GV (Frota and Vigário, p.c.). For more information about such prominences in European Portuguese, see Vigário (2001).
21. The Faithfulness constraint MAX$_{INIT_\mu}$ can be understood as a condition within the family of Positional Faithfulness Constraints which refer to a prosodically derived categories. These

languages such as Catalan or Spanish, the greater secondary prominence of the word-initial syllable can be observed in the assignment of rhythmic stresses: while secondary stresses are assigned in alternating syllables (*ènveríno* 'poison.1sg.Pr.Ind', *ènverìnaménт* 'poisoning'), there is a possibility of a ternary interval for odd-syllable words (*envèrinár* or *ènverinár* 'to poison') (cf. Oliva 1992 for Catalan, Harris 1983 for Spanish). The phenomenon of getting a foot at the left edge of the word in languages that otherwise assign stress from the end of the word is called the "initial dactyl effect" and is quite common, being found in English, Indonesian or Polish (cf. Hayes 1995, Kenstowicz 1996). Moreover, phonetic studies about secondary prominences in Catalan and Spanish reveal that the first rhythmic stress in the word is the one with a stronger phonetic expression (Prieto and van Santen 1996; Prieto 2003). Similarly, the presence of optional emphatic demarcative stresses, which are almost always placed at the beginning of the word, is also revealing the prominent role of word-initial positions.

The greater prosodic prominence of word initial positions might be rooted in articulatory contraints on gestural dynamics. Recent phonetic investigations have demonstrated that consonant gestures are controlled more tightly (that is, they exhibit less temporal overlap) word-initially than word-medially (Byrd 1996, Chitoran, Goldstein and Byrd in press). In general, the same happens in [CiV] sequences in Romanian (Chitoran and Hualde 2002). Following recent literature on the idea that sound change will occur in least noticeable contexts first (Steriade 2001), we claim that contexts where the change would be more salient (that is, word-initially) are more resistant to glide formation. In other words, glide formation is more prone to occur in contexts where the change is least noticed and less prone to occur in contexts where the change would be more salient.

The following tableau shows how the relative strength of $\text{MAX}_{\text{INIT}_\mu}$ correctly predicts the tendency to pronounce in hiatus words such as *piano* [piˈanu] 'piano' or *diadema* [diəˈðɛmə] 'diadem'.

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constraints are specially useful to explain the phonological contrasts observed in certain salient positions which preserve feature values of segments: for example, the special behavior of word-initial consonants, of vowels in word-initial syllables and of stressed vowels. A widely used Positional Faithfulness constraint of this type is FPH, Faithfulness to Prosodic Heads (cf. Kager 1999: 408, and Section 9.5 on Positional Faithfulness in his book, among others). A very similar condition to ours is used by Itô, Kitagawa and Mester (1996: 238): MAX-μ requires every input mora to have an output correspondent. Other ways that have been used to explicitly refer to 'metrified inputs' have the form UNIFORMITY V, which maintains the syllabic properties of vowels (Jiménez 1999: 102). The problem of Faithfulness conditions referring to the syllabic (moraic) structure of the input (or to prosodically derived categories) is essentially the same in Stratal OT.

(16) diaˈdem+a

	Candidates	MAX_{INIT_μ}	ONSET	*M/$V_{[+high]}$
☞ a.	d[iə]dema		*	
b.	d[ˈjə]dema	*!		*

piˈan+o

	Candidates	MAX_{INIT_μ}	ONSET	*M/$V_{[+high]}$
☞ a.	p[iˈa]no		*	
b.	p[ˈja]no	*!		*

To account for the presence of an obligatory back glide after a velar consonant (*q*[ˈwa]*tre* 'four', *adeq*[ˈwa]*r* 'to accommodate', *q*[ˈwa]*n* 'when'), we propose the existence of a segmental constraint which disallows the presence of a high back vowel after a velar consonant, namely, *C_{velar}uV. Even though these sequences have been considered as underlying sequences /k^w/, /g^w/ by Wheeler (1979), there are contexts in which the vowel and the corresponding glide alternate (cf. *liq*[ˈuu] 'liquify.1sg.Pr.Ind' > *liq*[ˈwa]*r* 'to liquify'; *evac*[ˈui]*s* 'evacuate.2sg.Pr.Subj' > *evac*[ˈwa]*r* 'to evacuate'; *adeq*[ˈui] 'accommodate.1/3sg.Pr.Subj' > *adeq*[ˈwa]*r* 'to accommodate'), thus providing evidence in favor of its non-phonemic status. The constraint *C_{velar}uV dominates MAX_{INIT_μ}. The tableau in (17) illustrates how the candidate *liq*[uˈa]r is not chosen because it crucially violates this segmental constraint.

(17) liqu+ˈa(r)

	Candidates	*$C_{[velar]}$uV	MAX_{INIT_μ}
a.	liq[uˈa]r	*!	
☞ b.	liq [ˈwa]r		*

When a rising sonority vocoid sequence with no preceding consonants is located in word-initial position (*iuca* 'yucca', *iogurt* 'yogurt', *iema* 'yoke', *ianqui* 'yankee', *iarda* 'yard', *iambe* 'iamb') it always becomes a diphthong. In these cases, the prominence of the first mora competes with a "consecutive double violation of the ONSET principle" (which could be formalized as ONSET+ONSET).[22] In Catalan, we have to differentiate between *piano* 'piano' (pronounced with hiatus, with only one violation of onset) and *iarda* 'yard' (which is always pronounced with a diphthong and has a double violation of onset). Thus, ONSET+ONSET dominates MAX_{INIT_μ} (*iarda* vs. *piano*), which at its turn dominates ONSET (ONSET+ONSET ≫ MAX_{INIT_μ} ≫ ONSET). This is the reason why we need a separate constraint ONSET+ONSET rather than

22. Note that, if we formalize ONSET+ONSET as a "consecutive" double violation of ONSET, a word such as *vio*l*aria* would not get affected by this constraint.

ONSET alone. The following tableau shows that *iuca* surfaces with a glide because otherwise it would violate the higher-ranked constraint ONSET+ONSET, as follows:

(18) iˈuc+a

Candidates	ONSET+ONSET	MAX_{INIT_μ}	ONSET
☞ a. [ˈju]ca		*	
b. [iˈu]ca	*!		**

Remember that some bisyllabic words like *ió* 'ion', *IEC* (acronym of Institut d'Estudis Catalans), *hiat* 'hiatus' were very reticent to glide formation. We argue that there is another competing force which tends to preserve hiatus in order to maintain word bisyllabicity (WD-BIN). To explain why glide formation is blocked from applying in initial stressed syllables of bisyllabic words, WD-BIN must dominate both ONSET+ONSET and MAX_{INIT_μ} (cf. *ió* [iˈo] 'ion' vs. *iuca* [ˈju]*ca* 'yucca').

With the conditions presented so far we can account for the distribution of glides and hiatuses in the greater part of the output forms in the innovative varieties and in word-initial position in the conservative varieties. Nevertheless, these requirements do not account for the distance-to-stress effects. Remember that the two varieties show the same contrast in word-initial position: while *diàleg* 'dialogue' and *dialoga* 'engage-in-dialogue. 3sg.Pr.Ind' are pronounced with a hiatus, *dialogar* 'engage-in-dialogue.Inf' and *dialogaré* 'engage-in-dialogue.1sg.Fut' are pronounced with a diphthong. It seems that the prominence of the first mora only operates if it is immediately followed by the word stress or if the stress is located one syllable after. Once the stress moves to the right, the tendency is to reduce the length of the pretonic sequence. We will interpret this apparent syllable-counting effect as a prosodic tendency that disfavors a succession of more than two syllables, which we will name *LAPSE.[23] This constraint, together with its counterpart *CLASH, have been shown to be active in the prosodic phonology of different languages. In Catalan, it has been held responsible at the postlexical level for the assignment of rhythmic stresses on a sequence of unstressed syllables (*véns amb la Rosér* > *véns amb là Rosér* 'you are coming with Roser'; Oliva 1992; cf. also Nespor and Vogel 1989). In the lexical domain, this constraint has the effect of reducing the presence of a long sequence of unstressed syllables through glide formation. This easily explains why a hiatus appears in forms such as *d*[iə]*loga* and a diphthong in forms such as *d*[jə]*logar* and *d*[jə]*logaré*. Further motivation of this constraint appears at the phonetic level: the fact that unstressed

23. Wheeler (forthcoming) calls this restriction *TROUGH.

syllables in long words are significantly shorter (cf. Recasens 1991b) demonstrates that a compression strategy is taking place at the phonetic level in order to 'repair' the presence of a long sequence of unstressed vowels.

The constraint *LAPSE dominates $\text{MAX}_{\text{INIT}_\mu}$ guaranteeing that the initial high vowel will become a glide when the pretonic stretch cannot be minimally parsed in one foot. The tableaux in (19) show the contrast in the output forms between *diadema* 'diadem' and *diademeta* 'diadem.dim'.

(19) dia$^{\text{l}}$dem+a

	Candidates	*LAPSE	$\text{MAX}_{\text{INIT}_\mu}$	ONSET
☞	d[iə]dema			*
	d[jə]dema		*!	

diadem+$^{\text{l}}$et+a

	Candidates	*LAPSE	$\text{MAX}_{\text{INIT}_\mu}$	ONSET
	d[iə]demeta	*!		*
☞	d[jə]demeta		*	

We summarize in (20) the hierarchy of prosodic conditions that account for the situation found in the innovative varieties of Central Catalan. Both the segmental constraint *$C_{[\text{velar}]}$uV and the prosodic constraints ONSET+ONSET and WD-BIN – which in fact dominates all of the conditions in the ranking – are only active when these exceptional cases appear.

(20) *Innovative Central Catalan variety*
*LAPSE ≫ $\text{MAX}_{\text{INIT-}\mu}$ ≫ ONSET ≫ *$\text{M/V}_{[+\text{high}]}$

The prosodic constraints found in conservative varieties are quite similar to the ones in innovative varieties. As we mentioned in the preceding section, conservative varieties are less prone to display glide formation in words of the type *juliol* [ʒuli$^{\text{l}}$ɔl] 'July' and *moniato* [muni$^{\text{l}}$atu] 'sweet potato'. We will interpret this as the prosodic tendency to minimally parse the pretonic word-initial syllables within a foot and will express this empirical observation through a condition named FT-LEFT, that is, a condition which enforces, if possible, a bisyllabic foot at the beginning of the word. FT-LEFT is an alignment constraint belonging to the family of ALIGN-L proposed by McCarthy and Prince (1993) which have the function of keeping the left edge of the word immune to phonological changes (for the effects of similar constraints, see Kager 1999: 111). ALL-FT-LEFT is a practically equivalent constraint that has been profusely used within OT which, if undominated, enforces the presence of a prosodic foot at the left of prosodic words. This condition accounts, for example, for the presence of 'demarcative' stresses at the beginning of the word in many languages (see, for example, Kager 1999: 157).

As we mentioned before, Catalan offers independent motivation for the strength of the word-initial positions from stress facts. It is fairly common to pronounce Catalan words with an optional demarcative stress (used for emphatic purposes) or, in rhythmic speech, with a secondary prominence word-initially. We will assume that Catalan uses metrical parsing on the right edge of the word for primary stress assignment. Provided that we have evidence of a secondary prominence on the word-initial syllable and that Catalan blocks glide formation at the beginning of the word, we propose that the minimal metrical parsing of a Catalan word includes a (trochaic) foot for the primary stress and another (trochaic) foot at the left edge of the word. All other potential remaining pretonic syllables will remain unparsed. Thus, *enverinar* would be parsed as *(enve)ri(nár)*.[24]

The tableaux in (21) show that FT-LEFT and $\text{MAX}_{\text{INIT}_\mu}$ dominate the tendency to create diphthongs (ONSET) and that FT-LEFT and $\text{MAX}_{\text{INIT}_\mu}$ are unranked with respect to each other.

(21) (moni)(ˈat+o)

Candidates	$\text{MAX}_{\text{INIT}_\mu}$	FT-LEFT	ONSET	*M/V$_{[+high]}$
☞(moni) (ˈato)			*	
mo(nja.to)		*!		*

(juli)(ˈol)

Candidates	$\text{MAX}_{\text{INIT}_\mu}$	FT-LEFT	ONSET	*M/V$_{[+high]}$
☞(juli)(ˈol)			*	
ju(ljol)		*!		*

Note that in conservative varieties, the output form of words like *diadema* [diəˈðɛmə] respects both the constraint $\text{MAX}_{\text{INIT}_\mu}$ and FT-LEFT, as the following tableau shows.

(22) (dia)(ˈdem+a)

Candidates	$\text{MAX}_{\text{INIT}_\mu}$	FT-LEFT	ONSET	*M/V$_{[+high]}$
☞(dia)(ˈdema)			*	
(dja)(ˈdema)	*!	*		*

Conservative varieties display the same phenomenon of pretonic stretch minimization than innovative varieties, that is, the first mora is not maintained when the word stress is located further away than two syllables. In this case, the shortening tendency emerges and the high vowel becomes a glide. Thus, the ranking of the prosodic conditions for the conservative varieties is as follows

24. We owe this suggestion to J. Mascaró.

– we should keep in mind that ONSET+ONSET, *$C_{[velar]}$uV and WD-BIN are also present at the topmost part of the ranking in these dialects.

(23) *Conservative Central Catalan variety*
*LAPSE ≫ $MAX_{INIT_{\mu}}$, FT-LEFT ≫ ONSET ≫ *$M/V_{[+high]}$

In sum, the difference between the two varieties of Central Catalan lies in the presence vs. absence of FT-LEFT, a parsing requirement on word-initial syllables that blocks glide formation from applying in words such as *juliol* 'July' and *moniato* 'sweet potato'. We claim that this parsing constraint is active in the conservative variety (which can be considered as an older stage of the innovative variety) and has gradually weakened and disappeared during the evolution of this phenomenon, generalizing diphthongs word-medially in the innovative variety.

5.2. The role of morphological analogy

Let us now consider a case of morphological and nonmorphological analogy which favors a diphthong solution in words predicted to surface with a hiatus by the abovementioned prosodic restrictions. We know that conservative Central Catalan varieties generally pronounce words such as *cam*[iˈo] 'truck' with a hiatus – a general tendency also proven by pronunciation of nonce words such as *tat*[iˈa]. Yet, this pattern presents a great number of counterexamples, the majority of which end in [ˈsjo] (*nac*[ˈjo] 'nation', *pass*[ˈjo] 'passion', *ficc*[ˈjo] 'fiction'). The preponderance of nominalized forms such as *elevac*[ˈjo] 'elevation', *distribuc*[ˈjo] 'distribution', *afirmac*[ˈjo] 'statement', *inhibic*[ˈjo] 'inhibition' suggests that the tendency to pronounce with a diphthong words ending in [ˈsjo] must have initially arisen by a morphologically conditioned analogy with the nominal suffix *-ció* and its allomorphs (one of the most productive suffixes in the language) and then generalized by nonmorphological analogy to other unrelated words ending with similar segmental sequences (cf. *fus*[ˈjo] 'fusion', *reg*[ˈjo] 'region', *nac*[ˈjo] 'nation'). We thus argue that this word-final segmental sequence has acted as a phonological pattern in the synchronic phonology of Catalan.

Recent work within OT has examined similarity effects and paradigm levelling cases and a variety of solutions have been proposed to extend the identity family of constraints to cover analogy cases between morphologically related words. In particular, Kenstowicz (1996) proposes the existence of the Uniform Exponence constraint which guarantees a minimal phonological difference between different morphologically-related items.[25] In the Catalan data at hand,

25. *Uniform Exponence* (Kenstowicz 1996: 382): Minimize the differences in the realization of a lexical item (morpheme, stem, affix, word).

the strings related by correspondence will be the [ˈsjo] suffix (and allomorphs) and also similar phonological endings in nonmorphologically-related words (cf. *regió* 'region'). We adopt Itô and Mester (1997)'s idea within Correspondence Theory that each speaker is able to establish a series of idiosyncratic output-to-output correspondence relations between different lexical items which become active in the evaluation process. In our analysis, we extend the UNIFORM EXPONENCE (& [ˈsjo]) to nonmorphologically related cases: this will thus be responsible for maintaining syllabic structure among morphological and nonmorphological correspondents. We argue that a word-final [ˈsjo] pattern is acting as a general correspondent (which can be understood as an analogical form) in conservative varieties of Central Catalan and that the presence of this pattern favors a diphthong pronunciation in all words ending in sibilant plus [ˈjo], as we can see in (24).

(24) nació(n)

Candidates	UNIFORM EXPONENCE (& [ˈsjo])	FT-LEFT
a. nac[iˈo]	*	
b. nac[ˈjo]		*

Another clear case of analogical pressure on this gliding process are the sequences ie/ue. As we mentioned before, most words with *ie* and *ue* normally surface with a diphthong, no matter if they belong to hiatus-favoring environments (cf. *s*[ˈwɛ]*c* 'Swedish.ms', *d*[ˈwɛ]*l* 'duel', *qu*[ˈje]*t* 'calm.ms', *s*[ˈwɛ]*ter* 'sweater', *c*[ˈjɛ]*ncia* 'science'or *p*[jə]*tat* 'pity'). We hypothesize that the Spanish cognates containing historical diphthongs (derived from breaking) are acting as lexical attractors in the speakers' decisions on syllabification. As Wheeler (forthcoming) points out:

> [T]his state of affairs resembles the initial stage of lexical diffusion in a change in progress. [...] Most of the words mentioned have close phonological cognates in Spanish, containing cases of the stressed rising diphthongs [je] and [we] which are very common in that language.

Thus, we hypothesize that before deciding between a hiatus/diphthong pronunciation, a Catalan speaker takes into account both prosodic tendencies and analogical pressures. Thus, while pronunciation is practically predictable when there are no competing tendencies (e.g., *piano* 'piano', *camió* 'truck'), this is less so when there is competition between analogical attractors and prosodic tendencies. If we take a word like *dietista* 'dietist', for example, which we are likely to encounter in reading, the presence of two competing tendencies (word-initial hiatus vs. sequence [je]) explain why we would find more variation in these cases.

5.3. Idiolectal variation

In our data, the contrast between the conservative and innovative varieties has been answered for by the deletion of FT-LEFT, i.e., a constraint which is imposing a parsing condition on the output and which is responsible for maintaining a hiatus in certain positions in conservative varieties. As we already mentioned, the hiatus/diphthong distribution exhibits another type of microvariation, variation across speakers. Even though speakers of the same Catalan variety share a tendency to diphthongize in certain prosodic contexts, they also display somewhat different distributions of hiatuses and diphthongs across the lexical items belonging to each group. It is evident that while simple constraint reranking accounts for parametric dialectal differences, it cannot explain this type of variation present in the data. As McMahon (2000a: 235) has argued, constraint reranking contributes to viewing synchronic language systems as static linguistic stages and language change as a sudden shift from one linguistic stage to another: "The status of OT as a model operating with completely ranked constraints, each hierarchy converging unambiguously and categorically on a single output for each input form, would seem to preclude the analysis of variation."

It is important for formal phonological theories to be apt to deal with variation in phonological processes. In this vein, there have been some recent attempts to derive variation in synchronic phonology within OT. One of the most common solutions adopted has been to weaken the requirement for total ranking of constraints (Anttila 1997, Anttila and Cho 1998, Nagy and Reynolds 1997). Taking up a suggestion by Prince and Smolensky (1993) about "crucial nonranking",[26] Anttila (1997) takes the view that "crucial nonranking" reflects variation in the empirical domain. Unless specifically blocked, absence of ranking will take up as a possibility provided by the theory.[27] Similarly, Nagy and Reynolds (1997: 37) propose the existence of "floating constraints, whereby some particular constraint within a single grammar may be repre-

26. "We asume that the basic hypothesis is that there is some total ranking which works; there could be (and typically will be) several, because a total ranking will often impose noncrucial dominance relations (noncrucial in that either order will work). It is entirely conceivable that the grammar should recognize nonranking of pairs of constraints, but this opens up a possibility of crucial nonranking (neither can dominate the other; both rankings are allowed), for which we have not yet found evidence. Given present understanding, we accept the hypothesis that there is a total order of domination on the constraint set; that is, that all nonrankings are noncrucial." (Prince and Smolensky 1993: 51).

27. "One possible scenario is that in the initial stage of language acquisition the constraints are unranked and during the process of language acquisition rankings are set incrementally on the basis of positive evidence." (Tesar and Smolensky 1995).

sented as falling anywhere within a designated range in the ranking hierarchy". This lack of decision between candidates generates alternative or optional outputs of a given input, but, as Anttila (1997) observes, this does not allow common frequency or subregularity effects to be captured. In order to address frequency of application, Zubritskaya (1997) suggests constraints could be assigned a particular weight which could be controlled by extragrammatical factors. Zubritskaya offers a somewhat different view of variation in her account of the gradual loss of palatal assimilation in Russian. She views this process as a stepwise demotion of the constraint *PAL, which is associated with other subconstraints that control this demotion. Zubritskaya's proposal is quite an interesting solution, when a family of constraints is involved.

Clearly, the Catalan glide formation data is not subject to free variation, as it is not the case that a speaker can alternatively pronounce *p*[i.a]*no* and *p*[ja]*no* (this only occurs very sporadically). Rather, certain prosodic patterns display clear quantitative tendencies and, within each group, each speaker's grammar has a set of words whih will be pronounced with a diphthong or a hiatus. The unranked or floating constraint solution is not able to account for the "net of lexical relationships" which are established by each speaker nor to make explicit quantitative predictions on the output because we are not dealing with a phenomenon of grammar undeterminacy. Moreover, we are not aware that any segmental or morphological subcontraints play a role in the selection of analogical relationships in Catalan and thus we are not facing a phenomenon involving a family of constraints in the sense of Zubritskaya.

Intuitively, idiolectal variation in the case at hand responds to the difference between analogical relationships each speaker establishes between different lexical items. One possible reason for the emergence of these "individualized grammars" is that gliding is not a perceptually salient phenomenon in connected speech, which can easily induce speakers to start establishing a particular net of lexical relationships. In previous sections, we have seen how speakers are particularly resistant to extend the rule of glide formation to contexts where the change is more noticeable, more salient. In other words, variation and change arise from lack of perceptual information. We propose to encode the expression of this type of variation by resorting to differences between individual speakers in the establishment of analogical relationships between lexical items. We will adopt Itô and Mester's (1997: 439) instantiation of this idea within Correspondence Theory: each speaker is able to set up a series of idiosyncratic correspondence relations between different lexical items which become active in the evaluation process. Thus, some lexical idiosyncratic marking is needed to explain idiolectal variation (and expressed by the presence of the relevant correspondent in the evaluation tableau). It might well be that some identity and analogical patterns will emerge in this net of lexical relationships within each particular grammar.

6. Conclusion

We have shown that the gradual process of glide formation in rising sonority sequences in Catalan can be accounted for in terms of a correspondence-based OT analysis (McCarthy and Prince 1994, 1995; Benua 1995). Lexical glide formation can be regarded as an intrincate process closely guided by prosodic and analogical conditions. One of the main advantages of the OT analysis presented here is the fact that a small differences in the ranking of prosodic constraints can explain the dialectal and sociolectal variation found within Central Catalan. We claim that the difference between the conservative and the innovative varieties of Central Catalan lies in the presence vs. absence of FT-LEFT, a parsing requirement on word-initial syllables that blocks glide formation from applying in words such as *juliol* 'July' and *moniato* 'sweet potato'. This parsing constraint has gradually weakened and disappeared during the evolution of this phenomenon, generalizing diphthongs word-medially in the innovative variety. Finally, inter-speaker variation in the data has been accounted for by assuming that each speaker is able to set up a set of idiosyncratic correspondence relations between different words which are active in the evaluation process. This intuitively accounts for the fact that the emergence of these individualized grammars in the hiatus/diphthong distribution patterns responds to the different analogical relationships each speaker establishes between different lexical items.

The significance of the data presented here is made manifest when we observe the behavior of other Romance languages with regards to glide formation. It is not surprising that Spanish, a language which represents a more advanced stage of this phenomenon, still shows some of the anti-diphthong restrictions Catalan presents. In this sense, a CT/OT analysis of glide formation appears to be very promising, as it may provide us with a unified view of the hiatus/rising diphthong synchronic and diachronic distribution found in Catalan and concomitantly may shed some light on a plausible general view of the evolution of this phenomenon in the Romance region.

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Appendix. Questionnaire

Nom: _____ Edat: _____

Procedència geogràfica: _____

Separeu amb una ratlla les síl·labes de les paraules següents (p. ex., *caseta* ca|se|ta). En cas que les dues vocals altes ([i, u]) formin diftong, senyaleu el nucli amb un accent:

iaia
iambe
ianqui
iarda
ieisme
filiació
ioga
tió
Ció
Tià
Biel
Lió
brioix
rient
Pié (surname)
biaix
suor
lluent
fuet
pouet
coet
roent
duet
quiet
cuina
piula
cuiro
truita
fruita
fiança
Viena
piano
dialectal
viola
iogurt
aviació
iuca
ió
iot (letter)
iota
UAM
fuel
quan
suec
fruit

riu
piu
viu
buit
nació
cuit
dual
duel
fiar
miol
copiós
niar
pioc
diari
fiança
siciliana
Tiana
diable
viatge
lloança
duana
suara
truana
iol (barca)
hiat
IULA
IEC
UAB
UOC
ien
suau
cruel
foniatria
client
cruent
gruar
criat
prior
triar
triomf
truà
cloent
viaró
croat
suec

Boet (surname)
coet
koala
juerga
ciència
ciàtica
biela
biòleg
buata
pietat
diari
diària
Boavi (top.)
dieta
diada
diòcesi
cueta
fiable
jueva
nuesa
ciutat
siureny
violí
vianant
cianur
lloar
pioner
Priorat
biològic
diabòlic
diamant
dietari
cuereta
diagnosi
biologia
diapasó
diagonal
diana
diapositiva
diocesà
dualitat
fiabilíssim
dialectologia
liofilitzar
avió

enciam
camió
corriol
flabiol
aviat
poniol
espiar
vuit
oliós
caviar
riada
riota
estàtua
suèter
triangle
triàcid
cloenda
Joana
dialecte
dualista
duodè
fiador
lionesa
mielina
miocardi
miolar
miopia
muetzí
niador
violar
violent
pietós
miografia
viabilitat
violador
diamantí
piemontès
puericultura
suavitat
violentar
violoncelista
triangular
seriós
missió
orient

guardià
preciós
Premià
pensió
contenciós
estudiar
oficiar
reflexió
poeta
poagra
troana
bienni
diàleg
cruesa
criada
diana
pianista
Piemont
diadema
diafragma
piolet
diaca
científic
clientela
criador
criatura
Tiurana (top.)
priorat
triomfar
poetitzo
dialectòleg
criaturer
prioritat
triomfador
triomfalisme
coeditor
coarrendatari
coalició
poetitzar
poetització
paciència
obsequiar
esquiar
circuit
cordial

comiat
arterial
artificial
associar
glòria
escorpió
avariar
associat
atiar
avaluar
opció
bestial
evacuar
labial
calumniar
capciós
col·legial
sènia
sèquia
vàlua
riera
perpètua
pròpia
nòvia
àvia
vàcua
ingènua
ambigua
maniàtic
radiòleg
aliança
sarsuela
semiòtic
liana
valeriana
vidriera
glorieta
historieta
seriosa
estudiava
IEC
embrionari
apassionar
apreciació
enlluernar

bruel
radiador
avioneta
confidencial
conciliar
miop
deliciós
defectuós
il·lusió
població
filial
saciar
vidriós
variar
llàntia
fàtua
pèrdua
vàcua
història
eufòria
supèrflua
Èlia
paciència
piragua
llengua
idioma
escriure
aliena
amniòtic

asiàtic
bibliòfil
bestiola
bestiesa
patriarca
clariana
conciliari
espiaré
expiació
pensionista
camioneta
iode
idiomàtic
pediatria
ambiental
puntuació
construir
deduir
despectiu
festiu
australià
asturià
repatriar
col·legiat
peruà
genuí
escuat
conspícua
inòpia

Cecília
bèstia
Calàbria
pàtria
vídua
mútua
contínua
comèdia
canviar
pediatra
confiança
corriola
guardiola
Juliana
moniato
patriota
foniatra
variable
idioma
espiava
patriotisme
societat
semiesfera
missioner
oriental
preciosíssim
estudiaré
reflexionar
variabilitat

Nonsense words

tià
pió
tuà
puós
tatià
papiós
tatuà
papuó
tiata

piopa
tuata
puopa
tiatà
piopà
puatà
tuaspà
tàtia
pòpia

tàtua
pòspua
papuota
tatuata
tatiata
papiota

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