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Vowels, glides, off-glides and on-glides in English: a Loose CV analysis

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Abstract

Glides are segments which only contain the element **I** or **U**, not occupying the central position of a nucleus. In English, glides cannot occur word-finally or preceding a consonant. In addition, I have established that they are prohibited between a stressed and an unstressed vowel if the stressed vowel is short. The latter restriction can be explained as part of the former if such intervocalic consonants are analysed as virtual geminates, for which I argue on the basis of the distribution of short and long vowels. I also examine off-glides, derived glides and on-glides in English, and analyse them in a CV approach. I show that off-glides of closing diphthongs cannot just be associated to a C or a V position, instead they occupy both. Glides derived from high vowels preceding an unstressed vowel, as in *obvious* [ˈɒbv{i/j}əs], result from spreading and not movement to the following empty C position inside the hiatus. Finally, I analyse the sequence [juː] as a light diphthong overlapping a long vowel, to account for the distribution of the on-glide. The different types of glides thus can be distinguished by differences in association between melody and skeleton. No differences in segmental representation need to be posited.

Keywords: diphthongs; glides; on-glides; phonotactic restrictions; Government Phonology; English

1. Introduction

In this paper, I examine the different configurations in English (Received Pronunciation, RP) where glides can occur and aim to find representations for them in a recent version of Government Phonology. Glides provide an interesting topic for investigation because they form a category in between vowels and consonants. They resemble vowels as far as their segmental content is concerned, as they only contain the resonance element **I** or **U**, whereas “real” consonants like stops have some additional melodic components, such as closure, release, voicing, etc. However, glides are unlike vowels in that they do not occupy the central position of the nucleus in syllable structure. More specifically, glides occur at syllable margins, in an onset or a coda, or in the dependent position of a nucleus.

In a framework like Strict CV Phonology (cf. Lowenstamm, 1996), syllable structure is dismantled, and we find an alternating sequence of C and V positions, some of which remain empty (i.e. without melodic content). The structural possibilities available for a melodic expression solely containing the resonance element I in such a model are presented in (1).

(1) *Strict CV options for association of the melodic expression (I)*

a. *Head position of a nucleus*

```
C  V1  C  V
|  |   |
t  I   p          [tɪp] tip
```

b. *Onset*

```
C1  V   C  V
|   |______/
I   uː            [juː] you
```

c. *Dependent position of a nucleus*

```
C  V  C  V2  C  V
|  |     |   |  |
d  e     I   t  ə       [ˈdeɪtə] data
```

d. *Coda*

```
  C  V  C2  V  C  V
  |  |  |      |  |
* v  ʊ  I      t  ə     *[ˈvʊjtə]
```

In (1a) the element I occurs in a V position and is realised as the short vowel [ɪ]. In (1b) it occurs in a C position that is followed by a filled V position and is realised as the glide [j]. (1c) presents one possibility for representing a diphthong, with the off-glide occupying the V_2 position. In English, glides are ruled out in coda position, that is, in a C position followed by an empty V position, as C_2 in (1d). This means that such a structure could provide another possible representation for diphthongs in this language (as has been proposed for German by Ségéral and Scheer, 1998). I will examine both of these proposals and will conclude that in fact both are problematic, and a third solution is called for, whereby the element I of the off-glide is shared by the C_2 and V_2 positions.

Apart from the static patterns illustrated in (1), the melodic expression (I) can also take part in alternations, such as the process of glide formation. I will examine High vowel gliding, in which an underlying high vowel preceding an unstressed vowel is in free variation with a glide, as in *nucleus* [ˈnjuːkliəs ~ ˈnjuːkljəs]. One question is how to represent this alternation: does the element I move from a V position to the following empty C position inside the hiatus? Is such movement allowed, and is it desirable? Another question concerns the distribution of these derived glides which is surprisingly free: why can they occur after any type of consonant or consonant cluster (and, for example, create the seemingly triconsonantal onset in the above example)? I will argue that the melody cannot move, it simply spreads to the following C position. As the representation still starts like a vowel, these derived glides behave like their underlying vowel with respect to preceding consonant (cluster)s.

In the configurations discussed so far, there is either one-to-one association between melody and skeletal position (as in a short vowel (1a), or a glide (1b)), or one piece of melody is associated to two skeletal positions (as in an off-glide, or a derived glide). In fact, long vowels also belong to the latter category, as shown by the long [uː] in (1b). Now the question arises whether two melodic expressions can be associated to a single skeletal position in English, where at least one of the melodic expressions only contains a resonance element. I will argue that this configuration also exists.

To show this, I will examine the behaviour of [j] in a post-consonantal context. Compared to [w], [j] imposes much less severe restrictions on the preceding consonant, whereas it can only be followed by the vowel [uː] (and we find examples like *mule* [mjuːl]). These facts suggest that the [j] forms a unit with the following vowel, instead of constituting a complex onset with the preceding consonant. Modifying the analysis of Davis and Hammond (1995) (discussing American English), I propose to analyse the sequence [juː] as a complex vowel, built up of a light diphthong overlapping a long vowel (i.e. as [i̯uː]). In the light diphthong, the melody (**I**) and the melody (**U**) both associate to the same V position, without fusing into a front rounded vowel [y]. At the same time, the melody (**U**) is also associated to the following V position, thereby creating the long vowel portion of the complex vowel.

All in all, it becomes clear that in a CV approach it is not necessary to distinguish the different types of glides (underlying and derived glides, off-glides, and on-glides) in terms of their segmental representation (pace Levi, 2008). Their different behaviour can be captured by differences in association between melody and the skeleton in each case.

The paper is built up as follows. As diphthongs and long monophthongs have the same distribution in English, to provide sufficient background for the following discussion, in sections 2 and 3, I present the data on the distribution of English short and long stressed vowels, and its CV analysis (providing a summary of Polgárdi, 2012). Section 4 presents the data on the distribution of glides in English, including a generalisation not previously observed in the literature. In section 5, I discuss the evidence against representing closing diphthongs either as (1c) or as (1d), and I propose a new analysis of diphthongs, involving sharing the melody of the off-glide between a C position and a following V position. In section 6, I turn to an analysis of High vowel gliding. Section 7 presents the complex vowel analysis of [juː] sequences. Section 8 summarises the results.

2. Stress-to-Weight in English

Let us first examine the patterning of stressed vowels in English (Received Pronunciation). (The data presented below are based on Burzio, 2007; Chomsky and Halle, 1968; Gimson, 1980; Hammond, 1999; Harris, 1994; Jones, 1966; Kreidler, 1989; Nádasdy, 2006; Rubach, 1996; Wells, 1982, 1990.) The table in (2) shows the distribution of short and long stressed vowels (the latter including diphthongs) in different syllabic positions. I only consider monomorphemic forms here. The symbol $ stands for syllable boundary and the symbol # stands for word boundary.

(2) *Distribution of stressed vowels in syllable structure*

		(i) Short	(ii) Long
Internal	a. __ $CV	ˈsɪti ‘city’	ˈmiːtə ‘meter’
	b. __ C$CV	ˈvɛktə ‘vector’	—
	c. __ $V	*	ˈruːɪn ‘ruin’
Final	d. __ #	*	braʊ ‘brow’
	e. __ C#	hʊk ‘hook’	hɔːk ‘hawk’
	f. __ CC#	gʌlp ‘gulp’	—

Columns (i) and (ii) show that the distribution of short and long vowels is almost complementary in English. Short vowels do not occur before a vowel, see (2i.c), and word-finally, see (2i.d), that is, they cannot stand at the end of a syllable, except as in (2i.a). Long vowels, in contrast, cannot occur in a closed syllable, as is shown in (2ii.b) and (2ii.f), except in (2ii.e).[1] These generalisations are summarised in (3).

(3) *Generalisations*

a. Short vowels must be followed by a tautosyllabic consonant (but: (2i.a)).
b. Long vowels cannot be followed by a tautosyllabic consonant (but: (2ii.e)).

Note that the restrictions in (2b) and (2f) do not apply to coronal clusters, and clusters involving [s] (indicated by ‘—’, instead of ‘*’), and examples like *shoulder* [ˈʃəʊldə], *easter* [ˈiːstə], *paint* [peɪnt], and *ask* [ɑːsk] exist (although [s] + non-coronal clusters like the last one only occur after long vowels in accents like RP that lengthened the historically short vowel in this environment). I will not deal with these cases further here (see e.g. Borowsky, 1989; Harris, 1994; and Hall, 2001 for possible treatments).[2]

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[1] Long vowels that have arisen through the influence of a following historical [r] (e.g. [ɑː ɔː ɪə], as in *far*, *for*, *fear*) are also ruled out prevocalically. This can be understood as a historical accident.

[2] Sequences of more than two consonants following short vowels, where the last two consonants cannot form a branching onset, as in *empty*, *antler* or *mulct*, exist in English, but they are

The pattern in (2i) can be accounted for by requiring stressed syllables to be heavy in English (Stress-to-Weight), as proposed by Hammond (1997). In his analysis, a nonreduced syllable in English must be minimally bimoraic (or bipositional). Long vowels and diphthongs satisfy this requirement underlyingly, while in a closed syllable containing a short vowel, the second mora is provided by the coda consonant (Weight-by-Position). (2i.c–d), like *[ˈrʊɪn] and *[bræ], are then excluded because a short vowel in an open syllable is light, i.e. monomoraic.

To account for examples like [ˈsɪti] in (2i.a), Hammond (1997) assumes that the stressed syllable in such cases is in fact closed, albeit by a virtual consonant, viz. a covert geminate, providing the second mora required. Hammond follows the proposal of Borowsky et al. (1984) that cases of apparent ambisyllabicity must be treated as gemination (see also van der Hulst, 1984, 1985 for the same idea). Such geminates are virtual because their phonological length does not correspond to phonetic length, but it is still recoverable from their environment (i.e. they behave as if they were long). As virtual geminates are predictable, they cannot be contrastive.

Apart from the distribution of stressed vowels, independent evidence for virtual geminates in English is provided by expletive infixation, as discussed by Hammond and Dupoux (1996). As shown in (4), the expletives *fuckin'* and *bloody* can be placed between two feet within a word (in certain dialects).

(4) *Expletive infixation* (Hammond and Dupoux, 1996:290)

a.	fantastic	[ˌfænˈtæstɪk]	fan – fuckin' – tastic
b.	Tennessee	[ˌtɛnəˈsiː]	Tenne – fuckin' – see
c.	typhoon	[ˌtaɪˈfuːn]	ty – fuckin' – phoon
d.	raccoon	[ˌræˈkuːn]	*

The expletive can appear after a consonant, as in (4a), a schwa, as in (4b), or a long vowel, as in (4c), but it cannot occur after a short vowel, as (4d) indicates. If the stressed short vowel is followed by a virtual geminate, then the lack of expletive insertion can be explained by Geminate Integrity because the virtual geminate straddles the foot boundary in examples like (4d). (In addition, Hammond and Dupoux (1996) also cite psycholinguistic evidence for this view on syllabification of intervocalic consonants and consonant sequences.)

The restriction in (2ii.b,f) above, that is, that superheavy rhymes, involving long vowels in closed syllables, are ruled out as well in English (i.e. examples like *[ˈviːktə] and *[guːlp] are ill-formed) is analysed by Borowsky (1989). To account for this, she poses an upper limit on rhymes (at Level 1), restricting them to contain maximally two positions (or moras). In addition, she assumes that final consonants are extrasyllabic. Therefore, certain types of "superheavy rhymes", like those in

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rare, and the so-called intrusive obstruent in forms like *em<u>p</u>ty* is optionally absent. Note that at least the last consonant of such clusters is always coronal (except for the word *pumpkin*). An exhaustive list is provided by Borowsky (1989). I will not discuss them further here.

(2ii.e) and (2i.f), are well-formed in English, but only word-finally (viz. [hɔːk] (VV$C) and [gʌlp] (VC$C)), because now such rhymes are also bipositional (which, of course, will not help examples like *[guːlp], still being tripositional).

If we want to combine the insights of Hammond and Borowsky in a unified analysis, then stressed rhymes in English need to be restricted to *exactly two* positions (for an analysis of Dutch rhymes along the same lines, see van der Hulst, 1984, 1985; and Kager and Zonneveld, 1986). This means that after stress assignment, a word-final consonant must be incorporated into the rhyme when it directly follows a stressed short vowel, as in [hʊk] in (2i.e), to satisfy the bipositional requirement. Final consonants of “superheavy rhymes”, in contrast, must be extrasyllabic to be able to state the complementary distribution between short and long stressed vowels and to explain the pattern in (2i–ii). However, using extrasyllabicity in this way is stipulatory, as is requiring rhymes to contain exactly two positions (and not for example exactly three, exactly four, etc.).

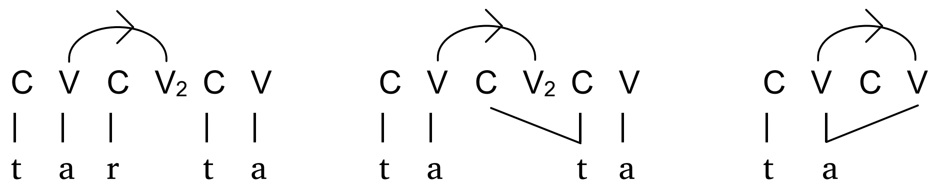
In Polgárdi (2012), I analyse this pattern in a recent version of Government Phonology, which provides several advantages.

3. A Loose CV analysis with trochaic proper government

Let me begin with the basic ingredients of the analysis, the underlying assumptions that I adopt. I follow Lowenstamm’s (1996) Strict CV approach in the idea that syllable structure consists of strictly alternating C and V positions. As a consequence, the representation of closed syllables, geminate consonants and long vowels involves an empty position, as shown by the hypothetical forms in (5).[3]

(5) *Strict CV* (Lowenstamm, 1996)

a. *Closed syllable* b. *Geminate consonant* c. *Long vowel*



Geminates and long vowels are built up of two CV units. In a geminate the consonantal melody straddles an empty V position, while in a long vowel the vocalic melody straddles an empty C.

Following Rowicka (1999a,b), I employ trochaic (left-to-right) proper government

[3] In this approach, there is no syllabic structure above the skeleton, all we have are the CV units, with some positions potentially remaining empty. For ease of exposition, I will keep using expressions like rhyme, closed syllable, branching onset etc., but only as descriptive terms, referring to specific configurations in the data, which then will receive a CV analysis.

instead of the more usual right-to-left type[4], as defined in (6).

(6) *Trochaic (left-to-right) Proper Government* (Rowicka, 1999a,b)

A nuclear position *A* properly governs a nuclear position *B* iff

a. *A* governs *B* (adjacent on its projection) from left to right

b. *A* is not properly governed

Government is a binary, asymmetric relation between skeletal positions. Proper government, indicated by a curved arrow in (5) and in subsequent diagrams, is a special form of government, which works in conjunction with the Empty Category Principle, given in (7).

(7) *Empty Category Principle (ECP)* (Kaye et al., 1990:219)
A position may be uninterpreted phonetically if it is properly governed.

As a result, an empty V position may remain silent if it is properly governed, as shown by V_2 in (5a–b) above. However, if an empty V position is not properly governed, then it must surface as the default vowel (illustrated by the schwa following the long vowel in the example of *charlatan* [ˈʃɑːlətən] in (12b) below).

Finally, I use a so-called Loose CV skeleton instead of the Strict CV one (as argued for in Polgárdi, 1998, 2002). These two approaches are not radically different: word-medially they are the same, they only differ (potentially) at the edges. More precisely, Loose CV dispenses with domain-final empty nuclei that are always inaudible. This means that words do not need to end in a V position: C-final words are allowed (just like V-initial words, when there is no phonetic consonant initially). However, word-medially a strict alternation of C and V positions is still required.

Domain-final empty nuclei present some serious problems, as discussed in Polgárdi (1998). One of the problems is illustrated in (8), where the noun-forming suffix *-er* is added to the verb *listen*, resulting in the form *listener*. In a Strict CV approach, the root ends in the empty V_3, while the suffix starts with the empty C_4. This empty sequence is then customarily deleted, indicated by angle brackets, referred to as the operation of Reduction by Gussmann and Kaye (1993).

(8) *Strict CV*: Reduction

C	V	C	V_2	C_3	<V_3	C_4>	V_4		C	V	C	V_2	C_3	V_4
ˈl	ɪ	s	ə	n	+		ə	→	ˈl	ɪ	s	ə	n	ə

This is, however, problematic because it violates the Projection Principle, given in

[4] Iambic proper government was proposed by Kaye (1990) and Kaye et al. (1990), and it has been employed by most proponents of Government Phonology. Advocates of trochaic proper government include Gibb (1992) and Yoshida (1999).

(9), by also removing the proper governing relation between V_2 and V_3.

(9) *Projection Principle* (Kaye et al., 1990:221)
Governing relations are defined at the level of lexical representation and remain constant throughout a phonological derivation.

In a Loose CV approach, as shown in (10), no reduction is necessary, as a consonant final root and a vowel initial suffix can simply be concatenated. As a result, no governing relationship has been deleted in this analysis.

(10) *Loose CV*: No reduction

```
C  V  C  V  C       V        C  V  C  V  C  V
|  |  |  |  |       |        |  |  |  |  |  |
ˈl ɪ  s  ə  n   +   ə   →    ˈl ɪ  s  ə  n  ə
```

In Polgárdi (2012), I propose to analyse the bipositional requirement on stressed rhymes (Stress-to-Weight) by demanding that the stressed position in English properly govern an empty nucleus to its right. A heavy rhyme corresponds to two CV units in the CV approach, bound by trochaic proper government, as shown in (5a–c) above.[5] As proper government is a binary, non-transitive relation, the requirement automatically ensures that stressed rhymes will be both minimally and maximally bipositional.[6] Short vowels in seemingly open rhymes are followed by a virtual geminate to satisfy the requirement, similarly to Hammond's (1997) proposal.

Let us now see how the data in (2) can be analysed in this approach. The representation of stressed vowels (underlined) preceding a single intervocalic consonant, i.e. in a word-internal "open syllable" is shown in (11).

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5 Note that with iambic proper government, it is not easy to identify the relevant units.

6 Note that the implication only works in one direction, i.e. if there is stress, then there is also a proper governing domain, but not in the opposite direction, and therefore unstressed "closed syllables" exist in English. Although heavy syllables typically attract stress in this language, there are exceptions word-internally (e.g. *character* [ˈkærəktə]), and more word-finally as a result of final syllable extrametricality in nouns (e.g. *agent* [ˈeɪdʒənt]). Unstressed heavy syllables also occur in word initial pretonic position (mostly comprising a Latinate prefix, as in *conform* [kənˈfɔːm]), and in two-sided clash configurations (e.g. *guarantee* [ˌgærənˈtiː]). Thus, even though the Weight-to-Stress principle is active as well, it can be violated in certain situations, unlike Stress-to-Weight, which is in focus in this paper.

(11) __ $CV (=2a)

a. Short: virtual geminate

C V [C_2 V] C_3 V

s ɪ t i

b. Long

C V_1 C V_2 C V_3

m iː t ə

The representation of a long vowel involves two CV units, as seen in (11b). According to Rowicka (1999a,b), the relationship between the two halves of a long vowel is one of proper government. Since the C position between V_1 and V_2 is unfilled, this governing relationship is manifested by spreading the melodic content of V_1 into V_2. The ECP permits properly governed positions to remain uninterpreted, but it does not demand that they do so. Therefore, the realisation of V_2 in (11b) does not contradict the ECP. (In those cases where the intervening C position is filled, there is of course no possibility, or need, for spreading, as in *vector* in (12) below, for example.) In this analysis, the V_2 position is properly governed by V_1 and not by V_3, satisfying in this way the requirement on stressed positions in English to properly govern an empty nucleus to their right.

The stressed short vowel in (11a) is also required to properly govern an empty nucleus to its right, therefore it is followed by an extra CV unit, indicated by square brackets in (11a) and in representations below. I assume, following Bermúdez-Otero (2012), that stress assignment in English is represented by lexical redundancy rules so as to account for its limited productivity and lexical exceptions. Thus, lexical entries are fully prosodified stem-level output structures, also already containing the extra CV unit standing for tonic lengthening in forms like (11a).[7] As proposed by Larsen (1998), a totally empty CV unit cannot remain completely silent.[8] If its V position is not properly governed, then it must be interpreted as the default vowel, according to the ECP. If the V position of the empty CV unit is properly governed, then it is required that at least one of its positions be eventually filled via spreading (Larsen, 1998). This more specific requirement thus overrides the ECP.

The extra CV unit in (11a) is properly governed, therefore spreading ensues. In principle, either the neighbouring vowel or the consonant could lengthen, but lengthening the vowel would neutralise the contrast between (11a) and (11b).[9] As

[7] See Larsen (1998) and Ségéral and Scheer (2008) for proposals of inserting an extra CV unit after the stressed V position in languages with tonic lengthening, and Chierchia (1986) for a solution in terms of a branching rhyme requirement. I discuss Larsen's (1998) and Ségéral and Scheer's (2008) analysis and how they differ from the present one in more detail in Polgárdi (2012).

[8] This restriction does not apply to the initial empty CV unit proposed by Lowenstamm (1999), which replaces the boundary symbol #, traditionally used to identify the beginning of the word. This site normally remains silent. In this paper, employing trochaic proper government, however, I cannot adhere to the idea of the initial site.

[9] Phonetically, corresponding long and short vowels in English also exhibit a difference in quality (usually captured in terms of a tense–lax distinction). In recent versions of Government

consonant length is not contrastive in English, spreading the melody of the following consonant into C_2 avoids such neutralisation. However, phonetically there are no long consonants in standard English,[10] so the resulting geminate is merely virtual. (For earlier use of this device in Strict CV phonology, see for example Barillot and Ségéral, 2005; Larsen, 1994; Lowenstamm, 1991, 1996; Ségéral and Scheer, 2001.) By contrast, virtual gemination of the vowel would not be possible because a virtual long vowel in (11a) would occur in the same context as the phonetically long vowel in (11b), and there would be no way to tell why one can remain phonetically short while the other one cannot. The length of the virtual geminate, on the other hand, is predictable from its environment.

Finally, to preserve the insight that in both (11a) and (11b) the spreading melody is distinctively located only in the head position, C_3 and V_1, respectively, and it is phonologically unspecified in the dependent position, I employ Harris' (1994:167) notion of spreading as interpretation. The line connecting the melody to the dependent position then simply indicates the domain over which that melody should be phonetically interpreted. (Of course, as it happens, in the virtual geminate the melody is *not* interpreted phonetically in C_2. Nevertheless, the domain is phonologically demarcated.) In this analysis, virtual geminates in English are present underlyingly in the same way as long vowels are, and their distribution is captured by the lexical redundancy rules responsible for stress. Thus, (11a–b) show that the superficially similar surface forms in (2i.a) and (2ii.a) in fact have different representations.[11]

The diagrams in (12) show stressed vowels in the word-internal "closed syllable" context.

Phonology (e.g. Backley, 2011), however, their phonological representations only differ in the number of skeletal positions their melody is associated to, but not in the melodic content itself.

10 This does not hold for fake geminates, as the [nː] in *un#natural*, the two halves of which are separated by a word-level boundary. However, their phonological representation is quite different from that of the true (albeit virtual) geminates discussed here, as the melody of the former is lodged distinctively in both C positions separately and does not result from spreading to an empty position.

11 Stressed vowels preceding a word-internal "branching onset", like *macro* [ˈmæ̲krəʊ] and *micro* [ˈmaɪ̲krəʊ] have a representation entirely parallel to those in (11a–b), as the empty nucleus inside the internal cluster [kr] does not need to be properly governed because it is trapped inside a closed domain of consonantal interaction, called infrasegmental government, which licenses it to remain silent (Scheer, 1999).

(12) __ C$CV (=2b)

a. Short

C	V	C	V	C	V	
v	ɛ	k		t	ə	
	æ	t		l	ə	s

b. Long

						*			
	C	V	C	V_2	C	V_3	C	V	
*	v	iː			k		t	ə	
*		e	ɪ		t		l	ə	s
	ʃ	ɑː			l	ə	t	ə	n

A stressed short vowel can occur here because it can properly govern the empty nucleus to its right, as is shown in (12a). A long vowel, however, cannot occur in this position, see (12b), because the governed V_2 position cannot properly govern V_3. An ungoverned position such as V_3, however, cannot remain silent. It is for this reason that a long vowel cannot be followed by an inaudible nucleus. Of course, if the ungoverned empty V_3 surfaces as the default vowel, schwa, as in the example of *charlatan* [ˈʃɑːlətən], then the preceding long vowel is well-formed.

The contrast in (12) in fact provides an additional argument for a CV representation: the restriction concerning short vs. long vowels shown in (12a–b) applies not only in the case of coda–onset clusters, but also before so-called bogus clusters (e.g. *atlas* [ˈætləs], but *[ˈeɪtləs],[12] again well-formed with a pronounced schwa inside the cluster, as in *odalisque* [ˈəʊdəlɪsk]), where the consonants cannot form either a coda–onset cluster, or a branching onset in any version of Government Phonology, therefore they must be separated by an empty nucleus (e.g. Kaye et al., 1990).[13] In a standard Government Phonology analysis the restriction cannot be formulated in a uniform way: long vowels are ruled out in a closed syllable and preceding an empty nucleus. In the CV approach both contexts involve a following empty nucleus, requiring proper government.

The representations in (13) illustrate the situation of hiatus, that is, the context before a vowel.

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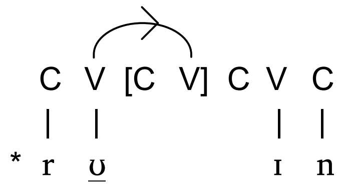
[12] There are a handful of exceptions, like *evening* [ˈiːvnɪŋ] and *maudlin* [ˈmɔːdlɪn], containing a long vowel before a bogus cluster.

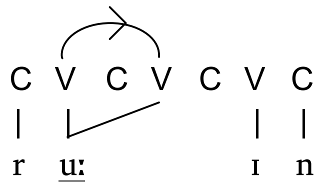
[13] In standard Government Phonology (Kaye et al., 1990) consonant clusters come in three types. In complex onsets and coda–onset clusters, the consonants are considered adjacent, as evidenced by phonotactic constraints holding between them: the first type is (roughly) restricted to non-homorganic obstruent–liquid sequences, the second to clusters of falling sonority. Any other type of consonant cluster is considered bogus, that is, separated by an inaudible nucleus. Of course, in a Strict/Loose CV framework, all clusters enclose an empty nucleus.

(13) __ $V (=2c)

a. Short: CV unit cannot remain empty



b. Long

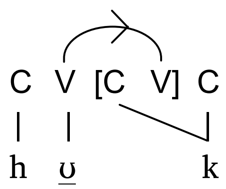


A stressed short vowel cannot occur in this position because it needs to properly govern, but the required extra CV unit, indicated by square brackets in (13a), cannot be filled, as there is no consonantal melody on the right to spread there. The vocalic melody of [ɪ] cannot spread either because long vowels are left-headed, and therefore in this case an illicit representation would arise. Since properly governed CV units cannot remain completely empty, such a representation is ill-formed. A long vowel, in contrast, can occur in this position without further provisions, as seen in (13b). The representation of stressed vowels in absolute word-final position in (2d) above (*[bræ] vs. *brow* [braʊ]) is completely parallel to those in (13a–b), therefore I do not provide them separately.

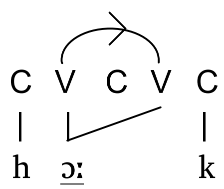
The examples in (14) illustrate the context before a single word-final consonant.

(14) __ C# (=2e)

a. Short



b. Long



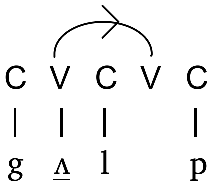
These representations are entirely parallel to the ones given in (11) above, with the exception of the lack of a final vowel. In Strict CV, even this difference would be missing because both forms would end in an empty V position. This, however, would result in ill-formed representations because these empty nuclei would be ungoverned, and therefore could not remain silent, as shown in (12b) above. This could be remedied by reintroducing the parameter of domain-final licensing (which has been made superfluous by switching to trochaic proper government) just for these cases. The problem with this solution is that words like *finish* would then have two possible analyses, one where the final empty nucleus is governed by the preceding pronounced vowel, and another where it is licensed parametrically. In Loose CV, these problems can be avoided because here words do not need to end in a V position.[14]

[14] The question might arise here whether in words like *hook* [hʊk] the virtual geminate is

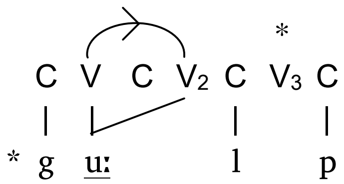
Finally, let us examine the context before two word-final consonants in (15).

(15) __ CC# (=2f)

a. Short



b. Long



Again, these representations are parallel to those in (12a–b), and a stressed short vowel can occur in this environment, as is shown in (15a), because it can properly govern the empty nucleus inside the final cluster, whereas a long vowel is illicit in this position, see (15b), because the ungoverned V_3 cannot remain silent. Note also that it no longer needs to be stipulated that "superheavy rhymes" such as (14b) and (15a) can only occur word-finally because the "bachelor" Cs (i.e. Cs without a following V) involved in such rhymes are restricted to the edges.

One further question arises in relation to (15a), namely, whether bogus clusters are also allowed to follow short vowels word-finally, just as they were allowed word-internally in (12a). The answer is that they are not, but this is in fact part of a larger pattern, extending to word-final branching onsets, which are also absent. That is, the generalisation is that rising sonority at the end of the word is interpreted as a syllabic peak in English, i.e. as a pronounced V position[15] – as all such words can either be pronounced with a schwa followed by a non-syllabic sonorant (as in *settle* [ˈsɛtəl], *muffle* [ˈmʌfəl]), or with a syllabic sonorant without a preceding schwa ([ˈsɛtl̩], [ˈmʌfl̩]). Syllabic consonants in English behave like unstressed vowels (as discussed by Polgárdi, 2015). This is also shown by the fact that they can be preceded by a long vowel in this position (as in *beetle* [ˈbiːtəl]/[ˈbiːtl̩]), which is not true of word-internal

necessary, instead of having a CVCv representation with a final empty nucleus being properly governed by the stressed V position. In fact, in Dutch, where virtual geminates are present before stress assignment, exactly that representation has been proposed for this type of final sequences by Polgárdi (2008), to account for the fact that they behave as heavy, and not as superheavy, with respect to stress, and are therefore skipped (in contrast to internal virtual geminates, which attract stress, similarly to other closed syllables). In English, however, virtual geminates are based on stress, and therefore this kind of evidence is unavailable. Support for the structure in (14a) can be provided by the parallel treatment of word-internal cases in (11), and by the gemination facts in Welsh English, discussed below.

[15] The only exceptions monomorphemically involve stop + [s] clusters, as in *lax* [læks]. These have been analysed by assigning [s] to an appendix (see the discussion in Harris, 1994:81–82, for example). Across a morpheme boundary, in addition to [s], as in *lacks* [læks], [z], as in *hugs* [hʌgz], and [θ], as in *eighth* [eɪtθ], also appear in this context. Note, however, that all monoconsonantal suffixes in English involve a coronal obstruent, and we have already seen in (2) that these can violate phonotactic restrictions respected by other consonants. Therefore, I will not deal with them further here.

bogus clusters. The requirement that the V position inside a word-final rising sonority cluster must be pronounced overrides potential proper government of an empty nucleus in this position, shown in (16a–b) for the two possibilities.

(16) *Word-final rising sonority clusters*: Pronounced V position

a. *settle* [ˈsɛtəl]

```
C V1 [C  V]  C  V2  C
|  |              |
s  ɛ        t  ə  l
```

b. *settle* [ˈsɛtl̩]

```
C  V1 [C  V]  C  V2  C
|   |
s   ɛ          t      l̩
```

Schwa, as in (16a), is the interpretation of an ungoverned empty nucleus. A syllabic consonant, as in (16b), is analysed by Polgárdi (2015) as branching on a preceding V position in English (following Szigetvári, 1999; and Scheer, 2004), accounting for its alternation with schwa in (16a–b). As a syllabic consonant acts like any other unstressed vowel, virtual geminates are necessary in (16a–b) to satisfy the requirement of proper government. Finally, coda–onset sequences as in (15a) behave differently because in them sonority is falling.

In summary, stressed short and long vowels are in complementary distribution in English. At this point, let me summarise the advantages of the present analysis over previous approaches. As opposed to the bipositional rhyme analysis (following Hammond, 1997; and Borowsky, 1989), where stressed “rhymes” were required to contain *exactly two* positions, in the present analysis the restriction is no longer arbitrary: a stressed position must properly govern an empty nucleus. Defining properties of proper government include that it is binary and non-transitive (arrived at on the basis of independent evidence, e.g. vowel ~ zero alternation in various languages). Therefore, in this analysis, variation is restricted to two possibilities: either a language requires stressed vowels to properly govern or there is no such requirement. In a bipositional rhyme approach, in contrast, there is no reason why rhymes should be restricted to exactly two positions, instead of any other imaginable number. As no other numbers seem to be supported empirically, such an analysis overgenerates. In addition, a CV analysis can unify the representations of coda–onset clusters and bogus clusters, both of which can provide a following context for short vowels. Another advantage is that there is no need (or even possibility) for extrasyllabicity, and all final consonants are treated in a uniform manner, that is, as a “bachelor” C. In the extrasyllabic account, only final consonants of “superheavy rhymes” are analysed as extrasyllabic, whereas consonants following short stressed vowels belong to the rhyme. Therefore a final “bachelor” C is not equivalent to extrasyllabicity, neither is it invented for the sake of “superheavy rhymes”.

Furthermore, an analysis employing virtual geminates is supported by accents like Welsh English, where the distribution of short and long stressed vowels in syllable structure is identical to that shown in (2) (although differences in melodic identity can be found), but where virtual geminates in fact become audible. Different sources do not agree exactly about the context of lengthening. Thomas (1984:185) only mentions that “single consonants in medial position following a short stressed vowel are phonetically long”, as in (17a).

(17) *Welsh English*

a. __ $CV (=2a.i)

```
C  V  [C  V]  C  V
|  |          |  |
s  ɪ          t  i      [ˈsɪtːi]
```

b. __ C# (=2e.i)

```
C  V  [C  V]  C
|  |          |
h  ʊ          k      [hʊkː]
```

However, Connolly (1981) also reports lengthening in the word-final context, as in (17b). In his description, lengthening also applies after [iː, uː] and the diphthongs when these are fully shortened before a fortis consonant, and to certain, not precisely specified, types of clusters (the latter of which I cannot account for here).

With this background, we can now turn to the topic of glides, first examining the distribution of [j] and [w] in English.

4. Distribution of the glides [j w]

I have used the electronic database at http://seas3.elte.hu/epd, based on Hornby et al. (1974), and the database of Lindsey and Szigetvári (2013) at http://seas3.elte.hu/cube to collect data for this section. I have checked all examples cited in Wells’ (1990) *Longman Pronunciation Dictionary*.

In English, [j] and [w] can precede a stressed (i.e. full) vowel (V), following an unstressed (i.e. reduced) vowel (v), as in (18a), at the beginning of the word, as in (18b), or after a consonant, as in (18c).

(18) *Preceding a stressed vowel*

a. v __ V	beyond	[bɪˈjɒnd]	aware	[əˈweə]
	picayune	[ˌpɪkəˈjuːn]	chihuahua	[tʃɪˈwɑːwə]
	majolica	[məˈjɒlɪkə]	caraway	[ˈkærəˌweɪ]
b. # __ V	yawn	[jɔːn]	week	[wiːk]
	year	[jɪə]	wolf	[wʊlf]
	unit	[ˈjuːnɪt]	water	[ˈwɔːtə]
c. C __ V	secure	[sɪˈkjʊə]	equip	[ɪˈkwɪp]
	mule	[mjuːl]	dwell	[dwɛl]
	continuity	[ˌkɒntɪˈnjuːəti]	persuade	[pəˈsweɪd]

Note that the three examples in (18a) are the only ones I have found involving [j] in this context. In (18c), for [w], the most common combination is the sequence [kw], as in *equip*, and for [j], all examples contain the complex vowel [ju:] or its broken counterpart [jʊə] (to be discussed in more detail in section 7).[16]

The glides cannot occur before a consonant (whether after a stressed or an unstressed vowel), as shown in (19a), or at the end of the word (whether after a short or long stressed vowel, or an unstressed vowel), as shown in (19b) (cf. examples containing "real" consonants like [k] in these positions).

(19) *Preceding a consonant, or at the end of the word*

a.	V __ C	*[ˈvʊjtə]	(cf. [ˈvɛktə] (2i.b))
	v __ C	*[ˈkærəjtə]	(cf. *character* [ˈkærəktə])
b.	V __ #	*[hʊj]	(cf. [hʊk] (2i.e))
	V: __ #	*[hɔ:j]	(cf. [hɔ:k] (2ii.e))
	v __ #	*[ˈbʌtəj]	(cf. *buttock* [ˈbʌtək])

Similar phonetic sequences are well-formed in English (except for the long vowel + glide combination) when they can be interpreted as a diphthong, but [ʊɪ] and [əɪ] are not possible diphthongs in RP (cf. (27) below), and therefore all these examples are ruled out.

The context preceding an unstressed vowel provides an interesting extra restriction. Here again glides can occur after an unstressed vowel, as in (20a), at the beginning of the word, as in (20b), or after a consonant, as in (20c).

(20) *Preceding an unstressed vowel*

a. v __ v		*[əjə]	cassowary	[ˈkæsəwəri]
			Ottawa	[ˈɒtəwə]
			Iowa	[ˈaɪəwə]
b. # __ v	yahoo	[jəˈhu:]	wazoo	[wəˈzu:]
	yeshiva	[jəˈʃi:və]	wisteria	[wɪˈstɪəriə]
	euphoria	[juˈfɔ:riə]	Watusi	[wəˈtu:si]
c. C __ v	accurate	[ˈækjərət]	penguin	[ˈpɛŋgwɪn]
	bucolic	[bjuˈkɒlɪk]	cuirass	[kwɪˈræs]
	onion	[ˈʌnjən]	bulwark	[ˈbʊlwək]

[16] The only exceptions I have found are *cordillera* [ˌkɔ:dɪlˈjeərə], *vignette* [vɪnˈjet] and *milieu* [ˈmi:ljɜ:], containing a different vowel from [u:] or [ʊə] after [j].

d. V: __ v	halleluja	[ˌhælɪˈluːj̲ə]	peewit	[ˈpiːw̲ɪt]
	Maya	[ˈmɑːj̲ə]	narwhal	[ˈnɑːw̲əl]
	hiya	[ˈhaɪj̲ə]	Taiwanese	[ˌtaɪw̲əˈniːz]
e. V __ v		*[ˈæj̲ə]		*[ˈæw̲ə]

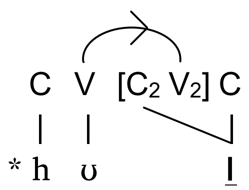
There are no examples of *[əj̲ə] sequences in (20a), however, we have already seen in (18a) that very few examples exist even with a following stressed vowel. With [w], we find about a handful of examples in (20a), and few examples in (20b). In (20c), the first line includes word-internal examples, the second word-initial ones, and the third examples where the consonant and the glide belong to different syllables. Similarly to (18c), most cases involve [kw] and reduced versions of [juː]/[jʊə] (the latter also being true for (20b)). I will return to examples like *onion* [ˈʌnj̲ən] in section 7.

The pattern of interest for us is shown by the contrast of (20d) vs. (20e). That is, when the glide is immediately preceded by a stressed vowel, this vowel must be long, as in (20d), and a short vowel like in *[ˈæj̲ə] or *[ˈæw̲ə] in (20e) is ruled out (compare ill-formed *[ˈsɪw̲i] with examples containing “real” consonants, like [ˈsɪt̲i] in (2i.a)). Examples like (20d) (as, in fact, all examples in (20)) are claimed to be non-existent in the literature (e.g. Kreidler, 1989)[17], however, in actual fact more such examples exist for [j] than of the allegedly only licit type in (18a).[18]

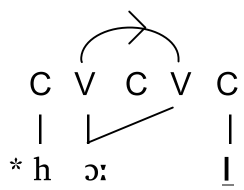
If the intervocalic glide is analysed as a single C position in both (20d) and (20e), then it is difficult to make sense of this pattern. In contrast, if short stressed vowels in seemingly open syllables must be followed by a virtual geminate, as in (11a) above, then the lack of (20e) fits together with the lack of (19): i.e. the generalisation is that glides in English must be followed by a pronounced V position, as shown in (21).

(21) *Glides must be followed by a pronounced V position*

a. V __ #



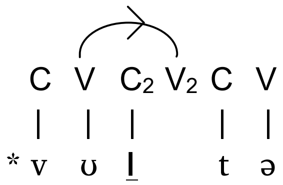
b. V: __ #



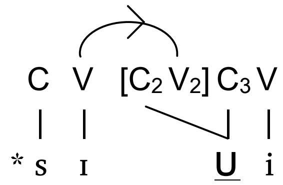
[17] Note that the same is true for [h]. In the literature, it is claimed to only occur before a stressed vowel or word-initially. But examples fitting into (20a–d) exist, even if not in great numbers (e.g. *Monahan* [ˈmɒnəh̲ən], *harangue* [h̲əˈræŋ], *inhalation* [ˌɪnh̲əˈleɪʃən], *maharaja* [ˌmɑːh̲əˈrɑːʤə]). There are, however, no examples fitting into (20e).

[18] Although in this type of approach the difference between systematic and accidental gaps is not always easy to establish, an experimental investigation of these patterns (e.g. well-formedness judgements of nonce words, or perceptual experiments, Kawahara, 2011) goes beyond the scope of this paper. However, I think that the generalisation is natural enough (as explained below) to make the restriction on glides following short stressed vowels a plausible grammatical constraint.

c. V __ C



d. V __ v



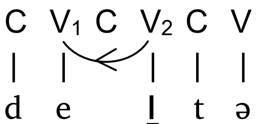
This is clearly not the case word-finally, see (21a–b), and in a coda position, see (21c). In (21d), C_3 *is* followed by a pronounced V position, and yet the form is ungrammatical. V_2, however, is silent, therefore the C_2V_2 sequence violates the generalisation in the same way as it does in (21c). If the C_2V_2 sequence was missing, we would not understand why such forms are ruled out. For that reason, this generalisation is only expressible in an approach where short stressed vowels in English are followed by a virtual geminate. (See also Maddieson, 2008 on the cross-linguistic markedness of geminate glides.)

5. Representation of diphthongs

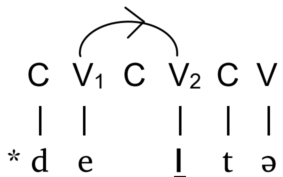
Let us now consider how to represent diphthongs in this approach. In this paper, I will only treat closing diphthongs, while centring diphthongs resulting from pre-R breaking will be disregarded (but see a possible analysis of the latter in Polgárdi, 2013). As discussed in section 1, the most straightforward possibility for representing diphthongs in a CV approach involves associating the off-glide to the V_2 position, as in (22a).

(22) *Off-glide in the nucleus*

a. *Szigetvári (1999)*



b. *Proper government impossible*



This type of representation has been proposed in passing by Szigetvári (1999:72), without discussing any actual data or providing any specific arguments. In his version of Ségéral and Scheer's (1999) Coda Mirror theory, Szigetvári posits right-to-left licensing between V_2 and V_1 (shown by an arrow under the CV tier in (22a)). In the present approach, however, this type of representation cannot be adopted for English because for V_1 to be able to properly govern V_2, the latter position must be melodically empty, see (22b).

As glides in English are ruled out preceding a consonant or at the end of the word, shown in (19) above, unless they form part of a diphthong, another option for representing diphthongs becomes available whereby the off-glide is associated to the C_2 position, that is, it is treated as the coda of a closed syllable, shown in (23a).[19] This type of representation has been proposed by Ségéral and Scheer (1998) for diphthongs in German to account for the fact that off-glides do not take part in apophony.

(23) *Same distribution, different representations*

a. *Diphthong as closed syllable*

```
C  V  C2 V  C  V
|  |  |      |  |
d  e  l      t  ə
```

b. *Long monophthong*

```
C  V  C  V  C  V
|  |        |  |
m  iː       t  ə
```

As discussed in sections 2 and 3, diphthongs and long monophthongs have the same distribution in English. However, their representations will differ if the off-glide resides in a coda position, as shown in (23a–b). In fact, this solution does not prove problematic when accounting for the distributional pattern in (2) as both diphthongs and long monophthongs involve a proper governing domain, but it does encounter problems elsewhere.

First, let us examine primary stress assignment. In nouns, final syllables are generally regarded as extrametrical (e.g. Hayes, 1982), indicated by angle brackets in (24).

(24) *Primary stress in nouns*: Final syllable extrametrical

a. —VC<σ>#	b. —VV<σ>#	c. —V<σ>#
a.gén.<da>	ho.rí.<zon>	cí.ne.<ma>
a.mál.<gam>	a.ró.<ma>	ém.pha.<sis>
	mu.sé.<um>	
	ba.ná.<na>	

If the penultimate syllable is closed, as in (24a), or it contains a diphthong or a long vowel, as in (24b), then it counts as heavy, and it attracts stress. However, if it is open and contains a short vowel, as in (24c), then the antepenultimate syllable is stressed. Thus, word-internally, closed syllables and syllables containing a long vowel or a diphthong all behave alike.

In contrast, in verbs only the final consonant behaves as extrametrical, shown in (25).

19 Under such an analysis, the generalisation in (21) must be formulated in a different way, as only the other three structures are then ill-formed. I will return to this issue below.

(25) *Primary stress in verbs*: Final consonant extrametrical

a. —VC<C>#	b. —VV<C>#	c. —V<C>#
de.fén<d>	con.tái<n>	fí.ni<sh>
con.sís<t>	pro.dú<ce>	a.bán.do<n>
	de.ný	cá.rry
	ag.rée	vá.ry

Again, if what remains is heavy, that is, a closed syllable, see (25a), or a diphthong or long monophthong, see (25b), then it is stressed, but if what remains is light, see (25c), then stress falls on the penult. Therefore, word-finally, diphthongs form a natural class with long vowels in being heavy and attracting stress (e.g. *dený*, *agrée* in (25b)), as opposed to syllables closed by a single consonant, which normally remain unstressed, due to counting as light (e.g. *fínish* in (25c)).

In a Loose CV approach, this translates as the question why the final empty V position is obligatory in a diphthong, as in (26a), while it can be absent in the case of syllables closed by a "real" consonant, as in (26b), which end in a C position.

(26) *Word-final*

a. *Diphthong*

```
C  V  C  V  C  V
|  |  |  |  |
d  ɪ  n  a  ɪ
```

b. *Closed syllable*

```
C  V  [C  V]  C  V  C
|  |          |  |  |
f  ɪ          n  ɪ  ʃ
```

In the diphthong the final governing domain attracts stress, which is not present in the case of a word-final closed syllable, where the preceding vowel is stressed and a virtual geminate is present to provide a proper governing domain.

The second problem concerns the fact that phonotactic restrictions exist between the melodies constituting a diphthong (i.e. only the combinations in (27a–b) occur in RP), whereas no such restrictions apply between short vowels and "codas" proper, shown in (27c), and all short vowels can occur in this context.

(27) *Phonotactic restrictions*

a. *Off-glide* [ɪ]

[eɪ] data
[aɪ] mitre
[ɔɪ] loiter

b. *Off-glide* [ʊ]

[əʊ] motor
[aʊ] doughty

c. *Coda consonant*

[ɪ] victor
[ɛ] vector
[æ] factor
[ɒ] doctor
[ʌ] conductor
[ʊ] pulpit

However, no such difference in behaviour is predicted by their identical structure, as illustrated in (28a–b).

(28) *Same representation, different behaviour*

a. *Diphthong*

```
C  V₁ C₂ V  C  V
|  |  |     |  |
d  e  I     t  ə
```

b. *Closed syllable*

```
C  V₁ C₂ V  C  V
|  |  |     |  |
v  ɛ  k     t  ə
```

On the basis of (28a), we do not expect phonotactic restrictions between the melodies in a diphthong because V_1 and C_2 do not contract any sort of relation, similarly to (28b).

To solve these problems, and to be able to preserve the generalisation for all cases in (21), I propose to represent diphthongs in English as given in (29).

(29) *Representation of diphthongs*

a.

```
C  V  C₂ V₂ C  V
|  |  | /   |  |
d  e  I     t  ə
```

b.

```
C  V  C₂ V₂ C  V
|  |  | /      |
b  ə  U        ə    'boa'
```

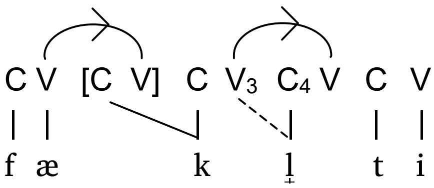
Since in English, glides (i.e. C positions containing a single element **I** or **U**) must be followed by a pronounced V position, the melody of the off-glides of the diphthongs in *data* and *boa* in (29) spreads to the following V position. Glides in (18)–(20) above, fulfilling a purely consonantal role, are of course still only connected to a C position, and forms like (21) are ruled out. Note that (21d) could be "repaired" in the same way as (21c), by spreading the melody of the glide to the V_2 position: in this case, we would get a sequence of a diphthong followed by a glide, as in the form *hiya* [ˈhaɪjə] in (20d).

The restriction that glides must be followed by a pronounced V position might look strange at first sight as they only contain a single element and, therefore, should not require too much support from a following vowel. In fact, lenition (i.e. loss of elements) is quite common in exactly the positions from which glides are prohibited (e.g. Harris, 1990; Ségéral and Scheer, 1999). The reason for this restriction might lie in the fact that glides only contain a resonance element and are thus identical to vowels in their melodic composition, and it seems that vocalic melodic expressions do not like to reside in a consonantal position, or at least not exclusively in a consonantal position. That is why spreading to the following V position can be of remedy in this situation.

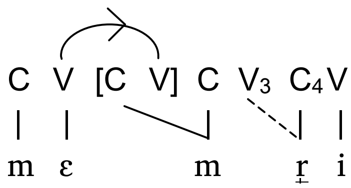
Another question that might arise at this point is why the representation in (29a) is not realised as *[ˈdejɪtə]. But we have already seen in (20e) above that short stressed vowels cannot precede a glide in English. That is, there is no contrast between a diphthong and a short stressed vowel + glide + unstressed vowel sequence. Therefore, in English a diphthong is simply the interpretation of a structure like the one in (29a) – in the same way as a syllabic consonant is not interpreted phonetically as a sequence of a vowel and a consonant, even though that is its representation in the CV approach, as shown above in (16b), and again in (30) (see Polgárdi, 2015, on the basis of Szigetvári, 1999; Scheer 2004).

(30) *Syllabic consonants*

a. *faculty* [ˈfækl̩ti]



b. *memory* [ˈmɛmr̩i]

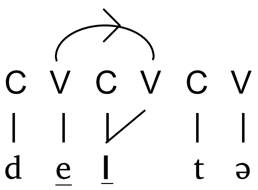


A comparison of (29) with (30) also demonstrates the differences between off-glides and syllabic consonants in English. First, off-glides spread to a following V position, while syllabic consonants spread to a preceding one. Second, off-glides follow a filled V position, while syllabic consonants follow a filled C position. Finally, off-glides are stressed (i.e. part of the stress domain), while syllabic consonants are unstressed in English. Spreading in syllabic consonants is indicated by a dashed line because they alternate with a schwa + non-syllabic consonant sequence (i.e. [ˈfækəlti] and [ˈmɛməri]), as shown above in (16a–b).

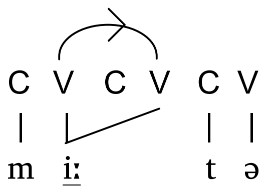
The representation of diphthongs and long vowels is thus parallel in this approach in that both of their V positions are phonetically interpreted, that is, the proper governing relation is manifested by spreading in both cases, as in (31a–b), whereas they differ from "closed syllables", whose second V position remains silent.

(31) *Parallel representations*

a. *Diphthong*



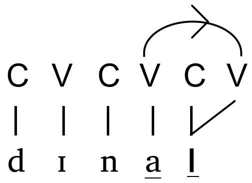
b. *Long monophthong*



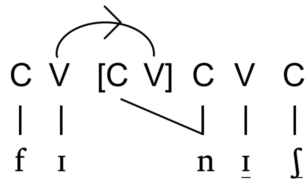
This difference can be utilised in accounting for their divergent behaviour with respect to stress word-finally, as shown in (32).

(32) *Word-final*

a. *Diphthong*



b. *Closed syllable*

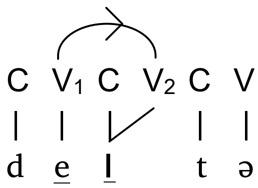


The V position must be present in the diphthong for the melody of the off-glide to spread into, see (32a), whereas it is not necessary in the case of a “real” consonant, see (32b).

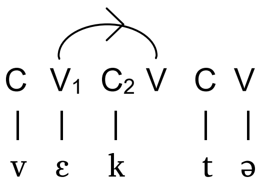
Phonotactic restrictions between the melodies constituting a diphthong can now follow from the proper governing relation contracted between the two V positions, shown in (33a)[20], whereas in a “closed syllable” like in (33b) the V_1 position is not related to the following C_2 in any way and therefore no phonotactic constraints apply.

(33) *Phonotactic restrictions*

a. *Diphthong*: yes



b. *Closed syllable*: no



This hybrid analysis of the off-glide might be further supported by the fact that some of the diphthongs are subject to additional phonotactic restrictions, imposed by a following consonant. Namely, [ɔɪ] (with a handful of exceptions) can only occur before alveolar consonants, illustrated in (34a), and [aʊ] can only precede coronals, shown in (34b).

[20] It is not completely clear how exactly these phonotactic restrictions can be captured, but similar restrictions have been reported before in the literature. For example, Yoshida (1993) discusses syncope in Palestinian Arabic, where [a] can only be properly governed if its governor is also [a] (Yoshida employs iambic proper government).

(34) *Additional phonotactic restrictions*

a. [ɔɪ] __ alveolar		b. [aʊ] __ coronal	
[t]	loi<u>t</u>er	[θ ð]	sou<u>th</u>, mou<u>th</u>$_V$
[d]	avoi<u>d</u>	[t d]	shou<u>t</u>, pow<u>d</u>er
[s]	cloi<u>s</u>ter	[s z]	mou<u>s</u>e, thou<u>s</u>and
[z]	noi<u>s</u>e	[tʃ ʤ]	cou<u>ch</u>, gou<u>g</u>e
[n]	joi<u>n</u>	[n]	cou<u>n</u>cil
[l]	toi<u>l</u>et	[l]	ow<u>l</u>
		[r]	cow<u>r</u>ie

A representation where the off-glide was only connected to the second V position of the diphthong (as in Szigetvári, 1999) – in addition to violating the requirement of proper government – could not account for such restrictions either, because V_2 in (35a) is not related to C_3 in any way. But C_2 and C_3 show phonotactic restrictions in coda–onset clusters as well, shown in (35b).[21]

(35) *Phonotactic restrictions*

a. *Off-glide and onset*

```
C  V1 C2 V2 C3 V
|  |  | /    |  |
l  ɔ  l      t  ə
```

b. *Coda and onset*

```
C  V  C2 V  C3 V
|  |  |      |  |
v  ɛ  k      t  ə
```

Thus, in an analysis where the melody is connected to both a C and a V position, both interactions between V_1 and V_2, and between C_2 and C_3 are expected.

An advantage of this analysis is that it can explain the relationship of stress to the distribution of both vowels and glides. In addition, it can capture the nature of diphthongs as a category in between long vowels and closed syllables, and it can account for both types of phonotactic restrictions affecting them, as well as for their patterning in stress assignment.

6. High vowel gliding

Turning now from the distributional patterns involving glides to an alternation, let us examine the free variation between a high vowel and a glide preceding an

[21] The exact form of the phonotactic restrictions in (35a) is not completely clear. One source of difficulty is that they affect the combination of melodies in the diphthong and not simply the off-glide (i.e. [ɔɪ] is affected but [aɪ] and [eɪ] are not, and similarly for [aʊ] vs. [əʊ]). Another problem concerns the representation of coda–onset restrictions in the CV approach. There is no consensus about this in the literature, but see Szigetvári (1999) for a solution in terms of C-to-C government. I leave the specifics of a solution for further research.

unstressed vowel in English, called High vowel gliding (Szigetvári, 1999, 2002), illustrated in (36).

(36) *High vowel gliding*

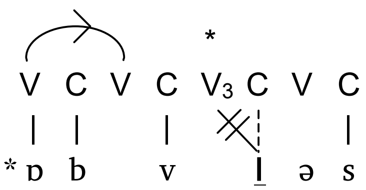
a.	gradient	[ˈgreɪd{i/j}ənt]	gradual	[ˈgræʤ{u/w}əl]
b.	ambient	[ˈæmb{i/j}ənt]	actual	[ˈæktʃ{u/w}əl]
c.	obvious	[ˈɒbv{i/j}əs]	annual	[ˈænj{u/w}əl]
d.	nucleus	[ˈnjuːkl{i/j}əs]	influence	[ˈɪnfl{u/w}əns]
e.	vitriol	[ˈvɪtr{i/j}əl]	congruous	[ˈkɒŋgr{u/w}əs]
f.	requiem	[ˈrɛkw{i/j}əm]	vacuum	[ˈvækj{u/w}əm]

This alternation is very unrestricted: it can occur after any type of consonant (even [r j w], as in (36e–f), which cannot stand before a consonant otherwise in RP) or after any type of consonant cluster (coda–onset, as in (36b), bogus, as in (36c), complex onset, as in (36d–f)). This means that the resulting glide cannot form a complex onset with the preceding consonant.

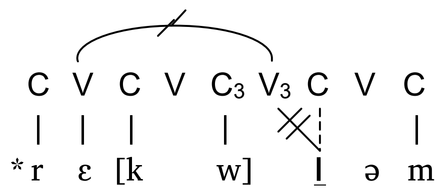
The question that arises then is whether the glide occupies an onset to begin with in these forms, as a result of movement from a V position to the following empty C position inside the hiatus. Szigetvári (1999) proposes that it does. Then, however, we arrive at representations like in (37) for examples where a cluster precedes the alternation site. In the case of a preceding bogus cluster, see (37a), the representation is ill-formed because the vacated V_3 cannot be properly governed to make sure that it remains silent. (The same problem appears after coda–onset clusters or long vowels.)

(37) *Representation of gliding as movement*

a. *After a bogus cluster*



b. *After a branching onset*



A “branching onset” like [kw] in (37b) can be preceded by both short and long vowels in English, in the same way as a non-branching onset can (in (11) above), and differently from coda–onset clusters and bogus clusters (in (12)). Therefore, licensing of the empty nucleus inside a branching onset cannot come from the preceding vowel. Scheer (1999) proposes that such empty nuclei do not need to be properly governed because they are trapped inside a closed domain of consonantal interaction (indicated by square brackets in (37b)), called infrasegmental government, which licenses them to remain silent. Hence, after a short stressed vowel, normally a virtual geminate would appear. In this case, however, we could try to provide a proper governor for the vacated V_3 position in the way illustrated in

(37b), by omitting the extra CV unit constituting the virtual geminate. Unfortunately, such a representation is still ill-formed because the infrasegmental governing domain has to be licensed by a following ungoverned nucleus according to Scheer (1999). In fact, there is also another problem with this representation: the glide [w] in C_3 cannot be followed by an unpronounced V position. Consequently, V_3 cannot remain silent here either.

Therefore, instead of movement, I propose to represent the alternation between the high vowel and the glide by means of spreading, as shown in (38a–b).

(38) *Representation of gliding as spreading*

a. *High vowel*

```
V  C  V  C  V3  C3 V  C
|  |     |  |         |
ɒ  b     v  ɪ      ə  s
```

b. *Glide*

```
V  C  V  C  V3  C3 V  C
|  |     |  |  /      |
ɒ  b     v  ɪ      ə  s
```

During gliding, the high vowel spreads into the following empty C position, illustrated in (38b). If we assume that schwa is the interpretation of an ungoverned empty nucleus, then the condition on gliding that the following vowel must be a [ə] can be understood as a means of avoiding a melodically empty CV unit (shown by underlining in (38a)).

The representation of the resulting glide is identical to the representation of syllabic consonants shown in (30) above (except for the direction and source of spreading), which can explain its distributional freedom: as these representations start like a vowel, these glides behave like a vowel with respect to preceding consonant (cluster)s. Gliding also complies with the restrictions on Syllabic Consonant Formation: V_3 is unstressed, and C_3 is a sonorant which is itself more sonorous than the preceding consonant (except for the glide–glide sequences in (36)). And again, similarly to the interpretation of syllabic consonants and off-glides in diphthongs, the glide in words like *obvious* in (38b) is not interpreted phonetically as a VC sequence, that is, as *[ˈɒbvij̠əs].

7. The representation of [juː]

Finally, let us consider the behaviour and properties of the sequence [juː] in more detail, to discover the nature of the glide [j] in this configuration. As we have seen in (18) above, both word-initial glides can be followed by different stressed vowels, whereas post-consonantally this is only true of [w]. Some further examples of the first generalisation are presented in (39).

(39) *Word-initial glides*

[ɪ]	yip	witch	[ɜː]	yearn	work
[ɛ]	yes	web	[iː]	yeast	week
[æ]	yank	wax	[uː]	you	womb
[ɒ]	yacht	wash	[əʊ]	yoke	woe
[ʌ]	young	one	[aʊ]	yowl	wound
[ɔː]	yawn	warm	[ɪə]	year	weird

The table in (40) illustrates word-initial clusters in RP. The first consonant is placed on the vertical axis and the second consonant on the horizontal axis. Combinations for which very few examples exist appear in parentheses. The first three columns show that normally a word-initial cluster is made up by a stop or a voiceless fricative followed by a liquid or a glide. Such clusters are usually analysed as branching onsets in the literature (e.g. Kaye et al., 1990; Harris, 1994 in standard Government Phonology). That is, an affricate, a [h], a voiced fricative, or a sonorant cannot occupy the first position of a complex onset, whereas a nasal or an obstruent cannot occupy the second position (shown by the last two columns). [s] and [ʃ] contradict the latter generalisation, but there is independent evidence that they do not form a branching onset with a following consonant (e.g. Kaye et al., 1990; Harris, 1994). In addition, the clusters [pw bw fw tl dl θl] are ruled out. As [r] is postalveolar in English, this can be formulated as a non-homorganicity restriction on complex onsets.

(40) *Word-initial clusters*

	r	l	w	j	m n	p t k f
p	preɪ	plɔɪ	*	pjʊə	*	*
t	truː	*	twɪn	tjuːn	*	*
k	krəʊ	klɪə	ˈkwaɪət	kjuːb	*	*
b	braʊ	bluː	*	ˈbjuːti	*	*
d	drɔː	*	dwɛl	djuː	*	*
g	grɑːs	glɛə	ˈgwɑːnəʊ	gjuːlz	*	*
f	frɒg	flʌʃ	*	ˈfjʊəri	*	*
θ	θriː	*	(θwɔːt)	θjuː	*	*
s	*	slæk	swɜːv	s(j)uː	smɪə snəʊ	spɔɪl staʊt skuːl sfɪə
ʃ	ʃrɪŋk	(ʃlɒk)	(ʃwɑː)	*	(ʃmʌk) (ʃnæps)	(ʃpiːl) (ʃtʊp)
h	*	*	*	hjuː	*	*
v	*	*	*	vjuː	*	*
z	*	*	*	ˈz(j)uːgmə	*	*
m	*	*	*	mjuːl	*	*
n	*	*	*	njuː	*	*

glosses: *pray, ploy, pure, true, twin, tune, crow, clear, quiet, cube, brow, blue, beauty, draw, dwell, dew, grass, glare, guano, gules, frog, flush, fury, three, thwart, thew, slack, swerve, sue, smear, snow, spoil, stout, school, sphere, shrink, schlock, schwa, schmuck, schnapps, spiel, schtup, hue, view, zeugma, mule, new*

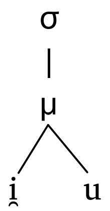
The column containing [j] as the second consonant is special in several respects. First, in addition to stops and voiceless fricatives, [j] can also occur after [h], voiced fricatives and nasals (but not after affricates, liquids and [ʃ ʒ][22]). Second, the vowel following post-consonantal [j] can only be [uː] or its broken counterpart [ʊə]. Both these peculiarities suggest that the [j] does not form a branching onset with the preceding consonant, but it forms some sort of a unit with the following vowel (referred to as a “complex vowel” by Nádasdy, 2006).

Davis and Hammond (1995), using the same distributional arguments (although

[22] It cannot occur after [ð] either, but as this consonant does not occur initially in content words at all in English, I omit it from this discussion.

only mentioning [m] as also occurring before [j] in American English), in addition to evidence from language games, propose a light diphthong analysis of [i̯u], as shown in (41).

(41) [i̯u] *as a light diphthong* (Davis and Hammond, 1995:164)



They argue for the co-moraic structure on the basis of stress facts: namely, nouns containing this vowel in an open penult, like *árgument*, *cálculus*, *fórmula*, have antepenultimate stress, which means that the penult in these cases is light.

However, this analysis cannot be correct for several reasons. First, there are also such nouns with penultimate stress, like *lacúna*, *caesúra*, *ichnéumon*. Second, the distribution of [ju:] is identical to the other long vowels and diphthongs discussed above, as shown in (42).

(42) *Distribution of* [ju:] *in syllable structure*

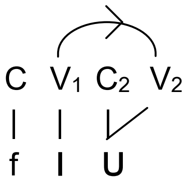
		(i) Long		(ii) [ju:]	
Internal	a. __ $CV	ˈhɔːti	‘haughty’	ˈbjuːti	‘beauty’
	b. __ C$CV	*		*	
	c. __ $V	ˈfaɪəl	‘phial’	ˈfjuːəl	‘fuel’
Final	d. __ #	həʊ	‘hoe’	hjuː	‘hue’
	e. __ C#	piːk	‘peek’	pjuːk	‘puke’
	f. __ CC#	*		*	

Third, [ju:] parallels [u:] in taking part in pre-R breaking, that is, *cue* [kjuː] corresponds to *cure* [kjʊə] in the same way as *boo* [buː] does to *boor* [bʊə]. Finally, sources on the historical development from [iu̯] to [ju:] (e.g. Dobson, 1968; Ekwall, 1975; Lass, 1999) also treat the resulting vowel as long, Dobson and Lass explicitly discussing the lengthening of the second element during the change from a falling to a rising diphthong (in the later 16th or earlier 17th century). Therefore, [ju:] cannot simply be analysed as a light diphthong.

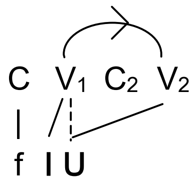
I propose the analysis in (43) for the development of the sequence [i̯u:] from [iu̯] in the history of English, on the basis of the example of *few*.

(43) *Development of* [i̯uː] *from* [iu̯]

a. *few* [fiu̯]



b. *few* [fi̯uː]



[iu̯] in (43a) is a regular closing diphthong, like the ones represented in (29) above, where the off-glide fills the following V_2 position. The change involved reconnecting the melody **U** from the C_2 position to the V_1 position, while keeping the structure intact, as shown in (43b).[23] In fact, there is no obvious reason for the diphthong to shorten, and the analysis in (43) captures that. However, as **I** and **U** share the same line in English (since there are no front rounded vowels), the elements cannot fuse, and the resulting combination can only be interpreted sequentially, as a type of contour segment, a light diphthong (which overlaps a long vowel, by sharing its second piece of melody with the following V position), and instead of *[yu̯] we get [i̯uː]. The expression “complex vowel” thus seems quite appropriate here.

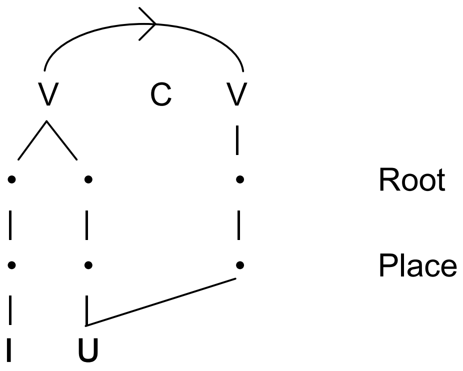
Previous analyses of light diphthongs in Government Phonology include Kaye (1985), Kula (2002), and Rhee (2002). They use the same type of distributional arguments as we have seen above. In fact, Kula (2002:56) proposes a structure which is almost identical to the one in (43b) for sequences like [jaː] resulting from [i + a] through gliding and lengthening in Bemba. The only difference concerns the direction of the governing relation.

Thus, in a light diphthong, two phonological expressions are associated to a single position. What is unclear, however, is what prevents fusion of elements inside a light diphthong (when fusion of those elements is otherwise permitted in the language, as in Bemba). The problem occurs in a slightly different form in English, too, because if **I** and **U** occupy the same line in this language, then they should not be able to connect to the same skeletal slot, according to Kaye et al. (1985).

These problems can be solved by assuming feature geometry, and the presence of two root nodes within light diphthongs, similarly to the representation of affricates by Harris (1994). (See also van de Weijer, 1994 for the same idea in a Dependency Phonology based model, employed to other complex segments as well, such as clicks, consonants with secondary articulation, etc.) The exact representation of [i̯uː] is shown in (44).

[23] Perhaps this change was motivated by the desire to avoid a falling diphthong with equal sonority between its members. This idea might be supported by the fact that the falling diphthong [ui̯], containing the same elements in the opposite order, also disappeared in the same period, eventually being replaced by the diphthong [ɔɪ].

(44) *Two root node analysis of* [i̯u:]

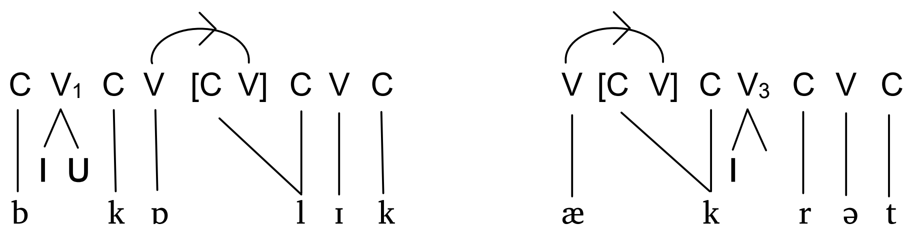


As far as I am aware, this possibility (or, in fact, the problem itself) has not been discussed in the Government Phonology literature with respect to light diphthongs.

In unstressed positions, [i̯u:] is reduced, similarly to other vowels. The representation of reduced versions of [i̯u:], as in *bucolic* [bju'kɒlɪk] and *accurate* ['ækjərət] in (20c) above is shown in (45). These can now have the structure of simple light diphthongs.

(45) *Reduced versions of* [i̯u:]

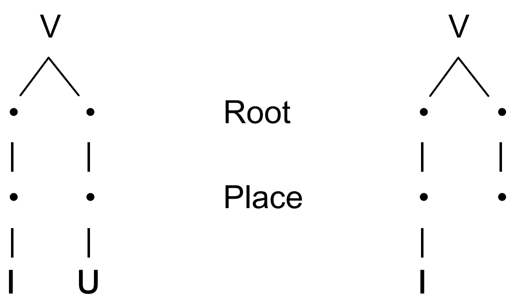
a. *bucolic* [bju'kɒlɪk] b. *accurate* ['ækjərət]



V_1 in (45a) is the shortened version of [i̯u:], while V_3 in (45b) is both shortened and reduced from [u] to [ə], by losing the element **U**. The two root node analysis is shown more precisely in (46).

(46) *Two root node analysis*

a. [i̯u] b. [i̯ə]



As can be seen in (46b), the two root node structure is not affected by the melodic reduction, and the light diphthong [i̯ə] surfaces. The reason for loss of **U** is that the on-glide in a light diphthong cannot be more sonorous than the syllabic portion. The element **I** therefore cannot be delinked, at least not by itself. There are a few words, however, where both elements might be lost, and in such cases a schwa surfaces, as in *augury* [ˈɔːg{jʊ/jə/ə}ri].

The complexity of the structures in (44) and (46) is also demonstrated by the fact that they are simplified whenever possible: that is, if [i̯u:] (or its reduced versions) are not preceded by a consonant, then the element **I** occupies the preceding C position, the light diphthong has thus been dismantled and reanalysed as the sequence [ju:] (or [ju] or [jə]). This is shown in (47a).

(47) [i̯u:] > [ju:]

a. *unit* [ˈju:nɪt]

```
C  V  C  V  C  V  C
|  |        |  |  |
I  U        n  ɪ  t
```

b.

[ən] / [ði]	[ˈæpl̩]	*apple*
[ə] / [ðə]	[pɛə]	*pear*
[ə] / [ðə]	[wi:k]	*week*
[ə] / [ðə]	[jɪə]	*year*
[ə] / [ðə]	[ˈju:nɪt]	*unit*

The evidence for this is provided in (47b). Indefinite and definite article allomorphy in English is governed by whether the initial segment of the noun occupies a V or a C position. The melodic identity of the sound is irrelevant. It can contain solely vocalic melody, if this occupies a C position, it behaves like a “real consonant”. And as shown by the last example, the [j] of the complex vowel [ju:] behaves in the same way as the other glides this time. Therefore, their representations must also be identical.

The sequence [i̯u:], however, has also been analysed as the concatenation of an onset [j] and a branching nucleus [u:] in a post-consonantal position. For example, Harris (1994) claims that although historically [j] was prohibited from occurring in complex onsets in English, the first part of the diphthong [iu̯] has since moved from the nucleus to the onset. Two main arguments are provided in support of this proposal. The first is that the [j] never occurs after a branching onset, that is, it remains unrealised in examples like *clue* [klu:] and *threw* [θru:] (where evidence for its historical status is provided by accents where the [iu̯] reflex of [ju:] is retained, like the one in rural south Wales[24]).

The second argument concerns the gaps in table (40), illustrated in (48a), viz. that [j] fails to surface after [tʃ ʤ ʃ ʒ r l], and optionally after [s z] in RP. The case of

[24] In this accent, the allomorph of the articles selected by words like *unit* is the same as those found in other prevocalic contexts, exemplified by *apple* in (47b) (Wells, 1982).

[l] is not completely clear: although according Harris (1994) [i̯uː] can follow a lone [l] in examples like *lewd*, the first pronunciation listed in Wells (1990) for such words always lacks the [j][25]. If, however, [i̯uː] cannot occur after [l], it will not occur after clusters containing [l] either.

(48) *Gaps in* (40)

a.	chew	[tʃuː]	b.	tune	[t̠uːn]
	juice	[dʒuːs]		dew	[d̠uː]
	sure	[ʃʊə]		thew	[θ̠uː]
	luxurious	[lʌgˈʒʊəriəs]		new	[n̠uː]
	rue	[r̠uː]			
	lewd	[l̠uːd]			
	sue	[s̠(j)uː]			
	zeugma	[ˈz̠(j)uːgmə]			

In other accents, like General American, the restriction on [j] is extended to all coronals, and we find surface forms like those given in (48b). This is taken to be a similar restriction against homorganicity within branching onsets as the one discussed above in relation to the lack of [pw bw fw tl dl θl] clusters.

In my opinion, however, these phenomena do not support a complex onset analysis of Cj sequences. As shown by (40), [tʃ], [dʒ] [ʒ] and [z] do not occur in complex onsets at all in RP, [s] and [ʃ] behave differently from initial members of branching onsets, and [r] and [l] are also illegal as initial members. In addition, although [ʃj] and [rj] sequences are ruled out, [ʃr] sequences are well-formed.[26] Therefore, this does not seem to be a general non-homorganicity constraint, but rather a constraint specifically referring to the on-glide [i̯] of the complex vowel [i̯uː].

The restriction on [tʃ dʒ ʃ ʒ r l] + [i̯uː] sequences fits into the type of constraints between onsets and following nuclei discussed by Clements and Keyser (1983), van der Hulst (1984), and Steriade (1988). These constraints are restrictions on homorganicity and not on sonority distance (Steriade, 1988), and they typically refer to individual segments rather than to natural classes (van der Hulst, 1984:56). The latter claim is further reinforced by the fact that this restriction does not (necessarily) affect a [j] resulting from High vowel gliding, as shown in (49).

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25 The only exceptions are *lure* and *lurid*, where the first pronunciation contains the [j], while the second lacks it, similarly to examples with [s z].

26 It is also interesting to note that while [ʃr] is licit, all other ʃC-clusters are marginal in English, whereas we find the opposite situation with sC-clusters, where [sr] is illicit, while everything else is well-formed. This suggests that [ʃr] is derived from [sr] via place assimilation. This does not disqualify the argument in the text, based on a distinction between *[ʃj] and *[rj] sequences on the one hand, and [ʃr] sequences on the other.

(49) *High vowel gliding*: Glide preserved

associate	[əˈsəʊʃ{i/j}ət]
collegial	[kəˈliːʤ{i/j}əl]
osier	[ˈəʊz{i/j}ə] / [ˈəʊʒ{i/j}ə] / [ˈəʊʒə]
area	[ˈɛəṟ{i/j}ə]
alien	[ˈeɪḻ{i/j}ən]
nutrient	[ˈnjuːṯṟ{i/j}ənt]
nucleus	[ˈnjuːḵḻ{i/j}əs]

I have not found any examples with [ʧ]. Examples with [ʒ] always result from palatalisation, where the [j] is missing, either optionally (as in (49)) or obligatorily. With [ʤ] and [ʃ], the [j] can also be absent, depending on the example. But with [r] and [l] this never happens, whether they stand alone or after another consonant. The on-glide restriction thus treats the glide resulting from High vowel gliding differently from the on-glide of the sequence [i̯u:].

It should be noted, however, that the glides in (49) are by definition followed by an unstressed vowel, whereas the gaps in (40) concern stressed positions. As the restrictions affecting unstressed [i̯u] and [i̯ə] are slightly different from those referring to stressed [i̯u:], let us examine the former in more detail in (50).

(50) *Distribution of reduced* [i̯u] *and* [i̯ə]

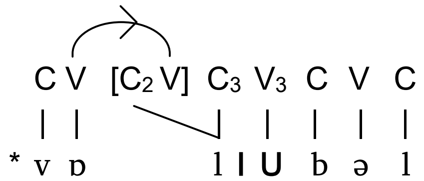
a.	voluble	[ˈvɒḻjʊbəl]
	affluent	[ˈæf̱ḻuənt]
	lucerne	[ḻuˈsɜːn]
b.	virulent	[ˈvɪṟ{ʊ/jʊ/jə/ə}lənt]
	quadruple	[ˈkwɒḏṟ{ʊ/ə}pəl]
	rubescence	[ṟuˈbɛsəns]

(50a) shows that a stable [j] is present after [l] when this follows a stressed vowel, whereas no [j] is possible when the [l] is preceded by a consonant or it occurs at the beginning of the word. The same is true for [r], in (50b), except that the [j] is optional after a stressed vowel (and it is only the second pronunciation in Wells, 1990).

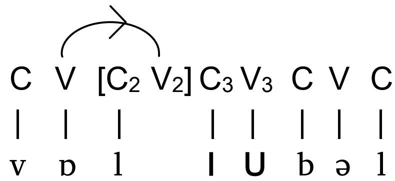
Davis and Hammond (1995), on the basis of Borowsky (1984, 1986), find a similar distribution of [j] after the coronals [l n t d] in American English. Borowsky proposes that in cases like *voluble* there is stress-based resyllabification of the [l] into the preceding syllable, and the on-glide restriction fails to take effect because the coronal and the [j] are not in the same syllable. This idea can also be implemented in the present approach, as shown in (51).

(51) [li̯u] *after a stressed vowel*

a. *voluble* *[ˈvɒl̠ʊbəl]



b. *voluble* [ˈvɒl̠jʊbəl]

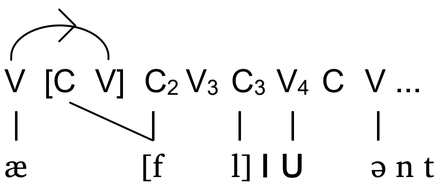


The expected pronunciation of *voluble* would be *[ˈvɒl̠ʊbəl], on the basis of the restriction against [i̯u:] following [l], as given in (51a), where the on-glide, delinked from V_3, remains unrealised. In fact, this is ungrammatical. However, another analysis is also possible. Stress-based resyllabification corresponds to the virtual geminate in this model. But in this case the extra CV unit required by stress is utilised in a different way. To save the on-glide from disappearance, the [l], previously forming the virtual geminate, has been reanalysed to only occupy the C_2 position, while C_3 has been taken up by the on-glide (similarly to what has happened in word-initial position, in (47) above). As the on-glide restriction refers to a light diphthong, it is not applicable in (51b).[27]

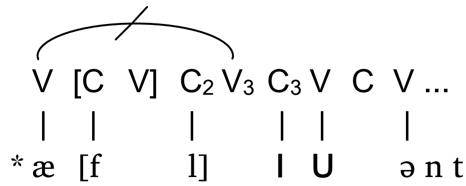
After a consonant, however, this maneuver is not possible, as shown in (52).

(52) [li̯u] *after a consonant*

a. *affluent* [ˈæf̠luənt]



b. *affluent* *[ˈæf̠ljuənt]



As discussed above, "branching onsets" like [fl] involve infrasegmental government, to license the intervening empty nucleus to remain silent (indicated by square brackets). Hence, in (52a), the extra CV unit required by stress is present and is filled by a virtual geminate in the same way as in (51a), and the on-glide of V_4 is similarly unrealised.[28] In this case, however, the C_3 position cannot be freed for the

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[27] Note that in words involving [r], as in *virulent*, something more needs to be said. [r] in RP is prohibited before a silent V position, like V_2 in (51b). In Polgárdi (2013), I propose that because [r] only contains the single resonance element **A**, it behaves in the same way as the other glides in such configurations, as shown in (29a) above. That is, it forms a diphthong with the preceding vowel, and the **A** spreads to the following V position, thereby licensing the structure. As Broadening is a completed historical change, no quality changes happen here.

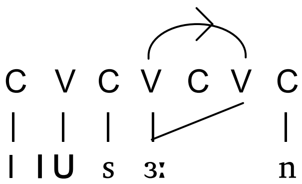
[28] In fact, I think, the on-glide is absent in present-day forms like *affluent*, as it is no longer recoverable for speakers. It is only shown in these representations for ease of exposition of the historical development.

on-glide to migrate into, see (52b), because V_3 cannot be properly governed to remain silent, as infrasegmental governing domains have to be licensed by a following ungoverned nucleus according to Scheer (1999) (as also discussed with respect to (37b) above). Thus the on-glide cannot be saved from disappearance. The reason, however, is not that it cannot form a complex onset with the preceding consonant because the latter already constitutes the second member of such a structure. The on-glide never forms a complex onset, and the historical ban on [j] in branching onsets thus still holds in present-day English.

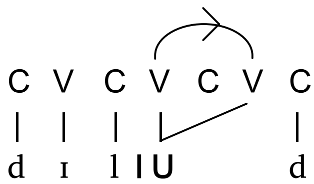
The word-initial situation is shown in (53a).

(53) [li̯u] *word-initially*

a. *lucerne* [l̠uˈsɜːn]



b. *delude* [dɪˈl̠uːd]



Here, it is obvious that there has been no space for the on-glide to move into, and therefore it had to delink. In fact, this is no different from the case of a stressed [i̯uː] following a [l] after an unstressed vowel, as in *delude* [dɪˈl̠uːd] in (53b).

For an analysis like that of Harris (1994), where the on-glide has disappeared from certain complex onsets because of a non-homorganicity restriction, the contrast between (53a) and (51b) is problematic. On the one hand, if [j] normally forms a complex onset with a preceding [l], then it cannot form a bogus cluster just in words like *voluble* to save the [j] from disappearance exactly in these cases. On the other hand, if the on-glide restriction is assumed not to be applicable in unstressed positions after [l r], then the [j] should also appear in words like *lucerne*, and not only in words like *voluble*. Thus, [j] is either absent in both contexts or in neither, contrary to facts.

In the present analysis, disappearance of the on-glide can only be avoided when the extra CV unit required by stress provides extra space in the structure. This only happens if the stressed vowel is short. Therefore, this analysis predicts that the on-glide should never be preserved following a long stressed vowel. There are five counter-examples to this prediction, listed in (54).

(54) *Long stressed vowel preceding* [li̯u] *and* [ri̯u]

a. ululate [ˈjuːl̠{ju/jə}leɪt]/[ˈʌl̠{ju/jə}leɪt]
   curlew [ˈkɜːl̠{juː/uː}]
   purlieu [ˈpɜːl̠{juː/uː}]
   failure [ˈfeɪl̠jə]

b. purulent [ˈpjʊər̠{ʊ/jʊ/ə}lənt]

However, *ululate* also has a pronunciation with a short stressed vowel, and in *curlew* and *purlieu* the [j] is optional, whereas in examples with a short stressed vowel the [j] is stable.

So far, we have only examined [r] and [l] preceding reduced [i̯u] and [i̯ə]. What happens after the other consonants listed in (48a) when they follow a stressed vowel? This is summarised in (55).

(55) *Distribution of reduced* [i̯u] *and* [i̯ə]

a. ritual [ˈrɪt̠ʃuəl]
   individual [ˌɪndɪˈvɪd̠ʒuəl]
   pressure [ˈprɛʃə]
   measure [ˈmɛʒə]

b. insular [ˈɪns̠jʊlə]
   chasuble [ˈtʃæz̠jʊbəl]

[tʃ] and [dʒ] can never be followed by [j]. [ʃ] and [ʒ] are typically not followed by [j] (except in the third pronunciation of *commensurate*, *issue* and *tissue*, and the second pronunciation of *casuist* and *usual*). [s] and [z] can be followed by stable [j], but for them this is also possible in stressed position (although in the latter case the [j] is optional). In fact, for [sj], all the examples are post-consonantal, but we know that [s] shows special behaviour in several respects. “Resyllabification” thus seems more easily possible in the context of liquids than of palato-alveolar obstruents. Perhaps a glide has only been able to “push” the melodically simpler liquids to be reanalysed but not the more complex obstruents.

Comparing (50) and (55) with (49), it is clear that the on-glide restriction distinguishes between the [j] resulting from High vowel gliding and the on-glide of the sequence [i̯uː]. Although melodically both glides contain the element I, their association to the skeleton is different, therefore their behaviour can be distinguished in this approach, without resorting to melodic differentiation.

The last question to consider is how examples like *onion* [ˈʌnj̠ə̠n] in (20c) above are to be represented. Other examples belonging here are *paviour* [ˈpeɪvj̠ə̠], *halyard* [ˈhælj̠ə̠d], etc. These examples contain a post-consonantal sequence [jə], but they do not originate from [i̯uː]. They either result from High vowel gliding or from some other source, but in either case the [j] they contain is stable and does not alternate with a high vowel. As phonologically speaking they cannot be distinguished from examples like *accurate* or *voluble*, I propose the same analysis for them, in terms of the light diphthong [i̯ə] and its "resyllabified" version.

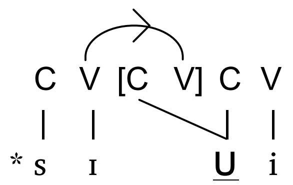
8. Conclusion

I have shown that a Loose CV analysis, employing trochaic proper government, can account for the relationship between stress and the distribution of both vowels and glides. The complementary distribution between short and long vowels in English can be explained if we assume that a stressed position must properly govern an empty nucleus to its right. A short stressed vowel in an apparently open syllable then must be followed by a virtual geminate.

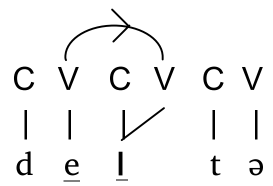
This analysis can also explain why glides can occur after long stressed vowels but not after short ones, shown in (56a), (an observation not previously recorded in the literature) in addition to being ruled out word-finally and preceding a consonant: a glide in English must be followed by a pronounced V position.

(56) *Summary*

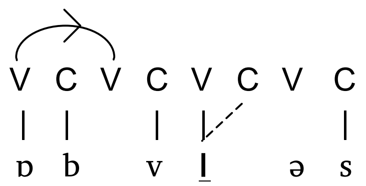
a. *VGv



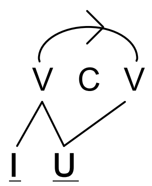
b. *Diphthong*



c. *High vowel gliding*



d. [i̯uː]



This also means that English diphthongs cannot simply be analysed as closed syllables, which is also supported by evidence from stress and phonotactic restrictions. I have proposed to spread the melody of the off-glide to the following V position, shown in (56b), explaining in this way the intermediate character of diphthongs in between long vowels and closed syllables. Conversely, in High vowel gliding, the melody of the high vowel spreads into the following C position, as in (56c), resulting in a structure identical to that of syllabic consonants, explaining such glides' distributional freedom.

Finally, I examined the sequence [juː] and, on the basis of distributional evidence, I analysed it as a complex vowel, consisting of a light diphthong overlapping a long vowel, that is, as [i̯uː] in (56d). As a result, the historical prohibition on the glide [j]'s occurrence in complex onsets is still observed in present-day English. The representation of the light diphthong contains two root nodes, just like the representation of other complex segments. It was also shown that the phonotactic restriction involving the on-glide does not apply to all glides but only to those forming part of a light diphthong.

We have seen therefore that although melodically glides always just contain the element **I** or **U**, their association to the skeleton can differ. In English, they can associate to a single C position (as in an underlying glide), to a C position and a following V position (as in an off-glide), to a V position and a following C position (as in a glided high vowel), or to the first root node of a V position in a two root node structure (as in the on-glide of a light diphthong). As a result, a CV analysis is able to distinguish all these different types of glides without resorting to different featural representations, the only viable solution claimed by Levi (2008). Her observation that a phonetic distinction does not necessarily accompany these phonological distinctions is, however, confirmed.

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