

VOCALIC ELEMENTS IN PHONOLOGY
A STUDY IN MUNSTER IRISH

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1. ISSUES IN GOVERNMENT PHONOLOGY

1.1. Introduction

Government Phonology (GP) (Kaye, Lowenstamm and Vergnaud (1985, 1990)),¹ Kaye (1990), Harris (1990a), Charette (1991), Gussmann (1992)) aims to demonstrate that relations of government are present in phonology as well as in syntax. It makes a dramatic break with the classical generative approaches in that it replaces the rule component with a group of universal principles common to all linguistic systems along with a series of parameters delimiting the nature of linguistic variation from one system to another. Unlike the rule-based approaches, GP is fundamentally a theory of representations where phonological phenomena are viewed as stemming directly from a series of principles and parameters. It is a highly constrained theory in its view of phonological structure. Formally (structurally), it imposes a binary limit on the number of positions that a syllabic constituent - onset, nucleus, rhyme - may contain, while substantively, it does not make use of distinctive features. On the other hand, all phonological oppositions are expressed in terms of univalent elements each of which has an independent phonetic interpretation. The elements may combine to form new segments. The notion of government is central to the theory and it is defined as a maximally binary, asymmetrical relation between two skeletal points. These relations are subject to a series of conditions discussed below. GP attempts to eliminate any arbitrariness in the relation between a phonological event and the context in which it takes place: it claims that there is a direct relation between a phonological process and the context in which it occurs, and it tries to reveal the factors motivating phonological events.

¹Below, we will use KLV to refer to Kaye, Lowenstamm and Vergnaud (1990, 1985).

1.2. Conditions on phonological government

As mentioned above, government is defined as a binary asymmetrical relation holding between two skeletal positions. In order for this relation to be established, both formal and substantive types of conditions must be satisfied. The formal conditions involve the notions of *locality (adjacency)* and *directionality*. The substantive conditions involve the properties of segments which contract governing relations.²

1.2.1. Formal conditions

Let us begin with the formal conditions from which the binary theorem is derived (KLV (1990)).

(1)

a. THE STRICT LOCALITY CONDITION

The governor must be adjacent to the governee at the P_o projection, i.e. the projection containing every skeletal point. (No position may intervene between the governor and the governee)³

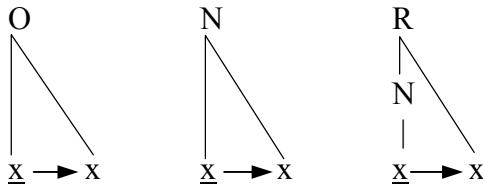
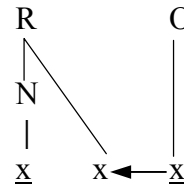
b. THE STRICT DIRECTIONALITY CONDITION

Directionality of government at the skeletal level is universal and not subject to parametric variation.

There are basically two types of government: *constituent* and *interconstituent*. The former is head-initial while the latter is head-final. Thus, strict directionality universally defines how skeletal points are syllabified into constituents, or even how the constituents are grouped together within a domain such as the word. This is illustrated below (heads are underlined).

²The initial proposal (KLV (1985)) concerning the substantive conditions on government referred to charm values of segments. The theory has been revised in this respect in favour of the notion of segmental complexity (Harris (1990a)). Both issues are introduced below for comparison.

(2)

a. *Constituent governing domains*b. *Interconstituent government*⁴

(←)/(→) direction of government

Three basic syllabic constituents are recognised by the theory, namely, O(nset), N(ucleus) and R(hyme). GP rejects the Coda as a possible constituent. The syllabic constituents may or may not branch, subject to parametric variation within individual languages. All branching constituents are head-initial.

Resulting from the Strict Locality and Strict Directionality conditions, the following theorem is derived:

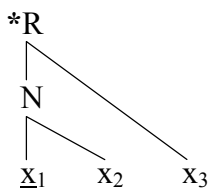
(3)

BINARITY THEOREM

All syllabic constituents are maximally binary

The binary theorem precludes the existence of the so called Super-heavy rhyme illustrated below.⁵

(4)



³The strict adjacency condition is relaxed in a few situations e.g., in the case of internuclear or interonset relations where the head and the complement of such governing relations are adjacent at the relevant projection.

⁴Apart from the Rhyme-Onset interconstituent relation the theory recognises government between nuclei or onsets at their projection (KLV (1990), Kaye (1990), Charette (1991)). Internuclear government is discussed below in 1.3 in connection with Proper Government and the Empty Category Principle.

⁵See however Harris (1994a) for conditions underlying the occurrence of what appears to be this structure in English forms such as *find*, *chamber* and *laughter*.

The reason for excluding this structure from the list of possible phonological representations is that the head of such a domain (x_1) cannot govern (x_3) because these positions are not adjacent. On the other hand, if we assume that any other position is the head of the governing domain e.g. (x_2), then the strict directionality of government within a constituent (\rightarrow) would be violated.

Thus the formal conditions restrict the types of syllabic constituents that can occur in natural languages. Now let us see what governs the way segments are grouped into constituent or interconstituent relations. The question is why a sequence of adjacent segments [t] and [r], in that order, are always syllabified as a branching onset (a constituent) rather than a rhyme-onset (interconstituent relation).

1.2.2. Substantive conditions

In GP, syllabification, i.e. the grouping of segments into constituents, results from governing relations that skeletal points along with their segments contract. This means that skeletal positions are organised and associated with constituents in terms of governing relations. Thus, syllabification proceeds from government and not vice versa. On the other hand, the types of governing relations that are contracted depend on the governing properties of segments which delimit their combinatorial possibilities.

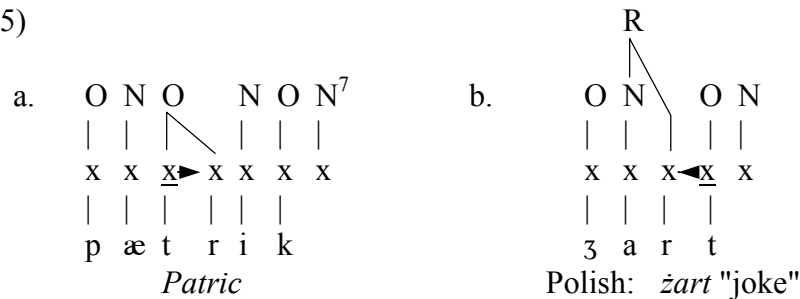
Initially (KLV (1985)), these special governing properties of segments were defined in terms of charm. There were three charm values: positive ($^+$), negative ($^-$) and neutral (0). Governors were either positively (vowels) or negatively (obstruents and fricatives) charmed, while governees were charmless (sonorants).

The theory of charm has recently been replaced with the notion of segmental complexity (Harris (1990a)), which is expressed by the number of elements forming a compound object. The complexity defines governing relations by simply stating that the governor must be more complex than its governee. Given that the respective representations of [t] and [r] in terms of elements are (H, h, \emptyset , R) and (h, R),⁶ we may state that [t] will always govern [r], but the latter may not govern [t] because it is less complex. Therefore, depending on the order of these objects in the phonological string, they may either form a

⁶The phonological elements are discussed in section 1.5.

branching onset [tr], i.e. a head-initial governing domain (5a), or an interconstituent governing domain [r-t] which is head-final ((5)b).

(5)



We can now introduce a special type of government with accompanying principles.

1.3. Proper Government

Proper Government is a special type of government which, among other things, is responsible for vowel-zero alternations in languages like Polish, French, and, to some extent, Irish. The formalism is given below.

(6)

PROPER GOVERNMENT

α properly governs β if

α and β are adjacent on the relevant projection

α is not itself licensed

no governing domain separates α and β

Proper Government is strictly related to the phonological *Empty Category Principle* (ECP) in that a properly governed nuclear position remains phonetically null, while in the absence of such a relation the position has to be realised.

(7)

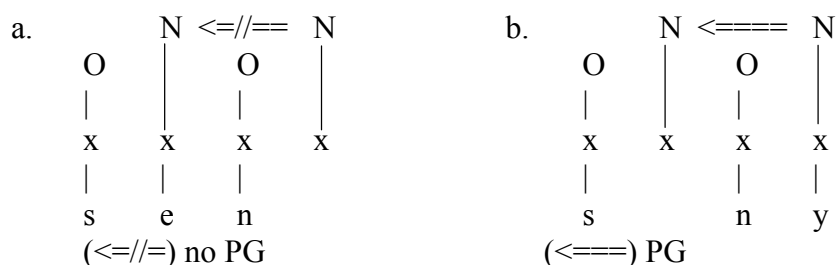
EMPTY CATEGORY PRINCIPLE

A properly governed position remains uninterpreted phonetically.

⁷See the section on licensing in which the presence of word-final nuclei is justified (Coda Licensing (Kaye (1990))).

Let us illustrate the application of Proper Government (PG) and the ECP on the basis of the Polish examples *sen* / *sny* "dream/pl.". ⁸

(8)



The relation of Proper Government takes place on the projection level where the two nuclei are adjacent. In the case of *sen* ((8)a), the domain-final nucleus is itself licensed (by parameter);⁹ therefore it is unable to properly govern the preceding nucleus. This results in the phonetic realisation of the first nucleus as [e]. On the other hand, in *sny* the inflectional vowel (itself unlicensed, i.e. realised) properly governs the preceding nucleus which in turn remains unrealised as per the ECP.¹⁰ Thus only a phonetically realised nucleus can properly govern, and the governee of such a relation must be empty. The direction of this type of relation is assumed to be subject to parametric variation, i.e. either from right to left, or vice versa.

An additional point that needs to be made here is that in the case of phonetically unrealised positions such as the first nucleus in *sny* (/søny/) there is no restructuring or resyllabification of the phonological form. This is ensured by the *Projection Principle* (KLV (1990:221)).

(9)

PROJECTION PRINCIPLE

Governing relations are defined at the level of lexical representation and remain constant throughout a phonological derivation.

Let us now turn to the notion of phonological licensing

⁸For a recent thorough analysis of the Polish yers in this model see Gussmann and Kaye (1993).

⁹All phonological domains end with a nucleus which may or may not be licensed in a given language (see also Coda Licensing (1.4.1)).

¹⁰The application of ECP has been extended also to non-nuclear positions, i.e. to word-initial empty onsets (Charette (1991)) and to the rhymal complement (Cyran (1992)). For the latter see also section 3.2.

1.4. Phonological licensing

Phonological positions are subject to the licensing principle (Kaye (1990:306)).

(10)

LICENSING PRINCIPLE

All phonological positions save one must be licensed within a domain.

The unlicensed position is the head of this domain.

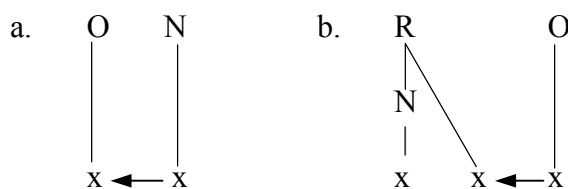
Each phonological unit must be sanctioned in the phonological representation by some other unit. Thus government, be it constituent or interconstituent, may be viewed as a form of licensing in that the head of a governing relation licenses its complement.

Below we present two basic types of licensing, namely *prosodic* (p-licensing) and *autosegmental* (a-licensing). The former refers to the prosodic hierarchy, where each unit has to belong to some higher-order unit (Harris (1992, 1994a)), while the latter occurs between skeletal positions and the melody.

1.4.1. Prosodic Licensing

As mentioned above, constituent and interconstituent governing relations are forms of licensing, from which it follows that licensing may be subject to the locality and directionality conditions. Within branching constituents such as onset, nucleus and rhyme, licensing is head-initial, while licensing between adjacent positions which belong to different constituents is head-final.

(11)



As far as the structure ((11)b) is concerned, Kaye (1990:311) proposes the following licensing principle.

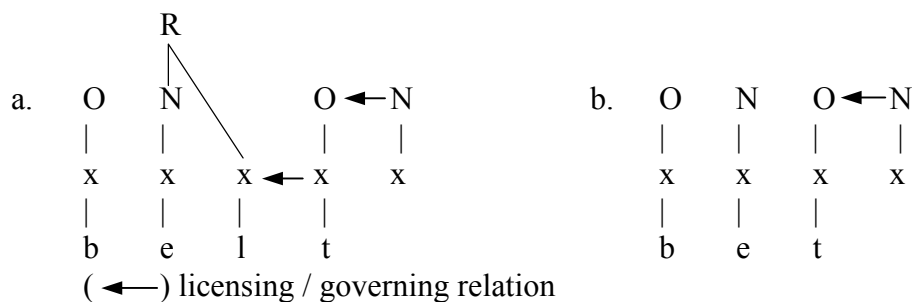
(12)

CODA LICENSING PRINCIPLE

Post-nuclear rhymal positions must be licensed by the following onset.

This universal principle ensures that in all languages a single word-final consonant will always be syllabified as the onset of the following syllable. Such onsets are followed (licensed) by a nucleus which may be empty. The word-final empty nuclei are themselves licensed by parameter, and are required because onsets do not exist on their own, i.e. they must be licensed by a nucleus (see ((11)a) above). To illustrate the application of the Coda Licensing Principle we provide representations of the English words *belt* and *bet*.

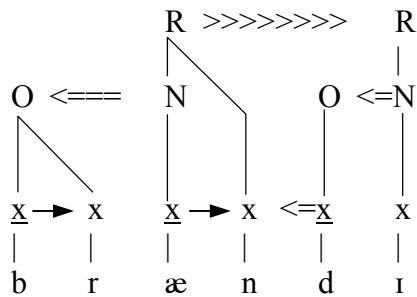
(13)



In *belt*, the rhymal complement is sanctioned (governed/licensed) by the following onset which itself is licensed by its nucleus. On the other hand, in *bet*, there is no following onset to license [t] as the rhymal complement (coda) therefore, this consonant may only be syllabified as the onset itself. Both *belt* and *bet* have an empty nucleus word-finally which is licensed by parameter.

Bellow we attempt to illustrate all the existing prosodic licensing relations in the word *brandy* on the basis of Harris ((1992, 1994a)).

(14)

(\rightarrow) *constituent* licensing(\Leftarrow) *interconstituent* licensing(\ggg) *projection* licensing

This structure illustrates three basic types of p-licensing:

- constituent licensing which takes place between adjacent positions within branching constituents (here: the branching onset and branching rhyme).
- interconstituent licensing which occurs between the onset [d] and the preceding rhymal complement, and between nuclei and their onsets.
- the last type is referred to as projection licensing (Harris (1992, 1994a)), which takes place at the relevant projection (where the domain of licensing corresponds to some unit such as the foot or word).

With respect to the licensing of non-nuclear heads by their nuclei, Charette (1990:242) proposes the following principle.

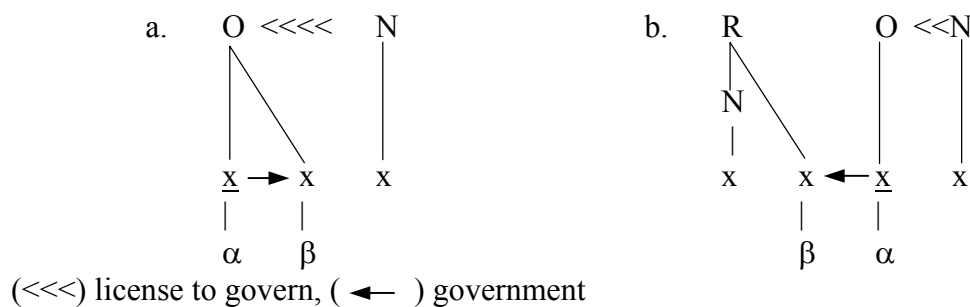
(15)

GOVERNMENT LICENSING PRINCIPLE

For a governing relation to hold between a non-nuclear head α and its complement β , α must be government-licensed by its nucleus.

This principle refers to two types of governing relations, the existence of which must be sanctioned by a nucleus.

(16)



In ((16)a) the nucleus licenses indirectly, as the position occupied by the nucleus is not directly adjacent to the head-position of the branching onset, while in ((16)b) the nucleus licenses the non-nuclear head directly.

Charette proposes also that the licenser of such a relation, i.e. the nucleus, may exhibit different licensing potentials. For example, if in a given language the word-final clusters are limited to interconstituent domains ('coda'-onset ((16)b)), and branching onsets are not found in this position, then this means that the domain-final nuclei in this language do not license indirectly. This is the case in Irish and to some extent in English, in which branching onsets do not occur word-finally. Thus, in Irish we find word-final [...rt#] as in [k'art] *ceart* "right", but * [...tr#] is absent, as Irish empty nuclei do not license indirectly.

The licensing properties of nuclei (their licensing potential) are best manifested in a situation when empty nuclei are compared with realised nuclei. One property of realised nuclei which we have already mentioned is their ability to properly govern empty positions, while empty nuclei cannot do so (see /senø/-/søny/ in 1.3). In section 3.2 we discuss the phenomenon of compensatory lengthening in Irish which seems to be dependent on the different licensing potential exhibited by full (realised) vowels and empty nuclei. This phenomenon can be viewed as an effect of the interaction between prosodic and autosegmental licensing in that a weakly p-licensed position cannot a-license its melodic material (see 3.2). Let us now turn to the question of a-licensing.

1.4.2. Autosegmental Licensing

In order to be pronounced, phonological elements must be associated with the skeletal position, i.e. a-licensed. In 1.4.1, we provided one example of the interaction between the

a-licensing and p-licensing, namely, compensatory lengthening (to be discussed in detail in 3.2).

Another instantiation of that interaction is connected with the dependence of a-licensing potential of a point on its position in the prosodic hierarchy (Harris (1992, 1994a)). Namely, the a-licensing potential of a skeletal point is weaker in prosodically recessive positions, e.g. in complements of governing domains. If we look at the phonotactics within a branching onset, for example, it is immediately obvious that the ability to represent contrasts is greater in the head position (fricatives, stops) than in the governed position (sonorants). This is due to the diminished a-licensing potential of positions which are low in the prosodic hierarchy.

Finally, in recent work (Cobb (1993), Denwood (1993), Charette and Göksel (1994/96)) it has been proposed that autosegmental licensing is additionally subject to certain constraints of a parametric nature which define the combinatorial possibilities that elements exhibit within the melodic units of a given language. Or, to put it differently, certain melody internal constraints define the possible representations of phonological objects.¹¹ This issue is discussed in detail in section 2.4 with respect to possible parameter settings responsible for the Irish vocalic system, while in chapter 4 we propose some parameters defining consonantal systems in general. Let us now see what the phonological primes are in GP and try to articulate possible constraints on their combinability.

1.5. Phonological elements

Elements are the smallest units in the theory of segmental representations (KLV (1985, 1990), Harris (1990a), Harris and Lindsay (1995)) to which phonology has access. They are the primitive phonological units of which segments are composed. Each element is autonomous and pronounceable in isolation. This has been expressed in terms of the realisation autonomy hypothesis (Harris and Lindsay (1995)) which says that elements are big enough to be independently interpretable. For example, the element 'I', when pronounced, corresponds to the vowel [i]. On the other hand, elements can combine to form complex

¹¹ The reader is also referred to Rennison (1990) for a similar proposal.

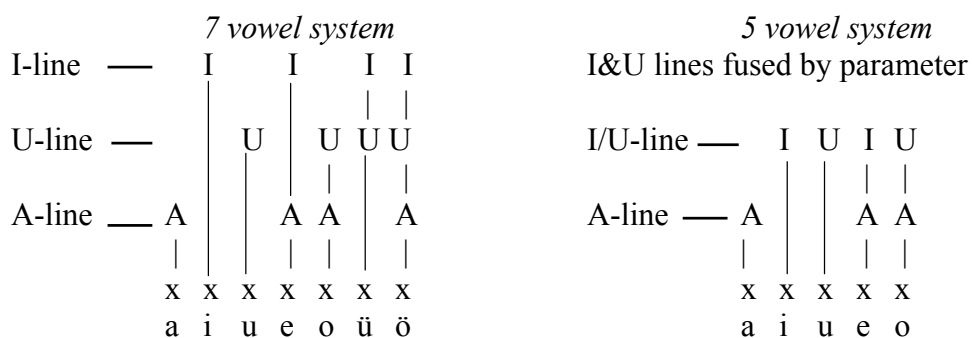
segments. In such combinations two or more elements form a HEAD - OPERATOR relation.¹² Let us first look at the elements used in defining vocalic systems.

1.5.1. "Vocalic" elements

There are three basic resonance elements 'A', 'U', and 'I' which, when pronounced, correspond to the corner vowels [a], [u] and [i] respectively. These elements may combine to form complex vowels. Such combinations take the form of asymmetric relations in which one of the elements acts as the head and the other as the operator. Thus the phonetic reflex of a particular compound is dependent on the role which is assigned to the elements involved in fusion. This can be demonstrated by comparing the two results obtained when we fuse 'A' and 'I'. When 'A' is the operator and 'I' is the head (A.I), the resultant vowel is [e]. On the other hand, when the relations are reversed (I.A), we obtain [æ]. The same applies to the combination of 'A' and 'U', where we can get an open [ɔ] (U.A) or a close [o] (A.U) depending on the combination.¹³

Below, we provide two types of vowel systems, one with seven members, and the other with only five. For the purposes of exposition we assume, following KLV (1985), that elements reside on their own autosegmental tiers where compound expressions involve the co-registration of elements on separate lines.

(17)



¹²For a good introduction to the element theory and a justification of individual elements on the basis of phonological processes see Harris (1990a, 1994a), Harris and Lindsey (1995.).

¹³The head is on the right-hand side.

The five vowel system is derived by the parametric fusion of the 'I' and 'U' tiers. This means that the elements 'I' and 'U' will not combine in such a system.¹⁴

In addition to 'A', 'U', 'I', three other elements were initially proposed, namely, 'N' (nasality), 'F' (ATR), and v^0 (the cold vowel, or neutral element) (KLV (1985)). Of these three, the ATR element was abandoned as the tenseness contrasts came to be expressed in terms of the headedness or headlessness of the vocalic elements 'A', 'U', 'I' (Cobb (1993), Charette (1994), Harris and Lindsey (1995)). Examples are provided below.

(18)

<i>headed vowels</i>	<i>non-headed vowels</i>
(<u>I</u>) = i	(I.v ⁰) = ɪ
(<u>U</u>) = u	(U.v ⁰) = ʊ
(A. <u>I</u>) = e	(A.I.v ⁰) = ε
(A. <u>U</u>) = o	(A.U.v ⁰) = ɔ

Thus the tense vowels are now expressed as headed objects, while the lax vowels are not headed by an active element ('A', 'U', 'I') but rather by the neutral element v^0 .

The status of v^0 (the cold vowel) is that of an "identity" element (KLV (1985), Harris and Lindsey (1995.)). When it acts as the head of an expression it yields a reduced schwa-like vowel. In section 4.1.1. the use of that element in vowels and consonants is discussed in detail. Let us now introduce the elements which are used to define consonantal objects.

1.5.2. "Consonantal" elements

The resonance elements 'U', 'I', 'A', and v^0 are also found in segmental representations of consonants where their role is to define the place of articulation. Thus, 'U' defines labiality, 'I' is used to mark palatality, 'A' indicates pharyngeality, while the cold vowel (v^0) represents velarity.¹⁵ In KLV (1990) and Harris (1990a) we find the following consonantal elements:¹⁶

¹⁴More recently the autosegmental tiers have been dispensed with in GP, and the absence of front rounded vowels in a given system is accounted for by setting a parameter which disallows a combination involving 'I' and 'U' (Cobb (1993)). This development is discussed in detail in 2.4 where we try to define the Irish vocalic systems by means of such parameters.

¹⁵In chapter 4, we consider the possibility that the element 'A' may be used to define coronality as well.

(19)

- R - coronal gesture
- ʔ - occluded (constriction)
- h - noise
- N - nasal
- H - stiff vocal cords (fully voiceless)
- L - slack vocal cords (fully voiced)

These elements may combine to produce complex segments. For example, a combination of 'U' and 'h' yields a labial fricative, while the compound (h, ʔ, U) defines a labial stop which may further be voiceless (H, h, ʔ, U) or voiced (L, h, ʔ, U).¹⁷ Consider the representations of some labials below in which the tone element 'H' is ignored.

(20)

[p]	[f]	[w]
x	x	x
U	U	U
h	h	
ʔ		

The decreasing complexity of the segments presented above corresponds to the lenition trajectory of the opening type (see e.g. Lass (1984:178) and a discussion in Harris (1990a)). The lenition of [p] to [f] is found, for instance, in Irish e.g. [potə] *pota* "pot" - [sə fotə] *sa phota* "in the pot". In the following paragraphs more will be said about the way in which GP views phonological processing.

¹⁶Of the list given below, the element defining coronality (R) is now assumed to be otiose. In chapter-4, we return to the different new interpretations of coronality within GP, either by means of other elements (e.g. Broadbent (1991), Scheer (1994)) or by assuming that coronals are nonspecified (Backley (1993), Harris (1994b)).

¹⁷Typically, the 'L' element is used to define fully voiced objects, otherwise the contrast voiceless / voiced is represented by the presence versus absence of the element 'H'.

1.6. Phonological process in GP

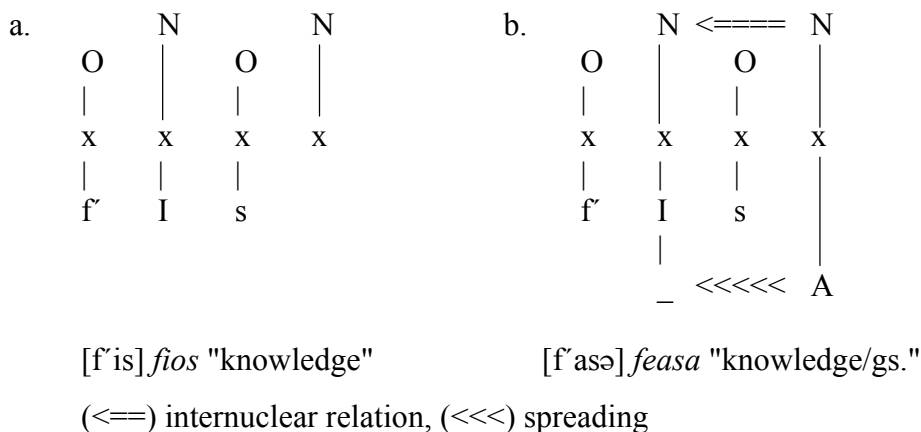
Unlike the rule-based approaches, GP is fundamentally a theory of representations where phonological phenomena are viewed as stemming directly from the structural and segmental conditions which are present in the phonological representation. In this model the phonological processing is viewed as either the *decomposition* or *composition* of segmental material (elements). An example of the former was given above where the lenition of [p] (h, ʔ, U) to [f] (h, U) is treated as the loss of element (ʔ) (see e.g. Harris (1990a)). Similarly, in vocalic systems, vowel raising or lowering may be viewed as the decomposition of a compound. For example, Irish [e] tends to be raised to [i] in palatalised environments, while [o] is raised to [u] in velarised contexts (see 2.4). This may be uniformly represented as the loss of the element 'A'.

(21)



The other type of phonological process, i.e. *composition*, is the reverse of this. Elements are added to a compound by, for example, spreading. In this way we may account for various harmony processes. In section 2.3.4. we discuss what appears to be A-spreading into a nucleus containing 'I'. The resulting compound is a front low vowel [a] which may be viewed as an (I.A) compound. This spreading results from a governing (licensing) relation holding between two consecutive nuclei.

(22)



Segmental composition is conditioned in that the element which is added to a segment must be locally present. In the example above the locality is derived from the relation between two nuclei.

The spreading phenomenon in general, be it an instance of assimilation between consonants or a case of vowel harmony, may be also expressed in "non-dynamic" terms. Namely, it may be understood as the static identification of a governed (licensed) position with its governor (licenser) with respect to melodic material lexically lodged in the latter (Harris (1990b, 1994a)).

Finally, let us see in what way the various linguistic systems may be defined in terms of the principles and parameters reviewed in this chapter.

1.7. Principles and parameters vs. linguistic systems (some examples)

Let us first consider the way in which principles and parameters define the phonological structure of natural languages.¹⁸ Recall that the syllabic constituents: Onset, Nucleus, Rhyme, are maximally binary, i.e. they may contain up to two positions. However, not all languages exploit the binarity of constituents. Thus, for instance, in Polish there are no branching nuclei (hence, no length contrasts), while in Hungarian there are no branching onsets. It is claimed (e.g. Kaye (1990:324)) that the choice between branching and non-branching constituents is parameterized across languages. The parameters are listed below.

(23)	Branching
Onset	YES/NO
Nucleus	YES/NO
Rhyme	YES/NO

It should be stressed that if a language has branching constituents e.g. nuclei, it also has their simplex counterparts and exhibits length contrasts (e.g. English, but not Polish).

Apart from the constituents, we also referred above to parametric licensing of domain-final nuclei. This parameter distinguishes between such languages as Polish and

¹⁸We only concentrate on the parameters which are relevant to this work.

Italian in that, in the former, words may phonetically end with a consonant, while in Italian, the parameter licensing domain-final nuclei is set in the OFF and words must end with a vowel.¹⁹

The parameters mentioned above have the ability to capture various types of phonological systems, and additionally, they allow us to understand better the conditions underlying segmental distribution. Earlier we mentioned that in some languages which have branching onsets their distribution may be limited to word-initial and word-medial position. This phenomenon is ascribed to the licensing properties of domain-final nuclei, which are also claimed to vary parametrically (see Government Licensing (1.4.1)).

More recently, parameters have been employed to delimit possible phonological objects within a given linguistic system. In 1.5.1 we saw how the five-vowel system is distinguished from a seven-vowel one by means of the parameterized exclusion of I-U combinations, thus eliminating front rounded vowels. In 2.4, we will try to define the Irish vocalic system by employing similar parameters, while in 4.2.10 we propose a parameter for the occurrence of the element 'h' in linguistic systems which may allow us to account for languages lacking voice contrasts among fricatives (e.g. Irish) and the absence of affricates in such systems.

Further relevant aspects of the theory of government in phonology will be introduced and expanded in the appropriate sections.

¹⁹Recall that word-final consonants are syllabified as onsets (Coda Licensing (1.4.1)).

2. SHORT VOWELS: CONSONANT - VOWEL INTERACTION

2.1. Introduction

The aim of this chapter is to outline the interaction between the resonance elements A-I-U in the vocalic system of Munster Irish by analysing their distribution and the alternations which are traditionally referred to as consonant-vowel interaction (Sjoestedt (1931), Ní Chiosáin (1992)). First, the consonantal system of Irish will be presented and discussed with respect to quality specification, which is largely responsible for the interactions between consonants and vowels. Then we introduce the data which illustrate the vocalic alternations caused by the quality of neighbouring consonants, and present a traditional account of the Irish vocalic system. An attempt is made to define the objectives of the present enquiry, which is followed by an analysis couched in the framework of Government Phonology. Finally, recent advances in analysing vowel systems, namely, the Licensing Constraints, are introduced and applied to the Irish facts. The results of our analysis will be compared to analyses of other languages in terms of the constraints.

2.1.1. The Irish consonantal system

Irish has two sets of consonants, i.e. velarised and palatalised. These values bear phonological contrasts therefore consonants must be specified for one of these values in underlying representations.¹ Thus we have the following two series of consonants in Irish.

(1)

velarised	p, t, k, b, d, g, f, s, χ, h, v, ʏ, m, n, ŋ, l, r
palatalised ²	p', t', k', b', d', g', f', j, χ', h', v', j, m', n', ŋ', l', r'

¹An additional contrast, namely that between "tense" and "lax" sonorants (Ó Siadhail (1989:92)), will be discussed at length in 3.2.

²h' is not normally regarded as a separate phonological unit (Ó Cuív (1975:11)). It will nonetheless be used in phonetic transcription to indicate the presence of palatalisation. [ŋ'] is also found marginally, i.e. most of the time it is a result of assimilation to palatalised velar plosives. Additionally, [j] must be regarded as a palatal consonant rather than a palatalised version of [s].

Velarised consonants show heavy labialisation when they occur before front vowels. This, in certain descriptions of the language, is sometimes marked by an off-glide in the phonetic transcription e.g., [k^wid'] *cuid* "part". In our analysis, the contrast between the two sets of consonants will be represented only by a diacritic in the case of palatalisation (the second consonant in [k^wid']). Although the phonetic effect of palatalisation of consonants may not be as strong as that of velarisation (Gussmann (1985)), it seems that, in general, the phonological effects of palatalisation are more prominent.³ More reasons for that choice will be given later, in any case, this particular mode of representation does not affect the analysis.

The quality specification of consonants, i.e. palatalisation or velarisation, may be present lexically or play a grammatical function. For example, the first consonant in [k'u:f] *ciumhais* "edge" is palatalised lexically and contrasts with its velarised counterpart in [ku:f] *cúis* "reason". On the other hand, the palatalisation of the last consonant in [f'ir'] *fir* has a grammatical function of denoting the genitive case of the noun [f'ar] *fear* "man". The nature of palatalisation and velarisation is considered in detail below.

2.1.2. **Palatalisation** (slender consonants)

It has become a common practice within Government Phonology to define palatalised consonants as containing the element 'I' (Harris (1990a:263)). We will follow this assumption here in trying to show the scope of palatalisation in Irish. One of its functions, apart from the lexical marking of consonants, is to define grammatical categories, e.g. the genitive case. Consider the data below taken from (Sjoestedt-Jonval (1938:4)).

(2)

[sop]	/	[sip']	<i>sop / soip</i>	"wisp/gs."
[olk]	/	[il'k']	<i>olc / oilc</i>	"evil/gs."

In ((2)), the palatalisation in the genitive affects the final consonant or cluster as well as the preceding vowel. However, the preceding onset in [sip'] remains intact. The same can be said about the forms in ((3)a) but not in ((3)b) below.

³The labial off-glide will be used in the phonetic transcription only to emphasise the strong labialisation of velarised consonants.

(3)

a.	[d̪aːrəv] / [d̪aːrəvʲ]	<i>dealramh / dealraimh</i>	"resemblance/gs."
	[asəl] / [asilʲ]	<i>asal / asail</i>	"donkey/gs."
b.	[dorən] / [dirʲinʲ]	<i>dorn / doirn</i>	"fist/gs."
	[dorəs] / [dirʲiʃ]	<i>doras / dorais</i>	"door/gs."
	[soləs] / [selʲiʃ]	<i>solas / solais</i>	"light/gs."

In ((3)a), only one consonant becomes palatalised in the genitive while the data in ((3)b) exhibit what might be called a "long distance" spreading of palatalisation [dirʲiʃ]. This provokes the question of how far palatalisation (the element 'I') can spread. Notice that the first onset of the forms in ((3)b) remains unaffected as in [sipʲ]. This means that something blocks further spreading. It seems that the plural forms of the data in ((3)b) offer useful clues as to what constitutes the "buffer" preventing palatalisation from spreading further. These forms are given below.

(4)

[doːrʲə]	<i>doirse</i>	"doors"
[doːrnʲə]	<i>doirne</i>	"fists"
[siːlʲʲə]	<i>soilse</i>	"lights"

Let us disregard here the lengthening of the first vowel as well as the fact that [r] resists palatalisation.⁴ What is important here is that the original vowel, which separated [r] from the following onset in the singular forms, has disappeared. In standard GP the existence of a vowel - zero alternation of this type suggests that an underlying empty nucleus is involved which is licensed in the plural forms by the following realised nucleus.⁵ Having established that the second nucleus in [dirʲinʲ] is underlyingly empty and realised here due to the absence of a licenser in the following nucleus, we may assume that the "blocking" of palatalisation spreading depends on the type of nuclei. Specifically, the empty nucleus in [dirʲinʲ] allows palatalisation to affect [r], as well as the preceding vowel which now finds itself within the

⁴A GP analysis of this type of lengthening can be found in Cyran (1996a) while the question of [r] in homorganic contexts is discussed at length in chapter 4.

⁵See 1.3 for an introduction to the treatment of vowel-zero alternations as an instantiation of Proper Government in GP.

scope of application of the spreading. However, this vowel is not underlyingly empty itself and constitutes a "buffer" to further spreading. Hence, the first onset remains velarised.

We are now able to define palatalisation more precisely as a leftward spreading of the element 'I' which affects both consonants and vowels. The exact nature of this phenomenon as regards the way in which consonants and vowels are affected will be explored in the ensuing sections. Palatalisation spreading is stopped by the first vowel with underlying melody. Therefore, palatalisation cannot be viewed as merely a lexical property of consonants. Once it is present in the representation it will spread leftwards as far as it can (unbound spreading).

This definition has two important implications. First, there can be no distinction in terms of the behaviour of the element 'I' between lexical and grammatical palatalisation, i.e. the effects characteristic of the presence of the element 'I' in the representation must be identical. Secondly, the vocalic modifications which accompany palatalisation need not be viewed as instances of vowel-consonant interaction, but rather as effects of 'I' spreading within the available harmonic span.⁶ This last point is crucial in that it precludes the possibility that a governing relation exists between a vowel and the following onset. Such a relation is not recognised in GP. On the other hand, given the fact that the same process, i.e. I-spreading, affects both vowels and consonants, the emerging picture of the phonological representation in Irish seems to be one in which consonants and vowels share certain properties, e.g. the autosegmental line on which 'I' resides.

2.1.3. **Velarisation** (broad consonants)

Although velarised consonants are phonetically distinct, a fact which is normally represented by a strong labial off-glide in phonetic transcriptions, they seem to play a lesser role in the grammatical and phonological systems of Irish. The question arises then whether velarised consonants should not be treated as neutral, i.e. not defined by the presence of any additional element. However, in the following sections evidence will be presented which points to the fact that the velarisation of consonants does play a substantial role in the distribution of vocalic objects and in certain phonological processes like, for instance, vowel lengthening

⁶For morphological conditioning of palatalisation in Irish see e.g. Doyle (1992).

before some sonorants (section 3.2). In fact, it appears that, whatever element defines velarisation, this element spreads leftwards in the same manner in which the element 'I' does in the case of palatalisation, even if the effects of velarisation spreading seem to be less spectacular. Let us look at possible candidates for the elements which might be present in the segmental make-up of such consonants.

Harris (1990a:263) proposes that the velarity of consonants is defined by the presence of the so called "cold" vowel (v^0). However, this element is used to define the velar place of articulation of e.g. the consonant [k], rather than the secondary quality of consonants. Historically speaking, the Old Irish consonantal system possessed three types of quality: *i*-(palatalised), *u*-(velarised), and *a*-(velarised?, neutral?) (Pokorny (1914:13), Thurneysen (1949:97)). Whether Modern Irish broad (velarised) consonants contain v^0 , 'U', 'A' or nothing has to be established on the basis of their phonological behaviour. Recall, however, that velarised consonants have a strong labial off-glide which might suggest that the element 'U' is involved. Additionally, in GP the element 'U' is realised in non-nuclear position as [w], i.e. a labio-velar. If the presence of this element defines velarisation in Irish, this would explain the raising of the back of the tongue in the production of velarised consonants. Let us then tentatively assume that this is the case.⁷

Before we consider closely the distributional restrictions traditionally referred to as "consonant-vowel interaction", it is necessary to demonstrate that the quality specification of consonants is independent of what type of vowel follows or precedes. This is illustrated by the data in ((5)) where long vowels are involved. Irish long vowels are in general immune to any processes which are typically motivated by the flanking consonants. Hence the vocalic and consonantal contrasts in ((5)) are completely independent of each other.⁸

(5)

a.	[k'u:n']	<i>ciúin</i>	"calm"
	[k'i:l']	<i>cíl</i>	"raddle"
b.	[ti:]	<i>tuí</i>	"straw"
	[t'i:]	<i>tí</i>	"house-gs."
c.	[ku:f]	<i>cúis</i>	"reason"
	[k'u:f]	<i>ciumhais</i>	"edge"

⁷See e.g. Smith (1988) where dependent [U] is used to define velar constriction.

d.	[kɑ:s]	<i>cás</i>	"case"
	[kɑ:f]	<i>cáis</i>	"cheese"
e.	[ge:l']	<i>Gaeil</i>	"Irishmen"
	[g'e:l']	<i>géill</i>	"surrender"
f.	[bo:]	<i>bó</i>	"cow"
	[b'o:]	<i>beo</i>	"alive"

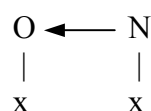
Examples ((5)b-f) show clearly that the palatalisation and velarisation of consonants are distinctive. As far as ((5)e,f) are concerned, Ó Cuív (1975:10) notices a phonetic retraction or advancement of the long mid vowels depending on whether they follow a velarised or a palatalised consonant respectively. These effects may, however, be treated as purely phonetic in nature.

In the following sections we will take a closer look at the distributional peculiarities in Irish and ask specific questions concerning the consonant-vowel "harmony" which need some clarification before we look at the vocalic transitions observed in the dialect under study.

2.1.4. Consonant-vowel harmony

So far we have seen that Irish consonants exhibit a contrastive quality specification which affects the distribution of short vowels (Ward (1974)). The existence of dependencies and distributional restrictions between consonants and the following vowels is predicted in Government Phonology in that the theory recognises that onsets are in a licensing relation with their nuclei.

(6)



Thus the fact that certain combinations of segments may be illicit in a given language has its basis in the nature of a given phonological representation. As an illustration of the

⁸The behaviour of long vowels and diphthongs is discussed in chapter 3.

dependency between onsets and nuclei let us look at some distributional facts concerning the high front vowels in Polish which point to the nature of such restrictions, as viewed in GP.

Polish has two high front vowels, i.e. [i] which is tense, and a lax [ɨ]. In GP the contrast between the two objects can be defined by means of headedness (Cobb (1993), Harris and Lindsey (1995)).

(7)

[i] = (I)

[ɨ] = (I.v⁰)

Thus [i] is headed by an active element 'I' and [ɨ] is empty-headed or non-headed.⁹ The distribution of these vowels seems to be governed by the following conditions:¹⁰

1. *The I-headed vowel requires I as an operator in its onset.*
2. *The onset and the following nucleus cannot have the same element as the head.*

Note that both statements require that the resonance element enjoys a different status in the two consecutive positions.

The first condition ensures that the vowel [i] will always follow a palatalised consonant in Polish, i.e. a consonant will contain 'I' as an operator, e.g. [v'ɨdɔk] *widok* "view" as opposed to [vɨmɔk] *wymóg* "requirement". On the other hand, the second condition makes two predictions. First, a consonant which contains 'I' as the head e.g. [ʃ, ʒ, tʃ, dʒ] will never be followed by [i], which is also I-headed, but rather by [ɨ]. Second, [ɨ] should not follow consonants which contain v⁰ as the head, which is the case with velar consonants. Hence, forms like *[gɨ...] and *[kɨ...] are illicit in Polish, but [pɨ...] and [tɨ...] are correct.¹¹ The structures below illustrate the operation of the two conditions. The heads are underlined.

⁹Typically, the empty-headed vowel will be represented as (I.). The symbol v⁰ is used here for expository reasons and denotes the so called 'cold vowel', which additionally defines the velar place of articulation. For more discussion on v⁰ see chapter 4.

¹⁰These conditions are merely rough approximations of what happens in Polish (see Gussmann, Kaye and Cyran (in prep.) for details) and may be derived from certain universal properties of segment distribution like the OCP.

(8)

a.	O ← N	b.	O ← N	c.	O ← N
x	x	x	x	x	x
<u>U</u>		h		<u>v</u> ⁰ --/-- <u>v</u> ⁰	
h		I --/-- I		?	
I ----- I				h	I
[v'i...]		*[i...]		*[gɪ...]	

Having seen what factors may influence O(nset)-N(nucleus) dependencies let us turn to the Irish facts again.¹²

2.1.5. The vowel inventory of Munster Irish

Irish has short and long vowels which exhibit the phonological contrasts outlined in ((9)) below. In addition, some long vowels can result from lengthening in certain contexts (Cyran (1992)). The discussion regarding lengthening and diphthongs will be postponed till the following chapter.

(9)

[i:n']	<i>sín</i>	"stretch"	[in']	<i>sin</i>	"that"
[gu:nə]	<i>gúna</i>	"gown"	[gunə]	<i>gunna</i>	"gun"
[t'e:p']	<i>téip</i>	"tape"	[t'ep']	<i>teip</i>	"fail"
[ko:tə]	<i>cóta</i>	"coat"	[kotə]	<i>cotadh</i>	"shyness"
[ba:s]	<i>bás</i>	"death"	[bas]	<i>bas</i>	"palm of hand"

On the basis of the above evidence it can be claimed that there are five underlying long vowels in Irish /i:,e:,ɑ:,o:,u:/. The data above suggest also that the inventory of phonologically short vowels is practically the same. This, however, cannot be confidently asserted at this stage for the following reasons. First of all, phonological contrast among

¹¹[χi...] as in e.g. *chyba* "possibly" is exceptional and may be accounted for by assuming that the native [χ] is not v⁰-headed unlike the [χ] in borrowings e.g., *historia* "history". However, this problem is not directly relevant to our argument.

¹²The co-occurrence conditions concerning Polish high front vowels will be returned to in chapter 4 when we discuss the segmental make-up of palatalised coronals.

short vowels is rare. This is emphasised by Sjoestedt (1931:65) and Ó Siadhail (1989:36) who mention just a few contrastive pairs which are not contingent on the quality of surrounding consonants. Secondly, the phonetic shape of short vowels is to a large extent predictable from the context in which they occur. This context relates to the character of the flanking consonants. Thus, for instance, whether these consonants are palatalised or velarised will have a direct bearing on the surface realisation of the short vowel (Ward (1974), Ó Siadhail (1989), Ní Chiosáin (1991)).

Generally speaking, the dependencies between short vowels and flanking consonants can be most clearly defined by means of the following constraints which show what sequences are impossible.

(10)

*C' u C'	e.g. [m'ik'] <i>mic</i> "son-gs."	*[m'uk']
*C i C	e.g. [muk] <i>muc</i> "pig"	*[mik]

In other words, a back vowel can appear only between two velarised consonants, while a front vowel must be flanked by palatalised ones. These restrictions clearly point to the fact that both palatalised and velarised environments are phonologically active, which in turn may be taken as an argument that both types of consonants need to be specified by the presence of an active element.

If the two flanking consonants are of different value, i.e. C'-C or C-C', a certain degree of variation is allowed in the phonetic realisation of short vowels. Thus, given all possible combinations of the consonants surrounding a short vowel, i.e. C-C, C'-C, C'-C', C-C', one might expect to encounter numerous phonetic realisations of vocalic segments. This, in fact, is the case. One should add another comment here concerning the actual degree of palatalisation that certain consonants exhibit phonetically, a factor which also contributes to the ultimate phonetic shape of short vowels. This means that any analysis aiming to describe the vocalic system of Irish is not going to be an easy task.

In trying to establish the system of short vowels researchers have made contradictory claims. For instance, Sommerfelt (1927) and Sjoestedt (1931) in their phonetic descriptions of Munster Irish established a system of more than twenty vowels. Ó Cuív (1975) reduced the number to seven. The first fairly accurate presentation of the vocalic system which fully explores the dependencies between short vowels and the quality of the flanking consonants

can be found in Ward (1974). He posits four short vocalic elements /æ/, /œ/, /y/ and /ə/. These symbols stand for low, mid, high and a reduced vowel respectively, and their actual phonetic realisations are derived in the following way (Ward (1974)).

(11)

/æ/	is [a] in C'-...	e.g. [k'ark] <i>cearc</i> "hen"
	[ɑ] in C-...	e.g. [kapəl] <i>capall</i> "horse"
/œ/	is [e] in C'-C'	e.g. [g'et'] <i>geit</i> "start"
	[o] in C-C, C'-C	e.g. [gort] <i>gort</i> "corn-field"
		[d'oχ] <i>deoch</i> "drink"
/y/	is [u] in C-C, C'-C	e.g. [muk] <i>muc</i> "pig"
		[m'un] <i>mion</i> "small"
	[i] in C'-C', C-C'	e.g. [f'ir'] <i>fir</i> "man-gs."
		[kid'] <i>cuid</i> "part"

More recently, a similar system of three underlying vowels has been proposed by Ní Chiosáin (1991) for Connemara Irish. Her system differs, however, from that of Ward's in that she proposes two abstract archisegments [I] and [E] (these are simply underspecified high and mid vowels respectively, which acquire their backness specification from the environment) and a low vowel [ɑ]. The variation [a / ɑ] is treated by Ní Chiosáin as a phonetic effect (see also Ní Chiosáin and Padgett (1993)).

It must be noted at this stage that the dependencies are not limited to the Onset-Nucleus licensing domain. In fact, as the few examples in ((11)) demonstrate, the phonetic shape of Irish short vowels depends on the quality of both flanking consonants. In the following section we will take a closer look at "consonant-vowel" dependencies and try to establish a provisional inventory of short vocalic objects in Irish on the basis of the distributional facts.

2.1.6. The distribution

Given that the short vowels in Munster Irish are dependent on the quality of both flanking consonants, we need to determine whether the effects will be the same or different depending on the direction of influence. In other words, we need to establish the nature of the two types of interaction, namely, C-V and V-C. Let us first look at certain monosyllabic (CV) forms in Irish which exhibit very strict dependencies. Recall that this situation is predicted in GP due to the licensing relation which holds between the onset and the following nucleus.

(12)

- | | | | |
|----|--------|--------------|-------------|
| a. | [b'í] | <i>bith</i> | "existence" |
| | [k'í] | <i>cith</i> | "shower" |
| | [kr'í] | <i>crith</i> | "trembling" |
| | [rí] | <i>rith</i> | "running" |

Note also: [ru] as a variant of [rí] *rith* "running".

- | | | | |
|----|-------|--------------|---------------|
| b. | [p'e] | <i>peith</i> | "dwarf elder" |
| | [re] | <i>reith</i> | "heat" |
| | [b'e] | <i>beith</i> | "birch" |
| c. | [l'a] | <i>leath</i> | "half" |
| | [m'a] | <i>meath</i> | "decline" |
| | [ra] | <i>reath</i> | "rutting" |
| d. | [pu] | <i>puth</i> | "breeze" |
| | [kru] | <i>cruth</i> | "shape" |
| | [sru] | <i>sruth</i> | "stream" |
| e. | [bo] | <i>both</i> | "hut" |
| | [ro] | <i>roth</i> | "wheel" |
| f. | [da] | <i>dath</i> | "colour" |
| | [ka] | <i>cath</i> | "battle" |
| | [ra] | <i>rath</i> | "prosperity" |

Whether these forms are indeed phonologically monosyllabic is questionable, as all of them show a latent consonant in alternations involving the addition of an inflectional vowel, e.g. the genitive singular of [bo] "hut" is [bohə].¹³ Nevertheless, the set of data in ((12))

¹³ Some transcriptions e.g. Sjoestedt (1931) and Ó Cuív (1975) include the final consonant in such forms (e.g. [boh]).

represents the only situation in Irish when short stressed vowels appear to be found word-finally.

The main observation here is that the frontness or backness of vowels is contingent on the preceding onset. Thus palatalised consonants can be followed only by front (or fronted) vowels. On the other hand, velarised consonants are followed by back vowels. This restriction refers to all vowels, i.e. high, mid and low ones. It is interesting to notice the variants of the word "running", i.e. [ri] and [ru]. In Irish the word-initial [r] is phonetically never palatalised (or velarised for that matter). This presumably results in some kind of confusion as to whether the onset is palatalised or velarised phonologically, and accounts for the two forms [ri] and [ru] for "running" (see 2.3.6).

The strong dependencies observed in ((12)) exclude the possibility that all six types of short vowels are underlyingly present. However, all these reflexes should be derivable from the vocalic system that we are trying to define. Before the basic problems concerning the distribution are formulated let us see which vowels are allowed before palatalised and velarised consonants respectively, i.e. in the presence of a right hand side influence.

The VC context shows the same distributional restrictions as the CVC one, due to the fact that word-initial empty onsets in Irish seem to retain their specification as regards resonance elements defining broad and slender quality (Gussmann (1986)). This phenomenon is discussed in some detail in section 3.4.1.

(13)

- a.
- | | | | | |
|---|----|---|-------|-------------------|
| C | *i | C | | |
| C | *e | C | | |
| C | *a | C | | |
| C | u | C | [muk] | <i>muc</i> "pig" |
| C | o | C | [sop] | <i>sop</i> "wisp" |
| C | a | C | [kat] | <i>cat</i> "cat" |
- b.
- | | | | | |
|---|----|----|---------|--|
| C | i | C' | [kid'] | <i>cuid</i> "part" |
| C | *e | C' | | |
| C | *a | C' | | |
| C | *u | C' | | |
| C | o | C' | [skol'] | <i>scoil</i> "school" (limited in occurrence?) |
| C | a | C' | [kat'] | <i>cait</i> "cat-gs." |

- c. C' i C [f'is] *fios* "knowledge" (limited in occurrence)
 C'*e C
 C' a C [l'ak] *leac* "stone"
 C' u C [f'l'uχ] *fliuch* "wet"
 C' o C [d'oχ] *deoch* "drink"
 C'*a C
- d. C' i C' [f'ir'] *fír* "man-gs."
 C' e C' [t'ep'] *teip* "fail"
 C'*a C'
 C'*u C'
 C'*o C'
 C'*a C'

We can see that certain forms show a violation of the strict agreement in backness between the nucleus and the preceding onset established in ((12)) e.g. CiC', C'uC, C'oC. Additionally, the right-hand context allows fewer vocalic contrasts in the preceding nucleus if the consonant is palatalised. One question to ask concerning the distribution presented above is whether all the violations of the CV restrictions mean that the right-hand context is responsible? This would suggest that Irish has both 'I' (palatalisation) and 'U' (velarisation) spreading. As far as the latter is concerned, the forms like [f'l'uχ] *fliuch* "wet" and [d'oχ] *deoch* "drink" clearly indicate that the right-hand context sanctions the element 'U' in the nucleus.¹⁴ Recall that in ((12)) neither [u] nor [o] could follow a palatalised onset. On the other hand, the only high vowel that could follow such an onset was [i] as in [b'i] *bith* "existence", while [e] is the only licit mid vowel in this context e.g. [p'e] *peith* "dwarf elder".

Forms like C'uC and C'oC do not seem to be marginal, and the following consonant need not be [χ] as the examples above might suggest. Below we provide more data illustrating this point (Sjoestedt (1931:87), Ó Cuív (1975:22)).

(14)

[g'ulə]	<i>giolla</i>	"servant"
[spr'uk]	<i>sprioc</i>	"mark"
[ʃupə]	<i>siopa</i>	"shop"
[p'ubər]	<i>piobar</i>	"pepper"

¹⁴The representations of these nuclei are (U) and (A.U) respectively.

The occurrence of such forms is too regular to be treated as exceptional. Thus the velarised right-hand context seems to be also active. What is exceptional, on the other hand, is the existence of such forms as [f'is] *fios* "knowledge" which show no influence from the right-hand context and in which the nucleus agrees in frontness with the preceding onset. These words, however, may be explained in terms of the peculiar qualities of [s].¹⁵ In a sense, forms like [f'is] could be viewed as marginal, or at least conditioned by the fact that the following consonant is "neutral" or "exceptional" with respect to palatalisation and velarisation e.g. [s] or the latent [h] ((12)). More examples are given below.¹⁶

(15)

[f'is]	<i>fios</i>	"knowledge"
[l'is]	<i>lios</i>	"garth"
[kr'is]	<i>crios</i>	"belt"

Thus, on the whole, we may conclude that the CV dependencies established in ((12)) may be "upset" by the right hand side context both when the following consonant is palatalised and when the following consonant is velarised (except ((15))).

Let us yet again emphasise some of the conditions underlying the distribution of short vowels.

[i] and [u] must have support from at least one of the flanking consonants. However the distribution of high vowels is not symmetrical in that the context C-C' precludes [u] while C'-C does not preclude [i]. The contexts C-C and C'-C' nonetheless suggest that these two vowels are in complementary distribution, and that both palatalised and velarised contexts are active.

[e] and [o] may be viewed as being in complementary distribution in Munster.¹⁷ [e] must follow C' and precede C' which is practically the only natural context for this vowel to appear in. As will be seen later, certain additional conditions need to be fulfilled in this context depending on the source of [e], i.e. whether it is lexical or derived from [a] which only occurs in C'-C context.

¹⁵More on forms like [g'ulə] and [f'is] can be found in 2.3.1 and 2.3.4.

¹⁶See the section on 'A'-harmony for more detailed discussion of the data.

¹⁷The dialects of Munster and Connemara seem to differ markedly in this respect as in the latter dialect [e] is found in the C-C' context. An important consequence of this distributional fact is that [o-e] alternations are possible, unlike in Munster (see 2.3.7).

[a] and [ɑ] seem to be in complementary distribution in that [a] must follow C' and precede C while [ɑ] must follow C and may be followed by either C or C'. It is not clear whether they should be represented in the same way since their phonological behaviour seems to be different (see below).

Let us now see how the CVC dependencies are manifested in vocalic alternations evoked by palatalisation spreading. The understanding of these mechanisms, which traditionally are referred to as consonant-vowel interaction, will be crucial in the establishment of the phonological representation of both vowels and consonants.

2.2. Vocalic alternations

The vocalic alternations below are traditionally referred to as the effects of consonant-vowel interaction (Sjoestedt (1931), Ní Chiosáin (1992)). In the present analysis it is assumed that the only type of vowel-consonant interaction that can take place is that between an onset and the following nucleus (see the dependencies above and 2.1.4 on Polish C-V harmony). This assumption follows from the general licensing properties whereby an onset is licensed by its nucleus. On the other hand, the effects brought about by the right hand context are not viewed here as V-C interaction but as independent 'I/U'-spreading. This distinction between the left hand side and right hand side contexts follows from the fact that no governing relation obtains between an onset and the preceding nucleus.¹⁸ Consider the data below.

(16)

a.	[muk]	/	[mik']	<i>muc / muic</i>	"pig / dat."	u/i
	[pu]	/	[pih'ə]	<i>puth / puithe</i>	"breeze / gs."	u/i
	[sop]	/	[sip']	<i>sop / soip</i>	"wisp / gs."	o/i
	[knok]	/	[knik']	<i>cnoc / cnoic</i>	"hill / gs."	o/i
	[f'ar]	/	[f'ir']	<i>fear / fir</i>	"man / gs."	a/i
	[k'ark]	/	[k'ir'k'ə]	<i>cearc / circe</i>	"hen / gs."	a/i
b.	[obir']	/	[eb'ir'ə]	<i>obair / oibre</i>	"work / gs."	o/e
	[d'as]	/	[d'e]ə]	<i>deas / deise</i>	"nice / gsf."	a/e

¹⁸Recall that palatalisation spreading has a broader application than that predicted by V-C interaction (cf. the cases of "long distance" spreading in, for example, [dorən / d̪ir'in̪] *dorn / doirn* "fist/gs.").

c.	[kos]	/	[koʃ]	<i>cos / cois</i>	"leg / dat."	o/o
	[kat]	/	[katʰ]	<i>cat / caít</i>	"cat / gs."	a/a

The alternations shown above are fully predicted by the distributional facts presented in the previous section and show three basic patterns. In the first one, vocalic expressions regularly alternate with a high front vowel ((16)a). This type of alternation seems to be predominant. In ((16)b) the target vowel is [e]. This involves the fronting of [o], a phenomenon limited in occurrence in Munster (see 2.3.7), or the raising of [a]. The latter type is additionally conditioned by the fact that the following nucleus must be phonetically realised. The last set ((16)c) shows cases in which a vocalic transition fails to occur. This phenomenon is regular in the case of back [ɑ], while [o] is typically affected and realised as [i] ((16)a). This may suggest that there are two types of [o]'s and [a]'s in Irish. Namely, some [o]'s and [a]'s alternate with [i] and others remain immune ("opaque") to I-spreading. Another type of transition, i.e. of [o] and [a] to [e] will be shown to be strictly conditioned.

2.2.1. A feature analysis

Ní Chiosáin (1992) represents a very recent description of vocalic alternations in Connemara Irish couched in terms of feature geometry and other devices of non-linear generative phonology. The dialects of Munster and Connemara exhibit certain phonological differences in the distribution of segments as well as in their phonological behaviour. In the discussion of Ní Chiosáin's analysis an attempt will be made to concentrate on points in which the two dialects are comparable. Additionally, the relevant differences will be pointed out. One has to admit that the theoretical frameworks employed in the present analysis and in that of Ní Chiosáin (1992) are not fully translatable, therefore the criticism will be restricted to those areas which are common to both.

In her analysis of consonant-vowel interaction in Irish, Ní Chiosáin considers only the qualitative changes of vowels involving the feature [BACK]. Her primary aim is to show the advantages of the equipollent (binary) approach to feature specification (Farkas and Beddor (1987), Steriade (1987a), Kiparsky (1991)) over the privative one (Schane (1984, 1987), Anderson and Ewen (1987), Hulst (1988, 1989), Selkirk (1991)). Her arguments are

presented within a restricted variety of the underspecification theory (Steriade (1987b), Clements (1988), Mester and Itô (1989)).

The inventory of short vowels proposed by Ní Chiosáin consists of three objects, i.e. [I], [E] and [a]. The first two are underspecified for the feature [BACK] and stand for [HIGH] and [MID] archisegments. The low vowel [a] is opaque to vowel-consonant interaction, and the fronting to [a] is viewed as phonetic in nature (see also Ní Chiosáin and Padgett (1993)).

Ní Chiosáin claims that consonants and long vowels in Irish are specified underlyingly for both values of [BACK]. Short vowels (I and E) have no [BACK] specification. This feature is provided by the ordered feature filling rules given below.

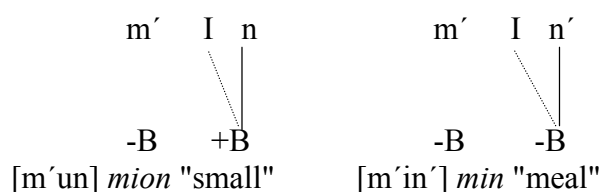
(17)

- a. spread [BACK] leftwards.
- b. spread [BACK] (default).

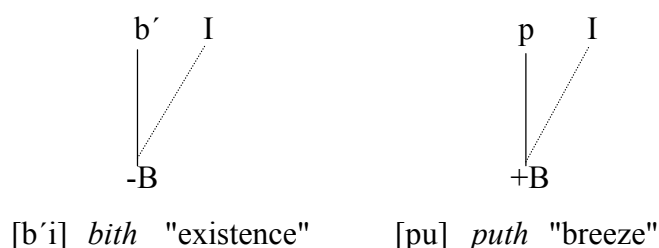
The consequence of these rules is that, if the vowel is flanked by two consonants, it receives its backness specification from the one which follows (rule ((17)a)). In cases where no consonant follows the vowel, it acquires its specification for feature [BACK] from the preceding one (rule ((17)b)). The mechanism of the application of these rules is illustrated below in ((18)) (cf. Ní Chiosáin (1991, 1992)).

(18)

- a. *spread* [BACK] *leftwards*



- b. *spread* [BACK] (*default*)



Since these are feature filling rules, this analysis predicts that long vowels will not interact with consonants as they already are specified for the feature [BACK]. Given the distributional facts presented in previous sections which to a large extent agree with the Connemara facts, it seems that the two rules proposed by Ní Chiosáin should neatly account for the vocalic alternations. However, this analysis seems to account only for a part of what happens in the vocalic system of Irish.

2.2.2. Problems with the feature analysis

This analysis requires that the low vowel be left aside for a variety of reasons. First, [a] does not interact with the following palatalised consonant e.g. [bʌn'ə] (Connemara [bɑ:N'ə])¹⁹ *bainne* "milk", which makes it different from the mid and high archisegments E and I. Second, the fronted low vowel [a], whether we treat the fronting as phonological or phonetic in nature, violates the rule ordering proposed in ((17)), as it is the preceding consonant that affects the vowel and not the following one e.g. [l'ak] (Connemara [l'æ:k]) *leac* "stone". However the price to be paid for the exclusion of the low vowel from interaction with palatalisation is that instances of [a/i] and [a/e] alternations (Connemara [æ:/i] and [æ:/e]) as in [f'ar / f'ir'] *fear / fir* "man/gs." and [l'ak / l'ek'ə] *leac / leice*²⁰ "stone/gs.", which are numerous in both dialects, have to be disregarded.

In other words, the rules proposed in ((17)) only account for [u/i] and [o/e] transitions in Connemara. The latter does not form a productive pattern in Munster Irish where [o] either shifts to [i] e.g. [sop / sip'] *sop / soip* "wisp/gs.", or remains unaffected e.g. [kos / kof] *cos / cois* "leg/dat." Although [o] is affected in a different way in Munster than in Connemara, it is also true that in the latter dialect a distinction between alternating and non-alternating [o] also has to be made (de Bhaldraithe 1945:14), which is not predicted in Ní Chiosáin's analysis. Additionally, both in Munster and in Connemara, there are numerous lowering and raising phenomena which would require a separate set of rules to derive (Ó Siadhail (1989:38-47)), i.e. rules which manipulate the feature [HIGH] rather than [BACK]. Ideally, most of these

¹⁹In Connemara, all stressed low vowels are lengthened (cf. de Bhaldraithe (1945:12), Ní Chiosáin and Padgett (1993)). However, the nature of that lengthening is phonetic.

²⁰The Connemara forms are [f'æ:r / f'ir'] and [l'æ:k / l'ek'ə].

phenomena should be unified, as indeed they can be, if a different view is taken of the alternations, and especially of the phonological representation as such.

As far as the immunity of long vowels to spreading is concerned, a phenomenon for which Ní Chiosáin accounts by assuming that they are underlyingly specified for the feature $[\pm\text{BACK}]$, it will be shown (chapter 3) that some interaction is to be found in both Munster and Connemara. The conditions which underlie such phenomena will be demonstrated to be dependent on both the melodic content of long vowels and their formal (syllabic) structure (Cyran (1995)).

The basic question which should be asked at this stage is why Irish allows for vowel modifications and what such modifications tell us about the three-vowel system $[I, E, a]$ posited for Irish. Even if there is a phonological distinction between low, mid, and high short vowels in Irish, as the $[I, E, a]$ classification suggests, there are reasons to believe that this does not play an important role within the vocalic system of that language. Ó Siadhail (1989:36) notices that in Connemara Irish the short vowel system is not stable so that, phonetically speaking, the oppositions back/front and high/low are "indistinct", and minimal pairs, involving for instance the $[u/o]$ contrast (e.g. $[kur]$ *cur* "put, imper." vs. $[kor]$ *cor* "move"), are extremely rare. The same can be said about Munster Irish. Sjoestedt (1931:70) points out fluctuations in the pronunciation of certain words e.g. $[l'et'ir']$ / $[l'it'r']$ *leitir* "letter" or $[d'en'im']$ / $[d'in'im']$ ²¹ *deinim* "I do". This, to a large extent, may be a matter of convention in phonetic transcription or due to misjudgements regarding the actual phonetic event (Edmund Gussmann (p.c.)). However, in one sense it also reflects the actual absence of the necessity to see or represent a distinction between $[I]$ and $[E]$, which further undermines this system.

In other words, although observationally the three-vowel system $[I, E, a]$ seems to be correct in that it captures the phonetic distinction between low, mid and high vowels, it offers little help in terms of an accurate representation and understanding of vocalic alternations of the type demonstrated in ((16)), most of which cannot result from a mere assignment of the feature $[\pm\text{BACK}]$.

2.2.3. Munster vocalic alternations: problems and objectives

The data in ((16)) may suggest that the forms in the nominative case constitute a base on which the process of palatalisation operates to form the genitive case. This would overlook the fact that in the nominative case we should expect velarisation spreading (cf. Ní Chiosáin's rule of $[\pm\text{BACK}]$ spreading). Whether we treat the nominative forms in ((16)) as basic and the genitive as derived or the other way round, i.e. whether we want to view either 'I' or 'U' spreading as dominant, something still has to be said about the underlying forms of the nuclei which participate or do not participate in the alternations.

The aim of this section is to pinpoint the possible phonological phenomena which are caused by 'I' or 'U' spreading, and to define them in terms of element combinations. For this purpose we will assume that the vocalic modifications in ((16)) mean that one form is indeed derived from the other, i.e. in the case of $[\text{o}/\text{i}]$ transition we assume that the underlying vowel is $[\text{o}]$ and the alternation is caused by 'I'-spreading. Additionally, we will look at the reverse situation and assume the possibility that $[\text{i}]$ may be the underlying vowel, and try to derive $[\text{o}]$ by velarisation spreading. As a result of this unusual and, in fact, bogus comparison we should be able to select the possible effects of 'I' and 'U' spreading as well as discover certain facts concerning the underlying representation of Irish short vowels. (Recall that there are three basic elements defining vocalic systems which are employed here, i.e. 'I', 'U' and 'A').²²

GP recognises only two types of phonological processes, namely, *composition* and *decomposition*. Therefore, the effects of 'I' and 'U' spreading, presented below in ((19)), will be limited to element addition or suppression. Additionally the phenomenon of isomeric switch in the status of elements in compounds comes into play, e.g. $(\text{A.I}) > (\text{I.A})$, which is widely recognised in GP and accounts for various raising and lowering effects (KLV (1985), Charette and Göksel (1994/96), Harris (1994a)). As far as element suppression is concerned, one should note the difference between 'I' and 'U' suppression on the one hand, and the suppression of the element 'A' on the other. This difference follows from two facts. First, the processes of 'I' and 'U' spreading are mutually exclusive, and secondly, these elements never combine in vocalic objects in Irish, which results in the absence of front rounded vowels

²¹A similar raising phenomenon can be observed in velarised contexts in which $[\text{o}]$ is raised to $[\text{u}]$ e.g. $[\text{knok}] > [\text{knuk}]$ *cnoc* "hill", or $[\text{loxt}] > [\text{luxt}]$ *locht* "fault" (Sjoestedt 1931:67).

²²The so called "cold vowel" is left aside here.

from the system. Therefore, where necessary, 'I' and 'U' suppression will be also referred to as element substitution or dislodgement. Consider the putative effects of this below.²³

(19)

a. *effects of 'I'-spreading*

[muk/mik']	u/i	[U]	->	[I]	U-suppression
[sop/sip']	o/i	[A.U]	->	[I]	U- and A-suppression
[f'ar/f'ir']	a/i	[I.A]	->	[I]	A-suppression
[obir'/eb'ir'ə]	o/e	[A.U]	->	[A.I]	U-suppression
[d'as/d'eʃə]	a/e	[I.A]	->	[A.I]	switch of status to I-head
[kos/koʃ]	o/o	[A.U]	->	[A.U]	lack of interaction
[kat/kat']	ɑ/ɑ	[A]	->	[A]	lack of interaction

b. *effects of 'U'-spreading*

i/u	[I]	->	[U]	I-suppression
i/o	[I]	->	[A.U]	I-suppression and A-addition
i/a	[I]	->	[I.A]	A-addition
e/o	[A.I]	->	[A.U]	I-suppression
e/a	[A.I]	->	[I.A]	switch of status to A-head
o/o	[A.U]	->	[A.U]	lack of interaction
ɑ/ɑ	[A]	->	[A]	lack of interaction

The putative processes presented above in ((19)a,b) share certain properties, namely, both 'I' and 'U' spreading involve the suppression of other elements. A marked difference is to be observed in the fact that 'U' and 'A' may be suppressed as a result of 'I' spreading, while only 'I' disappears when 'U' spreads. It remains to be seen how such mechanical replacement of elements can be accounted for in a non-arbitrary fashion. Let us first concentrate on the interaction between the elements 'I' and 'U' which results in the suppression of one by the other.

²³In section 2.4, we consider the possibility of unifying the behaviour of 'I', 'U' and 'A' with respect to suppression by attempting to derive these effects from one property of element licensing, namely, from so called "Licensing Constraints" which define possible element combinations in a given language.

One way of viewing this phenomenon would be to assume a model of representation in which the elements 'I' and 'U' reside on the autosegmental lines BACK ('I') and ROUND ('U') which may be claimed to be parametrically fused in Irish to form one BACK / ROUND line (KLV (1985:307), Rennison (1990)). The tier fusion hypothesis ensures that when 'I' and 'U' appear on the fused line one excludes the other, and also accounts for the absence of front rounded vowels from the vocalic system of Irish.

Another way out would be to assume that, given the presence of the processes of 'I' and 'U' spreading, these elements are not present in the representation of short nuclei, in which case the problem of element substitution or dislodgement (I/U suppression) becomes irrelevant because what takes place is merely the spreading of the relevant element into the nucleus. The predictions concerning the underlying representation of Irish short nuclei which follow from this claim are considered in the following sections.

The case of A-suppression in ((19)a) e.g. [f'ar / f'ir'], has to be treated as a separate phenomenon. The reason is that 'I' and 'A' are not mutually exclusive and in an autosegmental model these two elements would reside on separate lines, which should allow them to combine. One way to naturally account for the phenomenon of A-suppression is to refer to the combinatorial possibilities that elements exhibit in a given language. For example, it may be the case that 'I' and 'A' may combine only in one way, i.e. as (A.I) and not as *(I.A), which means that, when these elements combine, only one of them may act as the head and license the other within the nucleus.²⁴ At any rate, it seems that both cases of element suppression in ((19)a) and ((19)b) may be accepted as possible processes in a natural language.

Unfortunately, the same cannot be said about the putative process of A-addition ((19)b) which appears to be effected by the spreading of the element 'U'.²⁵ In Government Phonology, elements which take part in combinations must have a local source, therefore one must assume that 'A' is present underlyingly in the nucleus involved in [i/o] and [i/a] alternations. This claim entails the existence of A-suppression rather than A-addition as a possible phonological process accompanying 'I' and 'U' spreading ((19)a). Indeed, the process of A-delinking or A-suppression has been found in other languages and has received various

²⁴ Note that the existence of certain conditions on element combinations must be recognised in order to account for the absence of *(I.U), *(U.I) and *(I.U._).

treatments.²⁶ An additional argument for the existence of A-suppression in Irish seems to be provided by the raising phenomena mentioned earlier, i.e. [e/i] e.g. [d'en'im' / d'in'im'] *deinim* "I do" and [o/u] e.g. [knok / knuk] *cnoc* "hill" (Ó Siadhail (1989:36), Sjoestedt (1931:67-70)). The fact that the raising phenomena occur in both palatalised and velarised environments suggests that these contexts are equally active.

So far we have established that judging by the putative processes involved in vocalic transitions in Irish which were enumerated above in ((19)a,b) the phenomenon of 'A' addition is not likely to be due to 'I' or 'U' spreading. Additionally, a closer look will need to be taken at the phenomenon involving a switch of status in the elements of compound expressions as it could enable us to account for raising effects like [a] to [e] ([d'as / d'eʃə]) in a palatalised environment. Note that this case of raising, i.e. [a/e], differs slightly from other raising phenomena like [e/i] and [o/u] in that here no suppression of the element 'A' takes place.

However, the main focus of the ensuing analysis should be on the understanding of the complex phenomenon of the suppression of the elements 'I', 'U' and 'A', which, for expository reasons, will be divided into two parts. The first concerns the interaction between the elements 'I' and 'U', employing such terms as element substitution or element dislodgement. The phenomenon of 'A' suppression will also be investigated within the context of other processes in which this element is involved.

The second objective of this analysis will be to account for the "opaque" vowels which do not seem to be affected by 'I' or 'U' spreading. These include [ɑ] and [o], e.g. [kat/kat'] and [kos/koʃ] as opposed to [f'ar/f'ir'] and [sop/sip'] where palatalisation spreading affects the nuclei only in the last two examples, as well as [a] as in [l'ak] *leac* "stone" and [ɑ] as in [kat] *cat* "cat" which resist 'U'-spreading. Notice that parallel to [d'ox] *deoch* "drink" we should expect the element 'A' in *leac* to be affected by velarisation and yield *[l'ok]. In other words, we need to explain the absence of the [a/o] alternation.

As far as the phonological representation of Irish short nuclei is concerned, one may at this stage make minimal assumptions which will have to be revised as more facts are taken into consideration. Namely, given the existence of the 'I' and 'U' spreading, these elements may be assumed to be absent from certain nuclei, while the fact that no 'A' addition has so far

²⁵Irish has a separate process of 'A' spreading, the mechanism of which differs markedly from that of 'I' and 'U' spreading (see section 2.3.4).

been attested (at least as a result of I/U spreading) means that 'A' must be present in those nuclei in which alternations or surface forms show its presence e.g. [f'ar/f'ir'] or [kos/kof].

2.3. A GP analysis

Following Ní Chiosáin's line of argument, one would expect that the resonance element defining velarised consonants should undergo spreading in the same fashion as the one defining palatalised consonants. This means that the rules proposed by Ní Chiosáin do not predict any asymmetry as far as the operativeness of the two types of environment is concerned. In other words, spreading of the element defining velarisation should affect short vowels in the same way as palatalisation spreading.²⁷ We agree with this to a limited extent. It seems that indeed both elements defining palatalisation (I) and velarisation (U) spread into the short nuclei; however, the nature of the spreading of the two elements will be shown to differ slightly. Generally speaking, palatalisation exhibits a stronger influence on vocalic objects than velarisation, as we saw in the previous section. This asymmetry requires a formal explanation.

Our analysis begins with the formulation of a condition on the underlying representation of Irish short nuclei. It will be proposed that the C-V dependencies which are manifested most evidently in monosyllabic forms like [pu] *pu* "breeze" and [b'i] *bith* "existence" should be formally reflected in the phonological structure and defined in terms of the sharing of the elements 'I' and 'U' between the nucleus and the preceding onset.

In this light, the vocalic alternations (or, in fact, the derivation of vocalic objects in general) will be viewed as an interaction between the left-hand context (C-V relation) and the 'I' and 'U' spreading from the right. The nature of the interaction will be first defined on the basis of the [u/i] alternation (e.g. [muk/mik'] *muc / muic* "pig/dat.") which constitutes the simplest situation, involving as it does only the elements 'I' and 'U'. Then, we turn to the alternations in which more complex nuclei are involved. Specifically, we will concentrate on the phonological behaviour of the element 'A' with respect to palatalisation spreading.

²⁶See Harris (1990b) for an account of vowel harmony in Pasiego Spanish as well as Cobb (1993) and Denwood (1993) for an analysis of A-loss in Uyghur.

²⁷Note that there is no inherent difference between the properties [+BACK] and [-BACK] which would predict any asymmetry in the effects of spreading of these features.

Finally, the segments which exhibit immunity to element spreading will be inspected (e.g. [kat/kat'] *cat* / *cait* "cat/gs.>").

2.3.1. The "Sharing Condition" and element spreading

Let us first recall the data which demonstrate distributional restrictions concerning short vowels in monosyllabic words.

(20)

[b'i]	<i>bith</i>	"existence"	C'i	*C'u
[p'e]	<i>peith</i>	"dwarf elder"	C'e	*C'o
[l'a]	<i>leath</i>	"half"	C'a	*C'ɑ
[pu]	<i>puth</i>	"breeze"	Cu	*Ci
[bo]	<i>both</i>	"hut"	Co	*Ce
[dɑ]	<i>dath</i>	"colour"	Cɑ	*Ca

These forms clearly show an agreement in "backness" between the vowels and the preceding onsets. Front or fronted vowels follow palatalised onsets which contain the element 'I', while back vowels follow velarised ones (with the element 'U'). In order to capture this pattern of distributional restrictions formally one can propose the following condition on the phonological structure of Irish short vowels.

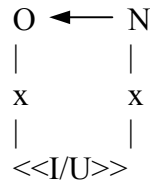
SHARING CONDITION

Nuclei share the element 'I' or 'U' with their onsets.

Structurally, the application of the *sharing condition* reflects the universal licensing relation that holds between the onset and the following nucleus (KLV (1990), Charette (1991)), and may be represented in the following way.²⁸

²⁸[Cɑ] appears to be problematic in that we should expect an open [ɔ] rather than a fully low back vowel if the shared element, i.e. 'U', acts as an operator within the nucleus. One may, however, assume that the shared element is not fused with the active element in the nucleus, i.e. with the element which is underlyingly present in the nucleus, or that it is spread from the right (cf. the discussion of [ri/ru] in 2.3.6).

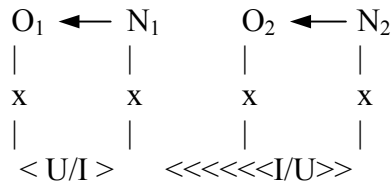
(21)



(<< >>) sharing

We may assume the nature of this sharing to be non-directional, i.e. both participants are equally entitled to the shared element, which means that this element is not spread from one of the participants to the other but rather reflects the governing relation holding between onsets and their nuclei.²⁹ On the other hand, we will assume that the shared element, which defines any onset-nucleus relation in a non-directional way, spreads leftwards and may affect the preceding nucleus.³⁰

(22)



Thus the shared element I/U, which is lexically lodged in the O₂-N₂ licensing relation, extends its own domain of application leftwards until it meets another O-N sharing domain. The latter is defined by its own element 'I' or 'U', and depending on which of the two elements is present there, we may expect different outcomes.

As hinted at before in the discussion of the distribution of short vowels, any violation of the *sharing condition* may be attributed to the influence of 'I' or 'U' spreading from the right-hand context. In other words, we may say that whatever the effect of 'I' and 'U' spreading is, the nucleus always contains the element 'U' or 'I' underlyingly as per the *sharing condition*.³¹ It is worth noticing that the undoing of the sharing condition by 'I' and 'U' spreading from the right results in a situation similar to that encountered for long vowels in

²⁹This structure was suggested to me by John Harris.

³⁰This fact could be derived from the foot structure, namely, if feet are right-headed then the identification of all the positions with element shared in the right branch is obvious.

³¹This statement is necessarily too general as will become clear in the discussion of low vowels. It will be modified in later sections.

which this condition appears to be by and large inapplicable. Namely, the phonetic quality of the vowels does not reflect the quality of the preceding onset, e.g. [k'u:n'] *ciúin* "calm". Let us observe how the *sharing condition* interacts with element spreading in the high vowel environment, i.e. in alternations of the type [u/i].

(23)

[muk]	/	[mik']	<i>muc</i> / <i>muic</i>	"pig/dat."	u/i
[pu]	/	[pih'ə]	<i>puth</i> / <i>puithe</i>	"breeze/gs."	u/i

The vocalic alternations involving short high vowels as in e.g. [muk / mik'] *muc* / *muic* "pig/dat." may be illustrated by the following structures.

(24)

a.	O ₁	N ₁	O ₂	N ₂	b.	O ₁	N ₁	O ₂	N ₂
	x	x	x	x		x	x	x	x
	m		k			m		k'	
	< U >		<<<U>>> ³²			< U() _		<<<<I>>>	
			[muk]					[mik'] ³³	

(<<>>) - non-directional sharing of an element

(<<) - spreading of an element

(||) - buffer

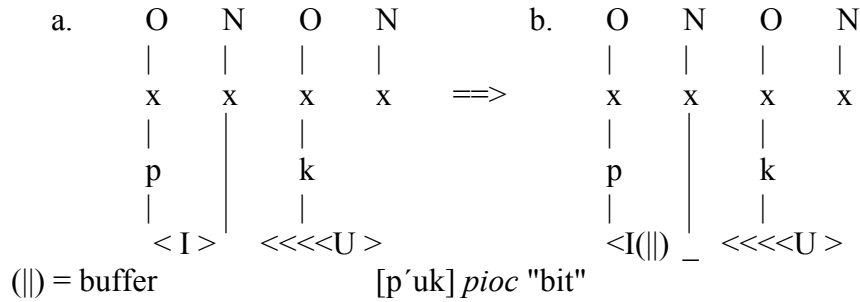
In the case of ((24)a), the effect of U-spreading is not obvious for the simple reason that the preceding onset also contains the same element, i.e. this element is shared by the nucleus and the preceding onset from the start. Since the nucleus N₁ shares 'U' with its onset and at the same time finds itself within the scope of application of the 'U' element lodged in the O₂-N₂ domain, one might expect that the multiple occurrence of the element 'U' would be reduced here by the OCP.³⁴ On the other hand, in ((24)b) the element 'I', which is spread into the nucleus (is licensed in it), pushes the element 'U' out. As a result, a strong labial off-glide is

³²We assume that the sharing between O₂ and N₂ is observed. However, the domain-final empty nucleus does not license any melody.

³³One needs to bear in mind the fact that the undoing of the sharing condition as in *muic* is accompanied by a strong labial off-glide from the onset, which some linguists represent as [m^wik'].

formed while further spreading of the element 'I' is blocked.. This fact has its exact mirror image in the situation in which the element 'U' upsets a structure in which the element 'I' is shared. The dynamic nature of the derivation below is only assumed for expository reasons and reflects the fact that the sharing condition (structure (a)) is undone by U-spreading.

(25)



Again, in such a case one can talk about a strong palatal off-glide (cf. [p^juk] Sjoestedt (1931:87)). Notice that this analysis need not refer to the problem of mechanical element substitution but rather to the element being expelled or dislodged without being lost. It may be suggested that the element 'I' in [p^juk], or 'U' in [m^wik'] need not be banished from the representation but rather form buffers to further spreading of the "intruding" elements from the right.

This rather provisional description of the effects of 'I' and 'U' spreading will be refined later. What is interesting here is how to understand the *sharing condition* with respect to the structure of the nucleus. Does it mean that the nucleus physically contains the shared element or that it is empty? The latter possibility would upset our analysis of palatalisation spreading. Recall that empty nuclei allow palatalisation to affect the preceding onset (cf. [dorəs / dir'if / do:r[ə] *doras* / *dorais* / *doirse* "door/gs./pl." (2.1.2)), while here ([muk / mik']) further propagation of palatalisation is blocked, most probably because of the element shared by the nucleus with its onset. An additional argument against the possibility that the affected nucleus in *muic* is empty comes from the fact that empty nuclei in Irish may remain unrealised if the following nucleus has melody (cf. [dorəs - do:r[ə]]). This does not happen in the genitive of "pig", *muice*, which is [mik'ə] and never *[mk'ə]. Nonetheless, the question of the exact structure of the nucleus will be returned to.

³⁴Following e.g. Yoshida (1993:148), we will assume that the effects of the OCP are possible only within governing or licensing domains. This condition is fulfilled here, if we view N₁ as lying within the domain of application (licensing domain) of element spreading from the right.

Another intriguing issue is that concerning the actual way in which the elements 'I' and 'U' are licensed in the nuclei and in the consonants that they affect. This problem is taken up in the ensuing sections as well as in chapter 4, which is devoted to consonants.

The difference between this analysis and that of Ní Chiosáin's lies in the fact that here we are not dealing with an underspecified underlying vowel which obtains further specification by means of filling rules. Concepts like underspecification are alien to Government Phonology; therefore, in this approach we cannot postulate some underspecified segment like [+HIGH] within that nucleus. In this approach the height of the resultant vowel need not be separately specified as the element which is spread from the right is a fully specified (autonomously realisable) segment, either 'U' or 'I', and these are inherently high.

To summarise: short nuclei share the elements 'I' and 'U' with the preceding onset as per the *sharing condition* which accounts for the C-V restrictions in monosyllables (e.g. *bith*). Additionally, Irish has the process of 'I' and 'U' spreading from the right, due to which the shared element may be "dislodged" (pushed out) from the nucleus and docked on the preceding onset thus producing a labial or palatal off-glide (cf. [m^wik'] and [p^juk]). It is important to note that the shared element is not lost (deleted) but seems to act as a buffer to further spreading of elements from the right.

Below we turn to the phenomena encountered in mid and low vowels in which I-spreading causes not only dislodgement of the element 'U' shared by the nucleus with the preceding onset but also suppression of the element 'A' in the nucleus.

2.3.2. A-suppression

This section initiates the discussion of phenomena connected with the phonological behaviour of the element 'A' in Irish which will be shown to follow directly from the notion of phonological licensing.³⁵

In order to be pronounced, phonological elements must be associated with skeletal position, i.e. licensed. This type of licensing (autosegmental) may be dependent on the status

³⁵Here, the main focus is placed on the notion of autosegmental licensing (a-licensing) which controls the attachment of melodic material to skeletal positions and is ultimately responsible for the phonetic interpretability of the melody (see introduction (1.4) for a broader discussion of licensing in phonology).

of the position within the prosodic hierarchy (Harris (1992), Harris (1994a)), which involves various levels at which smaller units are integrated into larger ones.

In what follows, we will concentrate on the lowest level of the phonological hierarchy, i.e. the autosegmental licensing (a-licensing) between skeletal positions and the melodic content. Two facets of a-licensing will be investigated with reference to the behaviour of 'A' in vocalic alternations in Irish, namely, one in which a-licensing is dependent on the higher levels of organisation (prosodic licensing), and one where melody licensing depends on the interaction between elements within a segment. In the first case, it will be shown that melodic material may be licensed within a nucleus due to a licensing relation with another nucleus. In other words, the a-licensing of melodic material is sanctioned by an external licenser (see the phenomenon of A-support in 2.3.3).

Now we turn to the other aspect of a-licensing which refers to the interaction between phonological elements within one segment. Initially, we adopt the view that an element may not be licensed within a segment (here: short nucleus) because it cannot fuse with other elements present within that segment. The aim of this analysis is to discover the conditions underlying such phenomena. Let us begin by looking at the [o/i] and [a/i] alternations in Munster Irish where palatalisation spreading causes, among other things, the suppression of 'A'. Below we reproduce the data which are of interest here.

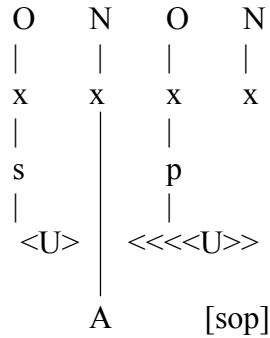
(26)

a.	[sop]	/	[sip']	<i>sop / soip</i>	"wisp/gs."	o/i
	[knok]	/	[knik']	<i>cnoc / cnoic</i>	"hill/gs."	o/i
b.	[f'ar]	/	[f'ir']	<i>fear / fír</i>	"man/gs."	a/i
	[k'ark]	/	[k'ir'k'ə]	<i>cearc / circe</i>	"hen/gs."	a/i

The alternation [o/i] involves two things, i.e. U-dislodgement, which is by now familiar, and A-suppression, and can be given the following provisional account.

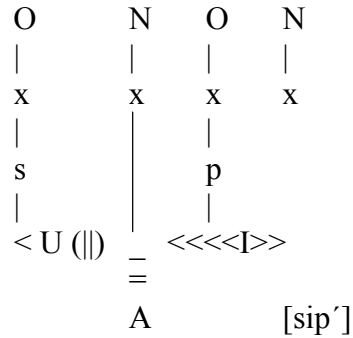
(27)

a.



(=) - element suppression

b.

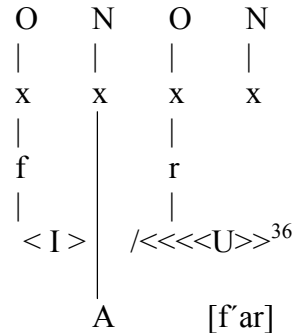


The situation in [sop] is similar to that in [muk] in that no matter what the actual result of spreading is, the nucleus contains the element 'U' which is shared with the preceding onset. Additionally, in [sop], the element 'A' is present in the nucleus. On the other hand, in [sip'], the interaction between palatalisation spreading (<<I) and the element 'U' which is shared by the nucleus and the preceding onset is the same as in [muk/mik'], except that in [sip'] the element 'A' cannot be licensed within the affected nucleus.

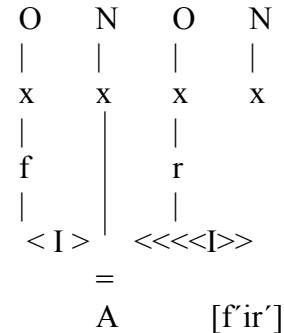
A similar kind of interaction may be assumed to obtain in the [a/i] type of alternations in which the element 'A' cannot be licensed in the nucleus if it is affected by palatalisation.

(28)

a.



b.



The facts concerning [o/i] and [a/i] transitions clearly indicate that U-spreading is not as effective as I-spreading. Notice that the structures ((27)a) and ((28)b) are parallel if not identical except that palatalisation spreading suppresses 'A', while velarisation spreading does not affect such a nucleus. This issue will be addressed later when opaque segments are

³⁶There is no spreading of the element 'U' in the case of [a] or [ɑ], which is not dependent on the nature of the consonant (in this case [r]) but rather on the nature of the nucleus. See section 2.3.8 on "opaque" segments.

discussed. It will be shown that the status of 'A' is different in alternating mid vowels from that in low vowels.

We may conclude that I-spreading suppresses the 'A' of a preceding nucleus, or to put it differently, the element 'A' may not be licensed within a nucleus affected by palatalisation, which points to the interaction between 'I' and 'A' as the cause of the loss.

Problems with an exact account of A-suppression aside, this analysis already shows certain advantages over that proposed in Ní Chiosáin (1992). Namely, bearing in mind that there are opaque segments in which 'A' is involved,³⁷ we are now in a position to include the existing alternations in which low vowels are involved (e.g. [f'ar / f'ir']) as well as those where mid vowels are affected in the same manner (e.g. [sop / sip']) in the pool of phenomena evoked by element spreading. The single phenomenon of A-suppression explains neatly the modifications which, in traditional terms, involve not only the feature [BACK] but also [HIGH] and for that reason had to be treated as unconnected.³⁸

Finally, let us look at some intriguing data which may reveal how the vocalic system of Irish operates. The forms presented below involve a rare case of an [a/i] type of alternation which is strictly related to a shift in stress. This type of data illustrates probably the only productive context in which the low back [a] is affected by palatalisation.

(29)

[f'i'nax / 'finig']	<i>sionnach / sionnaigh</i>	"fox/gs."
[tə'sax / 'tosig']	<i>tosach / tosaigh</i>	"beginning/gs."
[mər'kax / 'markig']	<i>marcach / marcaigh</i>	"rider/gs."
[pər'tax / 'portig']	<i>portach / portaigh</i>	"bog/gs."

It appears that under certain conditions the low back [a] also has to be included in the list of interactions between nuclear content and element spreading. What is more, the [a/i] alternation can be easily accommodated in our analysis as it involves A-suppression evoked by I-spreading once the conditions are met. Roughly speaking, the main condition for the low back vowel to be affected by palatalisation is its reduction to a schwa-like vowel (see

³⁷It would be erroneous to assume that only low vowels are opaque to element spreading as certain [o]'s and in fact [e]'s exhibit the same property (see the discussion of "opaque" segments (2.3.8)).

³⁸One should make it clear that this analysis accounts for the Connemara facts too, in which [sop] alternates with [sep]. In this case, all that needs to be said is that the element 'A' is not suppressed and only U-dislodgement occurs.

Gussmann (1994)), but it is unclear what is responsible for the reduction, i.e. whether it is palatalisation or stress shift that is responsible.

In 2.4, an attempt will be made to find out the exact reasons for A-suppression. However, one should bear in mind two facts concerning the interaction between 'A' and 'I'. First of all, the back [ɑ] is typically not affected by I-spreading. On the other hand, the existence of short [e] as well as long [e:], although conditioned, indicates that the two elements may combine.

Given the above analysis one may, however, think of a few reasons for A-suppression now. Firstly, the suppression might be due to the break-up of the relation between 'A' and the element shared with the onset. This means that 'A' forms a bound structure with the shared element, the break-up of which disallows a combination with the incoming element provided by I-spreading. Such an interpretation, however, would only apply to the forms like [sop/sip'] where I-spreading breaks-up the U-A combination, while the alternation [f'ar/f'ir'] would require a different explanation as the sharing is not upset here.

The line of argument adopted in the ensuing analysis is that the element which spreads into the nucleus cannot fuse with whatever is present in that nucleus because of certain properties in the spread element.³⁹ Thus, although 'I' and 'A' may combine, it may be claimed that the nature of that combination is strictly conditioned in Munster Irish.⁴⁰ The following section offers an analysis of a set of data in which the element 'A' is licensed in the affected nucleus from outside that nucleus, i.e. from the following nucleus, which clearly indicates that A-suppression is strictly related to element licensing.

2.3.3. A-support

The following series of examples illustrates two sets of facts. First, it shows that low vowels alternate in palatalised environments. Second, it supplies more evidence indicating that both the preceding and the following context can influence the intervening vowel, though not in the same fashion. The difference lies in the nature of element sharing, which is non-directional in the C-V context, as opposed to the leftward spreading of the elements 'I' and

³⁹This would account for both U-dislodgement and A-suppression as a unified phenomenon.

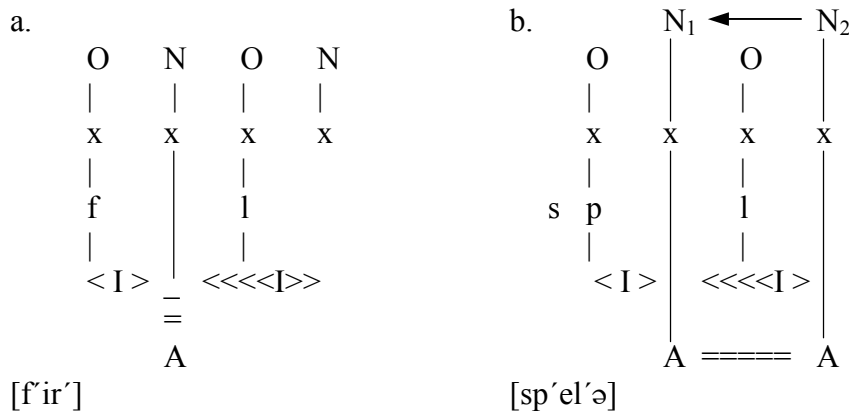
'U'. In the previous section, it was shown that front [a], which distributionally always follows a palatalised onset, alternates with [i] if the element 'I' is spread from the right. In this respect the data below may look exceptional since the I-spreading yields the mid vowel [e]. Consider the data in ((30)a) taken from Ó Siadhail (1989).⁴¹ Notice that only [a] alternates with [e].

(30)

a.	[sp'al]	/	[sp'el'ə]	<i>speal / speile</i>	"scythe/gs."	[a/e]
	[d'as]	/	[d'efə]	<i>deas / deise</i>	"nice/comp."	[a/e]
	[l'ak]	/	[l'ek'ə]	<i>leac / leice</i>	"flagstone/gs."	[a/e]
	[n'ad]	/	[n'ed'ə]	<i>nead / neide</i>	"nest/gs."	[a/e]
b.	[sop]	/	[sip']	<i>sop / soip</i>	"wisp/gs."	[o/i]
	[knok]	/	[knik']	<i>cnoc / cnoic</i>	"hill/gs."	[o/i]
	[f'ar]	/	[f'ir']	<i>fear / fir</i>	"man/gs."	[a/i]
	[k'ark]	/	[k'ir'k'ə]	<i>cearc / circe</i>	"hen/gs."	[a/i]

In order to account for the data listed in ((30)a) it will be assumed that the inflectional ending of the genitive and comparative forms contains the element 'A'. It will become clear that the presence of this element in the following nucleus is necessary. Consider the phonological structures of [sp'al] and [sp'el'ə] below.

(31)



⁴⁰Given the existence of [o - e] alternations in Connemara, one may assume that in this dialect the element 'A' may fuse with the incoming element 'I'. This difference between Munster and Connemara may be crucial to the understanding of the behaviour of long [e:] in the two dialects (see 3.3.6).

⁴¹[a] is a front low vowel. Although phonetically speaking it is not exactly [æ], it may still be viewed as an (I, A) compound. In Munster there is no [a/æ] contrast to speak of, and in fact, [a] is often identical to the English [æ] of *man* (Sjoestedt (1931:74), Wagner (1958:XXIII)).

(←) governing relation
 (==) bridge
 (<< >>) sharing

The forms in ((31)) offer several clues as to how elements interact in Irish palatalised environments. The fact that 'A' in N₁ of [sp'el'ə] has to be supported by the following nucleus provides an argument in favour of our assumption that A-suppression results from a lack of licensing or fusion possibilities once the element 'I' is spread from the right (Recall the alternation [f'ar/f'ir'] in which the element 'A' is suppressed). In [sp'el'ə] this element is licensed by the following nucleus, i.e. from outside N₁, in which case we may talk about a licensing or governing relation formed between the nuclei. Let us elaborate on this point in some detail.

Charette and Göksel (1994/96) refer to the phenomenon of A-bridge in Turkic languages as an instance of OCP by which two elements merge in one and become licensed within a governing expression. Their analysis will be discussed in more detail in section 2.4.2 when we turn to the question of licensing constraints in linguistic systems. In the case of Irish [sp'el'ə] ((31)b) the A-bridge reflects the relation between N₁ and N₂, which licenses the element 'A' within the first nucleus and prevents suppression of that element like in [f'ar/f'ir'] ((31)a). Thus in fact, the element 'A' in N₁ is licensed by N₂.

This analysis remains in agreement with the conditions on A-licensing proposed for Uyghur, a Turkic language, by Denwood (1993). Denwood discusses [a] - [i] alternations in Uyghur and determines the following conditions on A-licensing in the nucleus position.

(32)

'A' IS LICENSED:

- a. in the head of domain, i.e. in the nucleus which functions as the head of domain.
- b. in a long vowel, in which case 'A' is linked to two skeletal positions .
- c. by the following nucleus which contains 'A'.

The first condition refers to the prosodic status of the nucleus containing 'A' and will be left aside for the moment. As to the other two conditions, ((32)b) and ((32)c), they may also apply to the Irish facts. First of all, in line with ((32)b), long vowels in Irish are immune to element spreading and hence 'A' is never suppressed in such forms, while the A-support or bridge structure proposed for [sp'el'ə] in ((31)b) expresses exactly the same idea as

Denwood's last condition, namely, licensing of the element 'A' by the following nucleus.⁴² Let us now try to look at the consequences of A-support in the Irish analysis.

At the outset of our discussion of the phenomena connected with the phonological behaviour of 'A' in Irish we made a distinction between two aspects of autosegmental licensing (licensing of melody within a position) that are crucial to this analysis. First, it was mentioned that a-licensing of an element may depend on the restrictions connected with the fusion possibilities that elements in a given language may exhibit. Examples of this type of conditioning are provided by the alternations [f'ar/f'ir'] and [sop/sip'], in which we claim that the element 'A' is not licensed (hence suppressed) due to the fact that the element 'I', which is spread into the nucleus (by I-propagation), may not combine with 'A'.

The other aspect of a-licensing is connected with the dependence of the position on the phonological hierarchy, i.e. prosodic licensing (p-licensing). In this case, the a-licensing potential depends on the interaction with p-licensing. The case of [sp'el'ə] seems to exemplify this interaction in that the element 'A' is a-licensed due to a p-licensing relation holding between the two nuclei N₁ and N₂, and illustrates a typical instance of vowel harmony.

Thus, in the case of [sp'el'ə] one may speak of a conflict between the combinatorial restrictions which preclude a fusion of 'A' and 'I' (cf. [f'ir']) in a nucleus affected by palatalisation spreading and the phenomenon of A-bridge which, irrespective of the restrictions, supports 'A' in N₁. The question is how the elements 'I' and 'A' combine to form [e] in [sp'el'ə] and what role is played by the A-bridge in supporting this combination.

In GP, the vowel [e] has normally been described in terms of an I-headed element combination in which 'A' acts as an operator, i.e. (A.I) (see KLV (1985:309)). Assuming that Irish [a] is a compound containing exactly the reverse combination, i.e. (I.A), which follows from the representation provided for [sp'al] and [f'ar], then the following hypothesis concerning A-suppression in [sip'] and [f'ir'] may be constructed. The element 'A' is suppressed if it cannot act as the head, i.e. when it is demoted to the operator position in the nucleus affected by I-spreading. This may mean two things: first, the element 'I' is spread and licensed in the affected nucleus as the head, in which case the difference in the behaviour of 'I' shared with the preceding onset and the 'I' which is spread from the right-hand context

⁴² Clearly the conditions (b) and (c) are similar in nature in that in both cases two skeletal positions

would follow directly from its status within the affected nucleus, i.e. whether it is an operator or the head. Second, given that elements form a head-operator relation, we may safely adopt the view that the head of such a relation licenses the operator, parallel to other instances of heads licensing their complements.⁴³

It appears that there are two factors involved in the way elements interact within a compound which have a direct bearing on the phonetic interpretability of such segments. One of the factors involves the status that elements enjoy within a compound, i.e. whether they function as the head or as the operator. The other factor refers to the combinatorial possibilities of elements which follow from their licensing properties. For example, assuming that 'I' in Irish is unable to license other elements (operators) and is itself licensed (by I-propagation) as the head of the nucleus, then any other element which is dependent on the head will not be licensed (interpreted) in that nucleus.

On the other hand, one may equally well propose that some elements may occur only in the head position of compounds and may not be licensed as operators. This, too, might account for the behaviour of 'A' which becomes suppressed when demoted to the operator position.⁴⁴

Thus, the element suppression may be due to either the absence of licensing properties in the element 'I', or to the very fact that 'A' is demoted. At any rate, the A-bridge clearly salvages the situation by supporting, or licensing the element 'A' in the affected nucleus.⁴⁵ The question is, what role is played by the A-bridge and what is the element 'A' supported as? Clearly, the intervention of the A-bridge could not avert the combinatorial restrictions that 'I' and 'A' exhibit because these are lexical properties which may not be altered in the course of the derivation. Therefore it is natural to hazard a guess that what is involved is the status of the supported element.

Let us consider two possibilities with respect to the status of the element 'A' in N_1 when supported by the A-bridge, i.e. the operator and the head. Before that, however, we

are involved.

⁴³Compare this with the situation in branching onsets, branching nuclei and 'coda'-onset relations in which the head licenses its complement. All of these relations may be said to exemplify p-licensing of skeletal positions.

⁴⁴The theory of licensing properties of elements will be discussed in detail in 2.4.

⁴⁵The tendency for 'A' to be suppressed in languages (cf. e.g. Pasiego Spanish (Harris (1990b)) and Uyghur (Denwood (1993))), and the special requirements that need to be fulfilled for this element to be

should decide on the status of 'I' when spread from the right. It has been hinted that I-propagation licenses this element as the head of nuclei. There are arguments in support of this view. First of all, the influence of this element on the phonetic shape of vowels is stronger in the case of spreading ($\langle\langle I \rangle\rangle$) than it is in the case of sharing ($C\langle I \rangle V$), an asymmetry which may be accounted for by the head/operator distinction. Secondly, the very phenomenon of A-suppression suggests that 'I' is spread as the head, otherwise 'A' should combine with the incoming element 'I', just as it does with the 'I' shared with the preceding onset (e.g. in [f'ar]).⁴⁶ More evidence in favour of the view that 'I' spreads as the head will emerge as we go along. Henceforth, it will be assumed that this is the case. We come back now to the problem of the nature of A-support in [sp'el'ə].

The first hypothesis concerning the status of the supported element 'A' is that the A-bridge phenomenon licenses 'A' in N_1 as the operator, which, given the fact that 'I' is licensed as the head (by I-propagation), has the following consequences: 'I', which is the head of the nucleus, may not license 'A' as the operator (hence [f'ir'] and [sip']), therefore, such an analysis is either impossible, or it allows the phonological derivation to override lexical (underlying) restrictions to create an illicit object $*(A.I)$ in [sp'el'ə]. An alternative interpretation of this hypothesis might be that the supported element 'A' does not fuse with 'I', but, being licensed within the nucleus by the A-bridge, it has the phonetic effect of lowering [i] to [e].⁴⁷

The other way to understand the A-bridge phenomenon would be to view it as support of 'A' in the head position of the nucleus. Recall that [a] may be viewed as an (I.A) compound in which case the A-bridge would genuinely support the underlying state of affairs in which 'A' acts as the head of the first nucleus, rather than effecting a switch in status to the operator. This interpretation, however, also has undesirable consequences. First of all, if 'A' is supported as the head, then technically speaking one has to accept the fact that no I-spreading into N_1 is possible as the nucleus cannot contain two heads. In this case, the phonetic

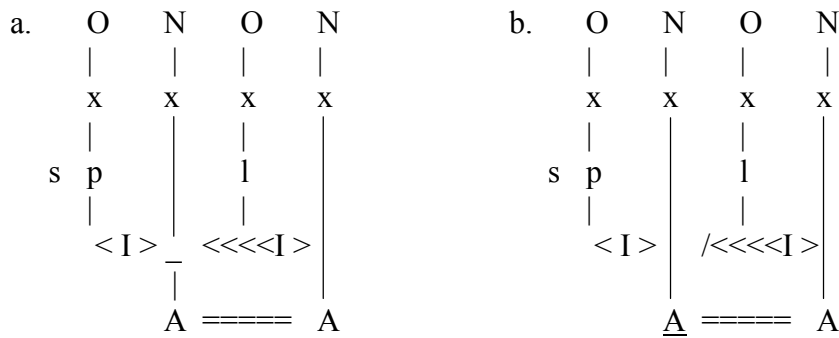
licensed, clearly set 'A' apart from other vocalic elements, and means that more needs to be understood about this element (Edmund Gussmann (p.c.)).

⁴⁶This argument is plausible only if 'A' indeed fuses with the shared element 'I' in *fear*. Recall that Ní Chiosáin and Padgett (1993) view the fronting as phonetic in nature.

⁴⁷No claims will be made here as to whether such a course of action is possible or not. Clearly, more needs to be understood about the way elements interact within compounds with respect to phonological licensing in general. A similar problem will be encountered in the discussion of Munster [e:] (3.3).

difference between the realisation of the same combination (I.A) as [a] in [sp'al] and [e] in [sp'el'ə] would have to be treated as a purely phonetic effect. This, in fact, does not seem to be such an outrageous idea given the fact that neither [a] nor [a] seems to be found between two palatalised consonants in Munster Irish. Additionally, the putative co-operation of two palatalised onsets to yield a phonetic [e] might explain the restricted distribution of this vowel (it must be flanked by two palatalised consonants) as well as accounting for the lack of [o] / [e] alternations in the dialect under study, which is connected with the fact that [o] follows a velarised onset while [e] is absent from the C^U - C^I context (see 2.3.7). The structures below illustrate the two hypotheses concerning the nature of the A-bridge in [sp'el'ə] *speile* "scythe/gs.", in which the putative heads are underlined.

(33)



(/<<) blocked spreading

(====) bridge

((33)a) illustrates A-support as an operator within the affected nucleus which is headed by the element 'l'. On the other hand, ((33)b) shows A-support as the head of the nucleus. Both interpretations have certain consequences which we have to face. Let us take a closer look at the phenomenon of A-harmony which is found in other contexts in Irish to see which of the two possibilities finds support.

To summarise the analysis so far: we have seen that short nuclei in Irish are influenced by the elements I/U in two ways. First, nuclei share one of these elements with the preceding onset in which case the status of the shared element within the nucleus seems to be that of an operator. Second, the elements I/U affect nuclei also from the right-hand context where the I/U-spreading may "upset" the sharing relation (e.g. [p'ubər] *piobar* "pepper"). The interaction between shared I/U and spread I/U is characterised by a dislodgement of the

former by the latter from the nuclear position but not from the phonological representation, hence the glide formation in [p^jubər] and [k^widʲ].

With respect to the element 'A', which is underlyingly present in some nuclei, we concentrated on the A-I interaction rather than the A-U interaction, as the latter is limited by the fact that U-spreading from the right is less spectacular in the case of mid and low vowels than it is with high ones ([p^jubər]).

As far as the A-I interaction is concerned, we established that the element 'A' in front [a] tends to be suppressed when the nucleus is affected by I-propagation ([f'ar / f'ir'] *fear/fir* "man/gs."). An exception to the suppression phenomenon is found in the context when the following nucleus containing 'A' supports this element in the nucleus affected by palatalisation ([sp'al / sp'el'ə] *speal / speile* "scythe/gs."). We tentatively assumed that an A-bridge tampers with the status of the supported element rather than with its licensing (combinatorial) possibilities. In the following section, we will try to establish what the actual influence of the bridge is.

2.3.4. A-spreading

The phenomenon of A-support discussed above does not seem to involve the spreading of the element 'A' from one nucleus to the other, but rather, the licensing of a lexically present element by a following nucleus which contains the same element.⁴⁸ It seems, however, that A-spreading exists in Munster Irish and is manifested and conditioned in a similar fashion to A-support. Thus we may speak generally of one phenomenon of A-harmony which is

⁴⁸This analysis is also identical to that of height harmony in Pasiego Spanish (Harris (1990b)).

manifested in two ways: by A-support and A-spreading.⁴⁹ The conditions on A-harmony will be discussed in the following section. Let us now consider the data below.

(34)

- | | | | |
|----|-----------------|--------------------|-----------------|
| a. | [kid' / kodə] | <i>cuid/coda</i> | "share/gs." |
| | [trid' / trodə] | <i>troid/troda</i> | "fight/gs." |
| b. | [f'is / f'asə] | <i>fios/feasa</i> | "knowledge/gs." |
| | [l'is / l'asə] | <i>lios/leasa</i> | "garth/gs." |
| | [b'i / b'ahə] | <i>bith/beatha</i> | "existence/gs." |
| | [k'i / k'ahə] | <i>cith/ceatha</i> | "shower/gs." |

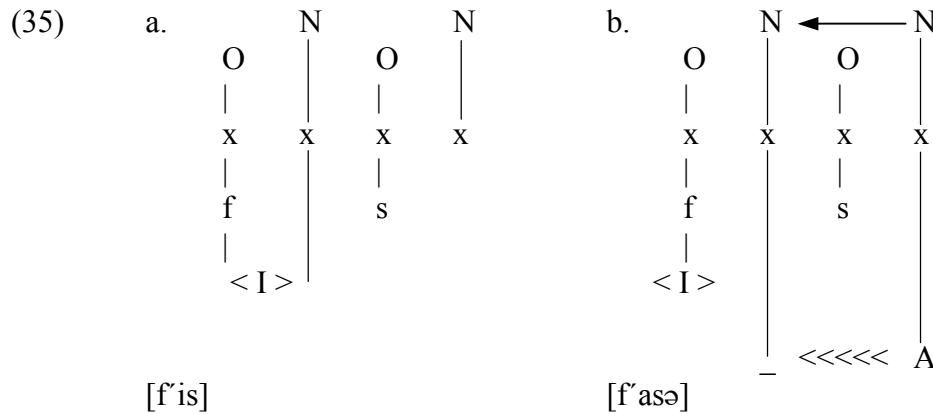
In [kid'] and [trid'] the vowel is clearly derived by I-spreading. However, in the genitive the vowel is [o], which may mean two things. Either the nucleus contains [o] in the nominative too, parallel to [sop] *sop* "wisp", or it contains 'U' only and the element 'A' is spread from the following nucleus in the genitive.

The situation in [f'is / f'asə] and [k'i / k'ahə] is more clear. The vowel [a] in the genitive form must be derived by A-spreading from the second nucleus because this element is not present in the nominative form. One reason for assuming its absence in the nominative form is that we have not discovered a possible mechanism by which this element would not be licensed in this context. If this nucleus contained the element 'A', the result would have to be *[f'as] as it is in e.g. [d'as] *deas* "nice". It follows then that the first vowel in [f'asə] has to be viewed as a result of A-spreading from the following nucleus.

The data in ((34)b), i.e. forms like [f'is] and [k'i], are "irregular" in that the segment [s] and, in fact, the latent [h] in *cith*, being non-palatalised, should contain the element 'U' as

⁴⁹The two phenomena, although subsumed under the broader term "A-harmony", exhibit different behaviour in that A-support requires the presence of 'A' in the preceding nucleus, while A-spreading provides this nucleus with the element 'A' (see the following section).

other velarised consonants do. In this case, we should expect U-spreading and in effect *[fʰus] parallel to [pʰuk] *pioc* "bit". However, it appears that these two segments ([h] and [s]) are neutral with respect to velarisation and palatalisation. This is manifested by the fact that [h] is neither palatalised nor velarised, while the palatalised version of [s] is in fact palatal [ʃ]. Nonetheless, this "irregularity" in the forms in ((34)b) is not directly relevant to the question of A-spreading except that it allows us to see the effects more clearly. For this reason no specification of [s] is given in the structures illustrating A-spreading below.



What is relevant in the alternation [fʰis / fʰasə] is the fact that in the genitive case ((35)b) the element 'A' spreads from the following nucleus and combines with the element 'I', which is shared by the first nucleus with the preceding onset, to yield [a] as in [spʰal] *speal* "scythe". It has been established that the shared element ('I') acts as the operator within the nucleus (see previous section), therefore we may safely adopt the view that the element 'A' which is provided by spreading from the following nucleus captures the head position. If this is the case, then the phenomenon of A-spreading argues strongly for the hypothesis that the A-bridge supports the element 'A' as the head in [spʰelʰə].⁵⁰

We can now claim that in the case of A-harmony, the element 'A' in the first nucleus is licensed or spread as the head, just as 'I' and 'U' do when spread from the right. In both cases the direction of spreading is the same and agrees with the direction of internuclear government in Irish. The nature of A-harmony, it seems, is in some respects similar to that of 'I' and 'U' spreading in that only a certain type of nucleus is affected by these processes. On the other hand, there is a major difference between the two processes in terms of the scope of

⁵⁰In chapter 4, it will be shown that an almost identical kind of A-bridge is found in the consonantal system of Irish.

their application. It has been shown that, for example, palatalisation affects both consonants and vowels and is only stopped by certain nuclei e.g. [ɔ].⁵¹ The A-harmony, however, seems to be restricted to inter-nuclear licensing relations and is subject to similar conditions as, for instance, Proper Government.

2.3.5. Conditions on A-harmony

Let us now concentrate once more on the A-support supplied by the vowel in the following nucleus, and consider some evidence in favour of the assumption made earlier that the inflectional vowels in Irish contain the element 'A'.

We know that in Irish the direction of internuclear government is from right to left. So the A-support in palatalised environments can be viewed as element licensing by the following nucleus which contains a melody. It seems though that it is not enough for the following nucleus to contain an expressed segment. Consider the data below.

(36)

- | | | | |
|----|--------------|--------------|-----------------------|
| a. | [l'ak] | <i>leac</i> | "stone" |
| b. | [l'ek'ə] | <i>leice</i> | "gs. of stone" |
| c. | [l'i'k'i:n'] | <i>licín</i> | "diminutive of stone" |

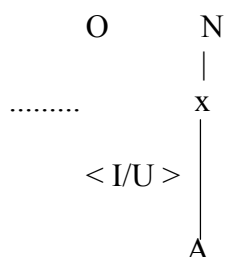
The vowel in the first nucleus of ((36)c) cannot be viewed as a reduced vowel due to stress shift, because in Irish vowels which are followed by a long [u:] or [i:] are not reduced (Ó Cuív (1975:104)). So we should expect a form like *[l'e'k'i:n'], which we do not find.⁵²

Thus one can safely assume that only a vowel which itself contains the element 'A' can support (license) this element in the preceding nucleus. Hence, A-support may indeed be viewed as a form of vowel harmony. Below, we supply what seems to be the representation of short vocalic inflectional endings in Irish.

⁵¹One must add here that element spreading is also blocked by the "dislodged" element 'I' or 'U' (e.g. [m^wik'] and [p^luk]), but in these case the nucleus itself is affected, unlike nuclei containing [a] (e.g. [ban'ə] *bainne* "milk").

⁵²It seems to be true that beside [l'i'k'i:n'] one may find the form [l'a'k'i:n'] parallel to [f'ar] *fear* "man" which has two diminutives: [f'i'r'i:n'] and [f'a'r'i:n']. This is, however, connected with the

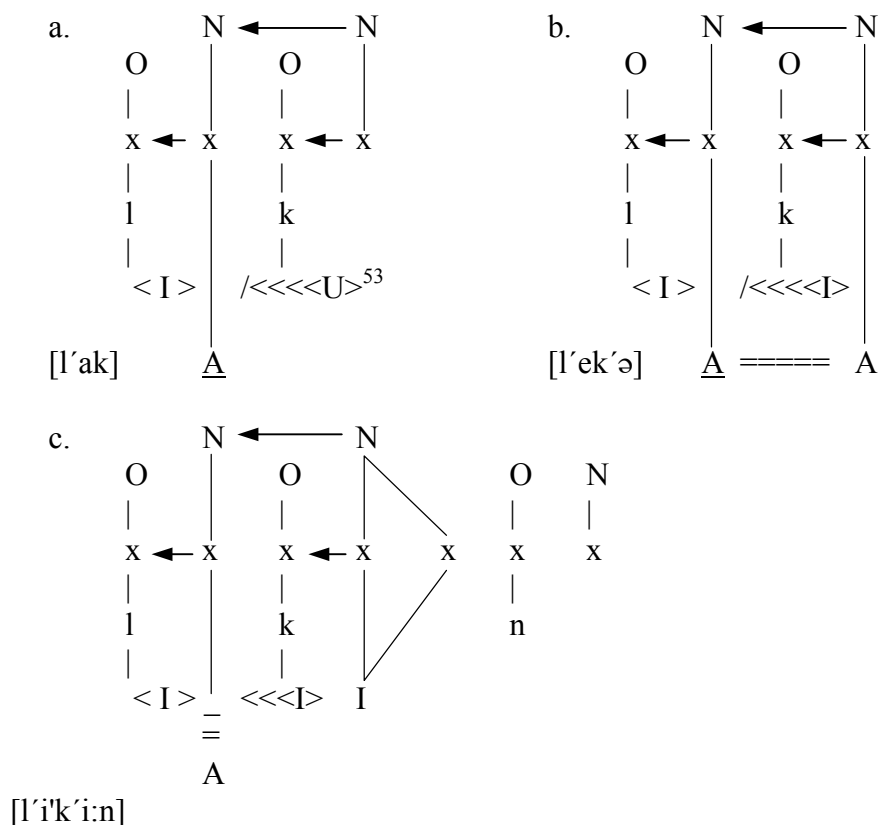
(37) structure of the vocalic inflectional ending



This structure involves a non-headed (schwa-like) vowel containing 'A'. This vowel is always reduced to a schwa although phonetically it may have a close or an open variety. This distinction depends on the quality of the preceding consonant, i.e. on the element shared between the onset and the nucleus.

Below the derivation of the data in ((36)) is illustrated structurally.

(38)



variation morphological status of the diminutive suffix *-in* (see Doyle (1992:118) where this suffix is shown to be either cyclic or non-cyclic). At any rate, we do not find *[l'e'k'i:n'] or *[f'e'r'i:n'].

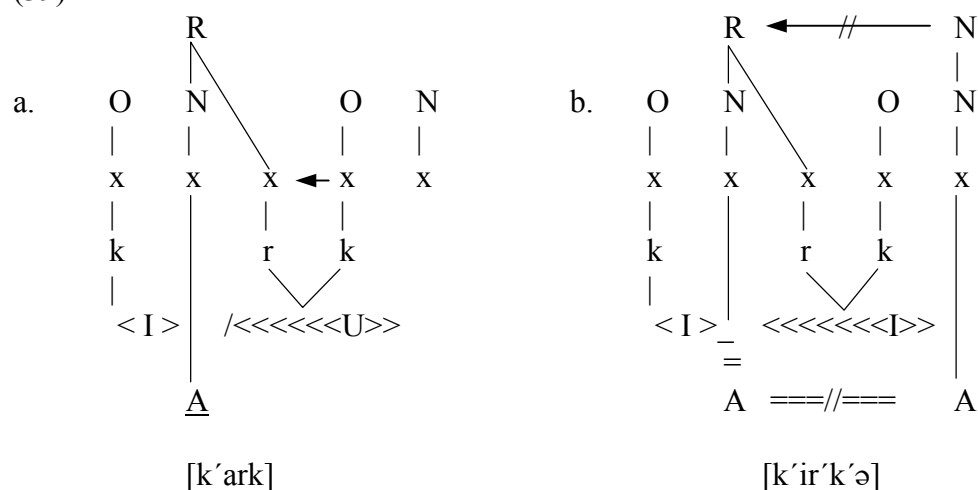
⁵³If the assumption that the element 'A' which is headed or supported as a head by the A-bridge is not in fact phonologically affected by palatalisation (recall the discussion of [e] as a phonetic effect), then the lack of U-spreading in [l'ak] is no longer irregular, as the headed 'A' should be opaque to both 'I' and 'U' spreading.

In ((38)a) 'A' is the head and shares the element 'I' with the preceding onset (by the *Sharing Condition*), which results in a front low vowel [a]. In ((38)b) the head of the vocalic expression in the first nucleus is supported by the A-bridge, without which the element 'A' should be suppressed (cf. [f'ar / f'ir']). In ((38)c) the element 'A' cannot be supported, because the following nucleus contains only 'I', and hence 'A' is not licensed within the first nucleus.

This analysis illustrates the interaction between two processes, i.e. A-support and I-spreading. It is time to examine the basic difference in the application of the two processes. It seems that, although we can correlate A-harmony with internuclear government, we cannot do the same in the case of 'I' and 'U' propagation.

One of the conditions on internuclear government is that it cannot apply across a governing domain (Kaye, Lowenstamm and Vergnaud (1990), Charette (1991:115)). Consider the structures below in which the nuclei are separated by a 'coda'-onset governing relation [-rk-].

(39)



The difference between the two major spreading processes lies in the dependence on internuclear government which is displayed by A-harmony but not by I-propagation which still takes effect in ((39)b). The reason for that is that I-spreading is of an unbounded nature. In autosegmental terms this may be explained by the fact that the line on which the elements 'I' and 'U' reside (the BK/RD line) is shared by consonants and vowels, therefore the elements

I/U can propagate along this line and affect both vowels and consonants irrespective of the constituent structure.

Thus there can be no A-support in [k'ir'k'ə] because the final nucleus, even though it contains the element 'A', cannot govern the preceding nucleus due to the intervening governing domain. There seems to be an additional condition on A-spreading which concerns the structure of the target nucleus. Namely, the element 'A' may spread only to a nucleus which is not headed, i.e. to one in which none of the active elements plays the role of the head.

We have seen the difference between A-harmony and I/U spreading. One should also bear in mind the discrepancy between A-support and A-spreading within the major set of A-harmony processes. It seems that the difference is of the following nature. A-support refers to a bridge formed between two successive nuclei containing this element lexically, to the effect that the first nucleus is supported (licensed) as A-headed. On the other hand, A-spreading may, it seems, only occur if the first nucleus is not headed and involves physical spreading of the element 'A'. In other words A-support is impossible if 'A' is not present underlyingly in the first nucleus and A-spreading is impossible if this nucleus is headed. As will become clear, this refers to palatalised environments.

Let us look at the forms below and decide on the status of the first nucleus. It should be borne in mind that the inflectional vowel in the genitive contains the element 'A' (cf. the structure in ((37)))

(40)

- | | | | |
|----|----------------|-----------------------|-----------------|
| a. | [k'ɪ / k'ahə] | <i>cith / ceatha</i> | "shower/gs." |
| | [f'is / f'asə] | <i>fios / feasa</i> | "knowledge/gs." |
| b. | [ji / jih'ə] | <i>sith / sithe</i> | "endurance/gs." |
| | [pu / pih'ə] | <i>puth / puithe</i> | "breeze/gs." |
| c. | [l'a / l'eh'ə] | <i>leath / leithe</i> | "half/gs." |
| | [d'as / d'e]ə] | <i>deas / deise</i> | "nice/gs." |

Let us assume that in ((40)a) the first nucleus is non-headed; therefore in the genitive the element 'A' may spread and assume the role of the head. In ((40)b), the nucleus is headless in

the nominative form but it seems that in the genitive case it is headed as 'A' cannot spread in.⁵⁴ Notice that initially the first nucleus did not contain the element 'A', therefore A-support is impossible. Thus 'I' assumes the role of the head in the genitive form of "endurance" and "breeze", which blocks A-spreading and disallows A-support, which in forms like [l'a / l'eh'ə] *leath* / *leithe* "part/gs." ((40)c) is clearly operative due to the fact that the first nucleus contains 'A' underlyingly.

So, on the one hand, certain nuclei require physical spreading of 'A' (e.g. [f'asə]) and on the other, only its prior presence allows for interaction with 'A' in the following nucleus. An interesting point concerning these facts is that A-spreading seems to be allowed over a velarised consonant but not if a consonant is palatalised. On the other hand, A-support occurs predominantly in the latter case. This observation might contribute to the understanding of the putative asymmetry in the behaviour of I/U spreading. Consider the facts below taken from Sjoestedt (1931:81).

(41)

[kru / krəhə]	<i>cruth</i> / <i>crutha</i>	"shape/gs."
[sru / srəhə]	<i>sruth</i> / <i>srutha</i>	"stream/gs."

The open variety of the mid back vowel in the genitive forms suggests that the compound is A-headed, i.e. (U.A). These facts might suggest that perhaps if there is U-spreading in *crutha* parallel to I-spreading in *puithe* then the difference between these two phenomena would lie in the fact that 'U' spreads as an operator and 'I' spreads as a head. Such an analysis allows us to account for the data in ((41)) above. If 'U' spreads as an operator then the first nucleus is still headless and liable to A-spreading.⁵⁵ Note that this distinction between 'I' and 'U' spreading may also account for the asymmetry concerning the phonological effects of spreading. For example, if 'U' spreads as an operator then it is easier for us to understand why it does not cause A-suppression.

⁵⁴In a sense, one may claim that the nominative and the genitive forms of *puith* have distinct underlying representations in that the nucleus is headless in the nominative, while in the genitive, it is defined by the I-spreading from the right which licenses 'I' as the head of that nucleus.

⁵⁵[h] is neither truly palatalised nor velarised in Irish. This, however, seems to be a matter of the licensing or non-licensing of 'I' and 'U' by consonants and has no consequences as far as the presence or absence of these elements is concerned (see the discussion of [ri/ru] in 2.3.6).

To summarise: the A-harmony effects have been shown to be strictly connected with the governing (licensing) relation holding between nuclei and are subject to the same conditions as Proper Government (Kaye, Lowenstamm and Vergnaud (1990), Charette (1991)). For example, Proper Government does not apply across governing domains. Similarly, A-support is blocked in e.g. [k'ir'k'ə] due to the intervening domain ([rk-]). Another condition concerning A-harmony requires that the second nucleus (the licenser) contains 'A' (cf. [l'ek'ə] vs. [l'ik'i:n']). It is proposed that all short vocalic inflectional endings contain this element.

We distinguished two seemingly disparate processes within A-harmony, i.e. A-support (A-bridge) which supports 'A' as the head in the first nucleus, and A-spreading which supplies 'A'-head to a headless nucleus. Given that in both instances the effect is identical, i.e. as A-headed nucleus, the two processes need not be viewed as separate. One could suggest that all there is A-spreading which in the case of the A-bridge applies vacuously (Edmund Gussmann (p.c.)).

Generally speaking, 'A', 'I' and 'U' spread to headless nuclei, but only A-spreading depends on an internuclear relation (cf. [k'ir'k'ə] in which palatalisation spreading applies across the governing domain and affects the nucleus). Additionally, it appears that the asymmetry between 'I' and 'U' spreading may follow from the status of the spread element. Namely, 'I' spreads as the head, and 'U' spreads as an operator.

In the following section we take up the problem of 'I' and 'U' licensing in onsets and nuclei.

2.3.6. I/U licensing in onsets and nuclei

We should now take a closer look at the way palatalisation and velarisation operate. Specifically, we are interested here in the way the elements 'I' and 'U' operate and are licensed in consonants. These elements, it will be recalled, are shared with the following nucleus.

The restrictions in the C-V context suggest that the nuclei depend on the value of the preceding onset. However, the onsets themselves do not have to be "truly" palatalised or velarised. In other words, the phonological influence exerted by consonants does not always match their actual phonetic shape. This point becomes particularly pertinent in the case of

word-initial empty onsets which, although devoid of any phonetic substance, still affect the following vowels as well as preceding consonants in sandhi effects as if they contained the element 'I' or 'U'.⁵⁶

In order to be able to understand the behaviour of 'I' and 'U' in consonants let us look at the way word-initial [r] affects its nucleus in monosyllabic words of the *puth* and *bith* type. This context is chosen for two reasons. First, it is the context in which the shape of the nucleus depends strictly on the value of the preceding onset. Recall that the quality of short vowels in such forms always agrees with the quality of the preceding onset as required by the *Sharing Condition*. Secondly, word-initial [r] resists both palatalisation and velarisation in Irish (Ó Cuív (1975:49), de Bhaldraithe (1945:42)). Thus if such forms still exhibit the same type of restrictions as monosyllables preceded by other consonants, then the conclusion should be that the elements 'I' and 'U' which define palatalisation and velarisation do not need be licensed in the consonants (associated with the position) in order to be active phonologically. In other words, one may postulate that these elements may be floating in some cases. Such an interpretation would allow us to accept the putative specification of the word-initial empty onsets as regular, and can be formally captured in terms of the lack of association of the elements 'I' and 'U' with the skeletal position.⁵⁷

This last point is discussed at length in the ensuing sections. However, it seems appropriate to adumbrate the problem here. Essentially, word-initial empty onsets in Irish behave as if they were specified for 'I' or 'U'. On the other hand, if these elements were to be associated with the onset position then we should expect the glides [j] and [w] to appear phonetically in such forms. Below, the difference between a word-initial empty onset, a glide, and what appears to be the Irish empty onset is illustrated structurally.

⁵⁶See Gussmann (1986) as well as section 3.4.1 for a more detailed discussion of empty onsets in Irish.

(42)

a. *empty onset*⁵⁸

O	N
(x)	x.....

b. *glide*

O	N
x	x.....
I/U	

c. *Irish empty onset*

O	N
x	x.....
I/U	

The behaviour of Irish word-initial onsets and a justification of the structure proposed in ((42)c) will be provided later. Now let us return to the variants of the word for "running".

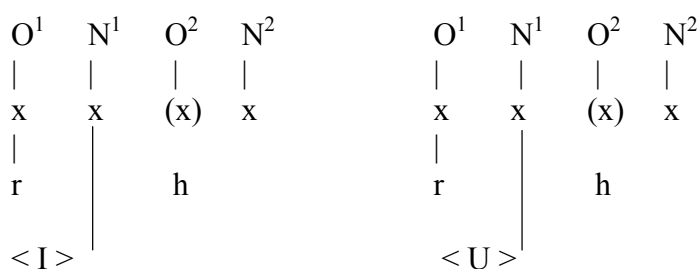
The word for "running" (*rith*) can have two pronunciations viz. [ri] and [ru], which is indicative not only of the underlying specification of the word-initial [r] but also of the way the nucleus is affected by the preceding onset and the way consonants are affected by palatalisation or velarisation. The word-initial [r] cannot be palatalised or velarised phonetically, but it seems that phonologically it has to bear one of these values. The question is how to represent this form and why the two pronunciations are possible.

Let us assume that the absence of surface palatalisation or velarisation of [r] has no bearing on the phonological fact that the consonant has to be specified for one of the values, just as every filled or empty onset in Irish is. Or, to put it differently, all onsets, whether filled or empty, are phonologically specified for 'I' or 'U', but these elements need not be associated (a-licensed) to the position ((42)c). The two forms, i.e. [ri] and [ru], may then be viewed as a logical consequence of a misconstrued phonological representation, following from the absence of phonetic cues as to the specification of the onset, which must be either palatalised or velarised. The point is that whichever element is present, it will not be licensed by the word initial [r], or by any empty onset for that matter. This element will nonetheless exert an influence on the following nucleus. Below we propose a structure for both [ri] and [ru].⁵⁹

⁵⁷In chapter 4. an attempt is made to explain why word-initial [r] resists palatalisation and velarisation.

⁵⁸An empty onset need not have a position (see e.g. Charette (1991:92)).

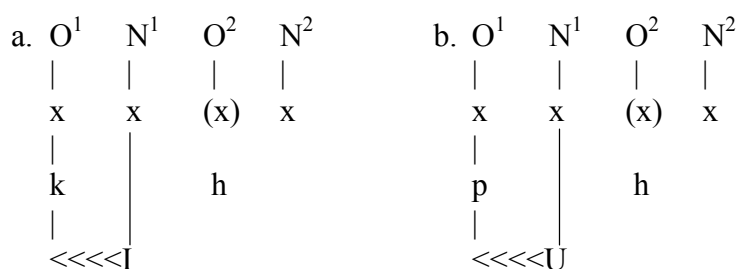
(43)



It is clear that the *Sharing Condition* requires a reinterpretation if it is to capture the fact that the "shared" element may not be associated with one of the partners. Notice that if this interpretation is correct then it provides another argument for having 'U' in the representation of velarised consonants.

One should, however, be aware of the possibility of an alternative interpretation of the forms in ((43)). Namely, since the [r]-onset cannot be either palatalised or velarised (similarly to empty onsets), then one may claim that the elements 'I' and 'U' are underlyingly present in the nuclei of [ri] and [ru]. This interpretation would shift the responsibility of bearing 'I' and 'U' to nuclei and ultimately would mean that the quality of consonants is dependent on the element provided by the nucleus. To illustrate this point we use similar monosyllabic forms in which the initial onset is palatalised or velarised e.g. [k'i] *cith* "shower" and [pu] *puṭh* "breeze" and assume that the quality of the onsets is effected by the spreading of the relevant element ('I' or 'U') from the following nucleus.

(44)



In fact, this analysis makes the notion of "sharing" redundant, and replaces it with mere spreading of the relevant element from the nucleus. There are, however, serious problems with this interpretation which will force us to abandon it.

⁵⁹O² and N² in both forms are postulated on the basis of the alternations in the genitive in which the "monosyllabic" forms show the presence of a latent [h] e.g. [rahə] *reatha* "running-gs."

First of all, the question arises as to what is responsible for the specification of word-final onsets in terms of the elements 'I' and 'U' if these elements are to be provided by the following nucleus. Both palatalised and velarised onsets are found in this position in Irish while the following nucleus is empty and licensed by parameter. Thus, if the quality of consonants were to be dependent on the element spread from the following nucleus then we should either have no specification of word-final consonants, or no word-final empty nuclei. In neither case is this true.

Another argument against the view that nuclei define the quality of the preceding onset follows from the fact that certain vowels do not contain either 'I' or 'U', while the onset is specified for the relevant element. For example, the vowel [ɑ] in [fɑdə] *fada* "long" which is phonologically represented by the element 'A' may not velarise or palatalise the onset because there is no source for 'I' and 'U' in that nucleus, and the only quality that this nucleus is able to provide is "A-ness".⁶⁰ Similarly, there are vowel initial nouns which palatalise the article, e.g. [ən' oχir'] *an eochair* "the key", despite the fact that the nucleus does not seem to contain the element 'I', but rather (U.Ḃ), while nouns beginning with a high front vowel, e.g. [ən i:hə] *an oíche* "the night", fail to palatalise the article.⁶¹

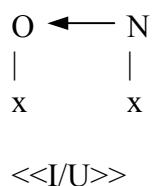
Thus, we have seen that in a sharing domain ($O^1 < I/U > N^1$) the elements 'I' and 'U' which define the palatalisation and velarisation of consonants need not be associated with the onset position (e.g. [ri], [ru]). At the same time the source of the elements I/U which affect the nucleus N^1 in [ri/ru] as well as the preceding onset in sandhi positions, e.g. [ən' oχir'], may not be identified with the nucleus itself. This poses the question as to how the elements defining palatalisation and velarisation should be represented phonologically, and ultimately, what is sharing?

We will begin with the most abstract and highly symbolic representation in which an attempt will be made to capture both the facts concerning the nature of consonant quality specification (specification without association), and the effects of the *Sharing Condition* on the nucleus.

⁶⁰In standard GP A-ness corresponds to pharyngeality.

⁶¹One could also ask the question whether the fact that in this analysis 'I', 'U' and 'A' spread from the nucleus should not mean that the nature of the spreading should be identical, which is not the case. Recall the distinction made in 2.3.5 between I/U- spreading on the one hand and A-harmony on the other.

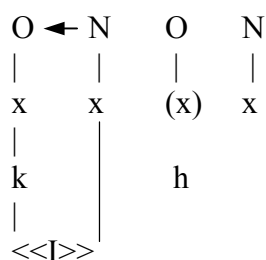
(45)



Generally, we may say that every "O<-N" licensing relation constitutes a sharing domain which contains one of the elements ('I' or 'U').⁶² The actual phonological representation of any such domain in terms of the presence or absence of association lines will depend on two major factors. One of them is the segmental make-up of the onset and the nucleus, and the other, which relates to the nucleus alone, is the presence or absence of element spreading from the right. First, let us concentrate on the way in which the shared elements I/U are licensed within the onset.

The licensing (association) of these elements in the onset seems to depend on the content of this segment. Thus, I/U are not licensed within an empty onset, hence e.g. [i:hə] *oíche* "night" (not *[wi:hə]) and [oχir'] *eochair* "key" (not *[joχir']),⁶³ and in the case of word-initial [r] e.g. [ri] and [ru] *rith* "running" ((43)). On the other hand, I/U would be normally licensed by any other consonantal segment and associated with the skeletal position e.g. [k'i] *cith* "shower".

(46)



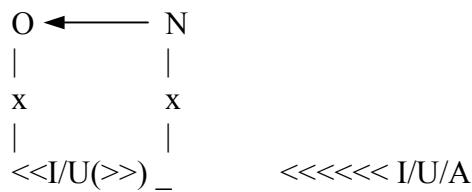
The above form additionally illustrates one of the two contexts in which the nucleus licenses (is linked to) the shared element (see also [pu] *puθ* "breeze" where 'U' is shared). The other

⁶²One should be aware of the cases in which the I/U specification is extended to two successive onsets. This happens in the case of nuclei which alternate with zero. Recall forms like [dɔrən / dɪr'in / dɔ:rən ə] *dorn / doirn / doirne* "fist/gs.pl." (2.1.2).

⁶³Recall the sandhi effect in [ən i:hə] *an oíche* 'the night' and [ən' oχiɾ'] *an eochair* 'the key' which suggest that 'U' and 'I' are present in the representation of the nouns and spread onto a preceding onset with phonetic content, either velarising or palatalising it.

instance of licensing of the shared element by the nucleus is found in forms like [f'is] *fios* "knowledge". Generally speaking, such licensing is possible only if there is no other source of resonance elements in the nucleus. We have identified two such sources of elements in short nuclei. First, they may be underlyingly present, e.g. the element 'A' as in [k'ark] *cearc* "hen" and [kat] *cat* "cat" or (U.A) and (I.A) combinations as in [kos] *cos* "leg" and [t'ep'] *teip* "fail".⁶⁴ Secondly, elements may be provided by the spreading of 'I', 'U' and 'A', which is illustrated below.

(47)

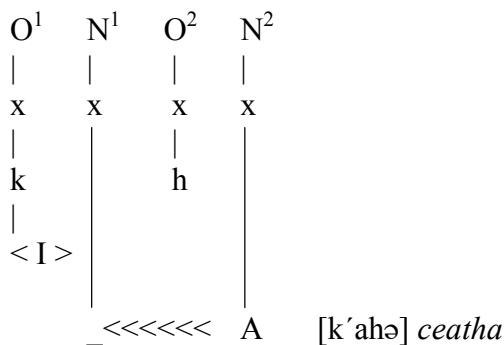


The structure above illustrates a nucleus which is available for the spreading of whatever is available or possible from the right. Ideally, one would like to claim that in the case of spreading from the right the shared element I/U is not licensed by the nucleus. This is already represented in the form above by severing the sharing symbol, and is best illustrated by such forms as [k^wid'] *cuid* "part" and [g^julə] *giolla* "servant" in which the surface shape of the vowel suggests that the nucleus contains the element provided by spreading from the right-hand context, i.e. the element defining the quality of the following consonant. Thus, the spread element does not combine with the shared one within the nucleus. On the other hand, the "dislodged" element plays an important role in blocking further spreading, hence the off-glides [w] and [j].

The forms [k^wid'] and [g^julə] clearly demonstrate that the shared element is not licensed by the nucleus if there is another source viz. spreading. Otherwise, we should expect *[kü'd'] and *[g'ülə] in which the combination (U.I) or (I.U) should yield a front rounded vowel. A slightly more complicated question is whether the shared element combines with the 'A' provided by spreading. Consider again the genitive form of [k'i] *cith* "shower", i.e. [k'ahə] *ceatha* with the element 'A' spread from the inflectional vowel.

⁶⁴Some arguments against including 'I' and 'U' as independently present in the phonological representation of Irish short nuclei are presented in the following section.

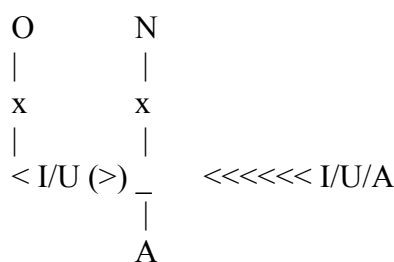
(48)



The diagram suggests that the elements 'I' and 'A' combine to form a fronted [a] which seems to upset our generalisation that the nucleus does not license the shared element if there is other source of vocalic elements in that nucleus. Recall that [e] was claimed above to be a phonetic effect when an A-head is flanked by two palatalised onsets. Given this fact, it is possible to accept the view that an A-headed nucleus yields surface fronted [a] when only one of the flanking onsets is palatalised.⁶⁵

In order to round off the discussion of nuclear structure with respect to the *Sharing Condition* one has to acknowledge the fact that the symbolic structure proposed in ((47)) does not exhaust all lexical possibilities. We have found that in certain nuclei 'A' must be postulated as underlyingly present (e.g. in [sop] *sop* "wisp"). Such nuclei will differ from the ones discussed above in exactly this respect.⁶⁶

(49)



The interpretation of this structure will vary depending on whether the conditions on A-licensing are fulfilled, or whether it has to be suppressed.

⁶⁵It was mentioned earlier that the vowel [a] is treated as a phonetic effect in Ní Chiosáin and Padgett (1993).

⁶⁶We leave the question of fusion open.

2.3.7. Why is there no [o/e] alternation in Munster?

The aim of this subsection is to signal and enlarge on issues concerning the absence of [o/e] alternations in Munster Irish. Recall that in Connemara Irish this type of alternation is possible e.g. [sop / sep'] *sop / soip* "wisp/gs." (de Bhaldraithe (1945), Ní Chiosáin (1992)). One possible explanation concerning the Munster dialect is provided by distribution facts which demonstrate that the mid front vowel [e] must be followed and preceded by palatalised consonants, e.g. [t'ep'] *teip* "fail" and [sp'el'ə] *speile* "scythe-gs."⁶⁷ On the other hand, [o] is normally found following a velarised onset. Therefore, logically, the existence of an [o/e] alternation in Munster would require that the onset preceding [o] be palatalised.

There is only one context in which palatalisation spreading may affect an onset across a nucleus. This happens if the nucleus itself is empty e.g. [uəsəl / uil'ə] *uasal / uaisle* "noble/pl.". However, the Munster [o] is unlikely to be derivable from an empty nucleus. This excludes the possibility that the onset which directly precedes [o] may be affected by palatalisation and predicts that the [o/e] alternation is banned in Munster.

Another question is why exactly Munster [e] must follow a palatalised onset. Note that both 'I' and 'A' may follow a velarised onset, e.g. in [kid'] *cuid* "part" and [kat] *cat* "cat". Why then, is the combination of the two elements restricted to nuclei which follow a palatalised onset, and why is it possible in Connemara after a velarised one? Let us recall the effects of I-spreading with respect to the element 'A' in Munster. We found that if the nucleus is A-headed, e.g. in [kat'] *cait* "cat-gs." and [ban'ə] *bainne* "milk", then palatalisation spreading is blocked and the vowel remains intact. On the other hand, there are nuclei which contain the element 'A' and are accessible to I-spreading, e.g. [a] in [f'ar] *fear* "man" and [o] in [sop] *sop* "wisp". This results in A-suppression ([f'ir'] *fir* "man-gs.", [sip'] *soip* "wisp-gs.").⁶⁸ Note that in both instances, i.e. in the case of blocking and suppression, the overall impression is that the two elements (I-A) find it hard to combine in Munster. Since both 'I' and 'A' may follow a velarised onset, it seems that the Munster restriction against *Ce... may be better understood as following from the combinability of these elements in connection with distributional restrictions. For instance, we may hypothesise that the role of palatalised

⁶⁷Compare this with the nominative form of "scythe", i.e. [sp'al] *speal*, in which the vowel is followed by a velarised consonant.

onsets in the distribution of [e] in Munster is purely phonetic. In this interpretation the representation which yields a surface [e] is in fact reduced to the presence of an A-headed nucleus flanked by two palatalised consonants, i.e. C'AC'. This view finds support in the distributional facts such as the virtual absence of [ɑ] or [a] in this context.⁶⁹ This claim requires more refinement, as clearly the existence of an I-A combination, i.e. of a lexical [e], must be recognised if only to account for the Munster long [e:]. Thus, we may be dealing simply with a restriction on the type of I-A combination (e.g. *(A.I)=NO, (I.A)=YES).⁷⁰

In the following section (2.4), we will try to apply a recent model of parametric treatment of element combinability which has been developed in GP to find out how the Munster restriction (and indeed the whole vocalic system) can be defined in terms of licensing properties of elements. In this model the difference between Munster and Connemara Irish may be captured in terms of constraints of a parametric nature which would reflect the fact that in Connemara the elements 'I' and 'A' may combine (hence [sop / sep'] *sop / soip* "wisp/gs.").⁷¹

Let us now return to the question of the [o/e] alternation and consider an apparent example of this phenomenon in [obir' / eb'ir'ə] *obair / oibre* "work/gs.". This alternation will be viewed as exceptional for at least two reasons. First, the palatalisation of both onsets O² and O³ in the genitive form (see the diagram below) suggests that the intervening vowel is derived from an underlying empty nucleus. On the other hand, the nominative form suggests that this vowel has an underlying melody which prevents the palatalisation from spreading onto the preceding onset O². Second, our analysis predicts that when palatalisation spreads, [o] may either remain intact as in [koʃ] or alternate with [i] as in [sip']. An independent argument for this analysis comes from the fact that distributionally [e] requires a palatalised onset to precede it.

⁶⁸Recall that the element 'A' may be supported by an A-bridge in [sp'al / sp'el'ə] *speal / speile* "scythe/gs.".

⁶⁹Recall that the natural contexts for these vowels are (C'aC) for [a], and (CaC) and (CaC') for [ɑ].

⁷⁰In 3.3.1, we propose a mechanism of I-A decomposition ([e] to [a]) which seems to be parallel to what happens to Munster long [e:] in the context (C'-C). This might enable us to understand what happens to phonological (I.A) in this dialect.

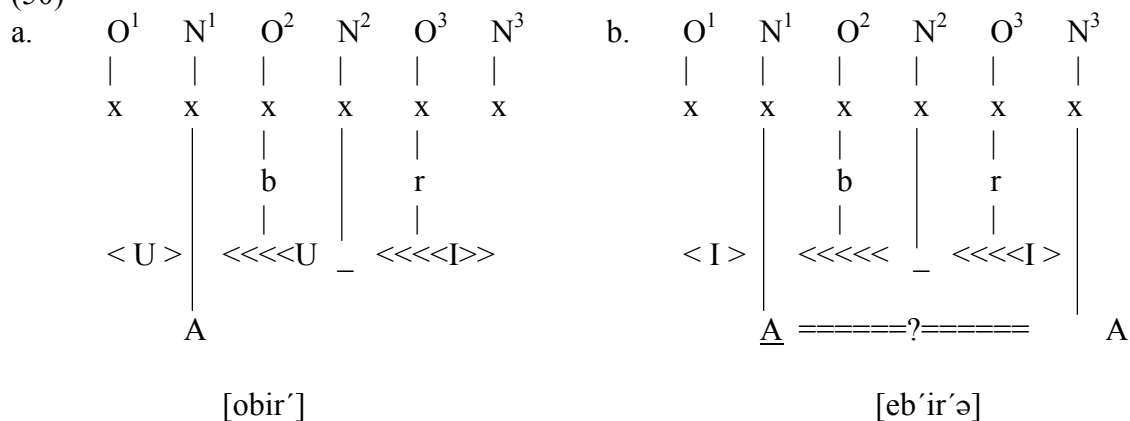
⁷¹There is more to the Connemara facts than meets the eye. While the [sop / sep'] alternation suggests that 'I' and 'A' combine freely, the front low vowel seems to follow the Munster pattern viz. [f'æ:r / f'ir']. However, the behaviour of Connemara [e:], which will be discussed in the following chapter, will show that the [sop / sep'] alternation is more representative of the element combinability settings in that dialect than [f'æ:r / f'ir'].

Thus the form [eb'ir'ə] will be predicted by this analysis only if the initial empty onset O¹ bears a palatal specification. Recall that word-initial empty onsets in Irish are specified for one of the qualities palatalisation or velarisation (Gussmann (1986)). This specification is responsible, for example, for the quality of the consonant in the preceding definite article *an*. Thus the absence of palatalisation in the definite article in [ən obir'] "the work" suggests that the noun begins with a velarised empty onset which does not allow a change to [e].

It seems, however, that the genitive form has a similar representation as the verb "to work" *oibrigh* ([eb'ir'ig']) which clearly shows the palatalised quality of the initial empty onset. In the past form [d'eb'ir'i:mər] *d'oibríomar* "we worked" and in [jeb'ir'ə mə] "I worked" the marker of the past tense is affected by palatalisation (Wagner (1964:303)). Notice that the reflex of the lenited [d] in [jeb'ir'ə mə] clearly indicates that the consonant is palatalised as the lenited reflex of a velarised [d] is [ɣ]. Thus the alternation [obir' / eb'ir'ə] is not regular and this analysis clearly points to the reason for this irregularity.

The phonological representations of the two forms are given below.⁷²

(50)



These are clearly two different phonological representations. The main difference lies in the "across-the-board" application of palatalisation which is exceptional in Irish.⁷³ The fact that the initial onset is palatalised in ((50)b) is not irrelevant in the derivation of [e]. See,

⁷²We could claim that we are dealing with long distance A-support in [eb'ir'ə] if we were to combine our results with what we already know about the behaviour of derived [e]'s. Given the exceptionality of this form in other respects, this additional stipulation has no real consequence.

⁷³A similar exceptional example is provided by the forms [mak / m'ik'] *mac / mic* "son/gs.". First of all, a back [ɑ] is affected by palatalisation, and secondly, the initial onset is palatalised in the genitive case. It seems prudent not to try and account for such isolated examples.

however, the structures of [ri] and [ru] above for a justification for the unassociated element being shared with a nucleus.

2.3.8. "Opaque" segments and I/U- spreading

By "opaque" segments we understand objects which resist influence from elements which are provided by spreading. In Munster, such objects will not license 'I', 'U' and 'A', i.e. they will not be affected by these elements. In the previous sections a few such consonantal objects were alluded to, viz. empty onsets (e.g. [obir']), [h], and the word- initial [r]. In this section we will concentrate on "opaque" vocalic objects which refuse to license 'I' and 'U'. The data below illustrate this problem.

(51)

[kat']	<i>cait</i>	"cat-gs."
[bal'ə]	<i>baile</i>	"home"
[dar']	<i>dair</i>	"oak"
[skol']	<i>scoil</i>	"school"
[kof]	<i>cois</i>	"leg-dat."
[t'ep']	<i>teip</i>	"fail"
[g'et']	<i>geit</i>	"take fright"

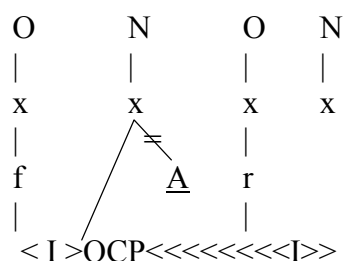
The data in ((51)) demonstrate a lack of interaction between palatalisation (I-spreading) and the nucleus containing the vowels [a], [o] and [e]. We have seen earlier that certain [o]'s are affected by this process e.g. [sop / sip'] *sop / soip* "wisp/gs.". On the other hand, [a] could be affected only if reduced to a schwa-like vowel e.g. [ʃi'naχ / 'ʃunig'] *sionnach / sionnaigh* "fox/gs."

The forms with [e] require some additional explanation. We have speculated that this vowel may be treated as a phonetic effect when an A-head is sandwiched between two palatalised consonants, in which case the elements 'I' and 'A' do not fuse. However, our analysis of such forms predicts that the element 'A' is suppressed (cf. [f'ar / f'ir']) unless it finds support in the following nucleus containing 'A' (cf. [sp'el'ə]). Despite the fact that forms like [t'ep'] and [sp'el'ə] are different in that the former does not participate in

alternations involving quality changes of the following consonant, the lack of A-suppression in [t'ep'] constitutes an apparent counterexample to this analysis.⁷⁴

The situation is saved to some extent, it seems, by the existence of [e / i] fluctuations, e.g. [l'et'ir' / l'it'ir'], which indicate that such nonalternating [e]'s tend to lose the element 'A'. One way of accounting for this phenomenon might be to assume that due to the OCP the nucleus becomes I-headed.⁷⁵ This gives us the following possibility of deriving [f'ir'] *fir* "man-gs."

(52)



Generally, it seems, the "opaque" vowels share one property, viz. the presence of the element 'A' which forms the head within the nucleus. This statement, although it constitutes a blatant contradiction to what is illustrated above, has some justification. Thus the difference between [o] in [sop], which alternates with [i], and the [o] in [skol'], which remains intact, may be accounted for in terms of headedness. Namely, the alternating [o] is not headed, and hence liable to 'I' and 'U' spreading, while the nonalternating [o] is A-headed and immune to spreading. In fact, A-headedness itself need not be evoked here, and the notion of headedness in general may suffice to correlate the behaviour of "opaque" short vowels with long ones. Recall that long vowels are generally immune to palatalisation spreading, and at the same time they are headed.

In order to be able to include the [f'ar / f'ir'] alternation in this system it would be enough to propose that the front low vowel [a] is not headed. Then the [a/i] alternation would conform to the pattern of [sop / sip'] *sop / soip* "wisp/gs.". An additional advantage of this move is that the absence of A-suppression in forms like [t'ep'] *teip* "fail" is no longer

⁷⁴Alternatively, forms like [f'ar / f'ir'] might be claimed to be exceptional. Note that the [æ:/i] alternation is also problematic in Connemara.

⁷⁵Parallel to this the fluctuation [knok / knuk] might be understood as construing the nucleus as U-headed.

exceptional. Representationally, the information concerning the possibility of A-suppression in [f'ir'] will be present in the nucleus (C'AC'), i.e. in the headless nature of the expression, rather than dependent on an arbitrary application of OCP (see ((52)) above). The representation of [t'ep'] could be then characterised by the presence of a headed 'A' (C'AC'), if the view that [e] is phonetic is to be maintained, or an A-headed compound (C'I.AC').

The speculation that [a] is a headless vowel allows us to understand its behaviour with respect to palatalisation spreading, which is the major process affecting nuclei in Irish. However, this interpretation poses a few questions concerning the place of [a] in the vocalic system of Munster and its interaction with other processes such as U-spreading, which, although less spectacular and problematic, still occupies a respectable position in the system constructed here.

The first question that suggests itself concerns the headedness or headlessness of the nuclei containing the element 'A' in [a] and also in [ɑ]. Distributionally, it may seem suspicious if we say that we have A-headed nuclei when preceded by a velarised onset, e.g. [ɑ] in [mak] *mac* "son", and headless ones when the nucleus follows a palatalised onset, e.g. [f'ar]. One may ask what exactly prevents the opposite situation, i.e. (f'Ar) and (mAk)? Is the headless (A) meant to palatalise [m] in (mAk) to make sure that the distributional facts (C'A...) are correct? Or is [m] meant to make sure that 'A' becomes headed to obtain the correct form [mak] (CA...)? These somewhat naive questions have to be answered if we want to avoid making arbitrary claims about segmental distribution in Irish.

This is where our system comes into play. Note that apart from 'I' spreading we recognise the spreading of the element 'U' which also affects headless nuclei (cf. [g'ulə] *giolla* "servant"). Thus, if a headless (A) finds itself between two velarised onsets, it is liable to spreading of 'U', which yields [o], i.e. an U-A combination. This is the same [o] which participates in the [o/i] alternation e.g. [sop /sip'].⁷⁶ It goes without saying that the headed (A) in [mak] will not be affected by U-spreading, as headed nuclei are immune to element spreading ("opaque"). Parallel to [sop] and [g'ulə] (note that in the latter the first onset is palatalised!) we may expect that the element 'A' in the C'AC context will be susceptible to

⁷⁶More on the structure of Munster nuclei and the derivation of surface forms will be found in the following section (2.4). Note, however, the advantage of this analysis in that it treats the [o] in [sop] as derived by U-spreading. In this light the [o/i] alternation no longer looks like an arbitrary substitution of both 'U' and 'A' for 'I', but rather a case of interaction between 'I' and a headless 'A' which results in A-suppression.

similar developments, i.e. if the nucleus is A-headed, it will remain unaffected by U-spreading, while a headless (A) should yield [o]. It seems that this pattern is borne out in Munster with a vengeance, although in a slightly disturbing way, as it brings us back to square one with respect to forms like [f̃ar].

The forms in ((53)a) illustrate [a]'s which resist U-spreading parallel to [a] in e.g. [møk] and for that reason will be viewed as headed. On the other hand, the data in ((53)b) show headless [a]'s which are affected by U-spreading parallel to [sop].

(53)

a.	[f̃ar]	<i>fear</i>	"man"	*[f̃or]
	[l̃ak]	<i>leac</i>	"stone"	*[l̃ok]
	[ñad]	<i>nead</i>	"nest"	*[ñod]
b.	[b̃og]	<i>beag</i>	"small"	*[b̃ag]
	[d̃okir̃]	<i>deacair</i>	"difficult"	*[d̃akir̃]
	[d̃oχ]	<i>deoch</i>	"drink"	*[d̃aχ]

In this analysis, the difference between [f̃ar] and [b̃og] is attributed to the status of the element 'A' in the nucleus, i.e. to the fact that in [b̃og] the nucleus is headless and liable to U-spreading, while the immunity of [a] to U-spreading is put down to the headed status of the element 'A' in that nucleus. The nuclear structures of [f̃ar] "man" and [b̃og] "small" are provided below for comparison.

(54)

a.	O	N	b.	O	N
	x	x		x	x
	<<I>>	/<<U		<<I(II)	<<<U
		<u>A</u>			A
	[f̃ar]			[b̃og]	

The absence of A-suppression in [b'og] is predicted by the fact that 'U', unlike 'I', spreads as an operator. Thus, both 'A' and 'U' are licensed as operators in this nucleus and the context for suppression is not met.⁷⁷

It is hoped that the above analysis clearly demonstrates that the general view that "opaque" vowels are headed may be maintained. In this respect, the alternation [f'ar / f'ir'] appears to be troublesome if not exceptional. Naturally, the claim that the nucleus in such forms is headless has more appeal with respect to palatalisation facts; however, if the spreading of 'U' is part of the system then it should not be ignored, and one must look for an explanation of [f'ar / f'ir'] elsewhere.

One promising line of investigation is the correlation of forms like [sp'al / sp'el'ə] *speal / speile* "scythe/gs." (where [sp'al] corresponds to [f'ar] and [sp'el'ə] is analogous to [t'ep']) with the composition and decomposition phenomena involving the long vowel [e:], e.g. [k'ial / k'e:l'ə] *ciall / céille* "sense/gs." (composition in C'-C') and [f'iar / f'e:r'] *féar / féir* "grass/gs." (decomposition in C'-C). This point will be taken up in chapter 3 which is devoted to long vowels.

2.3.9. Summary

The following picture of the Munster vocalic system emerges from our analysis so far. Concerning the phonological representation of Irish short nuclei, we have distinguished two major groups viz. *headed* and *headless*. The former are immune to element spreading from the right, while the latter readily interact with the spreading of the elements 'I', 'U' and 'A' (cf. Demirdache (1988)). Of these, 'I' and 'A' seem to become (be licensed as) the head of the target object, while 'U' becomes the operator.

I/U- spreading differs from "A-harmony" effects in general in that the latter is dependent on internuclear relations, and hence subject to the same conditions as Proper Government, which, in addition to the restriction that 'A' may physically spread only to headless nuclei, contributes to the complexity and restrictiveness of "A-harmony" in Irish. Nonetheless, as suggested in 2.3.5, the effects of "A-harmony" may be reduced to one process of A-spreading, which still differs from that of I/U-spreading.

⁷⁷This point will be clarified in the following section.

The reason for the 'I-U' asymmetry lies in the nature of the spreading, as 'I' becomes the head of the affected nucleus while 'U' seems to be spread as an operator.

Additionally, our analysis captures the relation between the I/U specification of consonants and I/U spreading on the one hand, and the stringent restrictions on the distribution of the vowels [i] and [u] ((*C'uC'), (*CiC)) on the other.

In the following section, a closer look will be taken at the interaction of elements in the vocalic system of Munster. We will try to define the vocalic alternations and indeed the whole vocalic system in terms of licensing properties of elements (Cobb (1993), Charette and Göksel (1994/96)).

2.4. Licensing constraints in vocalic systems.⁷⁸

In Government Phonology vocalic objects are viewed as realisations of the elements 'I', 'A', 'U' which, if pronounced independently, yield the simplex vowels [i], [a] and [u] respectively. The elements may combine to form compound expressions, for example, the combination (A.I) yields [e] and (I.U.A) gives [ø]. The combinations are asymmetrical in that the elements in combination find themselves in a head/operator relation. In the standard element theory (KLV (1985)), the asymmetry is illustrated by two isomeric compounds involving 'I' and 'A', of which the I-headed combination (A.I) corresponds to phonetic [e], while the A-headed compound yields [æ].⁷⁹ However, individual languages do not exploit all the combinatorial possibilities among elements. For instance, Polish does not seem to possess the contrast between [e] and [æ], which means that one of the combinations involving 'I' and 'A' is not present in the system. Given that the three elements 'I', 'U', 'A' may combine freely (the question of ATR contrast aside) we should expect a total of 12 underlying vocalic objects in a given system, a rather unlikely possibility.⁸⁰

To avoid this undesirable outcome, languages select only some combinatorial possibilities. For example, a language which lacks front rounded vowels does not allow the elements 'I' and 'U' to combine. In autosegmental terms this is understood by viewing the I/U (or BACK and ROUND) tiers as fused (KLV (1985), Rennison (1987, 1990)). In the recent

⁷⁸ This section draws on Cobb (1993), Denwood (1993) and Charette and Göksel (1994/96).

⁷⁹ More recently Charette and Kaye (in [prep.]) suggest that [æ] is in fact a headless (A._).

development of the element theory (Charette and Kaye (in prep.), Cobb (1993), Charette and Göksel (1994/96)) this device is replaced by a set of stipulations of a parametrical nature which state, for example, that the elements 'I' and 'U' do not combine in a given language. Such a stipulation belongs to a set of "licensing constraints" (LC) which aim to define the combinatorial possibilities of elements and in this way restrict the number of representations. Such constraints should additionally throw light on phonological phenomena affecting vowels.

At first sight, the replacement of the notion of tier conflation with a mere set of stipulations or conditions on element combinations may seem arbitrary and of little theoretical impact. However, one possible advantage that "licensing constraints" may bring to phonological analysis is that they may unify such a notion as tier fusion with other conditions on element combinations holding in linguistic systems. In other words, apart from stating which elements cannot combine at all, licensing constraints may additionally define the conditions underlying the existing combinations.⁸⁰ For example, in a language in which 'I' and 'U' may combine, the combination of these elements will yield [ü] irrespective of which element acts as the head and which one is the operator (KLV (1985)). It is only through a careful analysis of the phonological behaviour of the whole vocalic system of such a language that we can decide on the correct representation of [ü]. If the system suggests that e.g. 'U' must always be a head in vocalic expressions then the vowel [ü] cannot be represented as a compound *(U.I) in which it would be I-headed. Likewise, [o] may have the representation (A.U) rather than *(U.A).

Ideally, if licensing constraints are to mean anything, they should fall out directly from the way the vocalic system of a particular language works. Additionally, being set as conditions on well-defined lexical representations, the constraints should not be overridden during the phonological derivation. One reason for such a restricted view is the notion of structure preservation which in GP is expressed by the Projection Principle discussed above (1.3) and repeated here for convenience.

⁸⁰The following objects are possible in such a system: (I), (I), (A), (U.I), (I.U), (A.I), (I.A), (A.U), (U.A), (U.A.I), (I.A.U), (I.U.A).

⁸¹Recently, a very interesting attempt has been made to salvage the autosegmental tiers in Government Phonology and avoid the need to refer to licensing constraints by proposing a model with tier geometry, which to some extent follows the proposals in Rennison (1987, 1990). The readers are referred to Backley (1995) and Takahashi (in prep.).

PROJECTION PRINCIPLE

Governing relations are defined at the level of lexical representation and remain constant throughout a phonological derivation.

This principle ensures that phonological derivation cannot create new governing relations or alter the existing relations between two objects. Therefore if licensing constraints are to define the correct lexical representations of vocalic objects, they should remain constant throughout the phonological derivation (see however Cobb (1993)).

This declaration is particularly crucial if the notion of realisational autonomy (Harris and Lindsey (1993, 1995)) is to be maintained in GP. One of the implications of this hypothesis is that phonological representations are characterised by full interpretability at all levels of the derivation, and hence, the systematic level of phonetic representation is dispensed with. One way to understand this hypothesis is to view all derivation as taking place in the lexical representation as a result of the governing or licensing relations that are contracted there. Since phonological processes in GP take place under government or licensing which are defined at the level of lexical representation, we might ask whether there should be any difference between objects present lexically and objects derived by the phonological component.

Harris (1990b) views harmony processes in Pasiego Spanish as the result of licensing relations that obtain between vowels within harmonic spans. Thus the effects of vowel harmony are understood in this analysis to be due to the existing licensing constraints rather than a purely transformational operation of the phonological component on the lexically defined representation. Viewed in this way, vowel harmony does not derive objects in the generative sense, but rather constitutes part of their representation. In other words, the network of governing and licensing relations contributes to the lexical representation of nuclei in harmony languages.

2.4.1. The tense / lax distinction

One of the first steps when establishing the licensing conditions existing in a vocalic system is to find out if the objects exhibit tenseness contrasts. In the standard element theory the tenseness of vocalic expressions is expressed by the presence of the ATR element in their representation (KLV (1985)). This approach assumes that the ATR element contributes its positive charm value to the vocalic expression regardless of its status within a compound. The absence of low tense vowels is expressed in this framework by assigning a positive charm value to the element 'A' and the combination between the ATR element and 'A' is then excluded by the fact that elements of the same charm value are repelled.⁸²

More recently charm has been abandoned and the ATR contrast between vowels has come to be expressed by the notion of the headedness and headlessness of vocalic expressions (Cobb (1993), Charette and Göksel (1994/96), Harris and Lindsey (1995)). Thus, tense vowels are now viewed as fully-headed, e.g. [i] = (I), where the active element forms the head, and lax vowels are empty-headed or headless, e.g. [ɪ] = (I_), with the active element in the operator position. It is not clear, however, how the observation that low vowels are universally(?) non-ATR can be captured within this new approach. Logically, a headed 'A' should yield a tense vowel. This apparently never happens.⁸³

The contrast between headed and headless vowels is typically found between long and short vowels respectively. This is the case in English where long vowels are analysed as fully-headed and short ones as empty-headed. The headedness of long vowels is assumed to be universal (Cobb (1993)). The tenseness contrasts are also found among short vowels.⁸⁴

Before we try to propose the licensing constraints which define the Munster Irish vocalic system let us consider some existing analyses employing this device. Namely, we will look at the vocalic systems of a few Altaic languages such as Uyghur (Cobb (1993)), Turkish and Sakha (Charette and Göksel (1994/96)) which exhibit remarkably similar characteristics to Irish.

⁸²One problem with such a procedure is that a nasal low vowel should be made impossible as both 'A' and 'N' (nasality) are assumed to be positively charmed.

⁸³KLV (1985: 314) vaguely allude to the existence of ATR [a], which, however, seems to be marked.

⁸⁴See Harris and Lindsey (1995) for a reanalysis of ATR harmony (e.g. Clements (1981)) within this model).

2.4.2. Licensing constraints in Altaic

We saw earlier in section 2.3.3 that in Irish the element 'A' succumbs to the same licensing conditions as it does in Uyghur (Denwood (1993)). One of the conditions states that 'A' must be licensed by the following nucleus containing the same element. For this reason, given that the problem of the phonological behaviour of 'A' in Irish is crucial to the whole analysis of this language, it seems prudent to examine such systems as Uyghur in some more detail

The most prominent feature of the languages to be considered below is that they exhibit vowel harmony. Thus formally these languages seem to be quite distinct from Irish in which only traces of A-harmony are to be found (2.3.5). However, the comparisons between Irish and the Altaic languages will be made at the level at which only the element interaction will be important, while the nature of element spreading - vowel harmony or C-V interaction, rightward or leftward - remains immaterial. Thus what is crucial is how the target vowel is affected by the incoming element. We begin with a brief illustration of the way in which licensing constraints can define the vocalic system of Uyghur (Cobb (1993)).

Cobb proposes that the following three licensing constraints on element combinations hold for Uyghur.

(55)

- a. $(_)$ *licenses no operators*
- b. 'A' *licenses no operators*
- c. 'U' *must be head*

The first constraint expresses the idea that any element must either be headed or licensed by another "full" element. This reduces the inventory of vocalic objects in Uyghur to only headed ones plus an empty head denoting the empty nucleus. The second constraint excludes complex A-headed objects, i.e. $*(I.\underline{A})$, $*(U.\underline{A})$ and $*(I.U.\underline{A})$, but not (\underline{A}) . And finally, the third constraint defines all combinations involving the element 'U' as U-headed.

The resulting system of Uyghur contains 8 objects listed below (Cobb (1993:59)):

(56)

- [ɨ] ()⁸⁵
- [i] (I)
- [a] (A)
- [u] (U)
- [e] (A.I)
- [o] (A.U)
- [ü] (I.U)
- [ö] (A.I.U)

To see how licensing constraints allow for explanations of the mechanisms in which vowels are involved we will consider the analyses of Turkish and Sakha, languages which are related to Uyghur (Charette and Göksel (1994/96)).⁸⁶ Their analysis will prove particularly useful for the understanding of the Irish facts.

Charette and Göksel propose to define the vocalic systems of Standard Turkish, and Sakha (Yakut) using very similar licensing constraints as Cobb did for Uyghur.

(57)

- | Charette and Göksel (1994/96) | Cobb (1993) |
|--------------------------------------|-------------------------------------|
| a. <i>operators must be licensed</i> | a. () <i>licenses no operators</i> |
| b. 'I' <i>licenses no operators</i> | b. 'A' <i>licenses no operators</i> |
| c. 'U' <i>must be head</i> | c. 'U' <i>must be head</i> |

It is clear that only the constraints in ((57)b) are substantially different, which is enough for the systems to exhibit slightly different characteristics. The systems are given below:

⁸⁵ The empty nucleus () surfaces as [ɨ] if realised phonetically.

⁸⁶ Cobb's analysis indeed deserves more attention as it brings up such important issues connected with the licensing constraints as the problem of Structure Preservation. Due to lack space we bypass these issues here. However, the reader is urged to consult (Cobb (1993, 1997)).

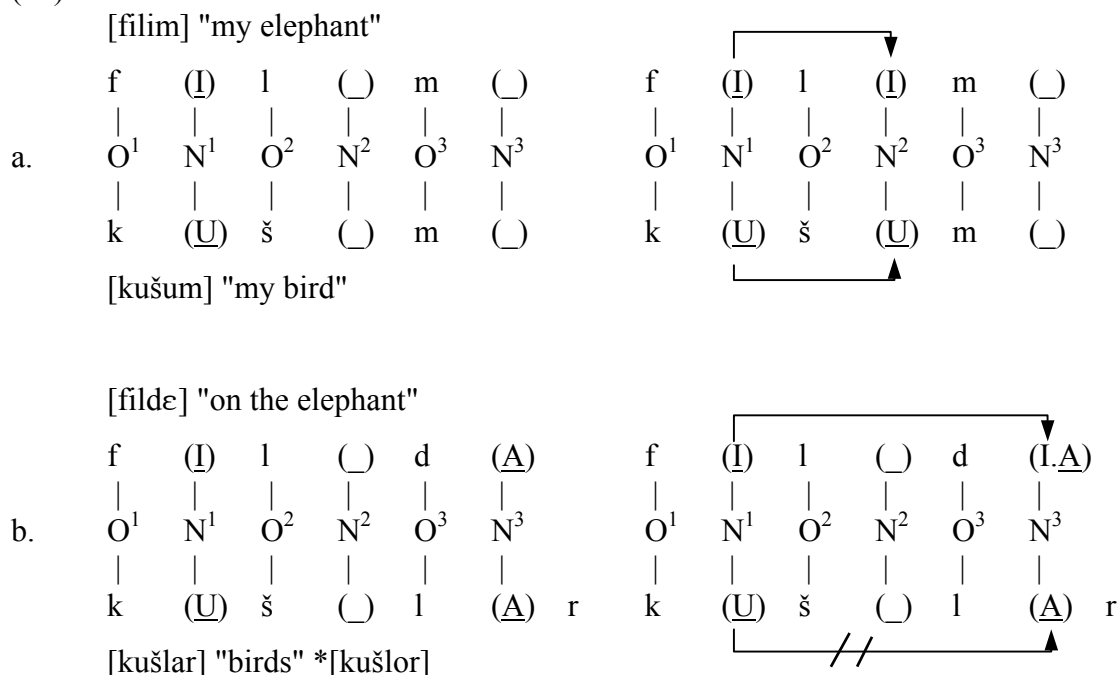
(58)	Turkish, Sakha	Uyghur
	(<u> </u>)	(<u> </u>)
	(<u>I</u>)	(<u>I</u>)
	(<u>A</u>)	(<u>A</u>)
	(<u>U</u>)	(<u>U</u>)
	(I. <u>A</u>)!	(A. <u>I</u>)
	(A. <u>U</u>)	(A. <u>U</u>)
	(I. <u>U</u>)	(I. <u>U</u>)
	(A.I. <u>U</u>)	(A.I. <u>U</u>)

The only real difference between the two systems concerns the representation of the vowel [ε]. Let us now look at the way the constraints proposed by Charette and Göksel account for the vowel harmony phenomena.

The Altaic languages discussed in this section display vowel harmony where the elements 'I' and 'U' spread to the following nucleus. Just as in Uyghur (Cobb (1993)), Charette and Göksel found that the complex objects in recessive nuclear positions are all derived by I/U-harmony from simplex representations (A) and (). There are, however, certain conditions on how the elements 'I' and 'U' spread, i.e. are licensed in the recessive nuclei. Generally, both elements spread as heads to (). On the other hand, (A) is affected in different ways depending on the language. In Standard Turkish, (A) may only be harmonised by 'I', yet this element may not be licensed as the head of that expression but rather as the operator.⁸⁷ The structures in ((59)) are adapted from Charette and Göksel (1994/96) and illustrate the Standard Turkish I/U-harmony effects. The nucleus N³ in ((59)a) is licensed domain finally while N² must be realised and undergoes harmony. In ((59)b) N² is licensed through Proper Government from N³ and remains unrealised.

⁸⁷ The two facts, namely, that both an empty-head and a headed (A) can be harmonised, as well as the nature of I-spreading once as a head and once as an operator are in sharp conflict with the conditions on harmony proposed by Demirdache (1988). Later we will see that the Irish facts are more in line with the latter work.

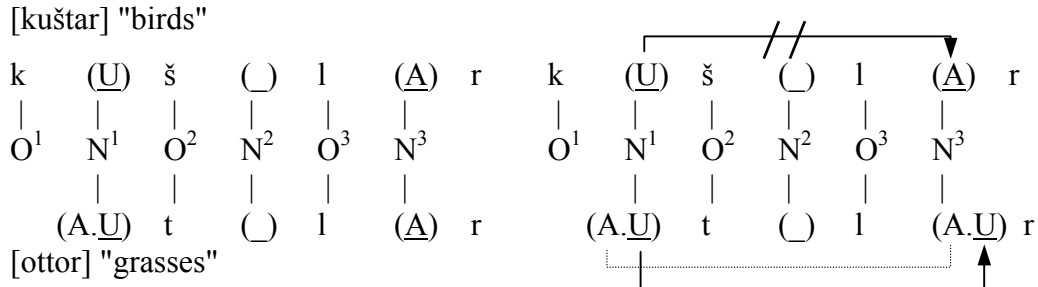
(59)



((59)a) shows that () can be harmonised both by 'I' and by 'U', where the spread element assumes the head position of the affected nucleus. On the other hand, in the case of (A) in the recessive nucleus ((59)b), only 'I' can spread, however, it is licensed in N³ as the operator. As to the absence of U-harmony in ((59)b), the licensing constraints proposed by Charette and Göksel seem to offer a neat explanation. Recall that one of the constraints says: *'U' must be head*. Clearly, N³ in [kušlar] cannot contain two heads. But the licensing constraints proposed for Turkish offer additional predictions concerning U-harmony. Firstly, unlike 'I', 'U' cannot be licensed as the operator in N³ as this would produce an unattested object *(U.A). Secondly, one can think of another potential outcome, namely, that the status of the element 'A' in N³ is switched to the operator, thus allowing for the licit object (A.U) to be constructed. Although this does not happen in Turkish, Charette and Göksel claim that it is possible in other languages. Moreover, their analysis of Sakha shows that the two languages differ precisely in terms of the presence or absence of such status switching. Let us now turn to the Sakha facts

Sakha and Turkish differ only with respect to U-harmony, in that in Sakha 'U' may spread to (A). The phenomenon, however, exhibits a rather strange conditioning. Namely, 'U' spreads to (A) from [o] and not from [u].

(60)



(———) - bridge

(———>) - spreading

Charette and Göksel claim that the presence of spreading in [otlor] is not accidental and is connected with the presence of the element 'A' in the governing nucleus. The two elements form a bridge which could be due to OCP. The elements in N¹ and N³ are aligned, i.e. the status of the element 'A' is switched to the operator status in N³.⁸⁸ Thus the bridge between the two nuclei facilitates U-harmony and the resulting object is licit, i.e. it observes the licensing constraints established for Sakha.

The reader will have noticed that the bridge phenomenon in Sakha resembles the A-support phenomenon in Munster Irish (2.3.3) in which the same mechanism facilitates the construction of [e] in [sp'el'ə] *speile* "scythe/gs.". ⁸⁹

To summarise the similarities between the Altaic languages and Irish we may note the following parallelisms:

First of all, it appears that the I/U-harmony in Altaic is comparable to I/U-sharing or spreading in Irish in that in both types of systems the respective mechanisms define the representation of vowels by licensing 'I' or 'U' in the nucleus. Additionally, in both cases, we are dealing with asymmetries concerning the phonological behaviour of 'I' and 'U'. Compare, for example, the constrained operation of U-harmony in Turkish with the fact that U-spreading in Irish also seems to be less prominent.

Another major similarity is that concerning the behaviour of the element 'A' with respect to the incoming elements. We saw earlier that, like in Uyghur, certain conditions must be met for 'A' to be licensed in Irish nuclei.⁹⁰ Thus, the phenomenon of A-support in

⁸⁸ See Charette and Göksel (1994/96) and Harris and Lindsey (1995) for more details concerning head alignment and its use in analyses of ATR harmony.

⁸⁹ Compare also the A-licensing conditions proposed for Uyghur in Deanwood (1993).

⁹⁰ Hence both Uyghur and Irish exhibit [a] - [i] alternations.

Irish (2.3.3) finds a counterpart in the A-licensing conditions proposed in Denwood (1993) for Uyghur, as well as in the A-bridge mechanism in Sakha (Charette and Göksel (1994/96)). Clearly, then, A-suppression in Irish must be due to some licensing constraints with operate in this system.

Having seen how licensing constraints can define vowel systems in terms of their inventory as well as their participation in vowel harmony processes, let us now turn back to the Irish vocalic system. First, we will consider the question of the tense / lax distinction in Irish.

2.4.3. Irish vowels and the headed / headless distinction

The previous analysis of the Munster Irish vocalic system (2.3) points to the headless nature of most underlying short nuclei. Their headedness, however, seems to be derived by such processes as 'I' and 'A' spreading. Additionally, it appears that the only lexically headed vowels are those containing the element 'A' as the head. However, headedness does not seem to correspond phonetically to tenseness in Irish.⁹¹

Sjoestedt-Jonval (1938:68) observes that Irish long vowels are tense, while short vowels may be tense or lax depending on whether they are stressed or not and on the specification of the flanking consonants. Let us look at some cases of fluctuation in the tenseness of short stressed vowels.

(61)

	<i>tense</i>		<i>lax</i>			
i - ɪ	[il'ə]	-	[ɪl'ə]	<i>uile</i>	"every"	VC'
	[ɪjk'ə]	-	[ɪjk'ə]	<i>uisce</i>	"water"	
			[dm'ə]	<i>duine</i>	"man"	CɪC'
			[f'ɪs]	<i>fios</i>	"knowledge"	C'ɪC
	[gl'ik']			<i>glic</i>	"clever"	C'ɪC'
u - ʊ	[ən uməd]	-	[ən' ʊməd]	<i>an iomad</i>	"great number"	CuC/C'ʊC
	[unəs]	-	[ʊnəs]	<i>ionas</i>	"so that"	

⁹¹John Harris rightly pointed out to me that since ATR is no longer treated as a category, we should not expect that phonological headedness will always imply phonetic tenseness.

The tense variety of the high front vowel requires that both flanking consonants be palatalised e.g. [gl'ik']. Otherwise, especially in the VC' context, fluctuations are expected e.g. [i]k'ə / ɪ]k'ə]. The case of high back vowels seems to be parallel, i.e. [u] is perceived as tenser when flanked by two velarised onsets, and as more open and centralised when the preceding onset is palatalised (Sjoestedt (1931:87)).

The conclusion is that whatever the status of the elements involved in the segmental make-up of these vowels, ATR contrasts are irrelevant. This does not mean that the distinction headed/headless does not exist (see "opaque" segments).

It is interesting to note how the phonetic tenseness of [i] and [u] which depends on the context, i.e. C'-I-C' and C-U-C (((61)) above), could be correlated with the raising of mid to high vowels when the backness of these vowels corresponds to the quality of both flanking consonants e.g. C'-e-C' and C-o-C. In such contexts the mid vowels tend to lose the element 'A' which produces raising to [i] and [u] respectively. First, consider the data below.⁹²

(62)

e - i	[f'ek'im'] - [f'ik'im']	<i>feicim</i>	"I see"
	[l'et'ir'] - [l'it'ir']	<i>leitir/litir</i>	"letter"
	[d'en'im'] - [d'in'im']	<i>deinim</i>	"I do"
o - ɪ	[krok'ən] - [kɾɪk'ən]	<i>croiceann</i>	"skin"
o - u	[knok] - [knuk]	<i>cnoc</i>	"hill"
	[loχt] - [luχt]	<i>locht</i>	"fault"

Schematically, the raising phenomenon may be illustrated in the following way.

(63)

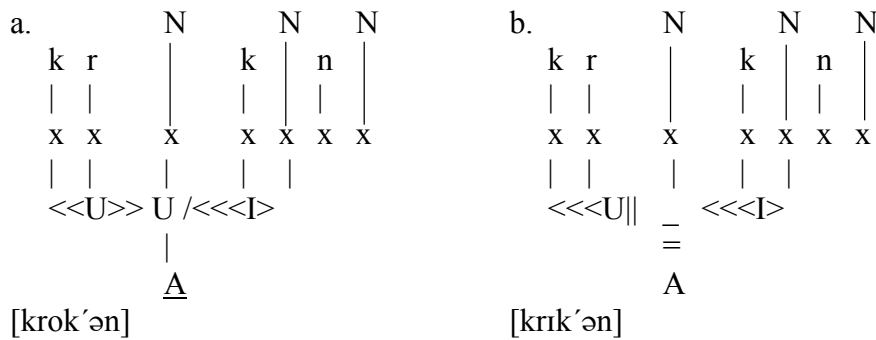
$$\begin{array}{ccc}
 C^I - \underline{I} - C^I & & C^U - \underline{U} - C^U \\
 = & & = \\
 A & & A
 \end{array}$$

⁹²All these variants may be understood as stemming from fluctuations in headedness induced by the environment.

If the surface tense / lax distinction, as in [ɪl'ə / il'ə] *uile* "every" ((61)), may be connected with the phonological headed / headless distinction (contingent on the specification of the flanking consonants), then one might hazard the guess that in e.g. [f'ik'im'] and [knuk] the elements 'I' and 'U' of the nuclei are construed as the head in these forms, and that this head in some way induces A-suppression. This hypothesis would not only agree with the tenseness facts concerning high vowels ((61)), but also with what we already know about A-suppression (see [sop / sip'] and [f'ar / f'ir']). Nonetheless, in a situation when we cannot decide whether the tensing of high vowels in ((61)) reflects the status of 'I' and 'U' as heads or whether it is a mere phonetic effect, the raising phenomena cannot be viewed as obvious, although they are clearly indicative of something.⁹³

Having found that "opaque" vowels are A-headed and only non-headed vowels can be affected by spreading, the case of [krok'ən - krɪk'ən] *croiceann* "skin" (((62)) above) is particularly instructive as it indicates that indeed a shift of headship from 'A' to 'I' or 'U' leads to suppression. The difference between the phonological representations of [krok'ən], with "opaque" [o], and [krɪk'ən] which behaves like [sip'] is illustrated below.

(64)



In [krok'ən], palatalisation spreading is blocked due to the fact that the nucleus is A-headed.⁹⁴ On the other hand, in [krɪk'ən] the first nucleus is construed as headless and hence

⁹³With respect to the raising to [u] in [knuk], the interpretation involving headedness of the element 'U' in the C-U-C context provokes the question of what is responsible for the status of this element. Recall that 'U' spreads as an operator.

⁹⁴In structure (a) above, we tried to reflect the fact that the nucleus has to contain 'U' which may undergo OCP with the "shared" element. The reason is, that an A-headed nucleus may not combine with anything that is not present underlyingly in that nucleus. Otherwise, there would be no contrast between the first nucleus in [krok'ən] and that in [ban'ə] *bainne* "milk" (i.e. we should expect *[bon'ə]).

liable to interaction with I-spreading. It is then important to assume that spreading does not switch the status of the element 'A'.

Generally, we may maintain the following view of the Irish vocalic system: short vowels are either headless or headed and the distinction is revealed by the way they are affected by 'I', 'U' and 'A' spreading; only headless vowels are affected (cf. Demirdache (1988)).

One result which follows from the above analysis is that Munster Irish has a peculiar restriction concerning I/U-headed vowels, to the effect that the element 'A' may not be licensed (present) in such nuclei. Additionally, the headedness of 'I' and 'U' seems to be derived⁹⁵ (contingent on the environment), while headed 'A' is found in both contexts, i.e. velarised ([mak] *mac* "son") and palatalised ([t'ep'] *teip* "fail"). This dependence of 'I' and 'U' is reflected in the distribution of [i] and [u] (recall *CiC and *C'uC'). If 'I' and 'U' could be headed lexically, independently of the environment that is to say, then we should expect forms like *CiC and *C'uC' to be licit as indeed they are when the vowels are long (headed) e.g. [ki:səχ] *cuíosach* "fairly good" and [k'u:n'] *ciúin* "calm".⁹⁶

We will now try to define the phenomena involved in vocalic transitions by means of parameters on element combinations along the lines proposed in Cobb (1993) and Charette and Göksel (1994/96).

2.4.4. Licensing constraints and Munster alternations

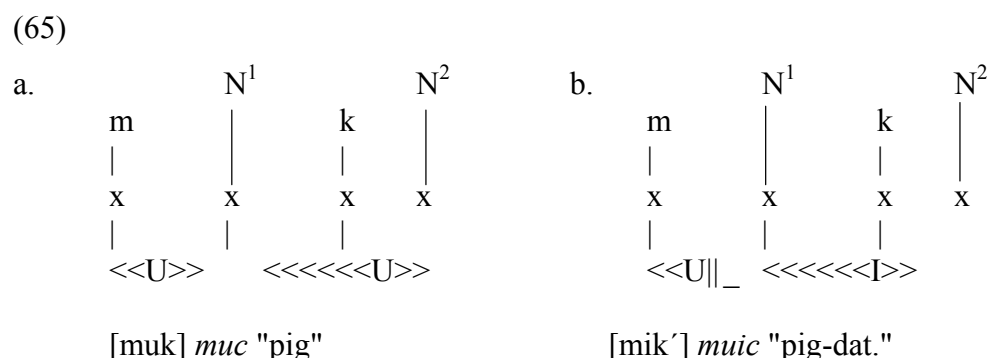
In what follows we will try to demonstrate that the vocalic system of Munster Irish can be fairly accurately defined in terms of licensing constraints, i.e. conditions on element combinations. However, although the constraints to be proposed below define all the existing vocalic objects, it seems that the actual phonological inventory is even smaller.

⁹⁵Later in this section we consider the question of the derivation of vocalic objects. The word "derived" is not meant to express a dynamic process here, but rather the fact that part of the specification of Irish nuclei is defined by the type of environment to which the nucleus belongs.

⁹⁶This argument may not be strong enough given that long vowels have a different structure, i.e. a branching nucleus, which may be responsible for the distribution discrepancies. However, in chapter 3 it will be argued that Irish long vowels have a structure of two consecutive nuclei rather than a branching one, in which case the structural argument becomes irrelevant, being outweighed by the substantive factor (melody).

Let us begin by looking at the high vowels and the interaction between the elements 'I' and 'U'. On the basis of the distributional restrictions concerning the high vowels (*Ci, *C'u, *CiC, *C'uC'), their regular participation in vocalic alternations induced by element spreading, and the apparent irrelevance of tenseness contrasts, it will be assumed that underlyingly the high vowels are empty-headed (headless). The actual derivation of high vowels should be divided into two distinct categories. The first one involves the "restricted" nuclei in monosyllabic words ([b'i] *bith* "existence" and [pu] *puith* "breeze"), where no other source of elements is present (no I/U spreading) and the nucleus licenses the element shared with the preceding onset (due to the *Sharing Condition*).⁹⁷ Note that an A-headed nucleus may follow both palatalised and velarised onsets, e.g. [l'a] *leath* "part", [da] *dath* "colour".

Quite a different treatment of the shared element is found in the second category of forms in which I/U spreads from the right-hand context. This is illustrated by the alternation [muk / mik'] *muc* / *muic* "pig/dat.". (65)



(||) buffer to further spreading

We will adopt the view that in such forms it is the spread element that defines the shape of the nucleus. If the spread element happens to be identical to the shared one (e.g. [muk]), then we expect OCP to take effect. On the other hand, forms like [mik'], as well as [p'ubər] *piobar* "pepper", show that the incoming (spread) element does not fuse with the shared one, while the latter forms a buffer to further spreading.⁹⁸

⁹⁷Such empty-headed nuclei must not be confused with empty nuclei which have no melodic content and do not share an element with the preceding onset (cf. N¹ and N² in *muic*). This distinction explains why nuclei like N¹ are not properly governed in forms like *muice* "pig-gs." and also accounts for palatalisation spreading across empty nuclei e.g. [soləs / si:l'ʃə] *solas* / *soilse* "light/pl.".

⁹⁸To emphasise this point we may use the palatal and labial glides in the phonetic transcription e.g. [m^wik'] and [p^lubər].

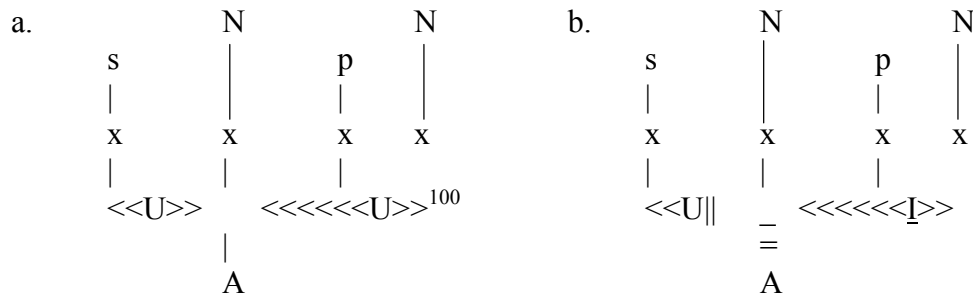
It seems to be generally true about Irish that the elements 'I' and 'U' do not combine, hence *[mük'] and *[p'übər] are not expected, and this follows from the structures presented above. Leaving aside the question whether this fact needs to be expressed in terms of any additional stipulation on element combinations, we will capture the lack of I-U combinations in Irish by the following licensing constraint.

LC1 - 'I' and 'U' do not combine

This constraint accounts for the interaction between 'I' and 'U' not only in the alternations involving the high vowels, but also the mid ones to which we now turn.

In accordance with our views on "opaque" vowels, those mid vowels which participate in alternations will be assumed to be headless similar to [i] and [u]. Let us consider again the alternation [sop / sip'] which at first blush looks like an arbitrary replacement of the compound (U.A.)⁹⁹ with the element 'I'. So far, we are in a position to understand the "replacement of 'U' (as per LC1). What remains to be defined is the nature of the A-suppression. Recall that 'I' spreads as the head into headless nuclei.

(66)



The difference between ((66)a) and ((66)b) lies in the nature of 'I' and 'U' spreading. Recall that 'U' seems to spread as an operator and 'I' as a head. The [o/i] alternation follows the pattern established for the high vowels as regards the interaction between 'I' and 'U'. In this case, however, both 'U' and 'A' may not be licensed in the nucleus to which 'I' spreads and assumes the head position.

⁹⁹The compound is headless because otherwise we would not expect interaction with palatalisation spreading (cf. (U.A) in [kof] *cois* "leg/dat.")

This time we may not propose the same type of constraint as LC1, and say that 'I' and 'A' do not combine in Irish because we have found that the compound (I.A) is required in this system if only to be able to account for the presence of long [e:]. What we may say to define the A-suppression above is that 'I' does not license operators.

LC2 - *'I' does not license operators*

Notice that LC2, in a way, excludes LC1 (it makes *(U.I) illicit) which may mean that only one of the constraints is true. However, LC2 itself does not exclude the possibility of deriving front rounded vowels completely, as (I.U) is still possible. Let us now see what types of objects are defined by the two constraints and consider the relation between the constraints and the actual phonological structure of Irish nuclei that we want to propose here.

2.4.5. The structure of Irish short nuclei

The analysis presented above led to the establishment of the following two constraints.

LC1 - *'I' and 'U' do not combine*

LC2 - *'I' does not license operators*

However, to be able to account also for raising phenomena like [knok - knuk], and to exclude the (I.U) combination mentioned above, one might want to modify LC2 to include 'U':

LC1 - *'I' and 'U' do not combine*

LC2 - *'I' and 'U' do not license operators*

Let us first observe how these parameters define the vocalic system of Irish and what kind of vocalic inventory results from them:

¹⁰⁰Here too we assume that the spread element combines with the headless 'A'. Recall examples like [d'ox] *deoch* "drink" and [b'og] *beag* "small" which clearly show that the headless 'A' fuses with the spread element rather than with the shared one.

(67)

<i>headed</i>			<i>non-headed</i>	
a. (I)	b. *(A.I)	c. *(I.U.A)	d. (I._)	e. *(U.I._)
(U)	*(U.I)		(U._)	*(A.U.I._)
(A)	*(I.U)		(A._)	
(I.A)	*(A.U)		(A.I._)	
(U.A)	*(A.U.I)		(A.U._)	
	*(A.I.U)		()	

The objects grouped under ((67)a) and ((67)d) are made possible by the system of constraints proposed in this analysis. Before we discuss the correspondence between the licit headed and headless objects we should first take a look at the two constraints proposed above. It was mentioned earlier that they are very similar, and even mutually exclusive to some extent. The LC2 eliminates the objects listed under ((67)b) from the vocalic inventory and ultimately accounts for the vocalic alternations in Munster Irish, while what is left for the LC1 to do is to exclude *(U.I.A) ((67)c) as well as *(U.I._) and (A.U.I._) ((67)e). Thus, the question is if we should retain the LC1, or could the restriction on I-U combinations follow from something else? The proposal which we will make below seems to get round that problem partially in that it accounts for the headless objects involving 'I' and 'U' without having to resort to the LC1. Let us consider first the headed and then the headless objects listed above and try to further reduce the inventory in ((67)).

One inevitable observation concerning the licit phonological objects listed in ((67)a) and ((67)d) above is that the inventory seems to be too numerous for a restricted and impoverished vocalic system like Irish. Ought we to further narrow the system by proposing additional constraints, or are some of these forms derivable from the phonological context, in which case they do not need to be postulated as part of the vocalic system, which would be independent of the environment?

The headed objects of ((67)a) seem to be justified by the fact that they neatly correspond to the long vowel series [i:, u:, a:, e:, o:]. However, in short vowels, the headed (I) is found in the contexts (C'-I-C') and (C-I-C') and is contingent on the spreading (licensing) from the right-hand context. (U), on the other hand, is only found only in the

context (C-U-C), while in (C'-U-C) it seems to be licensed as an operator (e.g. [b'og] *beag* "small" and not *[b'ug]).¹⁰¹ Thus both instances of headed 'I' and 'U' are clearly dependent on the environment. Additionally, if the objects (I) and (U) are viewed as derived, then the restrictions *C'uC' and *CiC are accounted for in a natural way. Firstly, [i] and [u] will logically not be derived in a non-licensing environment (Note that C'uC and CiC' are possible as the element spreading comes from the right). Secondly, lexically headed [i] and [u] would be expected to be immune to element spreading (parallel to long vowels, and other "opaque" short vowels) and should appear in *C'uC' and *CiC contexts. Thus, these restrictions need not be arbitrary, but rather follow from the phonological representation of short nuclei in that (I) and (U), being context dependent, will never appear where they cannot be derived. It should be stressed that the term "derived" is used metaphorically here. What we have is simply licensing of the elements 'I' and 'U' by the environment, which bears one or the other element. Thus the "environment", i.e. I/U spreading, may be simply understood as part of the lexical representation of phonological forms in Irish.

The remaining headed objects (A), (I.A) and (U.A) are "opaque" to element spreading as opposed to (A._), (I.A._) and (U.A._) which are alterable. It seems that the group of A-headed types of nuclei (the "opaque" vowels) cannot be reduced anymore so that the elements 'I' and 'U' would have to be provided by the environment to an A-headed vowel. This follows from the nature of "opaque" vowels which are immune to element spreading. Thus if we wanted to derive e.g. (I.A) from (A) by means of 'I' spreading or sharing, then the (A) may no longer be viewed as "opaque".¹⁰² In fact the compounds (I.A) and (U.A) seem to be the only instances in which we need to postulate the presence of the elements 'I' and 'U' underlyingly in the nucleus. In all other cases these elements are provided by the environment, i.e. by sharing or spreading.

As for the inventory of headless objects, i.e. alterable vowels ((67)d), although they, in a sense, copy the headed series, their number seems to be too large. First of all, the object (A._) does not seem to correspond to any phonetic entity in Munster Irish because both back

¹⁰¹We are in fact at a loss here. 'U' spreads as an operator, however, the parallel behaviour of palatalised and velarised contexts in vowel raising phenomena suggests that it acts as the head. We may postulate that the U-headed vowel may be lexical in such forms; however, the fact that this happens in the context C-U-C is disturbingly analogous to the derivation of I-head in C'-I-C'.

¹⁰²One may, however, ask why such immune nuclei are still distributionally restricted, i.e. *C'-(U.A)-C' and *C-(I.A)-C.

[ɑ] as in [bʌn'ə] *bainne* "milk" and fronted [a] as in [l'ak] *leac* "stone" are phonologically headed (A), where the fronted or back reflex is contingent on the quality of the preceding consonant (Ní Chiosáin and Padgett (1993)).¹⁰³ Additionally, it is not clear what the phonetic reflex of the empty head () would be.¹⁰⁴ In other words, we seem to get only the following alterable vowels:

(68)

(I.)	[b'ɪ]	<i>bith</i>	"existence"
(U.)	[pu]	<i>puth</i>	"breeze"
(I.A.)	[p'e]	<i>peith</i>	"dwarf elder"
(U.A.)	[bo]	<i>both</i>	"hut"

It is interesting to note that all of the objects enumerated above contain the elements 'I' and 'U', and that the presence of the respective elements in their nuclei is due to the quality of the preceding onsets. Recall that nuclei share either 'I' or 'U' with their onsets. One may therefore propose that the elements 'I' and 'U' in alterable nuclei of the type given in ((68)) are "derived" by *sharing*. This proposal allows us to account for two problems. First of all, it explains the strict agreement in quality between onsets and nuclei in the monosyllabic forms ((68)), in that 'I' and 'U' will never appear where they cannot be derived, i.e. licensed by the environment (compare e.g. *[b'u]). Second, this analysis provides an explanation for the problem of illicit I-U combinations of Munster vowels. Namely, it predicts precisely why the compounds *(I.U.) and *(I.U.A.) are impossible in Irish. The reason is that such compounds will never be licensed, as the preceding onset is either palatalised or velarised but not both at the same time. Therefore, the constraint '*I and U do not combine*' would only duplicate information inherent in the phonological structure.

This proposal reduces the inventory of headless objects in Munster dramatically and leaves us with only two objects, () and (A.), which receive further specification from the phonological environment (cf. Cobb (1993), Charette and Göksel (1994/96) discussed in

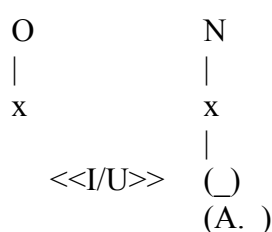
¹⁰³ Since the vowels in [l'a] *leath* "half" and [da] *dath* "colour" are represented as headed (A) one needs to explain the existence of [a / ɪ] alternations (in, for example, [f'ar / f'ir]). This vowel is exceptional in that a headed vowel is affected.

¹⁰⁴ The object () could be taken to represent the empty nucleus. However, the question of its phonetic shape remains pertinent in cases where empty nuclei are realised in Irish (below in this section, we provide a possible distinction that could be made between empty nuclei and empty-headed ones.).

2.4.2.¹⁰⁵ Note that these are precisely the two objects for which no phonetic reflex is found, although our system of constraints predicts that they should be present. Thus, () would be the structure of the nucleus which phonetically is realised as [i] or [u] (cf. *bith* and *puth*) depending on the quality of the preceding onset. In other words, (I.) and (U.) could be viewed as derived by the *Sharing Condition*. On the other hand, the headless nuclei containing the element 'A' can be represented as (A.), with the elements 'I' and 'U' provided by the same mechanism as in the case of (), namely, by sharing.

Structurally, the headless (alterable) short nuclei in Irish which are derived by sharing can be represented as in ((69)) below. These forms exhibit no right-hand source for the elements 'I' and 'U'. Note that almost identical representations of alterable vowels have been established for e.g. Uyghur (Cobb (1993)). The striking difference, however, lies in the fact that in Uyghur the element 'A' acts as the head.

(69)



This symbolic representation of the alterable short nuclei is able to capture fully the C-V dependencies in Irish, and account for such facts as the lack of I-U combinations, which simply follow from the phonological representation, as these elements are provided one to the exclusion of the other (consonants are either palatalised or velarised).

Technically speaking, the following objects are derived by sharing.

(70)

by I-sharing

()	=>	(I.)	[k'i] <i>cith</i> "shower"
(A.)	=>	(A.I.)	[p'e] <i>peith</i> "dwarf elder"

¹⁰⁵ One should bear in mind that apart from I/U-sharing in O-N domains Irish exhibits the process of I/U-spreading from the right-hand context in words containing more than one phonetically realised

by *U-sharing*

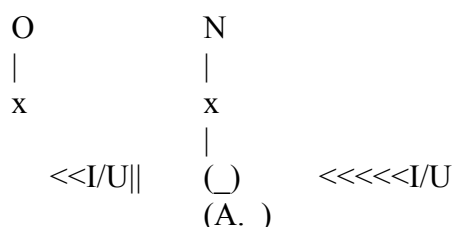
() => (U.) [kru] *cruth* "shape"

(A.) => (A.U.) [bo] *both* "hut"

As for the remaining forms, i.e. [Cə] and [C'a] as in [də] *dath* "colour" and [l'a] *leath* "half", we have adopted the view that they contain a headed (A) in the nucleus which is generally unaffected (as elsewhere) by a velarised onset, and fronted (phonetically?) by a palatalised one. Note that this assumption neatly accounts for the derivation of [o] in *both*, as this is a headless nucleus containing 'A', as opposed to [ɑ] in *dath* which has to remain low. Otherwise, such forms as [də] would be impossible in the language, and similarly, there would be no way to represent the contrast between [e] and [a] as in *peith* and *leath*. In this analysis it is the status of the element 'A' that accounts for these distinctions.

Let us now consider the other type of element licensing in alterable nuclei which we referred to as I/U-spreading. In the presence of element spreading from the right-hand context, the shared element is "dislodged" from the nucleus if the spread element is different from the shared one. Recall that the dislodged element then forms a buffer to further spreading of the intruding element. This is represented below.

(71)



Element spreading allows us to derive the following objects from the same representation of alterable short vowels:¹⁰⁶

(72)

by *I-spreading*

() => (I) [kid'] *cuid* "part"

(A.) => (I) [sip'] *soip* "wisp/gs." (and LC2)

O-N domain. Below, it will be shown how both phenomena, i.e. *sharing* and *spreading*, constitute the "environment" which is responsible for the derivation of vocalic objects.

¹⁰⁶ The difference between 'I' and 'U' spreading is that the former spreads as the head, and the latter as the operator. This, among other things, accounts for the different outcomes when (A.) is affected

by *U-spreading*

(\square) \Rightarrow (U. \square) [p'ubər] *piobar* "pepper"

(A. \square) \Rightarrow (A.U. \square) [b'og] *beog* "small"

This simple and "open" system allows for surface variation and it also accounts for the paucity of vocalic contrasts. It reflects the asymmetry between high vowels on the one hand and mid and low ones on the other. Thus, the elements 'U' and 'I' may be licensed within a nucleus only by the preceding onset (*sharing*), or by the right-hand environment (*spreading*), all of which may be understood as part of the specification of Irish short vowels. On the other hand, in the series of inalterable vowels (headed objects) the elements 'I' and 'U' are licensed by the element 'A' (for example, in (U.A) and (I.A)).

However, this system seems to pose a question as to the possibility to distinguish between empty nuclei which alternate with zero and are represented as (\square), and [i] and [u] in *bith* and *puth* which are derived here from the non-specified (\square).¹⁰⁷

Recall that empty nuclei allow palatalisation spreading to the preceding consonant ([soləs / sel'ij / si:l'jə]). This does not happen in the case of our "restricted nuclei", e.g. [pu / p^wihə]. The difference might be attributed to the structure proposed below, which treats the shared elements 'I' and 'U' as part of the representation of such nuclei, as opposed to the absence of I/U sharing in the case of empty nuclei.

(73)

a. *restricted nucleus*

O	N
x	x
I/U	
	(\square)

b. *empty nucleus*

O	N
x	x
	(\square)

This interpretation accounts for the fact that the onset followed by an underlyingly empty nucleus ((73)b) receives its specification from the following onset. This takes place even if the nucleus is realised (cf. [soləs / sel'ij / si:l'jə] Cyran (1996a)).

by the two elements (compare [sip'] and [b'og] below, where LC2 is responsible for the A-suppression in [sip'], while in [b'og] the derived object remains headless (A.U. \square)).

2.4.6. Structure vs. Condition (conclusions)

It seems that we now have two systems for Munster Irish vowels: system ((74)a), which is defined by licensing constraints and gives all the attested objects (except for () and (A.)), and system ((74)b), which is what we seem to need in the underlying representation of short vowels. The question marks in ((74)a) indicate the problematic objects.

(74)

a.	<u>headed</u>	<u>headless</u>	b.	<u>headed</u>	<u>headless</u>
	(I)?	()?		(A)	()
	(U)?	(I.)		(I.A)	(A.)
	(A)	(U.)		(U.A)	
	(I.A)	(A.)?			
	(U.A)	(I.A.)			
		(U.A.)			

The question arises as to whether system ((74)b) should also be defined in terms of licensing constraints. This would make it very restricted, and the derivation of system ((74)a) from the underlying forms might be thwarted by the additional constraints.

System ((74)b) proposed here seems to constitute a compromise between the urge to define the whole vocalic system only in terms of stipulatory parameters on the combination of elements, and the desire to generate vocalic expressions on the basis of the information present in the underlying representation of phonological forms. The approach presented here shows that the licensing constraints must fall out of the system and that they simply reflect the mechanisms responsible for generating phonological objects (LC1), or describe (underlie) the existing processes (LC2). We have seen that the vocalic system of Munster Irish is partly defined by such constraints and partly by other mechanisms, namely, *spreading* and *sharing*.

One might ask whether we are not dealing here with a conflict between the lexical representation (defined by constraints) and the phonological component (derivation by *spreading* and *sharing*)? In the light of Harris and Lindsey (1993), who suggest that there is no phonetic level of representation, the phonological representation are characterised by full

¹⁰⁷On the differences between underspecification and non-specification see Harris (1994b).

interpretability at all levels of the derivation. It seems that the static status of the derivation of Irish vowels may be maintained. Recall that licensing and governing relations are contracted at the level of lexical representation (the *Projection Principle*). I/U-sharing then is an instantiation of a licensing relation holding between onsets and nuclei, therefore, the I/U specification of nuclei by sharing takes place lexically, i.e. at the time when all governing and licensing relations are contracted. As for the element spreading, we may view it in a similar way, namely, not as a dynamic process but rather as the static identification of objects with the element lodged in sharing domains. In other words, we may view spreading as licensing of a given element within a particular domain of application - in the case of spreading the domain may be identified with the foot.

Thus by assuming that sharing and spreading, as forms of element licensing, interact with licensing constraints on element combinations we avoid the question at which stage the constraints are relevant. They are relevant all the time in that they do not allow impossible combinations to arise, but they need not restrict the number of underlying segments fully, because, as we have seen in ((74)a) and ((74)b), the inventory (in the phonemic sense) may be even smaller than that defined by constraints, due to information inherent in the structure.

The analysis of the vocalic system of Munster Irish presented here is not without its problems, however, it also shows that we need to understand a lot more about the way in which resonance elements interact. To this end, more work is required in the area of comparative linguistics in order to emphasise the universal character of element interaction. Also, more theoretical work is needed concerning the nature and position of licensing constraints in phonology (see e.g. Cobb (1997)).

3. LONG VOWELS: DIAGNOSTIC CONTEXTS FOR PHONOLOGICAL STRUCTURES

3.1. Introduction

We have seen that the propagation of 'I' in palatalised environments results in various vocalic alternations. The direction of I-spreading is from right to left, i.e. the same as that of internuclear government. In this situation 'I' becomes the head of the vocalic expression it docks onto. Additionally, a process resembling vowel harmony has been observed whereby the element 'A' is spread from the following nucleus. Although both palatalisation spreading and A-harmony accord with the direction of internuclear government, only the latter can be maintained to be an instantiation of that relation. I-propagation, on the other hand, must be independent of internuclear government, as it is allowed to apply across governing domains (cf. the discussion of [k'ark / k'irk'ə] (2.3.5)).

Another important observation is that the elements 'I' and 'U' of palatalised and velarised consonants can be shared by the consonant and a following nucleus (by the *Sharing Condition*). In this context only shared 'I' seems to affect a headed nucleus phonetically ([f'ar]),¹ while shared 'U' constitutes a barrier to palatalisation spreading e.g. [k^wid'] *cuid* "part", but does not influence the nucleus unless there is no other source for an active element in the nucleus (cf. [pu] *pu* "breeze").

In the introductory sections we saw the absence of interaction between palatalised consonants and long vowels; Ní Chiosáin (1992) allows for this by specifying long vowels for the feature [±BK], hence, no spreading of that feature is possible from flanking consonants. Recall the, by now familiar, examples.

¹A similar phenomenon is observed in the case of long [ɑ:] which tends to be fronted if preceded by a palatalised onset (Ó Cuív (1975:18)).

- (1)
- | | | | |
|----|----------------------|--------------------------------|----------------------------|
| a. | [k'u:n']
[k'i:l'] | <i>ciúin</i>
<i>cíl</i> | "calm"
"raddle" |
| b. | [ti:]
[t'i:] | <i>tuí</i>
<i>tí</i> | "straw"
"house gs." |
| c. | [ku:f]
[k'u:f] | <i>cúis</i>
<i>ciumhais</i> | "reason"
"edge" |
| d. | [kɑ:s]
[kɑ:f] | <i>cás</i>
<i>cáis</i> | "case"
"cheese" |
| e. | [ge:l']
[g'e:l'] | <i>Gaeil</i>
<i>géill</i> | "Irishmen."
"surrender" |
| f. | [bo:]
[b'o:] | <i>bó</i>
<i>beo</i> | "cow"
"alive" |

Thus the strict dependence of short nuclei on the flanking consonants, i.e. *CiC and *C'uC', is relaxed here, and Ci:C and C'u:C' are possible in the case of long vowels.

(2)

C'u:C'	[k'u:n']	<i>ciúin</i>	"calm"
Ci:C	[ki:səχ]	<i>cuíosach</i>	"fairly good"

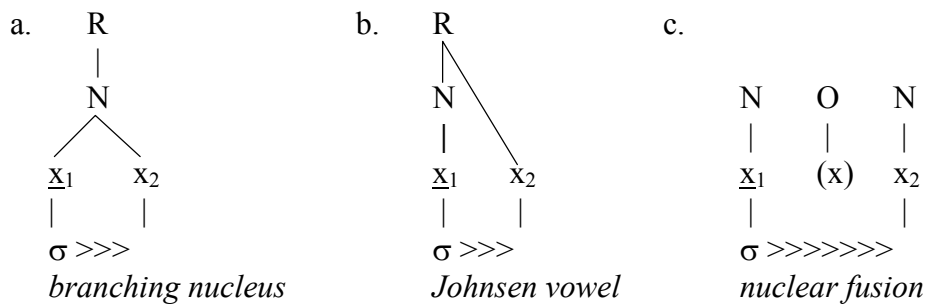
In GP this discrepancy between the behaviour of short and long vowels cannot be handled by feature manipulation, and other ways of accounting for phonological processes or their absence must be sought. It appears, however, that the facts concerning the behaviour of Irish long vowels and diphthongs are much more complex than the data in ((1)) may suggest. In this chapter we will consider cases where phonetically long vowels are in fact affected by the elements defining the quality of consonants, and show that the effects depend both on the formal (syllabic) and substantive (melodic) structure of long vowels. It will be shown how different structures produce different effects which in most cases resemble the facts encountered in the short vowel alternations.

First, various sources for long vowels in Irish will be discussed and appropriate structures proposed. Then instances of long vowel-consonant interaction will be considered. Finally, we return to the question of the immunity of long vowels to external influence.

3.1.1. Sources and structures of long vowels

Let us begin by stating the uncontroversial fact that in Irish not all long vowels are long underlyingly. Some of them will be shown to result from lengthening of lexically short vowels while others, although lexically long, need not be understood in a traditional way, i.e. as branching nuclei. Below, we introduce three types of representations for long vowels which will be discussed in this chapter.

(3)



((3)a) represents a branching nucleus which can be regarded as the structure of a true long vowel.

((3)b) was proposed by Lars Johnsen in Kaye, Hellan and Johnsen (1990) for Norwegian, and henceforth will be referred to as the "Johnsen vowel".² This vowel in which the melody from the nucleus spreads onto a metrically created position (x₂), to some extent resembles the structure to be proposed below for Irish. In both cases we are dealing with an underlying short nucleus which can either remain short or be lengthened depending on certain conditions. However, in Irish, the extra position is not created metrically. It is there underlyingly in the form of an empty non-nuclear rhymal position, i.e. a rhymal complement of a sonorant geminate (Cyran (1992, 1996a)). Thus the Irish version of the "Johnsen vowel" simply constitutes a case of compensatory lengthening rather than a metrical lengthening. An additional difference between the original "Johnsen vowel" and the Irish case lies in the fact that no melody spreading from the nucleus is required in the latter. This structure will be discussed at some length in 3.2 below.

²See Kaye (1992/96:310) for a discussion of that structure.

((3)c) represents a situation where two consecutive nuclei are fused under government. This structure requires an empty onset with or without a position. Both possibilities will be shown to exist in Irish in later sections. The main aim is to demonstrate that these structures behave disparately with respect to I-propagation, and thus need to be postulated to exist in Irish side by side. The different behaviour of these three structures is illustrated in ((4)), where the data sets (a), (b), and (c) correspond to the representations (a), (b) and (c) in ((3)).

(4)

a.	[kɑ:s]	<i>cás</i>	"case"
	[kɑ:ʃ]	<i>cáis</i>	"cheese"
	[ʃk'í'bo:l]	<i>scioból</i>	"barn"
	[ʃk'í'bo:l']	<i>sciobóil</i>	"barn-gs."
b.	[k'au]	<i>ceann</i>	"head"
	[k'i:n']	<i>cinn</i>	"head-gs."
	[laum]	<i>lom</i>	"bare"
	[li:m']	<i>loim</i>	"bare-gs."
c.	[k'u:nig']	<i>ciúnaigh</i>	"calm-voc."
	[k'u:'ni:m']	<i>ciúnaím</i>	"I calm"
	[k'u:'nu:]	<i>ciúnú</i>	"calming (V.N.)"

The initial assumption is that branching nuclei are not affected by palatalised consonants which is shown above in ((4)a). Below we will consider the possibility that the *Minimality Condition* (Charette (1989)) might take effect here. As for ((4)b), which shows the surprising [au / i:] alternation, it will be claimed that the melodic interaction obtains in exactly the same manner as in the case of short vowels, which will follow from the representation of such vowels. Namely, these are cases of compensatory lengthened vowels, hence the interaction with element spreading. Finally, the situation in ((4)c) will be dealt with at some length in 3.4 as there are a few aspects to consider.

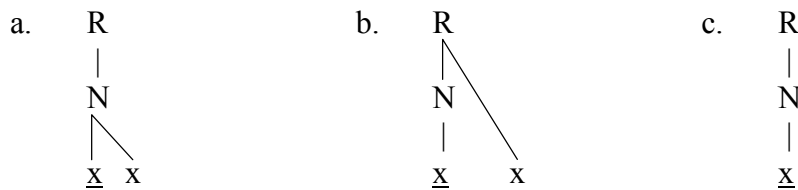
3.1.2. The Minimality Condition

We have seen that I-propagation differs from A-harmony in Irish in that palatalisation spreading is not directly dependent on internuclear government. This difference is manifested in, for example, the possibility of 'I' to propagate across governing domains which is ruled out in the case of A-harmony. The alternation [k'ark / k'ir'k'ə] "hen/gs." as opposed to [sp'al / sp'el'ə] "scythe/gs." illustrates this difference (cf. 2.3.5). In the case of A-harmony we also expect that this process will not affect long vowels. Can we say that I-propagation should also be unable to affect branching constituents, i.e. a branching nucleus? The question is whether we can explain the immunity of long vowels to the two processes by employing just a single condition which refers to their syllabic structure.

In GP all syllabic constituents are maximally binary and form head initial governing domains (KLV (1990)). The binarity theorem ensures that the governing relations in syllabic constituents are strictly local. The direction of constituent government is universally head-initial. Thus any ternary constituent structure would violate one of these formal conditions (1.2.1).

With relation to rhyme structure, the theory of government predicts three possibilities, presented in ((5)):

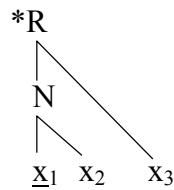
((5))



((5)c) is not a governing domain while ((5)a,b) represent the only possible rhyme structures which do not violate the conditions outlined above. On the other hand, GP precludes a structure of the following type.³

³Harris (1994a) suggests that the stringent principles defining syllabic constituents should be relaxed to accommodate such cases of super-heavy rhymes as English *find*, *chamber* and *draft*.

(6)



Such a structure violates the locality condition as x^1 and x^3 are not adjacent and no governing relation can be established between them. The structure in ((5)a) represents long vowels and heavy diphthongs which in Irish may not be affected by transmission of the element 'I'.

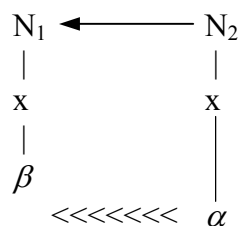
It has been proposed that governing domains resist government by a remote governor.⁴ In phonology, the Minimality Condition was examined by Charette (1989). In order to account for the asymmetry in the behaviour of branching and non-branching constituents she proposes that phonological government is subject to the minimality condition.

THE MINIMALITY CONDITION

α does not govern β if γ is the IMMEDIATE projection of δ excluding α .

To understand what is meant by this definition let us imagine that in a given language the nuclei N_1 and N_2 normally contract a governing relation in which N_1 is governed by N_2 .

(7)



⁴The Minimality Condition was first proposed by Chomsky (1986) for syntax.

One possible outcome of such a relation may be the spreading of melodic material from the governor (N₂) to the governee (N₁).⁵ To illustrate this phenomenon Charette provides the following examples of Korean umlaut.

(8)

<i>Radical</i>	<i>Subject</i>	<i>Gloss</i>
[pam]	[pæm-i]	"night"
[tam]	[tæm-i]	"wall"

The mutation is described as the propagation of the element 'I' of the subject marker (the suffixal vowel) to the stem vowel under internuclear government, which results in the (I.A) combination.

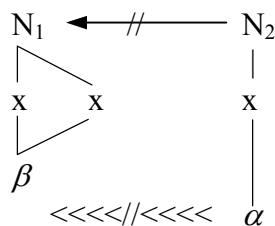
However, in the case of long vowels the propagation is blocked.

(9)

<i>Radical</i>	<i>Subject</i>	<i>Gloss</i>
[pa:m]	[pa:m-i]	"chestnut"
[ta:m]	[ta:m-i]	"energy"

It is in ((9)) above that the Minimality Condition investigated by Charette takes effect due to the fact that the governee in such forms (N₁) itself constitutes a governing domain (a branching nucleus) as shown below.⁶

(10)



⁵In "non-dynamic" terms spreading may be understood as the static identification of a governed (licensed) position with its governor (licenser) with respect to melodic material lexically lodged in the latter (see e.g. Harris (1990b)).

⁶This is an indecently oversimplified illustration of the application of the Minimality Condition as it does not include the relevant projections mentioned in the definition. The reader is referred to Charette (1989) for details.

Under our analysis, the process of palatalisation transmission in Irish appears to be parallel to Korean umlaut in that it can affect short vowels only, but this does not seem to take place under government (except for A-harmony). Thus 'I' can spread virtually unhindered across governing domains as long as they are not branching nuclei. Whether this is an effect of the Minimality Condition or perhaps of some other conditions remains to be seen. First, the long vowels in Irish must be subjected to a closer inspection.

Two things, however, force us to think that the immunity of long vowels cannot be sufficiently explained by the Minimality Condition. First, the nature of I-propagation does not seem to be government driven, although the effects of that process might be described as I-licensing. Second, it seems intuitively more appropriate to connect the behaviour of long vowels with the "opaque" short nuclei. In other words, the Minimality Condition may explain the non-interaction in the case of long vowels but it has nothing to offer as far as the immune short vowels are concerned. Additionally, it will be shown that the immunity of long vowels and diphthongs is not overwhelmingly regular.⁷ The first instance of an irregularity is presented below.

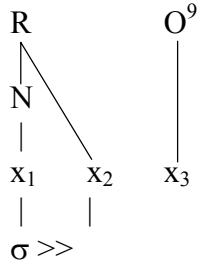
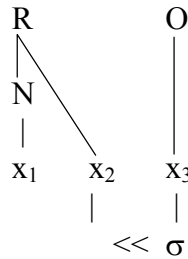
3.2. Vowel lengthening before "tense" sonorants

Although there are a few lengthening processes in Irish (Ó Siadhail (1989:49-56)), we will concentrate first on the phenomenon of compensatory lengthening in which the resultant vowel resembles the "Johnsen vowel" (Kaye, Hellan and Johnsen (1990)) which in Irish, as mentioned above, has its source in sonorant geminates (Cyran (1992, 1996a)). First, compare the structures of the "Johnsen vowel" with that of geminates.⁸

⁷One should mention in this context the fact that certain umlaut phenomena in Germanic dialects appear to constitute a glaring counterexample to minimality as both long and short vowels seem to undergo umlaut.

⁸The structure of geminates is reproduced from KLV (1990:217).

(11)

a. *Johnsen vowel*b. *The syllabic structure of geminates*

A skeletal position cannot be normally governed by two governors. The case of the non-nuclear rhyml position (x_2) constitutes an exception here. Charette (1989:183) argues that this position has to be doubly governed. Thus it is governed by the head of the rhyme (x_1), within the constituent rhyme, and by the following onset (x_3) across constituents (*Coda Licensing*). In Irish, this ambiguous situation - two governors compete for the rhyml complement - results in different effects depending on the context, as is illustrated below.¹⁰

(12)

[gaun]	<i>gann</i>	[gan'ə]	<i>gainne</i>	"scarce/gs."
[ba:r]	<i>barr</i>	[barə]	<i>barra</i>	"top/pl."
[k'i:l']	<i>cill</i>	[k'il'ə]	<i>cille</i>	"churchyard/gs."
[aum]	<i>am</i>	[amə]	<i>ama</i>	"time/gs."
[baun]	<i>bonn</i>	[bonər'ə]	<i>bonnaire</i>	"sole/walker"

The "Johnsen vowel" is found when the geminate is followed by an empty nucleus. In Cyran (1992) this phenomenon is attributed to the licensing properties of empty nuclei in Irish. Since the structure of geminates involves an interconstituent governing relation, the head of

⁹The onset is provided here for two reasons. First, according to the Coda Licensing Principle (Kaye (1990)) any rhyml complement (here x_2) must be licensed by the following onset. Second, the inclusion of the onset illustrates the relation between the two structures.

¹⁰Phonetically speaking the contrast between plain sonorants and geminates is still retained in Donegal and North Connacht Irish. These dialects, however, do not normally exhibit the vowel lengthening in this context which we find in Munster.

this relation, i.e. the onset, has to be licensed to govern.¹¹ This follows from the Government Licensing principle discussed above in 1.4.1.

GOVERNMENT LICENSING

For a governing relation to hold between a non-nuclear head α and its complement β , α must be government licensed by its nucleus.

The head of the geminate in Irish can only be licensed to govern by an expressed vowel. Therefore, the non-nuclear rhymal position, which cannot be governed by its non-nuclear head (the onset), is taken over by the rhyme in that the melody from the nucleus is spread onto this position.¹²

Having seen the mechanism of vowel lengthening before such sonorant geminates, let us now look at the qualitative alternations that obtain in these structures. The following data illustrate the case in point.

(13)

a.	[laum]	[li:m']	[lim'ə]	
	<i>lom</i>	<i>loim-gs.</i>	<i>loime-comp.</i>	"bare"
b.	[k'aun]	[k'i:n']	[k'anə]	
	<i>ceann</i>	<i>cinn-gs.</i>	<i>ceanna-pl.</i>	"head"
c.	[klaun]	[klin'ə]	[klənə]	
	<i>clann</i>	<i>clainne-gs.</i>	<i>clanna-pl.</i>	"children"
d.	[ba:r]	[ba:r']	[barə]	
	<i>barr</i>	<i>bairr-gs.</i>	<i>barra-pl.</i>	"top"

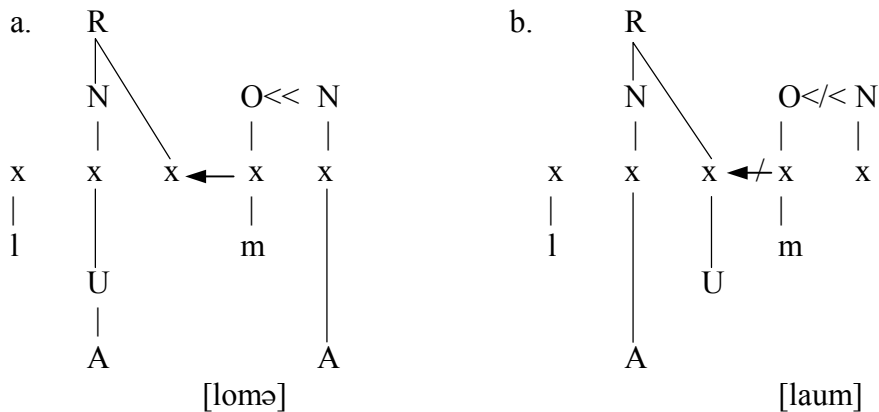
In Munster Irish, the lengthened vowel usually takes the form of a diphthong which, in some cases, can be viewed as decomposition of the vowel in the first nucleus. Before 'r' the lengthened vowel is usually [ɑ:].¹³ Below, the process of decomposition in the word [laum] ((13)a) is illustrated. The underlying melody in the first nucleus is assumed to be [o] (cf. [lomə] *loma* "bare-npl.").

¹¹In fact, in the case of geminates it is proposed in KLV (1990) that there is a relation of proper government between the head of the geminate and the rhymal complement.

¹²Below, the vocalisation of the rhymal complement will receive an alternative interpretation in which the melody of the nucleus need not spread.

¹³See the section on r-sounds (4.2.5) for a possible explanation of this point.

(14)



(<<) license to properly govern

(←) proper government

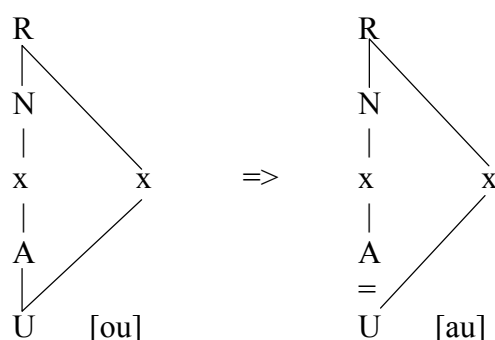
(/) absence of relation

((14)) represents the underlying structure of *loma* and *lom*, both of which contain a geminate. The rhymal complement can either be properly governed and not realised as in [lomə] ((14)a) or be taken over by the rhyme and form a diphthong ((14)b). In the former case, the first nucleus remains short. This is possible only when the geminate is followed by a phonetically realised vowel. When the geminate head is followed by an empty nucleus it is not licensed to properly govern, and its complement is "taken over" by the rhyme.

It should be noted that the form [laum] is the result of a fairly recent development in Munster Irish. In most sources, the word is usually transcribed as [loum] (Wagner (1964:268), Ó Cuív (1975:30)). On the other hand Sjoestedt (1931:8) transcribes this word as [laum]. The development from [ou] to [au] can be captured in the following way; in [ou] the element 'U' of the compound (U.A) spreads to the complement, while in [au], 'U' seems to be lost from the nucleus. This is demonstrated below.¹⁴

¹⁴These structures were suggested to me by Edmund Gussmann (p.c.).

(15)



There is one problem connected with this analysis. Namely, it involves spreading of the element 'U' from left to right, and we have demonstrated that this element spreads from the right-hand context. One way to account for this complication is to assume that different directionality of spreading is related here to the governing relation within the constituent rhyme, while the familiar cases of U-spreading from the right do not take place under government.

An alternative analysis of *lom* / *loma* is also available which suggests itself when the form [lim'ə] *loime* "bare-comp." is considered. This form clearly indicates that the vowel [o] is susceptible to I-spreading. This, in turn, suggests that this vowel should be represented as (A.) rather than (U. A).¹⁵ If this is the case, then we may not view the diphthong [au] as a decomposed [o]. Additionally, there are other data which show that the element 'U' in the "Johnsen vowel" diphthongs must have a different source than the nucleus. Consider the forms below.

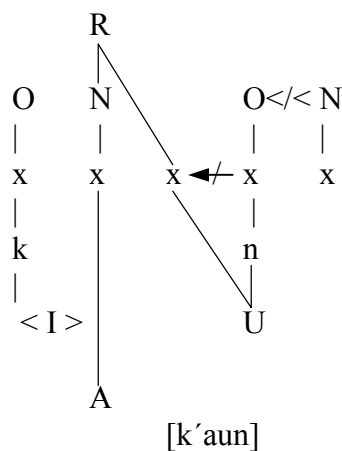
(16)

- | | | | | | |
|----|--------------------|---|------------------------------|----------------------------|--------------|
| a. | [laum] or [loum] | / | [lomə] | <i>lom</i> / <i>loma</i> | "bare/npl." |
| | [draum] or [droum] | / | [dromə] | <i>drom</i> / <i>droma</i> | "back/gs." |
| b. | [k'aun] / [k'anə] | | <i>ceann</i> / <i>ceanna</i> | | "head/pl." |
| | [klaun] / [klanə] | | <i>clann</i> / <i>clanna</i> | | "tribe/pl." |
| | [gaun] / [gan'ə] | | <i>gann</i> / <i>gainne</i> | | "scarce/gs." |

¹⁵Recall the case of [sop / sip'] as opposed to [kos / koj] and the structures for alterable vowels proposed in 2.4.5.

In the case of [laum] and [draum] we can view the diphthong [au] as a result of decomposition (cf. [lomə]). The data in ((16)b), however, show the problem quite clearly. Namely, there are cases where we cannot relate the diphthong [au] satisfactorily to the content of the nucleus because these forms alternate with [ɑ] or [a] rather than with [o]. So decomposition cannot be the source of this diphthong. It may be proposed that the element 'U' in [au] of [k'aun] and [laum] and in [ou] of [loum] has its local source in the velarised sonorant geminate. Consider the structure below.

(17)



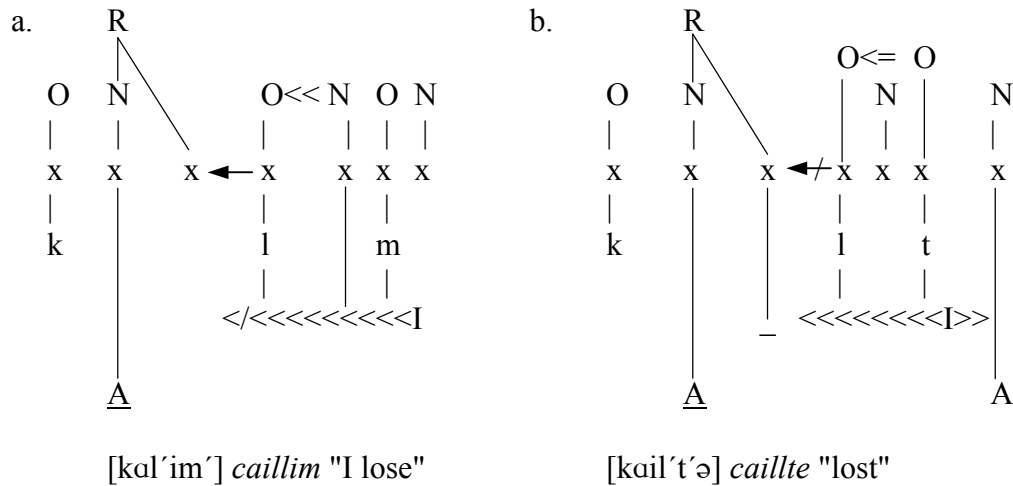
The domain final nucleus is empty and it cannot license the head of the preceding geminate to properly govern its rhymal complement. The element 'U' is present in the melodic make-up of the velarised geminate. This phenomenon can be understood as a result of the identification of the rhymal complement by the geminate head, and seems to support this analysis in that this identification is exactly what is expected in the case of a non-nuclear rhymal complement. Recall that the rhymal complement must be licensed by the following onset (*Coda Licensing* (Kaye (1990))).

If this analysis is correct, and there is no other local source for 'U', then we have another reason for having this element in the representation of velarised consonants. Recall that [a] is immune to U-spreading, hence the element 'U' can only go as far as the rhymal position (hence [k'aun] and not *[k'oun]).

There is some evidence supporting this analysis. It was mentioned earlier that the "Johnsen vowel" interacts with consonants in the same way as short vowels do. This is hardly surprising given the structure of the vowel. This, among other things, also means that in some cases the vowel [ɑ] will not interact with the following palatalised consonant. Recall the examples like [ban'ə] *bainne* "milk" or [bal'ə] *baile* "home" where no I-propagation

takes place. The structures below illustrate two possible outcomes when the vowel involved is [a] and the following geminate is palatalised.¹⁶

(18)

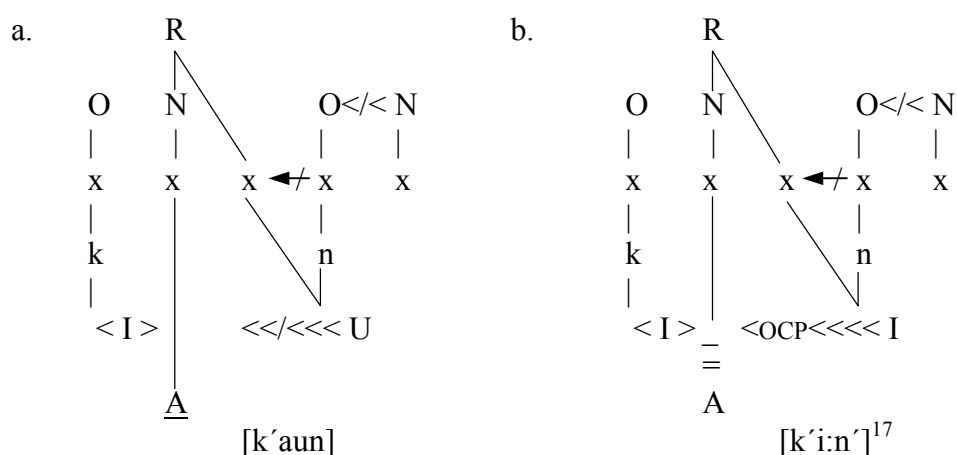


Thus the non-interacting [a] remains intact in [kal'im'] as it did in [bal'ə]. When the head of the geminate is licensed to govern the rhymal complement, this complement remains unrealised in Irish. On the other hand, when the head of the geminate cannot govern its complement it is taken over by the rhyme (in a metaphorical sense). In [kail't'ə], the element 'l' cannot spread onto the nucleus because we are dealing with the non-interacting "opaque" [a] here too. However, it remains linked to the rhymal complement yielding the diphthong [ai]. Notice that this is exactly what happens in [k'aun] where there is no other local source for the element 'U' in the diphthong than the following sonorant, and also the 'U' could not affect [a] in [k'anə] because the nucleus is headed. In other words, the whole pattern of vocalic modifications observed in short nuclei is basically maintained in the case of lengthened vowels of the "Johnsen vowel" type.

¹⁶ In *caillte* we are dealing with interonset government which in Irish overrides the Government Licensing principle (Cyran (1996a)). Normally, in a word-medial situation an empty nucleus which directly follows a governing domain - in this case a sonorant geminate - has to be realised in order to government license the head of the geminate to govern its complement. If, however, the following onset is homorganic with the head of the geminate they may contract a governing relation. The second onset must be followed by an expressed vowel. In this case, the head of the geminate cannot govern its complement because it is not licensed to do so, the reason being that the following nucleus is now trapped in the interonset relation and cannot be realised. This results in lengthening of the preceding nucleus. See Cyran (1992, 1996a) for details.

Thus [kal'im' / kail't'ə] *caillim* / *caillte* "I lose / lost" corresponds to [kat / kat'] *cat* / *cait* "cat/gs.", while [k'aun / k'anə] *ceann* / *ceanna* "head/pl." is analogous to the facts observed in [f'ar / f'ir'] *fear* / *fir* "man/gs." in two ways. First, the front [a] (as in [f'ar]) remains immune to U-spreading both in [k'anə] and in the case of the compensatorily lengthened vowel, i.e. [au]. Second, the front [a] has been shown to be affected by I-spreading ([f'ir']). Thus we should expect A-suppression when the front [a] is affected by palatalisation in the genitive form of "head" which additionally exhibits lengthening. Recall that the susceptibility of [a] (as opposed to [ɑ]) to I-propagation was tentatively ascribed to an OCP effect. Compare again *ceann*, where [a] is opaque to U-spreading (as in *fear*), but not to I-spreading in *cinn* "head-gs" (cf. *fir*).

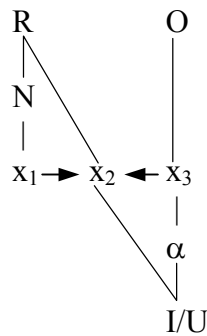
(19)



Thus, the structure of the "Johnsen vowel" accounts for two things. First, it allows us to understand the mechanism of vowel lengthening before the "lengthening" sonorants. And second, it explains neatly that the vocalic alternations involved in these forms are merely a repetition of the regularities already established on the basis of short vowels. This stresses the need to postulate the structure of the "Johnsen vowel" in the phonological representation of Irish, the relevant portion of which is represented below.

¹⁷Given just the surface alternation [au / i:] in *ceann* / *cinn* one might be hard put to account for such an alternation especially since the predominant pattern, found with other [au] diphthongs, is different (see Cyran (1995) and section 3.3.3).

(20)



The interpretation of this structure is conditioned and depends on whether the rhymal complement is properly governed (licensed as in [k'anə] *ceanna*) or not ([k'aun] and [k'i:n']). This in turn depends strictly on the nature of the nucleus which follows the onset head.¹⁸ One should bear in mind, however, that this structure is not an exact copy of the vowel proposed by Johnsen and differs in two respects. First, the rhymal complement (x_2) is not created metrically, but rather, it is present in the underlying representation of Irish sonorant geminates. And second, the melodic content which is realised under (x_2), i.e. in cases of compensatory lengthening, is not provided by the nucleus (x_1) but by the onset head (x_3). In this respect, the Irish response to the "Johnsen vowel" is a pure instance of a compensatorily lengthened vowel.¹⁹

3.3. Long vowels and diphthongs: distributional restrictions

The "Johnsen" vowel, as we have seen, need not constitute a counterexample to the general claim that long vowels are immune to element spreading. Given that it is underlyingly short, the astonishing alternations in which this form participates, e.g. [k'aun / k'i:n'] *ceann / cinn* "head/gs.", are not only unsurprising but in fact expected. Thus, having excluded the set of data involved in the phenomenon of vowel lengthening before certain sonorants from our

¹⁸An alternative proposal to the one presented here assumes that Irish sonorant geminates form interonset governing domains rather than rhyme-onset ones (Bloch-Rozmej (1994)).

¹⁹This synchronic instance of compensatory lengthening as diphthongisation is in agreement with the proposals put forward in de Chene and Anderson (1979).

analysis of phonologically long vowels, we may now turn to the problems concerning the latter group.

The greater freedom of long vowels to occur in different contexts is explained by the general immunity of long vowels to I-propagation, which, as suggested earlier, may be accounted for by the notion of headedness of certain short, and most of the long, vowels, or by means of the *Minimality Condition* (Charette (1989)). However, in the light of examples showing that I-propagation cannot be treated as a direct instantiation of internuclear government, because we would have to accept government over a governing domain, the effect of this condition in Irish will also have to be revised, especially, that there are exceptions to the generalisation that long vowels are immune to palatalisation, and as will be seen below, these exceptions are of a regular nature. In what follows we concentrate on the effects of I-spreading, which are more spectacular than those of U-spreading, as has been shown in the discussion of short vowels.

3.3.1. Munster [e:]: composition and decomposition

Let us now consider some intriguing phenomena which are practically the only productive alternations in Irish involving true long vowels. The data in ((21)) are taken from Ó Siadhail (1989) and display the regular [iə / e:] alternation which is common to practically all dialects.

(21)

[gr'íəɲ]	/	[gr'e:n'ə]	<i>grian</i> / <i>gréine</i>	"sun/gs."
[k'íəɪ]	/	[k'e:l'ə]	<i>ciall</i> / <i>céille</i>	"sense/gs."
[kl'íəv]	/	[kl'e:v'ə]	<i>cliabh</i> / <i>cléibhe</i>	"chest/gs."
[iəsk]	/	[e:fk']	<i>iasc</i> / <i>éisc</i>	"fish/gs."
[m'íəɲ]	/	[m'e:n'ə]	<i>mian</i> / <i>méine</i>	"desire/gs."

It should be noticed that the [iə/e:] alternation takes place in a well defined context, i.e. [iə] occurs between a palatalised and a velarised consonant (C'-C). On the other hand, this diphthong corresponds to [e:] when both flanking consonants are palatalised (C'-C'). Notice that the process takes place regardless of whether the palatalised consonant is followed by an inflectional vowel or not (cf. [gr'e:n'ə] vs. [e:fk']).²⁰

²⁰There are exceptions to this phenomenon (e.g. [bl'íəɲ] *bliain* "year") which are rather marginal.

The question is how to treat these alternations, assuming that [e:] should be represented as a branching nucleus. The data in ((21)) might suggest that it is the diphthong [iə] which is underlying and that it becomes [e:] when the following consonant is palatalised. In fact, this assumption seems to be correct for a variety of reasons. First of all, one should note the pandialectal character of this phenomenon, i.e. [iə/e:], while in Munster there is a separate phenomenon whereby a long [e:] has to be modified in the same context, i.e. in C'-C, and the result is [ia].²¹ Secondly, [e:] is regularly found in the C'-C context outside Munster, which suggests that [iə], although restricted to this particular context, is not derived from [e:].

Let us assume then that the diphthong [iə] in ((21)) is indeed underlying and undergoes monophthongisation when the following consonant is palatalised, while [ia] is derived from [e:] in Munster exactly in the context in which [iə] occurs, i.e. C'-C. Since [e:] is allowed in the C'-C' context, there will be no decomposition of [e:] in that context, or in fact in any other context except C'-C.²²

The data below illustrate this typical Munster development where an otherwise long [e:] is realised as [ia] if the following consonant is not palatalised (Ó Siadhail (1989:62), Ó Cuív (1975:25), Sjoestedt (1931:104)).

(22)

[m'iar]	/	[m'e:r'ə]	<i>méar / méire</i>	"finger/gs."
[ian]	/	[e:n']	<i>éan / éin</i>	"bird/gs."
[k'ial]	/	[k'e:l']	<i>scéal / scéil</i>	"story/gs."
[b'ial]	/	[b'e:l']	<i>béal / béil</i>	"mouth/gs."
[f'iar]	/	[f'e:r']	<i>féar / féir</i>	"grass/gs."

Although most of the velarised consonants quoted in the context C'iaC are coronals, this need not be a condition for the replacement of [e:] by [ia]. Ó Cuív (1975:25) mentions also

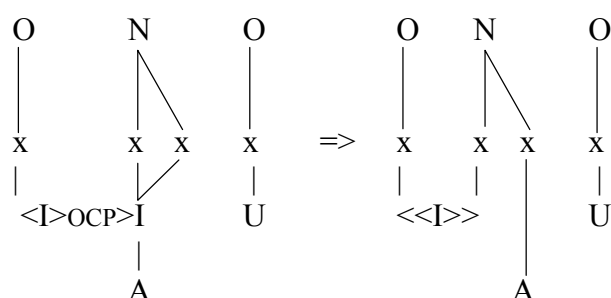
²¹The symbol [ia] is used here to represent this diphthong, following Ó Cuív (1975), although it has to be treated as a convention of phonetic transcription rather than the actual phonological form. (Ó Siadhail (1989) and Sjoestedt (1931) transcribe this diphthong as [i:ə]). It is important to note that [iə] and [ia] are contrastive in Munster, e.g. [iəd] *iad* "they" contrasts with [iad] *éad* "jealousy".

²²Ó Cuív (1975:16) quotes forms like [bi'd'e:l] *buidéal* "bottle" where the C'-C context is removed from the word-initial position, and words in which the following consonant is [χ], e.g. [dr'e:χt] *dréacht* "part", where [e:] can appear in Munster Irish.

forms with a velar and labial consonant ([iag] *éag* "death", [p'ɾ'iaɪ] *préamh* "root").²³ On the other hand, it seems that the physical presence of a velarised consonant is crucial in the transition to the diphthong [ia] as it does not occur in word-final position (unlike [iə], see [d'ia / d'e:hə] *dia / déithe* "god/pl." in 3.3.5).

Schematically we may represent the decomposition of [e:] to [ia] in the following way.²⁴

(23)



The decomposition of [e:] may be viewed as an OCP effect whereby the element shared with the preceding onset cannot spread to the second position in the nucleus. This account, however, is far from satisfactory as it does not explain why the element 'A' remains linked only to the second position or why 'U' is required in the following onset. Thus, it appears that we seem to be dealing with two different [e:]'s in Munster; one of them results from fusion (composition) of [iə], while the other decomposes into [ia].

Let us first look more closely at the [iə] / [e:] alternation ((21)) and the distribution of these sounds in Irish. As mentioned above, this alternation does not only concern the Munster dialect.

3.3.2. The [iə] contexts

The most productive context for [iə] is the one presented in ((21)), namely, between a palatalised and a velarised consonant (C'-C). This diphthong can also occur quite regularly in

²³Nonetheless, this observation has to be borne in mind when the segmental make-up of coronals is analysed in chapter 4.

²⁴This analysis is problematic in that the resulting structure of the diphthong [ia] seems to be disallowed in GP (see below).

two other phonetic contexts, i.e. word finally after a palatalised consonant (C'-) e.g. [d'íə] *dia* "god", and word-initially before a velarised consonant (-C) e.g. [iəsk] *iasc* "fish". In the latter case the diphthong [iə] is preceded by an empty onset with which it "shares" its palatalisation element. Formally, the empty onset need not be associated with the element defining palatalisation (which is also the case with consonants which resist palatalisation (cf. [rɪ])).²⁵ Furthermore, evidence will be offered which shows that at least in some cases the word-final [iə] may be followed by a phonetically empty onset which is realised in some contexts.²⁶

((24)) summarises the contexts mentioned above.

(24)

a.	iəC	[iəd]	<i>iad</i>	"they"
		[iəsk]	<i>iasc</i>	"fish"
		[iəl]	<i>iall</i>	"thong"
b.	C'íə	[b'íə]	<i>bia</i>	"food"
		[d'íə]	<i>dia</i>	"god"
		[f'íə]	<i>fia</i>	"deer"
c.	C'íəC	= ((21))		
		[gr'íən]	<i>grian</i>	"sun"
		[k'íəl]	<i>ciall</i>	"sense"
		[kl'íəv]	<i>cliabh</i>	"chest"

²⁵Recall the discussion of the licensing options of the "shared" element which involve a situation in which such an element may be associated with both "partners", i.e. onset and nucleus, as in [b'í] *bith* "existence", or only to one of them e.g. [g'ulə] *giolla* "servant" (with the onset), or [iəd] *iad* "they" (with the nucleus). The "shared" element may also remain unlicensed by any of the partners, as in [oxir'] *eochair* "key", in which case the element 'l' shows up by associating with the onset of the preceding definite article e.g. [ən' oxir'] (see also 3.4.1 for more details concerning these options.).

²⁶To illustrate this point the alternation [d'íə / d'e: / d'e:hə] *dia* / *dé* / *déithe* "god/gs./pl." may be mentioned. This exhibits the same latent [h] as the monosyllabic forms like [l'a / l'ehə] *leath* / *leithe* "half/gs" discussed in chapter 2.

In ((21)) we saw that in the case of [gr'ia̯n] the diphthong [ia̯] is monophthongised if the following consonant is palatalised. The alternation with [e:] is found with some words of the ((24)a,b) type too.

(25)

a.	[iəsk]	/	[e:jk']	<i>iasc / éisc</i>	"fish/gs."
	[iəl]	/	[e:l'ə]	<i>iall / éille</i>	"thong/gs."
b.	[d'ia̯]	/	[d'e:]	<i>dia / dé</i>	"god/gs."

The three contexts summarised in ((24)) are identical from the phonological point of view. Word initial empty onsets are defined for 'I' or 'U' quality regardless of the fact that these elements may not be physically associated. The word-final context (C'ia̯) is problematic in this light as there seems to be no consonant following the diphthong which can be said to account for the monophthongisation in [d'ia̯ / d'e:]. Recall that [e:] cannot be decomposed to [ia] in this context, which suggests that the physical presence of a velarised onset following [ia] is required. It is not certain if the same can be said about [ia̯] as there are some data which suggest that this diphthong is not truly final.

Consider the following data which in fact resemble the monosyllabic forms containing a latent [h], e.g. [b'i / b'ahə] *bith / beatha* "existence" and [l'a / l'ehə] *leath / leithe* "half/gs.". ²⁷

(26)

[d'ia̯] nom.	[d'e:] gs.	[d'e:hə] pl.	<i>dia</i>	"god"
[b'e:] nom.		[b'e:hə] pl.	<i>bé</i>	"maiden"
[kl'ia̯] nom.		[kl'e:hə] gs.	<i>cliath</i>	"hurdle"

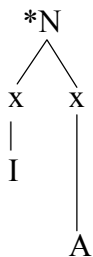
The condition for the final [h] to appear is that it has to be followed by an expressed nucleus. There is no vocalic inflectional ending to fulfil this condition in the nominative and genitive case of "god" ([d'ia̯ / d'e:]), and the case contrasts are expressed by palatalisation alone

²⁷The actual phonological representations illustrating the alternations [d'ia̯ / d'e: / d'e:hə] are provided in the following section where a formal structure for [ia̯] is proposed.

which is responsible for the [iə/e:] alternation (cf. [gr'ian / gr'e:n'ə] ((21))). Only in the plural form is the [h] licensed due to the inflectional ending (parallel to [b'ahə]).²⁸

We have decided that [iə] is underlying. The question is, however, what structure should be ascribed to this diphthong. Since it alternates with [e:], one might be inclined to postulate a branching nucleus, in which case the contrast between [e:], [iə] and [ia] would be difficult to represent, as the formal structure of a branching nucleus does not offer enough flexibility to accommodate both [iə] and [ia]. Additionally, a branching nucleus containing 'I' as the head and 'A' as the operator under the right hand side position ((27)) does not appear to be possible. This, in standard GP, used to be expressed by the ban on structures in which a charmless segment governs a positively charmed one (cf. KLV (1985)). Now that we are not taking charm into account, the same restriction may follow from the impossibility of a headless object governing a headed one.²⁹

(27)



At any rate, such phenomena as composition of [iə] to [e:], and especially the decomposition of [e:] to [ia], are not typical of branching nuclei, a behaviour which Munster [e:] features with a vengeance.³⁰ Thus we need to take a closer look at the structure of long vowels in Irish, bearing in mind that if [iə] and [ia] are shown not to be subsumed under a branching nucleus then we have to say the same about [e:]. On the other hand, if we give up the idea that long [e:] is a branching nucleus, how will this fact impinge on the whole vocalic system, and on the structure of pure long vowels in particular?

²⁸It must be stressed that the latent [h] may not be treated as part of the plural ending. One reason for this is the fact that this consonant appears also when the genitive marker is added e.g. [kl'e:hə]. Additionally, it is claimed that this consonant was still pronounced in word final position (as part of the stem) at the beginning of this century (Sjoestedt (1931:50)).

²⁹Recall that the elements 'I' and 'A' are allowed to combine into an A-headed object in Munster, i.e. (I.A).

³⁰Recall, for instance, the inaccessibility of branching nuclei to I-spreading in Korean (3.1.2).

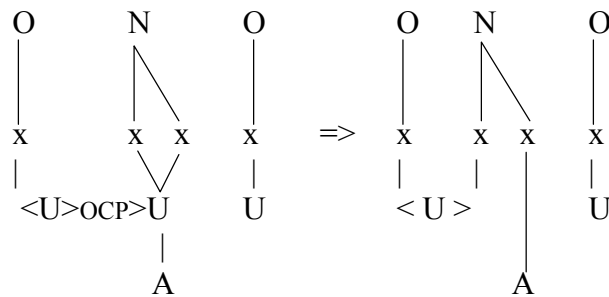
The first thing that strikes us is the fact that from the distributional point of view [iə] is highly restricted and may only appear in the C'-C context, a restriction which does not tally with the facts about pure long vowels (except [e:]). A change of one parameter concerning the quality of flanking consonants will render the structure contrastive. Namely, if the following consonant is palatalised, then we get [e:], and when the preceding onset is not palatalised, then we get [uə].

In the following section we discuss the correspondence between the two diphthongs [iə] and [uə] in the hope of revealing their structures.

3.3.3. The [iə / uə] parallelism

We have seen that the diphthong [iə] can alternate with [e:]; parallel to that we might expect [o:] to decompose to [uə] following a velarised consonant. Our discussion raised the possibility that velarised consonants (at least in Munster) contain the element 'U'. Recall that [o:] is a compound containing 'U' and 'A'.

(28)



[o:] > [uə]

((28)) shows what we would expect in the case of [o:], parallel to the alternations involving [e:]. Such structures do not arise too often, and alternations between [o:] and [uə] can only be found in the form of variants of pronunciation rather than as a productive process (Ó Siadhail (1989:64)).³¹

³¹In a sense, this situation should not be surprising, recall that the "shared" 'I' exhibits a stronger influence on headed objects than 'U' (cf. the fronting [ɑ:]>[a] in *fear*, or [ɑ:]>[a:] in [br'a:] *breá* "fine").

(29)

	MUNSTER	CONNEMARA	
<i>mór</i>	[muər]	[mo:r]	"big"
<i>nua</i>	[no:]	[nu:]	"new"
<i>fógra / fuagra</i>	[fo:gərə]	[fuəgrə]	"notice"
<i>cnósach / cnuasach</i>	[kno:səχ]	[knuəsəχ]	"collection"

Although the existence of such inconsistent variants is not devoid of significance, we have no grounds to treat their occurrence as due to a synchronic process. Nevertheless, as in the case of [iə], the context in which [uə] can be found is also subject to stringent restrictions.

The phonetic distribution of [uə] is parallel to that of [iə]. The two diphthongs are in complementary distribution to the effect that [uə] can only follow a velarised consonant, although, in contradistinction to [iə], it can be followed by a palatalised consonant, too.³² The effects in the latter context are quite intriguing.

(30)

uəC'	[uɣ']	<i>uaidh</i>	"from him"
	[uɪr']	<i>uair</i>	"time"
uəC	[uəsəl]	<i>usal</i>	"noble"
	[uən]	<i>uan</i>	"lamb"
Cuə	[buə]	<i>bua</i>	"victory "
	[ruə]	<i>rua</i>	"red-haired"
CuəC'	[klum']	<i>chuain</i>	"meadow"
	[fum']	<i>fuaim</i>	"sound"
CuəC	[muər]	<i>mór</i>	"big"
	[buəχəl']	<i>buachaill</i>	"boy"

³²The second member of the diphthong followed by a palatalised consonant is a mid to high vowel [ɛ] (Sjoestedt (1931:105)) or [ɪ] (Wagner (1964:32)). Sjoestedt compares the sound to German *ä* in *tätig*. Both transcriptions try to reflect the fact that we are dealing with a reduced (schwalike) sound which is coloured by 'l'. Here we will use the symbol [ɪ] to better illustrate the difference between the [uə] followed by a velarised onset and the one affected by palatalisation.

The similarity between [iə] and [uə] is obvious. In both cases the first element is conditioned by the type of the consonant it follows. This can be summarised in the following way.

(31)

C' iə	*C' uə
C uə	*C iə

It is striking that the restrictions concerning the occurrence of [iə] and [uə] are parallel to those concerning the nuclei in apparent monosyllables, e.g. [b'i] and [pu] discussed in 2.1.6. Note also that these restrictions are reminiscent of what we observed about short [u] and [i], i.e.:

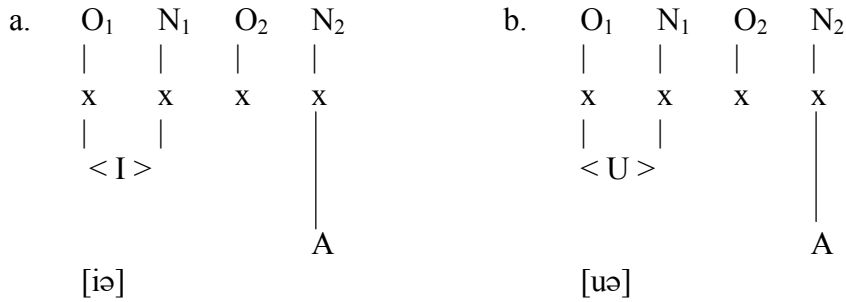
(32)

*C' u C'	e.g. [m'ik'] <i>mic</i> "son gs."	*[m'uk']
*C i C	e.g. [muk] <i>muc</i> "pig"	*[mik]

For the time being let us disregard the material following the diphthongs. The affinity of the two diphthongs is obvious and the fact that their distribution is mutually exclusive cannot be ignored. It seems peculiar that their occurrence should be so highly conditioned, especially if [iə] and [uə] are to be subsumed under branching nuclei. Recall that not only can long [u:] follow a palatalised consonant (cf. [k'u:n'] *ciúin* "quiet") but also the short [u] can do so, e.g. [m'un] *mion* "small"; when U-spreading is involved. Why should the first element of [uə] be prevented from occurring when preceded by a palatalised onset? The same can be said about the diphthong [iə]. We have words where [i:] can follow a velarised consonant e.g. [ti:] *tuí* "straw". On the other hand, when short [i] is taken into account, then phonetically it can follow a velarised consonant, again, only if it results from I-spreading e.g. [kid'] *cuid* "part".

All this suggests that the first elements of the diphthongs [iə] and [uə] must be treated as independent short nuclei, or independent of the rest of the diphthong, while clearly the first elements of [iə] and [uə] are dependent on the type of preceding onset. Thus, provisionally, we may suggest the following structures.

(33)



For the purpose of clarity we ignore the possibility that O₂-N₂ might share 'I' or 'U'. However, this point will be addressed below as it appears to constitute a problem for the proposed *Sharing Condition*.³³

In the structures above, the first nucleus seems to be as directly dependent on the preceding onset as in *bith* and *puth*. Therefore this part of the diphthong should be treated as a separate nucleus. This entails the presence of an empty onset (O₂) to separate the first element of the diphthong from the second one. Let us assume that the empty onset contains a position. We may now look at further similarities and differences between [iə] and [uə] which are manifested in the behaviour of the second part of the diphthongs. It has been shown that [uə] has a broader range of occurrence than [iə] as far as its phonetic distribution is concerned, in that it can be followed by a palatalised consonant. Recall that in such cases [iə] is realised as [e:].

This claim has to be made more specific. [uə] can be followed by a palatalised consonant but this does not remain without effect on the ultimate phonetic shape of that diphthong. As opposed to the [iə/e:] alternation, where spreading of 'I' integrated the melodic expression, 'I' propagation in the case of [uə] results in further strengthening the distinction between both elements of the diphthong. Some more data are supplied below (Sjoestedt (1931:105)).³⁴

³³Recall that every O-N governing domain is defined by the presence of 'I' or 'U' in Irish. One exception to this condition seems to be empty nuclei (2.4.5).

³⁴Sjoestedt (1931:105) transcribes the second element of the affected diphthong as [ε]. We assume that [ɪ] is equally correct (see the discussion below).

(34)

[buəɫə]	/	[buɾl'ím']	<i>bualadh / buailim</i>	"beat V.N./1st.sg"
[kuən]	/	[kum']	<i>cuan / cuain</i>	"harbour/gs."
[kruəχ]	/	[kruɪh'ə]	<i>cruach / cruaiche</i>	"stack/gs."
[uəsəl]	/	[uɪfl'ə]	<i>uasal / uaisle</i>	"noble/pl."
[uən]	/	[um']	<i>uan / uain</i>	"lamb/gs."

The diphthong [uɪ] in ((34)), which is followed by a palatalised consonant, shows that the second element of the diphthong is treated as an ordinary short vowel. Thus the element 'I' is spread from the following palatalised consonant and affects the nucleus. The restrictions concerning the first element of [uə] and the behaviour of the second element in palatalised environments clearly show that these are separate nuclei, and support the suspicion that we are not dealing with a phonological diphthong, or even with a branching nucleus here. ((35)) shows a possible representation for the data in ((34)) based on the assumption that [uə] is a sequence of two separate nuclei.

(35)

[uə]						[uɛ] / [uɪ]					
O ₁	N ₁	O ₂	N ₂	O ₃	N	O ₁	N ₁	O ₂	N ₂	O ₃	N
x	x	x	x	x	x	x	x	x	x	x	x
k				n		k				n	
< U >						< U >				<<<<I	
			A						(=)		
									A		
[kuən] <i>cuan</i> "harbour"						[kum'] <i>cuain</i> "harbour/gs."					

(=) optional suppression?

The structures in ((35)) involve an empty onset with a position. In 3.4 below, we will look at processes which show clearly that such a structure is not only acceptable but in fact quite common in Irish. In the word-medial situation as in ((35)) we have to assume that the onset O₂ must be followed by a phonetically expressed vowel (Charette (1991:92)). Here, this

vowel contains the element 'A' which is postulated on the basis of the [iə / e:] alternation,³⁵ as well as on the basis of the effects of palatalisation of [uə], i.e. [uε/ur]. Below, a slightly modified structure of the centring diphthongs is proposed.

3.3.4. The representation of [uə]

What is most interesting about the diphthong [uə] when affected by palatalisation is that the 'I' does not spread across to the first nucleus in [kuɪn'], which should be the case as there is no buffer element present in the above structure except for the one shared between O₁ and N₁. The question is what prevents the palatalisation from further propagation.³⁶ Let us first concentrate on the nucleus N₂.

If [ε] is the phonetic reflex of the melody subsumed under N₂, (Sjoestedt (1931:74) compares that sound to German *ä* as in *tätig*), it may mean that the element 'A', which is underlyingly present in that nucleus, combines with the incoming 'I'. Such a situation is not predicted in our analysis because a nucleus which contains 'A' and is affected by I-spreading normally loses that element e.g. [f'ar / f'ir'] or [sop / sip'].

This observation should be particularly applicable to such reduced (schwalike) vowels as the second portion of [uə] which are viewed as headless due to their prosodically weak position. On the other hand, the element 'I', which normally is licensed as the head of affected nuclei (hence the suppression of 'A'), need not be viewed as being the head of the second element in [uε] for the same reasons, namely, due to the prosodically weak position of N₂. In this case, the combination (I.A.) (and the reflex [uε]) may be considered legal, and the difference between [uε] and [ur] lies in the amount of melodic material that a weak position such as N₂ may license (bear). At any rate, once we agree that N₂ is affected by palatalisation

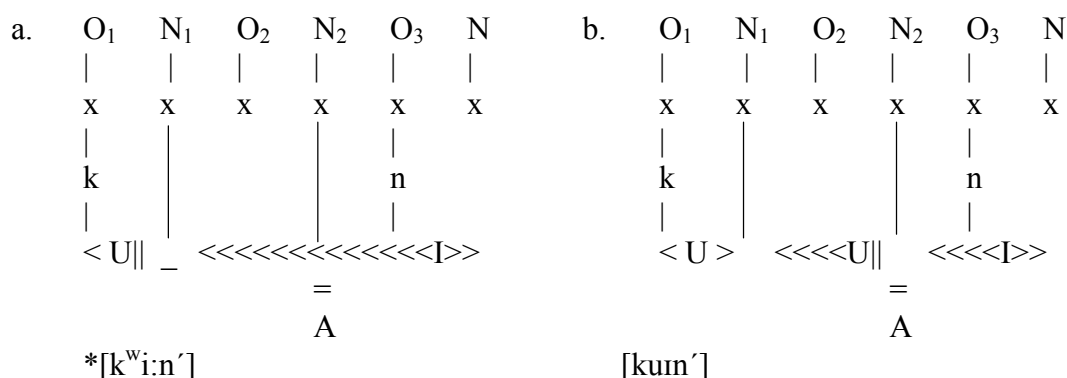
³⁵For [e:] to be derived from [iə] we must assume that the element 'A' is underlyingly present in the diphthong. Otherwise, no source for that element is available.

³⁶Clearly, the empty onset (O₂) does not constitute a barrier here. Recall the case of palatalisation of the definite article in [ən' oxir'] *an eochair* "the key", where the element 'I' does spread across an empty onset (more such cases are discussed in 3.4.1).

then we may not blame it for blocking further spreading of 'I' in the structure proposed above, unless we postulate that N₂ shares the element 'U' with the preceding onset.³⁷

The structure ((36)a) shows the expected application of I-spreading in *cuain* "harbour/gs." given the structure of [uə] proposed so far, while in ((36)b) the buffer element is assumed to be underlyingly shared between O₂ and N₂.

(36)



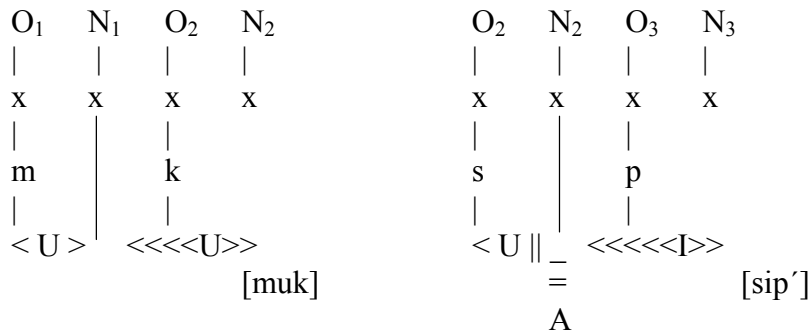
Thus, what should take place in ((36)a) is a "long distance" spreading due to which N₁ should be affected, while O₁ should remain velarised thanks to the shared (buffer) element 'U'. This would be exactly analogous to the alternation [pu / p^wiħə] *pu*th / *pu*the "breeze/gs.", where in [pu] the N₁ shares 'U' with the onset, while in [p^wiħə] N₁ is affected by I-spreading. Thus, the structure proposed for [uə] in ((36)a) does not exclude the possibility of deriving an ungrammatical form.³⁸

To prevent such an unwelcome outcome, it seems that we should postulate that O₂-N₂ share the element 'U' which would block I-spreading in the correct way and in the right place ((36)b). Note that the portion O₁N₁O₂ of ((36)b) is analogous to [muk] *muc* "pig", while O₂N₂O₃ is exactly what we have in [sip'] *soip* "wisp/gs."

³⁷Recall that a headed (A) blocks I-spreading e.g. [bən'ə] *bainne* "milk". In the case of headless nuclei it is the "buffer" element, shared between the onset and the nucleus, that stops further spreading e.g. [pu / p^wiħə] *pu*th / *pu*the "breeze/gs."

³⁸The alternation [iə / e:] seems to support the view that long distance spreading is possible here, as will shortly be demonstrated.

(37)



There seem to be additional arguments in favour of the structure proposed above in ((36)b) in that it allows for a range of different interpretations, all of which seem to be attested. Let us inspect some of them.

Ó Cuív (1975:105) notes that in pretonic position the front [a], which appears in C'-C, is raised to [i], a phenomenon which does not surprise us in the least given other phenomena where the element 'A' is lost. What is interesting to us here is that the nucleus is realised as [i], i.e. it is a reflex of the element shared with the preceding palatalised onset.

(38)

[g'i'ra:n]	<i>gearán</i>	"complain"
[k'i'to:g]	<i>ciotóg</i>	"left hand"
[f'i'do:g]	<i>feadóg</i>	"whistle"

A similar loss of 'A' in pretonic position is found in Cois Fhairrge Irish (Ó Siadhail (1989:39), de Bhaldraithe (1945:15)). Note that in velarised contexts the resulting vowel is [u].

(39)

- | | | | |
|----|--------------|-----------------|--------------------|
| a. | [b'i'ra:n] | <i>bearrán</i> | "nuisance" |
| | [l'i'da:n] | <i>leadán</i> | "burr of a teasle" |
| b. | [gu'ba:ʃt'ə] | <i>gabáiste</i> | "cabbage" |
| | [u'na:l'] | <i>anáil</i> | "breath" |
| | [sku'da:n] | <i>scadán</i> | "herring" |

The loss may be understood in the following way. When the nucleus loses the active element, it is realised as a vowel corresponding to the element "shared" with the preceding onset, i.e. 'I' or 'U'. Hence the pretonic [i] and [u] in these forms. Recall that this is exactly what we said about forms like [b'i] *bith* and [pu] *puth*. Namely, the nucleus has no other source than the element shared with the onset.

If the diphthong [uə] finds itself in pretonic context, it seems that the same happens to the element 'A' which is underlyingly present in the second nucleus, and - in a parallel manner to the forms above - the 'A' is lost. What we would expect in such a case is that the element which this nucleus shared with the preceding onset would now be realised in place of the lost active element. This is, in fact, what seems to take place in [u:'nɑ:n] *uanán* "froth" (Ó Cuív (1975:100)).

The structure proposed for [uə] may additionally be useful in accounting for the tendency to reduce this diphthong to an ordinary O-N sequence, i.e. a consonant followed by a short vowel. This typically happens in the (uɾC') context, i.e. when a word-initial diphthong is followed by a palatalised onset. As a result a semivowel [w] or [v] appears in place of the first element of the diphthong and is followed by [ɛ/ɪ] (Sjoestedt (1931:105), Ó Cuív (1975:100)).

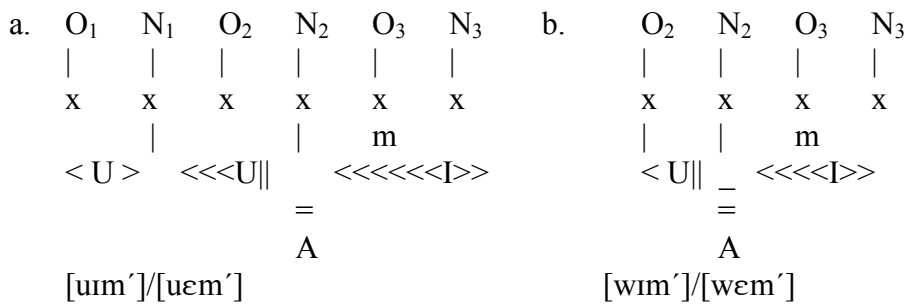
(40)

[uɪm'] / [wɛm'] / [vɛm']	<i>uaim</i>	"from me"
[uɪt'] / [wɛt'] / [vɛt']	<i>uait</i>	"from you"
[vuɪl'] / [vwɛl']	<i>bhuail</i>	"he hit"
[nə huɪl'ə] / [nə hwɛl'ə]	<i>na huaisle</i>	"the noble-pl."

The forms presented above exhibit a range of possible interpretations of the structure of [uə]. Below we represent the most dramatic one in which the syllabic structure of the diphthong is reduced by half. However, it seems that all of the possibilities are expressible by employing different association patterns. For instance, in [vuɪl'] the element shared between O₁ and N₁ is physically associated with O₁, while it is linked only to the nucleus in [uɪt'] and [uɪm']. On the other hand, in [vwɛl'] and [hwɛl'ə] no melody is associated with N₁.³⁹

³⁹Note that the same effects would be hard to represent if we are dealing with a branching nucleus.

(41)



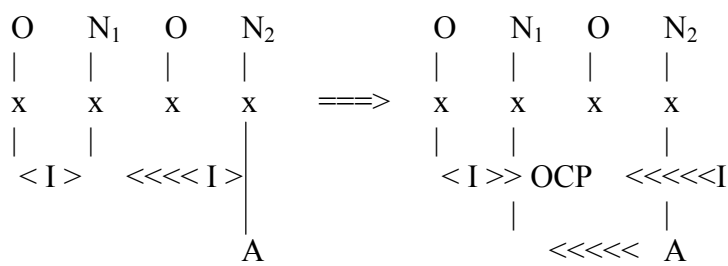
(= optional?)

Let us now briefly consider the [iə/e:] alternation, assuming that in the diphthong [iə] the element 'I' is shared between O₁-N₁ and O₂-N₂.

3.3.5. The interpretation of [iə / e:]

A similar structure to that of [uə] may be proposed for [iə] to explain the fact that [iə] and [uə] exhibit corresponding restrictions and are identical in terms of their syllabic organisation. Despite the structural affinity these forms yield different phonetic results because of substantive differences (the melodic material they contain). We predict that the two structures will behave in a different way with respect to palatalisation spreading from the right, precisely due to the presence of the elements 'I' and 'U' within the diphthongs. The alternation [iə / e:] is presented again below, employing the structure with two successive nuclei. Note that if 'U' were present in this diphthong we could expect a different outcome.

(42)



In this approach the alternation [iə / e:] consists in the spreading of the element 'I' onto the nucleus N₂, which results in the fusion (coalescence) of nuclei N₁ and N₂ to form [e:]. Therefore we might treat this melody integration process as yet another instantiation of the

OCP (for more on vowel fusion see 3.4.2). We stipulate that the element 'A' which is now licensed in two nuclei assumes the role of the head (recall the effects of A-spreading (2.3.4)), and the fused long vowel forms a compound (I.A). The analysis of [kurn'] ((36)b) and ((42)) above helps us capture the separateness of elements involved in the phonetic forms of the diphthongs [iə] and [uə].

A few words might be in order concerning the A-spreading in [iə/e:] ((42)), as it seems peculiar that the element 'A' is not suppressed in e.g. [k'e:l'ə] *céille* "sense-gs." (as in [kurn']), but rather promoted to the head position of the fused [e:].⁴⁰ It appears that this phenomenon is triggered by palatalisation; however, all that can be offered at this stage by way of explanation is the observation that the palatalisation which affects N₂ has another (possibly crucial) effect on the whole diphthong in that it fuses the melodic material of N₁ and N₂. Thus, the spreading of 'A' may be understood here as a result of that fusion by virtue of which 'A' is licensed in two nuclei (forms a bridge). Being licensed in N₁ and N₂, 'A' is no longer susceptible to suppression.⁴¹

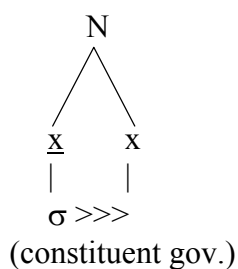
An additional issue which requires some explanation concerns the directionality of element spreading in the structures presented above. It accords with the directionality of the 'T' and 'A' spreading found in vocalic transitions. On the other hand, the fused nuclei N₁-N₂ may be said to form a governing domain in which the first nucleus (N₁) acts as the head of that domain because it bears stress. If this is the case, then the direction of element spreading (from right to left) remains in disagreement with the expected pattern in GP whereby elements spread from the head to the complement. For example, within a branching nucleus or within a geminate the melody is subsumed under the head and spreads to the complement.⁴² The directionality of spreading depends strictly on the position of the complement with relation to the head (the latter is underlined):

⁴⁰It should be remembered that in our analysis the compound *(A.I) is illicit in Irish (see 2.4).

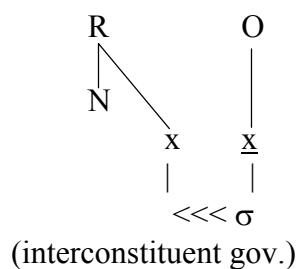
⁴¹In a sense, this situation resembles the cases of A-support in forms like [sp'el'ə] *speile* "scythe/gs." (2.3.3) in which 'A' in the first nucleus is supported from the second nucleus, or, as we may now put it, 'A' is *licensed* in two successive nuclei.

⁴²See KLV (1990:217) for an interpretation of the structure of the geminate.

- (43) *branching nucleus*



- geminata*



Note however, that in the alternations [f'is / f'asə] the element 'A' is also spread from the right to the head of domain, i.e. to the stressed nucleus. One way out of the directionality problem is to assume that the N₁-N₂ fusion in [iə / e:] takes place only at the melodic level while at the prosodic level the direction of the internuclear relation is still from right to left, which is a regular situation for an interconstituent relation. Such an interpretation tallies with the facts of vowel harmony in [f'is / f'asə] and the vowel-zero alternations in [uəsəl / uɪl'ə] which apply from right to left.

Let us summarise the analysis of the [iə/e:] alternation by providing phonological structures for some data mentioned earlier. If the analysis of the centring diphthongs is accepted, then we are finally in a position to represent structurally the forms [d' iə] nom. / [d' e:] gs. / [d' e:hə] pl. of "god". These forms show that some word-final [iə]'s are followed by a latent [h] as in monosyllabic forms like [b' i / b' ahə] *bith* / *beatha* "existence/gs." or [l' a / l' ehə] *leath* / *leithe* "half/gs." The derivation of these forms is given below.

- (44)

- a.
- | | | | | | |
|-------|---|---|-------|---|---|
| O | N | O | N | O | N |
| | | | | | |
| x | x | x | x | x | x |
| | | | | | |
| d | | | | h | |
| | | | | | |
| < I > | | | < I > | | |
| | | | | | |
| | | | A | | |
- [d'ie] *dia*

- b.
- | | | | | | |
|-------|-----|--------------|---|---|---|
| O | N | O | N | O | N |
| | | | | | |
| x | x | x | x | x | x |
| | | | | | |
| d | | | | h | |
| | | | | | |
| < I > | OCP | <<<<<<<<<<<< | I | | |
| | | | | | |
| | | <<<<< | A | | |
- 'e:] dé

Let us now see what might be said about the [e:/ia] decomposition and the [iə/ia] contrast.

3.3.6. Munster [e:]: phonological structure and behaviour

The alternations [iə/e:] and [e:/ia] are virtually the only productive alternations in Irish involving long vowels. Nevertheless, given that [e:] is not a branching nucleus, what does this tell us about the vocalic system at large?⁴⁴ The structures for [iə] and [ia] have to be different because they are contrastive. But it seems that the same process is responsible for the neutralisation of contrast where both [iə] and [ia] are realised as [e:]. This is why the two forms are considered together here. Recall the facts.

(45)

a.	[m'iar] / [m'e:r'ə]	<i>méar / méire</i>	"finger/gs."
	[ian] / [e:n']	<i>éan / éin</i>	"bird/gs."
	[ʃk'ial] / [ʃk'e:l']	<i>scéal / scéil</i>	"story/gs."
b.	[gr'ian] / [gr'e:n'ə]	<i>grian / gréine</i>	"sun/gs."
	[k'ial] / [k'e:l'ə]	<i>ciall / céille</i>	"sense/gs."
	[kl'iaɪv] / [kl'e:v'ə]	<i>cliabh / cléibhe</i>	"chest/gs."

The data in ((45)a) illustrate decomposition of [e:] to [ia] in the (C'-C) context, while in ((45)b) [iə], which is restricted to the (C'-C) context, becomes monophthongised in (C'-C'). Thus, one should not overlook the fact that despite the phonological contrast the two objects [ia] and [iə], whatever their source, will both have to become [e:] before a palatalised consonant. This points to the affinity of their phonological structures.

It seems that the nature of the decomposition in ((45)a) may be generally outlined as follows. Parallel to the situation encountered in the analysis of short nuclei the elements 'I' and 'A' cannot normally combine. We established that short [e] is either a simplex A-head (A)

⁴⁴One should bear in mind that one exception to the generalisation about the immunity of long vowels to I-propagation has already been identified as the "Johnsen vowel" phenomenon where the vowel is compensatorily lengthened (3.2).

flanked by two palatalised onsets, in which case we are dealing with a phonetic effect (cf. [d'eʃə]), or an (I.A) compound, which tends to be eliminated from the language (cf. [l'et'ir' / l'it'ir']). These facts concern mainly the Munster dialect and it is not surprising that it is in this dialect that long [e:] is decomposed. Recall that in Munster the I-head does not license operators as per the LC2 (2.4.4). For this reason in [sop / sip'] *sop / soip* "wisp/gs." the element 'A' is suppressed in the nucleus. On the other hand, in Connemara Irish the two elements may combine as (A.I): hence, the alternation [sop / sep'] as well as the lack of decomposition of [e:] to [ia] in (C'-C) is the norm.

Thus one reason for the Munster decomposition of [e:] to [ia] may be due to the restrictions on element combinations. In other words, one might stipulate that the context (C'-C) causes a redistribution of the compound (I.A) due to, for instance, certain requirements on the status of elements imposed by (C'-C) which are not met in (I.A). Recall that also short [e] cannot appear in this context, but rather, it has to be constructed with the help of palatalisation spreading from the right as well as A-support. In a sense, the two conditions for the short [e] to appear, i.e. I-spreading and A-support, suggest that the vowel has to be constructed "anew". This fact points to the futility of phonemic notions which force us to segmentalise fragments of distinctiveness that are lodged in different positions. It is time to decide what *can* happen to (I.A) in the (C'-C) context.

One hypothesis which can be proposed is that the preceding palatalised onset requires a following I-headed vowel.⁴⁵ Given that 'I' does not license operators in Munster Irish, a possible switch from (I.A) to an illicit *(A.I) will automatically have to cause decomposition of sorts. This interpretation would neatly account for the decomposition of [e:] to [ia] in that the element 'I', having become the head of the nucleus N₁ cannot license 'A'. The latter element will then remain linked only to the second nucleus (N₂). Unfortunately, this analysis fails to account for the decomposition of (I.A) to form the phonetic [a] in short nuclei e.g. [l'ak] *leac* "stone".

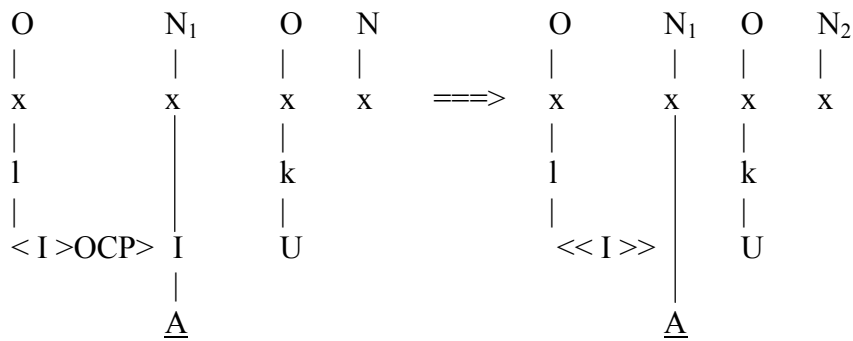
Clearly, if the nucleus were I-headed, then the element 'A' would have to be suppressed according to the LC2 (*'I' does not license operators*). Additionally, in our analysis the preceding palatalised onset provides 'I' to the nucleus as an operator (cf. e.g. [f'is / f'asə]

⁴⁵If palatalised onsets contain 'I' as an operator and require I-head in the nucleus, then this fact is reminiscent of what we referred to as "consonant-vowel harmony" in Polish (2.1.4).

fios / *feasa* "knowledge/gs." (2.3.4)), and it is the I-spreading from the right which licenses 'I' as the head of the affected nucleus. Hence, in [f'ar / f'ir'] *fear* / *fir* "man/gs.", A-suppression takes place in the genitive form where the second onset is palatalised, and not in the nominative, where the context is (C'-C).

It seems that one needs an explanation which would answer two basic questions. Firstly, how is (I.A) ([e]) decomposed, and secondly, why is additional I-spreading from the right necessary in order to obtain phonetic [e] or [e:]?⁴⁶ If phrased in this way, the questions themselves seem to suggest an interpretation which we can tentatively formulate in the following way: the 'I' operator is "taken away" from the (I.A) compound in the (C'-C) context due to the OCP. In other words, the 'I' of the (I.A) merges with the 'I' shared between the palatalised onset and the following nucleus. Recall that in our analysis of short vowels we found that the shared element is realised in the nucleus only if there is no other active element present or spread. Therefore, the fusion of the two 'I' elements will render the nucleus I-less.⁴⁷ Let us first illustrate the mechanism described above on the basis of short nuclei.

(46)



[l'ak] *leac* "stone"

If this interpretation is assumed, then we are able to answer the two questions posed above. Namely, the decomposition of (I.A) in the (C'-C) context involves subtraction of the operator

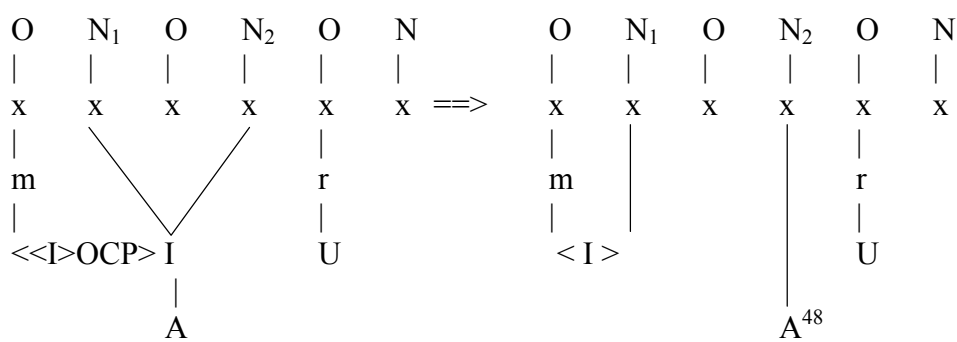
⁴⁶In the case of [e:], one should remember that this object is possible in (C-C) where no decomposition takes place, hence, no I-spreading is necessary, and in (C-C') where I-spreading is irrelevant because no decomposition occurs after a velarised onset.

⁴⁷This analysis closely resembles the phenomenon of absorption discussed in Smith (1988).

from the nucleus due to the OCP. This in turn, allows us to understand why additional spreading of 'I' from the right is required to derive phonetic [e] as in [l'ek'ə] *leice* "stone-gs."

If the same analysis is applied to the decomposition of [e:] to [ia] then, the distribution of Munster [e:] becomes clearer. This object is found not only in the (C'-C') context, but also in (C-C) and (C-C') e.g. [ge:l] and [ge:l'] *Gael / Gaeil* "Irishman/pl.". Since no decomposition takes place in the last two contexts, because the first onset is not palatalised, whether I-spreading from the right is present or not is irrelevant. The result of the long [e:] decomposition is different from that in a short nucleus in that the element 'I' is realised in N₁, while 'A' remains licensed in N₂. Let us illustrate the decomposition below.

(47)



[m'iar] *méar* "finger"

Here, we are dealing with two nuclei therefore the decomposition takes a slightly different form than in [l'ak]. That is to say, the compound (I.A) is deprived of 'I' parallel to what happens in [l'ak] and only 'A' is linked to N₂. On the other hand the element 'I' is realised in N₁ because that nucleus has no other active element. In a sense, the status of the first nucleus might be said to be identical to that in the diphthong [iə]. One question that might be asked at this stage is why the element 'A' is licensed only in one nucleus rather than in two. It seems that such a structure would, however, neutralise the contrast between the phonological (I.A) as in [m'iar] *méar* "finger" and (A) as in e.g. [m'a:n] *meán* "middle" in the (C'-C) context.⁴⁹

⁴⁸Since we represent the Munster [e:] as (I.A), i.e. an A-headed object, one might expect that the element 'A' should be headed in N₂ parallel to what happens in [l'ak]. If this is the case then this might be one reason why [ia] and [iə] contrast.

⁴⁹Recall that the long [ɑ:] is fronted to [ɑ:] in this context (Ó Cuív (1975:18)).

The problem of [e:] decomposition requires a more in-depth study as the resulting diphthong [ia] is exceptional in many respects, and the tentative interpretation presented above might have to be revised. One advantage of this analysis, however, is that it seems to account for the striking similarity in the behaviour of [e:] to what has been observed about short [e] in Munster, namely, the correspondence between [ia] and [a] in the C'-C context on the one hand, and the alternation [iə/e:] and [a/e] in (C'-C') on the other. For one thing, both [e] and [e:] are typically found in the (C'-C') context ([m'e:r'ə] *méire* "finger/g.s." and [t'ep'] *teip* "fail"), while neither [e:] nor [e] is regularly found in (C'-C).⁵⁰ On the other hand, the fronted [a], typically found in (C'-C) e.g. [l'ak] *leac* "stone", alternates with [e] in the (C'-C'A) context, i.e. when flanked by two palatalised onsets and followed by a nucleus which contains the element 'A'. This alternation resembles the alternation [iə/e:] e.g. [gr'ien / gr'e:n'ə] *grian / gréine* "sun/g.s.", in which, the context (C'-C') plus A-spreading from N₂ to N₁ are also involved.

To summarise: in this analysis the alternations [iə/e:] and [e:/ia] can be accounted for in terms of composition and decomposition of segmental material due to element combinability and the context in which these processes take place.⁵¹ The phonological representation of [iə] and [ia] (and in effect [e:]) proposed for Munster Irish, i.e. a sequence of nuclei rather than a branching nucleus, plays a crucial role in these alternations. The phonological contrast between [iə] and [ia] is claimed to subsist in the status of the element 'A'. That is to say, in [iə] the 'A' element is headless, while in [ia] it is headed. Note that if we treat the vowel [a] in [l'ak] as a decomposed [I.A], then the resulting vowel is also headed, and hence not affected by the 'U' element present in the segmental make-up of [k].

This analysis suggests that [e:] may not be subsumed under a branching nucleus thus we need to investigate the possibility that no long vowels in Irish may have this structure. In the following section we will see how other Irish diphthongs fare in a world dominated by palatalisation and velarisation.

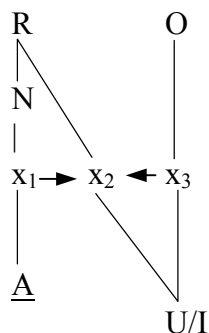
⁵⁰Some exceptions concerning the occurrence of [e:] in C'-C were mentioned earlier, e.g. [bi'd'e:l] *buidéal* "bottle" where the C'-C context is removed from the word initial position, and words where the following consonant is [χ] e.g. [dr'e:χt] *dréacht* "part" (Ó Cuív (1975:16)).

3.3.7. The [au] / [ai] parallelism

The disappearance of the old consonantal system resulted in a number of diphthongs in which the second element corresponds to the palatal or velar quality (Sommerfelt (1927)). We will inspect the possibility here that [au] and [ai] are structurally similar to [iə] and [uə] in that they contain an empty onset. It will be claimed that the difference between the two pairs generally lies in the order of elements involved. Specifically, while in [iə] and [uə] the first nucleus is dependent on the quality of the preceding onset and the second contains the element 'A', in [au] and [ai] it is the first nucleus that contains 'A' and the second one is largely dependent on the quality of the intervening onset.⁵²

In general, Irish diphthongs are much more generous than pure long vowels in supplying us with clues concerning their structure. In 3.2, we considered a context of vowel lengthening which is one of the sources of diphthongs and long vowels in Irish, namely, the "Johnsen vowel" phenomenon.

(48)



The structure of the "Johnsen vowel" in Irish involves an underlying short vowel (x_1) followed by a sonorant geminate.⁵³ This form yields a surface short vowel if the geminate (x_2 - x_3) is followed (licensed) by a phonetically expressed nucleus e.g. [k'anə] *ceanna*

⁵¹So far the composition and decomposition analysis unifies the phonological behaviour of the I-A combination in short and long vowels. In chapter 4, we will see that the same phenomenon has its place in the consonantal system of Irish.

⁵²See Sjoestedt (1931:61) for a discussion of dependencies between consonants and diphthongs.

⁵³The justification of the proposal that we are dealing with a phonological sonorant geminate here can be found in (Cyrán (1992, 1996a)). On the other hand, in 3.2. we discuss the similarities and differences between this structure and the original proposal made by Johnsen in Kaye, Hellan, Johnsen (1990).

"head/pl.". On the other hand, when the geminate is followed by an empty nucleus then the rhymal complement (x_2) is vocalised and forms the second element of a diphthong e.g. [au] as in [k'aun] *ceann* "head" when the sonorant is velarised, or [ai] as in [kail'] *caill* "lose" if the sonorant is palatalised.

Thus, the "Johnsen vowel" is involved in two types of phonological phenomena. One of them, the quantitative alternation, of the type just described e.g. [k'aun / k'anə] *ceann* / *ceanna* "head/pl.", is dependent on the licensing properties of the nucleus directly following the sonorant geminate, and the lengthening is of compensatory nature. The other phenomenon is dependent on element spreading and refers to qualitative alternations. We have mentioned that the second element of the diphthongs [au] and [ai] in [k'aun] *ceann* "head" and [kail'] *caill* "lose" is strictly dependent on the U/I specification of the sonorant. However, the most drastic example of a qualitative shift exhibited by this structure is probably the [au / i:] alternation as in [k'aun / k'i:n'] *ceann* / *cinn* "head/gs.". It has been demonstrated, nonetheless, that such alternations mirror the effects encountered in the behaviour of short vowels to the letter (3.2).

However, the "Johnsen vowel" is not the only structure that can be assigned to the surface diphthong [au] in Irish. There are data which show that certain [au]'s have not only a different distribution, in that they may be followed by non-sonorants, but also that they behave differently with respect to the quality and quantity phenomena described above. For instance, such [au]'s do not participate in quantity alternations (cf. [k'aun / k'anə] with [l'aun' / l'aunə] *sleamhain* / *sleamhna* "smooth/pl." (not *[l'anə])), and also, exhibit different effects when followed by a palatalised consonant. Namely, instead of [au / i:] alternation we observe that only the second element of the diphthong is affected. This may be accompanied by glide formation within the diphthong. In ((49)), a short list of words containing [au] before a palatalised consonant is given (Sjoestedt (1931:93-102)).

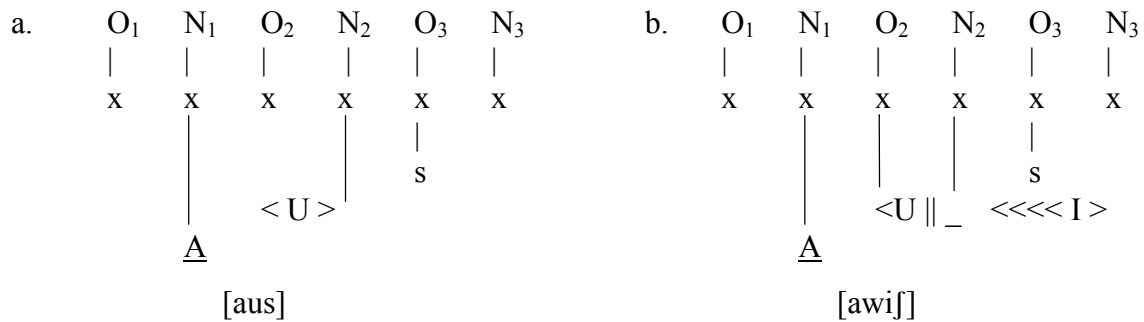
(49)

[awin']	/	[aun]	<i>abhainn</i> / <i>abhann</i>	"river/gs."
[awi]	/	[aus]	<i>amhais</i> / <i>amhas</i>	"gs./servant"
[faw ⁱ k']	/	[fauk]	<i>seabhac</i> / <i>seabhaic</i>	"gs./hawk"
[l'awin']	/	[l'aunə]	<i>sleamhain</i> / <i>sleamhna</i>	"slippery/npl."
[m'awir']	/	[m'aurəχ]	<i>meabhair</i> / <i>meabhrach</i>	"mind/gs."

It is uncontroversial that the diphthong [au] in ((49)) will have to be viewed as having a different structure from the [au] discussed above ("Johnsen vowel"). This time when [au] is followed by a palatalised consonant, the second element of the diphthong forms a glide [wi] or [wⁱ] which, in fact, is analogous to word-initial glide formation in words beginning with the diphthong [uə] discussed earlier e.g. [wimʰ] *uaim* "from me" (cf. Sjoestedt (1931:105) and Ó Siadhail (1989:63)).

Bearing in mind what we found about the centring diphthongs and the specification of empty onsets we are now in a position to describe the data in ((49)), i.e. the glide formation within the diphthong [au] by postulating an internal onset in the structure of this diphthong. Thus the word for "servant" would have the following representations: ((50)a) in the nominative and ((50)b) in the genitive.⁵⁴

(50)



The element 'I' pushes out the element 'U' from the N₂ position in ((50)b) in which case 'U' docks onto the preceding onset O₂. Notice that the glide formation involving O₂-N₂ is parallel to what happens in [muk / m^wikʰ]⁵⁵, [wimʰ] and [wiʰlʰə]. In the case of the diphthong [au], however, this phenomenon is not obligatory, as forms like [auf] are common. What is interesting to us here is the fact that we do not get *[aus -> ai].⁵⁶ This can be explained by the fact that whenever the second element of the diphthong is affected by palatalisation and as a result 'U' is banned from the nucleus, the 'U' has to dock on the preceding onset (cf.

⁵⁴Note that [aus / awi] shows a similar glide formation to that in [uəsəl / wiʰlʰə] word-initially. This similarity is predicted by the fact that in both cases the structure and the context are the same, i.e. the 'U' shared between O-N, which is "pushed out" from the nucleus by palatalisation, docks onto the onset.

⁵⁵The off-glide symbol is used here for emphasis.

⁵⁶We also have to remember that [au] and [ai] are contrastive. It seems that the contrast lies in the specification of the "diphthong-internal" onset.

[m^wik']). Thus, assuming that the diphthong [au] forms a sequence of nuclei, the structural parallelism between [awɪf] and [wɪl'ə] seems to be correct.

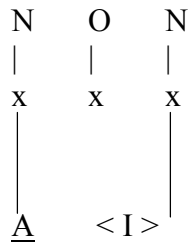
A similar structure to that proposed in ((50)) for [aus] may be assigned to the diphthong [ai]. See the data below first.

(51)

[raɪəd]	[raig' me:]	<i>raghad / raghaidh mé</i>	"I'll go"
[faɪən]	[faim']	<i>faigheann / faighim</i>	"he gets/I get"
[gaiər]	[gair']	<i>gadhar / gadhair</i>	"dog/gs."
[raiər]	[rair'k']	<i>radharc / radhairc</i>	"sight/gs."

Note that in the examples given above all diphthongs begin with a velarised onset and in such a context, it will be recalled, a headed 'A' is not affected by palatalisation parallel to cases such as for example [ban'ə] *bainne* "milk".

(52)



The structure proposed above, to some extent resembles the derivation of [ai] in [kail'] *caill* "lose" (3.2) in which the nucleus contains a headed 'A' therefore the element 'I' cannot affect it. However, the form ((52)) does not participate in quantity alternations and has to be represented separately.

Thus it may be shown that almost all Irish diphthongs behave as if they were not branching nuclei but rather a sequence of nuclei. This form accounts for the agreement between consonants and diphthongs which, given their structure, follows from the restrictions and mechanisms observed in the system of short vowels. The study of Munster diphthongs supports the view that the vowels [i] and [u], whether separate nuclei or parts of diphthongs, are very much dependent on the quality of surrounding consonants, or simply, constitute a residue of the quality of lost consonants.

Since most diphthongs do behave like sequences of nuclei, one might propose that all pure long vowels are also sequences, in which case we need to explain their immunity to palatalisation spreading. The behaviour of vowel [e:] in Munster seems to provide clues as to what may be involved. Namely, only a decomposed long vowel, such as [ia], or in fact any diphthong, may interact freely with palatalisation spreading from the right.⁵⁷ One reason for that is that the two elements involved in diphthongs are perceived by phonology as single nuclei. It seems that this generalisation holds for most, if not all, Irish diphthongs thus providing a strong argument for abandoning the structure of a branching nucleus from the representation of these vowels. If, however, we want to do the same with the pure long vowels, i.e. propose a structure of fused nuclei (which we, in fact, have already demonstrated to be the case for [e:]), then the immunity of pure long vowels to interaction with palatalisation and velarisation should receive a formal explanation.

3.4. The representation of long vowels and diphthongs

So far we have considered three possible phonological forms which yield long vowels or diphthongs. Namely, a branching nucleus, the existence of which, initially assumed without argument, is becoming more and more questionable in Irish; furthermore there is the so called "Johnsen vowel" which results from compensatory lengthening (3.2), and a sequence of nuclei which has been proposed on the basis of the distributional peculiarities exhibited by [iə], [uə] and [e:].

The results of the analysis of the [iə / e:] alternation and the similarity between [iə] / [uə] and [ai] / [au], which led to the establishment of their structures as a sequence of two nuclei separated by an empty onset position, necessitate further investigation of the vocalic system of Irish in terms of phonological structures of long vowels. In particular, more evidence is needed in support of the intervening empty onset.

In this section it will be demonstrated that not only [ai], [au], [iə], [uə], [ia] and ultimately [e:], but also [u:] and [i:] can be assigned the structure of a sequence of nuclei

⁵⁷Recall that the decomposition of [e:] to [ia] is itself effected by palatalisation of the preceding onset. However, this is due to the licensing relation between the onset and the following nucleus rather than to spreading.

separated by an empty onset in certain specific contexts. It will appear that the phonological behaviour of such forms dovetails with the rest of the system, e.g. in the stress placement phenomena, which suggests that we are dealing with *the* phonological representation of Irish long vowels. We begin by clarifying some additional points concerning the empty onsets in Irish with respect to their alleged specification for the I/U value.

3.4.1. Empty word-initial onsets and the I/U specification

The existence of empty onsets word-initially follows from the theory of government (KLV (1990)), but it is not restricted to this model only (cf. e.g. Clements and Keyser (1983)). Phonological words must begin with an onset even though phonetically it may be null, i.e. it may contain no melodic material. Structurally the existence of empty onsets may take the two forms.

(53)

a.	O	N	b.	O	N
	x	x.....			x.....

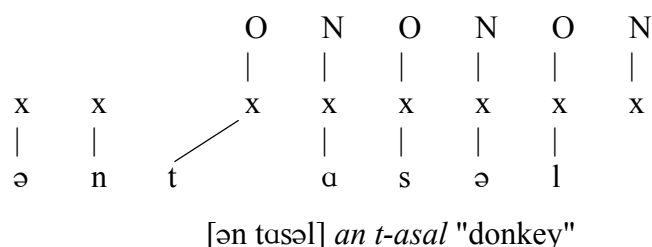
The difference between the structures presented above lies in the presence versus absence of a skeletal point in the word-initial onset. The form in ((53)a) allows us to account for the so called '*h-aspiré*' phenomenon in French (see Charette (1991:92)), as well as for '*t-prefixation*' in Irish. The latter process occurs when masculine nouns beginning with a vowel are preceded by the definite article *an* (Gussmann (1986)). The Irish facts are illustrated below.

(54)

a.	[ən toləv]	<i>an t-ollamh</i>	"professor"
	[ən tə'ra:n]	<i>an t-arán</i>	"bread"
	[ən tar'ig'əd]	<i>an t-airgead</i>	"money"
b.	[ən' t'i:m]	<i>an t-im</i>	"butter"
	[ən' t'iasc]	<i>an t-iasc</i>	"fish"
	[ən' t'ian]	<i>an t-éan</i>	"bird"
c.	[ən tir'i:ʃ'l'u:]	<i>an t-uiríslíú</i>	"humiliation"
	[ən tiʃk'ə]	<i>an t-uisce</i>	"water"

The word-initial empty onset of the nouns in ((54)) supplies a syllabic position for the floating segment of the masculine definite article. This is illustrated in ((55)).

((55))



As shown in ((53)b) the empty onset need not have a skeletal position. Such a positionless structure, for example, was proposed by Charette (1991:193) for certain inflectional endings in French. It seems, however, that in Irish the word initial empty onset must have a position. What is more, this empty position is not exactly empty as it has to be specified for either velarisation or palatalisation.

In ((54)) we see that in certain cases the "t-" prefixed to masculine nouns as well as the other consonant of the definite article are palatalised e.g. [ən' t'iask] *an t-iasc* "the fish" ((54)b). On the other hand, the two consonants are velarised when the definite article is prefixed to the words in ((54)a) or ((54)c) even though in ((54)c) the vowel which immediately follows the prefix is [i], i.e. a palatal vowel. This means two things. First, the specification of non-nuclear positions (consonants) for either palatalisation or velarisation is independent of the type of vowel they precede, and second, word-initial empty positions must be somehow phonologically specified for one of these values (Gussmann (1986)).

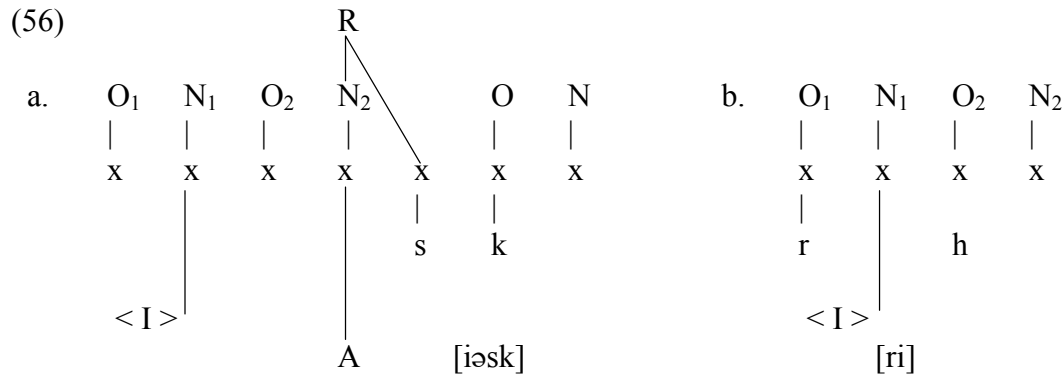
In earlier sections we pointed to certain aspects of consonant specification as regards palatalisation and velarisation. One of the conclusions was that every Onset-Nucleus sequence, which in GP constitutes a licensing domain, is characterised by the presence of an element ('I' or 'U') which is "shared" between the two positions (the *Sharing Condition*).⁵⁸ However, as we discovered, the "sharing" does not always entail physical association of the shared element to the onset and the following nucleus. One example in which the shared

⁵⁸Exceptionally, if the word-medial nucleus is empty, then the element I/U is linked to two successive onsets (see e.g. [soləs / si:l'əfə] *solas / soilse* "light/pl." (2.1.2)). Recall that we assume that domain-final empty nuclei still observe sharing. One possible explanation of the word-medial situation may be the fact that the flanking onsets e.g. [l'] and [j] in [si:l'əfə] are in a governing relation (Cyran (1996a)), hence they must agree as regards their I/U specification.

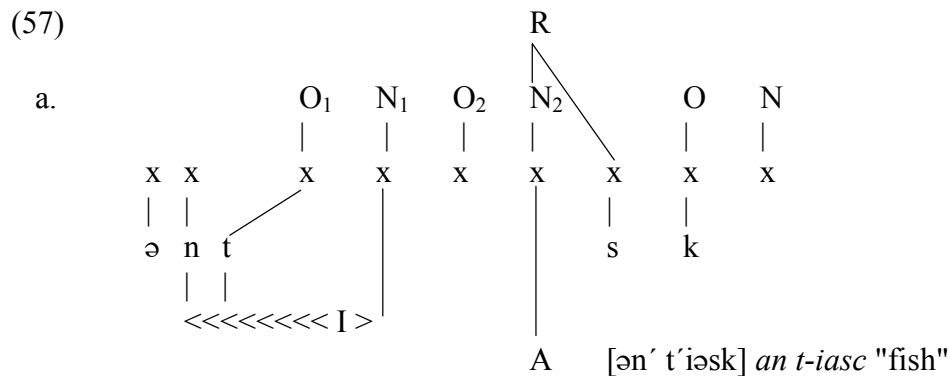
element is not licensed (associated) in/by the onset is the case of word-initial [r] which resists palatalisation in this position e.g. [ri] *rith* "running". Recall that in such monosyllabic forms the phonetic reflex of the nucleus strictly depends on the quality (I/U) of the preceding onset.

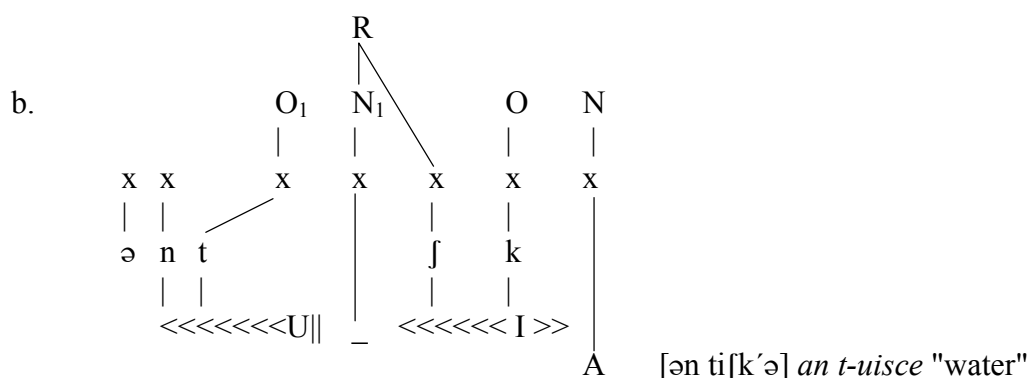
Another obvious case where the element 'I' defining palatalisation is not associated to the onset position is when this onset is empty. Note that an onset which licenses 'I' or 'U' should phonetically correspond to [j] and [w] respectively. Thus, we have to assume that these elements are present but not licensed in the empty onset.

Let us compare the two instances where 'I' is not licensed in the onset, i.e. [iəsk] *iasc* "fish" and [ri] *rith* "running".



It is interesting that the element 'I' shared between O₁ and N₁ in [iəsk] shows up when the word is preceded by the definite article, in which case, parallel to [ən toləv] *an t-ollamh* "professor", the stem initial empty onset provides a skeletal position for the floating [t] of the article. This time the consonants of the article are palatalised by the shared element 'I' ((57)a). In ((57)b) we provide an example which proves that it is the shared element and not the melody of the stem nucleus N₁ that affects the consonants of the preceding definite article. Note that in ((57)b) the nucleus contains 'I' (hence phonetic [i]) but, unlike in [iəsk], the sharing domain O₁-N₁ is defined by 'U'. Therefore, the consonants of the article are velarised.





The above structures illustrate two types of the manifestation of the element "shared" between O_1 and N_1 of the stem. Firstly, in both instances the shared element defines the quality of the consonants in the definite article by becoming linked to its onset O_1 when this contains some melody (here: the floating [t]). Secondly, the shared element constitutes a buffer to spreading from the right.

Note that if we just take the lexical form [iʃk'ə] (without the article) then the element 'U', which is shared between O_1 and N_1 is not linked to any of the "partners". Thus, it is not licensed in the nucleus because the nucleus finds itself within the domain defined by 'I'. Likewise, the 'U' is not associated to the empty onset as this would yield [w].

A similar situation can be observed in the behaviour of feminine nouns beginning with a vowel when preceded by the definite article. This time no '*t-prefixation*' occurs but instead the consonant in the definite article is palatalised in certain cases.⁵⁹

(58)

[ən i:hə]	<i>an oíche</i>	"the night"
[ən o:g'ə]	<i>an óige</i>	"the youth"

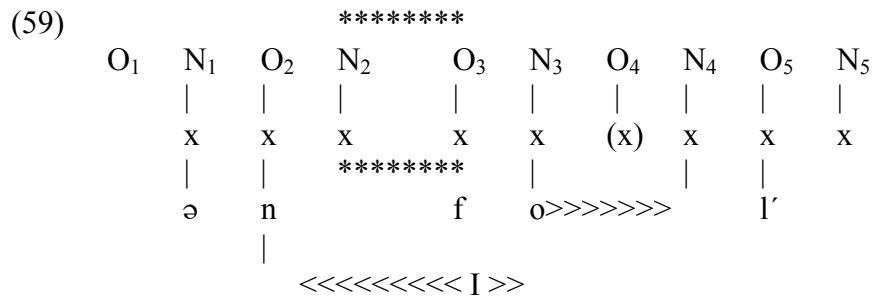
but

[ən' i:k]	<i>an íoc</i>	"the healing"
[ən' o:l']	<i>an fheoil</i>	"the meat"
[ən' oχir']	<i>an eochair</i>	"the key"

⁵⁹See Gussmann (1986) for a detailed analysis of both '*t-prefixation*' and palatalisation in Irish.

The above forms clearly show that palatalisation or velarisation of the definite article is independent of the vowel it precedes, as the article may be palatalised when the stem begins with a back vowel (e.g. [ən' oχir']), or velarised even if the stem begins with a palatal vowel (e.g. [ən i:hə]).

It is interesting to note what happens when the definite article *an* precedes a noun like [f'o:l'] *feoil* "meat": the onset of the noun is lenited and disappears phonetically but the specification of palatality remains and manifests itself by affecting the preceding consonant of the article. Thus it would be necessary to accept the view that the palatalising or velarising element is not only independent of the quality of the vowels (cf. [ən' o:l']), but also of the onset. Notice that when the palatalised [f'] is lenited the element 'l' remains in the phonological structure, but is not associated to the skeletal position of the onset (*[jo:l']), but rather, palatalises the definite article. This may be due to reduction of the N²-O³ sequence of empty positions.⁶⁰



[ən' o:l'] *an feoil* "the meat"

Thus "sharing", it seems, should be understood in a metaphorical sense, and perhaps it would be prudent to replace that notion with a postulation of phonological presence of the elements I/U between every onset and the following nucleus which can take different structural forms.

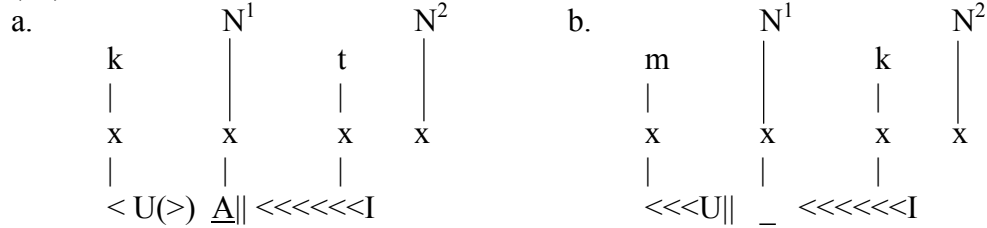
We may say that lexically the elements I/U are lodged in O-N licensing domains and extend their own domain of application (by spreading or licensing I/U in objects) leftwards, which is manifested in vocalic alternations and the quality of consonants.

There are two types of barriers delimiting such I/U domains. One of them is a group of headed ("opaque") vowels e.g. [ɑ] in [kat'] *cait* "cat/gs.", [o] in [kof] *cois* "leg/dat." and long vowels which are headed by definition. Symbolically, we may represent this type of

⁶⁰See Gussmann and Kaye (1993:435) for a similar type of reduction in Polish, and also the well-known cases in French: *le ami* => *l'ami* etc.

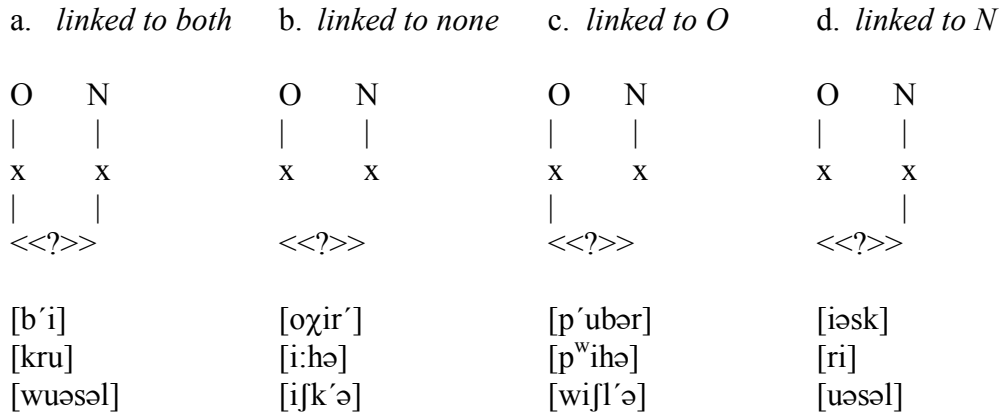
blocking as ($\underline{A}||<<<I/U$). The other type of barriers is constituted by the first non-identical element shared by the preceding O-N to which we refer as "buffer" ($U||<<<I$). One of the differences between the two barriers is that headed vowels prevent I/U licensing in the nucleus, while the buffer element protects the onset. Below we illustrate the two instances of blocking (delimiting) I/U spreading on the basis of $[kat']$ *cait* "cat/gs." and $[mik']$ *muic* "pig-dat."

(60)



We may now summarise the types of structures, or association patterns, in which the elements 'I' and 'U' defining palatalisation and velarisation of consonants may be involved with respect to the *Sharing Condition* (? = 'I' or 'U').

(61)



The above structures account for most of the facts concerning the consonant-vowel interaction.

((61)a) illustrates cases like $[b'i]$ *bith* "existence", $[kru]$ *cruth* "shape", and $[wuəsəl]$ *uasal* "noble"⁶¹ in which the nucleus strictly depends on the quality of the preceding onset. This, it will be recalled, refers to the monosyllabic forms and the first element of the

⁶¹This is one of the variant pronunciations of this word. See also $[uəsəl]$ (d), $[wi]l'ə]$ (c) and Sjoestedt (1931:149) for more cases of glides like e.g. $[i mə j'æg']$ *i mo dhiaidh* "after me", $[ni: fadə vuit']$ *ní fada uait* "not far from you" etc.

diphthongs [iə] and [uə]. However, it would be wrong to assume that such a "dual" association of the shared element depicted in ((61)a) is limited to the restricted cases only. A similar structure will be found in forms like [muk] *muc* "pig" and [f'ir'] *fír* "man/gs." where the quality of the nucleus agrees with the quality of its onset.

((61)b) depicts the most abstract but attested situation where the shared element cannot be deduced from the quality of the nucleus or the onset (because it is empty), and it is through the influence on the preceding definite article that we learn of the actual representation of such forms. This accounts for such an unexpected outcome as the initial palatalisation of the article when the stem begins with a back vowel e.g. [ən' oχir'] *an eochair* "the key", as well as for the velarisation of the article in words beginning with a palatal vowel in [ən i:hə] *an oíche* "the night" and [ən tiʃk'ə] *an t-uisce* "the water". In the latter case we assume that the element 'U' is present and blocks palatalisation spreading which, clearly, has affected the nucleus.

Structurally, [ən tiʃk'ə] corresponds to what we have in ((61)c) in that it illustrates how the sharing of 'U' in O-N is upset by I-spreading from the right. The best example of that is [p^wihə] *puithe* "breeze/gs." the nominative of which is [pu] *puth* and belongs to the ((61)a) group. Thus in ((61)c) the shared element is linked only to the onset, while the nucleus is influenced by element spreading from the right. In [p^wihə] and [wiʃl'ə] (variant of *uaisle* "noble/pl.") we have I-spreading to which the shared 'U' forms a buffer, while in [p'ubər] *piobar* "pepper" 'I' forms a buffer to U-spreading.

Finally, ((61)d) is in fact a repetition of ((61)a) in that the specification of the nucleus and the preceding onset is the same except that the onset does not license the shared element because it is empty as in [iəsk] *iasc* "fish" and [uəsəl] *uasal* "noble", or in the case of the word-initial [r] as in [ri] *rith* "running" which resists palatalisation in Irish. We may also add here such vowel-initial forms as [o:g'ə] *óige* "youth" and [i:k] *íoc* "cure" in which, as opposed to [oχir'] *eochair* "key" and [i:hə] *oíche* "night" ((58)), the quality of the shared element agrees with that of the vowel. This is proved by the way the definite article *an* is affected by these forms, i.e. [ən o:g'ə] and [ən' i:k] (cf. with [ən' oχir'] and [ən i:hə] ((58))).

Let us now concentrate on the word-medial empty onsets and possible arguments for maintaining the claim that in some cases they must be defined in terms of 'I' and 'U' elements.

3.4.2. Empty onset word-medially and pure long vowels

It will be shown here that empty onsets are acceptable in the system of Irish and manifest their presence not only in diphthongs such as [iə]/[uə] and [ai]/[au] but also in the creation of phonetically pure long vowels. So far we have discussed empty onset positions word-initially, while word-medial empty onsets were alluded to in the discussion of [iə]/[uə] and [ai]/[au]. There are other processes which clearly show that such empty non-nuclear positions need to be postulated word-medially. Let us first look at the data.

(62)

['br'ehəv]	/	[br'e'hu:nə]	<i>breitheamh/breithiúna</i>	"judge/pl."
['taləv]	/	[tə'lu:n]	<i>talamh/talún</i>	"land/gs."
['oləv]	/	[o'lu:nə]	<i>ollamh/ollúna</i>	"professor/pl."
[kosvil']	or	[ko'su:l']	<i>cosmhail</i> or <i>cosúil</i>	"similar"
['gr'anəvər]	or	[gr'a'nu:r]	<i>greannmhar</i>	"funny"

In ((62)) we observe an alternation of the type VC(V) >VV which may be viewed as suppression of the intervocalic consonant, and subsequent compensatory lengthening. It should be noticed that the resulting vowel is always [u:]. The shape of this vowel might be treated as a residue of the delinked consonant. In ((62)) it is [v] which contains 'U' (labiality) as the place defining element. On the other hand, we have alternations where the suppression of [v] may result also in the long vowel [i:]. This situation occurs when the intervocalic consonant is palatalised. Therefore it may be proposed that the quality of the fused vowel is contingent not so much on the place defining element of the delinked consonant as on its secondary place specification, i.e. whether it was a palatalised or a velarised consonant (containing 'I' or 'U').⁶² The data below illustrate the development of [i:] as a result of the delinking of [v'] and [g'].⁶³

⁶²Note that this is what happens in [ən' o:l'] *an fheoil* "meat" in which what remains of the lenited consonant (labial too!) is the element 'I' defining palatalisation. Recall that such an element is a property of the domain of palatalisation rather than of the consonant alone.

⁶³It may seem strange that a velar plosive should be liable to deletion on a par with a labial spirant. See, however, Foley (1977:28) for a proposed scale of propensity to spirantisation in natural languages in which the velar plosive features as the most susceptible obstruent. See also chapter 4., in which the weakness of [v] and [g] is correlated with their segmental representation.

(63)

[uv]	/	[i:]	<i>ubh / uibhe</i>	"egg/gs."
[n'iv']	/	[n'i:]	<i>nimh / nimhe</i>	"poison/gs."
[t'ig']	/	[t'i:]	<i>tigh / tighe</i>	"house/gs."
[n'ig']	/	[n'i:]	<i>nigh / ní</i>	"wash/V.N."

The quality of the long vowel in ((63)) is determined by the specification of the consonant that is delinked. Below we will attempt to illustrate the derivation of the forms in the [uv / i:] alternation which at first blush looks preposterous as it appears to involve a replacement of everything with a single element 'I'. In fact, all that happens in [uv / i:] is delinking of [v] in intervocalic position parallel to [gr'anəvər - gr'a'nu:r] except that here the delinked consonant is palatalised in the genitive case, hence, the resulting vowel is [i:] rather than [u:]. Recall that when [f'] was lenited in [ən' o:l'] *an fheoil* "meat" the element defining palatalisation could not be licensed in the empty onset as this would yield an incorrect form *[ən' jo:l']. This point is crucial because, as will be suggested below, the same happens in the case of the lengthened vowel [i:], namely, that the element 'I' is linked to two consecutive nuclei only.

In the structures presented below in ((64)) several assumptions have been made concerning the phonological representation as regards the elements which have the following justification; O₁ shares 'U' with N₁ because the definite article in [ən uv] *an ubh* "egg" is velarised. The derivation of [u] in N₁ ((64)a) is analogous to that in [muk] *muc* "pig" in that it may be understood as a result of U-spreading from the velarised consonant to the right. The multiple occurrence of 'U' under O₂ is used for expository reasons in order to keep the I/U specification of the consonant separate from labiality.⁶⁴

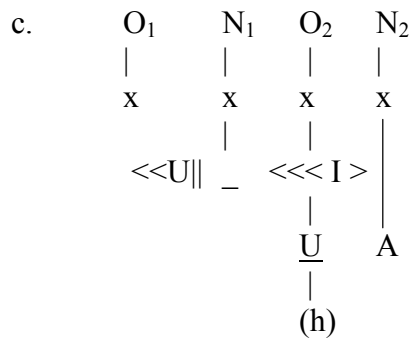
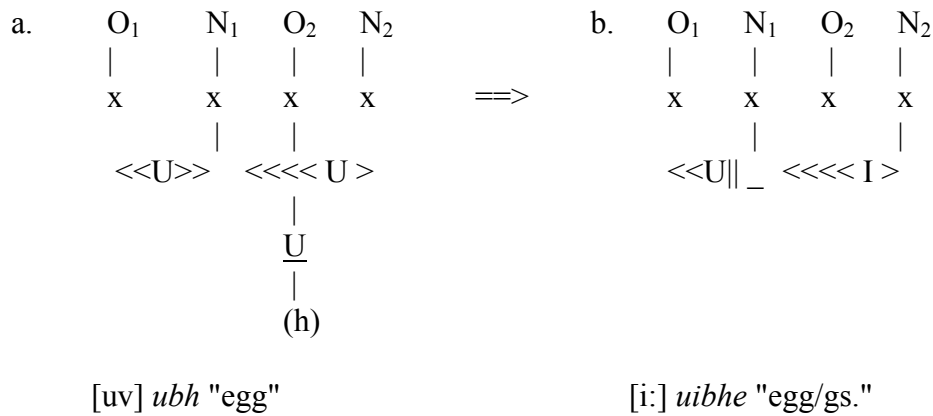
It seems that the actual representation of [v] could not only be reduced to (h.U) but in fact to (U) alone.⁶⁵ The reason for this is that the element (h) is normally used to bring out the contrast between [w] and [v] for which there is no need in Irish. Firstly, [w] is not found in

⁶⁴Note that if we left one 'U' to define the velarised labial consonant then the palatalisation of such an object should automatically eliminate labiality. This could be helpful in accounting for the [uv/i:] alternation, however it would wrongly predict that [v'] should be absent from the system (cf. [n'iv'] *nimh* "poison"). Thus, without excluding this interesting possibility, we will use two elements 'U'.

⁶⁵This possibility is fully exploited in chapter 4.

word-final position, and secondly [w] and [v] are to a great degree interchangeable in word-initial position (cf. e.g. [vuim'] and [wum'] *uaim* "from me"). In ((64)c), we represent what intuitively appears to be the intermediate stage (i.e. [iv'ə]) in the derivation of [uv/i:] ((64)a,b), which in fact, is a fully legitimate form found outside the Munster dialect (Wagner (1958:45)).

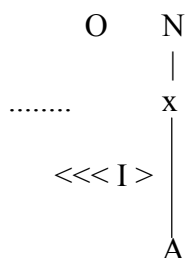
(64)



[iv'ə] *uibhe* "egg/gs." (in Connemara and Donegal)

Let us begin with [iv'ə] ((64)c) which, although it is not normally found in Munster, illustrates the relevant factors underlying the derivation of [i:]. The onset O₂ is palatalised in the genitive, hence the element 'I' spreads and affects the first nucleus N₁ in the same manner as in the alternation [muk / mik'ə] *muc / muice* "pig/gs." in which case the 'U' shared between O₁ and N₁ forms a buffer to further spreading. The element 'I' defining palatalisation of O₂ is shared with the inflectional vowel N₂ the structure of which agrees with what we proposed earlier in the discussion of A-harmony, i.e.:

(65)



Thus, in order to derive Munster [i:] ((64)b) we need to account for the suppression of the melodic material from O₂ and of the element 'A' from N₂. It seems that the context for the [v'] suppression can be defined quite clearly. Namely, this consonant, as well as [v] ((62)) and [g'] ((63)), tend to be lost in the intervocalic position, which entails fusion of the flanking nuclei.⁶⁶

Quite a different problem is posed by the presence of 'A' in the inflectional vowel. Note that the sole deletion of the melodic material from O₂ should yield a familiar structure of the centring diphthong [iə] with 'A' lodged in N₂. Thus we need to account for the suppression of 'A' from N₂ in some way. To do that, we may either relax the proposal concerning the make-up of Irish inflectional vowels ((65)) and accept the fact that certain endings have no 'A', or look for a reason why the 'A' is not realised.⁶⁷

There are reasons to believe that such a synchronically derived form as [i:] *uibhe*, which we view as a sequence N₁-N₂ will behave differently from the centring diphthongs [iə] and [uə] in a few respects. First of all, the centring diphthongs are strictly dependent on the quality of the preceding onset (*C_iə, *C'_uə), while, as can be seen in the structure ((64)b), [i:] (*uibhe*) is phonologically preceded by a buffer 'U'. Thus the phonological behaviour of the centring diphthongs clearly points to a difference in structure which may be responsible for suppression of 'A' in Munster *uibhe*.

Secondly, we have established that although [iə] is found word-finally e.g. [d'ɪə] *dia* "god" there are data which suggest that phonologically this diphthong may be followed by an

⁶⁶Recall that without assuming that both flanking nuclei are realised in such forms it would be difficult to account for the regular occurrence of [v], [v'] and [g'] word-finally (see also the discussion of the second conjugation of Irish verbs below which provides an additional argument in favour of our analysis, viz. stress placement with reference to such lengthened vowels).

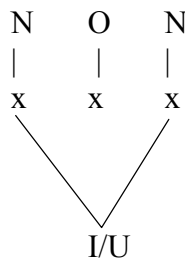
⁶⁷Wagner (1958:45) transcribes the genitive case of "egg" in the Cork area as [i:ː] which might point to the presence of 'A' in these forms.

additional (phonetically null) O-N sequence which shows up when the final nucleus is realised e.g. [d'e:hə] *déithe* "god/pl." (see also [kl'ia / kl'e:hə] *cliath / cléithe* "hurdle/gs." (3.3.2)). Such forms contain the latent [h] which may be phonetically realised only if followed by a realised nucleus (recall [b'i / b'ahə] *bith / beatha* "existence/gs.").

One may propose that this additional (phonetically mute) O-N sequence could be understood as a condition underlying the existence of word-final [iə] so that a centring diphthong must be followed (licensed?) by another nucleus, whereas in [i:] ((64)b) N₂ containing 'A' is not followed by another O-N sequence hence 'A' must be suppressed.⁶⁸ Another fact which might support this interpretation is that word final diphthongs, not only [iə] and [uə] but also [ai] and [au] are rare in Munster. Additionally, the word-final short vowels which follow a palatalised onset, tend to be raised to [ɪ] in Irish, i.e. they tend to lose 'A' e.g. [fa:l't'ɪ] *fáilte* "welcome", [ag'in'ɪ] *aigne* "mind", [ban'ɪ] *bainne* "milk", etc. (Sjoestedt (1931:93)). All these points do not entirely account for the suppression of 'A' from N₂ in Munster *uibhe*, but they allow us to believe that such an outcome is possible.

Thus, intuitively one may accept the derivation of [i:] from [uv] as licit where the syllabic structure of the long (lengthened) vowel is ((66)).

((66))



The phenomenon of consonant delinking and vowel lengthening described above as nuclear fusion appears to be pervasive in the verbal system of Irish. Certain verbs of both first and second conjugation have the vowel lengthened in this way. Additionally, verbs of the second conjugation exhibit stress shift onto the lengthened vowel parallel to ['gr'anəvər / gr'a'nu:r].

⁶⁸This last point refers strictly to the notion of interaction between prosodic and autosegmental licensing which in the case in hand means that the nucleus N₂ may autosegmentally license only certain amount of melodic material if it is not prosodically licensed by another nucleus. A similar phenomenon is considered in Yoshida (1992) where it is proposed that long vowels in certain languages must be followed (licensed) by another nucleus.

(67)

I CONJUGATION

IMPERATIVE

1ST PERSON SG.

	[las]	<i>las</i>	[lasim']	<i>lasaim</i>	"light"
	[kir']	<i>cuir</i>	[kir'im']	<i>cuirim</i>	"put"
but	[n'ig']	<i>nigh</i>	[n'i:m']	<i>ním</i>	"wash"
	[sig']	<i>suigh</i>	[si:m']	<i>suím</i>	"sit"

II CONJUGATION

IMPERATIVE

1ST PERSON SG.

	[k'anig']	<i>ceannaigh</i>	[k'a'ni:m']	<i>ceannaím</i>	"buy"
	[air'ig']	<i>éirigh</i>	[ai'r'i:m']	<i>éirim</i>	"get up"
	[k'u:nig']	<i>ciúnaigh</i>	[k'u:'ni:m']	<i>ciúnaím</i>	"calm"

The first person singular is formed by adding the marker [-im'] which once more shows that the consonant to be delinked finds itself between two realised nuclei. Note that the stress shift similar to that in ['gr'anəvər / gr'a'nu:r] can be observed, which suggests that fused nuclei behave exactly like other long vowels. Particularly instructive here are the forms [k'u:'ni:m'] and [ai'r'i:m'] in which the stress falls on the second long vowel. This perfectly agrees with the stress placement pattern found in Munster.

In this dialect stress assignment is to a large degree quantity sensitive (e.g. Loth (1913), Gussmann (1994)). The basic patterns of stress placement depend on whether the vowels are short (v) or long (v̄) and are given below.

(68)

a.	v v	['sagərt]	<i>sagart</i>	"priest"
b.	v v v	['skol'ənə]	<i>scoileanna</i>	"schools"
c.	v̄ v	['ko:tə]	<i>cóta</i>	"coat"
d.	v v̄	[ka'l'i:n']	<i>cailín</i>	"girl"
e.	v̄ v̄	[pra:'ti:]	<i>prátaí</i>	"potatoes"

Words containing two or three short vowels are stressed on the first syllable, while the last two examples show that the second nucleus always attracts stress if it is long. Notice what

happens in verbs of the second conjugation where the first syllable contains either a long vowel or a heavy diphthong and where the same type of nuclear fusion as in the first conjugation is observed. The stress in [k'u:'ni:m'] and [ai'r'i:m'] is shifted to the second syllable to fit the pattern shown in ((68)e).

From the point of view of the system of stress placement, a sequence of fused nuclei behaves exactly like other long vowels, which suggests that the difference between the two structures, if there is any, is irrelevant. The important point here is that the fused vowel, i.e. an underlying N-O-N is made equal to what we may still believe to be a branching nucleus as regards stress placement. Thus, without jumping hastily to conclusions, we may bear in mind the possibility that our Irish long vowels might be nothing else than N-O-N's.

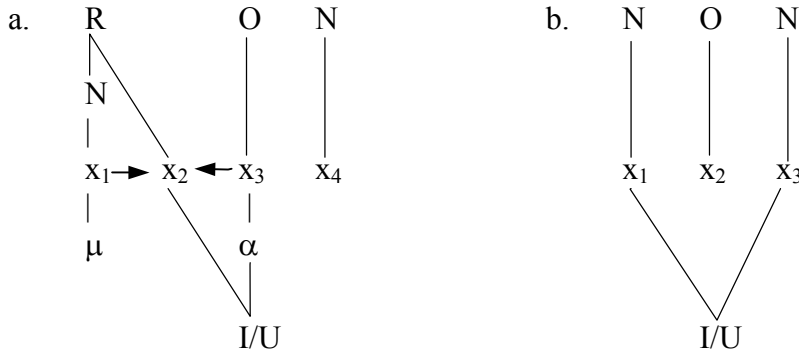
Thus, it appears that not only [iə], [uə], [ai] [au] and [e:] but also certain [u:]'s and [i:]'s may be shown to have the representation of a nuclear sequence in Irish rather than a branching nucleus. If on that basis, we want to propose that all long vowels in Irish are sequences rather than branching nuclei, we need to account for the integrity that other pure long vowels (except [e:]) exhibit. By integrity, we mean the general immunity of long vowels to element spreading despite the fact that, structurally, they may be formed by two short nuclei. This problem will be taken up below, but first, let us say a few more words about compensatory lengthening.

3.4.3. Digressions on compensatory lengthening in Irish

Perhaps this is the right place to drift slightly away from the frenetic activity of establishing different phonological structures for long vowels and try to clarify certain aspects concerning the predictions that such constructs entail. Specifically, the nuclear fusion discussed in the previous section is clearly a second instance of compensatory lengthening that we encounter in Irish.⁶⁹ The first example of this phenomenon that we considered was the lengthening of the "Johnsen vowel" type ((69)a). Let us compare the two processes in terms of their structure and behaviour.

⁶⁹The use of the term "compensatory lengthening" here is metaphorical as it agrees with the traditional concept in terms of the general mechanism only - lengthening as a result of consonant loss - while structurally, we are dealing with nuclear fusion.

(69)

[k'aun / k'anə] *ceann* / *ceanna* "head/pl."[uv / i:] *ubh* / *uibhe* "egg/gs."

The interpretation of the structure ((69)a) is conditioned by and depends on whether the rhymal complement (x_2) is properly governed (licensed as in [k'anə] *ceanna*) or not (as in [k'aun]). This in turn depends strictly on the nature of the nucleus (x_4) which follows the onset head (see 3.2 for details), i.e. on whether it is realised or not. On the other hand ((69)b) involves deletion of an intervocalic consonant (onset) which yields a vowel constituted by two consecutive nuclei where the requirement seems to be that the second nucleus (x_3) be realised phonetically. Thus both distributional (behavioural) and structural differences between the two types of compensatory lengthening are clear. It will be shown below, and in the following section, that these discrepancies have their phonological consequences.

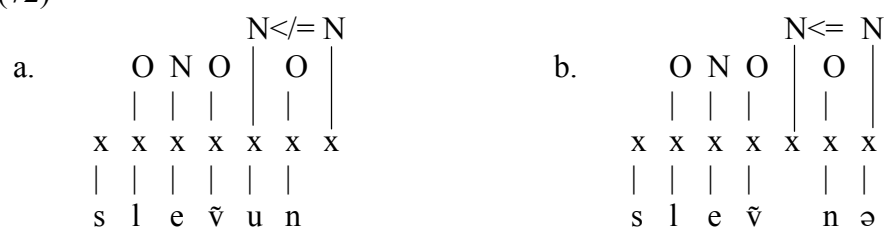
If we consider the segmental make-up of the lengthened vowels we see that the "Johnsen vowel" predominantly takes the form of a diphthong (e.g. [k'aun]), but pure vowels are also possible (e.g. [k'i:n'] *cinn* "head/gs."). On the other hand, the nuclear fusion seems to yield only pure [i:] and [u:]. Let us now concentrate only on the lengthening of the ((69)b) type.

The remark concerning the mechanism of nuclear fusion that we want to make here concerns the prediction that our analysis of this type of compensatory lengthening in Irish carries. Recall that the condition that has to be fulfilled here is that the second nucleus be realised, hence we prefer to represent the lengthened vowel as ((70)a) rather than ((70)b) below. In other words, we predict that a mere deletion of the final consonant will not result in compensatory lengthening in Irish.

regardless of whether the lost consonant is followed by a realised or licensed nucleus.⁷¹ Below we concentrate only on the type of lengthening which results in a nuclear sequence and try to account for the discrepancy as regards the word-final and word-medial situation.⁷²

The Old Irish word *slemun* "smooth" had a plural form *slemna* (Thurneysen (1949:118)) in which case we may speak of vowel syncope, or in GP terms, Proper Government by which the nucleus which directly follows "m" (phonetic [v̥]) is licensed by the inflectional vowel, hence empty. A hypothetical representation of the two forms is given below.

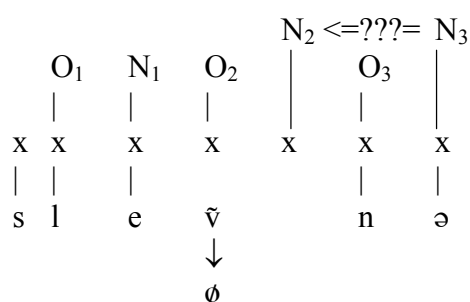
(72)



(<=) Proper Government, (</=) no Proper Government

What is important here is that the consonant [v̥] is phonologically sandwiched between two nuclei. The question now is why the deletion of the consonant [v̥] caused compensatory lengthening which is reflected in the present day forms [ʃl'aun' / ʃl'aunə] *sleamhain* / *sleamhna* "smooth/pl.". We expect no lengthening (as in [k'i]) because the nucleus directly following the deleted [v̥] is licensed. See below.

(73)



⁷¹An additional condition here is that such a language needs to possess quantity contrasts in the system already (de Chene and Anderson (1979)).

⁷²For a "textbook" example of a compensation as a result of rhymal complement loss see the development [nixt > ni:t > nait] in the history of English (e.g. Harris (1994a:35)).

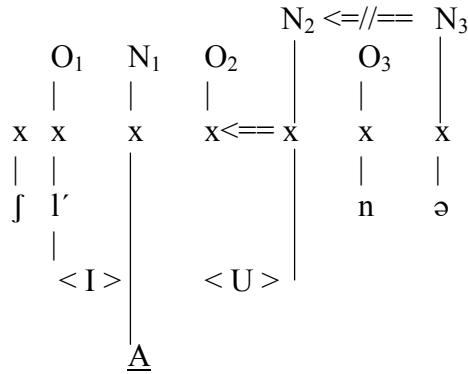
If we want to maintain the strict view on compensatory lengthening that it can only occur if both nuclei are realised when an intervocalic consonant is lost, then we have to assume that, for some reason, the nucleus N_2 has to be realised in this context, i.e. it cannot be properly governed.

It seems that we may account for this problem quite easily. It was mentioned earlier in this chapter that empty onsets must be properly governed, and thus obey the same principles as empty nuclei (Charette (1991:193)).⁷³ Charette (1991) proposes that such empty onsets are properly governed by the following realised nucleus, thus, a sequence of two empty positions O_2-N_2 (word-medially) is impossible and the nucleus must be realised, or else, such a sequence must be truncated. In other words, we are dealing here with a conflict between the licensing duties that the nucleus must discharge (properly govern the onset) and the fact that it itself may be properly governed by the following nucleus. A similar conflict of principles in French is discussed in Charette (1991:104) where a properly governable nucleus must be phonetically realised in order to license the preceding governing domain. The outcome in Irish seems to be identical to that in French. That is to say, the nucleus is realised in order to discharge its licensing (governing) duties.

Thus what happens in Irish is that when the melodic material lodged in the O_2 position is delinked then the following nucleus can no longer be properly governed because it itself has to properly govern the preceding empty onset. If this analysis is correct, then the connection between consonant loss and compensatory lengthening of the inter-nuclear type word-medially follows automatically from the general principles defining phonological structure. We illustrate this below and introduce the necessary changes in order to reflect the present day form and to be able to account for the melodic shape of the resulting diphthong. Namely, the 'U' element which constitutes a residue of the lost consonant (be it labiality or velarisation which we represent as U-ness).

⁷³See the discussion of the phonological Empty Category Principle in 1.3.

(74)



(<==) Proper Gov., (<==/) no Proper Gov.

Note that ((74)) gives precisely the representation of the diphthong [au] which was proposed in 3.3.7. The element 'U' which has the ability to spread leftwards will not however affect 'A' because 'A' is headed (cf. [l'ak] *leac* "stone"). Thus it seems that the strict view of the possible types of compensatory lengthening in Irish may be maintained. What is more, it would be interesting to be able to correlate the discrepancy between word-medial and word-final context as regards lengthening with the virtual absence of word-final diphthongs in Irish.

Let us now address the question of immunity of pure long vowels assuming that their structure is that of a sequence of nuclei. The assumption is based on the findings concerning [e:], [i:] and [u:] (this chapter) as well as on the conviction that there is no reason why the formal (syllabic) structure of pure long vowels in Irish should be different from diphthongs.

3.4.4. Fused nuclei and the question of immunity

We have seen that, apart from the cases where underlying short vowels are lengthened ("Johnsen vowel") and the diphthongs, pure long vowels do not partake in qualitative alternations, but we have also seen why only [e:] and marginally [ɑ:] can do so.⁷⁴ Below, we reproduce some data exemplifying the immunity of pure long vowels to element spreading (C-V interaction).

⁷⁴Recall that [e:] decomposes into [ia] in the C'-C context (but not word-finally!), while [ɑ:] is fronted to [a:] in C'-(C). Note that in both cases we are dealing with the influence of the preceding palatalised onset.

(75)

C'-C'	[k'u:n']	<i>ciúin</i>	"calm"
	[k'i:l']	<i>cíl</i>	"raddle"
	[f'o:l']	<i>feoil</i>	"meat"
	[g'e:l']	<i>géil</i>	"surrender"
	[χ'a:n']	<i>Sheáin</i>	"name/gs."
C-C	[du:n]	<i>dún</i>	"close"
	[ki:səχ]	<i>cuíosach</i>	"fair"
	[ko:tə]	<i>cóta</i>	"coat"
	[ge:l]	<i>Gael</i>	"Irishman"
	[bɑ:s]	<i>bás</i>	"death"

First of all, notice that [i:] in [ki:səχ] and [u:] in [k'u:n'] are found in the contexts from which short [i] and [u] are banned (*CiC, *C'uC'). Additionally, while short [e] is impossible between two velarised consonants, its long counterpart is found in this context although it is slightly retracted (Ó Cuív (1975:16)). Likewise, the short [a] or [ɑ] were not found between two palatalised onsets (hence [f'ar / f'ir'] *fear / fir* "man/gs."), while the long [a:] is possible in this context.⁷⁵

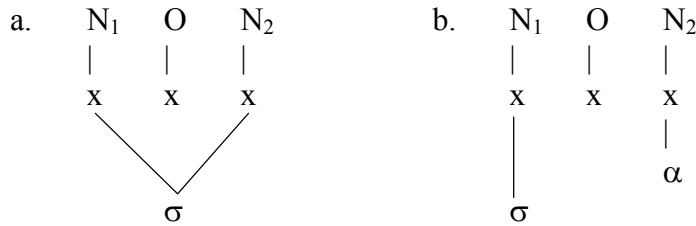
Given our assumption that Irish pure long vowels have the structure of a sequence of nuclei rather than a branching nucleus we must account for these distributional differences between short and long vowels. This, in effect, means that we have to consider possible reasons for the lack of interaction of pure long vowels with element spreading. Recall the discussion of the *Minimality Condition* (Charette (1989)) in 3.1.2 where we considered the possibility that this condition might be effective in Irish.

The main idea was that the structure of a branching nucleus should protect the melodic material lodged in such a domain from external influence. Since the main thrust of that proposal refers to the constituent structure (syllabic hierarchy) rather than to the substantive aspect of the phonological representation (melody) it carries the prediction that

⁷⁵Nonetheless, it must be acknowledged that a sequence (C'a:C') in which the second consonant is not palatalised due to a morpho-phonological process (i.e. case marking) as in e.g. [ja:n / ja:n'] *Seán / Seáin* "name/gs." is rare.

both pure long vowels and diphthongs should behave in the same fashion with respect to e.g. harmony processes. This is not the case in Munster Irish, as long vowels behave differently from diphthongs and it seems that the decomposition of [e:] points to the reason for this. Let us look again at the structure we want to propose for long vowels ((76)a) and diphthongs ((76)b).

(76)

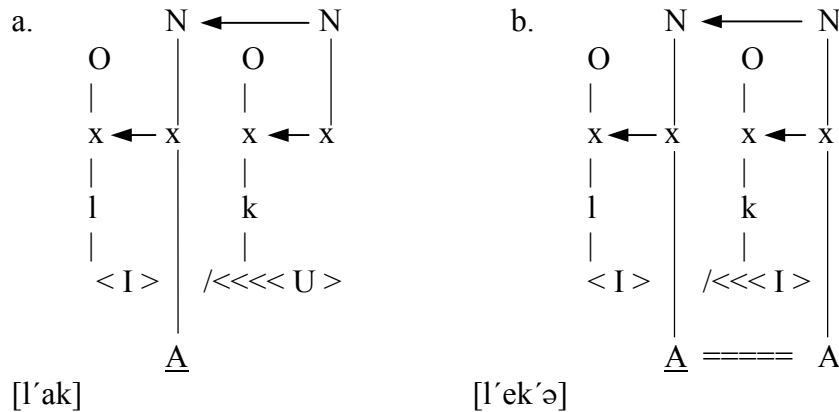


The decomposition of Munster [e:] to [ia] indicates that it is the melodic (substantive) aspect that is crucial and not the formal (structural) one, or at least, that both aspects are equally relevant in the distribution and derivation of that object. This assertion finds support in the facts concerning the immunity or "opaqueness" to palatalisation or velarisation of certain short nuclei which we view as A-headed, where, clearly, the immunity is due to the status of the melodic element lodged in the nucleus.⁷⁶ Thus one way of accounting for the immunity of long vowels would be to refer to the "integrity" that a structure like ((76)a) exhibits. This integrity, as opposed to diphthongs, may be derived from the fact that the same melodic material is associated to both nuclei, and it is only when a vowel decomposes (e.g. [e:] to [ia]) that the nuclei become susceptible to phonological processes. Another possible explanation is connected with the notion of headedness which, in fact, follows directly from the structure in ((76)a). Let us elaborate on these two possible factors.

The proposal that doubly linked melodic material exhibits stronger potential in terms of immunity to phonological processes finds support in Irish not only when long vowels are involved. Recall the phenomenon of A-support in the alternation [l'ak / l'ek'ə] *leac* / *leice* "stone/gs." in which the element 'A' is not suppressed in the genitive case as in e.g. [f'ar / f'ir'] *fear* / *fir* "man/gs.". This we ascribe to the fact that 'A' in the first nucleus in [l'ek'ə] is supported from the following nucleus containing an identical element.

⁷⁶See also the behaviour of Irish [r], which will be treated as A-headed, with respect to palatalisation (chapter 4.).

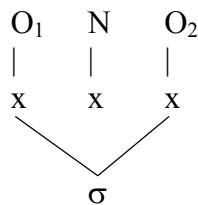
(77)



Note that this support phenomenon may be now understood as double linking of the element 'A', i.e. this element is licensed in two nuclei under government, hence, it is not liable to suppression any more. This interpretation, in fact, points to the similarity between the [l'ak / l'ek'ə] alternation and the composition / decomposition effects in which Munster [e:] is involved e.g. [gr'ian / gr'e:n'ə] *grian / gréine* "sun/gs." and [m'iar / m'e:r'ə] *méar / méire* "finger/gs.", to which we have referred in this chapter.

A similar phenomenon of element support is to be found in the consonantal system of Irish which we will discuss at length in the following chapter. Suffice it to say now that such effects will not be surprising at all given the fact that structurally, our long vowels are identical to consonant geminates proposed for some languages (see e.g. Kaye (1990:322), Bloch-Rozmej (1994)) which we illustrate below.

(78)



In our analysis, the Munster sonorant geminates (3.2) are viewed as a rhymal complement (coda)-onset relation rather than an interonset one. However, interonset relations appear to exist in Munster and involve homorganic consonantal sequences which contain a mute nucleus as in ((78)) above (see Cyran (1996a) and chapter 4).

As far as the headedness is concerned as the possible factor contributing to the immunity of pure long vowels, its main advantage is that it correlates the immunity of certain short vowels with that of long ones. Recall that in the immunity short "opaque" vowels to element spreading is attributed to their headed nature. However, the headedness of pure long

vowel follows directly from the fact that the melody is linked to two positions (Cobb (1993)). Thus the answer to the question of immunity may in fact involve a combination of the two factors, i.e. melody licensing in two positions and headedness. These appear to be related issues.

Note that we may now understand the reason for the susceptibility of diphthongs to element spreading in the following way: since the elements in diphthongs are not licensed in two positions their interaction with palatalisation and velarisation should be determined only by the lexical status of the melodic material lodged under the two separate nuclei. What we mean by status is simply whether the element is headed or not.

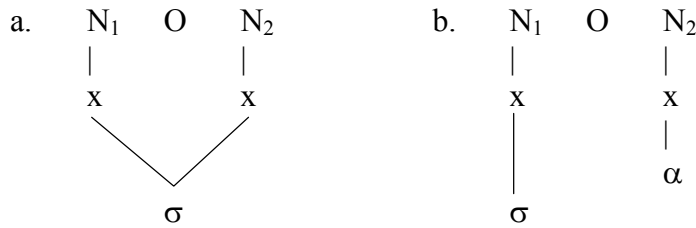
The headedness possibilities of short nuclei, in turn, are made precise by our analysis of the short vowel system. Namely, lexically only 'A' may be headed, which includes (A), (I.A) and (U.A) while the headedness of 'I' and to some extent 'U' is derived (2.4). In this light, the strict dependence of the first element of the diphthongs [iə] and [uə] on the quality of the preceding onset and the effects of glide formation within the diphthongs [ai] and [au] are no longer surprising, as they mirror the facts found in the short vowel alternations.

Thus, in fact, the immunity of pure long vowels can be accounted for by referring to the substantive aspect of their phonological representation, i.e. headedness which is lexically restricted to certain elements in the case of short vowels, while all long ones are headed due to the double linking. In this interpretation the only contribution of the structural (formal) aspect of representation is that two positions are involved regardless of whether they are separated by an empty onset (e.g. [i:] in [si:m'] *suím* "I sit") or a filled one (e.g. [k'] in [l'ek'ə] *leice* "stone/gs." ((77)b) above).⁷⁷

Nonetheless, we also have to deal with a situation in Irish where even certain diphthongs show an "integrity" which is normally attributed to pure long vowels (e.g. [awi] vs. [auf] *amhais* "servant/gs."). Following Ritter (1994) we may propose that such objects, may be accounted for by employing the structure of a nuclear sequence separated by a positionless onset. This proposal constitutes an alternative interpretation of immune pure long vowels ((79)a) and accounts for the immunity of certain diphthongs ((79)b), though it shifts the brunt of explanatory power to the structural aspect of representation.

⁷⁷Recall that our analysis of the decomposition of [e:] to [ia] also refers to the substantive aspect of that vowel, namely, to the restrictions concerning the combinability of 'I' and 'A'.

(79)



The structure ((79)b) allows us to view the inalterability of [au] in the following ways. One interpretation might be that the element 'U' cannot be pushed out of its nucleus because it has nowhere to go. The other possible explanation of the inalterable structure might be that the integrity of the diphthong is stronger when the respective nuclei are not separated by a skeletal point. This assertion might also help us understand the disparate behaviour of "pure" long vowels as opposed to short nuclei and diphthongs.

The structure of two successive nuclei separated by a positionless onset can, in fact, be assumed to be the representation of inalterable long vowels in general (Ritter (1994)). In other words, such vowels behave like branching nuclei which might pose the question as to what constitutes the difference between the structure of inalterable sequences of nuclei (with positionless onset) and a branching nucleus? It seems that phonologically they will behave in a similar fashion, i.e. they will show integrity and immunity to harmony processes, and may exhibit the same characteristics as far as stress placement is concerned, which is the case in Irish. The following section illustrates a possible distinction between the two structures.

3.4.5. Binariness saved or savaged?

There is one important prediction following from the presence of the fused structure in a language like Irish which contains branching rhymes as well, namely, we can expect to find surface forms that apparently violate the binarity theorem, i.e. we may find forms with super-heavy rhymes. This seems to be the case in Irish where instances of super-heavy rhymes do not seem to be conditioned as they are in e.g. English (see Harris (1994a:77)). Consider the data below and the structures in ((81)).⁷⁸

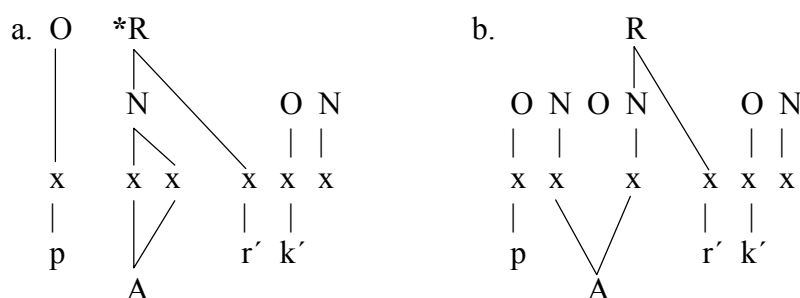
⁷⁸Two forms of the data below alternate with short vowels, i.e. [raʊŋ / raʊənə] *rang* / *ranganna* "class/pl." and [lu:ŋ / liŋ'ə] *long* / *loinge* "ship/gs.". The existence of these alternations may be put down to the operation of Proper Government whereby the second nucleus of the "long" vowel is properly

(80)

[pɑ:r'k']	<i>páirc</i>	"field"
[ɑ:rd]	<i>ard</i>	"high"
[tɑ:r'g']	<i>táirg</i>	"to produce"
[rair'k']	<i>radhairc</i>	"sight-gs."
[raʊŋg]	<i>rang</i>	"class"
[lu:ŋg]	<i>long</i>	"ship"

Given that e.g. a long [ɑ:] is a branching nucleus in Irish, then the only possible structure that can be assigned to the word *páirc* would be that in ((81)a). On the other hand, the assumption that Irish long vowels are sequences of nuclei yields the licit structure ((81)b).⁷⁹

(81)



The structure in ((81)a) is a blatant insult to the binary theorem which says that syllabic constituents can maximally contain two positions. Notice that the constituent rhyme contains a branching nucleus and a "coda". The structure in ((81)b), on the other hand, conforms to the condition on phonological structure which says that syllabic constituents are maximally binary. Thus, if the structure of long vowels in Irish indeed corresponds to a nuclear sequence, which is what we have established, then ((81)b) would be the only possible structure of the alleged super-heavy rhymes in this language (cf. Cyran (1994)).

One should add here, however, that this analysis has some grave consequences for the binary theorem and the apparent solution to its violation in ((81)a) may in fact prove fatal.

governed by the vowel in the inflectional ending. The simplification of the consonantal cluster eliminates a governing domain and thus makes the possible the application of Proper Government (Gussmann (p.c.)).

⁷⁹Notice that, if this analysis of super-heavy rhymes could be used as an argument against branching nuclei in Irish, then the forms in (64) show that also [ɑ:] must be a sequence of nuclei.

Given that vocalic length can be represented as a NON sequence the theorem is losing its empirical weight since it becomes impossible now to formulate what would constitute evidence to the contrary (Harris (p.c.)).⁸⁰

3.4.6. Conclusions

We have seen that the vocalic system of Irish is complex and very interesting from the point of view of phonological representation and principles governing the existing processes as well as the distribution of segments. We have tried to pin down a few principles to capture the most operative alternations by making certain assumptions concerning both the formal and the substantive representations of Irish vowels.

As far as the substantive aspect of the representation of Irish vowels is concerned, we proposed that the lexical representation of Irish short vowels is partly defined by the environment, i.e. the I/U quality of flanking consonants and spreading of 'A'. We concentrated on the interaction between resonance elements in spreading processes as well as on the static distributional patterns and proposed certain restrictions on element combinability in the form of licensing constraints. The main constraint, i.e. *'I' and 'U' do not license operators* accounts for A-suppression when a nucleus is affected by palatalisation (e.g. [sop / sip'] *sop / soip* "wisp/gs." and [f'ar / f'ir'] *fear / fir* "man/gs."), as well as for vowels raising in both palatalised and velarised environments (e.g. [l'et'ir' / l'it'ir'] *letir* "letter" and [knok / knuk] *cnoc* "hill").

The dependence of short nuclei on the specification of the preceding onset has been formally expressed in the form of the *Sharing Condition* which requires that every O-N licensing relation contains one of the elements I/U. This proposal is supported by such phenomena as palatalisation / velarisation of the definite article (I/U-spreading) and blocking of element spreading by "buffer" elements.

The phenomenon of spreading itself which we view as part of the phonological representation of short vowels, may be redefined to express its static nature by invoking domains of application or identification with the element lodged within a particular domain. As an example of this we may recall the form [k^wid'] *cuid* "part" in which the palatalising

⁸⁰For a version of GP which does not employ binary constituents see e.g. Lowenstamm (in press) and

element 'I', lodged in the O₂-N₂ licensing domain,⁸¹ identifies all the positions to the left except O₁ which shares 'U' with the nucleus N₁ thus beginning a domain defined by the quality of that element. In this case the element 'U' constitutes a buffer to further spreading of 'I', or a limit to the domain identified by (licensed by) 'I' depending on whether we want to stress the dynamic or static nature of the phenomenon. An additional factor delimiting domains of I/U spreading (licensing) is headedness of certain short nuclei, the so called "opaque" vowels.

The analysis of long vowels and diphthongs demonstrated that if the findings concerning the substantive aspect of the vocalic system were to be applied to the existing effects of element interaction in diphthongs then a different view on the formal structure of Irish long vowels and diphthongs should be taken. Particularly instructive in pursuing the possibility that Irish long vowels are in fact sequences of two short nuclei rather than branching nuclei is the behaviour of Munster [e:] ((de-)composition) as well as the derivation of [i:] and [u:] as a result of fusion of two successive nuclei when an intervocalic onset is delinked.

The question of immunity of most pure long vowels to element interaction can be dealt with in two ways. Either by referring to the substantive factor, i.e. headedness, which unifies the behaviour of pure long vowels with "opaque" short vowels, or by assuming that structurally pure long vowels and certain diphthongs contain a positionless onset while the basic structure, i.e. a sequence of nuclei is maintained. It seems that to account for the variety in the behaviour of long vowels and especially diphthongs one has to admit that the structural and melodic aspects of the Irish vocalic system are complementary.

In the following chapter, we will investigate the possibility of accounting for certain phenomena concerning the consonantal system in which resonance elements are involved. We begin with an assumption that there should not be too much of a discrepancy between the behaviour of resonance elements as witnessed in the vocalic system and their contribution to the phenomena involving consonants.

Scheer (1994, 1996).

⁸¹The nucleus N₂ is justified by the general principle of *Coda Licensing* (Kaye (1990)).

4. CONSONANTS: RESONANCE ELEMENT INTERACTION

4.1. Introduction

In this chapter we will consider certain distributional peculiarities concerning Munster Irish consonants. Specifically, we will concentrate on distributional effects in which the resonance elements 'I', 'U' and 'A' play a role. Recall that 'I' and 'U' define palatalised and velarised consonants. The question is if 'A' has any role to play in the segmental make-up of consonants. Traditionally within GP the vocalic elements 'I', 'U' and 'A' define palatality, labiality and pharyngeality of consonants (Harris (1990a), Williams and Brockhaus (1992)). The claim to be made in this chapter is that the element 'A' is found in coronal consonants (Broadbent (1991), Backley (1993), Scheer (1994, 1996).

In looking at phenomena connected with the participation of resonance elements in consonantal segments we will assume that these elements should exhibit the same effects and behaviour as in vowels. For instance, the vocalic system of Munster Irish shows that A-headed objects resist palatalisation. Thus, should there be an A-headed consonant, we would expect it to resist I-licensing. It will be demonstrated that the Irish facts support this assumption with a vengeance. Additionally, the headedness of resonance elements will be shown to play a crucial role in defining other consonantal properties such as, for example, friction. This fact corresponds to similar effects in vocalic systems, namely, narrowing or tenseness, and strengthens our claims concerning the affinity between the consonantal and vocalic systems.

This way of viewing phonological systems has a long history as linguists have increasingly found that certain phenomena and conditions should be generalised to both consonants and vowels. In Government Phonology, the first instance of such a realisation was probably an extension of the theory of charm, which was initially proposed for vowels, to consonantal objects (KLV (1985, 1990), Rennison (1987, 1990)). Additionally, it was assumed that the resonance elements 'I', 'U', 'A' and v^0 define palatality, labiality, pharyngeality and velarity respectively where the contribution of 'I', 'U', 'A' and v^0 to

consonants matches their acoustic signature in vowels.¹ The only cumbersome vocalic element for which no place was found in consonants was the ATR element (f^+) so that eventually it had to be abandoned. To a large extent, the "complexity condition" (Harris (1990a)), which was meant to replace charm in phonological representations follows the same pattern, namely, the complexity restrictions in vowels and consonants coincide.

More recently, headedness of phonological objects has received more attention in the analysis of vocalic systems (Cobb (1993), Charette (1994), Charette and Göksel (1994/96), Harris and Lindsey (1995), Ritter (1996)). Let us first see in what way the theory of headedness may influence the understanding of phonological representations as far as vocalic systems are concerned before returning to the question of the element 'A' in consonants. It is understandable that our assumption concerning the presence of 'A' in coronal consonants will involve a discussion on the representation of certain pertinent coronal segments such as [s] and [r]. We will first consider the current phonological standing of the neutral element, the so called "cold vowel", and introduce the notion of headedness in more detail. This will be followed by a discussion of [s] and [r] leading towards the proposal that the headedness of resonance elements may define the manner of articulation as well as place.

4.2. Headedness in V's and C's

It is impossible to begin the discussion of headedness without clarifying the phonological standing of the neutral element, which was initially referred to as the "cold vowel". It is defined as an object devoid of any salient property ('hot feature' in the sense of KLV (1985)) which behaves like an identity element. In vocalic objects, this element is assumed to appear whenever an active element is missing. Phonetically speaking the element defines a neutral vowel and corresponds to the centrality element in Dependency phonology (Lass (1984:278), Anderson and Ewen (1987:28n)) and to an empty segment in Particle phonology (Schane (1984:132)).

In GP, the neutral element (represented in the literature as $/v^0/$ or $/@/$) has been assumed to be present in the segmental make-up of both vocalic and consonantal objects. In

¹ Apart from the resonance elements consonants are defined also in terms of manner elements: ? -

vocalic objects the neutral element defines the baseline on which other resonances are superimposed (Harris (1994a:112), Harris and Lindsey (1995)). This allows for a neat and formal explanation of various vowel reduction phenomena as due to the suppression of active elements or to a switch in status whereby the latently present neutral element becomes promoted to the head position within a vocalic object (Harris (1994a)).

In consonants, the neutral element has been used to define velar consonants in which the 'cold' vowel has the status of the head. Thus /@/ may be understood as an independent element which defines the neutrality of vowels and the velarity of consonants.

More recently, /@/ has been assigned an even more prominent function in the GP treatment of vocalic objects as a result of eliminating the ATR element in that the contrast between ATR and non-ATR vowels is now expressed by the headship of either the active element or the neutral one (Harris and Lindsey (1995)).

(1)

ATR vowels		non-ATR vowels	
[I]	i	[I.@]	ɪ
[U]	u	[U.@]	ʊ
[A.I]	e	[A.I.@]	ɛ
[A.U]	o	[A.U.@]	ɔ

A slightly different view on the nature of the neutral element in what is basically an identical treatment of the ATR contrast is presented in Cobb (1993), Charette (1994) and Charette and Göksel (1994/96), in which the neutral element is excluded altogether from the phonological representation of vowels, and the ATR contrasts are expressed in terms of the headedness vs. headlessness of vocalic objects. Thus the active elements (I,U,A) are either headed or non-headed (empty-headed), with no special status assigned to the neutral element. This is illustrated below.

(2)

ATR vowels		non-ATR vowels	
[I]	i	[I. _]	ɪ
[U]	u	[U. _]	ʊ
[A.I]	e	[A.I. _]	ɛ
[A.U]	o	[A.U. _]	ɔ

(_) is used here only to show that the active elements are not headed. In this model, the ATR harmony consists merely in aligning the status of the resonance elements within a given domain (see e.g. Charette (1994)). Another consequence (if not advantage) of this approach is that the number of elements is yet again reduced which has an important influence on the number of possible phonological objects that the theory predicts, although, in this way, more prominence is given to headedness as an autonomous mechanism.²

The obvious logical step to be taken now is to exclude /@/ from the representation of consonants. One reason for this is the uniformity of the representations of consonants and vowels in terms of elements. Thus the earlier presence of /@/ as the head both in velar consonants and in the non-ATR vowels can now be captured in terms of its absence. The velar consonants are now represented as headless or empty-headed, i.e. none of the elements present in the segmental make-up of velar consonants forms the head. For example, the velar plosive [g] can be represented by just two elements in the operator position (h, ?, _).³

Thus the distinction HEADED vs. HEADLESS seems to gain more importance in representations. In the ensuing sections we will try to see to what extent the theory of headedness can be used in defining consonantal systems. One aim of this chapter is to show that headedness may define consonantal properties which have so far been restricted to

²It seems that both approaches to the neutral element are equally able to account for the empirical facts. The difference between them lies in the greater expressive power of the approach advocating /@/ as a separate element. For instance, the treatment of such processes as ATR harmony, which are now viewed in GP as head alignment (Charette (1994), Harris and Lindsey (1995)) can be also viewed as /@/ spreading if this element is recognised (Backley (1993)).

³The headless nature of velars naturally explains their propensity to lenition processes and may prove useful in accounting for the frequent neutralisation of the coronal / velar distinction under e.g. the influence of palatalisation, and the correlation between coronals and velars with respect to assibilation (Foley (1977:90)).

manner elements. The other objective is to see how the status of the resonance elements in consonants underlies element interaction. Recall that in vocalic systems only certain combinations of elements were possible.

Initially we will concentrate on the behaviour of resonance elements with respect to headedness. We begin with the controversial issue of the phonological representation of [s] and [r]. There are two reasons for this. Firstly, these segments recurrently exhibit their special status in consonantal systems. Secondly, if the assumption concerning the presence of the element 'A' in coronal consonants is correct then the interaction between coronal segments and palatalisation should exhibit similar phenomena to the A-I interaction found in the vocalic system discussed in chapters 2 and 3.

4.2.1. [s] and the complexity question

Typically, [s] used to be defined in terms of two elements (h^0 , R^0) (e.g. Kaye (1992/96)), and being a charmless segment, it could not govern a complement even though it was more complex than other neutral segments.⁴

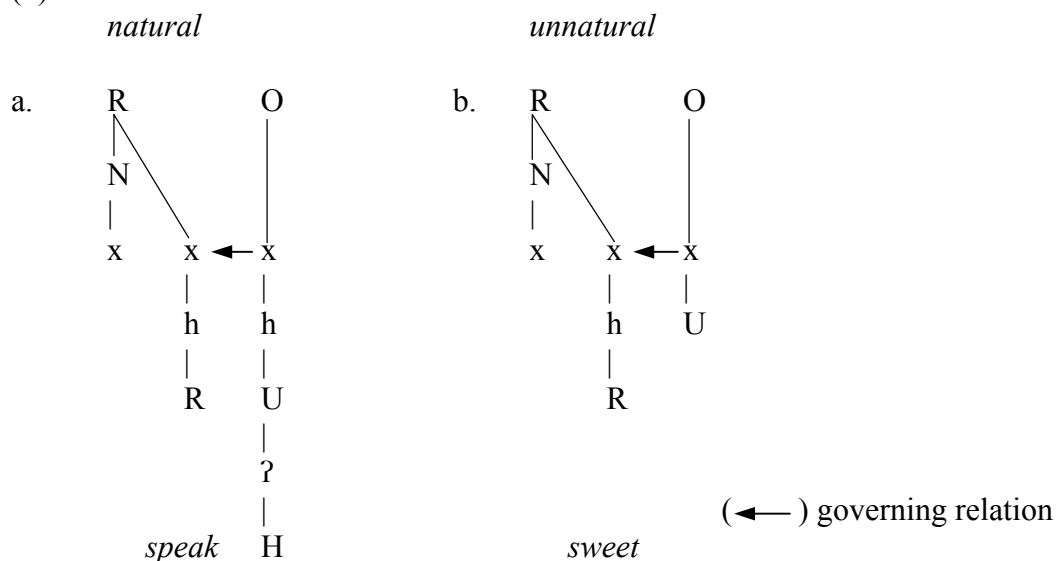
The theory of government predicts two situations where a non-nuclear segment governs a complement, namely, (a) within a branching onset, and (b) across constituents, where an onset governs the preceding rhymal complement (KLV (1990:218)), or the preceding onset (Kaye (1990:322)). The two types of relation are not symmetrical in that the interconstituent government allows more combinations, which is due to the fact that in this type of relation the head may be neutral. Thus, for instance, -rl-, -rn-, -rm-, -lm-, -ln- sequences are possible governing domains when the first segment belongs to the rhyme. The possibility of having such neutral sequences is accounted for by another criterion, viz. complexity of segments, which is calculated in terms of the number of operators occurring in the representation of these segments (KLV (1990), Harris (1990a)).

⁴See the introduction to GP (chapter 1.) for an exposition of the charm theory. Briefly, charm defines the governing properties of segments in that charmed consonants are governors and charmless ones are governees. Charm has now been replaced by complexity and we refer to it here strictly for the purpose of an adequate exposition of the ideas put forward in Kaye (1992/96).

Given that the complexity hierarchy of neutral segments is: {glides, r} < l < nasals (KLV (1990: 218)) we account for the absence of *-lr-, *-nr-, *-mr-, *-ml-, *-nl- sequences on the strength of the fact that the heads of such relations would be less complex than their complements. The segment [s] (R^0 , h^0) is not mentioned in this context in KLV (1990). On the other hand, Kaye (1992/96) addresses the question of the governing properties of this segment with relation to (s+C) sequences.

Kaye shows that word-initial (s+C) sequences are not branching onsets but rather interconstituent relations where [s] is transconstituently governed by the following segment which may be charmed or neutral. In the latter instance the requirement is that the neutral governor should be more complex. On the basis of this requirement Kaye divides (s+C) clusters into two groups. To one group belong the so called "natural" transconstituent sequences *sp*, *st*, and *sk*, in which the obstruents are indisputably recognised as more complex than the complement [s], as well as being charmed. The other is represented by the "unnatural" sequences *sl*, *sr*, *sn*, *sm*, and especially *sw*, *sj*, where, despite the smaller or equal complexity of the second segment, [s] continues to be treated as a rhymal complement (a governee). Even with the relaxation of the complexity condition to allow equally complex segments to govern (Harris (1990a)), the problem of *sw* and *sj* remains. The structure of "natural" and "unnatural" (s+C) sequences is presented below.

(3)



Following this line of argument, and bearing in mind the structure of unnatural (s+C) sequences in particular, Backley (1993) redefines the representation of [s] as containing only

one element (h) with coronality left unspecified. This results from the attempt to exclude the coronal element (R^0) from phonological representations, and also from the impossibility of replacing that element in the representation of [s] by any other element without running again into trouble with "unnatural" sequences as in *sweet*.

The question of the nonspecification of coronals aside, one notices that the need to represent [s] as a simplex consonant is forced upon us by the acceptance of ((3)b), i.e. a Rhyme-Onset relation, as the phonological structure of the "unnatural" sequences. Thus, assuming that it can be shown that the "unnatural" (s+C) sequences are not Rhyme-Onset governing domains, the requirement of a simplex representation for [s] might be relaxed. This is what we attempt to do in the following section.

4.2.2. "Unnatural" (s+C) sequences in Irish

The first argument against representing the "unnatural" sequences as (R-O) ((3)b) comes from the distribution facts in English. It seems that these sequences, i.e. *sl*, *sn*, *sw*, must always be followed by a vowel, which is not required for [sp], [sk] or [st], hence only the "natural" (s+C) sequences are found word-finally.⁵ A similar type of restriction applies to the Irish distributional facts except that in Irish every word final *sl* is broken up by a vowel e.g. [uəsəl] *uasal* "noble". Additionally, Irish word initial (s+C) clusters behave differently with respect to lenition processes precisely depending on whether they are "natural" or "unnatural" sequences. In brief, it seems that "unnatural" sequences behave like two onsets rather than (R-O). First of all, it will be shown that in Irish *sl*, *sn*, *sr*, behave like a single *s* or as branching onsets and cannot be viewed as structurally identical with *sk*, *st*, *sp* and (sic!) *sm*.⁶

⁵Note that when *sl* is found word-finally, then [l] is "syllabic" e.g. [wisl] *whistle*. In this respect the behaviour of [l] is not in any way different from that in [botl] *bottle* in which we are definitely dealing with two separate onsets [t] and [l] as *[tl] is not a possible branching onset or an (R-O) domain for that matter.

⁶The comparison of the "unnatural" sequences to branching onsets does not mean that this is their structure. In fact the branching onsets themselves may need to be redefined as spurious clusters in Munster Irish, as they too survive mostly in word-initial position.

Let us see how the "natural" and "unnatural" sequences behave with reference to some basic processes in Irish. Irish word-initial consonants of feminine nouns in the nominative are lenited when the definite article *an* is added.⁷ This applies no matter whether the first onset is branching or not.

(4)

[kʲ]	<i>cistin</i>	an [χʲ]	<i>chistin</i>	"kitchen"
[bʲ]	<i>bean</i>	an [vʲ]	<i>bhean</i>	"woman"
[kr]	<i>cruacht</i>	an [χr]	<i>chruacht</i>	"hardness"
[plʲ]	<i>pléasc</i>	an [flʲ]	<i>phléasc</i>	"bang"

When the feminine noun begins with *s*, *sl*, *sr*, or *sn* the definite article prefixes *t-*, while the [s] is not realised phonetically.⁸

(5)

[ʃ]	<i>seilg</i>	an [tʲ]	<i>tseilg</i>	"hunt"
[sl]	<i>sláinte</i>	an [tl]	<i>tsláinte</i>	"health"
[sr]	<i>srón</i>	an [tr]	<i>tsrón</i>	"nose"
[sn]	<i>snáthaid</i>	an [tn]	<i>tsnáthaid</i>	"needle"

Following the possessive pronouns *mo* "my", *do* "your" and *a* "his", the [s] of the above forms is lenited to [h].

(6)

[sl]	<i>sláinte</i>	mo [hl]	<i>shláinte</i>	"my health"
[sr]	<i>srón</i>	mo [hr]	<i>shrón</i>	"my nose"
[sn]	<i>snáthaid</i>	mo [hn]	<i>shnáthaid</i>	"my needle"

t- is not prefixed to feminine nouns beginning with *sk*, *st*, *sp*, or *sm*, nor is the [s] lenited in this context.⁹

⁷See Gussmann (1986) for an analysis of such forms within the autosegmental framework.

⁸Note that a single word-initial [s] (syllabified in the onset) behaves in an identical way to *sl*, *sr*, *sn* with respect to "*t-prefixation*" (e.g. *an* [tʲ] *tseilg* "hunt"), which supports our analysis.

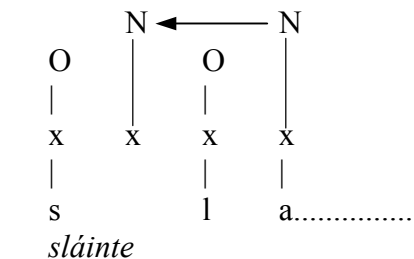
⁹Except Kerry, where we find [hmi:ni:s] *shmaoiníos* "I thought" (Aidan Doyle (p.c.)).

(7)

[sk] <i>scoil</i>	an [sk] <i>scoil</i>	"school"
[sp'] <i>spéir</i>	an [sp'] <i>spéir</i>	"sky"
[t'] <i>stéig</i>	an [t'] <i>stéig</i>	"slice"
[sm] <i>smaointeacht</i>	an [sm] <i>smaointeacht</i>	"pensiveness"

Likewise, the [s] in these clusters is not lenited by the possessive pronouns e.g. [mo skol'] *mo scoil* "my school". It is striking that *sl*, *sr* and *sn* behave more like other branching onsets e.g. [kr] and not like rhyme-onset sequences e.g. [sk]. This is not to say that they are branching onsets but rather that they are not rhyme-onset sequences. In fact, it seems more appropriate to syllabify *sl*, *sr* and *sn* as a sequence of onsets.

(8)



(←) Proper Government

In such cases, the second (realised) nucleus properly governs the empty nucleus, which word-initially, and in fact word-medially, is always the case. Word-finally, we predict that this sequence will be broken up due to the absence of a governor. Hence the alternation [uəsəl / uil'ə] *uasal* / *uaisle* "noble/pl.". Thus the representation of the "unnatural" sequences accounts for their behaviour with respect to lenition processes as well as for their distribution, i.e. the fact that there are no word-final *sl*, *sn*, *sr* clusters.¹⁰ This type of alternation, i.e. [uəsəl / uil'ə] never occurs with *sk*, *sp* or *st* sequences, as they are legal in word-final position.¹¹

¹⁰Since the distributional and lenition facts are identical for branching onsets and the "unnatural" (s+C) sequences one may propose that the alleged branching onsets also have the structure of a spurious cluster.

¹¹It must be acknowledged that *sm* which behaves like *sk* with respect to lenition processes has a similar distributional restriction as e.g. *sl* in that it is not to be found word-finally. One consoling fact, however, is that *sm* does not seem to participate in alternations of the [uəsəl / uil'ə] type, a peculiarity which suggest that the distribution of word-final *sm* is conditioned by other factors.

The source of the empty nucleus in ((8)) can be accounted for in a simple manner as following from a basic assumption in standard GP. Namely, two consonants are broken up by a nucleus if they cannot contract a governing relation. Given the fact that the differentiation of segments as regards charm, although now almost forgotten, has no role to play in *sl*, *sr* and *sn*, the reason why the sequence *sl*, *sr* or *sn* cannot form a governing domain of any kind may be due to the complexity criterion, which bars [l, r, n] from governing [s].¹²

This would mean that [s] is not simplex and may contain more than one element. The case of *sm* is particularly instructive here as the behaviour of [s] in this context seems to be parallel to its behaviour in *sk*, *sp* and *st* clusters. Given that [m] is more complex than [l, r, n] and that it can govern [s], this provides an indication of what kind of complexity we need to attribute to [s] in Irish in order for it not to be governable by [l, r, n] but to be readily governable by [m]. Such a distinction between [l, r, n] on the one hand, and [m] on the other, supports the importance of complexity in establishing governing domains over charm.

Irish [m] is different from other sonorants, and behaves like an obstruent in many respects. First of all, it is the only sonorant that undergoes lenition word-initially to become [v] e.g. [mɑ:hɪr'] / [əɲ vɑ:hɪr'] *máthair* / *an mháthair* "mother". Secondly, in word-initial *sm* cluster [m] behaves like other obstruents in that [s] is normally not lenited nor is "t-" prefixed to it.¹³ However, distributionally [sm] does not appear word-finally like e.g. [sk].¹⁴ Ó Siadhail (1989:113) notes that in certain subdialects of Munster the word-initial *sm* can be lenited to [hm] e.g. [hmut] *shmut* "stump" in which case *sm* patterns with *sl*, *sr* and *sn*.

Assuming that the structure proposed here for the "unnatural" s+C sequences is correct, we may now try to define the phonological representation of [s] in Irish bearing in

¹²These sequences cannot form branching onsets. This is due either to the homorganicity constraint operating in onsets (cf. e.g. *tl...), or to complexity. On the other hand, in Cyran (1996a) it is suggested that the palatalised version of [s] may govern [l, r, n] in interonset relations e.g. [si:l'jə] *soilse* "light/pl.", which, given that [j] is more complex than [l'], corresponds to such interconstituents domains as e.g. -r'l-, -rn-, -rm- etc.

¹³Additionally, the traditional process of vowel lengthening before "lengthening" sonorants occurs before [m] almost exceptionlessly (cf. section 3.2).

¹⁴Such a word-final governing domain is found in Polish *pasm* (Gussmann and Kaye (1993)), but it is not common. Word-medially, *sm* has to be [zm] in English (Kaye (1992/96)) which may be viewed as loss of (H) in order for [m] to govern the preceding spirant.

mind that it need not be simplex. First, let us consider if [s] indeed has to be viewed as exceptional phonologically.

4.2.3. The special status of [s]

The coronal fricative [s] has been assigned a special status among the class of fricatives mainly due to its exceptional behaviour. However, it seems that its special status may be derived from the primary "unmarked" status of coronals in general. Since coronals as a class behave differently from other major classes (see e.g. the papers in Paradis and Prunet (1991)), it is only natural to expect that a coronal spirant will also feature as exceptional within the class of spirants. The consequence of such a treatment of [s] is that it will be representationally viewed in the same way as other fricatives e.g. [f] or [χ]. Note that the distinction between the voiceless stops [p, k] and [t] is not due to the absence of the occlusion element (ʔ), or the tone element (H) in the coronal stop, but rather to the fact that coronal stops have a certain property which sets them apart.

If we accept this way of viewing the peculiar distribution of [s], then again one can derive it not from a special property of [s] but rather as an instantiation of the coronal property, whatever that is. For instance, [s] appears word-initially in consonantal clusters ([str..., sk..., sl...] etc.) while clusters like *[fk...], *[fpl...] *[ft...] or *[χkr...], *[χp...], *[χt...] seem to be illicit and constitute a good reason for [s] to be attributed special properties. Likewise, we do not get forms like *[kχ], *[pχ], *[tχ] or in fact *[tp], *[kp], *[tk] word-finally, but we do get [pt], [kt], just as we get [ks] and [ps]. Thus it is the status of coronals in general that needs to be understood better and not that of [s], as this segment exhibits similar properties to [t].¹⁵

The special property of coronals may be understood in various ways. The current understanding of this class suggests either underspecification of the coronal place of articulation (e.g. Avery and Rice (1989)), or, in GP, nonspecification of coronality (Backley

¹⁵What is intriguing in the distribution of coronal segments is not only the question of why [s] and [t] pattern in a similar way as opposed to [f], [χ] and [p], [k], but why, within the class of coronals, [s] and [t] behave differently from [l, r, n]. For instance, why are initial *[lp], *[rk], *[lkr], etc. impossible.

(1993), Harris (1994b)).¹⁶ It seems, however, that we can revive the once abandoned attempt to define coronality by means of an active element and reach some interesting conclusions by means of it. Assuming that coronals *are* defined by the presence of some element, we should be able to derive the special status of coronals from the phonological behaviour of that element which, in its turn, should be justifiable on the basis of phenomena found elsewhere in the phonology. Such a possibility will be explored in this work.

Harris (1994b) discusses two basic methods of capturing the special status of a certain segment class and its recurrent phonological behaviour, viz. intrinsic and extrinsic accounts.

(9)

a.

Intrinsic: the special behaviour falls out directly from some design property of representation.

b.

Extrinsic: the special behaviour is induced by the operation of some device external to the representation (e.g. constraints, markedness conventions, linking conventions, fill-in rules, patch-up rules, sonority / strength hierarchies,...).

He proposes that one may only appeal to (b) as a last resort.

Thus our attempt to account for the special behaviour of coronals by means of an element will relentlessly place us in the "b-camp", unless we show that the special properties of that element are justifiable and able to capture all the variation involved in the behaviour of coronals (Avery and Rice (1989), Paradis and Prunet (1991), Hume (1994)).¹⁷ Let us look at a recent proposal concerning the phonological representation of [s] and [r] which are directly relevant to our discussion of coronality as they represent segments of a reasonably simplex composition (as opposed to e.g. [t] which consists of a few elements (ʔ, H, h, R)) and therefore involve fewer parameters that need to be considered in order to arrive at their representation.

¹⁶A clear illustration of the fundamental differences between underspecification and nonspecification in phonology is given in Harris (1994b).

¹⁷This will not be possible in this work. On the other hand, we point to certain possibilities for a future more in-depth study of coronal representation.

4.2.4. An analysis of [s] and [r]

Backley (1993) proposes the following representation for [s].

(10)

O
x
<u>h</u>

In this representation, coronality is nonspecified and [s] is assumed to contain only the noise element. Backley accounts for the lenition of [s] to [h] as a switch of status from an h-headed object (h) to a cold-headed one, i.e. (h, v⁰). This lenition process need not be understood as the addition of an element (the neutral element), which would seem counter-intuitive, but rather a promotion of the latently present neutral element (v⁰) to the head position, or a switch of status of (h) from headed to non-headed. Thus, in a framework which does not make use of the neutral element the opposition [s] / [h] can be expressed as (h) / (h._), i.e. a headed vs. non-headed noise element.

However, such a definition of [s] forces Backley to assume that the process of rhotacism by which [s] developed into [r] in certain languages, (e.g. Latin *auris*, OE *ĕare* (Mod. Eng. *ear*) but Gothic *auso*, Polish and Russian *ucho*)¹⁸ must be treated as h-loss which produces the representation of [r] as (v⁰), i.e. realisation of an empty position.

(11)

O
x

Backley proposes then that r-sounds are language specific phonetic interpretations of an empty non-nuclear position, which is parallel to realisations of empty nuclei (hence the variety in r-sounds in different languages), and assumes that the realisation or non-realisation of the non-nuclear position is controlled by parameterised Proper Government.¹⁹ However,

¹⁸Andersen (1968) IE *s after *i, u, r, k* in Baltic and Slavic.

¹⁹Charette (1991) claims that empty onsets are properly governed by the following nucleus (see also the discussion of compensatory lengthening in Irish (3.4.3)).

the only possible example of an operation of such a parameter given by Backley is that of Haitian French Creole where in word-initial position [r] is realised in almost all *h-aspiré* words. This, according to Backley is due to the parameter being set in the OFF. The following data are quoted by Backley from Tinelli (1981).

(12)

[raʃe]	<i>hacher</i>
[rele]	<i>héle</i>
[ro]	<i>haut</i>
[raji]	<i>had'r</i>

Despite the assertion that [r] cannot be explained by the spreading of any element from the nucleus Backley does not quote forms in which [r] would be followed by [i] or [u]. In this way, he does not exclude a possible candidate for such spreading, namely, the element 'A' which is present in all the vowels quoted above.

The presence of 'A' in [r] notwithstanding, this analysis runs into other formal problems connected with the *Empty Category Principle* (ECP). According to Charette (1991) an empty onset is properly governed by its nucleus since the two are in a licensing relation.²⁰ This nucleus must be realised, which is the case in the forms above. However, if r-sounds are to be viewed as unlicensed non-nuclear positions a few problems have to be addressed and accounted for.

One of the difficulties that immediately springs to mind is how to account for the situation, typical of most languages, where words begin both in a vowel and in [r] e.g. English *reel* and *eel*. Do we want to claim that certain vowels properly govern the empty onset position while others do not? Admittedly, one way out would be to propose that in *eel* the initial onset is positionless, therefore it is not realised as [r], but would this not be an arbitrary claim about the representation of *eel*? Additionally, a question arises as to how we would distinguish between word-initial Proper Government (PG) and word-medial PG to account for languages which phonetically begin with a vowel but have r-sounds word-medially? Likewise, one might ask if there is a language which would have only word-final

²⁰Kaye (1990) proposes that interonset geminates also involve a relation of Proper Government. See also Bloch-Rozmej (1994) for a similar analysis of Irish geminates.

[r]'s, which would be realised due to the fact that they are followed by the empty domain final nucleus and cannot be properly governed?

It seems that what we witness is in fact the reverse situation, that is to say, [r] sounds need licensing from phonetically expressed nuclei in order to be pronounced. Consider non-rhotic English for example, in which, the [r] which is not licensed by an expressed nucleus is not realised, be it word-finally or in the "coda" position of consonantal clusters. Since empty nuclei are not proper governors, Backley's analysis should produce contradictory results in English. For example, such empty onsets should obey the same principles and conditions as nuclear empty positions, i.e. the *Empty Category Principle* and *Proper Government*, which state that an empty position must be realised if it is not properly governed. Thus, in English we would expect that every word-final [r] would be realised because there is no governor to properly govern the position. On the other hand, every intervocalic [r], including "linking" and "intrusive" [r]'s in English, should never appear as they are directly followed by an expressed nucleus which should properly govern the empty onset position.²¹

The last problem connected with Backley's proposal is connected with the distribution of r-sounds and word-medial empty non-nuclear positions. It does not predict the occurrence of r-sounds in the 'coda' position, e.g. Polish *park* "park", or Irish *beirt* "two people", i.e. when they are directly followed by an onset. Recall that an empty non-nuclear position followed by an onset forms the structure of a geminate (KLV 1990:217), which is characterised by the relation of Proper Government between the onset and its rhymal complement. The same applies to interonset geminates (Kaye (1990:322), Bloch-Rozmej (1994)).²²

The above objections are not aimed to demonstrate that Backley's proposal is fundamentally wrong, but rather, they point to a number of aspects of the present state of the GP model with which it is not entirely compatible.

²¹The last objection may be refuted if we give a different analysis of [r] sounds. This is the proposal of Harris (1994a:259) where [r]'s are analysed as part of nuclei. Nonetheless, Harris's analysis differs from that of Backley's in that the element R is still employed, and what is most important, the analysis is partly dependent on the clear distinction between R and v^0 . Thus, even if we eliminate R from the representation of [r], some other element is still required.

²²Certain onsets may not be able to properly govern their complement. This, however, does not seem to result in (r+C) sequences, but rather in compensatory lengthening of the preceding vowel (cf. such cases of compensatory lengthening in Irish (3.2)).

However, on the basis of these arguments it seems prudent to reconsider the possibility of representing r-sounds by the presence of *some* element. Broadbent (1991) suggests that 'A' be used for this purpose. Notice that the data from Haitian French Creole can be accounted for by regarding them as the spreading of this element from the nucleus if indeed no cases of [r] in place of *h-aspiré* are found before [i] and [u]. Additionally, the so called hiatus-breaking consonants in English can be given a straightforward account if the intrusive [r] is not treated as different from intrusive [y] or [w] glides in the data below (taken from Harris (1994b)), but rather as a realisation of the third element, the presence of which is obvious.

(13)

'I'	'U'	'A'
see[y]ing	woo[w]ing	bar[r]ing
say[y]ing	go[w]ing	saw[r]ing

In the following section we will consider the facts about r-sounds in Irish. There are reasons to believe that these sounds contain the element 'A'. Broadbent (1991) proposes that we treat the "linking" and "intrusive" [r] in English as A-glides, i.e. a realisation of the element 'A' in a non-nuclear position (see also Backley (1993)). It will be shown that the effects of palatalisation of r-sounds in Irish may be better understood if they are represented as 'A', in which case the effects of A-I interaction should resemble the situation encountered in vocalic transitions, and may be accounted for in a similar fashion. The next step will be to investigate the possibility that [s] also contains 'A'.

4.2.5. The element 'A' in Irish r-sounds

The distribution of r-sounds in Irish is puzzling. First of all, it seems that word-initially [r] may not be palatalised (Henebry (1898:74), Sommerfelt (1927:214), Sjoestedt (1931:46), Ó Cuív (1975:49)). It is difficult to assert whether the word-initial [r] is in fact velarised either.²³ Recall the behaviour of initial [r] in the monosyllabic forms [ri] and [ru] (2.3.6)

²³de Bhaldraithe (1945:42), in his description of the Cois Fhairrge dialect, acknowledges that word-initial [r] has the resonance of a half-open retracted ə-vowel when followed by a front vowel. Otherwise, it has an 'u-resonance' which is typical of velarised consonants. This may mean that the word-initial [r]

which are variants of the word for "running" *rith*. Given the Onset-Nucleus dependencies of such forms, discussed earlier, the variants clearly indicate that the elements defining palatalisation or velarisation are not licensed in the onset position, but still influence the nucleus.

Let us concentrate on the question of the absence of palatalisation in initial [r] despite the effects which point to the presence of the element 'I' (cf. e.g. [ri] *rith*). In phonetic descriptions of Munster sub-dialects it has been noticed that the manner of articulation of r-sounds differs depending not only on the quality but also on the position within the word. The r-sounds are realised in two different ways, namely, as a voiced fricative trill or as a voiced flapped consonant. There are palatalised and velarised versions of the two realisations. However, the distribution of the two qualities does not correspond to the manner of articulation. Thus, the non-palatalised [r] is pronounced as a fricative trill only in absolute initial position as in [ri:] *rí* "king" or [ru:n] *rún* "secret" and as a single (or double) alveolar flap in other positions, i.e. between vowels, word-finally, following consonants and preceding consonants. On the other hand, the palatalised r-fricative occurs between vowels and word-finally, and the palatalised alveolar flap is found in the context following or preceding a consonant.

For the sake of the argument let us concentrate on the most clear situation, i.e. the word-initial, intervocalic and word-final contexts. The distribution, of r-sounds in these contexts seems to be complementary. This is represented in the table below (based on Ó Cuív 1975:49).

(14)

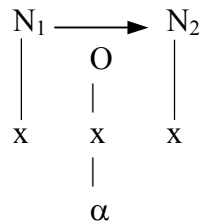
word-initial	intervocalic	word-final
r - spirant	r - flap	r - flap
*r'	r' - spirant	r' - spirant

One can propose the following interpretation of the facts presented in ((14)). Given the distribution of the velarised type of r-sounds it may be assumed that the alveolar flap is a

resists both palatalisation and velarisation. A similar assertion is made in the description of East Perthshire Gaelic (Ó Murchú 1989:104)

weakened form of the word-initial spirant (trill). This claim is supported by the phonetic realisation of non-initial [r]'s, as well as the phonological fact that the weakened member occurs in the context which has widely been recognised as a prime site for lenition or reduction (Harris and Kaye (1990), Harris (1990a)), represented below.

(15)



We have seen in the case of nuclear fusion in verbal forms, e.g. [sig' / si:m'] *suigh / suím* "sit / I sit" (3.4.2), that this context is indeed operative in Irish phonology.²⁴ The reduction context illustrated in ((15)) unifies the intervocalic and word-final position of the weakened r-sound. Recall that word-final consonants are always syllabified in the onset position and are followed by an inaudible nucleus (Kaye (1990)). The reduction of the intervening onset may be viewed in a metaphorical way as a weakening of a possible "barrier" to the internuclear relation (Harris and Kaye (1990)), or as the result of the diminished segmental licensing power of N₂ which itself is governed (Harris (1990a, 1992, 1994a)).²⁵

An independent argument for the proposed weakening of intervocalic [r] and its subsequent susceptibility to palatalisation and velarisation is provided by sandhi effects in which word-initial [r] may be palatalised if it finds itself in an intervocalic context. For example, in [ri:] *rí* "king" the initial r-sound is unaffected by palatalisation. However, in the vocative form [ə r'i:] *a rí* !, when [r] finds itself sandwiched between two nuclei, the consonant is palatalised (Sjoestedt (1931:46), Cyran (1996b)).²⁶ That is, the element 'I' may now be licensed within the onset

²⁴The direction of Irish internuclear relations seems to be from right to left. Nonetheless, the diagram demonstrates the original proposal of Harris and Kaye (1990).

²⁵The distinction between N₂ being licensed word-finally (by parameter), and the situation in which this nucleus has melodic content does not play any role here, although it can be crucial in cases in which word-final weakening effects differ from word-medial ones (see Harris (1990a:284) and also 3.4.3).

²⁶See also consonant delinking in verbal forms in an internuclear context (3.4.2).

The question is how to connect the fact that only weakened [r] can be palatalised or velarised and the proposal that the r-sound in (Munster) Irish contains the element 'A'. Recall that headed 'A' is not affected by palatalisation in the vocalic system, e.g. [ban'ə] *bainne* "milk", while the empty-headed 'A' of [sop / sip'] is. Recall also the only case of regular [a / i] alternations of the type [tə'sax / 'tosig'] *tosach / tosaigh* "beginning/gs.", which may be understood as palatalisation of a "weakened" A-vowel.²⁷ It seems that these facts can be correlated with what is happening to Irish [r].

Let us assume that 'A' is the only element present in the representation of [r] and that in the spirantised (trilled) version this element forms the head. Consequently, the weakened type of [r] contains 'A' which is not licensed as the head, but rather as an operator.²⁸ The two types of segments are presented below.

(16)

a. *trilled* [r] b. *flapped* [r]²⁹

O	O
x	x
<u>A</u>	A

The distribution of these segments is presented in the table above. It seems that now we are in a position to account for the lack of palatalisation of the headed [r], as its behaviour clearly corresponds to the situation encountered in the vocalic transitions in which the element 'I' could only affect nuclei which were not 'A'-headed. Hence, the lack of vocalic transition in [kat / kat'] *cat / cait* "cat/gs." and the resistance of the word-initial trilled [r] to palatalisation may have the same cause.³⁰

²⁷This is a simplified and possibly wrong interpretation of the [a / i] alternation (see Gussmann (1994)). A still different analysis is tentatively proposed later.

²⁸This type of weakening, i.e. switch of status, is well established in Government Phonology and has been used to account for various raising and reduction phenomena that affect vowels in recessive positions (see Harris (1994a:112) and Harris and Lindsey (1995)).

²⁹See Broadbent (1991), and Backley (1993) for a proposal of a similar structure for English.

³⁰It is obvious that the formulation invoking headedness of opaque segments may be insufficient, or too general. Clearly the trilled [r] is not the only headed consonant in Irish and other consonants are affected

The next question which must be taken up here is the effect of palatalisation and velarisation on the "weak" r-sound. As opposed to the word-initial situation, in which we can assume, following the comment made by de Bhaldraithe (footnote (23)), that neither 'I' nor 'U' may be licensed in the onset, the two elements are present in the segmental make-up of the reduced reflex. This is proved by the presence of the u- and i-resonance of the velarised and the palatalised types respectively. However, the effect of velarisation is different than that of palatalisation. The palatalised reflex of the reduced r-sound is again a fricative trill, i.e. a strong consonant, while the velarised reflex remains a mere flap with u-quality. This peculiarity can be accounted for by invoking the correspondence of this phenomenon to the way in which the elements 'I' and 'U' affect short nuclei.

As we argued in previous chapters, the element 'I' is licensed in the affected vocalic object as the head, whereas 'U' becomes the operator. If the effect of palatalisation of headless consonants is the same, then we will be able to answer the question why the palatalised reflex of r-sounds is strong, i.e. a fricative rather than a flap. The following interpretation might be proposed. Palatalisation can affect r-sounds which are not A-headed, in which case the element 'I' becomes the head of the affected expression, as it does in vowels. Therefore the palatalised reflex is headed, i.e. strong and phonetically realised as a spirant. This is illustrated below.

(17)

a. <i>velarised flap</i>	b. <i>palatalised trill</i> ³¹
O	O
x	x
A	A
U	I

The velarised weak r-sound does not become a headed expression because the element 'U' does not become the head of the affected expression.³² Recall that in the vocalic system the

by palatalisation. One conclusion that could be drawn from this is that it is rather a matter of the interaction between elements 'I' and A-head than between 'I' and headed segments in general.

³¹A similar proposal is made in Scheer (1994) to represent the palatalised trill in Czech.

³²This agrees with what we found about U-spreading in vocalic alternations. See also Ó Baoill (1979) who presents a formant chart which clearly indicates that [L], [N] and [R] in East Gweedore (Donegal

effects of 'U'-spreading were less spectacular than those of 'I'-spreading. One palpable result of the asymmetry between 'I' and 'U' spreading is the fact that the A-headed nucleus is realised as [e] between two palatalised onsets, but no obvious raising to [o] is observable between two velarised ones (if the nucleus is A-headed). Thus, the mechanism of both 'U' and 'I' spreading is that they both affect empty-headed nuclei (and consonants), but in different ways. One problem connected with this analysis involves the interaction of 'A' and 'I' in palatalised r-sounds. If our analysis of vocalic alternations is correct we should expect A-suppression. Such an outcome is undesirable as it would yield a semivowel [j] due to the Munster parameter "*I does not license operators*".³³

One way out would be to abandon the parameter, or to speculate whether something else does not license the element 'A' in [r']. Below we will look at one context in which the element 'A' seems to be licensed externally, a phenomenon resembling the A-support discussed in vocalic transitions. On the other hand, in later sections it will be proposed that 'A' and 'I' may be present in consonants without fusing, which might account for affrication and the assibilation of coronals (4.4).

4.2.6. Irish [r] in homorganic contexts

Apart from the word-initial position, Irish [r] resists palatalisation in the context in which it is followed by a homorganic consonant. First let us look at the way [r] behaves in nonhomorganic clusters.

(18)

[korp / kir'p']	<i>corp / coirp</i>	"body/gs."
[k'ark / k'ir'k'ə]	<i>cearc / circe</i>	"hen/gs."

Irish) have the acoustic characteristics of a vowel [o:], which in our terms entails the presence of the elements 'A' and 'U'.

³³Notice that this problem does not arise in e.g. Connemara Irish in which [o / e] alternations (Munster [o / i]) indicate that 'I' and 'A' may combine to form an I-headed compound expression (A.I).

In this context, as well as in branching onsets e.g. [b'ɾ'a:] *breá* "fine", the palatalised variety of [ɾ] is not pronounced as a trill but, similarly to intervocalic velarised [ɾ], as a single flap. Let us now observe the behaviour of [ɾ] in the context when it is followed by a homorganic consonant.

(19)

a.	[b'ert']	<i>beirt</i>	"two people"
	[f'r'agərt']	<i>freagairt</i>	"answering"
	[laurt']	<i>labhairt</i>	"speaking"
	[sagərt']	<i>sagairt</i>	"priest-gs."
b.	[bu:rd']	<i>boird</i>	"table-gs."
	[a:rd']	<i>aird</i>	"height-gs."

The forms are limited to [...rt'] and [...rd'] only, as instances of * [...ɾf] and * [...ɾn'] are always broken up by an intervening vowel unless the sequence is followed by a realised nucleus (see ((20)) below). Additionally, the cluster [rd] usually causes lengthening of the preceding stressed vowel (e.g. [a:rd] *ard* "height").

Let us look at a different set of data illustrating the same phenomenon of resistance of [ɾ] to palatalisation when immediately followed by a homorganic consonant. This time also [...ɾf..] and [...ɾn'..] are involved. However, as opposed to the data in ((19)), we can be sure that the surface homorganic sequence in the plural contains a licensed nucleus. Note that when this nucleus is realised in the genitive, then the r-sound is palatalised.

(20)

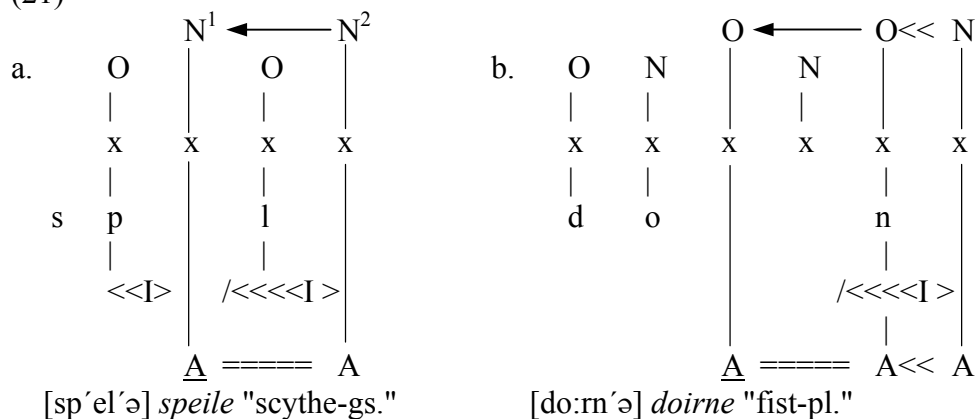
	NOM.	GEN.	PL.		
a.	[soləs]	[sel'ɪf]	[si:l'fə]	<i>solas / solais / soilse</i>	"light"
	[m'il'ɪf]	[m'il'ɪf]	[m'i:l'fə]	<i>milis / milis / milse</i>	"sweet"
b.	[dorən]	[dir'in']	[do:rn'ə]	<i>dorn / doirn / doirne</i>	"fist"
	[dorəs]	[dir'ɪf]	[do:ɾfə]	<i>doras / dorais / doirse</i>	"door"
	[karə]	[karəd]	[ka:rd'ə]	<i>cara / carad / cairde</i>	"friend"

The data in ((20)a) and ((20)b) differ in that in the genitive and the plural forms of ((20)a), [l] is palatalised both in the intervocalic position ([m'íl'íj]) and in the context when the following nucleus is licensed ([m'í:l'fə]), while [r] in ((20)b) can only be palatalised in intervocalic position. The existence of palatalised [r] word-finally e.g. [kir'] (/kir'ø/) *cuir* "put" clearly suggests that it is not the empty nucleus in [do:rn'ə] (/do:røn'ə/) that is responsible for the lack of palatalisation spreading (cf. also [si:l'fə] (/si:l'øfə/) in which the empty nucleus does not block spreading), but rather the following (homorganic) consonant.

The data in ((20)) above exhibit a number of phenomena. Let us disregard vowel lengthening and concentrate only on the vowel - zero alternations which are best analysed not as effects of Proper Government but rather in terms of interonset government (Cyran (1996a)), in which [r] is licensed (governed) by the following homorganic onset (see ((21)b) below).

Assuming that all coronal segments, which used to be defined by the element R, in fact contain the element 'A', then parallel to A-support in the vocalic system (2.3.3), the A-bridge might account for the licensing of the element 'A' as the HEAD of [r] which renders it immune to palatalisation spreading, as in word-initial position. The two situations are supplied below.³⁴

(21)



Recall that the vowel [e] in [sp'el'ə] was treated as a phonetic effect rather than a combination of 'T' and 'A'. The reason for this was the fact that 'A' in N¹ ((21)a), being a head,

³⁴The structure illustrating the interonset relation is simplified and contains only the information which is relevant to this discussion. Thus, lengthening of the stressed nucleus is not represented or explained (see Cyran (1996a)).

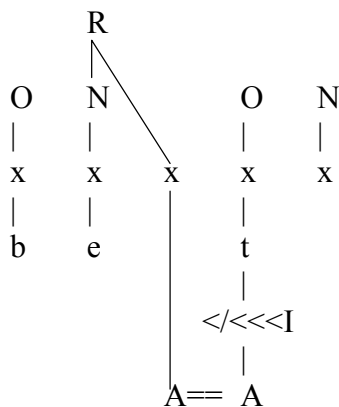
could not be fused with the incoming 'I'. Thus, once the element 'A' is supported as the head of [r] due to interonset government it is not affected by palatalisation ((21)b).

This analysis demonstrates the correctness of the proposal that Irish [r] should contain the element 'A'. Additionally, the facts discussed above provide supporting evidence in favour of the assumption that the interaction between resonance elements should produce comparable phenomena in vocalic and consonantal systems. However, the comparisons can be made only once we have established the correct representations and identified the constraints which underlie the interaction.

Admittedly, some degree of discrepancy in the phonological behaviour of vocalic and consonantal systems must be expected. For example, one might expect that in our analysis in ((21)b) the r-sound, being supported as the head, should correspond to its realisation in word-initial position, i.e. as a trill. This does not happen, and a flap is heard. Notice however, that the palatalised version of [r] which is fricative intervocally is also reduced to a single flap in branching onsets ([b'r'a:]) and rhyme-onset ([k'ir'k'ə]) contexts. Note also that in both cases the [r'] acts as a complement, i.e. it is governed by another consonant. This fact could explain the phonetic realisation of [r] as a flap in [do:rn'ə] ((21)b). Here, this consonant acts as a complement of a governing relation between onsets.³⁵

As to forms like [b'ert'] *beirt* "two people", where interonset government has not been observed, it seems that a similar analysis can still be applied as the final consonants are in a governing relation, though of a different type.

(22)



³⁵One may ask the question as to why [l'] in [si:l'fə] ((20)a) is palatalised, given that we expect a similar A-bridge. One possible explanation might be that [l'] does not contain 'A' and is represented as, e.g. (U, I, ʔ).

Here too, the [r] is supported by a homorganic consonant and hence not palatalised. From the formal point of view, there is not much difference between an interonset relation and the ordinary Rhyme-Onset governing domain presented above. In both cases the governee is licensed by the head of domain, i.e. the following onset. Recall that in [sp'el'ə] ((21)a), the support is also government driven. It also appears that the phenomenon of A-support is directional. This could explain the absence of this effect in branching onsets headed by a coronal obstruent, namely, the [r] in homorganic onsets is still palatalised e.g. [t'r'i:] *trí* "three".

Another problem that this analysis evokes is connected with the way other consonants are affected by palatalisation and indeed velarisation. One prediction that follows from the analysis of r-sounds is that other non-headed consonants should become 'I'-headed when palatalised.³⁶ This to some extent is what happens. The obvious group to consider in this context would be velar consonants because the head of these consonants is the "cold" vowel which, if it is treated in consonants the same way as in vowels, means that the consonants will be empty-headed or headless (cf. the discussion of the "cold" vowel in vowels and consonants (4.2)). However, let us first try to provide a tentative definition of the Irish [s] in terms of elements.

4.2.7. The segmental make-up of the Irish [s]

Government Phonology, like any other theory, strives to capture both the sets of segmental oppositions which characterise any phonological system and also the natural grouping into which sounds are organised according to their participation in phonological processes. Bearing in mind that [s] should be treated as phonologically more complex than [r], the latter being composed of at least the 'A' element, we have three choices for the representation of that consonant ((23)). The larger number of elements in [s] enables us to account for the

³⁶One could view the palatalisation of [s] to [ʃ] as an instantiation of this prediction, in that the palatalised version of [s] appears to be I-headed. There are claims however, that resonance elements cannot be heads in compounds involving the presence of manner elements (Chalfont (1995), Ingleby, Brockhaus and Chalfont (ms.)).

historical process of rhotacism (e.g. *honos* > Classical Latin *honor*) as decomposition or weakening of [s] so that all other elements are delinked except 'A'. Thus the presence of 'A' in [s] follows from its presence in [r]. Consider the three possibilities below.

(23)

- a. [s] = (H.h.A) (where H stands for high tone)³⁷
- b. [s] = (H.A)
- c. [s] = (h.A)

The representation of [s] involving the maximal choice, i.e. the three elements (H.h.A) can be described in the following way. 'H' (high tone) accounts for the voiceless nature of [s], 'h' (noise element) defines friction, while 'A' represents coronality. Below, we will consider the possibility that either 'H' or 'h' is superfluous in the representation of [s] and other Irish voiceless spirants (i.e. [f, ʃ, χ, h]). In order to see which representation of [s] is accurate we need to look at part of the phonology of Irish where this segment reveals its contents.

One area which needs to be investigated is the system of phonological oppositions. Let us first consider briefly the phonological standing of the elements 'H' and 'h' in Irish. We begin with 'H', i.e. the tone element which normally defines the voicelessness of consonants. It has a counterpart, i.e. 'L' (low tone), which is used in fully voiced consonants (Harris (1990a:264)). The voicing contrast must be specified in the group of Irish plosives. Sjoestedt (1931:8) provides the following contrastive pairs.

(24)

[pakə]	<i>paca</i>	"pack"	[bakə]	<i>bacadh</i>	"hindrance"
[ta:]	<i>tá</i>	"is"	[da:]	<i>dá</i>	"if"
[ka:]	<i>cá</i>	"where"	[ga:]	<i>gá</i>	"need"

Let us assume that the contrast is represented by the presence versus absence of the element 'H', i.e. the voiceless plosives contain 'H', while the voiced ones do not contain the laryngeal

³⁷Under the assumptions of the charm theory such a representation would be impossible as [s] was viewed as charmless. However, following the assumption that [s] differs from other fricatives only due to its identity as a coronal segment (a class which itself entails specific behaviour), the presence of the tone element should not come as a surprise given that other voiceless fricatives have it and that it plays some role in defining existing phonological contrasts in a given language.

element. There are a few reasons for that choice. First of all, phonetically speaking, Irish voiced plosives are fully voiced only in word-medial context, i.e. intervocalically. Otherwise, they are partially devoiced (Ó Cuív (1975:31)). Secondly, the voiced plosives come across as weaker than their voiceless counterparts which may be due to the smaller number of elements in their representation. This weaker status of voiced plosives manifests itself in, for instance, the process of compensatory lengthening discussed in the previous chapters e.g. [sig' / si:m'] *suigh / suím* "sit / I sit".³⁸

On the other hand, it seems that the voice contrasts among Irish fricatives are of lesser importance. In fact, one can practically assert that there is almost no contrast to speak of. For instance, [s] has no regular voiced counterpart [z]. Likewise, [f/ɣ] pairs are virtually non-existent in the system, where similarly to [s/z] only the voiceless object is present as the palatalised version of [s].

Some contrast may be perceived in the distribution of [f] and [v]. However, unlike [f], [v] does not seem to be an independent phonological unit in that word-initially only [f] appears independently, while [v] is either the result of morpho-phonological alternations like the lenition of [b] or [m], e.g. [ən v'an] *an bhean* "woman", [ən vɑ:hɪr'] *an mháthair* "mother", or the eclipsis of initial [f] e.g. [ən v'ɪl' tu:] *an bhfuil tú...* "are you...". Word-medially, [v] tends to be lost e.g. [gr'anəvər / gr'a'nu:r] *greanmhar* "funny", while word-finally [v] is found but [f] is virtually non-existent in native words. Similar restrictions apply to [χ] and [ɣ] in that both result from lenition. However, [χ] has a wider distribution than [ɣ] as the latter appears only word-initially.

Thus, in the case of fricatives we may speak of independent voiceless objects only. In this light it may seem superfluous to mark them by the presence of the element 'H' as it would have no function in defining phonological contrasts. This in turn suggests that the representation of [s] is (h.A). Likewise, [f] and [χ] would be defined as (h.U) and (h._) respectively. This representation assumes that, unlike in plosives, the absence of 'H' still renders the objects voiceless. A similar assumption is made in Backley's proposal (4.2.4) where [s] is defined as 'h' alone. One may wonder, however, if such a stipulation is not arbitrary.

³⁸Recall the derivation of long [i:] and [u:] (3.4.2) in which, [v'] and [v] (voiced labial fricatives!) are delinked on a par with [g'].

Let us now consider an alternative proposal which, it seems, captures the same facts about fricatives and makes their representation uniform with that of plosives. We may propose that it is the noise component ('h') that is superfluous in the phonological representation of Irish spirants and maybe in the whole consonantal system of the language.

4.2.8. Is "noise" a category in Irish?

To begin, let us again articulate the questions which are pertinent to the issue of Irish fricatives. Namely, why should it be the case that in general voiceless consonants have a wider distribution than voiced ones, and why is it that a wider distributional gap concerning the voice distinction is found in the class of fricatives rather than among plosives? The last point may appear paradoxical, however, as will be shown below, the distinction plosive / spirant, if understood in terms of element complexity, may quite logically account for the distributional facts in both classes.

Now let us turn to arguments against the presence of 'h' in Irish fricatives. For this, we need to look at the relation between voiced fricatives and glides. It was mentioned in 3.4.2 that the fricative [v] and the glide [w] are not contrastive in Irish. For instance, the aforementioned example [ən v^wil' tu:] *an bhuil tú...* "are you..." may have a variant pronunciation [ən wil' tu:]. Similarly, the variant forms like [uim' / wuim' / vuim'] *uaim* "from me" suggest that glides simply tend to be spirantised. The same applies to the glide [j] which is described by Ó Cuív (1975:42) as a palato-velar fricative.

Our previous analysis of r-sounds in Munster seems to provide us with a way of accounting for the spirantisation of glides which does not refer to the element 'h'. Recall that in our analysis [r] (an A-glide!) is pronounced as a fricative when the element 'A' is headed and as a single flap if it is headless.

Given that the same distinction can be applied to the [v]/[w] variants then we may dispense with 'h' from the representation of fricatives and replace it with the notion of the headedness of the resonance elements. Thus the distinction of glide / fricative in Irish may be expressed in the following way.

(25)

[w]	[v]	[r] flap	[r] fricative	[j] glide	[j] fricative
x	x	x	x	x	x
U	<u>U</u>	A	<u>A</u>	I	<u>I</u>

This way of representing Irish fricatives has a few considerable advantages. First of all, it allows us to see some logic in their distribution.³⁹ For instance, the presence of [v] word-finally, as opposed to the absence of [w] in that position, may be attributed to the headed nature of [v].⁴⁰ Likewise, the delinking of [v] in intervocalic position need no longer shock us with the number of elements lost (e.g. [uv / i:] *ubh* / *uibhe* "egg/gs." (3.4.2)), because all that is lost in the alternation [uv / i:] is the element 'U' and not a compound (h.U).⁴¹ Our representation of voiced [v] seems to additionally clarify certain lenition facts in Irish. If we assumed that [v] has to be represented as (h.U) rather than (U) alone, then logically, we would have to propose that Irish [m] which, when lenited, yields [v], also has to contain the noise element 'h'. This is rather unlikely. On the other hand, our analysis not only avoids such pitfalls, but also unifies the lenition of [m] with the sporadic weakening of [n] to [r] as a mere delinking of 'N' (nasality) e.g. [knuk / kruk] *cnoc* "hill"

Now we may propose that Irish voiceless spirants have the following representation.

(26)

[f]	[s]	[ʃ]	[χ]
x	x	x	x
<u>U</u>	<u>A</u>	<u>I</u>	
H	H	H	H

³⁹The distribution of r-sounds is discussed in the previous sections.

⁴⁰Similarly, the headed nature of [j], resulting from the lenited [g'] may contribute to a better understanding of such alternations as [sig' / si:m'] *suigh* / *suim* "sit / I sit" (3.4.2). This, however, requires more study.

⁴¹The notion of the headedness of resonance elements in the consonantal system seems to have additional potential in that it may account for segmental distribution. For instance, if we assume that headless objects of fairly simplex composition e.g. [w] (U.) cannot appear word finally precisely because of their headless nature, then we may try to account for the absence of Irish [f] word-finally by assuming that it is (H.U.) rather than (H.U).

Similarly to the forms in ((25)), these representations make no use of a separate category "noise" (h) to define the objects as fricatives. The headed status of the resonance element is sufficient.⁴²

It appears that these representations provide answers to our two questions concerning voice contrasts in the Irish consonantal system. Let us first concentrate on the question of the absence of voiced counterparts of certain fricatives e.g. [z] and [ʒ]. If the voice contrast is represented by the presence versus absence of the tone element 'H', then Irish [s] clearly contrasts with [r] in this respect rather than with [z], because [s] (H.A) without the tone yields (A), i.e. [r].

Note that such a representation of [s] and [r] has the potential of unifying such historical processes as rhotacism (*honos* > *honor*) with for instance the voicing of [s] to [z] (Verner's law), describing them uniformly as a mere delinking of the tone element 'H'. We also predict that rhotacism will take place in a system which has no [z] (h.A),⁴³ or to be more specific, in a system in which [s] is represented as (H.A) and not as (H.h.A). This is represented below.

(27) loss of 'H' (high tone):			
<i>rhotacism</i>		<i>voicing</i>	
[s]		[s]	[z]
x	=>	x	x
<u>A</u>		<u>A</u>	<u>A</u>
H		h	h
		H	

Clearly, Irish, which has no 'h' in the representation of [s] potentially belongs to a group of languages where rhotacism would be expected, should the process of 'H'-deletion be operative in this language.

⁴²One should look closer at the velar fricative which has no resonance element in our approach, and yet, it is realised as a fricative. Recent research shows that in some cases the high tone element 'H' may bring out friction (e.g. Ritter (1996)), however we leave this question unsettled.

⁴³Unless we are dealing with a process which delinks 'h' (noise) and not 'H' (tone).

The absence of [ʒ] in Irish can be explained in the same fashion; its voiceless counterpart [ʃ] without the tone element will yield [j] rather than [ʒ] precisely for the same reasons. For [ʒ] to appear in the system the element 'h' must be present in consonants. Note that this analysis has also something to say about the occurrence of [v] and [ɣ] in Irish, even though they can hardly contrast with [f] and [χ] respectively. In these cases, simply, the absence of 'H' does not produce such dramatic contrasts as in the case of [s] and [ʃ], and results in the labial or velar voiced fricatives [v] and [ɣ] or in vocalisation.

Now we may turn to the second part of our initial question, namely, why the distributional gap concerning the voice distinction is found among fricatives rather than in plosives. Let us look at the representations of Irish plosives below in which we assume that 'h' is also absent from these objects. Note that the absence of 'H' in voiced obstruents still renders them as plosives though inherently weaker than their voiceless counterparts.

(28)

[p] / [b]	[t] / [d]	[k] / [g]
x	x	x
<u>U</u>	<u>A</u>	
?	?	?
H	H	H

First of all, the voiced plosives in all series are weaker than the voiceless ones. Secondly, velar plosives are inherently weaker than other series and the voiced velar plosive appears to be the weakest. Recall that Irish exhibits compensatory lengthening due to [g] delinking (e.g. [sigʰ] / [si:mʰ] *suigh* / *suím* "sit / I sit" (3.4.2)) which is identical to that in which the labial fricative is lost (e.g. [nʰiv] / [nʰi:] *nimh* / *nimhe* "poison / gs."). Given that both objects are represented by a single element, i.e. (U) for [v] and (?) for [g], it becomes obvious why such disparate objects, from the phonetic point of view, pattern together in the lengthening process. They are susceptible to deletion because they are the weakest voiced consonants in terms of complexity.

Finally, we are in a position to define precisely what is targeted in the lenition of the objects in ((28)), namely, the occlusion element (?). However, more needs to be understood in

terms of element structure in consonantal objects as, for instance, both lenited [d] and [g] yield [ɣ] (or [j] if they are palatalised), which points to certain similarities in the representation of coronals and velars in Irish. Some aspects of this affinity can be accounted for by an assumption that Irish velars also contain 'A' while coronals may additionally have 'I'. The latter possibility will be discussed in the following chapter.

Thus, it appears that the proposal that the element 'h', i.e. "noise" as a separate category, is absent from the phonological system of Irish provides ways of understanding the phonological behaviour of segments, their inventory, as well as their distribution, which otherwise would have to be ascribed to factors of an arbitrary nature. In the remaining sections of this chapter the absence of the element 'h' from the Irish system is formalised in the form of a parameter and further advantages and consequences of this formalism are presented.

4.2.9. The 'h' parameter

The fact that 'h' is not available in Irish phonology does not mean, however, that the theoretical standing of this category in general is in danger. Quite conversely, given that its occurrence in languages may be governed by a parameter, it may provide a useful tool for understanding phonological processes and segmental distribution across languages, the two main areas of investigation in phonology.

Let us then propose the following parameter:

(29)

THE 'h'-PARAMETER

The occurrence of 'h' in languages is parameterised (ON/OFF)

Processwise, the parameterised occurrence of 'h' explains why the high tone (H) deletion in [s] yields [r] in some languages and [z] in others ((27)). Also, it brings together seemingly disparate phonological phenomena within one linguistic system. For example, given the representation of Irish plosives established above, it becomes clear why the lenition process, which clearly targets the element 'I', yields fricatives if the obstruent is voiceless (e.g. [p] => [f]), and why voiced obstruents tend to produce glides (e.g. [g'] => [j]) thus skipping one

stage on the lenition scale. One should also bear in mind the compensatory lengthening effects in Irish which target two quite disparate objects, namely, [v] and [g]. Clearly, systems referring to such notions as *sonority scale*, *natural class*, or in fact, *distinctive features*, will be hard put to capture the affinity between the two consonants.⁴⁴

If we take distribution into consideration, the presence versus absence of 'h' in the system accounts for the two-way ([s] - [r]) versus three-way ([s] - [z] - [r]) contrasts in a straightforward manner. In the former case the distinction is made between (H.A) and (A), while in the latter series between (H.h.A), (h.A) and (A) respectively. Additionally, the parameter, which applies uniformly to the Irish system of obstruents, directly accounts for the apparent asymmetry between plosives and fricatives in terms of voicing contrasts. Thus, Irish is a language which has the h-parameter set in OFF, i.e. it is an 'h-less' language, while 'h-ful' languages have the parameter set in ON.

From our discussion it appears that the same phonetic object, e.g. [s] can have different phonological representations in different languages. It seems that a move away from the universalism of phonological representations assumed initially in GP (KLV (1985)) is inevitable. More importantly, by explaining the subtleties of the Irish consonantal system through the h-parameter this analysis also demonstrates that such established labels denoting the "natural" classes as *voiced / voiceless*, *sonorant*, *glide* and *obstruent* are misleading from the phonological point of view. For example, Irish [v], which to all intents and purposes is a *fricative*, i.e. an *obstruent*, must, paradoxically, be labelled as a phonological *glide*. This ambiguous nature of [v] is expressed directly in terms of its phonological representation proposed above.⁴⁵

In the following section we examine further advantages and predictions that the parameterised occurrence of the element 'h' in languages carries.

⁴⁴The Jakobsonian feature [+grave] immediately springs to mind in this context. However, in our case we also need to exclude other labials than [v] and other velars than [g] from the phenomenon, which further complicates its description for a system which does not refer to complexity.

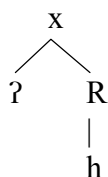
4.2.10. The parametric occurrence of 'h' and linguistic systems

Below, we consider the possibility that the parametric absence of the element 'h' in languages may be correlated not only with the absence of voiced fricatives, as we demonstrated in the preceding sections, but also with the absence of affricates in such systems. We begin with the facts from Irish and compare the Irish situation with the consonantal systems of Polish and English. Thus, we will concentrate here on the contrasts among coronal objects in terms of voicing, affrication and degree of palatalisation. While the first two are directly derived from the 'h-parameter' in that voice distinction among fricatives and the affrication of obstruents are indicative of a 'h-ful' system, the interaction of coronals with palatalisation, as well as the number of possible contrasts on the plane of palatalisation will be ascribed to the status of the palatalising element 'I' in a given segment.

Given our proposal that coronal consonants may be defined by the element 'A' we will investigate the possibility that the status of the palatalising element in affricates and in fact also in fricatives depends on the parameter settings concerning the elements 'A' and 'I'.⁴⁶ The prediction that we would like to see substantiated is that such a parameter will reflect the situation found in the vocalic system. Let us first consider the question of affricates in 'h-ful' and 'h-less' languages.

Harris (1990a:270) provides the following phonological representation of the affricate *ts*.

(30)



This is a contour segment in which the plosive element '?' does not combine with the noise element 'h'.⁴⁷ Thus, one may propose that affrication itself consists in breaking up the "h-?"

⁴⁵Nilsson and Cyran (1996) account for the ambiguous nature of [v] in Slavic in a similar fashion (see also section 4.3)

⁴⁶Indeed, it may be the case that affrication itself is derivable from the interaction of the elements 'A' and 'I'. This possibility is investigated further in the following section.

⁴⁷For the moment, we disregard the place defining element.

relation. Given the above structure and interpretation, it becomes immediately obvious that in Irish the possibility for affricates to occur is thwarted by the lack of the noise element.

(31)

Irish					
<i>fricatives</i>			<i>affricates</i>		
[s]	[ʃ]	---	---		
[r]	[rʰ]				

This impoverished system is to a large extent due to a single parameter which defines Irish as a 'h-less' language.

On the other hand, in languages which make use of 'h', such as Polish for example, we expect both the three-way ([s] - [z] - [ʒ]) contrasts as well as affricates. This in fact is the case in Polish as can be seen below.

(32)

Polish					
<i>fricatives</i>			<i>affricates</i>		
[s]	[sʰ]	[ʃ]	[ts]	[tsʰ]	[tʃ]
[z]	[zʰ]	[ʒ]	[dz]	[dzʰ]	[dʒ]
[r]					

Thus, what we observe in Polish is a host of fricatives and affricates, both voiced and voiceless. Namely, we have voice contrasts ([s/z], [sʰ/zʰ], [ʃ/ʒ]) and ([ts/dz], [tsʰ/dzʰ], [tʃ/dʒ]) which are due to two factors: a) the presence of 'h' in the system, and b) the presence vs. absence of the tone element responsible for the voicing distinctions.⁴⁸ Polish fricatives and affricates additionally exhibit a three-way contrast on the plane of palatalisation e.g. ([s] - [sʰ] - [ʃ]) and ([ts] - [tsʰ] - [tʃ]) which is dependent on an additional parameter, namely, on the interaction between coronality, which we represent as 'A', and the element 'I'.

What we seem to have achieved by proposing the 'h-parameter' is the possibility of defining systems which lack affricates and a voice distinction among fricatives by means of a single parameter.⁴⁹ What remains to be accounted for is the existence of coronal affricates in

⁴⁸Unlike Irish, Polish seems to use the 'L' element rather than 'H' in consonants. This difference, however, has no consequences on our analysis.

⁴⁹It should be borne in mind that voiced fricatives may be possible in 'h-less' languages such as Irish. Recall that the phonetic [v] / [w] distinction in Irish is expressed by the headedness or headlessness of the

general as well as the number of contrasts that they may exhibit. In other words, it is conceivable that a 'h-ful' language, which has a voice distinction among fricatives, may lack affricates.⁵⁰

Thus, we may provisionally state that palatalisation causes affrication in 'h-ful' languages while the number of contrasts is dependent on the status of the palatalising element in these objects. Additionally, it seems that the ideal situation in 'h-ful' languages is when the number of contrasts among affricates equals that of fricatives (e.g. Polish above). Below, we provide the English data which support this correlation.

(33) English					
<i>fricatives</i>			<i>affricates</i>		
[s]	---	[ʃ]	[ts]? ---	[tʃ]	
[z]	---	[ʒ]	[dz]? ---	[dʒ]	

Note that in English the number of contrasts with respect to palatalisation is parallel to that in Irish, i.e. two-way. On the other hand, the presence of [z] and affricates indicates that we are dealing with an 'h-ful' system. Thus English is like Polish as far as the 'h-parameter' is concerned in that both are 'h-ful' languages, while English and Irish seem to pattern together as far as the palatalisation effects go. Given that the number of contrasts on the plane of palatalisation can be defined by a single parameter, we will be able to account for at least three types of linguistic systems represented here by Irish, Polish and English.⁵¹

The initial assumption that we may wish to make is that the palatalisation contrasts are due to the A-I interaction. This assumption follows directly from the representation of coronals proposed here. Note that such an analysis will necessarily have to draw on the facts established on the basis of the behaviour of these elements in the vocalic system. Our

vocalic element. However, the important point is that no such distinction should be possible among coronals where the element 'A', whether headed or headless, will yield various varieties of r-sounds but not [z] for instance. One cannot exclude the possibility, however, that the representation of [z] in some languages may be (L.A).

⁵⁰It seems that French is such a language (Lass (1984:152)).

⁵¹The fourth type of linguistic system which could possibly be comprised by the set of these two parameters is French, given that the palatalisation parameter is able to capture the French situation.

analysis of the Irish vocalic system revealed that 'I' does not license (resonance?) operators hence *(A.I) is illegal.

We shall return to these problems in the following chapter. In the meantime, let us consider one more significant prediction that our analysis makes concerning the affinity between glides and fricatives, which is derived from the notion of headedness. We will examine the theoretical aspect of a historical shift from [w] to [v] in Slavic.

4.3. **Headedness as friction in language change**⁵²

In the previous section we mentioned the process of rhotacism which, potentially, could be unified with the other effects of Verner's Law if the languages which had rhotacism could be said to be indeed "h-less". In this section we shall consider another historical development which concerns most Indo-European languages, with a notable exception of English. Namely, we will see how the shift from the Common Slavic (CSl) *w, i.e. [w] to [v] in certain Slavic languages can be captured in a formal and at the same time explanatory fashion. Since the languages discussed below are "h-ful", it will be interesting to observe how the two mechanisms producing friction, i.e. headedness and the element 'h', interact.

In present day Slavic languages different reflexes of the historical glide *w are found which range from the original glide [w] (e.g. East Ukrainian [wɔda] "water", [ɫawka] "bench"), through a voiced labial fricative [v] (e.g. Standard Ukrainian [vɔda]) to a voiceless labial fricative [f] (e.g. Polish [wafka]), or even a voiceless velar fricative [x] (North Russian [ɫaxka]).

The data below are taken from Nilsson and Cyran (1996) and illustrate how the distribution of the reflexes is dependent on the prosodic position. Quite uncontroversially, the strong position can be identified with the beginning of the word (or "syllable"), i.e. the prevocalic position, while the weak environment can be identified with the traditional concept of the "coda".

⁵² This section is based on Nilsson and Cyran (1996).

The actual shift is described in two stages which are reflected in such present day languages as Standard Ukrainian and Polish. First, the object became reanalysed as a headed 'U', i.e. (U) in strong positions. This is shown below.

(36)

1st step

(U.) > (<u>U</u>)

This step involves a mere switch in status of the element 'U' in strong positions, which is a widely accepted phonological operation in Government Phonology. For example, the status switch is used in accounting for vowel reduction in recessive positions (Harris (1994a)) and for ATR harmony (Charette (1994)).

Although this shift involves a negligible alteration from the phonological point of view its phonetic consequence is quite dramatic. Namely, the headed object is phonetically realised with audible friction. Note that the distribution of the historical *w in Standard Ukrainian is parallel to the distribution of the r-sounds in Irish in that the stronger, headed object is licensed only in prosodically strong positions while the weaker, headless object is found in recessive environments.

Thus the alternation between [v] and [w] in Standard Ukrainian receives a fairly straightforward account which is applicable to other languages too. What is more, the analysis of the alternation tallies with the facts from the vocalic system of that language. Namely, the round back vowel in Standard Ukrainian has two realisations, that is, a tense [u] which is found under stress and a lax [ʊ] which appears in recessive positions. This point is crucial to the analysis of the shift ([w]>[v]) as well as to the central claim made in this book that the vocalic and consonantal systems work in the same way.

The correspondence between the [u]/[ʊ] and [v]/[w] in Standard Ukrainian additionally points to the possible motivation for the shift ([w]>[v]) in strong positions. Most probably what is at play here is a single parameter on the status of the element 'U' which applied to both the vocalic and consonantal systems. As a result, the alternation [v]/[w] arose,

which corresponds to the Irish [r]/[r̥], as well as a new object [v] appeared which sounds like a fricative but has to be treated phonologically as a glide.⁵³

The representation of the Ukrainian [v] as a simplex object is advantageous for a few reasons. One of them is the possibility of accounting for the fact that certain [v]'s alternate with the glide [w] while others with [f] in otherwise identical environments. This brings us to the second step in the development of the CSI *w which is illustrated below.

(37)

2nd step

(<u>U</u>) > (L.h.U)

This step involves a reinterpretation of the phonetically present properties as phonological. Namely, friction, which is typically represented by 'h', and voicing, defined by 'L', are now present in the phonological representation. The reinterpretation might be motivated by the need to bring the new object in line with other fricatives which are defined in terms of the 'noise' and tone elements.

Note that this time, the object cannot alternate with a glide in weak positions, but rather, like other "obstruents", it becomes devoiced. This phenomenon is captured in Government Phonology in term of unlicensing of the tone element 'L', hence the Polish form [swuf] as opposed to the Standard Ukrainian [sliw] (Brockhaus (1995)).

To conclude: the two-step analysis of the historical shift describes the change in a nonarbitrary fashion and offers a few valuable theoretical predictions. For example, we are able to predict that obstruentisation of glides will result in a voiced obstruent because we are always dealing with a phonologisation of the so called spontaneous voicing. In this respect, it is irrelevant how a given language defines the laryngeal contrasts, i.e. by using 'L', 'H', or both tone elements.

Additionally, the interplay between the two ways of expressing friction, i.e. through headedness of the resonance element, or by means of a separate element 'h', may lead to ambiguous situations in "h-full" languages. This is not only a true but in fact a desired

⁵³ Such an ambiguous object is independently needed in phonology in order to account for such puzzling phenomena as, for example, the absence of voice assimilation from the initial [v] in Russian, (see e.g. Jakobson (1956); Andersen (1969)).

situation for Polish (Gussmann (1981)), Russian (Andersen (1969)), Slovak (Rubach (1993)) and Hungarian (Siptár (1996)) to name but a few languages.

4.3.1. Summary

In the above sections we tried to demonstrate that the headedness of resonance elements can bring about friction. We also considered some consequences of this possibility. Thus, in Irish, the fricative trill [r] is distinguished from a flap [ɾ] by means of the status of the element 'A'. This was the first step in our analysis to show that headedness may produce a narrowing effect in consonants just as it does in vowels. Recall that the tense (ATR) or close vowels are represented as headed (4.2).

Another area in which the findings concerning the vocalic and consonantal systems corresponded with each other was the interaction between the elements 'A' and 'I'. In the vocalic system the two elements interact in the phenomenon of palatalisation (element 'I' spreading). We found that the element 'I' may only affect 'A' in headless vowels, while the headed (A) resisted palatalisation. These effects find an exact reflection in the consonantal system of Irish where [r] (A) resists palatalisation unless it is reduced (weakened) to the operator position. Taken together the Irish facts support the claim that headedness produces friction as well as point to the fact that coronality should be represented by the element 'A'.

The first genuine instance where headedness brings about phonetic friction was observed in the case of the Irish [v] sound and was then extended to other fricatives. It is here that the mechanism of headship allowed for dispensing with the noise element 'h' from the Irish system. However, as demonstrated in the preceding sections, 'noise' as a separate category is needed in other languages, and it seems evident that headedness cannot replace the element 'h' altogether.

There are a few arguments in support of this assertion. One of them is that headedness alone produces defective systems in languages lacking the 'h' element. For example, Irish, which has no 'h', does not have voicing contrasts among fricatives and lacks affricates altogether. Thus, from the point of view of language typology, headedness must be regarded as insufficient for defining consonantal systems. In other words, the typological distinction

between Irish and e.g. Polish would be impossible to state if headedness was the only mechanism defining friction.

On the other hand, the interaction between the h-parameter and the possibility to define friction by means of headedness may have a significant influence on the understanding and accounting for certain historical processes. The analysis of the historical shift from the Common Slavic glide **w* to a labial fricative clearly demonstrates the advantage of defining friction by means of headedness and provides further arguments for treating the occurrence of 'h' as parametric in nature. This property is present in Slavic languages and its interaction with headedness allows for gaining interesting insights into the workings of historical phonology.

In the following sections, which will be by and large speculative in nature, the model in which coronality is represented by the presence of the element 'A' will be pushed to its logical conclusion. Once again the notion of headedness will be shown to play a crucial part in phonology.

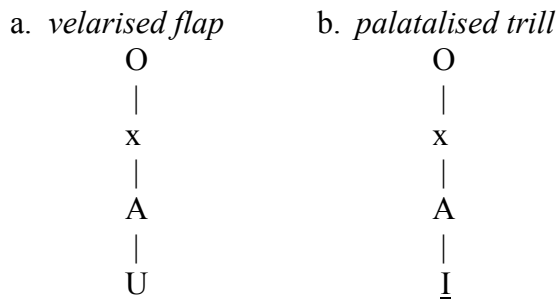
4.4. Coronal palatalisation as element interaction

Below, we consider a few additional problems connected with our assumption that coronal consonants in Irish contain the element 'A' with respect to their interaction with the element 'I'. Specifically, we need to understand the representations of the palatalised versions of [s] and [r]. Recall that we represent these consonants as (H.A) and (A) respectively.

In the analysis of the distributional facts concerning the palatalised [r'] we established that this segment exhibits some characteristics which allow us to correlate the r-facts with what we found in the vocalic system. Namely, A-headed [r] resists palatalisation just as the A-headed vowels do e.g. [ban'ə] *bainne* "milk". There are two contexts in which Irish [r] resists interaction with the element 'I': a) in word-initial position where [r] is headed, and b) when supported by a following coronal e.g. [do:rn'ə] *doirne* "fist/pl.", in which case we claim that a similar phenomenon of A-support (bridge) is responsible for the effects, just as in the vocalic system (e.g. [sp'el'ə] *speile* "scythe/gs." (see 2.3.3 and ((44)) below).

A problematic aspect of this analysis concerns the structure of the palatalised [r'] which is a fricative trill, hence a headed object, and whose headedness, it seems, is due to the element 'I'. The structures we proposed in 4.2.5 for the velarised and the palatalised [r] are supplied below again.

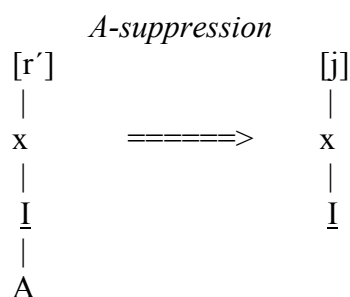
(38)



The status of the element 'A' (headless) in these objects is due to the weak position in which they are found. Recall that it is due to the headless nature of 'A' that [r] may be velarised or palatalised. The velarised flap results from the fact that the velarising element 'U' does not normally become the head of the affected object in Irish. This is what we found in the analysis of the vocalic system. On the other hand, the fricative nature of [r'] may be derived from the headedness of 'I' which also affects vowels as the head.

This is precisely where the problem begins, as the representation of [r'] as (A.I) seems to be illegal in Irish. In the vocalic system we found that only (A.I.) and (I. A) are possible. This is due to the parameter *I does not license operators*. Thus what we should expect here is A-suppression, as in [f'ar / f'ir'] *fear / fir* "man/gs." or [sop / sip'] *sop / soip* "wisp/gs.". In other words, what we expect is [j] rather than [r'].

(39)



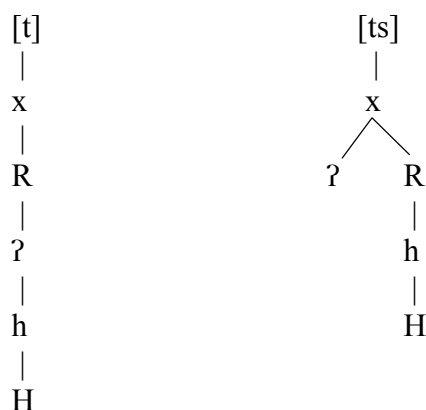
Interestingly enough, this is what evidently happens in Gweedore (Donegal Irish), where the palatalised [r'] is realised as [j] e.g. [ga:ji:] *gáirí* "laughing" (Ó Siadhail (1989:100)). In

Munster, however, this does not happen. The question then is why 'A' is not suppressed in [r'], and if it stays, what should be the phonological representation of this object?

One way of accounting for this problem would be to refer to certain constraints on what type of segmental decomposition can take place in a given system. Surely some such constraints must exist. For instance, the analysis of rhotacism ([s]>[r]), whether correct or not, relies on the exclusion of the possibility that this process might delink both 'H' (tone) and 'h' (noise). Otherwise, the distinction between [s]/[r] and [s]/[z] will depend on what a particular process targets ((H, h) or (H) alone), rather than on the representation of the targeted objects ((H.A) or (H.h.A)). Thus the brunt of responsibility would be shifted to the process rather than to the phonological representation, the latter option being intuitively more constrained.⁵⁴

Thus, one might accept the possibility that the palatalisation affecting the coronals need not result in segment decomposition, so that some phonological elements are lost. Alternatively, one might assume that decomposition itself need not require element loss. One example of such a phenomenon is provided by Harris (1990a:270), namely, affrication which we may, following Harris, illustrate in the following way.

(40)



This type of decomposition involves the dissolution of the compound (here: [t]) into a contour structure. Given that such a phenomenon is effected by palatalisation we may assume that a similar structure is formed in Irish [r'].

⁵⁴The correctness of this intuition is supported by the distributional facts which correlate [s]>[r] vs. [s]>[z] systems with the absence or presence of 'h' in them.

(41)



This form accounts not only for the trilled nature of $[r']$ (headed), but also for the fact that a headed 'I' does not fuse with the element 'A', and yet, the latter element remains licensed in the representation.

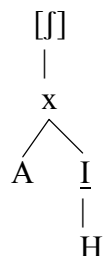
The other segment which, like $[r']$, has no right to contain 'A' because it seems to be I-headed, is the fricative $[ʃ]$. In the previous subsection this object was provisionally given the following representation.

(42)



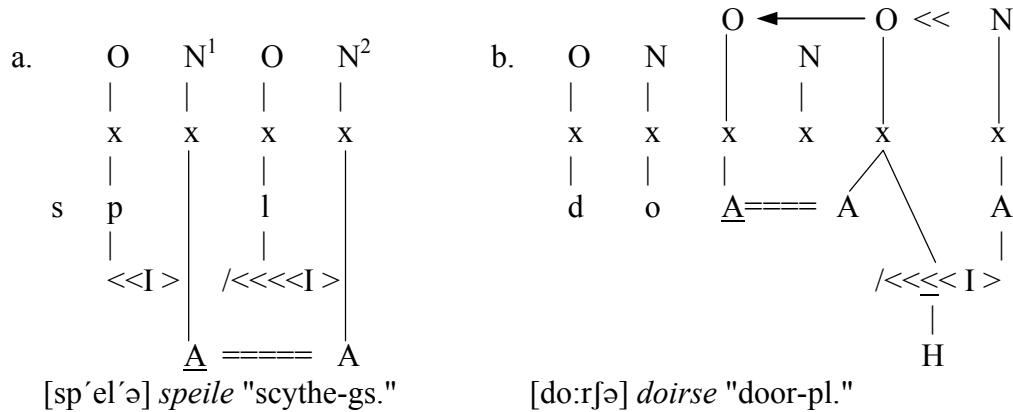
On the other hand, it seems that this object also has to retain the element 'A' in Irish. Recall that in the analysis of $[r]$ in homorganic contexts where $[r]$ resists palatalisation, due to A-support (bridge) from the following governing onset, $[ʃ]$ still patterns with other coronals e.g. $[dorəs / dir'ɪʃ / do:rʃə]$ *doras / dorais / doirse* "door/gs./pl.". If we accept the structure of $[r']$ ((41)) above as correct then there is no reason why $[ʃ]$ should not have the following form.

(43)



The presence of 'A' in [ʃ] follows from our analysis of [r] in homorganic contexts, where the function of the A-bridge is to disallow decomposition by licensing 'A' as the head of [r].⁵⁵ Let us look at the structures involving A-support in vowels and consonants again.

(44)



In [sp'al] *speal* "scythe" the vowel is fronted; however, we left open the question whether 'A' and 'I' fuse in [a] or whether we are dealing with a phonetic effect alone.⁵⁶ At any rate, this analysis supports the claim that Irish [ʃ] contains both 'A' and 'I'. In what follows we will consider some evidence which points to the possibility that other Irish coronals may contain the element 'I'.

4.4.1. 'I' in Irish coronals

Proposals attempting to correlate coronality with front vowels have a well established history now.⁵⁷ For example, in an attempt to unify palatalisation effects and the representation of coronals Lahiri and Evers (1991) propose a model of feature geometry which groups coronal consonants, front vowels and the palatal glide under a single articulator node Coronal. Similar claims are made in Hume (1994). This proposal, if translated into the framework of

⁵⁵ Another argument for this representation of [ʃ] may be that we might wish to reserve the compound (H.I) for the sound [χ] in Irish.

⁵⁶ For the parallelism between the alternations [a/e] ([sp'al / sp'el'ə] *speal* / *speile* "scythe/gs.") and [iə / e:] ([gr'ian / gr'e:n'ə] *grian* / *gréine* "sun/gs.") see e.g. 3.3.6.

Government Phonology, would be tantamount to saying that coronal consonants contain the element 'I' (cf. Smith (1988)). The question is how to reconcile the model which uses 'A' for coronality with those which point to the presence of 'I'? Below we consider the possibility that non-palatalised coronals may contain the element 'I'.

Some evidence to that effect can be found in Irish in such phenomena as for instance the fronting of low vowels ([ɑ] to [æ]) by non-palatalised coronal consonants in Cois Fhairrge, e.g. [dæ:r']⁵⁸ *dair* "oak" (de Bhaldraithe (1945:12), Ní Chiosáin (1992)), which typically occurs after palatalised consonants. In Munster, the short vowel [e], which can only follow a palatalised onset, is found in a few forms when preceded by [s] or [r] e.g. [sev'ir'] *saibhir* "rich" and [rev'] *raibh* (past form of "be"). Additionally, the historical loss of *dh* resulted in the development of the diphthong [ai] in a basically velarised environment, e.g. [rai³rk] *radharc* "sight", which may suggest that the element 'I' is a residue of the lost coronal.⁵⁹

Much stronger evidence for the presence of 'I' in coronals is provided by the behaviour of word-initial [r] in Irish. Recall that word-initial [r] in Irish is not palatalised, e.g. [ri:] *rí* "king", but when such a form is preceded by a vocalic particle, then palatalisation takes place e.g. [ə r'i:] *a rí* "king/voc.". We account for this palatalisation by comparing the intervocalic position of [r'] in [ə r'i:] to the word-medial and final situations in which [r] may be palatalised due to the weakening (intervocalic) environment. The question that may be asked here is what palatalises the [r] word-initially. The only morpho-phonological alternations in that position involve lenition or eclipsis but not palatalisation.

One possible answer is that the palatalisation effect is due to the high vowel [i:], together with the fact that the [r] is weakened in [ə r'i:]. However, this need not be true because, on the one hand, our analysis of the vocalic system shows that the quality of the vowel need not influence the onset, and secondly, there are data which seem to point to the fact that the quality of the vowel has nothing to do with the palatalisation of the initial [r], as

⁵⁷See for example the feature system proposed in Jakobson, Fant and Halle (1952) where [+grave], [+diffuse] defined the vowel [i] as well as dental/alveolar consonants.

⁵⁸The length is phonetic. Ní Chiosáin (1992) considers the fronting as phonetic too.

⁵⁹More evidence of this kind can be found in e.g. Smith (1988) and Hume (1994).

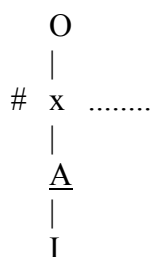
the phenomenon occurs before back vowels too. Below we repeat the data taken from Sjoestedt (1931:46) and Ó Cuív (1975:49) which illustrate the sandhi phenomenon.⁶⁰

(45)

[ru:n]	<i>rún</i>	"secret"	[ə r' u:n]	<i>a rún</i>	"his secret"
[rug]	<i>rug</i>	"take/past"	[də r' ug]	<i>do rug</i>	"he took"
[rau]	<i>rogha</i>	"choice"			
[rud]	<i>rud</i>	"thing"	[də r' au r' ud]	<i>do rogha rud</i>	"your choice"

In these forms, it seems, there is no local source for the palatalising element 'I' in e.g. [ə r' u:n].⁶¹ The only process that we may blame for this phenomenon is lenition, i.e. weakening in intervocalic position. The question is if we should not accept the fact that this element is already present in the non-palatalised form. In other words, should we not propose that the initial [r] in Irish has the following representation:

(46)



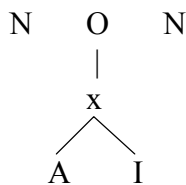
Note that the compound (I.A) is legal in Irish. However, the question is if this could be the representation of word-initial [r] and of coronals in general. Another question which should be asked is what would happen in languages which disallow the (I.A) combination.⁶² Let us demonstrate how the palatalisation of such a structure might result from weakening in the lenition context, i.e. when 'A' is demoted to the operator position. We need to assume that the element 'I' becomes the head of the object if 'A' is demoted, which results in breaking up the compound into the contour structure, a point discussed in the preceding section.

⁶⁰Since the palatalisation spreading in Irish is directional and goes from right to left, the particle has to be also excluded as the possible source of 'I'.

⁶¹Also, we are not dealing here with any morpho-phonological alternation of the type *cat* / *cait* "cat/gs." as this typically affects the right edge of lexical forms.

⁶²Cf. e.g. Polish, which disallows *(I.A), and has a licit (A.I) compound.

(47)



Such an analysis derives the palatalisation of initial [r] directly from its representation, although certain aspects of this mechanism require a comment. Recall that the headed status of the element 'I' in this object is directly derived from the nature of palatalisation in Irish. There is, however, one problem with this analysis. Namely, if the palatalisation of [r]'s may be derived from their representation by decomposition in weak environments, then we should expect all internal [r]'s to be palatalised, which is not the case as we have both palatalised and velarised [r]'s word internally and finally. It appears, however, that not all initial [r]'s are palatalised in weak environments.⁶³ This fact allows us to retain the proposal that some [r]'s may be represented by the compound (I.A) while others (the velarised type) by (U.A). The only objection that one may have to this proposal is that we have two quite different representations of [r]-sounds.⁶⁴ Below we show that the initial palatalisation of [r]'s may be given a different interpretation, i.e. one which accounts for the headedness of the element defining the palatalisation of [r'] and for the velarised [r]'s word-internally. However, it should be treated as an alternative proposal rather than an argument against representing coronality as a combination of 'I' and 'A'.

Our analysis of the vocalic system provides a way of accounting for the phonological presence of 'I' in forms like [ru:n]. It refers to the notion of element sharing which is formalised in terms of the following condition.

(48)

THE SHARING CONDITION

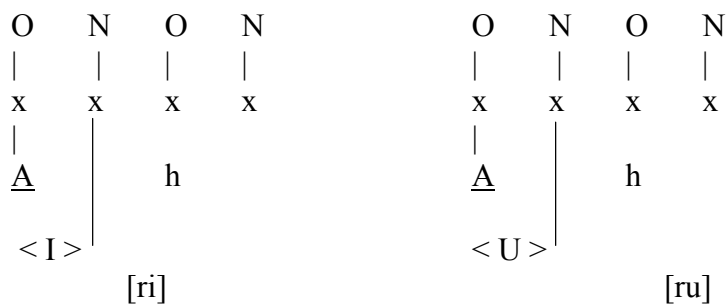
Nuclei share the element 'I' or 'U' with their onsets.

⁶³Aidan Doyle (p.c.).

⁶⁴The two structures must be contrastive, therefore, the fact that they have different representations should not be too controversial, especially that the distinction between the palatalised and velarised [r]'s must be made in terms of the elements 'I' and 'U' respectively.

In other words, we may say that every Onset-Nucleus domain is defined by one of these two elements. The various structural forms by which this condition is reflected in the phonological representations in Irish are discussed at length in 2.3.6 and 3.4.1. What is of interest to us here is the word-initial situation involving [r]. Earlier, in 2.3.6, we suggested that the shared element 'I' or 'U' is not licensed in this object and proposed the following structures for [ri] and [ru], the variant pronunciations of *rith* "running." The structures below are already modified to include the representation of initial [r] as A-headed.

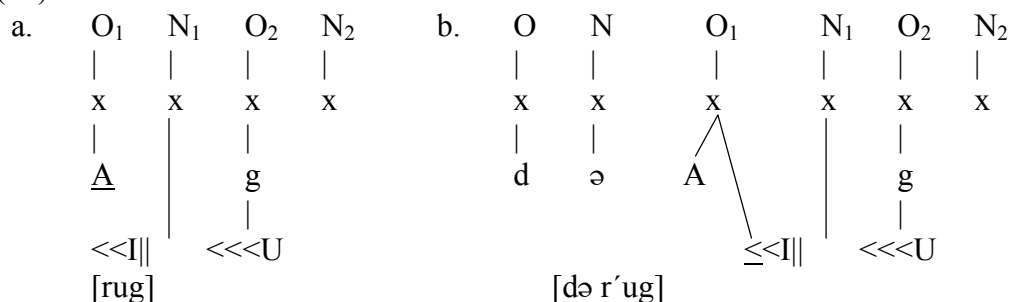
(49)



Thus [r] in this position behaves like an empty onset in that the shared element need not be manifested in the lexical form. Or, to be precise, the shared element is manifested in the nucleus only. Recall that in the case of empty onset specification the shared element is manifested by palatalisation or velarisation of the preceding definite article, e.g. [oχər'] *eochair* "key", which begins with a back vowel and palatalises the article in [ən' oχər'].⁶⁵

It seems then, that we are capable of accounting for the unexpected palatalisation of the initial [r] when sandwiched between vowels. This is illustrated below on the basis of the forms [rug] / [də r'ug] *rug* / *do rug* "take/(past) / he took".

(50)



⁶⁵Similarly, words beginning with high vowels can velarise the article as the shared element is 'U' e.g. [ən i:hə] *an oíche* "night".

The domain O_1-N_1 is defined by the element 'I' which cannot be licensed in the onset because the initial headed 'A' is not affected by palatalisation.⁶⁶ This element is not licensed in the nucleus N_1 either as this nucleus is defined by the element 'U', which is spread from the following velarised consonant (cf. e.g. [p'ubər] *piobar* "pepper"). Thus, 'I' forms a buffer (||) to further spreading of 'U'. When the onset O_1 finds itself in a weak environment, i.e. in an intervocalic context, the headedness of 'A' is lost and the object may license the shared element 'I'. What is important to remember at this stage is that the element defining palatalisation becomes the head of headless vowels e.g. [sop / sip'] *sop / soip* "wisp/gs.". Thus one may propose that the headed nature of the element 'I' in [r'] is directly derivable from the nature of palatalisation in Irish.⁶⁷

It appears that we may account for the initial palatalisation without having to propose that 'I' is part of coronal objects, yet the forms are still derived from the phonological representation established on the basis of other facts. One advantage of this analysis over the one which assumes that [r] is an (I.Ä) compound lies in the ability to account for the headed nature of 'I' in [r']. The other advantage is that we predict that the velarised nature of certain word-medial and initial [r]'s follows from the type of the shared element (U) rather than from a different representation of [r], i.e. one without the element 'I'. Additionally, the weak (flapped) variety of velarised [r]'s follows from the fact that, unlike 'I', the velarising element tends to affect objects as an operator rather than as the head.

Thus it seems that on the basis of the scant Irish evidence one cannot decide whether the coronal consonants should contain 'I'.⁶⁸ However, one should acknowledge the fact that with certain additional assumptions, e.g. the different representations of Irish [r], it is possible to maintain this alternative. After all one has to take into account other types of coronal segments, e.g. fricatives, to see the potential merits or additional difficulties for this proposal. Below we look at some facts from Polish which also suggest that coronality might be

⁶⁶The same behaviour is manifested by headed 'A' is found in the vocalic system e.g. [ban'ə] *bainne* "milk".

⁶⁷Admittedly, given this account of I-headedness, we may also maintain the idea that initial [r] is (I.Ä), in which case the weakened [r] will also yield an I-headed object.

⁶⁸If certain [r]'s could be shown to be (I.Ä) then one might be able to account for such mysterious historical processes as the umlaut effected by [r] in Old Norse e.g. *gler* "glass" (Edmund Gussmann (p.c.)).

represented by a compound involving 'I' and 'A'. On the other hand, in sections 4.4.3 and 4.4.4 we consider briefly some theoretical consequences of such a possibility with respect to palatalisation effects and to the defining of phonological oppositions in Irish, Polish and English.

4.4.2. The status of 'I' in Polish affricates and coronal fricatives

In the case of Polish we have an additional mechanism which will help us determine the status of 'I' in consonantal objects. Namely, as mentioned in 2.1.4, Polish consonants and high vowels must agree in certain respects (C-V harmony). The onset-nucleus harmony in Polish is reflected in the distribution of high front vowels (Gussmann, Kaye and Cyran (in prep.)). The headless vowel [ɨ] (I.) may follow an onset which is headed either by 'I' ((51)a) or by any other element ((51)b), but it cannot follow a headless consonant ((51)c) or one with 'I' as an operator ((51)d). The four situations are illustrated below.

(51)

a.	b.	c.	d.
$\begin{array}{cc} \text{ʃ} & \text{ɨ} \dots \\ & \\ (\text{I}) & (\text{I.} \underline{\quad}) \end{array}$	$\begin{array}{cc} \text{p} & \text{ɨ} \dots \\ & \\ (\underline{\text{U}}) & (\text{I.} \underline{\quad}) \end{array}$	$\begin{array}{cc} *k & \text{ɨ} \dots \\ & \\ (\underline{\quad}) & (\text{I.} \underline{\quad}) \end{array}$	$\begin{array}{cc} *p' & \text{ɨ} \dots \\ & \\ (\text{I.} \underline{\text{U}}) & (\text{I.} \underline{\quad}) \end{array}$
<i>szyc</i> "to sew"	<i>pytac</i> "to ask"	---	---

On the other hand, a headed 'I' in the nucleus requires an 'I' operator in the preceding onset.

(52)

a.	b.	c.	d.
$\begin{array}{cc} s' & i \dots \\ & \\ (\text{I.} \underline{\text{A}}) & (\text{I}) \end{array}$	$\begin{array}{cc} p' & i \dots \\ & \\ (\text{I.} \underline{\text{U}}) & (\text{I}) \end{array}$	$\begin{array}{cc} k' & i \dots \\ & \\ (\text{I.} \underline{\quad}) & (\text{I}) \end{array}$	$\begin{array}{cc} *t & i \dots \\ & \\ (\underline{\text{A}}) & (\text{I}) \end{array}$
<i>sito</i> "sieve"	<i>piwo</i> "beer"	<i>kino</i> "cinema"	---

Similar restrictions hold for Polish affricates.

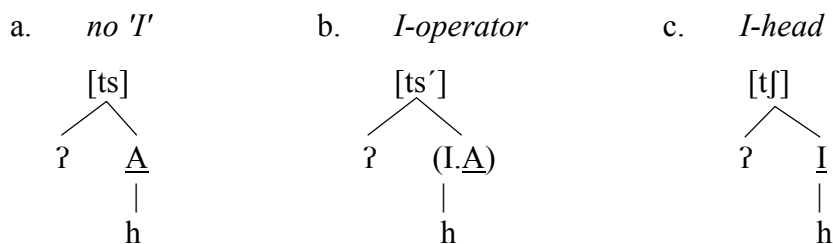
(53)

[tʃɨ]	<i>czy</i>	"if"	*[tʃi]
[ts'ɨ]	<i>ci</i>	"these/masc."	*[ts'ɨ]
[tsɨrk]	<i>cyrk</i>	"circus"	*[tsɨ]

It appears that the status of the element 'I' must not be identical in the onset and the following nucleus. Following this observation we may establish the status of 'I' in the above affricates in the following way. Since [ɨ] is headless (I.⌊), then the preceding consonant must be I-headed, or else, contain no 'I' e.g. [pɨtatsʰ] ((51)b). Thus we may propose that Polish [tʃ] is I-headed because it is followed by a headless [ɨ], while [tsʰ] has 'I' as an operator and is followed by a headed [i], parallel to [pʰivo] "beer" and [kʰino] "cinema" ((52)). On the other hand, [ts] would either have to be viewed as I-headed or I-less as it is followed by [ɨ] (cf. *szyc* and *pytać* respectively ((51))).

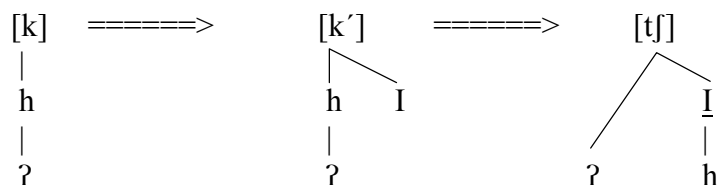
Initially, we will assume here that [ts] has no element 'I' and that parallel to [t] and [d], which are not palatalised, it is defined as an A-headed object. The tentative representation of the Polish affricates is presented below. For the moment, we disregard the interaction between 'A' and 'I' (H is also ignored), and concentrate only on the status of 'I'.

(54)



We assume that in [tʃ] ((54)c), the element 'A' is not present and the compound contains only one vocalic element, namely, a headed 'I'. The choice is supported by frequent [k]>[tʃ] alternations, e.g. *dome*[k] / *dome*[tʃ]*ek* "small house / diminutive", which are best understood as a shift from a headless consonant ([k]) to an I-headed one, with concomitant affrication. In fact there are two types of palatalisation which affect Polish [k], i.e. [k]>[kʰ] and [k]>[tʃ] (Rubach (1984)). In GP terms, the first of them adds an 'I' operator to a headless object (h.?.I.⌊), while the other produces an I-headed object (h.?.I) with concomitant affrication.⁶⁹

(55)



⁶⁹Rubach also assumes, following Gussmann (1980:16) that there is also a so called 2nd velar which alternates with dental affricates or spirants e.g. [k]>[ts] (*Pola*[k] / *Pola*[ts]y "Pole/pl.").

Note that the different types of palatalisation are neatly accounted for by means of the status of the element 'I', and that a very similar gradation due to the status of 'I' was given in ((54)) above for the three-way coronal contrasts.

Returning now to [ts] ((54)a), one may adopt the view that the representation is similar to that of [t] (A-headed consonant), with the contrast represented by affrication alone. On the other hand [ts'] ((54)b), has to contain 'I' as an operator due to C-V harmony. It seems, however, that we need to test this analysis further. The issue we want to concentrate on is that of the representation of the affricate [ts'] by a (I.A) compound. The question we want to ask is whether the compound is licit, and, if so, why should such a combination evoke affrication in Polish rather than a mere palatalising effect e.g. [t'] just as in the case of [k']?

In order to understand better the Polish system we need to establish the necessary parameters concerning the A-I interaction in this language. Since there is no contrast between Polish mid vowels e.g. [e] vs. [æ], we need to assume that there is only one licit compound involving the two elements, i.e. either (I.A) or (A.I). One way to establish the correct representation is to look at the distribution of the vowel [e] with respect to the affricates represented above. We predict that the I-headed object (A.I) should behave like an (I) in that it will follow an onset with an 'I' operator. On the other hand, if the licit object is (I.A), then we should not find it following an onset with an 'I' operator (cf. *[p'ĩ...] ((51)d)). It seems, however, that [e] may be found in all possible combinations, which suggests that there are two [e]'s in Polish. We provide the putative representation of [e] by each word.

(56)

[tsena]	<i>cena</i>	"price"	(I. <u>A</u>)
[ts'etʃ]	<i>ciecz</i>	"liquid"	(A. <u>I</u>)
[tʃesats']	<i>czesać</i>	"to comb"	(I. <u>A</u>)

Gussmann, Kaye and Cyran (in prep.) propose that there are indeed two representations yielding phonetic [e] in Polish; however, only one of them is a combination of 'A' and 'I', namely, (A.I), the other being a headless (A._). This distinction accounts, among other things, for the fact that a headless consonant ([k]) cannot be followed by a headless [e] e.g. *[ke...] (cf. *[ki...] ((51)c)), while the I-headed [e] palatalises [k] to [k'] e.g. [k'edi] *kiedy*

"when". Let us assume then that the representation (A.I) is indeed correct and tentatively propose that the compound *(I.A) is illicit and eliminated from the system by means of the following parameter (Licensing Constraint).

LC1 A does not license operators

The obvious consequence of this assumption is that the representation of [ts'] (in terms of resonance elements) as (I.A) must be treated as illicit. However, this apparently problematic move may turn out to be quite beneficial to our analysis as it offers some valuable, though, not altogether obvious predictions.

We may now try to interpret the palatalisation distinctions among Polish fricatives and affricates in the following way: A-headed objects do not license operators. Hence the coronals like [t], [d], [r] are not palatalised as this would yield illicit objects such as ((57)) below.

(57)

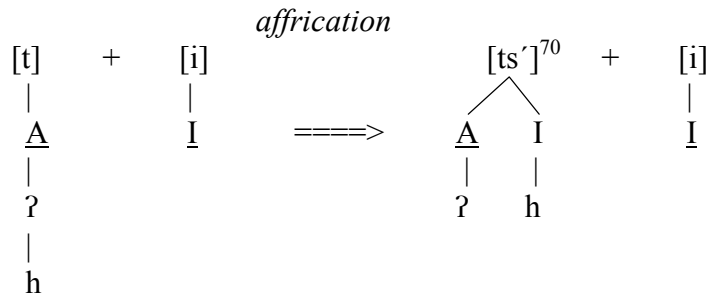
*[t']
*(I. <u>A</u>)
?
h

Note however that this is the structure that we proposed for [ts'] where 'I' has to act as an operator when followed by an I-headed vowel e.g. *ci* "these". How do we account for this object then? The interpretation proposed here is that in a situation when the A-headed onset must contain an 'I' operator due to C-V restrictions, i.e. when it is followed by an I-headed vowel, then the licensing of 'I' in such an onset does not entail fusion with 'A'. In a sense, the situation resembles that between '?' and 'h' in affricates in that 'I' and 'A' are present in the consonant but they do not fuse. This correlation might in fact allow us to account for the affrication of "palatalised" [t]'s in Polish ([t]>[ts']) in a fairly direct way.

Clearly, in the context illustrated in ((58)) below we are dealing with a conflict between the licensing constraint precluding I-licensing by the A-head in the onset, and the C-

V harmony requirements in Polish which state that I-head in a nucleus must be preceded by I-operator in the onset.

(58)



The element 'I' may only be licensed in the onset if it is not fused with A-head. This results in a contour structure, i.e. in affrication.

The question now is whether the parameter proposed for Polish is able to account for all the contrasts among coronals with respect to palatalisation. We have seen two types of element 'I' operation on the Polish plosives, namely, the element 'I' may become the head or the operator of the affected consonant. The former instance can be illustrated by the palatalisation of [k] to [tʃ] with concomitant affrication. The latter type, when 'I' becomes the operator, may have two outcomes, namely, the addition of secondary articulation e.g. [k'], or the affrication of [t] to [ts']. The two different results of licensing 'I' as an operator can be accounted for in the following way. The affrication of [t] to [ts'] is effected not so much by the 'I' operator as by the fact that the 'A' head of the coronal object cannot license 'I', hence the two elements do not fuse. We would like to propose that this impossibility to be fused into *(I.A) causes affrication because, as can be seen in the case of [k'], 'I' as an operator does not have to cause affrication hence the contrast [k'] vs. [tʃ].

It seems that this analysis leaves the following questions unanswered. First of all, if only I-A break-up ([ts']), or an 'I' head ([tʃ]) can cause affrication,⁷¹ then what is responsible for the affricate [ts], which we assume to be A-headed? Additionally, since we account for the three-way contrast [ts]-[ts']-[tʃ] as (A)-(A+I)-(I), we seem to be missing a possible object

⁷⁰Since [ts'] patterns with [s'], we will assume that this fricative also forms a contour structure with respect to the elements 'I' and 'A'. The contrast between the two objects is due to the absence of '?' from the representation of [s'].

⁷¹This we claim on the basis of [k'].

(A.I), i.e. the licit I-headed combination which we established on the basis of the interaction of the elements 'I' and 'A' in the vocalic system of Polish. One should ask the question if it is possible that this object may not be used in the consonantal system and, consequently, what makes the illicit I-A combination ([ts']) more privileged than the well-behaved and expected (A.I) in Polish? A tentative answer to these questions is given in the following section.

4.4.3. Palatalisation of "(I-A) coronals" as decomposition (Irish).

The putative representation of coronal consonants in terms of a I-A combination has some grave consequences. One of them is that this proposal definitely parts ways with the assumption that coronality is best understood as under- or non-specified for place (see e.g. Avery and Rice (1989), Paradis and Prunet (1991), Backley (1993), Harris (1994b)). Thus our aim should be to demonstrate how this representation is capable of accounting for the general recessiveness of coronals, as witnessed in, for example, their transparency and participation in assimilations.

The issue requires more study and cannot be fully explored here. However, in the light of the facts discussed in this work, it seems that deriving the special properties of coronals from their representation involving the element 'A' is not impossible. Recall that among the resonance elements it is 'A' which exhibits special characteristics too, pointing, in some cases, to its recessiveness comparable to the behaviour of coronals. For example, in the analysis of the vocalic system of Irish we found that this element must in some contexts be supported in order to be licensed in a given position (compare e.g. [sp'el'ə] "scythe-gs." and [f'ir'] "man-gs."). Likewise, in Uyghur, the element 'A' tends to be unlicensed unless some clearly defined conditions are fulfilled (Denwood (1993)).

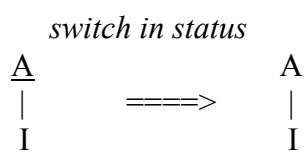
All this does not constitute unassailable evidence pointing to a particular solution but the facts suggest that at least the alacrity with which the coronal consonants undergo place assimilation can be explained in a fairly straightforward fashion, namely, by referring to the licensing constraints governing the interaction of 'A' with other elements. As this work does not aim to settle the discussion on coronality but rather attempts to present some predictions

of a particular approach, we shall now turn to the discussion of the behaviour of I-A coronals with respect to palatalisation.

The first issue which appears to be troublesome concerns the following question: If coronality is represented as a combination of 'A' and 'I' should we not expect all coronals to be palatalised? Drawing on the parallel situation in vocalic systems we may, however, understand this compound in a slightly different way. Namely, since the elements 'I' and 'A', which in isolation define [i] and [a] respectively, form an altogether different quality [e] by combining with each other, then perhaps one could expect that the combination (IA) in consonants does nothing but define coronality in which case the typical qualities of active 'I' may be suspended (the sporadic cases where these qualities show up in non-palatalised environments were mentioned above, e.g. the fronting of low vowels in Cois Fhairrge). The obvious question that should be asked now is how to obtain a palatalised coronal out of a non-palatalised I-A compound?⁷²

It appears that the way of understanding coronality advocated here would restrict the possible ways of viewing secondary or primary palatalisation to a considerable degree. Namely, the palatalisation of coronals would have to be represented either as a shift in status of the two elements defining coronality, or by decomposition of the compound. In both instances, the aim of the operation is for the element 'I' to act independently of 'A' regardless of its status. The first possibility is illustrated below.

(59)



This development may be followed by other effects depending on the parameter settings on the A-I interaction existing in a given system. Recall that in Irish the palatalisation of [r] and [s] results in decomplexification⁷³ to a contour structure due to parameter barring (A.I).⁷⁴

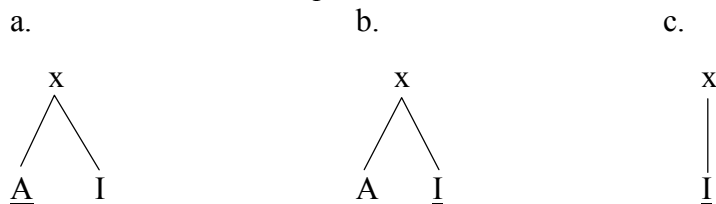
Let us now consider the logically possible types of (IA) decomposition.

⁷²Note that the same problem arises with a vengeance in models which assume coronality to be defined only by 'I' (cf. Lahiri and Evers (1991), Smith (1988)).

⁷³This term is used with respect to affrication in, for instance, Harris (1990a).

⁷⁴One might expect A-suppression in such systems too. Recall that the Donegal [r'] is pronounced as [j].

(60)

coronal decompositions

Type ((60)a) illustrates a situation in which the status of the elements is unchanged, i.e. 'A' still acts as the head while 'I' is the operator. The difference is that 'I' acts as a separate unit now. One should hasten to add that such a type of decomposition, as a process, would have to be triggered by something independent of the conditions on A-I combination because a fusion of these elements is licit and hence expected. Thus, one might want to assume that in a language which allows (I.A) compounds the decomposition illustrated by type ((60)a) is improbable (see however the Polish situation below).

On the other hand, types ((60)b) and ((60)c) are more plausible as it is likely that a language which allows for (I.A) combinations might not have (A.I) compounds. In such a system the decomposition of the type ((60)b) and ((60)c) is not only logical but also follows straight from the fact that *(A.I) is illegal. This is exactly what we find in Irish in that, for instance, the palatalisation of [r] yields the structure ((60)b), i.e. [r'] in Munster, while in Donegal the palatalisation of [r] yields a [j] fricative ((60)c).⁷⁵

Thus it follows from this model that palatalisation of coronals which are represented as a I-A combination can only be obtained through decomposition of this compound. The type of coronal decomposition is strictly determined by the licensing constraints defining the possible I-A relations in a given system. In other words, our representation of coronal consonants enforces a very restricted view on what palatalisation of coronals can be. We will see below that this model has other built-in advantages.

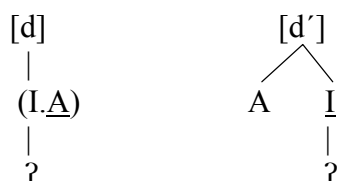
In the case of Irish, the restrictiveness of this model lies in the fact that only one type of palatalisation is allowed in this class of consonants. Namely, 'I' must become the head.⁷⁶ In other words, the contrast between palatalised vs. nonpalatalised (coronal) objects may be

⁷⁵These facts are discussed at length in the previous sections.

⁷⁶Recall that Polish has different parameter settings viz. (A.I) and not *(I.A).

expressed in one way, namely, by I-headedness. This follows from the structures ((60)b) and ((60)c) as well as from our observations of Munster palatalisation (e.g. [r]>[r'] and [s]>[ʃ] (4.4)). However, the question is if the same is true of the rest of Munster palatalised coronal consonants, i.e. [n'], [l'], [t'] and [d']. Let us look at the pair [d]/[d'].

(61)



Recall that Irish is an "h-less" language, hence the segmental break-up into a contour segment can not produce an affricate. Thus the headedness of 'I' may be accepted as the only way in which the contrast among coronal consonants can be represented, due to the parameter settings defining A-I combinations in this language. However, one need not necessarily assume that the palatalisation of labials or velars should be effected in the same way, as the requirement concerning the A-I interaction is not present in these classes for obvious reasons. Namely, labial consonants are U-headed, while velars are empty headed (headless). In the latter case, however, one could still expect that the effect of palatalisation will result in I-headedness, since parallel to the vocalic system, the element 'I' should affect headless objects as the head. If that happens, then a few aspects of Irish phonology will be accounted for.

First of all, we will be able to correlate the effects of the lenition of voiced palatalised coronal and velar plosives. Both objects yield a fricative [j], i.e. an I-headed glide. Thus, if both palatalised objects are I-headed, then the result of their lenition is not surprising. Second, if the contrast between palatalised velars and coronals is brought about by the presence of the element 'A' in the latter series, then this fact might shed some light on the absence of A-suppression in e.g. palatalised [r'] and [d'], as well as explaining why Irish has a two-way contrast with respect to the palatalisation of coronals. The answer is that objects headed by 'I' define palatalised velars. Let us now see if a similar assumption concerning the representation of coronals as I-A can be applied to the Polish facts.

4.4.4. Palatalisation of "(I-A) coronals" as decomposition (Polish).

First let us see if the proposal that Polish coronals are defined as (A.I) rather than (A) alone has any consequence on the distribution of high front vowels.⁷⁷

(62)

[sin]	<i>syn</i>	"son"	*[sin]
[tɨ]	<i>ty</i>	"you"	*[ti]
[dɨm]	<i>dym</i>	"smoke"	*[di]

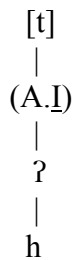
The forms above demonstrate that the non-palatalised coronals pattern with I-headed objects such as [tɨ], e.g. [tɨtam] *czytam* "I read", or [ɛ] e.g. [ɛts'e] *życie* "life", with respect to high front vowel distribution. Recall that the two Polish vowels [i] and [ɨ] differ in terms of distribution in C-V contexts in that [i] can follow a palatalised onset while [ɨ] occurs after non-palatalised ones and palatals e.g. *pytać* "ask", *dym* "smoke", *czytać* "read". With regard to the element status we found that [i] is represented as (I) and is preceded by an onset containing 'I' as an operator, while [ɨ] is defined by (I_) and may follow a I-headed object or one with no 'I' element. In a nutshell, we may say that the restrictions do not allow for a sequence of two elements 'I' enjoying the same status. In this respect, as shown above in ((62)) we may safely assume that the non-palatalised Polish coronals are defined by a (A.I) compound, and that these coronals will only differ from Irish non-palatalised coronals in the status of their elements.

Let us now consider the ability of Polish coronals to decompose. Just as with the Irish facts, we will accept as given that one way to palatalise such an object is to reverse the status of the elements 'I' and 'A'. Recall that in Irish this is the only way to represent the contrast between palatalised and non-palatalised coronals. Since 'A' does not license operators in Polish, the following types of coronals are made possible by the system (the tone element is ignored).

⁷⁷It should be borne in mind that Polish has a different parameter setting from Irish concerning the interaction of 'A' and 'I'.

(63) *coronal* (A.I)

a.



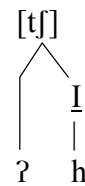
b.



c.



d.



Let us look at these structures from the point of view of A-I interaction. Structure ((63)a) defines coronal consonants which are I-headed in Polish. Thus, similarly to (I.A) systems like Irish, the palatalised reflex of a Polish coronal requires a switch in status, as only then can the element 'I' act independently and contribute its palatal quality. In Polish we seem to have three possibilities, which neatly dovetail with the three-way contrast with respect to palatalisation. In this respect structures ((63)a) and ((63)b) may be assumed to be identical in that only decomplexification of the elements involved takes place (without a switch in status). These objects, i.e. ((63)a) and ((63)b), pattern in the same way with respect to high front vowel distribution, e.g. [tɨ] "you" and [tsɨgan] "Gypsy". Of the remaining two structures, ((63)d) is headed by 'I', which is the only resonance element in such objects. On the other hand, ((63)c) illustrates the switch in status of the elements 'I' and 'A' to the effect that 'I' becomes the operator and 'A' is now the head. Let us take a closer look at this development.

It seems that the demotion of 'I' to the operator position is effected by the C-V harmony which operates in Polish. Recall that the element 'I' must not enjoy the same status in the onset and the following nucleus. This could be accounted for in terms of the OCP in that when an I-headed coronal is followed by an I-headed nucleus, then this element has to switch to the operator position in the onset. This, in turn, entails a break-up of the elements 'A' and 'I', as the element 'A' which took over the headship does not license operators. As a result of this break-up the elements form a contour structure which in an "h-ful" language like Polish yields the affricate [ts'] or the fricative [s']. Note that both objects are followed by [i].

(64)

a.



[ts'ixɔ] "quiet"

b.



[s'ito] "sieve"

There are a few quite gratifying consequences of defining Polish coronal consonants as a combination of 'I' and 'A'. First of all, this proposal grants the licit Polish compound (A.I) its place in the consonantal system, an outcome which is quite welcome for any model which strives to equate the vocalic and consonantal systems in terms of their phonological representation and behaviour. Thus using only (A) or nothing to define coronality would inevitably produce a serious gap between the two systems.

Another advantage of this approach is that it offers a fairly restricted model of coronal palatalisation - as decomposition - and allows for a direct correlation between palatalisation and affrication, for example, *[ti] > [ts'i]. On the other hand, the affrication of [k] to [tʃ] where a headless combination (?h.) becomes I-headed (?h.I) requires more study as what seems to be at issue here is the interaction between 'I' and consonantal (manner) elements.⁷⁸

Finally, one might wish to account for the lack of palatalisation of [r] in Polish, where [r] clearly contrasts with [ʒ] rather than with [r'] as in Irish.⁷⁹ Note that [r] should behave like [s], which has a palatalised counterpart [s'], as well as a palatal one [ʃ]. Given that [r] is defined as (A.I) there is no reason why it should not follow the pattern of other coronals. One possible way round the problem is to postulate that Polish [r] is in fact composed only of (A). Hence it can only contrast with the I-headed [ʒ].

In a sense this interpretation strengthens our proposal that (A.I) defines coronality. Note that a uniform representation of coronals as (A) would predict uniform effects of palatalisation when followed by an I-headed vowel. On the other hand, the prior presence of 'I' in coronals, except [r], ensures that no element is added to the coronal object, hence [r] is retained. Additionally, one must admit that an addition of 'I' to an A-headed object is not the

⁷⁸ See, for example, the discussion of this problem in Szigetvári (1996).

⁷⁹ Or Russian e.g. [r'eka] "river" vs. Polish [ʒeka].

most expected course of action in a language in which 'A' does not license operators.⁸⁰ This interpretation tallies also with the general assumption made here that palatalisation of coronals is a decompositional rather than compositional process.

Let us reiterate the effects of status switching within coronals in Irish and Polish and see how this phenomenon relates to the number of contrasts that these objects may exhibit. As argued earlier, in Irish, the switch is necessitated by the need to represent the contrast between palatalised and non-palatalised coronals. Recall that mere I-headedness is unavailable to Irish coronals as it defines palatalised velars (stipulation). The rest follows from the representation of Irish coronals, namely, from the possible ways of representing independent palatality.

In Polish, the switch is induced by the Consonant-Vowel harmony which disallows two elements of identical status within the Onset-Nucleus licensing domain. It should be stressed that both in Irish and in Polish the switch involves the emergence of an illicit combination, i.e. one which is not allowed by the existing parameters on element combination. In Polish, this phenomenon has clearly observable consequences, as we are dealing with an "h-ful" language, in that the impossibility of fusion is reflected in affrication. On the other hand, Irish, being an "h-less" language, does not exhibit such effects.

Thus the I-A representation of coronality imposes a very restricted view on palatalisation of such objects and provides us with a direct account of affrication which is understood as an interaction between the licensing constraints defining licit element combinations and other conditions on phonological structure in "h-ful" languages.

As far as the English system is concerned one thing is clear: neither palatalisation nor C-V harmony plays such a prominent role in the language, which has certain consequences. What we would expect is that neither of the motives given above for switching is available to English phonology. Therefore, the three-way contrast, e.g. [s]-[s']-[ʃ], predictably, will not be found in this language. The question now is how to represent the English coronal objects as regards A-I interaction.

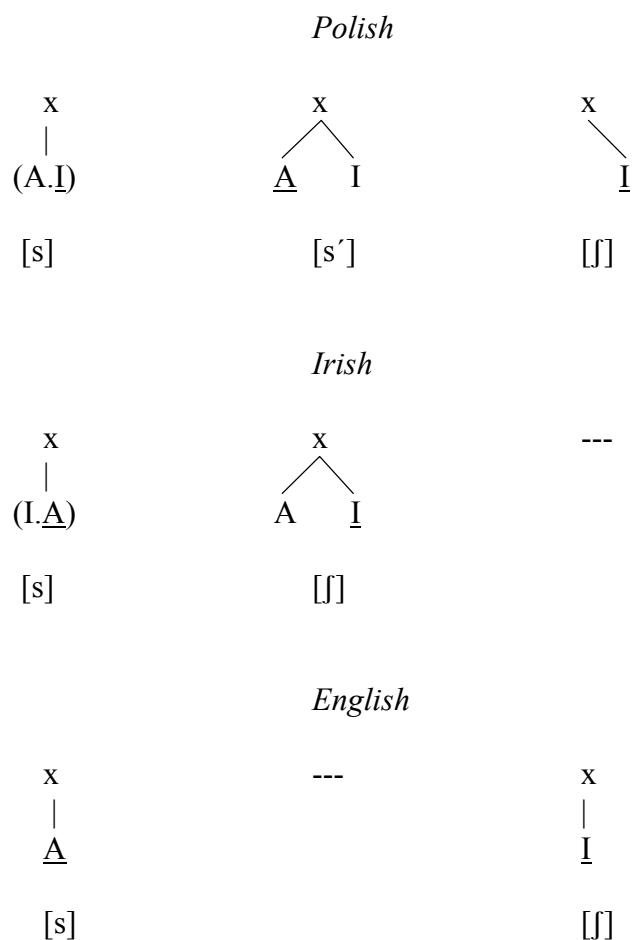
One might assume that English is, in fact, similar to Polish except that the absence of C-V restrictions in the former does not produce an object which would correspond to Polish

⁸⁰One might exploit this interpretation and propose that the Russian palatalisation of [r] is in fact due to the presence of the element 'I' in that object.

[s']. However, the marginal emergence of the English affricates [ts] and [dz] might suggest that the contrast between [t] and [tʃ] or [s] and [ʃ] is represented by (A) in a non-palatalised series and (I) in the palatal one. This would agree with our account of the Polish [r]-[ʒ] contrast as opposed to Russian [r]-[rʲ]-[ʒ].

Below we illustrate the three systems in terms of I-A relations. It will be recalled that such consonantal systems are additionally defined by the "h-parameter". Since the structures of affricates are similar to those of fricatives in our analysis, we will use the latter to illustrate the types of objects that the structures represent.

(65)



In this model, affrication of coronals is conditioned in two basic ways: a) the system must have palatalisation effects due to C-V interaction which enforce element switching and b) the obstruents must have 'h'. It seems that Polish fulfils these conditions with a vengeance. Irish does not fulfil the second condition and is therefore deprived of affricates. English, on the

other hand, having very little interaction between consonants and vowels, possesses a rather scanty system of affricates.

4.4.5. Summary

To conclude, in this chapter we looked at the phonological behaviour of vocalic elements I-U-A in consonants. The central notion that was emphasised in the analysis of the Irish consonantal system was the headedness of resonance elements. The first case which suggested that these elements exhibit similar properties was that of the distribution of Irish [r] with respect to palatalisation. We claimed that the representation of this consonant as the headed element 'A' accounts for the manner of articulation of Irish [r] as a fricative, as well as for its resistance to palatalisation. The latter phenomenon is correlated with the behaviour of "opaque" (A-headed) vowels in Munster Irish with respect to palatalisation.

Additionally, we extended the observation that the headedness of 'A' corresponds to spirantisation to other fricatives (e.g. [v] = (U)). This, together with the parameter on the occurrence of the noise element ('h'), allows us to capture the absence of voice contrasts among the class of Irish fricatives. The 'h-parameter' may additionally be used in accounting for the absence of affricates in a given linguistic system. Interaction between 'h'-parameter and headedness has the potential of clarifying such historical processes as rhotacism and the shift [w]>[v] in e.g. Slavic.

Finally, we investigated the interaction of the elements 'I' and 'A' in Irish and Polish and proposed tentative representations for coronal consonants in the two languages which involve the elements 'I' and 'A'. The actual combination of the two elements is dependent on the parameter settings (licensing constraints) present in a given language. Therefore the representation of Polish coronals is I-headed, i.e. (A.I), while in Irish it is A-headed (I.A). Such a representation of coronal consonants in general imposes a restricted view on the palatalisation of these objects. We propose that palatalisation of coronal consonants involves decomposition of the compound I-A into a contour structure.

Although the proposals concerning the representation of coronals are of tentative nature, they clearly show that the assumption concerning the uniform behaviour of elements in vocalic and consonantal systems may be fully borne out.

Conclusions

The presence of resonance elements in the representation of vowels and consonants is one of the central claims of Government Phonology. This suggests the possibility that if we are dealing with the same objects (I-U-A), which only differ with respect to their syllabic position, i.e. whether they are syllabified in the onset or the nucleus, then we should expect the same type of phonological phenomena in the vocalic as well as the consonantal system. This work demonstrates that the general expectations are by and large borne out, and explores the consequences of the uniform representation for vowels and consonants.

In order to test the initial intuitions the study begins with an analysis of the vocalic system by looking at alternations effected by the consonant-vowel interaction. It turned out that what we are dealing with is an interaction between the vocalic elements I-U-A which are spread into nuclei, where the spreading proceeds not so much from consonants as from places which we defined as sharing domains (onset-nucleus relations). Given the existence of element spreading into nuclei from the right-hand side sharing domain as well as the fact that these nuclei share their own element 'I' or 'U' with the preceding onset, a wide range of phonetic realisations are exhibited which, paradoxically, define a very small number of contrasts.

An important factor in understanding the nature of element interactions in Irish was the establishment of parameters on element combinability in Irish, i.e. licensing constraints. This in turn was connected with the establishment of the status of elements in nuclei with respect to their interaction with elements which spread from the right. The head / operator division allows us not only to formulate the licensing constraints but also to account for the "immune" short vowels which we define as headed. The most important parameter on element combination in Irish is that the element 'I' does not license operators. This means that, for instance, the representation of the Irish vowel [e] must be A-headed (I.A) rather than I-headed *(A.I). This parameter allows us to account for such phenomena as A-suppression,

i.e. the impossibility of an I-headed nucleus to license the element 'A' as per the licensing constraint mentioned above.

It was encouraging to discover that the same pattern of behaviour is found in the system of long vowels, which, in the end, led us to propose that Irish long vowels are not subsumed under a branching nucleus, but rather form a sequence of nuclei with a fused melody. The immunity of most such vowels to "consonant-vowel" interaction may be ascribed either to their headed nature, parallel to immune short vowels, or to certain structural devices. Namely, a sequence of nuclei which is separated by a positionless onset may be viewed as a structure which is more resistant to phonological processing. However, this question is left open to further investigation. It must be emphasised though that the fact that Irish long vowels are not subsumed under a branching nucleus weakens the empirical power of binarity which is one of the central claims in Government Phonology.

Finally, it was necessary to test the established parameters with respect to the resonance elements present in consonants. Since the main emphasis was put on the interaction between 'I' and 'A' in the Irish vocalic system, mainly due to the less spectacular nature of the effects of U-spreading, we concentrated on the possibility that the grammaticality of the compound (I.A) has its counterpart in the representation of certain consonants. By analysing the behaviour of Munster [s] and [r] we established that coronal consonants may be defined as a headed (A). This assumption proved particularly useful in the analysis of the distribution of [r]'s in Munster with respect to palatalisation. Here too, the head / operator division allowed us to account for the resistance of [r] to palatalisation and especially for the different phonetic realisations of [r] as a trill or a flap depending on whether it was headed or not.

Additionally, the head / operator distinction helped us to establish the phonological representation of Irish fricatives and to propose a parameter governing the occurrence of the noise element 'h' in linguistic systems. This parameter may account for the absence of distinctive voicing among fricatives as well as for the presence or absence of affricates in a given system. Thus, for instance, Irish is an 'h-less' language, hence it will have no distinctive voicing among the class of fricatives, and will not have affricates in the system. On the other hand, Polish, which is an 'h-full' language, exhibits both features. The 'h-parameter' has to be further investigated as it offers some promising possibilities. One possible prediction that this

parameter entails is the unification of such seemingly unrelated historical processes as the rhotacism of [s] to [r] and the voicing of [s] to [z] as instantiations of a single process, namely, the delinking of the tone element 'H'. In addition to that, by referring to headedness as a possible way of defining friction allows for a better understanding of such historical processes as the shift [w]>[v] found in e.g. Slavic.

However, the proposal that, for example, Irish and Polish are differentiated by the occurrence of 'h' (the noise element) does not explain why Polish coronals exhibit a three-way contrast with respect to palatalisation while Irish and English possess only a two-way contrast in this respect. What is more, the definition of Irish coronals as (A) does not explain why the licit combination (I.A) is not found in the consonantal system of that language. Similarly, although the three-way contrast in Polish could easily be accounted for by employing (A) to mark coronality, the licit (A.I) compound is still missing (note that the parameters on I-A interaction are different in the two languages). This led us to the conclusion that perhaps coronality should in fact be defined as I-A, while the actual type of relation, i.e. I-headed or A-headed, is language specific.

Such a view of the representation of coronality in general imposes restrictions on what a palatalised coronal may be. Specifically, if the presence of 'I' in coronals does not entail phonetic palatalisation, the only possible way to represent palatalisation of coronals is to decompose I-A so that the element 'I' can act independently, be it as the head or the operator. It is interesting that some sort of decomposition is also found in the vocalic system of Irish which is the result of the interaction between vocalic elements in the (O)nset-(N)ucleus licensing domain. Similar restrictions involving (O-N) have been observed in the distribution of Polish high front vowels, which depends on the status of the element 'I' in the preceding onset.

Finally, we proposed tentative representations for Irish, Polish and English coronals which appear to reflect their distribution with respect to the decomposition of I-A. As we showed, this decomposition may sometimes result in an illicit combination, i.e. one in which the status of the elements I-A does not correspond to the parameter settings in these languages. We also demonstrated that this decomposition is highly conditioned by the Onset-Nucleus interaction in the case of Polish and the necessity to represent the palatalised / non-

palatalised contrast in Irish, while no such phenomenon occurs in English as both types of conditioning are absent from this language.

A broader analysis of coronality, especially in the context of other proposals such as those involving under- or non-specification of this class to capture its special status, was not possible within the format of this work and has to be reserved for future study. However, in the light of the analysis presented in this book, it seems prudent to assume that there is no such thing as a uniform or universal representation of coronality. As we saw above, it can be represented as (A.I) in Polish, (I.A) in Irish and just (A) in English. Additionally, we may expect a degree of variation within one system, for example, Polish [r] seems to have only (A) while the coronal nasal [n], which participates in place assimilation, is probably best understood as non-specified for place.

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